



INTERNATIONAL SCIENTIFIC DAYS

Efficient, sustainable and resilient agriculture
and food systems – the interface of science,
politics and practice

Conference Proceedings

May 11 – 13, 2022
Nitra, Slovak Republic

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Slovak University of Agriculture in Nitra
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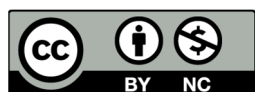
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Many thanks to all partners which have contributed to this event.

Foreword

Dear colleagues and friends,

I am pleased to introduce to you a collection of scientific papers presented during the international scientific conference “International Scientific Days 2022 (ISD 2022),” organized by the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra on May 11 - 13, 2022.

The main topic of International Scientific Days 2022 “Efficient, Sustainable and Resilient Agriculture and Food Systems – The Interface of Science, Politics and Practice” concerned the very current issue of sustainable agriculture and food systems, which has been resonating at the local, regional and global levels for a long time. However, its urgency has never been greater due to current climate, socio-economic, geopolitical conditions and crisis development crossing borders of nations and regions.

The Farm to Fork Strategy is at the heart of the European Green Deal aiming to make food systems fair, healthy and environmentally friendly. In March 2022, the European Commission adopted a package of measures to address short-term concerns in relation to agri-food markets while maintaining the longer-term plans to make the EU food system sustainable. In response to the impacts of the war in Ukraine on the EU agri-food markets, the implementation of short-term mitigation measures is also in place.

Dear readers,

I hope that the collection of conference research papers in proceedings will bring you inspiring and valuable reading, sources for citation and ideas for further research and new academic collaboration.

Dr. h. c. prof. Dr. Ing. Elena Horská

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SESSION 1

**THE AGRIFOOD POLICY: ECONOMICS, MANAGEMENT, TRADE,
FOREIGN INVESTMENT, INDUSTRIAL POLICIES AND
LOGISTICS**

**(Supported by project: Assessing the impacts of climate change on the agricultural
sector and the possibilities for adaptation
VEGA 1/0808/21)**

Assessment of Investment Attractiveness of Agro-Industrial Production

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Abstract

The relevance of the research topic is due to the fact that in modern economic conditions the issue of attracting domestic and foreign investment, as well as their rational use becomes especially relevant. The current state of market transformations in Ukraine requires such conditions that would guarantee economic security to investors and would ensure the innovative development of the domestic economy. Significant investment resources are needed for the efficient functioning of agricultural enterprises and the production of competitive products, which will make it possible to resolve the issue of updating the material and technical base. In addition, an assessment of export potential as a prerequisite for the growth of investment potential. The purpose of the article is to reveal scientific approaches to determining the investment attractiveness of agricultural enterprises. The study used a variety of scientific methods based on the evaluation of statistical information, as well as combined techniques based on expert statistical calculations. The study covers all major processes taking place in Ukraine, the agricultural sector, regions and enterprises, which provides a systematic view of the business entity and allows to identify strengths and weaknesses, in order to increase the investment attractiveness of agricultural enterprises, as well as to create a strategy their development on this basis.

Key words: agriculture, efficiency, investment attractiveness, investments,

JEL Classification: G11, Q14, Q17

1. Introduction

Agriculture occupies a leading place in the development of Ukraine's economy, so it is important to increase the efficiency of agricultural enterprises. Investments play a significant role in resolving this issue. In modern economic conditions, the issue of attracting domestic and foreign investment, as well as their rational use becomes especially relevant. The current state of the country's economy requires conditions that would guarantee economic security to investors and ensure the innovative development of the domestic economy. Significant investment resources are needed for the efficient functioning of agricultural enterprises and the production of competitive products, which will make it possible to resolve the issue of updating the material and technical base.

The Ukrainian agricultural sector with production potential that far exceeds the needs of the domestic market is a link that, on the one hand, can become a way of developing the national economy and its effective integration into the world economic space, and on the other – increasing the income of the rural population. , which accounts for more than a third of the country's population, can have a multiplier effect on the development of other sectors of the national economy.

The importance of agriculture for Ukraine is obvious, because the agro-industrial complex is one of the main sectors of the domestic economy. The share of agriculture in Ukraine's GDP is more than 12%, and exports of agricultural products in 2019 accounted for more than 40%

of all exports of Ukraine. In addition, a significant share of state revenues is generated due to tax revenues from the agro-industrial complex. And although the state of the agro-industrial complex is relatively better than other sectors of the Ukrainian economy, Ukrainian farmers today face serious challenges related to both the economic and political crises and the world market.

Effective investment promotes the development of both the individual enterprise and the state as a whole. Today, this quantitative issue concerns the financial strategy of building an information technology infrastructure in the country.

In addition, the effective attraction of investment contributes to the economic development of the country, as it is the main source of job creation and the main factor of economic growth of enterprises. The increase in investment implies an increase in gross domestic product and an increase in national income.

In the economic literature there is no single approach to the concept of investment attractiveness in general and the agricultural sector in particular, and does not identify the main components that have a direct impact on it.

Rusnak N.O reduces the definition of investment attractiveness of objects mainly to heuristic methods associated with the ranking of the studied objects on the basis of the assessment of specialists. Hence, investment attractiveness refers to the comparison of several objects in order to determine the best, average, worst [13]. Gaidutsky A.P. has a similar opinion, understanding the investment attractiveness of the enterprise as a set of characteristics that allows a potential investor to assess how one or another investment object is more attractive than others for investing available funds [4, p.83].

Instead, Napadovska IV believes that investment attractiveness is a systemic set of potential investment opportunities to obtain economic benefits in the future as a result of past economic activity of a potential investment object, subjectively assessed by the investor [9, p.57]. This approach does not include comparing the investor's goals with their capabilities without risky implementation, and does not take into account the degree of readiness of the investor to assume this risk.

Zadorozhna Ya. Ye., Dyadechko L.P. believe that investment attractiveness should be defined as a set of various factors, the list and weight of which may vary depending on: the goals of investors; production and technical features of the enterprise in which funds are invested; economic development of the enterprise in the past, at present, as well as expected in the future economic development [16]. This approach, in our opinion, takes into account a very important point - the requirements of investors, ensuring which is an important condition for high investment attractiveness.

According to Koyuda V.O., the investment attractiveness of the enterprise is a set of characteristics of its financial, economic and managerial activities, prospects for development and opportunities to attract investment resources [8, p.166]. This approach provides an unambiguous possibility of formalizing evaluation methods, which ignores the psychological aspect of this problem.

The author defines investment attractiveness as a set of conditions (economic, legal, political, social, etc.), which are created by the state for all business entities, as well as foreign investors, for profitable investment in order to develop the national economy in general and enterprises in particular [5,14].

In our opinion, the investment attractiveness of the enterprise is an integral characteristic of the enterprise as a future object of investment, taking into account a set of external and internal factors, prospects for development and the possibility of attracting investment resources.

2. Data and Methods

The results of the analysis of investment attractiveness of countries, presented by well-known investment, intermediary and consulting companies and rating agencies, as well as large corporations, stock exchanges and financial groups and business magazines representing their interests, are very popular today. The most famous are estimates of investment attractiveness and individual countries from World Bank, Institutional Investor, Euromoney, Business Environment Risk Index (BERI), Moody's Investor Service, Thane-Waters, Kotler-Heisler methodologies, The Economist, Fortune, Euromoney and others [1,3]. However, these estimates, as a rule, provide a limited, mostly one-sided characterization of the country's investment attractiveness, that is, do not provide an integrated approach.

In modern practice the following methods of assessing the investment attractiveness of enterprises: the method of rating assessment of the enterprise on the basis of financial statements, which provides an assessment of the financial condition of the enterprise, which assesses the solvency, financial stability, profitability and business activity of the enterprise; method of integrated assessment of investment attractiveness, which involved determine the integrate indicator of assessing the investment attractiveness of the enterprise, which includes: integrated indicator of property status, financial stability, profitability, business activity, liquidity of assets, as well as market activity of the invested object.

Most of the research conducted in this area makes it impossible to fully consider the main existing problems that need to be overcome to increase investment attractiveness, do not answer the question of what should be the ways to grow it, and what needs to be done. However, despite the significant number of scientific papers in this area, the question of assessing the investment attractiveness of the agricultural sector of the economy remains unsolved, which determines the relevance and necessity of further research.

3. Results and Discussion

The strategy of development of the agricultural sector of Ukraine is aimed at forming an effective socially oriented sector of the economy, able to meet the needs of the domestic market and ensure a leading position in the world market of agricultural products and food based on consolidating its diversity, that at this stage of development requires the priority of forming different categories of farms, the owners of which live in rural areas, combine the right to land with work on it, as well as their own economic interests with social responsibility to the community [5,6].

The investment attractiveness of the agricultural sector of the economy involves ensuring the availability of such characteristics that determine the relevance of the investment issue with the appropriate prospect of their return and increase - is a process that requires specific management influence.

Ukraine has a strong, industrially developed production potential, developed infrastructure, favorable geographical location. Monetary reform, stabilization of the national currency and controllability of inflationary processes had a positive impact. According to expert estimates, Ukraine is among the top ten European countries in terms of the level of economic potential, and is in the second hundred countries in the world in terms of the efficiency of its use.

It is the investment of the agricultural sector that will ensure the introduction of the most modern environmentally friendly technologies and bioresources for livestock, crop production and processing. This process will significantly increase the investment attractiveness of agro-industrial enterprises, which will contribute to its further development. But so far most agricultural enterprises remain economically backward due to low demand for agricultural products, low purchase prices, unformed market infrastructure, reluctance of the population to work in agriculture, high interest rates, low support for agricultural production by the state. All these factors have become even more complicated in recent years due to the global financial crisis.

Studies show that the main components of investment attractiveness of the agricultural sector of the economy are natural resources, organizational support, infrastructure, logistics and more (Fig. 1).

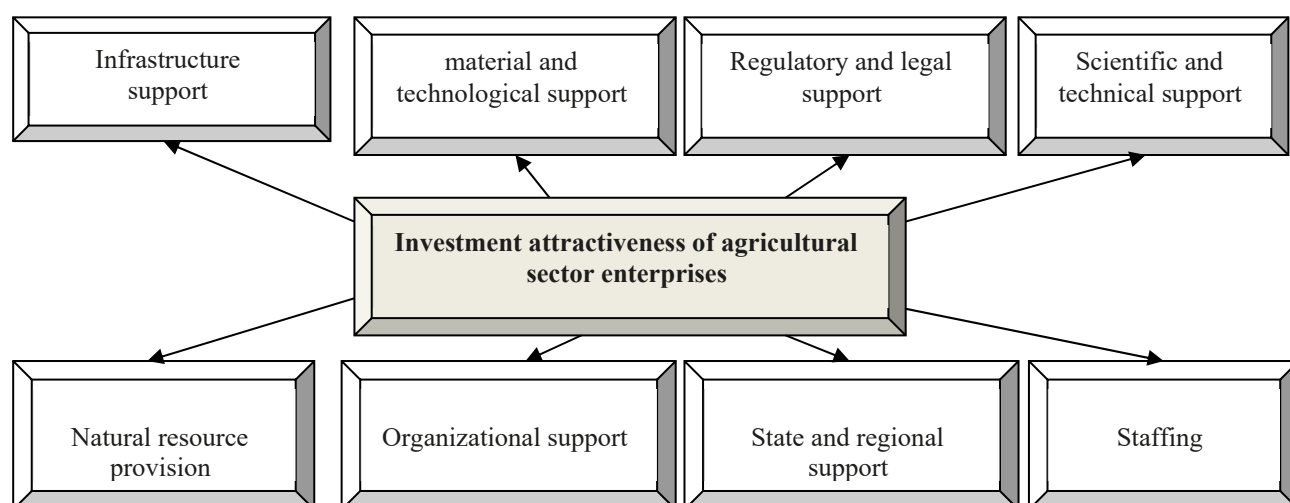


Figure 1: Components that affect the investment attractiveness of enterprises in the agricultural sector of Ukraine

Source: built by the author according to [15]

The problem of increasing investment attractiveness is particularly acute in the agricultural sector, which lags far behind in technical and technological development, has a number of features that necessitate the acceleration of investment processes: insufficient capacity of the domestic market; high tax pressure on business and its excessive administration; low competitiveness of Ukrainian goods on world markets, which makes it unprofitable to invest in their production; insufficient integration into the global economy; lack of consistent investment policy of the state and appropriate mechanisms for its implementation at the local level; lack of reliable and operational information, which reduces the effectiveness of cooperation between market participants; inefficient activity of local authorities, largely caused by the lack of incentives and mechanisms to attract investment in the real economy [2, p.40; 12].

Over the last decade, the agricultural sector of Ukraine has become extremely important for the development of Ukraine's economy, which is mainly due to the growth of agricultural production and exports. Stably high indicators of agricultural production allow not only to fully meet the domestic needs of the country, but also to expand the export potential of the industry (Fig. 2).

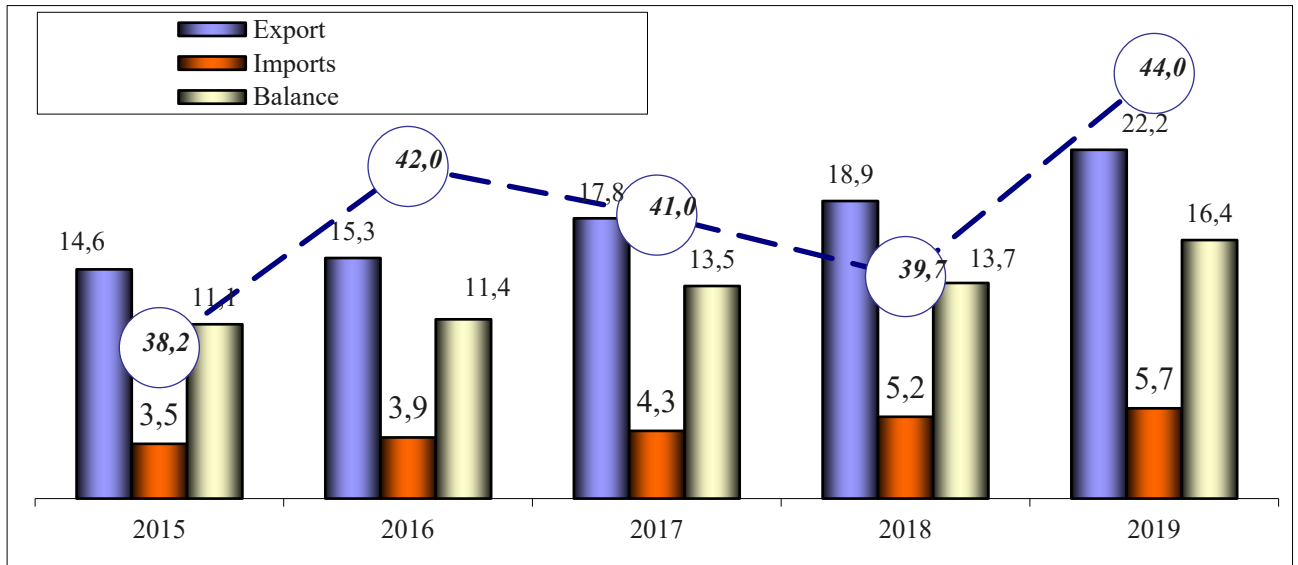


Figure 2: Dynamics of export-import of agri-food products, billion dollars USA

Source: built by the author according to [10]

The dynamics of agricultural exports mainly corresponds to the trends of total exports of Ukraine. Exports of agricultural products in 2019 increased by more than 50% (from 14.6 to 22.2 billion US dollars). It should be noted that during the study period there was an increase in the share of exports of agri-food products in total exports of Ukraine. Thus, in 2019 this figure was 44.3%, which compared to 2015 increased by 6.1%. Despite the positive trends in the industry, there are some negative factors. In particular, during the analyzed period, imports of agri-food products increased from \$ 3.5 billion. USA in 2015 up to \$ 5.7 billion. USA in 2019 However, it is worth noting that the trace remains positive and in 2019 it amounted to 16.4 billion dollars. US, despite the fact that in 2015 imports were lower, the positive balance was only 11.1 billion dollars. USA.

Investment resources are the most scarce for the company. They determine the processes of innovative development, product competitiveness, its quality. Also, these resources affect the external environment of the enterprise by increasing the level of its reputation, increasing the level of employment and living standards.

The process of formation of investment resources occurs continuously in the form of income from the main production activity, from the receipt of borrowed funds and from non-production activities. Specifically defined amounts of funds that will be directed to the development of the enterprise as investment resources, largely depend on the cost of their involvement, structure and size of capital of the enterprise and are determined in the strategic planning of the company.

Stimulating investment processes in agriculture is one of the priority tasks, which requires solving a number of problems at all levels of management. The investment strategy of Ukraine's development should be systematically directed to agricultural production, the productive functioning of which will ensure the country's food security, public health, effective development of processing industries, machine building for the agricultural sector of the economy, etc.

Capital investment is the basis of expanded production in enterprises, the restructuring of social production and the balanced development of sectors of the economy. Insufficient amount of such investments in the agricultural sector causes the impossibility of the processes of reproduction and renewal of fixed assets of enterprises.

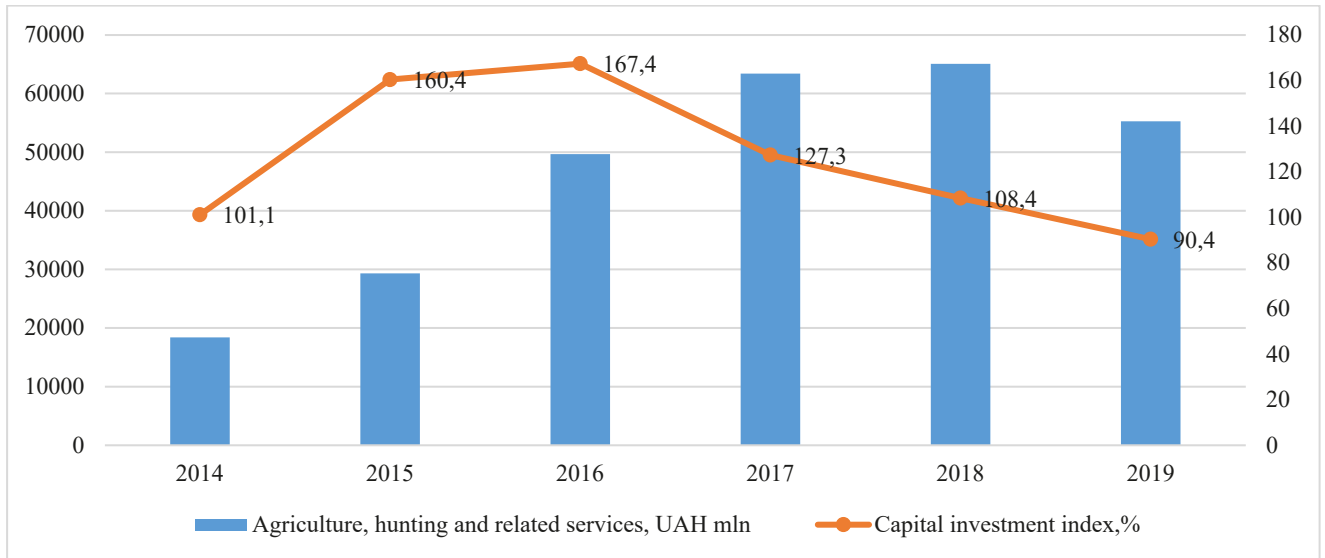


Figure 3: Dynamics of capital investments in agriculture of Ukraine, UAH million

Source: built by the author according to [10]

The dynamics of capital investment in agriculture in Ukraine indicates a sharp increase in their volume in 2017-2018, but in 2019 there was a slight decrease. It should be noted that over the past five years, capital investment has increased 1.9 times and amounted to UAH 55,254 million. It should be noted that the share of capital investments in their total amount also increased. During the economic crisis in the agricultural sector of the economy, investment activity deteriorates significantly, as evidenced by capital investment indices, which reflects their changes. It should be noted that despite the growth of capital investment, there is a heterogeneity of the capital investment index. In particular, there is a rapid growth of the index in 2015 - 160.4%, but in 2019 it decreased significantly - 99.4%. (Fig.3).

The development of capital investment in agriculture is significantly uneven. The best direction of development in agriculture for a long time is crop production, where the share of total investment in the agricultural sector of the economy in 2019 amounted to 73.2% of all investments in the industry.

The situation is somewhat different when it comes to investing in the development of animal husbandry. Analyzing this period, the development of capital investment is gradually increasing and in 2019 its structure was 17.5%. Unfortunately, this industry is becoming less attractive to investors, due to its unprofitability. The reasons for the decrease in investment in this industry is that the premises are already morally and physically worn out, there is a rapid decrease in livestock and decreased production of this industry.

Analysis of the dynamics of investments in fixed assets of the agro-industrial complex in Ukraine shows a positive process of increasing the share of investments in gross domestic product until 2018, when their share was 8.94%, but in 2019 there is a significant decrease to 1.4%. A similar trend is observed with regard to the share of investments in agriculture in their total volume. Thus, the highest figure was in 2017 and amounted to 14.14%, while in 2019 it decreased to 9.5%. (Fig. 4).

It should be noted that the main source of financing capital investments in the agricultural sector for a long time are the own funds of enterprises. Foreign investors in agriculture invest a relatively small share of investment. Every year, foreign investors invest less and less in our country. There are many factors that affect this. After all, any investor is looking for a country with a stable political and economic situation.

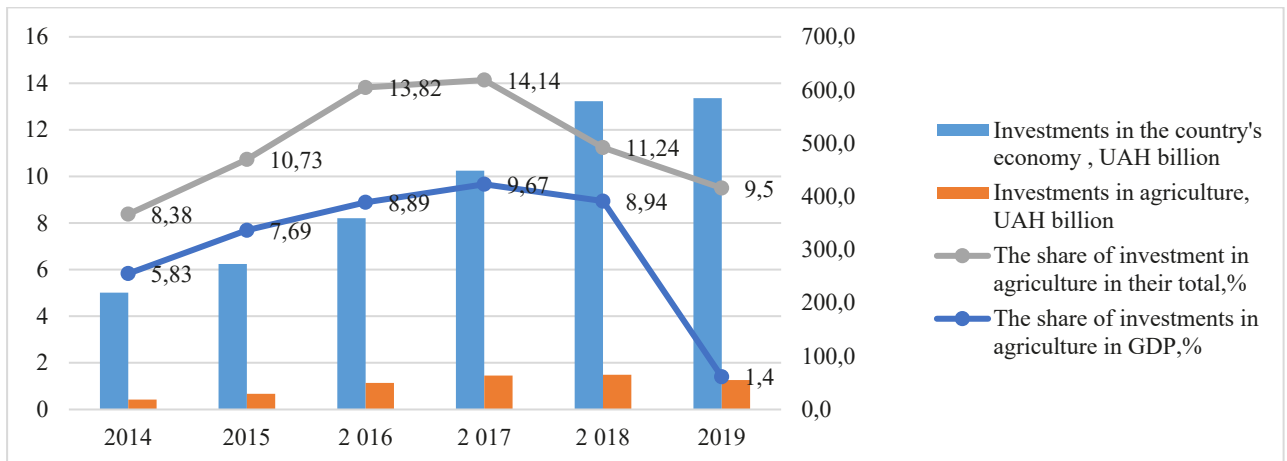


Figure 4. The share of investment in agriculture in their total volume

Source: built by the author according to [10]

Therefore, foreign investors use the method of standardization of indicators to assess the investment attractiveness of agro-industrial complex. To calculate it, use the following indicators: the growth rate of agricultural production as a percentage; the value of gross agricultural output; the amount of net profit or loss of agricultural enterprises in UAH million for the last two years.

The insufficient level of foreign investment in agriculture is primarily affected by the unstable political and economic situation in Ukraine [7, p. 12–18]. Also, the negative factors influencing the investment climate of Ukraine include: low level of purchasing power; unforeseen, with drastic changes in the regulatory framework; a large share of the shadow economy in the market, which acts as a factor in the weak competitiveness of non-shadow economy products; lack of government action in the areas of regional and state policy; high level of corruption, etc. [11; 17, p. 59–61]. A positive point for investors is the low level of taxes: the share of taxes in the structure of value added of the agricultural sector in Ukraine is three to four times less than in other European countries.

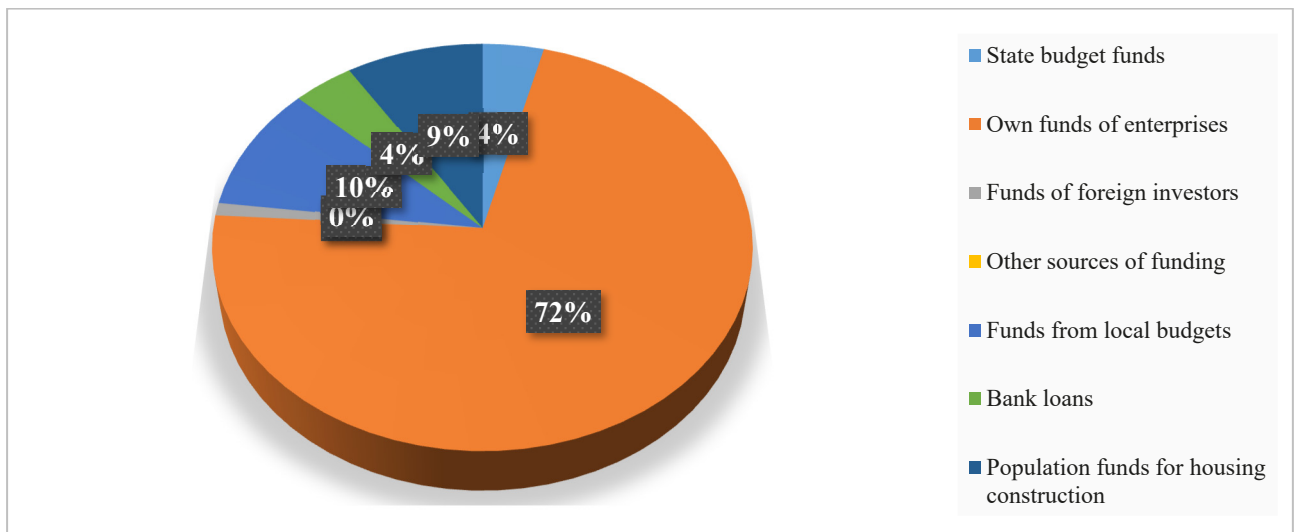


Figure 5: Structure of sources of financing of investments in agricultural production of Ukraine in 2019, %

Source: built by the author according to [10]

The structure of sources of financing of the agricultural sector in 2019 clearly shows that the largest share is occupied by own funds of enterprises and organizations of the country, their share is 72% of all invested funds. Foreign investors invest the least - 1% (Fig. 5).

Objectively, a radical increase in the investment resources of the industry depends on active measures to ensure business efficiency. Finding mechanisms to increase the amount of investment resources will really contribute to the development of business processes at the sectoral and regional levels and increase the efficiency of enterprises.

As for the role of foreign direct investment, it is important that they not only allow to some extent to compensate for the deficit of national funds, but also are a leader in modern production and management technologies, open the way to world markets for goods, capital and technology.

In addition, the inflow of effective foreign direct investment for the needs of the Ukrainian economy is an important qualitative indicator of the international attractiveness of our country.

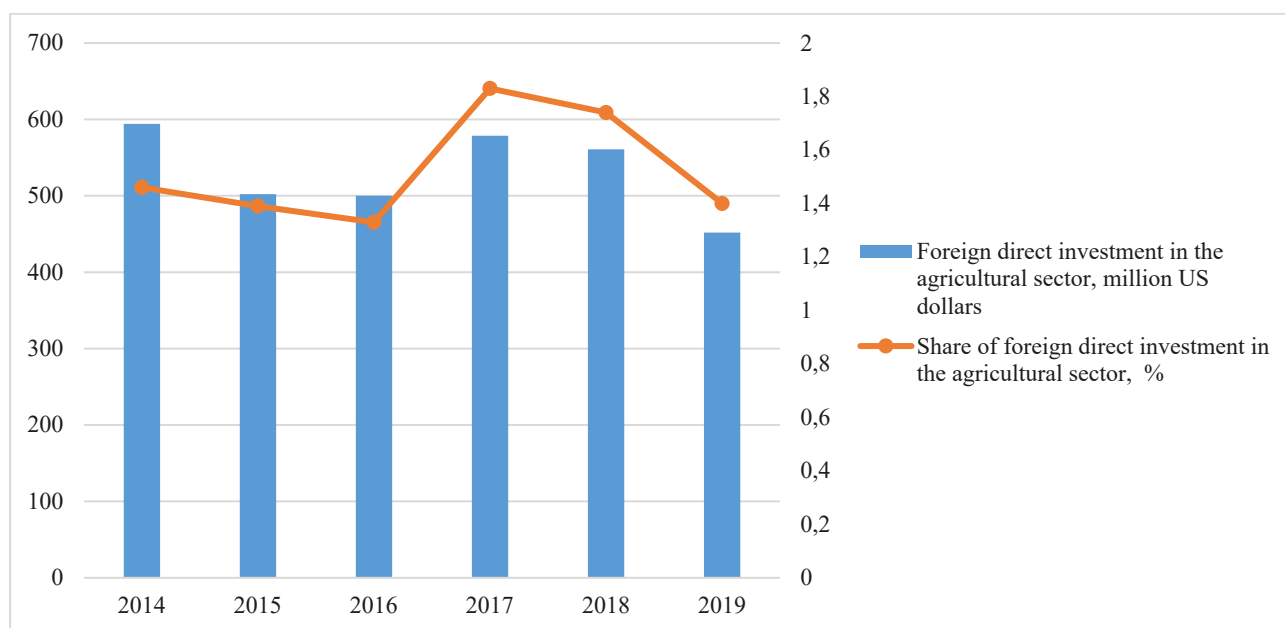


Figure 6: Dynamics of foreign direct investment in agriculture of Ukraine

Source: built by the author according to [9]

Analysis of the volume of foreign direct investment in agriculture shows that during the analyzed period as a whole there was a decrease of 24% and in 2019 amounted to 451.9 million dollars. Given the current dynamics, the share of foreign direct investment in the agricultural sector of the economy has decreased significantly and in 2019 amounted to only 1.4%. The largest investors in Ukraine in terms of investment in 2016 were EU countries, more than 50%. It should be noted that in recent years the agricultural sector of Ukraine's economy has become more attractive to foreign investors (Fig. 6).

Constraining factors in attracting foreign investment in the agricultural sector of the economy, in combination with the above macroeconomic, are the lack of a transparent land market, underdeveloped logistics and production infrastructure, low level of professionalism of entrepreneurs, lack of attractive investment projects.

Attracting foreign capital should be carried out on the basis of regional programs, which should identify priority areas for foreign capital inflows and measures to stimulate investment inflows. In our opinion, the best option would be when the program of attracting foreign investment is associated with a comprehensive program of regional development. This long-term program can identify both priority industries and individual companies for investment. It should now be noted that foreign investors are interested in industries that provide them with a quick payback and maximum profit.

4. Conclusion

A necessary prerequisite for making investment decisions is the analysis of investment attractiveness, which is important for the external investor, as the probability of making wrong investment decisions is quite high. Based on the analysis of investment attractiveness, you can prove to the investor the feasibility of investing in a particular country, region, industry and enterprise.

The analysis of the investment attractiveness of the agricultural sector of Ukraine's economy allowed us to conclude that during the study period there were significant fluctuations and reductions in recent years, due to the economic and political situation in the country.

The main problems of investment attractiveness of the agricultural sector are the instability and inconsistency of legislation, which does not contribute to the growth of investment and business activity; insufficient development of the infrastructure network for investment activities; territorial disparities in the inflow of investment resources. The main factors that increase the investment attractiveness of agriculture are the creation of a stable legal framework; ensuring adequate financing of priority sectors for the development of Ukraine's economy, namely the agricultural sector of the economy; improvement and simplification of the country's tax system, the formation of an investment risk insurance system.

Stimulating investment processes in the agricultural sector is one of the priority tasks, which requires solving a number of problems at all levels of management. The investment strategy of Ukraine's development should be aimed at the development of agricultural production, the productive functioning of which will ensure the food security of the country and others. It is necessary to develop a model of investment support for the agricultural sector, which would be based on the maximum possible investment in this sector in order to create conditions for the priority development of industries with the highest added value.

Currently, there are a need to justify and develop measures to increase investment attractiveness in order to implement food security of the state. Based on this requirement, the country needs to create economic, organizational, financial and legal conditions that will allow domestic agricultural producers to carry out expanded reproduction both from their own resources and through attracted investments. International experience showed that the world's leading countries, despite on the relatively low investment attractiveness of agricultural production, invest in this sector significant amounts of public investment.

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References

- [1] Abuselidze G. (2019). Modern challenges of monetary policy strategies: inflation and devaluation influence on economic development of the country. *Academy of Strategic Management journal*, 18(4), 1-10
- [2] Davydenko N., Skrypnyk H., Titenko Z. (2019). Investment attractiveness of agricultural enterprises. *Economic Science for Rural Development Conference Proceedings*, 52, 242-247.

- [3] Drych A. (2017). The main ways to achieve investment attractiveness of Ukraine. *Bulletin of the NBU*, 4, 40-41.
- [4] Gaidutsky A.P. (2014). Methodological aspects of investment attractiveness of the economy. *Regional economy*, 4, 81-86
- [5] Kaminskyi A., Nehrey M. Komar M. (2020) Complex risk analysis of investing in agriculture ETFs. *International Journal of Industrial Engineering and Production Research* *this link is disabled*, 31(4), 579–586
- [6] Kaminskyi, A., Nehrey, M., Rizun, N. (2020) The impact of COVID-induced shock on the risk-return correspondence of agricultural. *CEUR Workshop Proceedings* *this link is disabled*, 2713, 204–218
- [7] Korovko O.A. (2018). Foreign investment in the economy of Ukraine. *Business newspaper*, 5 (120), 12–18
- [8] Koyuda V.O., Lepeyko T.I., Koyuda O.P. (2018) *Fundamentals of investment management*: K. : Condor
- [9] Napadovska I.V. (2015) Theoretical and methodological aspects of the study of investment attractiveness of Ukraine. *Bulletin DonDuet*, 4 (28), 55-61.
- [10] Official site of the State Statistics Service of Ukraine (2020), Retrieved from <http://ukrstat.gov.ua> (Accessed 30 April 2020).
- [11] Poltorak, A.S. (2015) Assessment of Ukrainian food security state within the system of its economic security. *Actual Problems of Economics*, 173(11), 120–126
- [12] Poltorak, A., Volosyuk, Y. (2016) Tax risks estimation in the system of enterprises economic security. *Economic Annals-XXI*, 158(3-4), 35–38
- [13] Rusnak N.O., Rusnak V.O. (2013) Competitive consciousness. *Competition*, 1, 56–57
- [14] Slobodianyuk, A., Abuselidze, G. (2021). Influence of speculative operations on the investment capital: An empirical analysis of capital markets. *E3S Web of Conferences* 234:00001. <https://doi.org/10.1051/e3sconf/202123400084>
- [15] Strategy for the development of the agricultural sector of the economy of Ukraine for the period up to 2020 (2020). Retrieved from: <http://minagro.gov.ua/node/7644>.
- [16] Zadorozhnaya Y.E., Dyadachko L.P. (2017) Increasing the investment attractiveness of entrepreneurship as a direction of attracting investment resources. *Investments: practice and experience*, 2, 32-35.
- [17] Zharun O.V. (2018) Factors of activation of investment climate in agro-industrial complex. *Materials All-Ukr. Science. conf. of young scientists Uman*, 59–61.

Determinants of corn market development in Ukraine in the context of global challenges

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Abstract

The article identifies the main trends and factors influencing the formation of supply and demand in the corn grain market in Ukraine. Based on the analysis of the average monthly world spot price of corn (USA, Gulf of Mexico) and prices in Ukraine based on FOB, its volatility for 2019-2021 is calculated. It is concluded that in the conditions of climate change and lowering of norms of mineral fertilizers application, the dependence of the harvest on weather conditions will increase and the quality of Ukrainian corn grain will deteriorate. All this will negatively affect the level of food security of the country, the gross harvest of corn and the export potential of the industry. Based on the analysis, measures are proposed to increase the efficiency of corn grain production in Ukraine in the face of global challenges.

Keywords: corn market, price volatility, mineral fertilizers

JEL Classification: Q11, Q13, Q18

1. Introduction

In recent years, Ukraine has significantly increased the production of corn, by joining the cohort of the world's largest exporting countries. According to the results of 2020, Ukraine's share was over 15% of the world corn market, and according to the proceeds from its exports, our country ranked 4th in the world selling 27.9 million tons of grain worth \$ 4.9 billion to foreign markets. Bigger corn export share than Ukraine has only USA, Brazil and Argentina.

However, despite record harvests, the corn market operates in difficult turbulent conditions given by price dynamics. In particular, during 2020-2021 the average annual prices for corn increased almost 1.5 times. The increase in world food prices was facilitated by the COVID-19 epidemic, which caused barriers to grain supplies, as well as increased demand for grain from major importers to increase its reserves. However, in Ukraine such an increase in 2020 was also caused by drought, especially in the southern and central regions of the country, which began in winter and during the spring and summer was accompanied by a significant shortage of moisture, which eventually led to reduced corn production. Moreover, in some regions it was significant, and in some places - just catastrophic.

2021 was marked not only by a record corn harvest in the history of Ukraine (according to preliminary data, it is estimated at about 40 million tons), but also by new global problems of further development of grain production. In particular, due to record prices for natural gas, Ukraine is facing a serious threat to food security. Prices for fertilizers, which cost up to 80 % of the cost of natural gas, increased 3-4 times. And this is not the limit. As a result, prices for agri-food products may increase by another quarter due to rising costs.

An additional factor that will put pressure on prices may be a reduction of at least 15-20 % in the production of corn grain due to the projected application of less than the technological needs of mineral fertilizers. But the worst thing is that not only the gross harvest will decrease, but also the quality of Ukrainian grain. (National Research and Information Center for Monitoring International Commodity Markets, 2021)

Producers of beef, pork, chicken and other livestock products have already felt the effects of rising grain prices. Rising prices for meat and meat products can be a driver of food inflation, which in the face of declining purchasing power caused by the COVID-19 pandemic, significantly reduces the level of food security and deepens poverty in Ukraine.

Under these conditions, the issue of ensuring the competitiveness of Ukrainian corn on the world market is becoming increasingly important. After all, the price of it, in particular in the strategically important Chinese market, already exceeds the price of American corn, which will restrain its exports. Thus, in the current conditions there is an urgent need to introduce a balanced and systematic approach to the development and implementation of state agricultural policy aimed at balancing the interests of all participants in the grain market. Achieving this will largely depend on the effectiveness of state regulation of the grain market through the restoration of «rules of the game», which must be followed by all participants without exception.

2. Data and Methods

In the process of research dialectical methods of cognition of processes and phenomena, monographic method, empirical, comparative analysis, abstract-logical. During the research, the following methods were used: comparative analysis and expert assessments - for the analysis of quantitative and qualitative indicators of development of the domestic grain market in the conditions of globalization; statistical-economic - for the collection and processing of statistical data, studying the dynamics of exports and imports of grain; economics and mathematics - to predict the impact of demand factors (consumption on food and feed purposes, exports and stocks) and supply (yield, area, production, imports and stocks) on the grain market.

The initial information in the study was the legislation and regulations of Ukraine and the EU, the US Department of Agriculture, the State Statistics Service of Ukraine, the Organization for Economic Cooperation and Development, primary documentation and reporting of agricultural and processing enterprises and trade organizations, foreign and domestic scientific publications, as well as personal research and practical observations of the authors.

3. Results and Discussion

Corn is one of the main components of the grain market, the state of which determines the food security of the country, the results of economic activity of agricultural producers and the general well-being of the Ukrainian people. (Dibrova, 2020) Its uniqueness lies in the high potential yield and versatility of use. Corn is considered one of the most important fodder crops because it provides livestock with concentrated fodder, silage and green mass. Corn grain contains 9-12 % protein, 65-70 % carbohydrates, 4-8 % oil, 1.5 % minerals.

In recent years, Ukraine has seen an increase in sown areas and gross harvests of corn. In particular, the gross harvest of corn grain in Ukraine on average in 2016-2020 amounted to 30943.0 thousand tons, which compared to 2001-2005 increased more than 5 times. The increase in the gross harvest of corn occurred both due to the increase in yield by 1.78 times

and due to the increase in harvested areas by more than 2.8 times. On average in 2016-2020, the harvested area under corn in Ukraine was 4435.2 thousand hectares with an average yield of 65.5 quintal per hectares (Table 1).

At the same time, the corn yield in Ukraine in 2020 was 56.2 q / ha, which is 14.2 % lower than the average for 2016-2020. This is primarily due to the effects of climate change, which led to a lack of precipitation during the growing season and lack of moisture in a meter layer of soil, especially in the southern and central regions of Ukraine.

Table 1: Dynamics of production, harvested are and yield of corn in Ukraine

	2001-2005 yy.	2006-2010 yy.	2011- 2015 yy.	2016-2020 yy.	2016-2020yy. until 2001- 2005yy.
Production, thx. T	6145,9	9546,6	25314,6	30943,0	503,5
Harvested area, thx. ha	1651,9	2160,0	4290,6	4735,2	286,7
Yield, q/ha	36,8	43,7	59,0	65,5	178,0

Source: Crop production of Ukraine (2020), <http://www.ukrstat.gov.ua> and own research

In fact, over the past 10 years, Ukraine's corn belt has geographically «risen» 50-100 km north. Such movement of the corn belt is caused by the lack of soil moisture, significant droughts of the steppe and forest-steppe zones, dry winds during the growing season of agricultural crops in the central part of Ukraine.

If the gross corn harvest in Ukraine has tended to increase over the last decade, domestic consumption remains fairly stable. Therefore, changes in the gross harvest of corn grain are not critical, in terms of domestic consumption, because if in 2010 its share was 52.8%, in 2016 - 24.4%, in 2020 - it was 21, 5% (Table 2).

Table 2: Dynamics of corn grain balance in Ukraine, ths. tons

	2010 y.	2016 y.	2018 y.	2019 y.	2020 y.
Production	11953	28075	35801	35880	30290
Carry out	997	2970	6580	-4076	-4821
Import	30	32	41	36	25
Total Supply	12980	31077	29262	39992	35136
Export	4057	17286	21440	32346	27916
Feed use	5359	6229	6318	6018	5735
Sowing use	155	242	151	199	197
Losses	469	749	641	642	500
Processing for non-food purposes	831	501	545	628	632
Food use	117	130	167	159	156
<i>local consumption /production</i>	52,8%	24,4%	19,6%	19,0%	21,5%
<i>feed use/ production</i>	44,8%	22,2%	17,6%	16,8%	18,9%
<i>export/production</i>	33,9%	61,6%	59,9%	90,2%	92,2%

Source: Balances and consumption of the main food products by the population of Ukraine (2020), <http://www.ukrstat.gov.ua> and own research

The analysis shows that the domestic market is unable to meet the demand for existing corn grain production. Therefore, the growth of corn grain production in Ukraine is accompanied by an increase in its export potential, while domestic consumption remains relatively stable» (Rozhko, 2020)

Over the last decade, Ukraine has significantly increased its corn grain exports. In 2020, 27.9 million tons of domestic grain were exported to foreign markets, which accounted for 53.5% of grain exports from Ukraine and is almost 7 times higher than in 2010.

Despite the reduction of the gross harvest in 2020 compared to 2018 and 2019, Ukraine exported corn grains worth 4.9 billion US dollars, which was the second result for our country in its history. Only 2019 was more productive, when exporters exported 32.3 million tons of corn for \$ 5.2 billion. In the structure of corn exports, the lion's share falls on the EU, China, Egypt, Turkey, Iran and Korea - in 2020, 85.5 %. However, at the national level, the main importer of Ukrainian corn was China - 1.38 billion US dollars (28.3 %). And to Egypt and the Netherlands, exports were almost identical - a little more than \$ 500 million (10 %). (Khoroshun, 2021)

Difficulties in logistics and transportation caused by the coronavirus epidemic, which created barriers to grain supply chains, have contributed to increased demand for it from major traditional importers, including China. In addition, due to the corn crop failure in major producer and exporting countries, the revision of US stocks, uncertainty and instability in the world related to COVID-19, exchange rate fluctuations, and the situation in the oil market - contributed to increased volatility in the world grain market. Ukrainian FOB market in the period from 2019 till 2021 are closely dependent on the dynamics of corn world prices (Table 3).

Table 3: Average monthly price of corn grain in Ukraine on FOB terms and on the US FOB market, USD US per ton

Month of the year	Ukrainian Fob Market			US FOB market		
	2019 y.	2020 y.	2021 y.	2019 y.	2020 y.	2021 y.
January	177	180	252	171	179	223
February	180	182	263	178	174	253
March	172	177	266	168	165	220
April	175	178	272	162	144	249
May	174	175	297	166	151	296
June	185	182	295	194	155	290
July	196	181	276	208	164	280
August	192	181	271	162	169	262
September	165	190	265	167	206	235
October	166	220	276	173	229	242
November	171	240	289	171	228	250
December	174	232	277	188	217	264

Source: own research and <https://www.apk-inform.com>

Ukrainian grain export prices are formed in the US market (Chicago Mercantile Exchange, CME), which is considered the world's largest producer and exporter of this product. (Prospects for the use of derivatives in the grain market of Ukraine, 2020). Based on the analysis of the average monthly world spot price of corn and prices in Ukraine with FOB basis from January 2019 to December 2021, their volatility is calculated as a percentage change from month-to-month prices (Figure 1).

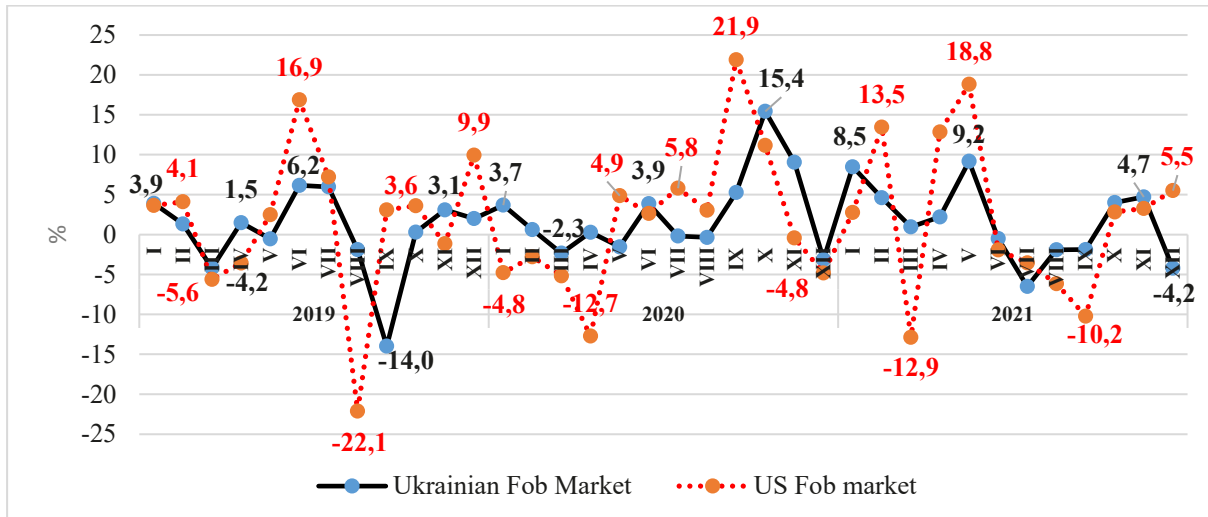


Figure 1: Volatility of corn grain prices in Ukraine on FOB terms and on the US FOB market
Source: own research and <https://www.apk-inform.com>

The analysis showed that fluctuations in the average monthly price changes in USD dollars reached peak values in 2019 compared to the previous month from -22.1 % to + 16.9 %, in 2020 from -12.7 % to + 21.9 %, in 2021 from -12.9 % to + 18.8 %. On the basis of FOB for Ukraine price fluctuations in 2019 compared to the previous month ranged from -14.0 % to + 6.2 %, in 2020 from -2.3 % to + 15.4 %, in 2021 from - 6,5 % to + 8.5 %.

Price volatility usually increases during the sowing campaign, is quite high during the growing season, and any information on the weather and gross harvest forecast affects forward corn prices. As a rule, volatility decreases in September, when the expected harvest becomes clear (Prospects for the use of derivatives in the grain market of Ukraine, 2020). However, in September 2020, in contrast to previous years, price volatility increased significantly in the corn grain market. Volatility of corn prices in Ukraine was estimated using the standard deviation of average monthly prices during 2019-2020 (Table 4).

Table 4: Standard deviation of the average monthly price of corn on FOB terms in Ukraine

	2019 y.	2020 y.	2021 y.
Average annual price of corn grain on FOB terms (Ukraine), USD US per ton	177,1	193,1	274,8
Interval of standard deviation of the average monthly price of corn on FOB terms (Ukraine):			
- Dollar USD per metric ton	9,5	23,2	13,3
- %	5,4	12,0	4,9

Source: own research and <https://www.apk-inform.com>

The analysis showed that on an average annual basis, the monthly volatility of corn grain prices on FOB terms in Ukraine was the highest in 2020 and amounted to 12% (or 23.2 US dollars per ton). At the same time, the average annual price in 2021 compared to 2019 increased by almost \$ 100 US per ton, or 1.6 times.

Although price volatility is common in commodity markets, significant price increases and decreases pose a threat to economic operators. High prices can lead to problems with food security for the population and limit the profitability of those industries that use agricultural raw materials as inputs. (Martyshev, 2020)

According to the Food and Agricultural Organization of the United Nations (FAO), in September 2021, world food prices reached a ten-year high. In particular, the FAO Food Price Index showed that they increased by 32.8 % over the year. At the same time, in 2021 the average value of the FAO Grain Price Index was 131.2 points, which is 28.0 points (27.2 %) higher than in 2020 and is the highest annual average since 2012. And the average prices for corn in 2021 compared to 2020 increased by 44.1 %, mainly due to growing demand and limited supply from major grain exporters. (FAO, 2022)

Rising corn prices in Ukraine provoked a 40-45 % increase in feed prices compared to the same period last year. According to the relevant associations, the increase in the cost of feed, which in the structure of the cost of livestock products occupies an average of 65-70 %, has led to a corresponding increase in production costs. From October 2020, the production of poultry meat, pork and table eggs is unprofitable, the profitability of poultry meat is 12%, eggs – 17 %, and pork – 3 %. Such developments can lead to catastrophic consequences for all branches of animal husbandry with all the negative social consequences». (Ukraine May Introduce State Regulation on Corn: the Situation Needs to be Stabilized, 2020)

At the same time, the sharp rise in natural gas prices in 2021 has provoked a three-to-four-fold increase in mineral fertilizer prices, as natural gas accounts for up to 80 % of the cost of fertilizer production. For example, ammonium nitrate, the most popular Ukrainian fertilizer, at the end of 2020 cost an average of UAH 7,000 per ton, and exactly a year later – UAH 21-21.4 thousand. (Ruban, 2021)

In turn, fertilizer prices affect the cost of agricultural products. All this poses new challenges for the further development of the grain industry in Ukraine in general and corn producers in particular. After all, corn is considered the most expensive crop for the use of mineral fertilizers because their share in the cost structure is 25-40 %.

Given the above, from a scientific and practical point of view, it is important to determine how rising energy prices will affect the efficiency of corn grain production and its competitiveness in foreign markets. Of course, such calculations can only be estimated because there is not enough information for analytical calculations. In particular, some agricultural producers were able to buy mineral fertilizers and plant protection products earlier, some are currently buying, and others are postponing the spring hoping for lower market prices or reimbursement from the state budget.

To calculate the impact of changes in the cost of mineral fertilizers on production efficiency used the actual average cost of corn production in 2020 per 1 ha (Table 5).

Table 5: The impact of rising prices for mineral fertilizers and tariffs for grain drying on the efficiency of corn production in Ukraine, USD dollar per 1 ha

Costs	Actual data for 2020 in USD dollars	%	Calculation in USD dollars	%
Direct cost.:	913,8	96,6	1 187,6	97,4
Remuneration with accruals	98,0	10,4	98,0	8,0
Seeds	85,2	9,0	85,2	7,0
Mineral Fertilizer	200	21,1	347,5	28,5
Plant protection	58,0	6,1	58,0	4,8
Fuel, oil and electricity	68,4	7,2	68,4	5,6
Rent	135,9	14,4	135,9	11,1
Depreciation of machinery and equipment	77,2	8,2	77,2	6,3
Finishing and drying costs	141,0	14,9	267,3	21,9

Other costs	50,0	5,3	50,0	4,1
Total expenditures	32,0	3,4	32,0	2,6
Total costs per 1 ha in USD	945,8	100,0	1219,6	100,0
Yield, ton per ha	6,5		6,5	
Sale price of 1 ton in USD	236		236	
Profit per 1 ha, USD USA	588,2		314,4	
The level of profitability, %	62,2		25,8	

Source: own research

The analysis shows that with the increase in prices for mineral fertilizers, the cost of them per 1 hectare of crops will increase 1.74 times from 200 to 347.5 dollars. USA. At the same time, the share of mineral fertilizer costs in the cost structure will also increase from 21.1% to 28.5%. Rising natural gas prices have also boosted the cost of drying corn grain. In Ukraine, the range of prices for drying corn with natural gas at the end of 2021 ranged from 3.03 to 6.60 dollars. USA for one ton-percent of moisture removal. (Yaroshenko, 2021)

This difference in prices is due to the fact that the elevators bought blue fuel at different times and at different prices. For example, «... the price of natural gas from October 2020 to October 2021 increased almost 6 times, from UAH 6.11 to UAH 36 per cubic meter». (Mukha, 2021)

To assess the impact of changes in the cost of drying corn with natural gas on the efficiency of its production, the following assumptions are made: average grain moisture – 20 %; final grain moisture - 14.5 %; on average, 5.5 tons of grain is needed to dry 1 ton of grain; shrinkage factor (loss) - 1.2 (Table 6).

Table 6: The impact of increasing tariffs on grain drying on the efficiency of production and sale of corn in Ukraine

Price for drying one ton-percent, USD dollars	Revenue per 1 ha of harvested area, USD dollars	Costs per 1 ha of harvested area excluding drying costs, USD dollars	Costs for drying grain per 1 ha, USD dollars	Total costs per 1 ha of harvested area, USD dollars	Profit per 1 ha of harvested area, USD dollars	The level of profitability %
3,30	1534	952	125	1078	456	42,3
4,21	1534	952	162	1114	420	37,6
4,76	1534	952	184	1136	398	35,1
5,68	1534	952	219	1171	363	31,0
6,60	1534	952	267	1219	315	25,8

Source: own research

Calculations have shown that the price of drying corn significantly affects the level of profitability of grain production and sales. Increase in the price for drying of one ton-percent from 3,3 to 6,6 dollars. The United States, with an average of 5.5 tonnes of withdrawal to a final humidity of 14.5%, reduces profitability from 42.3 % to 25.8 %. As a result, farmers are forced to postpone the harvest for as long as possible so that the corn can dry naturally. According to expert estimates, it is about 3-4 dollars. US per ton, taking into account the cost of transporting wet corn from the field to the elevator. (Shyshlov, 2021)

In general, the analysis shows that at current prices for mineral fertilizers and tariffs for grain drying, the cost of corn production will increase by 30-35%. And if it were not for the high gross harvest of corn and not favorable prices for it, one could predict a gradual abandonment of its cultivation in favor of other more profitable crops, including soybeans.

In our view, to ensure profits at the level of previous years, producers will also be forced to reconsider technological operations by deliberately reducing productivity per hectare in favor of economic efficiency. After all, «it is better to get a corn grain yield of 4 tons per hectare, securing a net profit of \$ 200, than to get a yield of 8 tons per hectare and get \$ 250». (Khvorostianyi, 2021)

4. Conclusion

Modern agriculture is impossible without the use of sufficient mineral fertilizers. At present, Ukraine applies almost twice as much mineral fertilizer as the United States and the European Union, which leads to soil degradation. Therefore, the rapid rise in prices and shortages of mineral fertilizers will reduce their application compared to previous years, weaken the country's food security, reduce yields and gross corn production, export potential of the industry, and worsen soil fertility. In the conditions of climate change and reduction of mineral fertilizers, the dependence of the crop on weather conditions will increase and the quality of grain will decrease, which will ultimately affect the income of agricultural producers.

Successful solution of the problem of improving the economic efficiency of grain farming involves the implementation of a comprehensive system of actions to increase production and improve the quality of cereals while reducing labor costs, cost of material resources per unit of output. (Cheremisina & Rossokha, 2021)

In order to optimize costs, agricultural producers need to diversify their mineral nutrition systems. In particular, to invest in fertilizers in advance, without which the production of agricultural products is impossible. And the second factor - you should buy those forms of fertilizers that reduce the cost of technology. For example, the same anhydrous ammonia.

Under these conditions, government agencies need to develop an effective mechanism to reduce or compensate for the purchase of mineral fertilizers for domestic producers. To solve this difficult problem, it would be worthwhile to involve PJSC «Agrarian Fund», which through forward procurement will be able to help provide them with fertilizers for sowing. (Khvorostianyi, 2021)

References

- [1] Cheremisina, S., Rossokha, V. (2021). Efficiency of grain production in Ukraine: analysis of the current state and prospects for improvement. *Ekonomika APK*, 6, 54-67. doi: <https://doi.org/10.32317/2221-1055.202106054>
- [2] Dibrova, A., Dibrova, L., & Dibrova, M. (2016). Priority directions of development of export agri-food productions of Ukraine. *The Agri-Food Value Chain: Challenges for Natural Resources Management and Society*. – Nitra: Slovak University of Agriculture in Nitra, 39-46. doi: 10.15414/ISD2016.S1.02
- [3] Dibrova, A., Dibrova, L., & Dibrova, M. (2020). Strategic Imperatives for the Development of the Grain Market in Ukraine. *International Scientific Days 2020: Innovative Approaches for Sustainable Agriculture and Food Systems Development. Conference proceedings*. Nitra: Slovak University of Agriculture in Nitra. 216-225. doi: 10.18515/dBEM.ISD.P01.2020.p024.
- [4] Food and Agriculture Organization of the United Nations. (2022). World Food Situation. Retrieved January 6, 2022, from <https://www.fao.org/worldfoodsituation/foodpricesindex/en>
- [5] Khoroshun, V. (2021, October 26). Cereal Market Overview 2021: Exports, Production, Trends. Message posted to <https://latifundist.com/analytics/23-obzor-rynka-zernovyh-kultur-2021-eksport-proizvodstvotendentsii>

- [6] Khvorostyani, V. (2021, December 7). Rising fertilizer prices will hit the cost of agricultural products. Message posted to <https://agropolit.com/spetsproekty/937-pidvischennya-tsin-na-dobryva-vdarit-pobivartosti-agrarnoyi-produktsiyi>
- [7] Khvorostyani, V. (2021, October 21). Rising gas prices - the causes and consequences of gas shock for agriculture. Message posted to <https://agropolit.com/spetsproekty/923-zrostannya-tsini-na-gaz--prichini-tanaslidki-gazovogo-shoku-dlya-apk>
- [8] Krylov, Ya. (2018). Major development trends in the grain market and mechanisms of its regulation in Ukraine. *Ukrainian Journal of Applied Economics*. Volume 3. №3. 43-53. Retrieved from <http://ujae.org.ua/en/major-development-trends-in-the-grain-market-and-mechanisms-of-its-regulation-in-ukraine>
- [9] Martyshev, P. (2020). *Regulation of the development of agri-food production under conditions of increased world prices volatility* (Doctoral dissertation). Available from http://ief.org.ua/wp-content/uploads/2020/09/Автореферат_Мартишев-захищено.pdf
- [10] Mukha, M. (2021, November 5). Drying corn 2021: Drying should not be left in the field. Message posted to <https://elevatorist.com/blog/read/740-sushka-kukuruzyi-urojaya-2021-sushit-nelzya-ostavit-v-pole>
- [11] National research and information center for monitoring international commodity markets. (2021). *Prices for agricultural products in 2022 will increase significantly*. Retrieved December 28, 2021, from <https://dzi.gov.ua/press-centre/news/tsiny-na-s-g-produktsiyu-u-2022-suttyevo-zrostut>
- [12] *Prospects for the use of derivatives in the grain market of Ukraine*. (2020). *Grain market research*. Kyiv: USAID project «Transformation of the financial sector». Retrieved from http://www.fst-ua.info/wp-content/uploads/2020/04/Grain-Market-Research_27.4.2020.ukr_.pdf
- [13] Rozhko, V. (2020). Ukrainian corn market: changing trends and uncertainty at the start of the new season. *APK-Inform: ITOGI*, 11 (77). 2-6. Retrieved from <https://www.apk-inform.com/uk/exclusive/topic/1515858>.
- [14] Rozhko, V. (2021). Results of 2020/21 MY and forecasts for the Ukrainian corn market at the start of 2021/22 MY. *APK-Inform: ITOGI*, 10 (88). 2-5. Retrieved from <https://www.apk-inform.com/uk/exclusive/topic/1523108>
- [15] Ruban, S. (2021, December 21). Fertilizers: a review of prices for the week. Has the price of nitrate fallen? Message posted to <https://latifundist.com/novosti/57788-dobryva-oglyad-tsin-za-tizhden>
- [16] Shyshlov, T. (2021, November 27). *To withstand competition, Ukraine will need to «buy demand» for corn – Risoil*. Message posted to <https://www.apk-inform.com/uk/news/1523698>
- [17] State Statistics Service of Ukraine. (2020). Balances and consumption of the main food products by the population of Ukraine. 01/01/2000 to 01/01/2021 [statistics]. Available from SSSU Data database. URL: <http://www.ukrstat.gov.ua>
- [18] State Statistics Service of Ukraine. (2020). Crop production of Ukraine. 01/01/2000 to 01/01/2021 [statistics]. Available from SSSU Data database. URL: <http://www.ukrstat.gov.ua>
- [19] Tanska, A. (2021). 2020 and one reason for the turbulence in the corn market of Ukraine. *APK-Inform: ITOGI*, 3 (81). 22-27. Retrieved from <https://www.apk-inform.com/uk/exclusive/topic/1518758>
- [20] Ukraine may introduce state regulation on corn: the situation needs to be stabilized (2020, December 7). Message posted to <https://superagronom.com/news/12125-v-ukrayini-mojut-vvesti-derjregulyuvannya-na-kukurudzu-neobhidno-stabilizuvati-situatsiyu>
- [21] Yaroshenko, S. (2021, November 11). *Corn 2021: Season Features, Grain Production, Drying Prices in Ukraine*. Message posted to <https://latifundist.com/blog/read/2831-kukuruza-2021-osobnosti-sezona-urozhaj-tseny-na-sushku>

The need for strategic management in the creation of innovative services in a selected company

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Abstract

An important factor not only for young farmers, but also for people working in the agricultural sector in general, is the right choice of financial services and their providers. In this work, we will look at the current opportunities in the market and what all the people in the agricultural sector can use to perform their profession. This work is focused on current management trends in the selected company. We chose the financial institution Tatra Banka for our work. The aim of this work will be to point out the current trends in management. We will take a closer look at the issues of competition and strategic management, which this company really makes full use of. In order to better be able to imagine what it really means to live and understand the system of such a company. Its vision is slowly being fulfilled every year, but becoming a unit in all segments is a real challenge. Overcoming strong competition in such a specific market is a really tough nut to crack. Tatra Banka has undergone significant internal changes in recent years, which has led to improved services, service offerings and also personnel changes. Introduction of the philosophy of bringing job positions closer to young people. Thanks to these changes, Tatra Banka has not only become a bank, but many have fulfilled their dream or lifestyle. Tatra Banka thus offers extremely fast career growth and attracts an ever-increasing group of qualified young people. As a result, it has succeeded in creating quality improvement processes.

Keywords: bank, client, innovation, technology, trend,

JEL Classification: M10, G21, M30

1. Introduction

The banking system is a system of banks operating in the national economy. Banking the system in the Slovak Republic is two-stage. The first level consists of the National Bank of Slovakia as the central bank and the second stage consists of commercial banks. The work consists of three parts, namely the theoretical part, the practical part focused on the goals, methodology and results of the work. The third honourable part consists of data sources and bibliography. In the first part of the practical part of the work we will get acquainted with the history of the company, its form and especially products and services that can be used by different clients. We will look at the structures and forms that this company uses and especially the communication channels. We will also include marketing strategies and goals. The second part of the work will follow up on the first and we will remember the internal environment of society. Strengths and weaknesses, internal and external analysis followed by swot analysis. We will certainly focus on business management strategies and so we will gradually move to the third, final phase of this work. The third content of the work will focus on the strategies used by this company. We will also look at the individual positive or negative impacts of various decisions and the subsequent impacts or results of these decisions. In part, we will also state the reason why, in some decisions, the company itself may have decided not to make the best strategic decisions directly. We will support some information with the simple questionnaire

based on 72 respondents with four main sections. The conclusion of the work will be a summary of all information and possible observations from one's own side. However, we will still not forget that individual observations do not necessarily mean quality observation on our part, as we do not know all the available information that the company itself contains.

1.1 Electronic banking services

The development of the business environment in banking has been dynamic in recent years and is characterized by a number of trends that ultimately have a significant impact bank management:

1. Development and use of information and telecommunication technologies.
2. Growth of education of bank clients.
3. Decrease in the loyalty of bank clients.
4. Growth of competition in the banking sector. (Medved' J. et al., 2012; Gavurova, 2019).

Cashless payment system as defined by Vokorokosová R., 2009, p. 24 laying makes a money transfer through bank (non-cash) money. Cashless money has an intangible form. Their existence is given in the form of records on accounts.

1.2 Redefining the art of the possible in a post-COVID-19 world

The banking industry's collective response to the pandemic thus far has been notable. It was no easy feat to go fully virtual and execute an untested operating model in a matter of weeks. Despite some hiccups, many banking operations were executed smoothly. Customers were served, employees were productive, and regulators were reassured. Banks effectively deployed technology and demonstrated unprecedented agility and resilience. (Wokoun, 2008; Mareš, 2018) More importantly, banks played a crucial part in stabilizing the economy and transmitting government stimulus and relief programs in the United States, Canada, the United Kingdom, Japan, and many European countries, among others. Banks' healthy capital levels before the pandemic also helped mitigate the negative impacts from the crisis and should pave the way for the global economy to thrive in the future. (Iľanovská, 2009; Konrádová, 2013; Džmuráňová, 2020)

1.3 Banking with a purpose

While banking seems to be changing, so does the purpose of banks. Societies around the world now expect banks to help address income inequality, racial and gender inequity, and climate change. As vital engines of growth in the global economy through a multitude of roles—financial market intermediaries, asset owners, investors, and employers—banks have a critical role to play in sustainable finance. In addition to helping allocate or redirect capital toward economic activities that are net positive to societies, they can also nudge new behaviours among clients and counterparties. (Nováčková, 2021; Pakhnenko, 2021)

1.4 Sustainable finance: A unique opportunity for inspiring leadership

The world is beset with unprecedented challenges. The pandemic is perhaps the most formidable test right now, but income, racial, and gender inequities, along with persistent risks from climate change, are no less daunting. Banks have embraced their social purpose with a new energy and focus: how best to contribute to a more equitable and sustainable society. (Horvatova, 2020)

Many banks are embracing this growing power and influence and have been strengthening environmental, social, and governance (ESG) commitments in meaningful ways. Three-quarters of respondents said their institutions will increase investment in climate-related initiatives. Recently, for example, Goldman Sachs announced it will deploy US\$750 billion across investing, financing, and advisory activities by 2030 on sustainable finance themes such as climate transition and inclusive growth. Similarly, UBS increased its core sustainable investments by more than 56%, to US\$488 billion. (Ondík, 2015; Horvatova, 2020; Moreno 2021)

Similarly, various industry entities, such as the Institute of International Finance, the World Economic Forum (WEF), the Task Force on Climate-Related Financial Disclosures, and the Partnership for Carbon Accounting Financials (PCAF) have also proposed structural changes to climate risk standards and transparency. While banks have made good progress on sustainable finance, there is much more that can be done. (Hussma, 2010; Polouček, 2013; Lartey 2022)

1.5 Need of Innovation in Banking Sector

As we have seen from the individual information provided so far, we see that innovation in the banking sector is not only growing, but also an important element for the competitiveness of the company. We will now take a closer look at the individual trends in banking management based on the information mentioned. Banks were making rapid strides in their digital transformation journey, but the pandemic accelerated the pace. To meet the demands of the new realities, projects that once took months or even years were accomplished in just weeks, such as the banks' response to the US Paycheck Protection Program (PPP). Banks that invested in digitizing their businesses over the last decade demonstrated higher agility and resilience in adapting to COVID-19-led changes than others. (Miklaszewska, 2021; Caby, 2022)

However, the first half of 2021 exposed vulnerabilities in banks' technology arsenals. Nearly four in five respondents agreed that COVID-19 has uncovered shortcomings in their institution's digital capabilities. Technical debt in the form of legacy infrastructure and data fragmentation across the enterprise continues to impede banks' digital transformation initiatives. But in many institutions, digital inertia has faded: There is now more appetite for technology-driven transformation, especially in core systems. (Akyüz, et. al, 2021)

1.5.1 Robotic Process Automation

The volume of unstructured data that the bank has to process is increasing exponentially with the rise of the digital economy. This is not just banking transaction data, but also other behavioural data that could potentially allow the banks to improve and innovate customer experience. This has made bankers realize that they need to find technologies that can mimic human action and judgment but at a higher speed, scale, and quality. The answer that has emerged is a combination of various technologies that enable cognitive and robotic process automation in banking. (Tabakov, 2021; Belton 2021)

1.5.2 Quantum Computing and Artificial Intelligence

Business needs and capabilities of AI implementations have grown hand-in-hand and banks are looking at Artificial Intelligence as a differentiator to beat down the emerging competition. Artificial Intelligence allows banks to use the large histories of data that they capture to make much better decisions across various functions including back-office operations, customer experience, marketing, product delivery risk management, and compliance. (Yekimov, et.al 2021; Rozhkova, 2021)

2. Data and Methods

The aim of this work is to present current trends in management in the banking sector. The individual work has an overall informative character, but we can divide it into two main parts, theoretical and practical. The aim of the theoretical part is to summarize the available information to introduce the issue. The aim of the practical side is to apply the acquired knowledge of the theoretical part to practical models and evaluate the results of the work. In order to be able to implement and meet the main goal, which is to bring trends in management in the banking sector, we must also meet the following partial goals of the work, which are:

- Evaluate the currently available information in the given issue and select data or data that concisely describe the current situation and issues regarding trends in the management of the banking sector.
- Define and present a selected company in the banking sector. In our case, Tatra Bank. Introduce the portfolio of products, services, communication channels and the overall profile of the company. This goal also includes a SWOT analysis in our work.
- Through selected employees to conduct a short interview and gain more detailed knowledge or information that will help us to make a final assessment of the issue, followed by 4 section survey. Hypothesis were tested according to survey parameters, taking into consideration variance, standard error, significance level, critical value and region acceptance.
- Finally, the conclusion includes a summary of all available information and knowledge that we obtained as individual results using our models. In this way we can present the results and on the basis of them create conclusions and recommendations in the given issue.

Paper work procedures:

When creating methodological procedures, we use professional work in this area, so we use the following procedure. Professional literature and scientific articles related to the issue or theme of new trends in management of a selected company and data related to the main objectives, supported by articles of newspaper and online magazine publication related to our topic and subsequent processing of information on a theoretical level.

The use of quarterly data provided by the NBS in the Macroeconomic Database, the source institutions. These figures are complemented by Tatra Bank's annual reports for 2020 to 2021 and the relevant statistics. Use of selected data in quarterly periods from the time horizon 4Q2020 to 1Q2021 is performed. As not all indicators were available for this period, to simplify the analysis, we selected all data only for the time indicator 4Q2019.

Use of graphical representation of individual indicators based on the obtained information and data. The individual graphs were selected so as to enable the reader to get closer to the historical development and in the next part of the work also to predict the development of individual determinants.

Separately we prepared SWOT analysis according to available data from Tatra Bank's annual reports and company evaluations. These data were also discussed with selected employees who provided interviews and thus confirmed their possible compliance.

Table 1: SWOT analyses – selected data

	TATRA BANK			SLOVENSKÁ SPORITELŇA, A.S.*		
	Weight	Value	Sum	Weight	Value	Sum
STRENGTHS						
SUM	1		4,5	1		3,7
WEAKNESSES						
SUM	1		-3,8	1		-3,1
OPPORTUNITIES						
SUM	1		4,7	1		4
THREATS						
SUM	1		-4	1		-4,4
INTERNAL	0,7			0,6		
EXTERNAL	0,7			-0,4		
SUM	1,4			0,2		

Source: own processing

*Leading bank in Slovakia 2020, according to Trend.sk

Interview of selected employees of Tatra Banka focused on future technologies and managerial trends in the company. The individual questions were selected so that the employees could talk about the issue as openly as possible without compromising the company's reputation. These were selected employees in the managerial position of the PR and AI&IT segment. Based on the SWOT analyses and employees answers, the company should focus on technological strategy and new youth generation of clients.

A simple questionnaire with questions, serves as a supplementary instrument to support new arguments. Its results are presented in this work under an interview with selected employees. The questions were asked to map the current state of electronic banking and the response of respondents to current innovations in this sector. The questionnaire was divided into 4 main section including, the use of bank products, satisfaction with products, experience with new products and the need for new innovative products. The questionnaire which includes phrases on a Likert scale: (1) Strongly agree, (2) agree, (3) Not sure, (4) disagree, (5) strongly disagree.

This work also includes several hypotheses as followed:

H1- The company is investing a large amount of resources into new technologies and innovations.

H2- There is a significant impact of clients' needs adoption on organization product portfolio.

H3 - There is a significant impact to use a strategy of innovative approaches in the banking sector in Slovakia.

3. Results and Discussion

In order to evaluate our data correctly, we also supported our arguments with the created questionnaire. This questionnaire briefly focused on the use of banking innovations, the willingness of clients to accept increased fees for better services and the overall evaluation of Tatra Bank's current products. This questionnaire was performed on a sample of 72 respondents and 4 respondents were rejected because they did not meet the age requirement. The results of the survey are as follows.

Table 2: Correlations of a survey

		First Section	Second Section	Third Section	Fourth Section	Total Degree
First Section	Pearson Correlation	1	,486**	,055	,467**	,604**
	Sig. (2-tailed)		,006	,768	,008	,000
	N	72	72	72	72	72
Second Section	Pearson Correlation	,486**	1	,371*	,170	,504**
	Sig. (2-tailed)	,006		,040	,362	,004
	N	72	72	72	72	72
Third Section	Pearson Correlation	,055	,371*	1	-,013	,431*
	Sig. (2-tailed)	,768	,040		,944	,016
	N	72	72	72	72	72
Fourth Section	Pearson Correlation	,467**	,170	-,013	1	,865**
	Sig. (2-tailed)	,008	,362	,944		,000
	N	31	31	31	31	31
Total Degree	Pearson Correlation	,604**	,504**	,431*	,865**	1
	Sig. (2-tailed)	,000	,004	,016	,000	
	N	31	31	31	31	31

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 3: Reliability Statistics

Cronbach's Alpha	N of Items
,688	5

Table 4: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
First Section	11,14296305931 3214	2,446	,490	,631
Second Section	10,19403832813 0420	2,422	,505	,626
Third Section	8,559629725979 882	2,118	,232	,791
Fourth Section	11,20223725286 1602	2,126	,407	,658
Total Degree	10,51599462365 5914	2,014	,921	,480

Source: own processing

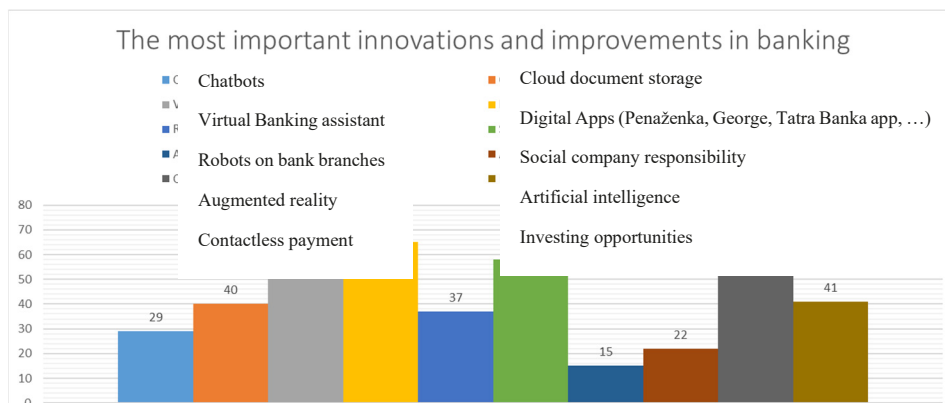


Figure 1: The most important innovations and improvements in banking based on survey results

Source: Own processing based on survey data

This question was very specific and respondents had the opportunity to express which innovations they use and at the same time which they would consider in the future. Of course, as these were technical terms, explanations were also available for respondents. It can't bother us that chatbots are not a very interesting element, as they are still in the development stage and many times they can't advise the client directly. However, there is great interest in digital assistants (Call & Video) and the applications themselves. A very interesting leap is social responsibility, where up to 58 respondents thought that the banking system should focus more on social responsibility¹. we can expect an increase in interest in robotic helpers but as a company we are not ready for a virtual environment.

¹ In addition to the record, we were confirmed during the interview that Tatra Banka gained great marketing success after the introduction of social and artistic projects, which gained a significant number of clients.

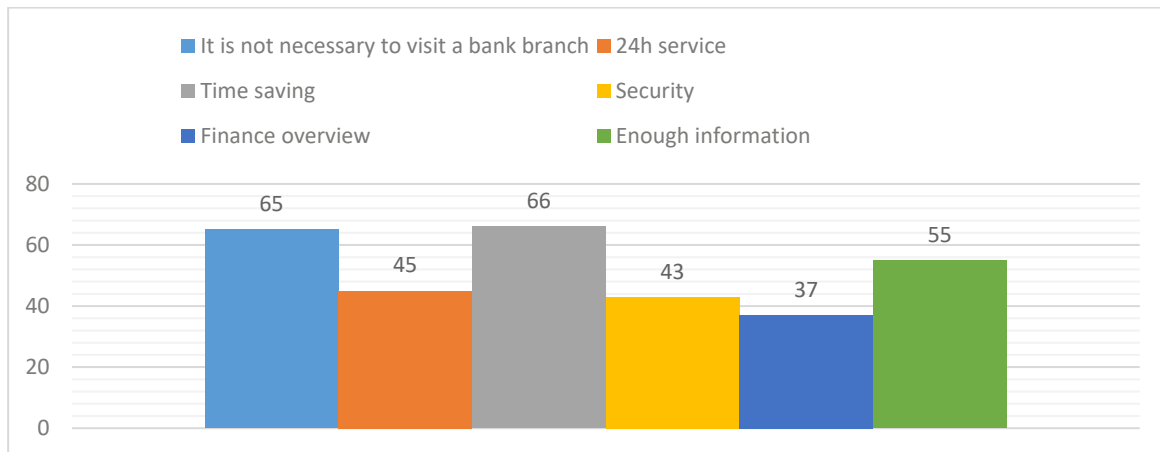


Figure 2: The biggest advantages of Digital banking

Source: Own processing based on survey data

As far as the issue of benefits is concerned, this is how various statistics, in particular time-saving and extensive information options, have been recording for many years. On this question, the respondents also had the opportunity to comment without giving an answer, but each respondent gave at least one.

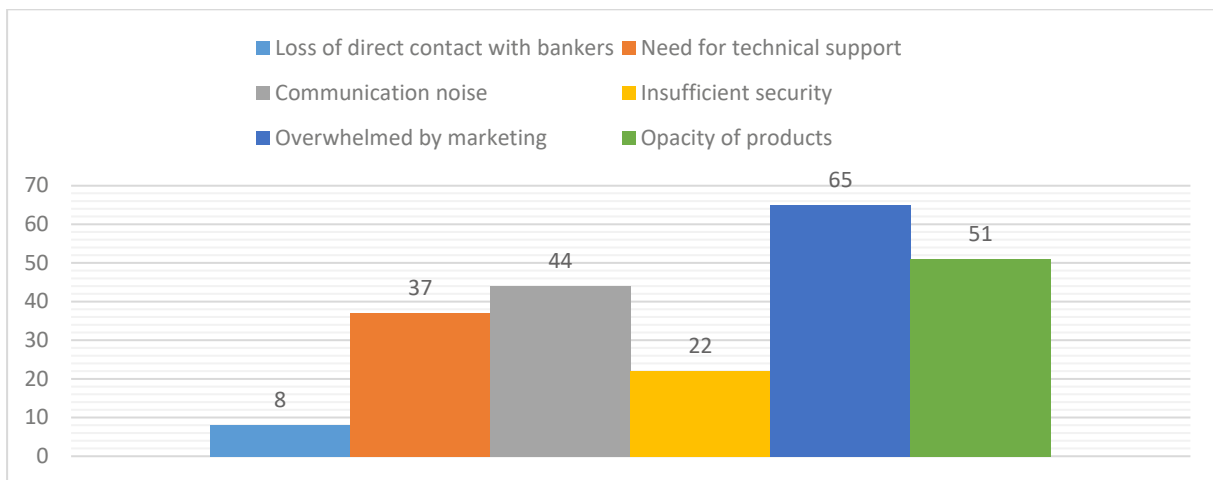


Figure 3: The biggest disadvantages of Digital banking

Source: Own processing based on survey data

As usual, too much marketing can sometimes hurt. We also noticed from the results that people are too often contacted by offers - but banks are starting to get used to this problem and rather contact only direct applicants. Negatives such as an impersonal meeting in the bank or a lack of security were ruled out by the respondents. We can evaluate that the questionnaire was successful, many respondents also used question number 8. The most interesting answers were: Bank that has: lower fees, holographic innovations, biometric finger signing, subcutaneous payment cards, investment consultants for ordinary people, investing in the stock market directly in the application, coffee to go at branches, greater social responsibility.

4. Conclusion

Tatra Bank has a plan despite its unfavourable fate, and that is to focus on the long-term horizon. The top management of the company always strokes at least 10 years in advance. What will happen to the young population in 10 years? It will be a working class. That is why it is necessary to catch these people today, and that is why maximum investment is being made in technologies. As mentioned in this chapter, recommendations for findings will be included. At the same time, we make sure that the recommendations are really deduced only within the knowledge from the available information. We know that Tatra Banka as a commercial bank is strongly limited by law, the National Bank of Slovakia and the European Central Bank. Therefore, the recommendations will address purely internal and external aspects that the bank has an impact on and can thus improve its image in the eyes of the client. We were therefore able to correctly confirm all our hypotheses in full scale and, based on the available data and information, we can suggest the following points for improvement:

- Continue to reduce the number of branches within the market and maintain only a few client zones. Rework these zones into future technologies and at the same time create a bank branch with an information center and help for clients who have a problem with technology.
- Banking academies as programs for university departments, where future employees would be trained in a short time. This would help to obtain a better quality workforce, which does not need to be trained in working hours for so long. The basics can be covered without the employee being paid during the university.
- Continue a strong marketing strategy across the social strata and create a strong image of the bank. As before, create individual marketing spots precisely focused on client segments.
- Home bank assistant. If we imagine that the COVID-19 situation will no longer be, then create special help, especially for technologically weaker individuals. The assistant can come to the client's home and help him start internet banking or applications, teach them to use the benefits and thus relieve the branches. Of course, the service would be free of charge and with the possibility of concluding the sale of services on site.
- Special or individual products and services for the agricultural sector, farmers. At present, and these data were confirmed by a controlled interview, most banks consider the agricultural sector rather than risky, unprofitable from the bank's point of view. In this regard, however, the state should step in more and help with all possible means.

From our point of view, Tatra Bank has a high potential, but it must consider whether its future will depend on profits or a stable and loyal clientele. Today we know that clients are more demanding and therefore it is important to satisfy his requirements to the greatest extent. However, we believe in the conclusion that Tatra Bank will always push the boundaries of banking for the better.

Acknowledgment

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References

- [1] Hussam, M. Elektronické bankovníctvo. In Acta Aerarii Publici 2010. ISSN 1336- 8818.
- [2] Konrádová, E. (2013). Analýza bankovního sektoru v ČR-aktuální stav, vývoj, perspektiva (Doctoral dissertation, AMBIS vysoká škola, as).
- [3] Medveď, J., Tkáč, M., et al. Banky teória a prax. Bratislava: SPRINT 2, 2012. ISBN 9788089393732.
- [4] Ondík, B. K. (2015). Nové trendy v bankovníctve. Bankovní Institut Vysoká Škola Praha Katedra Financí a Ekonomie, Praha.
- [5] Plíva S., Elek, Š., Liška, P., Marek, K., Bankovní obchody, Praha: ASPI, 2009. ISBN 978-80-7357-433-8.
- [6] Polouček, S., et al. Bankovníctví. Vyd. 2. Praha: C. H. Beck, 2013. ISBN 978-80-7400-491-9.
- [7] Pulpanová, S. Komerční bankovníctví v České republice. Praha: Oeconomica 2007. ISBN 978-80-245-1180-1..
- [8] Revenda, Z., Mandel, M., & Kodera, J. (2012). P. Musílek a P. Dvořák Peněžní ekonomie a bankovníctví. Vyd. 5.
- [9] Mareš, D. (2017). Nové trendy ve financích a ekonomice. Wolters Kluwer.
- [10] Wokoun, R., Červený, M. a kol. 2008. Ekonomika v prostoru – svět, střední Evropa, EU, OECD, ČR. Praha : Vydavatelství Linde., 2008. 189 s. ISBN 978-80-7201-698-3.
- [11] Workie, T. M. a kol. 2008. Vývoj a perspektivy svetovej ekonomiky. Bratislava : Ekonomický ústav SAV, 2008. 301 s. ISBN 978-80-7144-166-3.
- [12] Lartey, T., James, G. A., Danso, A., & Boateng, A. (2022). Bank business models, failure risk and earnings opacity: A short- versus long-term perspective. *International Review of Financial Analysis*, 80 doi:10.1016/j.irfa.2022.10204
- [13] Caby, J., Ziane, Y., & Lamarque, E. (2022). The impact of climate change management on banks profitability. *Journal of Business Research*, 142, 412-422. doi:10.1016/j.jbusres.2021.12.078
- [14] Akyüz, K., Chassang, G., Goisau, M., Kozera, Ł., Mezinska, S., Tzortzatou, O., & Mayrhofer, M. T. (2021). Biobanking and risk assessment: A comprehensive typology of risks for an adaptive risk governance. *Life Sciences, Society and Policy*, 17(1), 10. doi:10.1186/s40504-021-00117-7
- [15] Varkulevich, T. V., Pyzhov, A. S., & Titova, N. Y. (2020). Bank deposit and credit policy management in the field of individual customer service. *International Journal of Criminology and Sociology*, 9, 2548-2553. doi:10.6000/1929-4409.2020.09.312
- [16] Miklaszewska, E., Kil, K., & Idzik, M. (2021). How the covid-19 pandemic affects bank risks and returns: Evidence from eu members in central, eastern, and northern europe. *Risks*, 9(10) doi:10.3390/risks9100180
- [17] Moreno, J. F. A., & Ávila, R. C. (2021). Expanded abstract banking structure and income inequality. cooperative banking makes a difference. [Estructura bancaria y desigualdad de renta. La banca cooperativa marca la diferencia] *CIRIEC-Espana Revista De Economia Publica, Social y Cooperativa*, (102), 197-227. doi:10.7203/CIRIEC-E.102.19382
- [18] Pakhnenko, O., Rubanov, P., Hacar, D., & Yatsenko, V. (2021). Digitalization of financial services in european countries: Evaluation and comparative analysis. *Journal of International Studies*, 14(2), 267-282. doi:10.14254/2071-8330.2021/14-2/17
- [19] Nováčková, D., & Wefersová, J. (2021). *Use of digital technologies in business in slovakia* doi:10.1007/978-3-030-76632-0_12
- [20] Horvatova, E. (2020). Twenty years of mortgage banking in slovakia. *International Journal of Financial Studies*, 8(3), 1-30. doi:10.3390/ijfs8030056
- [21] Džmuráňová, H. (2020). The application of interest rate risk regulation on the czech and slovak banking sectors. *Ekonomicky Casopis*, 68(3), 211-230.
- [22] Gavurova, B., Kocisova, K., Rozsa, Z., & Halaskova, M. (2019). What affects the interest rate on deposit from households? *Montenegrin Journal of Economics*, 15(2), 41-57. doi:10.14254/1800-5845/2019.15-2.4

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- [23] Tabakov, A., & Fomina, I. (2021). Analysis of risk and threats to financial performance of enterprises in agro-industrial complex. Paper presented at the *E3S Web of Conferences*, , 273 doi:10.1051/e3sconf/202127308058
- [24] Belton, B., Win, M. T., Zhang, X., & Filipski, M. (2021). The rapid rise of agricultural mechanization in myanmar. *Food Policy*, 101 doi:10.1016/j.foodpol.2021.102095
- [25] Yekimov, S., Mukhina, E., Kostina, Z., Borodina, T., & Ermakova, M. (2021). Management according to international standards in farming. Paper presented at the *IOP Conference Series: Earth and Environmental Science*, , 699(1) doi:10.1088/1755-1315/699/1/012060
- [26] Rozhkova, A. (2021). Features and problems of lending to agricultural enterprises. Paper presented at the *IOP Conference Series: Earth and Environmental Science*, , 677(2) doi:10.1088/1755-1315/677/2/022045 Retrieved

Current situation in bakery industry in Slovak Republic

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Abstract

Bakery industry is one of the most crucial industries in Slovakia. Bakery products as bread or any other are part of daily meal of most of the Slovak population. In this paper we will talk about situation with bakery industry in the past years, but we will also focus on recent years and analyse problems that occurred in the industry due to global pandemic COVID – 19. This pandemic influenced lots of bakeries and endangered its existence.

Keywords: bakery, production, consumption, import, export

JEL Classification: Q00, Q02, O11

1. Introduction

Bakery products are one of the basic food, which is consumed by people. The bakery industry, like any other, is gradually evolving and is also affected by many aspects. The bakery industry in Slovakia has been changing recently due to the global pandemic COVID - 19. The aim of this paper is to present current situation with bakery industry in the Slovak Republic and identify factors that influencing this situation in the past period of time.

The food market in Slovakia is defined by the Act of the National Council of the Slovak Republic no. 152/1995 Coll. on food. The law defines food as products or substances intended for human consumption that are unprocessed, partially processed, or processed. According to the law, chewing gum, beverages, drinking water, and substances that are intentionally added to food during the production or preparation of food are also included in the food.

1.1 The current situation on bakery market in Slovak republic

Ács (2022) writes, that prices of bakery products in Slovakia are constantly rising due to the increase in the cost of inputs and lack of support from the government. Prediction for the year 2022 is, that prices will still rise due to an increase in input costs like food wheat, butter, poppy, or walnut. Due to the pandemic situation, there was also a lack of employees, which cause problems with the production of bakery products.

Web Webnoviny.sk (2021) writes, that year 2021 was one of the worst for bakers in Slovakia. The main reason was the increased price of materials but also increased price of energy and logistical costs. Bakeries are also complaining about the government, for lack of support of this industry, but not just financial support. Lapšanský (head of Union of bakers, confectioners, and pasta producers) says, that another problem is, that local producers are disadvantaged compared to foreign competition.

1.2 Covid - 19 complications in the bakery industry in Slovakia

According to Webnoviny.sk (2021), another problem occurred due to covid restriction on Slovakia. Based on restriction, The restriction tells, that the owners of the company are required to test employees for COVID - 19 virus every second day. This would significantly increase costs that bakeries are not able to cover.

Web Ekonomika.pravda.sk (2021) says, that The Union of bakers, confectioners, and pasta producers requested compensation in order to fulfill this request. For bigger bakeries this could increase costs by 100.000€ - 200.000€ monthly. These sudden costs would cause, that bakeries would increase the prices of final products, but also in a worst-case scenario, they would not be able to produce enough bakery products to cover the market.

According to SPPK (2022), year 2022 will be even harder for bakery industry. The difficult economic situation is reflected in every segment of food production. Last year, companies operating in the milling industry, which is one of the key inputs for bakery industry, reduced the volume of products produced precisely because of the unbearable increase in inputs to production. There is a 9% decrease in wheat flour and a 4% decrease in rye flour. Another indicator of the undesirable situation is foreign trade in this commodity. Wheat flour exports to European Union countries fell by as much as 17% last year. The companies in the milling industry do not want to take risks and produce at a loss in the current situation, so they have started to reduce production and adapt to the market situation and rising prices.

1.3 Factors influencing customers

According to Predanociová et al (2018), consumer behavior is described as the actions taken by customers in the search, acquisition, use, and disposal of items and services that suit their requirements. Several elements that the customer considers impact the consumer's meal decision are crucial in the purchase process, such as food safety perceptions, quality perception, health issues, and food, food origin, pricing. They also define, that freshness, pricing, and quality are three major aspects to consider while making a purchase, as well as the consumption of bread goods.

In addition to shape, appearance, color, and taste of bread and pastry, Nagyova et al. (2012) pointed out that consumers perceive quality on the basis of other subjective factors. Most consumers base their decision on the cost of specific bakery products.

Buying bakery products is associated with a relatively high share of impulses and emotions. Several factors contribute to the influences on purchasing decisions, including cultural, social, psychological, and personal factors (Géci, Nagyová, and Rybanská, 2017).

According to Kubicová et al. (2020), consumer behavior when buying bakery products is typically determined by psychological factors, which may be decisive in repurchasing a particular bakery product. The motivational aspect as a psychological factor may lead consumers to search for and purchase higher quality bakery products.

2. Data and Methods

The aim of this paper was to describe current situation in bakery industry in Slovak republic. To achieve this goal, we used secondary data gathered from National Statistical office of the Slovak Republic. We used secondary data to calculate development in bakery industry during years 2010 – 2018 (2020) – same data were not fully filled, so we used only available data. We

calculated the development in production, consumption, import and export of bread as one of the most significant bakery products. By usage of MS Excel we calculated also possible trend for next two time periods.

3. Results and Discussion

3.1 Overview of the situation on bakery industry in Slovak republic

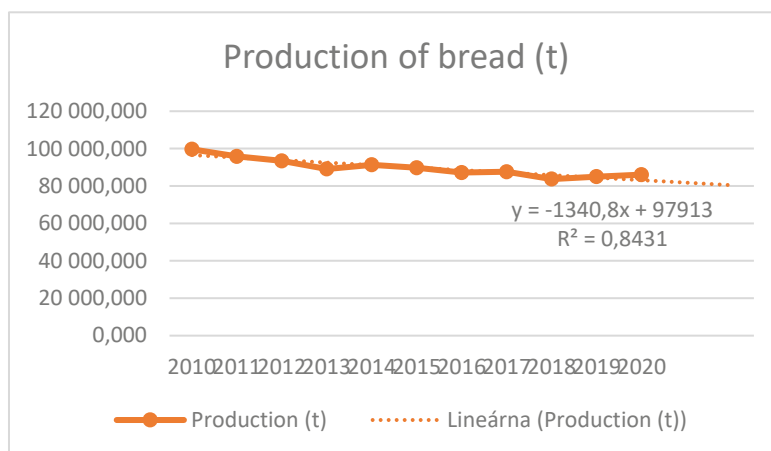
As we wrote previously, situation in bakery industry in Slovak republic in past years was highly influenced by global pandemic COVID - 19, however, this situation was developing for a several years. In next graphs and tables, we will describe development in bakery industry in the past years. We used data from national statistical office, however, data were not uniform, that's why we decided to describe development of production, consumption, export and import of bread as one of the most important bakery product.

3.2 Production:

Table 1: Production of bread in Slovak republic

Bread	Production (t)	Index
2010	99 616.179	
2011	95 831.582	0.9620
2012	93 418.205	0.9748
2013	89 112.425	0.9539
2014	91 299.030	1.0245
2015	89 741.757	0.9829
2016	87 178.683	0.9714
2017	87 612.023	1.0050
2018	83 712.379	0.9555
2019	84 975.430	1.0151
2020	86 052.185	1.0127

source: National statistical office, own processing



Graph 1 Production of bread in Slovak Republic

source : National statistical office, own processing

As we can see from the graph, production of bread was dropping in most of analysed years. Average annual drop in bread production was 1,45%. The trend of bread production development can be described by a linear function with the following parameters:

$$Q_t = 97913 - 1340,8 * t$$

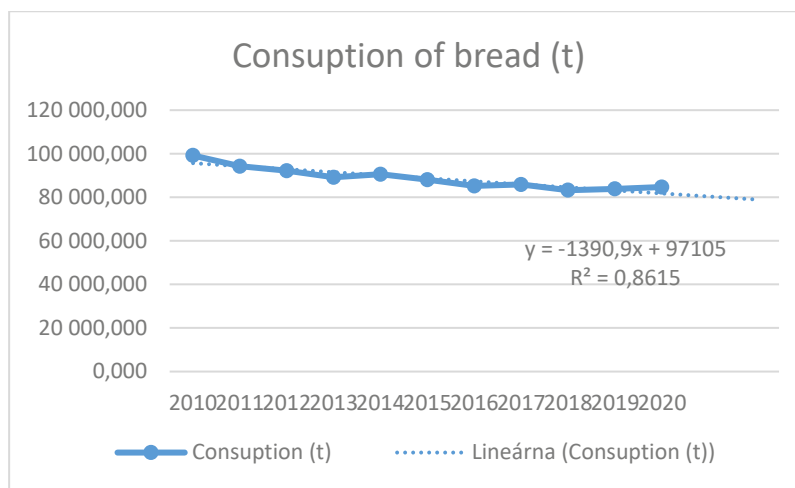
$$R^2 = 0,8431$$

3.2 Consumption:

Table 2: Consumption of bread in Slovak Republic

Bread	Consumption (t)	Index
2010	99 229.274	
2011	94 230.409	0.950
2012	92 194.972	0.978
2013	89 174.028	0.967
2014	90 584.849	1.016
2015	88 054.663	0.972
2016	85 221.759	0.968
2017	85 853.309	1.007
2018	83 294.831	0.970
2019	83 835.343	1.006
2020	84 686.765	1.010

source : National statistical office, own processing



Graph 2 Consumption of bread in Slovak republic

source : National statistical office, own processing

As we can see from the graph, consumption of bread was dropping in most of analysed years. Average annual drop in bread consumption was 1.57%. The trend of bread consumption development can be described by a linear function with the following parameters:

$$Q_t = 97105 - 1390,9 * t$$

$$R^2 = 0.8615$$

As we see production and consumption, we can say that both has similar trend, although volume of production and consumption is very similar, Slovak republic still has high foreign trade surplus. During 2022 food self-sufficiency was at the rate of 101.61%.

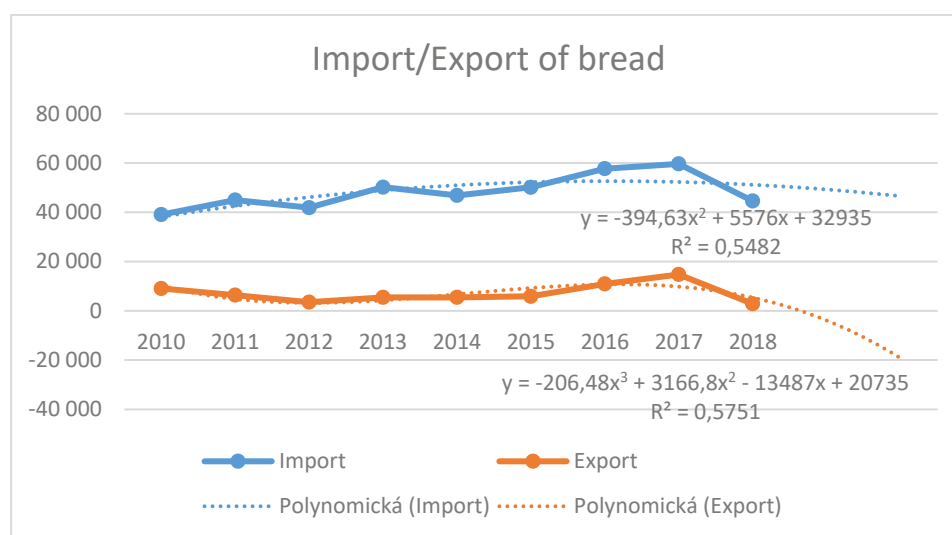
3.3 Import/export of bread in Slovak republic

Because of missing data, we were able to analyse only time period 2010-2018.

Tab 1 Import/Export of bread in Slovak republic

Import/Export	Bread Import (t)	Index	Bread export (t)	Index
2010	39 043		9 042	
2011	44 953	1.1514	6 362	0.7036
2012	41 854	0.9311	3 507	0.5512
2013	50 168	1.1986	5 450	1.5540
2014	46 830	0.9335	5 434	0.9971
2015	50 115	1.0701	5 856	1.0777
2016	57 699	1.1513	10 907	1.8625
2017	59 635	1.0336	14 742	1.3516
2018	44 567	0.7473	2 843	0.1929

source : National statistical office, own processing



Graph 3 Import/Export of bread in Slovak republic

source : National statistical office, own processing

As we can see out of data and the graph, import of bread was much higher than its export. Average annual import growth by 1.67% and average annual export dropped by 13.47%. This significant drop was caused mainly by the drop in years 2017-2018. As we can see the trend is declining for both import and export. Trends can be described by following polynomic function with the following parameters:

Import:

$$Q_t = 32935 + 5576 \cdot t - 394.63 \cdot t^2$$

$$R^2 = 0.5482$$

Export:

$$Q_t = 20735 - 13487 \cdot t + 3166.8 \cdot t^2 - 206.48 \cdot t^3$$

$$R^2 = 0.5751$$

4. Conclusion

The bakery industry is suffering during past period of time as we could see on the negative development in data. COVID – 19 pandemic even more increased the negative trend in this industry. We can see, that currently is industry at the edge, when lots of bakeries are threatened with bankruptcy. Current war situation between Russia and Ukraine can also have a negative impact on bakery industry, however, this situation is still fresh, so we didn't see any kind of impact yet.

For the future positive development on bakery market, there needs to be increased support from the government, who should compensate bakeries for their losses during global pandemic COVID – 19. As we can currently see, situation with pandemic is getting better, which also can influence positive growth of bakery industry.

Acknowledgements

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References

- [1] Ács, K. (2022). Ceny chleba a pečiva porastú aj tento rok, varujú pekári, Retrieved 1. 3. 2022 from <https://tvnoviny.sk/domace/clanok/143248-ceny-chleba-a-peciva-porastu-aj-tento-rok-varuju-pekari>
- [2] Datacube – štatistický úrad SR
- [3] Géci, A., Nagyová, E., Rybanská, J. 2017. Impact of sensory marketing on consumers buying behaviour, Potravinarstvo Slovak Journal of Food Sciences, vol. 11, no.1. p. 709-717. <https://doi.org/10.5219/835>
- [4] Holéciová, J. (2022). Rokovala Únia potravinárov Slovenska, Retrieved 1. 3. 2022 from <https://www.sppk.sk/clanok/4295>
- [5] Kubicová, E., Predanocyová, K., Kádeková, Z., & Košičiarová, I. (2020). Slovak consumers' perception of bakery products and their offer in retails. Potravinarstvo Slovak Journal of Food Sciences, 14, 24–32. <https://doi.org/10.5219/1240>
- [6] Nagyová, E., Horská, E., Paluchová, J., Kleinová, K., Kádeková, Z., Récky, R., Šimo, D., Vaňová, A. 2012. Trendy v spotrebiteľskom správaní na trhu potravinárskych produktov v SR (Trends in consumer behaviour on the food market in the Slovak Republic). Nitra, Slovakia : Slovenská poľnohospodárska univerzita v Nitre, 83 p. ISBN-13 978-80-552-0899-2. (In Slovak).
- [7] PRAVDA.SK (2021). Pekári odmietajú návrh vlády aby testovali zamestnancov na vlastné náklady, Retrieved 27. 2. 2021 from <https://ekonomika.pravda.sk/krajina/clanok/606653-pekari-odmietaju-navrh-vlady-aby-testovali-zamestnancov-na-vlastne-naklady/>
- [8] Predanocyová, K., Kubicová, E., & Kádeková, Z. (2018). Factors affecting consumer decision making in the market of bakery products. In Globalization and its socio-economic consequences. Žilina : University of Žilina, s. 854-862. ISBN 978-80-8154-249-7

-
- [9] WEBNOVINY.SK (2021). Pekári odmietajú covid testovanie vykonávané na ich náklady, hrozia prázdnyimi pultami s pačivom, Retrieved 27. 2. 2022 from <https://www.webnoviny.sk/nasvidiek/pekari-odmietaju-covid-testovanie-vykonavane-na-ich-naklady-hrozia-prazdnymi-pultami-s-pecivom/>
- [10] WEBNOVINY.SK (2021). Pekári zažili najťažší rok v histórii, pre rast vstupov očakávajú ďalšie zdražovanie, Retrieved 27. 2. 2022 from <https://www.webnoviny.sk/nasvidiek/pekari-zazili-najtazsi-rok-v-historii-pre-rast-vstupov-ocakavaju-dalsie-zdrazovanie/>
- [11] Zákon NR SR č. 152/1995 Z.z. o potravinách

Sensory Marketing Role on Consumer Behaviour on the Market of Selected Food Products, Case Study Slovakia – Mind Genomics

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Abstract

Sensory Experience based on consumer behavior have been used by marketers to develop marketing strategies. The paper deals with how people describe the importance of different sensory experiences as they drive product purchase. The research reported here uses Mind Genomics, an emerging branch of consumer psychology. Respondents evaluated unique sets of 24 different combinations of descriptions about a food store. The descriptions (elements) focused on the foods (produce, meat, beverage) and ambiance in the store. The respondents rated interest in buying based upon the description. The data revealed both the degree to which each element (descriptive term) drove purchase, and uncovered new-to-the-world mind-sets, individual in Slovakia who show different patterns of response to the same elements. The study shows the ability to understand what specific sensory characteristics of the products should be featured in stores, and how the marketer can focus efforts to please customers in the Slovak market.

Keywords: food products, consumer behaviour, Mind Genomics, Sensory marketing, Slovak market

JEL Classification: Q10, Q13, M31, M39

1. Introduction

Marketing is one of the most important company objectives, intimately connected to the customer's needs and wants. The company which understands it's customers at a deep level, can be more successful satisfying them, instead of looking at the competition for guidance. The marketing concept is focused on the customer and could be defined as the world view of “*sense and respond*” (Grębosz and Wrońska, 2010). It is no wonder that in today's world, the focus of a great deal of consumer science in theory, and marketing research in practice, has taken a lead role in the world of marketing. Author has written that although consumers are presumed to behave, decide and act rationally, that presumption is not always true, and certainly not for many products where emotion plays a role, or has played a role, whether that role is recognized and applauded, or simply part of the almost invisible ‘baggage’ that the product carries with it (Rybanská, 2015).

Mind Genomics comes from the disciplines of statistics (experimental design), consumer research, and with a background in experimental psychology. The original focus was psychophysics, the study of the relation between physical stimuli and subjective responses. Some aspects have migrated into the world of consumer neuroscience, where the focus is on the relation between physical stimuli and neural response. The aim of consumer neuroscience (Neuro Marketing research) is a better understanding of the principles of decision-making and the strategy of customer and consumer behavior in economic processes through neuroimaging and biometric methods, psychological and neurobiological concepts and knowledge” (Berčík

et al., 2016). Mind Genomics, with its history in the sister study of perception, rather than neural processes, is becoming a partner with consumer neurosciences, Mind Genomics showing the underlying decision-making ‘rules,’ consumer neuroscience showing the brain in action, as these cognitive rules are being implemented.

1.1 Sensory Marketing Role on Consumer Behaviour

In their study authors (Garber, Hyatt and Starr, 2003) found that the failure of taste tests to predict the market performance of new food products (cf. Burger King's new French fries, New Coke) illustrate the inability of marketing researchers to perform such tests effectively. “Food scientists, with their expertise at testing the sensory effects of foods, can make an important contribution to the ability of food producers to predict consumer preference and choice. Consumers are the final step in the production chain, it is useful to identify which factors affect their behavioral patterns (Font-i-Furnols and Guerrero, 2014)”. Companies, in search of new methods of reaching the customer, refer to all of their senses (Koszembar-Wiklik, 2019).

Sensory marketing which is one of the comprising methods is; a marketing technique that aims to seduce the consumer by using his senses to influence his feelings and behavior. In sensory marketing, with various stimuli that are sent to five senses, consumer's emotional and behavioral orientations are studied to be affected (Erenkol, 2015). People are increasingly purchasing (e.g., food, clothes) and consuming (e.g., movies, courses) online where, traditionally, the sensory interaction has mostly been limited to visual, and to a lesser extent, auditory inputs (Petit, Velasco and Spence, 2019).

Consumers nowadays are looking forward to a wholesome experience while shopping. They are attracted towards products that appeal to their senses and develop an emotional connect. For this not only the product attributes but the environment at the point of purchase influences their decision (Rajain and Rathee, 2017). Sensory marketing is increasingly gaining importance as a promising approach to effectively appeal to consumers. To predict and monitor the success of sensory marketing activities, it is necessary to assess consumers’ perception of sensory cues (Haase and Wiedmann, 2018).

1.1.1 Selection criteria on buying food products

Food quality and safety belong to the most important factors of building the image of the product, brand, or country of origin at the local, regional or global markets (Horská, Ůrgeová and Prokeínová, 2011). Extrinsic sensory cues bring numerous advantages to consumers (e.g. empower choice), to producers (e.g. increase consumer loyalty), and to the environment (e.g. reduce food waste) (Jürkenbeck and Spiller, 2021). Consumers eating habits keep changing everyday away from their regular meal, less time and more working hours have left people with the option to just pop in a restaurant or fast-food. The use of five senses in the marketing field helps to arouse customer's emotions and nowadays it is fundamental for the company to differentiate itself from its competitors (Roopchund Randhir *et al.*, 2016).

“Emerging application of human sensory science, namely sensory marketing, as a technique by which knowledge of sensory impressions, i.e., knowledge of sensory experiences, can help sell products and services is presented. Research suggest that shoppers are continually feeling a range of different emotions when they connect with brands. Feelings may be the most effective way to make sure that customers feel positive (Harizi, 2021).

2. Data and Methods

This study is created to understand, How sensory is effecting buying of products like sight, smell, hearing, touching and taste? Results of several studies conducted by many researchers has proved to many results and analysis on sensory marketing. The main objective of this study seeks to analyze and examine the effect of sensory marketing on buying food products. In order to collect and interpret the primary data, is used the last technical upgrade (Porretta *et al.*, 2019) “Mind Genomics” is the study of mixtures, the study of everyday stimuli, to understand the rules of choice, to discover what is important to a person and what is not. Mind Genomics highlight which variables of the topic have more interest and which do not have interest, how people answer in different ways for one aspect of the topic.

For this study we have 35 respondents from Slovakia where is been presented for a situation in today’s store, respondents are asked to choose one description from 1 to 5 (1 is Unlikely, 5 is Likely), and participants described themselves by gender and age. Raw materials are created in order to ask for a question which “tell a story”, for each question provide four separate answers in the form of simple sentences, and we have provide four answers for each question to where participants paint a word picture in the mind.

These answers are combined in small vignettes, vignettes are little stories about the topic that respondents rate, can consist of 2, 3 or 4 questions and one answer from each question, and have a combining rule: Only one answer can be used from each question area at a time. Each respondent sees and rates 24 different vignettes, so all vignettes are different and all people see different vignettes. For our study we have with 35 people, the system creates 35x24 or 840 different vignettes.

Figure 1 shows the self-profiling questionnaire as the respondent sees the questionnaire. The set-up is completed ‘templated,’ allowing the researcher simply to fill in the key information. Question in Figure 1 instructs the respondent to define herself or himself on gender, age, and where the person shops. The actual screen has a drop-down menu.



Figure 1 – Mobile view of Self Profiling Classification

Source: BimiLeap

Figure 2 shows a 3-element vignette, prescribed by the underlying experimental design. Each respondent evaluated a unique set of 24 vignettes, comprising 2, 3 or elements.

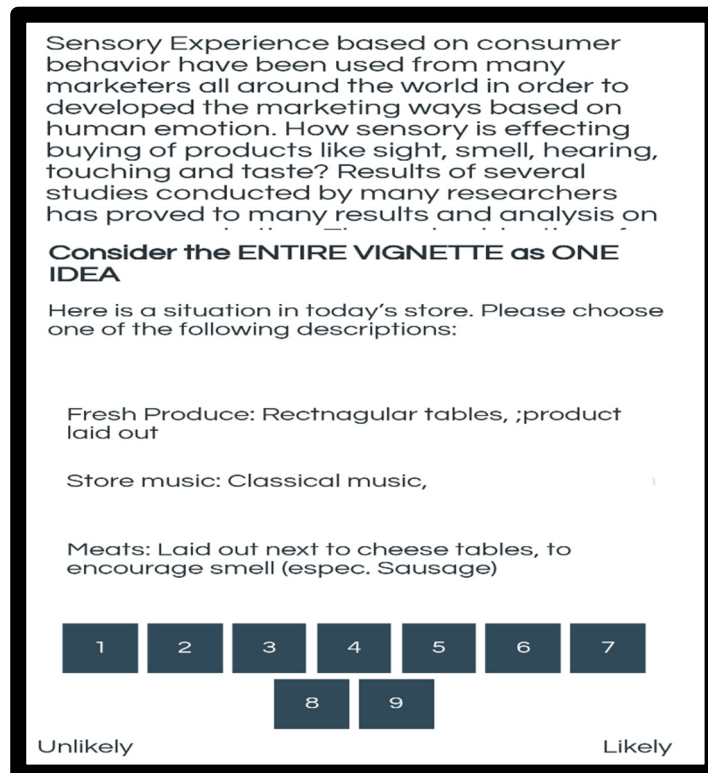


Figure 2 – Mobile view of a 3-element vignette

Source: BimiLeap

To understand the mind, Mind Genomics has developed the strategy to transform the 1-9 scale used by BimiLeap (application in website) to create two scale points: low/weak feeling and high/strong feeling by creating binary variables. Ratings of 1-6 on the scale transformed to 0 (i.e., low / weak feeling), Ratings of 7-9 on the scale transformed to 100 (e.g., high / strong feeling).When the scale is 1-7, then ratings of 1-5 transformed to 0, 6-7 to 100, when the sale is 1-5, then ratings of 1-3 transformed to 0, 4-5 to 100.

Ordinary Least Squares Regression shows how many rating points come from each answer, i.e., each independent variable in the regression model. Regression run at the level of the individual respondent, making the statistics much stronger and then combine the data from the relevant group. Rating points are the regression coefficients and answers are also called elements or messages.

Experimental is design created in order to test everyone with a unique set of 24 vignettes, and individual data can be analyzed separately. Mind Genomics transform ratings (1-6 → 0, 7-9 →100) by average relevant groups (total, ages, gender, mind-set segments). In the experiment additive constant is baseline and percent of people who would say yes, interested, even without elements are showed.

Rating Points

- Positive – adds. E.g., +8 means that when the element is inserted into the vignette, an additional 8% of the respondents go from a low of 1-6 to a high of 7-9.

- Negative – subtracts. E.g., a -8 means that when the element is inserted into the vignette, 8% of the respondents who were positive change (would rate the vignette 7-9) change their rating to neutral or negative (would rate the vignette 1-6).
- Strong positive > 8, strong negative < -6.

3. Results and Discussion

The Total Panel in this experiment is distributed in the Table 1, where the category of female participants is higher than males and the group with demographics characteristics is characterized from new generation from 18-34 years old.

Table 1 - Distribution of respondents and selection, based on the self-classification

Total	Gender		Age							Where do you shop mostly?			
	Male	Female	13 - 17	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+	Supermarkets	Retail Stores	Farms Market and Bakery	Everywhere where is food
35	12	23	0	5	18	6	5	1	0	22	0	1	12

Source: Author's elaboration

About the question of the study, where participants shops more, most frequent answer is at Supermarkets in 22 participants and the rest of them are not addicted to be focused only in one place to shop, but they can shop everywhere where food.

From the results of Table 2, based on respondent answers, is easily understandable that Males have strong positive feelings on fresh products section, from their look and the sound of music at the moment that they are shopping and also on the description of food. The second category Females are focused on beverages section, by smelling the products. What is interesting for the group sampling in Slovakia is that group ages from 18-24 have strong positive feelings on choosing products from smelling them, listening a good music at the moment of shopping and they buy products by evaluating them by sight. The generation 35- 54 are focused and have strong positive feeling on buying fresh products with detailed description, which is highly linked with smell, sight and touch.

Table 2 - Distribution of respondents and selection, based on the self-classification feelings

	Group	Total	Male	Female	18 - 24	25 - 34	35 - 44	45 - 54
	Base Size	35	12	23	5	18	6	5
	Additive Constant	59	55	60	33	64	80	61
	Question A: Describe the fresh produce section and product, look'							
A	1 Fresh Produce: Rectangular tables, ;product laid out	4	14		7		8	10
A	2 Fresh produce: Long tables, set up so you can look, smell, and touch (through a gauze)	3	10				6	16
A	3 Fresh produce: Theme areas for different colors and smells, highlighted for your enjoyment	2	13				10	30
A	4 Fresh produce: Full price and lower price sections as produce ages	7	5	9	6	5		18
	Question B: Describe the fresh produce section and product, sound'							
B	1 Store music: Sounds of nature,	3	10		13		6	
B	2 Store music: Classical music,	2	4	4	8	3		
B	3 Store music: Pop-jazz				5		14	
B	4 Store music: Fast tempo	4	10	3		3	8	
	Question C: Describe the meat section							
C	1 Meats; Laid out on shelves in attractive packages				14	3		
C	2 Meats: Laid out to give a sense of color, with whole meat visible	8	16	4	19	8		9
C	3 Meats: Laid out next to cheese tables, to encourage smell (especially. Sausage)	5	18		18	7		
C	4 Meats: Show of the same meat under three common types of lights in the home to be interesting	3	2	2	17	5		
	Question D: Describe the beverage section							
D	1 Beverages: Fresh roasted coffee in bags with theme of the week, so you can smell	8		14	14	6	2	7
D	2 Beverage: Table with theme of sodas, their sounds of being poured, and smells	4		9	20	8		

D 3	Beverage: Light show of same beverages under three common types of lights in the home to be interesting			6	7		
D 4	Beverage: Different coffees pods show, and a demonstration of a different pod (dark roast(each 30 minutes, with chance to taste the pod for 10 cents (one pods for each four people)	6		13	3	16	

Source: Author's elaboration

Three New-to-the-World Mind Sets

One of tenets of Mind Genomics is that within any experience, especially micro-experiences, such as shopping, people differ from each other in systematic ways called mind-sets. The analogy is to the genome. Genomes have alleles, different forms, which express themselves in different traits, possibly in different behaviors. Carrying that analogy forward, Mind Genomics creates these mind-sets by clustering the pattern of coefficients of the individual models relating the binary rating (here positive emotion) to the presence/absence of the elements in a study (here 16 answers to the questions, i.e., elements). The within-subjects experimental design allows the researcher to create the model (equation) separately for each respondent, and then cluster the respondents based upon the pattern of coefficients (excluding the additive constant.) The metric for 'distance' upon which the clustering is based is defined as (1-Pearson R).

The metric takes on the value 0 when the coefficients for two respondents show a Pearson R of 1.0. The metric takes on the value 2 when the coefficients for two respondents show a Pearson R of -1. As a rule of thumb, there should be fewer mind-sets, rather than more (parsimony) and tell a story (interpretability). 35 Three mind-sets emerged for these data, and for clustering based upon the coefficients for 'Likely'. The additive constant and the coefficients for three mind-sets appear in Table 3. All three mind sets show high to moderate coefficients 55-74, so that it is the elements which will drive the rating of 4-5, viz., 'likely.' It is clear from Table 3, that there are three different mind-sets, with strongly positive coefficients, reaching and exceeding the cut-off for statistical significance.

The mind-sets can be named by considering the commonalities of the elements generating the highest coefficients.

Table 3 – Mind Sets

		T o t a l	M S 1	M S 2	M S 3
	Group				
	Base Size	3 5	1 4	1 0	1 1
	Additive Constant	5 9	7 4	5 5	5 5

Strongest Elements – Mind-Set 1					
D 4	Beverage: Different coffees pods show, and a demonstration of a different pod (dark roast (each 30 minutes, with chance to taste the pod for 10 cents (one pods for each four people)	6	1 9	6	
D 1	Beverages: Fresh roasted coffee in bags with theme of the week, so you can smell	8	1 5	8	
D 2	Beverage: Table with theme of sodas, their sounds of being poured, and smells	4	1 4		4
A 4	Fresh produce: Full price and lower price sections as produce ages	7	1 1	5	9
D 3	Beverage: Light show of same beverages under three common types of lights in the home to be interesting	1	1 0		
Strongest Elements – Mind-Set 2					
B 1	Store music: Sounds of nature,	3		1 9	3
B 4	Store music: Fast tempo	4		1 7	7
C 1	Meats; Laid out on shelves in attractive packages	- 1		1 5	
C 4	Meats: Show of the same meat under three common types of lights in the home to be interesting	3		1 4	
C 2	Meats: Laid out to give a sense of color, with whole meat visible	8		1 2	1 7
B 3	Store music: Pop-jazz	- 4		1 2	7
Strongest Elements – Mind-Set 3					
A 1	Fresh Produce: Rectangular tables, ;product laid out	4			2 2
C 3	Meats: Laid out next to cheese tables, to encourage smell (especially. Sausage)	5		6	1 8

C 2	Meats: Laid out to give a sense of color, with whole meat visible	8		1 2	1 7
A 2	Fresh produce: Long tables, set up so you can look, smell, and touch (through a gauze)	3			1 4
A 3	Fresh produce: Theme areas for different colors and smells, highlighted for your enjoyment	2	5		1 4
Not strong for any mind-set					
B 2	Store music: Classical music,	2		2	4

Source: Author's elaboration

3. Discussion

How good is the potential innovation? - The Index of Divergent Thought (IDT)

Mind Genomics generates new opportunities for products (as well as services). The data presented here suggests three groups. How can we measure the promise of the information? Are these high impact elements simply 'departures' at random from mediocrity, or are there really these mind-sets out there?

The study has divided the respondents by the pattern of their coefficients in the clustering stage of analysis. The clustering gives us a sense of how many people are in each new cluster (viz., size of market, given by the base size), and the messages or ideas which appeal to the people in the market (given by the magnitude of the coefficients, especially the ones that are highlighted.)

The Index of Divergent Thought (IDT) weights the coefficients by the size of the mind-set. We are looking for big values of IDT, either because the mind-set is big, or if the mind-set is small, then elements with very high coefficients, 'breakthrough ideas', even breaking through to a smaller group of consumers, but doing so strongly.

Table 4 – The Index of Divergent Thought

Group	Total	Segment 1 of 2	Segment 2 of 2	Segment 1 of 3	Segment 2 of 3	Segment 3 of 3	
Weight	1	0.457	0.543	0.4	0.286	0.314	
Base	35	16	19	14	10	11	Sum
Regression Coefficient 0-9.99	14	4	7	2	5	6	38
Regression Coefficient 10-14.99	0	4	6	3	3	2	18
Regression Coefficient 15-19.99	0	0	1	2	3	2	8
Regression Coefficient 20+	0	0	0	0	0	1	1

Weight (Base/Total)	0.333	0.152	0.181	0.133	0.095	0.105	Sum
Regression Coefficient 0-9.99	4.7	0.6	1.3	0.3	0.5	0.6	8
Regression Coefficient 10-14.99	0	0.6	1.1	0.4	0.3	0.2	2.6
Regression Coefficient 15-19.99	0	0	0.2	0.3	0.3	0.2	1
Regression Coefficient 20+	0	0	0	0	0	0.1	0.1

Source: Author's elaboration

How many of these elements score 0- 4.99; 5-9.99; 10-14.99; 15-19.99, 20 and higher. When we look at the total number of elements scoring in these ranges, and when we look at the number 'weighted or corrected for base size' we get a sense of the potential of major discoveries. The idea research reveals a great number of high scoring elements, with large-base sizes.

4. Conclusion

The strategy of sensory marketing may be one of the smartest ways for any company to trigger emotion instantly in their audience, and maintain long-term engagement" (Harizi, 2021). Product description, packing, smell, sight and sound plays a significant role in the interactions between consumers and their decision making. Marketers manipulate the exterior of the packaging to influence consumer expectations, experiences, and behaviors (van Esch, Heller and Northey, 2019).

Mind Genomics creates these mind-sets by clustering the pattern of coefficients of the individual models relating the binary rating (here positive emotion) to the presence/absence of the elements in a study. Mind Genomics is that without any experience, especially micro-experiences, such as shopping, people differ from each other in systematic ways called mind-sets. Sensory Marketing is a Science which have to be in the attention of marketers in order to know better their costumers and to create creative strategies by attracted them and by creating their needs.

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References

- [1] Berčík, J. *et al.* (2016) 'Consumer neuroscience in practice: The impact of store atmosphere on consumer behavior', *Periodica Polytechnica Social and Management Sciences*, 24(2), pp. 96–101. doi: 10.3311/PPso.8715.
- [2] Erenkol, A. D. (2015) 'Sensory Marketing', *Journal of Administrative Sciences and Policy Studies*. doi: 10.15640/jasps.v3n1a1.
- [3] van Esch, P., Heller, J. and Northey, G. (2019) 'The effects of inner packaging color on the desirability of food', *Journal of Retailing and Consumer Services*. doi: 10.1016/j.jretconser.2019.05.003.
- [4] Font-i-Furnols, M. and Guerrero, L. (2014) 'Consumer preference, behavior and perception about meat and meat products: An overview', *Meat Science*. doi: 10.1016/j.meatsci.2014.06.025.

- [5] Garber, L. L., Hyatt, E. M. and Starr, R. G. (2003) 'Measuring consumer response to food products', *Food Quality and Preference*. doi: 10.1016/S0950-3293(02)00030-7.
- [6] Grębosz, M. and Wrońska, B. (2010) 'Sensory Impact on Customer Behaviour', *Konsumpcja i Rozwój*, 2(3), pp. 153–156.
- [7] Haase, J. and Wiedmann, K. P. (2018) 'The sensory perception item set (SPI): An exploratory effort to develop a holistic scale for sensory marketing', *Psychology and Marketing*. doi: 10.1002/mar.21130.
- [8] Harizi, A. (2021) 'Chapter 4. Imputing Emotions to Foods', in *Consumer-based New Product Development for the Food Industry*. Cambridge: Royal Society of Chemistry, pp. 49–65. doi: 10.1039/9781839163333-00049.
- [9] Horská, E., Ůrgeová, J. and Prokeinová, R. (2011) 'Consumers' food choice and quality perception: Comparative analysis of selected Central European countries', *Agricultural Economics*, 57(10), pp. 493–499. doi: 10.17221/103/2011-agricecon.
- [10] Jürkenbeck, K. and Spiller, A. (2021) 'Importance of sensory quality signals in consumers' food choice', *Food Quality and Preference*. doi: 10.1016/j.foodqual.2020.104155.
- [11] Koszembar-Wiklik, M. (2019) 'Sensory marketing - Sensory communication and its social perception', *Communication Today*.
- [12] Petit, O., Velasco, C. and Spence, C. (2019) 'Digital Sensory Marketing: Integrating New Technologies Into Multisensory Online Experience', *Journal of Interactive Marketing*. doi: 10.1016/j.intmar.2018.07.004.
- [13] Porretta, S. *et al.* (2019) 'Mind Genomics (Conjoint Analysis): The new concept research in the analysis of consumer behaviour and choice', *Trends in Food Science and Technology*. doi: 10.1016/j.tifs.2018.01.004.
- [14] Rajain, P. and Rathee, R. (2017) 'Sensory Marketing-Investigating the Use of Five Senses', *International Journal of Research in Finance & Marketing International Journal of Research in Finance and Marketing (IJRFM)*.
- [15] Roopchund Randhir *et al.* (2016) 'Analyzing the Impact of Sensory Marketing on Consumers: A Case Study of KFC', *Journal of US-China Public Administration*, 13(4). doi: 10.17265/1548-6591/2016.04.007.
- [16] Rybanská, J. (2015) 'Selected Personality Characteristics As Predictors of Emotional 1 Introduction', *European Journal of Business science and technology*, 1(2), pp. 128–136.

Air Transport Logistics in European Union

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Abstract

Air transport is an inseparable part of a transport system, it is the youngest, yet the most dynamic and developing form of transport of people and goods. The paper analyses the number of commercial airports and air transport of passengers and goods in the member countries of the EU as well as in the EU 27. It evaluates logistics of air transport in the European Union and deals with basic aspects of insurance and legal norms in logistics, applicable in the member states of the European Union. Within the legislation, attention is focused primarily on transport logistics and aviation insurance, because it is necessary to minimize and anticipate risks in air transport.

Keywords: logistics, European union, aviation, transportation, insurance, legal norms

JEL Classification: K2, G22, R41

1. Introduction

Air transport is a part of transport system of the country, it plays a strategic role especially in the area of provision of transport services abroad and at the same time contributes to the social and economic development of the state. For several countries, air transport is a prerequisite for the entry of foreign capital into the economy. The level of its development represents the economic and social maturity of the state and can also be a measure of the living standards of the population.

It is the youngest type of transportation, it is not limited by geographical barriers and it is also it is also an ideal solution for shipments that must be delivered as soon as possible. It is therefore possible to deliver the goods very quickly by air to almost all countries of the world. On one hand, air transportation is very fast, but on the other hand it belongs among the most expensive ways of transport. Regarding speed, it is undoubtedly the fastest way to transport goods over long distances. Scheduled flights are suitable for regular shipments through European airports to / from around the world, and charter flights are used to transport goods that are to be delivered flexibly - independently of scheduled flights.

Air transport has expanded in recent decades. In the early days of aviation, it was probably not even expected to be one of the most widely used modes of transport in the world. More than any other mode of transportation (ocean or ground), air transport has benefited from advanced technological innovations, which have had a revolutionary effect on long-distance travel (Pei-Fen Kuo, Gede Brawiswa Putra, Faizal Azmi Setiawana, Tzai, Hung Wen, Chui-Sheng Chiu, Umroh Dian Sulistyah, 2022).

Air transportation is the youngest type of transportation. On one hand, air transportation is very fast, but on the other hand it belongs among the most expensive ways of transport. Especially thanks to its speed, it is a very dynamic and developing way of transport. Just like in the EU, in other countries of the world, in relation to air transport, its impact on the environment is addressed. As Sallan & Lordan (2020) state “Air transport industry has been under constant evolution and transformation since its inception in the beginning of the 20th century. Its present configuration is the result of a set of heterogeneous forces: technological, political, regulatory and geographical”.

What matters are mainly aviation emissions, aircraft noise and environmental pollution around airports. The share of aviation in global pollution and global warming is minimal. The use of new technologies within the manufacture of aircraft, leads to a reduction of the level of noise and emissions from aviation. Compared to other modes of transport, air transport pays considerable attention to environmental protection by: monitoring noise at and around airports, measuring air quality, introducing new methods of cleaning and de-icing aircraft, introducing new technologies for liquid and solid waste disposal, more efficient use of agricultural land around airports and son on. The efficient provision of air traffic control services helps to minimize emissions and reduce aircraft noise around airports.

Throughout the year 2020, COVID-19 has turned into a fully blown pandemic, which poses a global risk to our health and global economies. Domestic and international air passenger markets have seen an in-crease with the rapid growth of low-cost carriers and aggressive route expansion; however, the coronavirus disease COVID-19 pandemic, which began in 2020, caused a steep decline in air travel and airlines face an uncertain future in regaining passengers. (Myeonghyeon & Jeongwoong, 2021). COVID-19 caused enormous damage in aviation that a 59–62% decrease by year in terms of global air transport passengers might be expected according to International Civil Aviation Organization.

For a comparison, we are stating information from a research realized in China. Pei-Fen Kuo, Gede Brawiswa Putra, Faizal Azmi Setiawana, Tzai, Hung Wen, Chui-Sheng Chiu, Umroh Dian Sulistyah (2022) state: “The number of routes decreased by approximately 68.3% from 41 to 13 during the outbreak (see figure 1). In addition, the total passenger volume decreased by approximately 98.4% from 466,780 to 7,387”

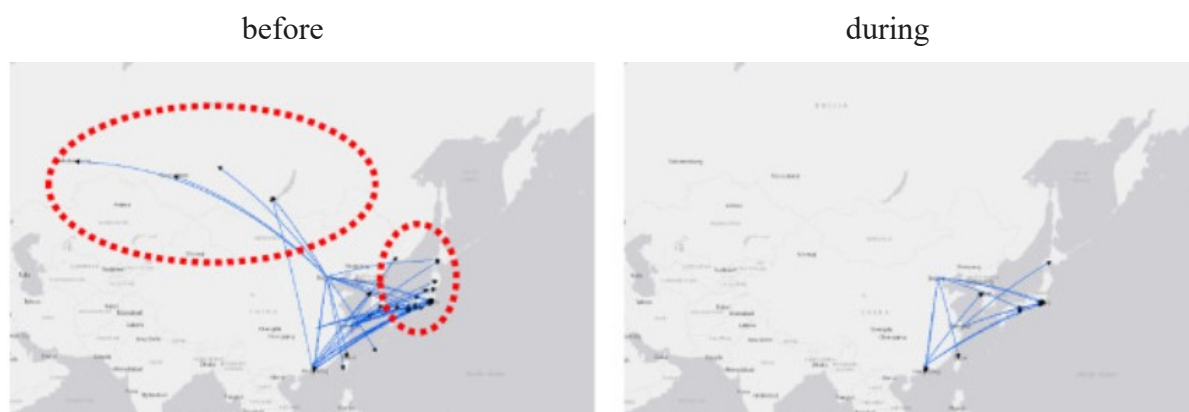


Figure 1. Medium-distance international flights originating from China (before and during COVID-19 pandemic)

Source: (Pei-Fen Kuo, Gede Brawiswa Putra, Faizal Azmi Setiawana, Tzai, Hung Wen, Chui-Sheng Chiu, Umroh Dian Sulistyah, 2022)

1.1 Insurance in Air Transport Logistics

About the unique of aviation insurance business written (Bassel F El-Kasaby, Scott E Tarry, Karisa K Vlasek. 2003). Authors state “the aviation insurance is a unique field from a business, legal, and regulatory standpoint. Issues such as risk management, contracts, and liability raise particular challenges within this highly specialized market. The aviation insurance market is unique. For one thing, the market relies on a relatively small pool of aircraft in terms of risk distribution. Additionally, the market must be able to absorb potentially staggering losses. In order to operate under these conditions, insurance companies engage in elaborate reinsurance mechanisms. In the US, underwriters reinsure each other in order to expand their capacity to absorb catastrophic losses as well as their ability to assume larger risks. Insurance companies also try to insure high risk ventures on the global market to further spread their losses”.

Two important features distinguish a contract of insurance from other contracts, namely, insurable interest and the duty of disclosure. As state:

- **“Insurable Interest** – A contract of insurance is distinguished from a wager by the requirement that the insured have an insurable interest in the subject matter of the insurance. This means that the insured should benefit from the subject matter's continued existence or suffer damage by its loss or destruction.
- **Duty of Disclosure** – Insurance policies are contracts done in the utmost good faith. Because the insured knows information about the risk being insured, he or she must act in the utmost good faith in making disclosures to the insurer either directly or through a broker. This disclosure enables the insurer to assess the risk properly, to decide whether or not to accept it, and, if so, to determine at what premium and on what terms”.

Very important is the duty. About the **duty of good faith** written (Bassel F El-Kasaby, Scott E Tarry, Karisa K Vlasek. 2003). Author/s state “this duty applies equally to insurer and insured, but the emphasis may vary from country to country. In the United Kingdom it seems that the duty is considered more frequently in relation to the actions of the insured, while in the United States it would seem that the duty is usually viewed in connection with the actions of insurers”.

The **duty of utmost good faith** requires an insured to make full disclosure of all "material facts" within the insured's knowledge. The duty also extends to the disclosure of facts which the insured could have ascertained by reasonable inquiry. A material fact is one which would influence the judgment of a reasonable insurer in deciding whether to accept the risk, and if so, for what premium. If the insurer receives information from an insured, either directly or through a broker, which should put a prudent insurer on inquiry, but the insurer fails to make such inquiry and accepts the insurance, the insurer will be unable to rely on the insured's nondisclosure (Bassel F El-Kasaby, Scott E Tarry, Karisa K Vlasek. 2003).

The **duty to disclose** material facts ceases when the insurance contract has been concluded but is revived when the contract is renewed. The policy wording may also impose a duty on the insured to inform the insurers of any material change in the nature of the risk during the policy period (Rod D. Margo. 1996).

The most common forms of insurance in aviation are hull, passenger, third party liability, war and airport or fixed base operator (FBO) insurance. Other types of insurance cover are repossession, residual value and products liability.

(Rod D. Margo. 1996) state „Notwithstanding the facts that certain types of insurance have become more or less standard, the contractual nature of insurance policies make them very flexible instruments. Parties may deviate substantially from standard insurance provisions to suit their particular needs. This is constrained, however, by insurers’ need to minimize and

predict aggregate risks. Aviation insurance markets tend to be very unpredictable compared to most insurance markets”.

1.2 Law in Air Transport Logistics

Airspace is a common resource for all categories of users that needs to be used flexibly by all of them, ensuring fairness and transparency whilst taking into account security and defence needs of Member States and their commitments within international organisations. Efficient airspace management is fundamental to increasing the capacity of the air traffic services system, to providing the optimum response to various user requirements and to achieving the most flexible use of airspace. The activities of Eurocontrol confirm that the route network and airspace structure cannot realistically be developed in isolation, as each individual Member State is an integral element of European Air Traffic Management Network (EATMN), both inside and outside the Community. A European upper flight information region (EUIR) encompassing the upper airspace under the responsibility of the Member States within the scope of this Regulation should facilitate common planning and aeronautical information publication in order to overcome regional bottlenecks. (REGULATION (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky)

Podľa REGULATION (EC) No 785/2004 of the European Parliament and of the Council on insurance requirements for air carriers and aircraft operators “Air carriers and aircraft operators shall be insured regards their aviation-specific liability in respect of passengers, baggage, cargo and third parties. Air carriers and aircraft operators shall ensure that insurance cover exists for each and every flight, regardless of whether the aircraft operated is at their disposal through ownership or any form of lease agreement, or through joint or franchise operations, code-sharing or any other agreement of the same nature”.

Insurance in respect of liability for passengers, baggage and cargo:

- For liability in respect of passengers, the minimum insurance cover shall be 250 000 SDRs per passenger.
- For liability in respect of baggage, the minimum insurance cover shall be 1 000 SDRs per passenger in commercial operations.
- For liability in respect of cargo, the minimum insurance cover shall be 17 SDRs per kilogram in commercial operations.

2. Data and Methods

The main source of information on the number of commercial airports, the number of transported persons and goods was Eurostat. The data analysed in the paper are shown in tables and graphs for better clarity. Data for EU Member States as well as EU-27 were analysed. In some cases, e.g. in the graph 1 we stated data for the countries which do not belong to the EU, for example Turkey. Norway.

The main source of information about legal norms was the portal of the European Commission EUR-Lex. It offers access to EU law, case law by the Court of Justice of the European Union and other public EU documents as well as the authentic electronic Official Journal of the EU.

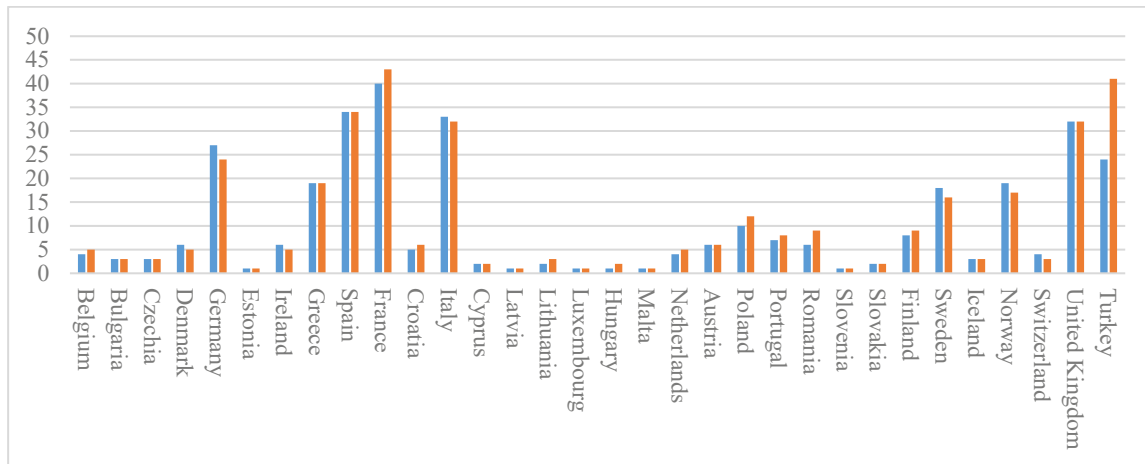
Source of information about air transport was the Act no. 143/1998 L. 1. on civil aviation (aviation law) as amended and source of requirements for insurance in air transport was Regulation of the European Parliament and Council (ES) no. 785/2004 from April 21, 2004 on requirements for insurance of insurance of air carriers and aircraft operators.

3. Results and Discussion

The main task and commercial activity of airports is to ensure the handling of aircraft, from landing to take-off, and of passengers and cargo, so as to enable air carriers to provide air transport services. For this purpose, airports offer a number of facilities and services related to the operation of aircraft and the processing of passengers and cargo, the cost of which they generally recover through airport charges (Directive 2009/12/EC of the European Parliament and of the Council of 11 March 2009 on airport charges).

In the graph 1 we can see that the highest number of commercial airports from the EU-27 is in France, namely 43 in 2020. More than 30 airports can be found in Italy and Spain. On the contrary, only one commercial airport is in five countries (Estonia, Latvia, Luxembourg, Malta and Slovenia). There are two airports in Cyprus, Hungary and in Slovakia.

From the graph 1 it is clear that the number of airports have increased in France and Romania since 2010 (3 airports). The opposite can be recorded in Germany, a decrease by 3. For instance, we can state the data for Turkey in graph 1. In this country there has been an increase in the number of commercial airports over the last 10 years to 17, which may be a result of increased interest in tourism in the country.



Graph 1. Number of commercial airports (year 2010 – blue colour, year 2020 – red colour)

Source: Eurostat

The table 1 shows the yearly number of passengers carried in Europe broken down by country. Passengers carried are all passengers on a particular flight counted once only and not repeatedly on each individual stage of that flight.

From the table 1, two basic facts are evident. On one hand, from 2012 to 2019, the number of air passengers in all EU Member States increased. On the other hand, we have recorded a decrease of air passengers in 2020. Compared to the previous year 2019, it is a decrease of more than 70%. In 2020, almost as many passengers were carried across the EU as in Spain in 2019. The most significant fall (more than 80%) can be seen in the countries with the lowest number of air passengers throughout the year, like Slovakia, Slovenia, as well as Croatia. Interestingly, the relatively smallest decline, despite it being more than 65%, cannot be seen in the countries with the largest passenger numbers per year, but in countries with an average to small passenger numbers, such as Norway, Luxembourg, Bulgaria, Greece.

The clear reason for this sharp decline in air passengers is the measures taken in connection with COVID-19. As Myeonghyeon & Jeongwoong, (2021) state „The air transport industry provides global connections between trade, tourism, and investment, and it is profoundly affected by external

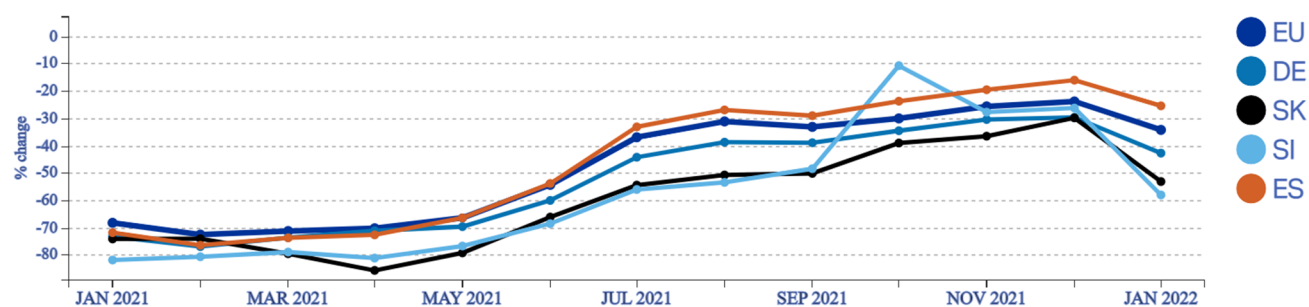
factors, such as the spread of infectious diseases, exchange rates, and oil prices“. Xiaoqian, Sebastian, Changhong, Anming (2021) add „the larger airports are those which often experience the hardest impact of COVID-19, given an extraordinary reduction in the number of global passengers”.

Table 1. Air transport of passengers by country (yearly data)

TIME		2012	2017	2018	2019	2020
	EU - 27 countries	734 860 381	938 854 476	996 295 411	1 035 185 440	276 754 355
1	Spain	159 771 261	209 824 089	220 611 429	228 262 372	57 797 305
2	Germany	178 591 103	212 389 343	222 422 361	226 764 086	57 795 978
3	France	129 764 462	154 096 485	161 991 179	168 726 788	50 724 011
4	Italy	116 029 388	144 306 325	153 352 444	160 667 939	40 405 355
5	Netherlands	55 680 209	76 240 304	79 644 163	81 192 507	23 594 783
6	Greece	32 082 336	50 170 728	54 258 826	56 088 527	17 341 192
7	Portugal	28 186 254	47 673 057	51 018 598	55 007 894	16 548 993
8	Switzerland	43 236 086	53 564 943	56 139 549	57 194 328	16 006 811
9	Poland	21 800 765	37 684 668	43 767 548	46 942 771	13 825 504
21	Croatia	5 422 632	8 843 053	9 731 294	10 623 239	1 919 100
22	Lithuania	3 166 628	5 246 101	6 254 178	6 504 685	1 804 500
23	Malta	3 650 347	6 007 731	6 805 817	7 318 357	1 752 445
24	Luxembourg	1 893 991	3 554 730	3 988 804	4 365 569	1 426 310
25	Estonia	2 202 427	2 635 145	2 995 528	3 258 003	857 837
26	Slovakia	1 563 197	2 402 651	2 794 094	2 839 787	500 604
27	Slovenia	1 167 877	1 682 133	1 810 567	1 719 039	287 787

Source: Eurostat

If we look at the current information on the percentage year-on-year change in the number of commercial flights in the selected EU countries (see graph 2.), namely first two countries of the table 1., i.e. Spain and Germany, together with the last two countries of the table 1., i.e. Slovakia and Slovenia, we can see, that the most significant change is in Slovenia. The rest of the selected countries have a very similar trend.



Graph 2. Commercial flights by reporting country (% change compared with same period in 2019)

Source: Eurostat

It is clear that with the summer season of 2021, the number of flights increased compared to January of the same year, yet it is significantly lower than in 2019. After the end of the summer season 2021, we see a slight decline. We can see it in all countries, most notably in Slovakia, even in January 2022. This decline is probably caused by reintroduction of measures due to the new Omicron variant of COVID-19. The number of commercial flights in EU countries can be expected to increase again with the approaching summer season of 2022, but it is unlikely that it will reach the numbers of 2019.

The table 2. shows the yearly volume of goods transported in Europe (in tonnes), broken down by country. The data covers the total volume of freight and mail loaded/unloaded.

In comparison with the table 1., which shows the number of air passengers per year, in the table 2. we can see, that the amount of goods transported per year did not have such a deep drop. The number of transported goods in the EU countries decreased by only about 10% between 2019 and 2020. Even in countries such as Luxembourg, Belgium, but also the Slovak Republic, Lithuania and Malta, the number of goods transported by air has increased over the year. In Slovakia this increase was most significant out of all the EU countries (more than 20%). The biggest drop (more than 30%) in transport of goods by air transport was recorded in countries like Finland, Portugal and Greece.

The logical conclusion is that COVID-19 measures have generally had a small impact on the carriage of goods by air in EU Member States. Still, for example The International Air Transport Association (2021) in connection with the transport of dangerous goods, states „The COVID-19 pandemic has significantly disrupted the way the air transportation of dangerous goods is taking place”.

Table 2. Air transport of goods by country (yearly data, tonne)

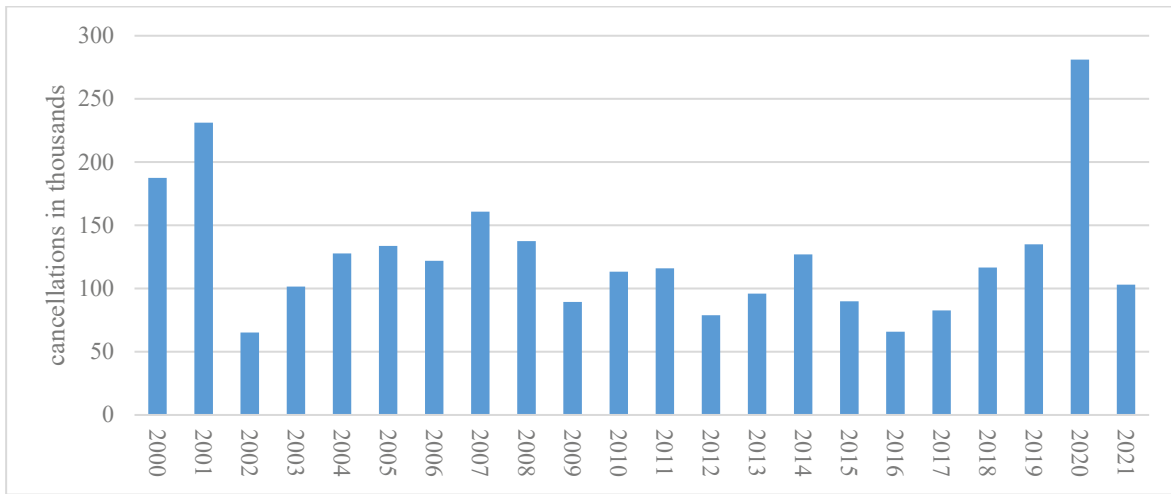
TIME		2012	2017	2018	2019	2020
	EU - 27 countries	11 212 453	13 954 124,4	14 243 667	13 743 488,6	12 426 326,7
1	Germany	4 218 208	4 773 359	4 842 716	4 684 553	4 497 805,1
2	France	1 753 085	2 450 326	2 407 878	2 371 614	1 938 349
3	Netherlands	1 563 500	1 865 106	1 840 419	1 703 556	1 591 388,6
4	Belgium	963 615	1 251 173	1 416 428	1 397 513	1 584 640
5	Luxembourg	615 286	892 660	895 004	853 030	905 397
6	Italy	790 493	1 077 874	1 066 221	1 021 941	776 205
7	Spain	593 523	742 443	806 518	815 612,4	599 930,3
8	Denmark	166 283	235 937	242 068	244 997	181 967
9	Norway	78 420	169 295	174 840	187 379	176 298
20	Slovakia	20 893	27 188	24 565	20 525	24 772,1
21	Cyprus	27 581	30 880	32 186	32 360	24 006,6
22	Lithuania	14 342	15 064	16 779	17 211	19 819,8
23	Latvia	31 460	21 204	24 628	25 866	19 246,8
24	Malta	16 493	16 194	17 677	12 210	13 444,2
25	Slovenia	7 572	12 025	12 337	11 358	10 552,6
26	Estonia	23 760	11 233	11 475	10 866	9 131,7
27	Croatia	6 961	9 510	11 934	10 846	7 638

Source: Eurostat

Portal of the European Commission states “Cargo deliveries by air remain crucial for Europe. The European Commission issued guidance on 26 March 2020 for the continued support of air cargo operations. The measures include:

- inviting Member States to grant temporary traffic rights for additional cargo operations from outside the EU, if restrictions would normally apply
- temporarily removing night curfews and/or slot restrictions at airports for essential air cargo operations
- enabling the use of passenger aircraft for cargo-only operations if necessary exempting aircrew flying the aircraft from travel restrictions if they do not show symptoms of COVID-19”.

For a comparison we are stating graph 3. Number of flights cancelled by airlines in the USA from 2000 to 2020.



Graph 3. Number of cancellations by major U.S. air carriers from 2000 to 2021 (in 1000s)

Source: Statista 2022

In the bar graph 3 we can see that from 2000 there were most of the flights cancelled in 2020 (281, 03 thousand of flights) and in 2001 (231, 2 thousand of flights). We can conclude that the reason for such a steep number of flights cancelled in 2020 were measures connected with COVID-19 pandemic and in 2001 there were issues from 9/11.

4. Conclusion

Air transport is characterized by some characteristics that determine its position in the state transport system. Air transport must fulfil its tasks and must therefore be fast, safe, high-quality and economical. Due to the number of factors that affect air transport, it is necessary to eliminate the risks arising from this mode of transport. We use various forms of insurance to eliminate risks.

The most common forms of insurance in aviation are Hull, Passenger, Third party liability, War and Airport or fixed base operator (FBO) insurance. Other types of insurance cover Repossession, Residual value and Products liability.

Aviation insurance is a unique field from a business, legal, and regulatory standpoint. Issues such as risk management, contracts, and liability raise particular challenges within this highly specialized market. The market relies on a relatively small pool of aircraft in terms of risk distribution. Additionally, the market must be able to absorb potentially staggering losses.

Insurance is primarily designed to protect the insured against loss or damage caused by unforeseen or unexpected future events. Since insurers intend to cover events of a contingent nature, they will not insure against future events which are certain to occur. Neither will insurance cover loss or damage deliberately caused by the insured.

Two important features distinguish a contract of insurance from other contracts, namely, insurable interest and the duty of disclosure. Lloyds of London is perhaps the most venerable aviation insurance establishment in the world.

In the aviation insurance market, the behavior of market participants does not always respond to market conditions.

References

- [1] Bassel F El-Kasaby, Scott E Tarry, Karisa K Vlasek. 2003. Aviation insurance and the implementation of the small aircraft transportation system. In *Journal of Air Transport Management*, vol. 9, no. 5, pp. 299-308. ISSN 0969-6997. DOI: [https://doi.org/10.1016/S0969-6997\(03\)00038-3](https://doi.org/10.1016/S0969-6997(03)00038-3)
- [2] DIRECTIVE 2009/12/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 March 2009 on airport charges
- [3] European Commission (2021). Green lanes - Ensuring the free flow of goods and services. . [February 2022]. Available to: Transportation during the pandemic | European Commission (europa.eu)
- [4] IATA (2021) Dangerous Goods Air Transport Guidance During the COVID-19 Pandemic. [February 2022]. Available to: Dangerous Goods Air Transport Guidance During the COVID-19 Pandemic (iata.org)
- [5] International Civil Aviation Organization. Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis. 2020. Available online: https://www.icao.int/sustainability/Documents/COVID-19/ICAO_Coronavirus_Econ_Impact.pdf (accessed on 29 September 2020).
- [6] Margo, R., 1989. *Aviation Insurance*. Butterworths, London
- [7] Myeonghyeon K., Jeongwoong S. (2021) Passenger airline and policy responses to the COVID-19 crisis: The case of South Korea. *Journal of air transport management*, 98(2022), Pages 102144. doi: 10.1016/j.jairtraman.2021.102144
- [8] Pei-Fen Kuo, Gede Brawiswa Putra, Faizal Azmi Setiawana, Tzai, Hung Wen, Chui-Sheng Chiu, Umroh Dian Sulistyah (2022). The impact of the COVID-19 pandemic on O-D flow and airport networks in the origin country and in Northeast Asia. *Journal of air transport management*, 100(2022). Published online 2022 Feb. 17. <https://doi.org/10.1016/j.jairtraman.2022.102192>
- [9] REGULATION (EC) No 551/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 March 2004 on the organisation and use of the airspace in the single European sky
- [10] REGULATION (EC) No 785/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on insurance requirements for air carriers and aircraft operators
- [11] Rod D. Margo. 1996. Aspects of Insurance in Aviation Finance. In *J. Air L. & Com.*, vol. 62, no. 2, 423 p. <https://scholar.smu.edu/jalc/vol62/iss2/4>
- [12] Sallan J.M., Lordan O. (2020). Airline Business Models. *Air Route Networks Through Complex Networks Theory*. 2020, Pages 17-43, <https://doi.org/10.1016/B978-0-12-812665-3.00009-8>
- [13] Wells, A. T., & Chadbourne, B. D. (1992). *Introduction to aviation insurance and risk management*.
- [14] Xiaoqian S., Sebastian W., Changhong Z., Anming Z. (2021). COVID-19 pandemic and air transportation: Successfully navigating the paper hurricane. *Journal of air transport management*, 94(2021). Published online 2021 Apr 14. doi: 10.1016/j.jairtraman.2021.102062, PMID: PMC8045456

The Level of Planning in Small and Medium-sized Enterprises in the Agricultural Sector in Slovakia in Relation to Green Controlling Considering Climate Change

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Abstract

In today's world of many unexpected changes, businesses cannot rely solely on unplanned and unexpected success. The purpose of controlling is to support the company's management by, among other things, providing crucial information for the management of the company. A company cannot rely only on intuitive estimates, but needs exact data for its work. It must be based on well-developed plans, so planning is a necessary condition for the existence of controlling in the company. The company's pressure to promote environmental aspects in business has also brought a new direction of controlling. Green controlling deals with the integration of the ecological perspective into business and its role is to ensure transparency in ecological issues so that aspects aimed at environmental protection are also taken into account in the economic decision-making process.

In this paper, we focused on examining the level of planning and promoting environmental aspects in the planning of small and medium-sized farms. Empirical findings are based directly on the answers of agribusinesses in Slovakia. On the basis of the empirical examination, it can be argued that neither the length of the market nor the legal form affects whether the companies plan. On the other hand, the size of the company and foreign capital participation are determining factors for the existence of a planning system. There is no planning for a longer period of time in Slovak agricultural enterprises. The company's focus mainly on planning their activities within one year. This study contributes to European research focusing on the importance of farm planning in a transforming economy such as Slovakia.

Keywords: *agricultural companies, small and medium sized companies, green controlling, climate change*

JEL Classification: *D24, Q19, M21*

1. Introduction

The tool for treating the economic systems is controlling, which allows not only detecting the action of economic and non-economic factors, but also their future development, analysis of deviations from the desired state and prepare corrective actions (Sedliačiková et al., 2015). The use of Managerial Information System and Controlling has significant impact on better business performance (Zámečník and Rajnoha, 2015). Controlling is a management subsystem focused on the planning and control process, on its coordination and information support (Horváth, 2004). Controlling is thus carried out using two subsystems, namely database security and planning and control (Máče, 2012).

Business planning is a popular managerial practice, especially in the SME context (Brinckmann et al., 2019). Business planning is a skill, or, more precisely, a collection of skills such as opportunity analysis, business-model development, strategic marketing, financial planning, decision making, etc. (Chwolka and Raith 2012). Changes in the business environment reinforced the case against formal strategic planning. Strategic planning had become less about strategic decision making and more a mechanism for coordination and performance managing (Grant, 2003).

At present, it is necessary to harmonize business activity and activity aimed at protecting the environment, because the increasing use of the environment leads to its endangerment (Lovciová, 2021). The importance of innovation for company's sustainability impacted also the practice of controlling. As a management service which provides transparent information for decision making process, controlling has to follow management's focus and activities (Vitezic, Vitezic, 2015). Controlling is a success factor, no doubt. Different perspectives of its development, e.g. controlling in SME's, crisis controlling, project controlling, controlling in HR, finance, production as well as controlling in non-profit organisations and sustainability or 'green' controlling are some of its future directions (Bedenik et al., 2019). There is a variety of terms used to name "green controlling" such as environmental controlling, ecologically oriented controlling, ecological controlling, eco-controlling etc. (Păunică and Mocanu, 2017). For a successful implementation of ecological goals, on the one hand transparency about the environmental performance of a company and on the other hand an integrated consideration of ecological information in controlling processes and instruments is required (Horváth, Isensee and Michel, 2012). An active, systematic approach of the organization to the issue of environmental responsibility, represents a comprehensive approach consisting in the implementation of all important steps in order to reduce the environmental burden of the organization on the environment. For organizations that choose this proactive approach, environmental responsibility is a stable part of their strategic plans (Nadae, Carvalho and Vieira, 2019).

Švikruhová et al (2020) identified the needs of primary milk producers regarding the new CAP 2021–2027. They pointed out that in the current situation and needs of milk producers in Slovakia in relation to the strategic objective is important to increase the competitiveness of the milk producers and importance of increase in investment planning. The agriculture represents one of the sectors of the economy, where economic differentiation is more than obvious (Vozárová, Kotulič, Vavrek, 2016). In comparison with other economic sectors, the agriculture is known for its specific characteristics. First, the production processes in agriculture are supplemented by a factor of the impact of natural conditions, weather, and the length of the production cycle and associated length of current assets turnover (Vozárová, Kotulič, 2017).

2. Data and Methods

The aim of the research was to analyze the extent to which the planning system in small and medium-sized agricultural enterprises in Slovakia is developed and the extent to which environmental objectives are taken into account in individual plans, resp. the degree of application of the principles of green controlling in agricultural holdings. The outputs presented in this article are the result of a pilot survey of an extensive research study. We conducted the survey on a sample of 67 farms using a questionnaire, which was supplemented by personal interviews with selected entities.

The research basis for the questionnaire conception was the findings from the study of foreign scientific publications dealing with the issues of planning and integration of the so-called green

goals into business plans. Theory and practice show that the business environment is currently unstable, also due to the increasing impact of climate changes. For this reason, the importance of planning is still growing. We followed up on Janík's (2006) research, which analyzed the performance of planning activities in Slovakia's business practice, regardless of the industry in which he tried to point out weaknesses and reserves in the area of planning activities. In our research, they focused primarily on the sphere of agriculture, in which planning is of particular importance, because agriculture is characterized by certain specifics compared to other sectors. As Steklá et al. (2015), the agricultural sector is an important part of an economy and has its own specifics. Its specificities are primarily of seasonal nature of production and dependence on natural conditions.

The questionnaire was filled in by corporate managers (managers, directors, heads of economic departments, controllers, accountants). The introductory part of the questionnaire contained the so-called classification questions, which approximated the structure of the research sample in terms of number of employees, legal form of business, length of market presence and foreign capital participation. In terms of size, the research sample consisted of 46% (31) small and 54% (36) medium-sized agricultural entities. Limited liability companies accounted for the largest share, at 66% (44). Cooperatives were accounted for 34% of the research sample (23). The questionnaire survey involved 52% (35) of agricultural holdings that have held their market position for more than 15 years, 40% (27) of holdings operating in the market between 5 and 15 years and 7% (5) of companies that have been operating in the market for less than 5 years. The structure of the research sample reflects the fact that agriculture has a relatively long history on the market. After accession of the Slovak Republic to the EU, agricultural enterprises with foreign capital also became a reality. From this point of view, 16 (24%) companies with foreign capital are represented in the research sample.

The research study focused on finding answers to questions in the following areas:

- existence of a comprehensive planning system,
- length of the planning period,
- areas in which plans are formed - types of functional plans with emphasis on the length of the planning period,
- implementation of green goals in the planning process in accordance the climate changes impact

Common mathematical methods were used to evaluate the questionnaire, supplemented by a graphical representation. The statistical method Chi-square test, which is aimed at determining the dependence between the studied phenomena, was also used. We also used the interview method to clarify and supplement the information obtained through the questionnaire. Sales managers from three farms answered the questions we tried to better understand the respondents' answers to the questionnaire.

3. Results and Discussion

Planning processes are a basic element of applying controlling in a company. They enable to predict the fulfilment of set goals and the development of the company in general in both global and analytical indicators of internal organizational units. We therefore asked respondents whether they have a comprehensive planning system in place on the farms they represent.

According to Mikovcová (2007), the planning system contains a summary of all business plans at each level and in each area, which ensures that all concepts, methods and planning tools are used uniformly and the company can achieve greater efficiency in the implementation of plans. From a research sample of 67 companies, 48 (72%) entities stated that they had a planning system in place. Planning processes are a basic prerequisite for applying controlling in a company.

From an interview with representatives of selected farms, we learned that even if they do not create all types of plans and at every level, in the case of farms we can declare a unified planning system. Whether the existence of a planning system in a company depends on the length of the company's operation in the market, the legal form of the business, the size or foreign capital participation, we tried to find out using the Chi-square test. Subsequently we set hypotheses. The results of the Chi-square test have shown that the legal form of the business and the duration of the market do not affect whether farmers plan the next steps of their activity. In both cases, we accept the null hypothesis at the significance level $\alpha = 0.05$ about the absence of dependence. On the other hand, the Chi-square test revealed a correlation between the existence of a planning system and the other two factors, which means that whether companies have a unified planning system depends on both their size and foreign participation in their capital.

Table 1 Chi-square test to determine the relationship between the existence of planning system and size of business and foreign capital participation in agricultural enterprises

Chi-square test		
Size of business	p value	0,010404
Foreign capital participation	p value	0,024528

Source: own processing

In the following questions, we asked respondents whether agricultural enterprises are involved in the creation of operational and strategic plans. Figure 1 gives us a picture of the structure of business plans in terms of time according to the size categories of agricultural holdings. Respondents answered that out of 19 small agricultural entities that have an established planning system, 100% of farms create short-term operational plans within one year and 14 (74%) enterprises set up and devote themselves to creating long-term strategic plans (over 5 years). Of the 29 medium-sized agricultural entities that responded to the introduction of the planning system, 100% of farms draw up short-term plans and 27 (93%) farms also deal with strategic planning.



Fig. 1 Structure of business plans in terms of time

Source: own processing

The structure of the responses of the two size categories of agricultural holdings is quite similar. This means that the surveyed companies most often focus on operational planning and, conversely, underestimate the need for planning with a longer time horizon. Our result is also confirmed by Szabo, Grznár and Janík (2008), whose research was focused on the evaluation of planning in Slovak companies. They argue that planners focus on short-term plans and, conversely, neglect strategic issues. It follows that strategic planning is a problem area not only in the agro-sector but also in other economic sectors.

A closer look at the issue is provided in the following table, which summarizes the types of functional plans, which are most often compiled in terms of time in the two size categories of agricultural holdings examined. During the interview we emphasized the importance of planning system application due to the impact of climate changes. Respondents claim that the production planning requires the most significant role in creating business plans according to the ongoing climate change.

Table 2 Number and structure of business plans according to time and function, which are drawn up by agricultural businesses

	Production plan	Sales plan	Human resources plan	Financial plan	Marketing plan	Purchasing plan	Investment plan
Operating plan	43	34	12	40	13	32	26
	90%	71%	25%	83%	27%	67%	54%
Strategic plan	23	15	4	38	2	14	35
	48%	31%	8%	79%	4%	29%	73%

Source: own processing

Already the first look at table 2 confirms the fact that agricultural holdings are mainly focused on drawing up short-term operational plans. Among them, the production plan, which compiles 43 (90%) farms, is at the forefront. The strategic production plan is compiled by 23 (48%) companies. Production planning must take into account a number of factors, such as market demand, cost-effective orders, assessment of company capacity, etc. The prerequisite for effective production planning is that it must be based on real and well-known conditions not only of the company but also its external environment. Also managers emphasized that they must constantly adapt to climate change in crop production. This fact needs to be implemented in the production plan. Number of 40 (83%) entities are engaged in financial planning in a short time, 38 (79%) companies compile a financial plan for a period of more than 5 years. Its role is to ensure the financial health of the company, which is conditioned by sufficient liquidity and solvency of the company. The third most frequent functional plan in operational planning is the sales plan. In the short term, this plan is compiled by 34 (71%) companies and only 14 (29%) entities are involved in strategic sales planning. A good sales plan should include a quantification of future sales revenue according to the production plan.

A number of facts need to be taken into account when planning a purchase. First of all, it is necessary to know what financial possibilities the company has not only from internal but also external sources. Managers must know how many stocks they can store and for how long, what are the delivery dates and how will they proceed if the deadline is not met. At the same time, they must have an overview of suppliers, their offers and quality levels, and they must also plan a number of other requirements. Insufficient purchasing planning reduces the quality of deliveries, the company will not be able to respond to unexpected situations, e.g. if he does not

receive the consignment in time, he will not have enough time to think about the next step and will act without sufficient discretion. Purchasing planning can be an important tool for improving the quality of work, so it needs to be paid attention not only at the level of operational planning, but also at a higher level. Purchasing planning in a time horizon of up to one year is carried out by 32 (67%) agricultural entities. If a company does not have such a purchase plan, it may affect its profit or loss. The investment plan must be based on the strategic intentions of the future development of the business unit.

This means that the company must have planned future investments, it must plan the amount of investments at least in the range of annual depreciation in order to ensure the reproduction of fixed assets. Every company should invest in its future development, because otherwise it could lose its competitive advantage. The short-term investment plan is drawn up by 26 (54%) small entrepreneurs. Number of 35 (73%) entities pay attention to long-term investment planning. Our analysis shows that the investment plan is gaining in importance in long-term planning. The goal of human resource planning is to provide a sufficient number of employees with the required education, skills and abilities that the organization needs to avoid staff surpluses or shortages. In addition to the above, human resource planning also deals with the constant development of employees in order for the company to ensure a flexible and qualified workforce. It can be said that 12 (25%) small businesses implement human resource planning in a short period of time. Only 4 (8%) companies are involved in strategic employee planning. As can be seen from tab. 2 farms pay the least attention to marketing planning. The marketing plan should serve to support the company's promotional and marketing activities and should include a marketing strategy according to the tools of the marketing mix. The marketing plan is compiled by 13 (27%) companies and long-term 2 (4%) companies within one year.

After studying the green controlling application in agricultural holdings and fulfilment another set goal, namely the examination of the degree of consideration of environmental objectives in farm planning e.g. adaptation to natural conditions, climate changes, etc. we asked the respondents the following questions. We found out to what extent they generally take environmental aspects in context of climate changes into account in their business.

Out of the 67 agricultural holdings, 43 companies answered positively. In the remaining 24 companies, environmental targets are not defined at all and company's management is not dealing with the environmental issues in planning processes specifically. Based on the answers from interviewed representatives of selected business entities, we found that many companies implement strict environmental approaches only if they have an economic benefit, e.g. improving the image of company or force of climate change. Rajnoha et al. (2019, p. 61) confirm that nowadays, customers are increasingly looking at sustainability aspects, and this situation to become even more intense in the future.

In order to determine the dependence, we performed a Chi-square test in which we examined whether examined factors as the size of the company, the legal form, the length of operation in the market and foreign capital participation had an impact on the respondents' answers. From the analysis, we found that whether companies solve problems of environmental management depends on the participation of foreign capital in the company, so we accept hypothesis H1.

Table 3 Chi-square test to determine the relationship between taking into account environmental aspects in business activities and foreign capital participation in agricultural holdings

Chi-square test	
p value	0,030148

Source: own processing

Respondents who answered in the affirmative to the previous question, as well as those who carried out the planning, also asked which processes they paid the most attention to environmental objectives.

Table 4 Level of consideration of environmental objectives in planning

	Modus	Median	Average	Min	Max
Strategic planning	4	4	4,09	3	5
Operating planning	3	3	2,91	2	5

Source: own processing

The responses show that the implementation of environmental aspects or objectives achieves a higher rate in strategic planning than in operational planning. The strategic plan determines where the company wants to go in the future and how and also taking into account the constant effects of climate change. We evaluate the relatively high average values of the answers to this question. From interviews with representatives of selected companies, we have derived the conclusion that farmers themselves are aware that the aspect of sustainability is becoming more intense in the business sphere, thus deviating from the traditional perception of strategic goals focused only on the financial dimension of sustainable development. On the other hand, many companies are struggling with financial problems, which acts as a barrier to focusing on environmental goals, and companies are only focusing on financial goals. This statement corresponds to the argument of Rajnoha et al. (2019), who wrote that although the importance of sustainable development is steadily rising and enterprise orientation to this objective abroad is higher, under conditions of the Slovak business environment, sustainable development is not firmly anchored in corporate practice.

4. Conclusion

The importance of planning in agricultural entities is declining with increasing time horizon. Businesses focus mainly on operational planning and, on the other hand, underestimate strategic ones. In terms of operational plans, the production plan, financial plan and sales plan have a dominant position. Within the strategic plans, the farms place particular emphasis on the investment and financial plan. Quality and flexible strategic planning is key to the long-term direction of the company in today's rapidly changing times especially in agricultural production which is under the impact of climate change. Rajnoha and Lorincová (2015) also confirm that a quality strategic planning system has a long-term positive impact on the company's performance. According to research by Bestvinová, Mrvová and Hrablík Chovancová (2017), small and medium-sized enterprises, unlike large companies, do not place such an emphasis on strategic planning, which results in small and medium-sized enterprises adapting more dynamically to change. Szabo, Grznár and Janík (2008) did research that focused on planning evaluation in Slovak companies. Their results are in some respects almost identical to ours, because at the same time they confirm that companies use operational planning the most and neglect strategic. They argue that planners focus on short-term plans and, conversely, neglect strategic issues. It follows that strategic planning is a problem area not only in the agro-sector but also in other economic sectors. On the other hand, they claim that the financial and marketing plan is at the forefront of the functional plans, but in our questionnaire survey, the marketing plan ranked last. One reason may be that farms still rely on the Slovak Agriculture and Food Chamber sales.

As the effort to protect the environment concerns not only individuals but also the business sector, we also examined the area of green controlling. We researched the issue of promoting

environmental goals in business planning regarding the impact of climate change. Our analysis has shown that foreign capital participation is an important factor influencing the promotion of environmental aspects in business. Farms that have long respected and taken into account environmental aspects in the business plan, i.e. are part of strategic plans. Naturally, not all environmental goals are appropriate for every business, even given the industry in which they operate. However, there are several general objectives to achieve environmental sustainability and address climate change. It is necessary to realize that the implementation of environmental goals in business does not mean reducing profits, on the contrary, it is a means of a successful strategy, because it improves the company's market position in relation to the general public by building its status and reputation. Likewise, customers (especially the younger generation) are often able to change their business habits just to reduce the negative impact on the environment. Socially responsible business is what can distinguish companies from their competitors.

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References

- [1] Bedenik N.O., Prebežac D., Strugar I., Barišić P. (2019), The Challenges of Controlling and IT Support in Non-financial Reporting. „International Journal of Industrial Engineering and Management (IJIEM)”, no. 1, vol. 10, pp. 21-29. <http://doi.org/10.24867/IJIEM-2019-1-021>
- [2] Bestvinová, V., Mrvová, E. & Hrablík Chovancová, H. 2017. Controlling ako efektívny nástroj riadenia podnikov strojárského a elektrotechnického priemyslu. Fórum manažéra. Vol. 13. N. 1 s. 3-8. ISSN 1339-9403
- [3] Brinckmann, J., Dew, N., Read, S., Mayer-Haug, K., & Grichnik, D. (2019). Of those who plan: A meta-analysis of the relationship between human capital and business planning. *Long Range Planning*, 52(2), 173-188.
- [4] Grant, R. M. (2003). Strategic planning in a turbulent environment: Evidence from the oil majors. *Strategic management journal*, 24(6), 491-517.
- [5] Horváth, P. (2004). Nová koncepcie controllingu: Cesta k účinnému controllingu. Praha, Profess Consulting
- [6] Horváth P., Isensee J., Michel U. (2012) „Green Controlling“– Bedarf einer Integration von ökologischen Aspekten in das Controlling. In: Tschandl M., Posch A. (eds) Integriertes Umweltcontrolling. Gabler Verlag. https://doi.org/10.1007/978-3-8349-6844-9_2
- [7] Chwolka, A., & Raith, M. G. (2012). The value of business planning before start-up—A decision-theoretical perspective. *Journal of business venturing*, 27(3), 385-399.
- [8] Janík, J. 2006. Plánovacie procesy v podnikoch SR a možnosti ich zdokonalenia. : doktorandská dizertačná práca. Bratislava: Ekonomická univerzita.
- [9] Lovciová, K. (2021). Zelené inovácie ako nástroj podpory environmentálneho podnikateľského prostredia Slovenskej republiky. *Economics and Informatics*, 19(2).
- [10] Máče, M. (2012). Účetnictví pro územní samosprávné celky, příspěvkové organizace a organizační složky státu. Praha : Grada Publishing.
- [11] Nadae, J. D., Carvalho, M. M., & Vieira, D. R. (2019). Exploring the influence of environmental and social standards in integrated management systems on economic performance of firms. *Journal of Manufacturing Technology Management*, 30(5), 840–861.
- [12] Päunică, M., & Mocanu, M. (2017). Green controlling—concept and practice. In *Proceedings of the International Conference on Business Excellence* (Vol. 11, No. 1, pp. 1137-1145).

- [13] Rajnoha, R. & Lorincová, S., Strategic management of business performance based on innovations and information support in specific conditions of Slovakia. *Journal of Competitiveness* [online]. 2015, vol. 7, iss. 1, s. 3-21. [cit. 2020-11-12]. ISSN 1804-1728.
- [14] Rajnoha, R., Lesnikova, P., Stefko, R., Schmidtova, J., & Formanek, I. (2019). Transformations in strategic business planning in the context of sustainability and business goals setting. *Transformations in Business & Economics*, 18(2), 44-66.
- [15] Sedliačiková M., Vacek V. and Sopková E. (2015) “How slovak small and medium enterprises perceive financial controlling”, *Procedia Economics and Finance*, Vol. 26, pp. 82-85. ISSN 2212-5671. DOI 10.1016/S2212-5671(15)00842-4.
- [16] Szabo, E., Grznár, M., Janík, J. 2008. Plánovanie – nástroj kompetentného manažmentu podniku. In *Acta oeconomica Cassoviensia: vedecký časopis*, roč. 1, č. 1, s. 28-35. ISSN 1337-6020
- [17] Švikruhová, P., Kapsdorferová, Z., Kataniková, R., Poláková, Z., & Grman, P. (2020). Identification of the needs of primary milk producers in the new common agricultural policy 2021-2027. In *Potravinárstvo Slovak Journal of Food Sciences*. 15, 1 (2021), s. 585–591. ISSN 1337-0960.
- [18] Vozárová, I. K., Kotulic, R., & Vavrek, R. (2016). Legal form as a determinant of the evaluation of agricultural entities in Slovakia using the topsis method. *Journal of Advanced Research in Management*, 7(2), 340-347.
- [19] Vozárová, I. K., & Kotulič, R. (2017). A partial view on the financial stability of agricultural enterprises in Slovakia. *International Multidisciplinary Scientific GeoConference: SGEM*, 17, 19-25.
- [20] Zámečník, R., & Rajnoha, R. (2015). Strategic business performance management on the base of controlling and managerial information support. *Procedia Economics and Finance*, 26, 769-776.

Development of Financial Performance Indicators of Agricultural Enterprises in Slovakia in the Context of Legal Form of Business

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Abstract

Persistent difference in management results between agricultural cooperatives and business companies Slovakia is long-discussed problem. The efficiency of management in agricultural companies is gradually improving, but it still varies considerably according to organizational forms of management. Business companies were more efficiently and achieved better results over the long-term than agricultural cooperatives. The study was focused on closer examination of the time period of alleviation of these disparities, respectively, the possibilities of their further deepening. The aim of this paper was to evaluate the trend of development of indicators of financial performance of agricultural enterprises according to the legal form, in the context of increasing the differences in their management in the period after the accession of the Slovak Republic to the European Union. The paper expands the knowledge for the given area of research and thus builds on previous studies that dealt with the issue before Slovakia's accession to the European Union.

Keywords: agricultural cooperatives, business companies, disparities, financial analysis, ratio indicators, Slovak Republic

JEL Classification: Q12, O13, R12

1. Introduction

Agriculture, an important sector of the economy, is often monitored by the government and is often the subject of international disputes. In Slovakia, the structure of farms is different from that of almost any other member state of the European Union. The majority of agricultural land is farmed by big farms, with high acreage, usually under two main legal forms. On the one hand are cooperatives, which existed also before 1989. On the other hand, at the time of the transformation process, some of them were replaced by business companies (Tóth, Lančarič & Savov, 2014). By entering the new market environment after 1990, the firms embarked on a journey of complex structural, economic and social changes that were reflected in measurable improvements in only some aspects of technical performance and competitiveness. There were created new forms of business, the number of subjects increased and their average concentration decreased.

The evaluation of new forms was also studied by Hanousek, Kočenda and Mašika (2012), who analysed the corporate effectiveness and the impact of the ownership structure after the transformation process, which was characterized by restructuring, privatization and support of the institutional reforms. Subsequently, the entry of the Slovak Republic to the European Union opened a large European agricultural market for Slovak agricultural producers, but also removed all protective barriers of the domestic market. These led to new challenges in the field of competitiveness and financial performance of the domestic agriculture (Spíčka, Hlavsa,

Soukupová & Štolbová, 2019; Maciková, Smorada, Dorčák, Beug & Markovič, 2018; Kotulič, Adamišin, Kravčáková Vozárová & Vavrek, 2017; Bielik & Rajčániová, 2004; Grznár, Szabo & Jankelová, 2009; Bujňáková, 2010).

Performance measurement system is an integral part of the control and management system in the company. The results obtained help to assess the current position of the companies and the opportunities for further development by improving the economic position of agriculture (Andric and Vukovic, 2013). Company leaders are under enormous pressure to increase their company's performance. Performance assessment or benchmarking is a widely used method for corporate development and profitability enhancement. The comparison of company performances, i.e., benchmarking, is becoming more and more critical. Presently, companies mostly still use traditional financial ratios to evaluate their financial performance (Fenyves et al., 2018).

The aim of this paper was to evaluate the trend of development of indicators of financial performance of agricultural enterprises according to the legal form, in the context of increasing the differences in their management. We analysed and compared two groups of agricultural entities: agricultural cooperatives (AC) and business companies (BC). This study expanded new original research and supplemented the main paper previously published by Kravčáková Vozárová, Kotulič & Vavrek (2019).

2. Data and Methods

This analysis is based on the measuring the financial performance of agricultural companies using financial indicators, which are the first benchmarks of the financial performance of enterprises. The data for the analysis were drawn from data of agricultural companies (balance sheets, profit and loss statements) provided by the Ministry of Agriculture of the Slovak Republic in the form of information sheets on anonymized agricultural subjects. The total file included 2509 subjects of legal and natural persons with up to 19 and more than 20 employees. These information sheets captured the economic data of the agricultural entities that cultivate 81.3% of the agricultural land in Slovakia (1,930,570 ha).

For the quantification of disparities of the financial performance of the selected entities, the following ratio indicators were selected:

- Profitability indicators: return on total assets ($ROA = EBIT/Total\ assets$), return on sales ($ROS = EBIT/Total\ sales$);
- Activity indicator: days payable outstanding ($DPO = Current\ liabilities/Total\ sales/number\ of\ days$);
- Liquidity indicator: quick ratio ($QR = (Current\ assets - inventory)/Current\ liabilities$);
- Stability indicators: self-financing ratio ($SFR = Equity/Total\ assets$), interest coverage ratio ($ICR = EBIT/Interest\ expense$).

3. Results and Discussion

The results of this study are interesting especially in the context of the size of the research sample. Due to the scope of the research sample and the timeframe for the analysis, we did not record any further studies on this issue to be carried out in the Slovak Republic.

In the previous research (Kravčáková Vozárová et al., 2019) we have identified differences between subjects working in the soil in the Slovak Republic depending on their legal form. In

2015, the indebtedness of assets was higher for business companies (54.3%) than agricultural cooperatives (34.4%), which is evidence of higher economic creditworthiness of business companies in the view of commercial banks in terms of cash flow and thus repayment of long-term loans that are not covered by support from the EU. Also, according to the study of Adamišin, Kotulič and Kravčáková Vozárová (2017), the legal form can be the key factor of differences, because in the case of business companies, it allows efficient management (also by concentration of ownership of the company) a higher level of motivation, and a concentration of ownership and responsibility.

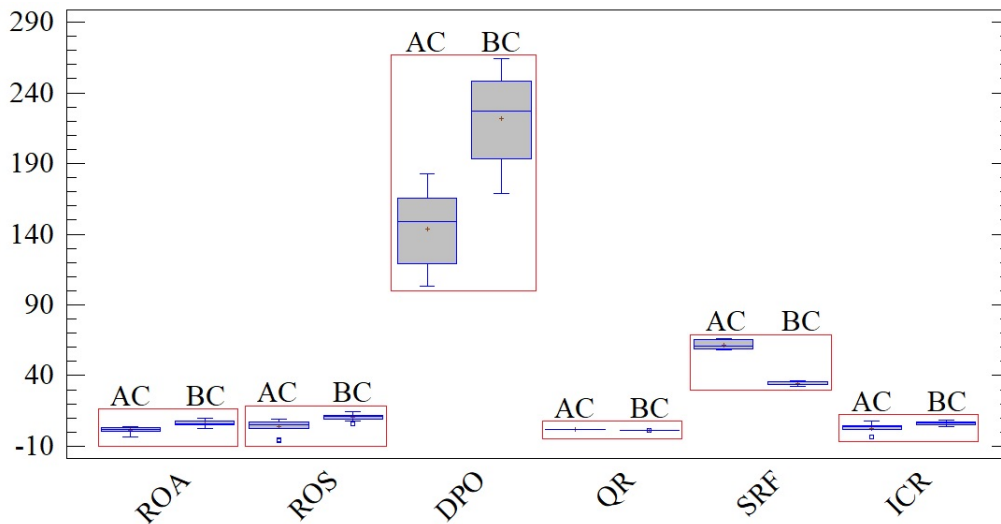


Figure 1: Differences in selected financial indicators based on the legal form of the entity

Source: author's calculations

From the graphical illustration of the monitored parameters (Figure 1) we can observe several differences in their moment characteristics, which is also shown in Table 1. For all monitored parameters, there was a statistically significant difference in mean value (median, average). We note a better evaluation of business companies in the case of indicators ROA, ROS, DPO, ICR, which we attribute to some important aspects. Business companies showed better economic results, higher share of profitable enterprises and higher production. Sales of goods, whose share in revenues was twice that of agricultural cooperatives, also contributed positively to the total revenues in commercial companies (Chrastinová, 2018). The difference in the case of the DPO indicator could also be due to the fact that the values of liabilities in the BCs significantly exceeded the values of liabilities in the AC. The most significant differences between legal forms were in the structure of capital. Although foreign capital had an increasing tendency in both legal forms, its dominant position was in the BC. The more positive economic results of the business companies were also reflected in the overall creditworthiness of lending, as confirmed by the ICR indicator. However, in the case of the QR and SFR indicators, agricultural cooperatives were dominant. In the case of business companies, the lower SFR value also represented an increase in the credit risk value.

Table 1: Identification of differences through selected torque characteristics

	Median	Mean	DF	Variance
ROA	yes**	yes**	yes**	no
ROS	yes**	yes**	yes**	no
DPO	yes**	yes**	yes**	no
QR	yes**	yes**	yes**	no
SRF	yes**	yes**	yes**	yes*
ICR	yes**	yes*	no	yes*

Note:

* – statistically significant at the significance level $\alpha < 0.05$

** – statistically significant at the significance level $\alpha < 0.01$

Source: author's calculations

Differences with the exception of the last indicator (ICR) are also observed in the distribution function of the measured values, however these disparities together with the homogeneous scattering, cannot be attributed to the development over time. An explanation could be provided by Figure 2, which shows the percentage changes of individual indicators in year-on-year terms. In all cases we observe a high variability across the whole monitored period, which is documented by e. g. the lowest coefficient of variation at 185% level (SRF indicator in the group of agricultural cooperatives).

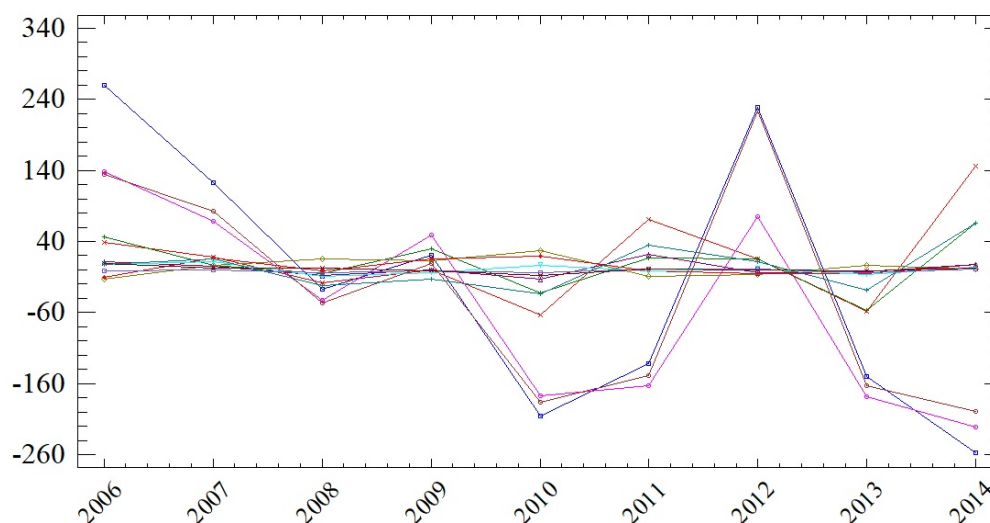


Figure 2: Percentage change of monitored indicators

Note: The purpose of the graph is not to point to a specific indicator, but to different developments over time as a whole group of indicators

Source: author's calculations

An interesting finding is a significant high negative correlation of the DPO indicator with QR and SRF indicators in the case of agricultural cooperatives, while the almost perfect correlation of ROS and ROA could be assumed due to nature of their calculation (similarly for both indicators of profitability and ICR indicator). In the group of other subjects (BC) it is not possible to identify similar associations when the only strong one is the linear relationship of ICR and ROA.

On the basis of the above, we decided to identify the timeframe in which it would be expected to minimize the differences identified above. Based on the results of this analysis, it is possible

to divide the monitored indicators into two groups. The first group includes ROA and SRF, in which it is possible to assume, based on the available data, a reduction in the differences between these groups of subjects (Figure 3).

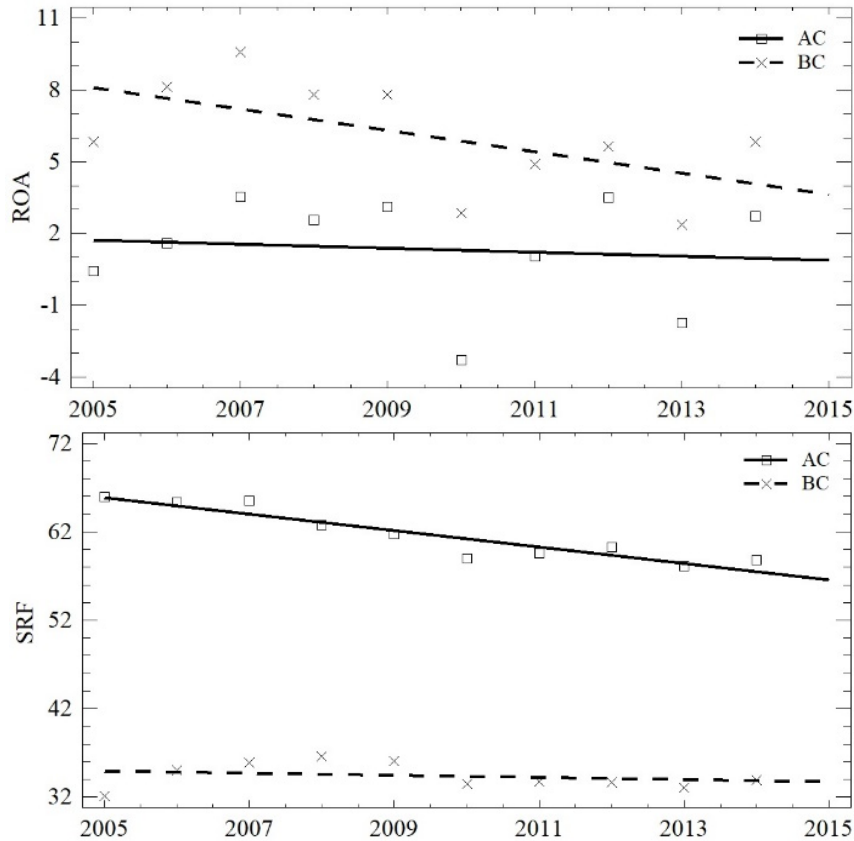
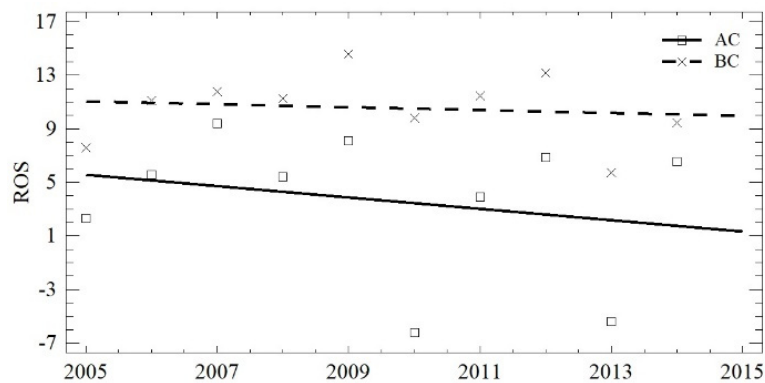


Figure 3: Comparison of regression models for ROA and SRF

Source: author's calculations

In the case of ROA, it would be possible to expect the same, respectively similar results up to about 10 years with a probability of 62%, under unchanged conditions. In the case of the second indicator (also even from the graphical comparison of regression models), it is necessary to count on longer period of settlement of differences (more than 40 years). The second assumption is also supported by the high value of the coefficient of determination ($R^2 = 99.25\%$).



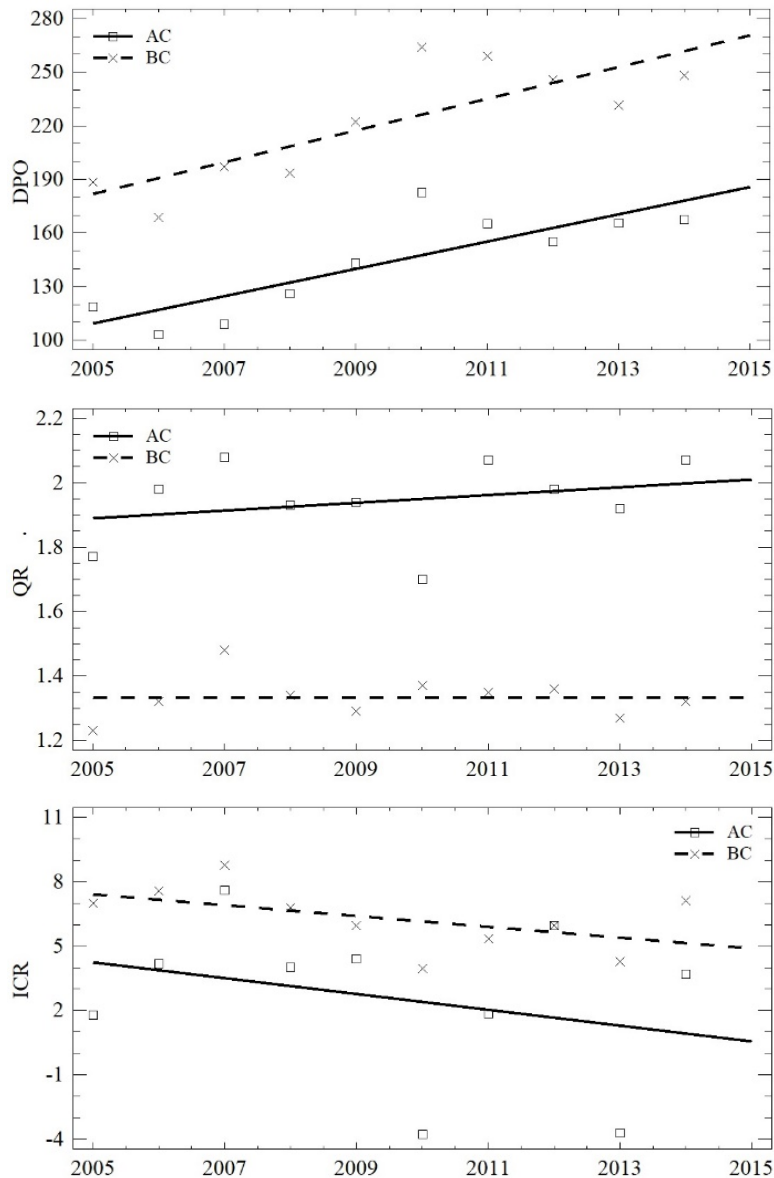


Figure 4: Comparison of regression models for indicators ROS, DPO, QR and ICR

Source: author's calculations

In the case of other 4 monitored indicators, it is not realistic to expect a narrowing of the differences between agricultural cooperatives and business companies, exactly on the contrary (Figure 4). We expect the differences between these two legal forms to increase in the future, especially at the level of the QR and ROS indicators. In the long term, business companies have been achieving higher efficiency and added value creation. Sales of goods, which were several times higher than in agricultural cooperatives, were also an important aspect of revenues in business companies. The persisting differences are also contributed to by the higher volume of investment aid that has been allocated to business companies, which supports the long-term restructuring of production and thus the sustainability of agricultural production. On the other hand, agricultural cooperatives were granted more non-investment aid. Differences in liquidity may also be due to the fact that investment aid requires self-financing by business companies and liquidity management can be even more complicated.

Persistent differences in economic results were caused by the impact of the formation of business companies, which mainly originated from the creditworthy parts of the property of the former

agricultural co-operatives without adequately taking over liabilities to banks and other business partners, and without compensation of shares, which determined the lower production-cost ratio (MPRV SR, 2012). However, the agriculture co-operative as a legal form of business is still attractive to farmers. Despite the transformation of agricultural co-operatives into business companies, such co-operatives exist in Slovakia that fulfill their role in the agrosector and are even in profit. These results are also consistent with the findings of Adamišin et al. (2017), whose conclusions are related to economic theory and the phenomenon known as the principal–agent problem. The analysis results show that in addition to the factors of production (labor, capital, and natural resources), agricultural enterprises also need subjective assumptions such as imagination, ambition, willingness to bear risk, better organizational and management skills, patience, and a sense of innovation.

The need for innovation as well as innovative approaches to management is becoming a necessity for all entities, and agriculture is no exception. Innovation is now seen as a source of cross-sectoral competitiveness linked to rapid technological development to which companies must respond flexibly. The basis is to create conditions for establishment of an innovative environment in agricultural enterprises through support of employee innovative behavior in an environment of information saturation (Jankelová and Joniaková, 2021). In such an era when innovation is paid great attention, intellectual capital plays an increasingly important role in the development of enterprises. First, agricultural companies should establish the concept of intellectual capital, and strengthen its management. Second, they should increase the investment in intellectual capital and take full advantage of the unique resources in the process of value generation (Xu and Zhang, 2021).

4. Conclusion

In this study, we examined trend of development of indicators of financial performance of agricultural enterprises according to the legal form, in the context of increasing the differences in their management. We found that in the case of ROA, it would be possible to expect the same, respectively similar results up to about 10 years with a probability of 62%, under unchanged conditions. In the case of the SFR indicator, it is necessary to count on longer period of settlement of differences (more than 40 years). In the case of other 4 monitored indicators, it is not realistic to expect a narrowing of the differences between agricultural cooperatives and business companies, exactly on the contrary. If data will be available for the following years, panel (data) analysis can deliver more accurate results that allow to analyze the trend in these indicators and their dynamic changes in the context of estimating the development disparities in the financial performance of companies both legal forms.

However, it can be still debated whether is the legal form, which to such a significant extent determines the difference in the financial performance of agricultural enterprises even after Slovakia's accession to the European Union. Better indicators of financial performance in business companies can be determined not only by different approaches to corporate governance, but also by the consequence of a better starting situation in the past (compared to agricultural cooperatives). Therefore, further analyzes will also focus on measuring the differentiated economic performance of entities according to other criteria in order to more objectify the obtained results.

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References

- [1] Adamišín, P., Kotulič, R., & Kravčáková Vozárová, I. (2017). Legal form of agricultural entities as a factor in ensuring the sustainability of the economic performance of agriculture. *Agricultural Economics – Czech*, 63(2), 80–92. doi: 10.17221/208/2015-AGRICECON
- [2] Andric, M., Vukovic, B. (2013). Performance Analysis of Agricultural Companies in Vojvodina. *Strategic Management*, 18(2), 17-24.
- [3] Bielík, P., & Rajčániová, M. (2004). Competitiveness analysis of agricultural enterprises in Slovakia. *Agricultural Economics – Czech*, 50 (12), 556–560. doi: 10.17221/5248-AGRICECON
- [4] Bujňáková, M. (2010). Competitiveness of Slovak agriculture within the V4 countries before and perspectives after the entry to the EU. In R. Kotulič & P. Adamišín (Eds.), *Prosperita poľnohospodárskej výroby pre zabezpečenie trvaloudržateľného rozvoja regiónov* (pp. 21–29). Prešov, Slovak Republic: University of Prešov.
- [5] Fenyves, V., Bács, Z., Karnai, L., Nagy, A., Tarnoczi, T. (2018). Financial performance measurement of hungarian retail food companies. *Contemporary Economics*, 12(4), 459-472. doi: 10.5709/ce.1897-9254.290
- [6] Grznár, M., Szabo, L., & Jankelová, N. (2009). The agrarian sector of the Slovak Republic after the entry to the European Union. *Ekonomický časopis*, 57, 903–917.
- [7] Hanousek, J., Kočenda, E., & Mašika, M. (2012). Corporate efficiency: effect of ownership structures and financial indicators. *Politická ekonomie*, 60(4), 459–483. doi: 10.18267/j.polek.857
- [8] Chrastinová, Z. (2018). Ekonomická, produkčná a sociálna situácia v poľnohospodárskych subjektoch. *Roľnícke noviny*, 7, 10-11.
- [9] Jankelová, N., Joniaková, Z. (2021). How to increase production performance of Slovak agricultural companies: The key task of supporting innovative work behavior and information sharing. *Agricultural Economics – Czech*, 67(1), 11–20. doi.org/10.17221/319/2020-AGRICECON
- [10] Kotulič, R., Adamišín, P., Kravčáková Vozárová, I., & Vavrek, R. (2017). Targeted regionalization of Slovakia to ensure economic efficiency and sustainability of agriculture. In V. Klímová & V. Žítek (Eds.) *20th International Colloquium on Regional Sciences* (pp. 185-192). Brno, Czech Republic: Masaryk University. doi: 10.5817/CZ.MUNI.P210-8587-2017-23
- [11] Kravčáková Vozárová, I., Kotulič, R., & Vavrek, R. (2019). Disparities in the financial performance of agricultural entities according to the legal form: the case of Slovakia. *Applied Economics*, 51, 5999-6008. doi: 10.1080/00036846.2019.1645285
- [12] Maciková, L., Smorada, M., Dorčák, P., Beug, B., & Markovič, P. (2018). Financial Aspects of Sustainability: An Evidence from Slovak Companies. *Sustainability*, 10(7), 2274. doi:10.3390/su10072274
- [13] MPRV SR 2012. *Správa o poľnohospodárstve a potravinárstve v Slovenskej republike za rok 2011*. Retrieved January, 14, 2020, from <http://www.mpsr.sk/sk/index.php?navID=122&id=6916>.
- [14] Špička, J., Hlavsa, T., Soukupová, K., & Štolbová, M. (2019). Approaches to estimation the farm-level economic viability and sustainability in agriculture: A literature review. *Agricultural Economics – Czech*, 65(6), 289–297. doi: 10.17221/269/2018-AGRICECON
- [15] Tóth, M., Lančarič, D., & Savov, R. (2014). Which legal form is a key to success in Slovak agriculture? In: *142nd EAAE Seminar Growing Success? Agriculture and Rural Development in an enlarged EU* (pp. 1-14). Budapest, Hungary: Corvinus University of Budapest. doi: 10.22004/ag.econ.169091
- [16] Xu, J., Zhang, Y. (2021). Does Intellectual Capital Measurement Matter in Financial Performance? An Investigation of Chinese Agricultural Listed Companies. *Agriculture*, 11(9), 1872. doi: 10.3390/agronomy11091872

Financial accounting and working capital management

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Abstract

The importance of timely, accurate and factual display of data in financial accounting forms the basis for a better calculation of the amount of working capital, which is an important indicator for managers. The amount of working capital must be constantly monitored in order to prevent the enterprise from unnecessarily tying up funds that it can use for other purposes. Working capital is funds that need to be permanently maintained in order for an enterprise to be able to provide its production and supply cycle.

Current assets include all assets that an enterprise expects to convert into cash during the year. Current assets thus mean short-term assets that can be in inventories or in the form of cash (cash and bank accounts, receivables, securities). Working capital management includes securing the enterprise's short-term resources to sustain ongoing activities, accumulation of funds and optimize liquidity. The time value of money and the time itself is crucial in managing working capital, because the delay of each day has its value. Effective working capital management requires striking a balance between liquidity and profitability in order to maximise the value of the business. Finding its optimal level may not be an easy task for managers.

Keywords: Financial accounting, working capital, current assets

JEL Classification: M41, M21, D24

1. Introduction

Nowadays, effective working capital management is a necessity. Working capital is inextricably linked to the liquidity of the enterprise and requires active management and control. Timely, faithful and truthfully displayed data in financial accounting are the basis for a better calculation of the amount of working capital. In the present article, we discuss the basic principles of the functioning of working capital and its close connection to cash flows in selected sugar factories in the Slovak Republic.

The optimal level of working capital is one at which an enterprise can carry out its operating activities without restrictions, while not allocating surplus funds to working capital and not causing excess costs. The time elapsing between the moment an enterprise pays its obligations to suppliers until the time of collection of receivables from customers is called the period of turnover of working capital and represents the period during which the enterprise must finance the working capital from its own or external sources. The aim of the enterprise is to reduce the turnover period of working capital as much as possible, thus reducing the amount of funds needed to finance it between the payment of supplier invoices and the collection of the receivable. Working capital should be used with current assets and the nature of an asset is determined by its function (Petriashvili 2017).

Allocations of working capital can be modulated to absorb exogenous shocks to firms' capital expenditure schedule (see more Chauhan 2020, Ben-Nasr, 2016; Ding et al., 2013; Fazzari and Petersen, 1993). If enterprises are unlikely to generate enough operational cash, they should at least temporarily press the work capital allocation to create incremental cash flows needed for capital expenditure.

Therefore, literature from the past suggests that working capital acts as a tactical tool for creating the value of enterprises. In contrast to the previous literature, Chauhan (2019) found that the relative allocations of enterprises' working capital within the industry remain persistent for several years, suggesting that these allocations are driven primarily by company-specific strategic motives and not by normative concerns about improving interim cash flows.

Working capital management studies fall into two competitive perspectives on working capital investment. In one opinion, higher levels of work capital allow companies to increase sales and get more discounts for early payments (Deloof, 2003) and thus can increase the value of companies (Baños-Caballero et al., 2014). Alternatively, higher levels of working capital require financing and consequently firms face additional financial costs that increase the likelihood of their bankruptcy (Kieschnick et al., 2011). The combination of these positive and negative working capital effects leads to a prediction of the nonlinear relationship between working capital investment and the value of the company.

2. Data and Methods

The main objective of the contribution is to highlight the importance of managing working capital. Given the relatively broad issue, we specify the main objective in the sub-objectives:

1. analysis of working capital in selected sugar factories,
2. the submission of proposals to improve the management of working capital.

The object of the investigation is the area of financial management in two selected sugar factories from Slovakia. The selection was focused on SLOVENSKÉ CUKROVARY, s. r. o., Považský cukor, a. s. Data for individual sugar factories are obtained from publicly available sources – annual reports stored on the website www.registeruz.sk website for the financial year 2020/2021. We are based on financial accounting data, where we focused on the following accounting classes of the framework chart of accounts for entrepreneurs accounting in the double-entry accounting system:

- 1 - Inventory,
- 3 - Accounting for receivables and liabilities,
- 5 – Expenses,
- 6 - Revenues.

In solving the specified issue, we used basic methods of research: analysis, synthesis, comparison and selected indicators for calculating working capital. We calculated working capital (WC) in three of the following ways:

- as an absolute value calculated from balance sheet items:

$$WC = \text{Inventory} + \text{Total short term receivables} - \text{Total short term liabilities} \quad (1)$$

- as a working capital to sales ratio (WCSR), expressed in %:

$$WCSR = WC / \text{Net Sales} * 100 \quad (2)$$

- as a working capital turnover in days (WCT) calculated from activity indicators:

$$\text{WCT} = \text{IT} + \text{RT} - \text{LT} \quad (3)$$

Formula for calculating the turnover period of inventories:

$$\text{Inventory turnover in days (IT)} = \frac{\text{INVENTORY}}{\text{NET SALES}} * 360 \quad (4)$$

Formula for calculating the turnover period of receivables (debt collection period):

$$\text{Receivable turnover in days (RT)} = \frac{\text{Trade receivables}}{\text{NET SALES}} * 360 \quad (5)$$

Formula for calculating the turnover period of liabilities (payment period of liabilities):

Liabilities turnover in days (LT) =

$$= \frac{\text{Trade payables}}{(\text{Cost of raw material} + \text{consumables and purchased merchandise} + \text{Service expense})} * 360 \quad (6)$$

Based on calculated activity indicators – the turnover period of liabilities and the turnover period of receivables, at the end of the paper we presented two options for financing working capital using internal or external sources – short-term bank loan.

3. Results and Discussion

Structure working capital in selected sugar factories for the financial year 2020/2021 is shown in Figure 1. Považský cukor a.s. has the highest value of working capital in the amount of 34,142 thousand EUR (TEUR). The amount of trade liabilities for both companies monitored oscillates around 5,900 TEUR. The amount of inventories represents the highest share of working capital in both companies surveyed. In Považský cukor a.s. it amounts to 27,154 TEUR.

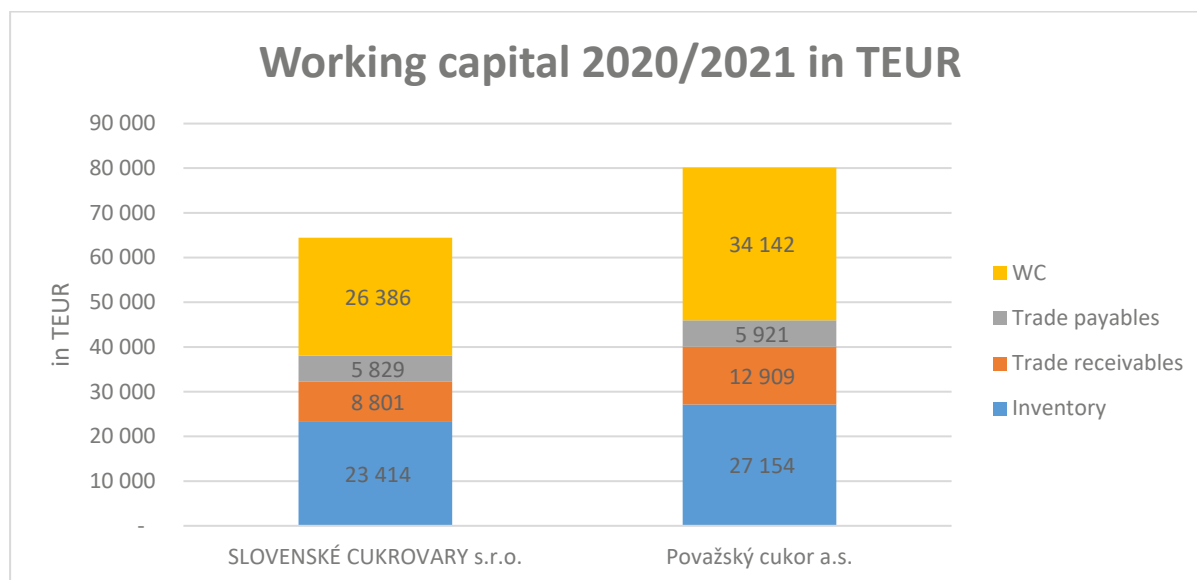


Figure 1: Working capital in selected sugar factories for the financial year 2020/2021 in TEUR

Source: author's calculations, data from www.registeruz.sk

Figure 2 is devoted to the working capital to sales ratio, values are expressed in %. The financial years 2018-2021 are compared in selected companies. Both companies surveyed

show a trend of growth in the share of working capital in sales. The biggest difference was recorded in 2020.

The highest share of the operating capital in sales is held by SLOVENSKÉ CUKROVARY s.r.o., where the share amount reaches up to 50% in the observed year 2020 and 2021. In the last year we see an increase in this share also by Považský cukor a.s., which reached 42%.

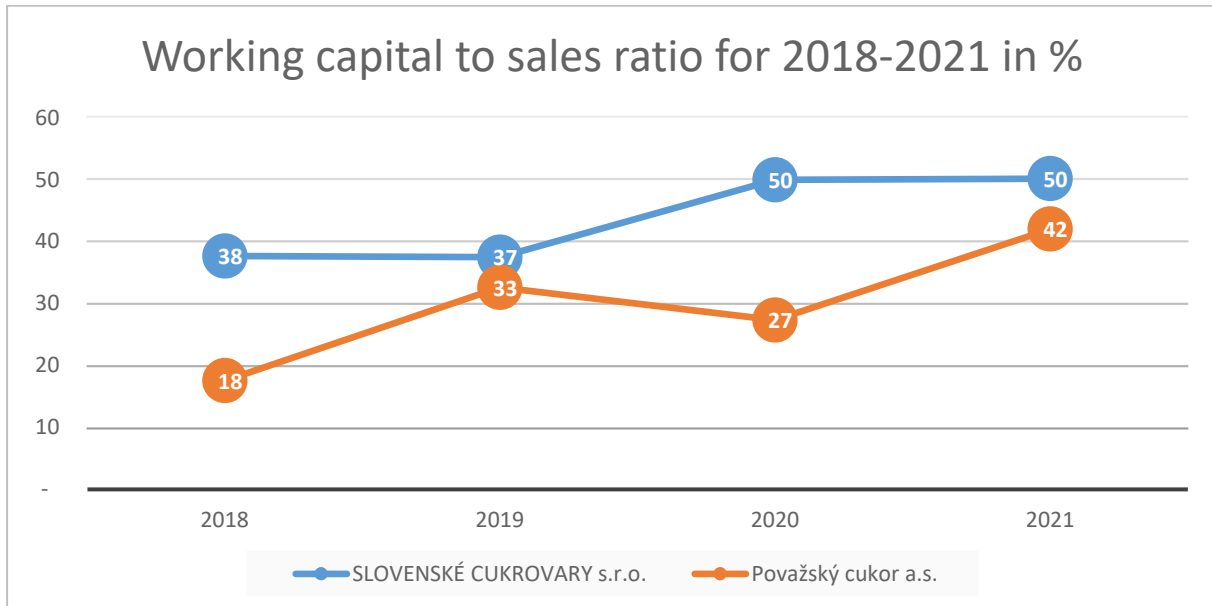


Figure 2: Working capital to sales ratio in selected sugar factories for the financial years 2018-2021 expressed in %

Source: author's calculations, data from www.registeruz.sk

The comparison of selected sugar factories in terms of working capital turnover is documented in Figure 3. The longest period of turnover of working capital is in the company SLOVAK SUGAR FACTORIES, s. r. o. 173 days. The working capital of this company amounted to 26,386 TEUR, which represents a 50% share of sales. In the reference period from 2018 to 2021, it is standard to maintain a working capital ratio of 44% (obtained by calculating using the median function in the reference period 2018-2021). The company's management should explore the possibility of reducing this share to 44%, bringing working capital from 26,386 TEUR to 21,109 TEUR thereby freeing up cash.

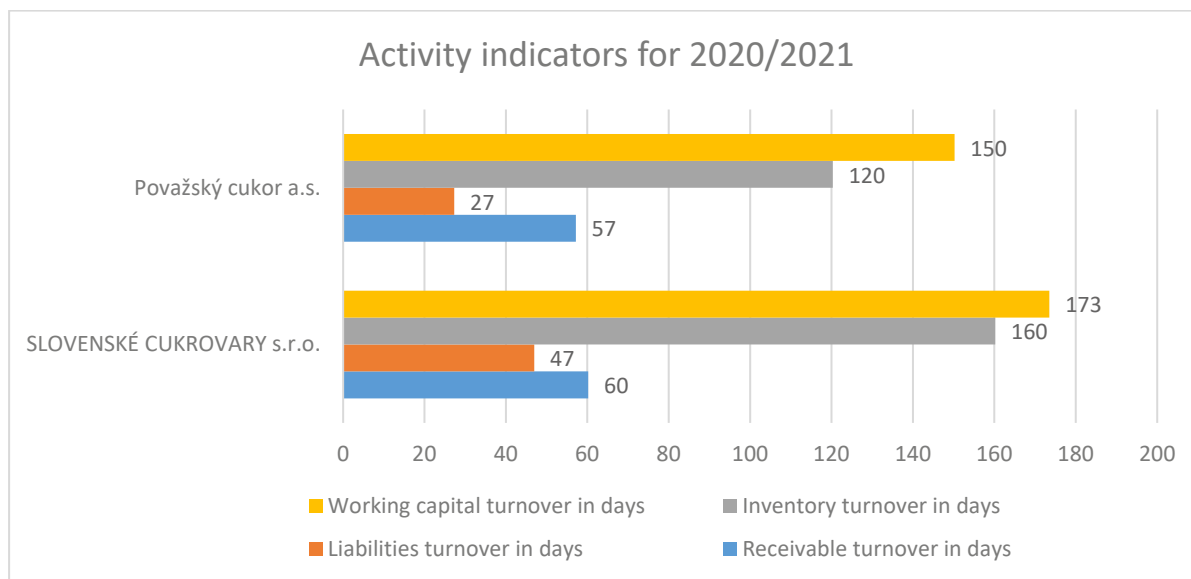


Figure 3: Activity indicators in selected sugar factories for the financial year 2020/2021, expressed in days

Source: author's calculations, data from www.registeruz.sk

In order to assess whether an enterprise operates with optimal working capital, it is possible to compare the level of working capital with other competing enterprises. A more detailed analysis assesses the amount of inventories, trade receivables and trade payables. The adequacy of receivables and liabilities can be assessed on the basis of activity indicators –turnover period of receivables, turnover periods of liabilities, between which there should not be much difference.

At the time of the turnover of liabilities, we can note the high value in Považský cukor a.s., which reaches 60 days.

The turnover period of receivables is significantly higher in SLOVENSKÉ CUKROVARY, s. r. o. compared to the turnover period of liabilities. This is a positive for the creditors of this enterprise and is a good prerequisite for the payment of liabilities.

The increasing turnaround period of liabilities indicates that the enterprise is late in making payments to suppliers, which could be seen as a sign of poor efficiency in the management of working capital.

The increasing turnaround period of receivables may also indicate that the enterprise does not manage its working capital very efficiently. It takes longer to collect payments from customers, as a result of which the enterprise may not have enough cash to finance its short-term liabilities from business relationships.

Companies should compare the achieved levels of working capital with previous years. Should values fall outside normal, managers should look for causes and take corrective action. Importance should be placed on the behaviour of working capital in the growth and decline of sales and how it affects cashflow itself. Each company should have predefined target levels of working capital, expressed as a turnover period or a share in % of sales. Track each component of working capital, which is inventories, receivables and liabilities.

4. Conclusion

In today's pandemic situation, it is very important to address the area of labour capital management, especially if the collection time of receivables increases. The ideal state of economic activity of an enterprise is when the duration of the production cycle, i.e. the period of inventory turnover and the period of turnover of receivables, is less than the turnover period of liabilities. This means that the enterprise gets its money earlier, has already paid suppliers for the material intended for this production. Otherwise, it is necessary to cover the missing time with another source of capital.

One option is internal resources, which are, for example, deposits of the owners of the enterprise. Other options are the use of external resources, such as the form of a short-term bank loan. Such a loan must be earmarked. In relation to the issue addressed, we list two options for the purposeful drawing of a short-term bank loan:

1. overdraft to finance trade payables,
2. a loan for current funds, which is intended to finance trade receivables and to purchase inventories.

In both cases, it is important that managers are able to make the right decision. The management of the enterprise must ensure sufficient financial resources to cover the working capital. It is therefore necessary that they be based in particular on timely and faithful financial accounting data. Which they use to calculate economic activity, such as the turnover period of liabilities, the turnover period of receivables and the turnover period of inventories.

Obtaining a short-term bank loan to finance trade payables would allow enterprises with a higher turnover period than the debt turnover period to increase liquidity. By paying supplier invoices in a timely manner, the turnover period of liabilities decreases and the enterprise becomes more trustworthy for creditors, specifically suppliers, on the basis of which it can obtain more favourable purchase conditions.

A short-term bank loan to finance trade receivables would allow enterprises that have a higher turnover period than the turnover period of liabilities (in our analysis SLOVENSKÉ CUKROVARY, s. r. o. and Považský cukor a.s.) similarly as in the previous case to increase liquidity.

Both methods of special-purpose drawing of short-term bank loans represent an operational solution to cover both planned and unplanned short-term operating needs.

In conclusion, we note that monitoring the amount of working capital and the turnover period of working capital is an important management tool through which managers can better manage cash flows. In the submitted contribution, we present the possibilities of calculating working capital, its analysis and practical application. Based on the generalization of the results obtained, we recommend that managers monitor the amount of working capital and the turnover period of working capital. The two indicators are linked to liquidity and indebtedness, which are among the financial indicators for assessing the competitiveness of enterprises.

References

- [1] Baños-Caballero, S., García-Teruel, J. P., & Martínez-Solano, P. (2014). Working capital management, corporate performance, and financial constraints. *Journal of Business Research*, 67, 332-338. doi.org/10.1016/j.jbusres.2013.01.016
- [2] Ben-Nasr, H. (2016). State and foreign ownership and the value of working capital management. *Journal of Corporate Finance*, 41, 217-240. doi.org/10.1016/j.jcorpfin.2016.09.002

- [3] Chauhan, G. S. (2019). Are working capital decisions truly short-term in nature? *Journal of Business Research*, 99, 238-253. <https://doi.org/10.1016/j.jbusres.2019.02.032>
- [4] Deloof, D. (2003). Does Working Capital Management Affect Profitability of Belgian Firms? *Journal of Business Finance and Accounting*, 30(3-4), 573-587. doi.org/10.1111/1468-5957.00008
- [5] Ding, S., Guariglia, A., & Knight, J. (2013). Investment and financing constraints in China: Does working capital management make a difference? *Journal of Banking & Finance*, 37(5), 1490-1507. doi:10.1016/j.jbankfin.2012.03.025
- [6] Kieschnick, R. L., Laplante, M., & Moussawi, R. (2013). Working Capital Management and Shareholders' Wealth, *Review of Finance*, 17(5), 1827-1852. doi.org/10.1093/rof/rfs043
- [7] Mathur, B. S. (2002). Working Capital Management and Control. New Delhi, K.K. Gupta for New Age International (P) Ltd.
- [8] Petriashvili, A. (2017). A Working Capital and Liquidity. In: Procházka, D. (eds) *New Trends in Finance and Accounting. Springer Proceedings in Business and Economics. Springer, Cham.* 67, 733-737. doi.org/10.1007/978-3-319-49559-0_67
- [9] Preve, L. A. & Sarria-Allende V. (2010). Working Capital Management. New York, Oxford University Press, Inc.
- [10] Rangarajan, M., & Misra, A. (2005). Working capital management. New Delhi: EXCEL BOOKS (pp. 256). ISBN: 81-7446-453-0.
- [11] Sagner, J.S. (2011). Cut costs using working capital management. *The Journal of Corporate Accounting & Finance*, 22 (3), 3-7. doi:10.1002/jcaf.20669
- [12] Sagner, J.S. (2013). Cut Costs Using Working Capital Management: Part III. *The Journal of Corporate Accounting & Finance*, 24 (3), 9-13, doi:10.1002/jcaf.21839
- [13] Sagner, J. S. (2014). Working Capital Management Applications and Cases. New Jersey, John Wiley & Sons, Inc.

Support for the food industry in the Slovak Republic

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Abstract

The food industry plays an important role in economic policy, and its development is dependent on agricultural productivity. Agricultural productivity may become a key issue in the future, because it is necessary not only to produce more, but also to produce in a sustainable manner. The purpose of this paper is to examine the opportunities for food enterprises to participate in calls and support programs approved by the Government of the Slovak Republic in current strategic plans, as well as the provision of subsidies for green investments in food enterprise innovation, and an examination of the publication of non-financial information on efforts to build the food industry in the Slovak Republic under the conditions of sustainable development set out in the annual report in accordance with Act No. 431/2002 Coll. on Accounting, as amended (Accounting Act), because the food industry currently requires changes toward modernisation, innovation, and transformation of production with a more efficient use of resources in order to ensure sufficient food for the population in the context of sustainable development.

Keywords: *European Green Deal, food industry, sustainable development, annual report, investment*

JEL Classification: *A12, M21, O31*

1. Introduction

Promoting environmental entrepreneurship in the food industry is essential because food businesses must develop their ideas, thoughts, and visions with the goal of providing enough food for people while being conscious of the environment. Food companies are changing their attitudes not only as a result of legislation or the implementation of environmental management measures, but also as a result of consumer pressure. Consumer pressures from the external environment are driving the need for the current food industry to invest in modernisation, innovation and transformation of production to use resources more efficiently. Because the transition to more resource-efficient production requires increased investment, not every enterprise is capital-ready to transition from conventional to more resource-efficient production in the context of sustainable development. It refers to all stages of the process, including design, construction, maintenance and delivery of solutions to the customer (Akyazi, Goti, Oyarbide, Alberdi & Bayon, 2020). Sustainable consumption and production is one of the goals of sustainable development as an important global market (Ivančáková, 2021).

The food processing industry is recognized as a major buyer of agricultural commodities from both domestic and international markets, ensuring their processing, production, and participation in food supply to the population. To ensure that more people have enough, better quality, and healthier food, as well as a gradual shift in consumer attitudes toward environmental protection, food businesses must implement a variety of measures and processes to transform production in order to achieve sustainability, efficiency, and environmental

protection, and thus they must develop green innovation practices to meet stakeholder expectations. (Soewarno, Tjahjadi, Fithrianti, 2019).

1.1 The European Green Deal and the Slovak Republic

Climate change and environmental degradation pose an existential threat to Europe and the world. To address these threats, the European Green Agreement will transform the EU into a modern and competitive, resource-efficient economy. (European Green Deal, 2021) The European Commission is committed to achieving climate neutrality by 2050. Under the EU Council's Green Deal, all European Union measures and policies contribute to the Green Deal objectives (European Green Deal, 2022). In its Communication, the European Commission announced initiatives in a number of policy areas, including:

- European climate legislation,
- EU Biodiversity Strategy 2030,
- Farm-to-table strategy,
- European Industrial Strategy and Action Plan for a Circular Economy,
- Just Transition Mechanism,
- Secure supply of clean and affordable energy,
- Sustainable and smart mobility,
- Renovation Wave,
- Forestry strategy.

The different initiatives of the European Green Deal are not mutually exclusive. On the contrary, they complement each other in terms of supporting the food industry in reflecting current food themes, with the farm-to-table strategy taking the center stage.

Farm-to-table strategy

The farm-to-table strategy should help bring healthier and more sustainable food. (RTVS, 2021) The farm-to-table strategy reflects the European Union's goal of achieving climate neutrality by 2050 by transitioning the current EU food system to a sustainable model. In addition to food safety and security, the European Union establishes the following goals as part of the strategy:

- ensuring that there is **enough affordable and nutritious food** within the limits of the planet's resources,
- ensuring **sustainable food production** by, among other things, significantly reducing the use of pesticides, antimicrobials and fertilisers and expanding organic farming,
- promoting more sustainable **food consumption and healthy eating habits**,
- reducing **food loss and waste**,
- fighting food **fraud** in the supply chain,
- improving **animal welfare**.

The EU food system ensures fresh and safe food for everyone in the European Union. Food production is not only a vital service but also a source of income. The agriculture industry is an important sector, bringing food security, but it also has a significant impact on the environment, with around a third of global greenhouse gas emissions coming from food systems, according to a report by the Intergovernmental Panel on Climate Change (IPCC). In addition, the current food model is having a detrimental impact on people's health, with more than 50% of adults in Europe being overweight, hence the objective of changing the way food is produced and consumed in Europe to reduce the environmental footprint of food systems,

strengthen their resilience to crises, and at the same time ensure that healthy and affordable food is available for everyone now and in the future.

A sustainable food system seeks to protect the nature and biodiversity of the European Community and therefore some of the proposed Green Deal initiatives are presented as complementary. The farm-to-table strategy is aligned with the EU's 2030 biodiversity strategy. The farm-to-table strategy and the EU's 2030 biodiversity strategy share the objectives of reducing pesticide and fertiliser use, restoring farmland and water management.

In October 2020, the Council adopted conclusions on this strategy, setting the goal of creating a European sustainable food system from production to consumption. The conclusions contain a threefold political message from the Member States, which agreed to guarantee:

- access to sufficient and affordable food while contributing to the EU's climate neutrality by 2050,
- fair income and strong support for primary producers,
- global competitiveness of EU agriculture.

In the context of supporting the development of food businesses under the conditions of the concept of sustainable development, the Government of the Slovak Republic in the field of support for research, innovation and other innovative solutions Strategic Plan of the Common Agricultural Policy for 2023 - 2027 and also supports businesses through various European Union research and innovation programmes.

1.2 Strategic plan of the Common Agricultural Policy for the period 2023 - 2027

For the further development of food production in Slovakia, it is necessary to create a Strategy for the development of the food industry until 2030, with regard to the entire food vertical. However, in terms of the development of the entire food sector, it is necessary to set policies on the basis of a comprehensive picture of the overall state of the sector, and at the same time for individual food sectors. (Strategické priority, 2020) In February 2022, the Government of the Slovak Republic approved the Strategic Plan of the Common Agricultural Policy for the years 2023 - 2027 (strategic plan of the CAP), which was submitted by the Ministry of Agriculture and Rural Development of the Slovak Republic. The CAP Strategic Plan is the basic strategic document of the Slovak Republic, on the basis of which the European Union's support from the European Agricultural Fund for Rural Development (EAFRD) and the European Agricultural Guarantee Fund (EAGF) will be implemented. (MPSR, 2022)

The Strategic Plan leads to the implementation of the 2030 Agenda for Sustainable Development through the achievement of general economic, environmental and social goals. The strategic plan takes into account and sets priorities to support the sustainable development of agriculture, food, forestry and rural areas in the Slovak Republic, while the new common policy of the European Union has three main objectives, to which the Slovak Republic will contribute (MPSR Communication, 2022), and to:

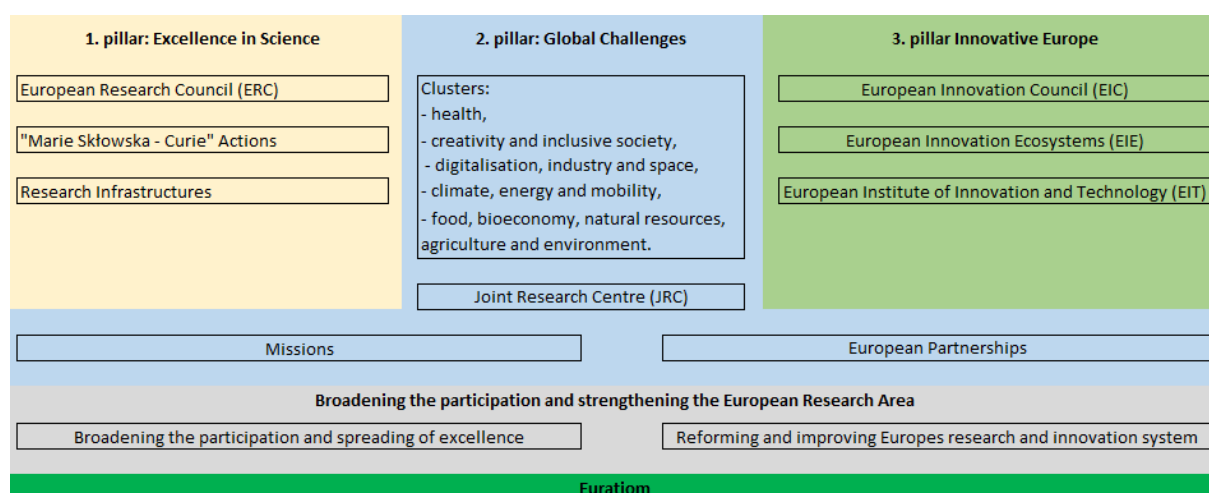
- a smart, competitive, resilient and diversified agricultural sector that guarantees long-term food security,
- protecting the environment, including biodiversity and climate action, and achieving the Union's environmental and climate objectives,
- strengthening the socio-economic structure of rural areas.

1.3 Promoting innovation Horizon Europe 2021-2027

The government also supports local businesses through various European Union programmes for research and innovation. One of the programmes is the European Union's 9th Framework Programme for the period 2021 to 2027. Horizon Europe builds seamlessly on Horizon 2020, which is one of the most important programmes funding projects in science, research and innovation in the European Union between 2014 and 2020. In order to prepare Horizon Europe, the outcome of the strategic planning exercise has been translated into a Strategic Plan (2021-2024) for the submission of proposals for the first four years of Horizon Europe (2021-2027). It is the document "Towards a first Strategic Plan for Horizon Europe" that explains the process of developing the first Strategic Plan and provides the basis for the Horizon Europe Work Programmes.

Its main objectives are to strengthen the EU's science and technology base and the European Research Area (ERA); to strengthen Europe's innovation capacity, competitiveness and employment; to meet citizens' priorities and sustain our socio-economic model and values. Particular reference can be made here to the manifestation of the objectives and vision of the European Green Deal, the digital transition, the transition to sustainability and the recovery from the COVID-19 crisis.

The new programme will be implemented through three main pillars, namely Excellent Science, Global Challenges and Innovative Europe (Schema 1).



Schema 1: Pillars of Horizon Europe

Source: ERAPORTAL, 2022

Under each pillar of Horizon Europe, objectives are defined:

1. **Excellence in Science "pillar"** - aims to support investigator-led research projects through the European Research Council (ERC), fellowships and staff exchanges under Marie Skłodowska-Curie Actions, and investment in world-class research infrastructures (including e-infrastructures).
2. **Global Challenges and the Competitiveness of European Industry" pillar** - this pillar aims to support EU policies and the Sustainable Development Goals, supported by EU and Member State policies through the activities of the Joint Research Centre (JRC). The second pillar is divided into 6 categories (clusters):
 1. health,
 2. culture, creativity and inclusive society,

3. civil security for society,
4. digitalisation, industry and space,
5. climate, energy and mobility,
6. food, bioeconomy, natural resources, agriculture and environment

Pillar 2 includes an emphasis on food safety (soil health, food and

healthy oceans, seas, coastal and inland waters). Horizon Europe supports and

European partnerships and strengthen the European Research Area (ERA). The following

two European Partnerships are relevant for food safety:

- Candidates for partnership in healthcare,
- Candidates for partnerships in food, bioeconomy, natural resources, agriculture and environment.

3. the "Innovative Europe" pillar supports solutions that contribute to building market and innovation-friendly ecosystems. It will aim to make Europe a key player in market-creating innovation through the European Innovation Council (EIC) and the European Institute of Innovation and Technology (EIT) to promote the integration of actors with the common goal of developing innovation in research, higher education and business. The pillar also includes the European innovation ecosystems area, which serves to strengthen the connectivity and performance of Europe's research and innovation environment.

2. Data and Methods

In this paper, we focused on the possibilities of supporting food industry enterprises in Slovakia in the field of innovation and possible investments under the conditions required by sustainable development in all its areas, because agricultural productivity is currently increasing, but at the expense of the resources provided by nature to mankind. It is the funds from subsidies, calls for investment that can help food businesses to improve their production in the context of sustainable development. The purpose of this paper is to examine the opportunities for food enterprises to participate in calls and support programmes approved by the Slovak government in current strategic plans, as well as the provision of subsidies for green investments in food enterprise innovations, as well as an examination of the disclosure of non-financial information on efforts to build production beneficial to environmental protection in annual reports in accordance with Act No. 431/2002 Coll. on Environmental Protection (Accounting Act) as amended.

3. Support for Slovak food businesses

The provision of a subsidy is a process in which the provider of the subsidy and the applicant for the subsidy, who is also the recipient of the subsidy, act together. This can be used to designate the food business as both the applicant and the recipient of the subsidy. The disclosure of information by a food producing company about its involvement in challenges, support programmes, research on increasing productivity in order to protect the environment for future generations is important information for various business partners who also subscribe to the conditions of sustainable development, but also for food consumers.

3.1 Accounting treatment of subsidies granted to food businesses

Together with the support programmes of the Slovak Republic, food processing enterprises have the opportunity to apply for subsidies for R&D, innovation and green investment projects if they meet all the conditions related to the subsidy (Sklenka et al., 2019).

The entitlement to the subsidy is a receivable for the entity, i.e. the food business. If a food business becomes eligible for a given subsidy on the basis of a decision of the competent authority which grants the subsidy. In the case of subsidy accounting, the procedure is followed in accordance with the provisions of § Sec. 52a and Sec. 52b of the Ministry of Finance of the Slovak Republic Measure No. 23054/2002-92, which establishes details of accounting procedures and the framework chart of accounts for entrepreneurs accounting in the double-entry bookkeeping system, as amended (Accounting Procedures, 2002). The subsidy can be provided from the state budget, from the funds of the European Union, from the budget of a municipality, city, self-governing region. From the point of view of the provider of subsidies, the accounts for accounting for subsidies are also arranged in the framework chart of accounts for entrepreneurs, namely:

- 346 - Subsidies from the state budget,
- 347 - Other subsidies (Accounting procedures, 2002).

The entitlement to the subsidy shall be booked by the entity on the basis of an internal accounting document on the Debtor side of the account 346 - State budget subsidies or 347 - Other subsidies by a corresponding entry in the relevant revenue account of account class 6 - Revenue or in account 384 - Deferred income. When the funds in the bank account are received, the receivable for the grant entitlement is extinguished. (Sklenka et al., 2019) The accounting cases in the context of entitlement to a subsidy are shown in Table 1.

Table 1: Procedure for accounting for entitlement to a subsidy

Accounting case	Debtor	Credit
Entitlement to a subsidy from the state budget (from the municipal budget)	346 (347)	6xx, 384
Acceptance of subsidies to the bank account from the state budget (from the budget of the municipality)	221	346 (347)

Source: Accounting procedures, 2002

The further accounting treatment of the grant entitlement depends on the purpose of the grant, whether the grant was made for an asset, distinguishing between a grant for depreciable fixed assets or a grant for non-depreciable assets, or whether the grant was made to reimburse costs.

3.2 Disclosure of information on green investments in the annual report

Disclosure of information on the provision of sufficient food for human consumption with regard to environmental protection should be published by individual food businesses in the Slovak Republic in their annual report. Corporate social responsibility in events is truly impactful and innovative (Košíčiarová & Kádeková, 2020). The conditions of disclosure of information to users and its content are regulated by the provisions of Sec. 20 of Act No. 431/2002 Coll. on Accounting, as amended. The information disclosed in the annual report may be financial but non-financial in nature. Non-financial information can also include information on green investments, information on new trends in the food industry, information on projects in which the food company has been involved, information on innovation-friendly

ecosystems, transformation of production to more environmentally friendly production, integration of new technologies into production that meet the concept of sustainable development, information on innovative sustainable solutions, or what funds from calls for proposals from the subsidy provider the food company has received to support its business. The obligation to prepare an annual report under the Accounting Act is limited; not every entity is obliged to prepare an annual report, but only those entities that meet at least two of the conditions at the date on which the financial statements are prepared and for the immediately preceding accounting periods (Accounting Act, Sec. 19 (1)). In recent periods, pursuant to Act No 198/2020 Coll. of 9 July 2020 amending certain acts in connection with the improvement of the business environment affected by anti-pandemic measures to prevent the spread of the COVID-19, the size criteria for the audit of commercial companies and cooperatives have increased. For the accounting period beginning on, or after 1.1.2021, the criteria have been increased, namely:

- total amount of assets exceeds € 3 000 000,
- net turnover exceeds € 6 000 000,
- average number of employees exceeds 40.

And for the accounting period beginning on, or after 1.1.2022 have increased as follows:

- total amount of assets exceeds € 4 000 000,
- net turnover exceeds € 8 000 000,
- average number of employees exceeds 50.

Some accounting entities on the territory of the Slovak Republic are required to prepare an annual report within the narrower scope of disclosure of information, which, according to the Accounting Act, Sec. 20 (1) (a), (b), (c), (d), is, for example, information on the entity's development, the entity's state, and the significant risks and uncertainties to which the entity is exposed. Such information shall be provided in the form of a balanced and comprehensive analysis of the state of affairs and a forecast of developments and shall include relevant financial and non-financial indicators, including information on the impact of the entity's activities on the environment and on employment, with reference to the relevant figures in the financial statements, events of particular significance occurring after the end of the financial year for which the annual report is made, the expected future development of the entity's activities and the cost of research and development activities.

In addition to entities that prepare an annual report within the narrower scope of disclosures, there are also entities that disclose non-financial information within the broader scope of disclosures in the annual report. Those public interest entities (other than a entity defined in Sec. 17b) that also disclose non-financial information in the broader scope of disclosure in the annual report shall disclose information on the development, conduct, position and impact of the entity's activities on environmental, social and employment issues, information on respect for human rights, and information on the fight against corruption and bribery (hereinafter referred to as the "social responsibility area"), indicating according to the Accounting Act, Sec. 20 (8):

- a) a brief description of the business model,
- b) a description of, and the results of, the entity's application of its corporate social responsibility policy, including the due diligence procedures applied,
- c) a description of the principal risks of the entity's impact on the area of social responsibility arising from the entity's activities that could have adverse consequences and, if appropriate, a description of the business relationships, products or services that the entity provides and how the entity manages those risks,

- d) significant non-financial information about the entity's operations by activity,
- e) a reference to information on the amounts recognised in the financial statements and an explanation of those amounts in terms of the effects on the area of corporate social responsibility, if applicable.

4. Conclusion

Providing enough food for the population in a sustainable way is becoming a major goal for food businesses, and communicating that a food business is committed to innovative and resource-efficient sustainable production practices is becoming increasingly important. More importantly, not only for the various suppliers of raw materials and agricultural products who also believe in sustainable development, but also for buyers of food products and, ultimately, for consumers who believe in environmental protection and the preservation of natural resources for future generations. The Accounting Act is one of the sources of non-financial information disclosure that allows food companies in the Slovak Republic to inform about their activities based on the concept of sustainable development in the sense of Slovak legislation in the narrower, but also in the broader scope of disclosure of this information.

Despite the fact that the Government of the Slovak Republic has approved support programmes in the field of research, innovation, and innovative solutions for enterprises in the food industry, they are insufficient, and it is necessary to provide even more support to improve their position on the market and functioning, because they are the main carrier and strategic link in the overall economy of the company.

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References

- [1] Akyazi, T., Goti, A., Oyarbide, A., Alberdi, E. & Bayon, F. (2020). A Guide for the Food Industry to Meet the Future Skills Requirements Emerging with Industry 4.0. *Foods*, 9(4), 492. doi: 10.3390/foods9040492
- [2] Accounting act. (2002). *Zákon č. 431/2002 Z. z. o účtovníctve v znení neskorších predpisov*. Retrieved February 8, 2022, from <https://www.slov-lex.sk/pravne-predpisy/SK/ZZ/2002/431/20220101>
- [3] Accounting procedures. (2002). *Opatrenie Ministerstva financií Slovenskej republiky č. 23054/2002-92, ktorým sa ustanovujú podrobnosti o postupoch účtovania a rámcovej účtovnej osnove pre podnikateľov účtujúcich v sústave podvojného účtovníctva v znení neskorších predpisov*. Retrieved February 10, 2022, from https://www.financnasprava.sk/_img/pfsedit/Dokumenty_PFS/Zverejnovanie_dok/Sprievodca/Postupy_uct/2018.01.12_podvoj_uctov.pdf
- [4] Act No 198/2020 Coll. of 9 July 2020 amending certain acts in connection with the improvement of the business environment affected by anti-pandemic measures to prevent the spread of the COVID-19
- [5] ERAPORTAL. (2022). *O programe*. Retrieved January 31, 2022, from https://eraportal.sk/horizont-europa/heu-o-programe/#tabs_desc_62575_2
- [6] European Green Deal. (2021). *Snaha stať sa prvým klimaticky neutrálnym kontinentom*. Retrieved April 26, 2022, from https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_sk
- [7] European Green Deal. (2022). *Európska zelená dohoda*. Retrieved February 1, 2022, from <https://www.consilium.europa.eu/sk/policies/green-deal/>

- [8] Ivančáková, J. (2021). Manažment potravinového rizika z hľadiska udržateľnej spotreby a výroby. Retrieved April, 28, 2022 from <https://doi.org/10.5817/CZ.MUNI.P210-8640-2021-8>
- [9] Košičiarová, I. & Kádeková, Z. (2020). Publicity as a tool of PR activities within CSR concept in food enterprises in Slovakia. *Marketing Science & Inspirations*, 15(1), 2-14.
- [10] MPSR. (2022). *Vláda schválila dokument národného významu*. Retrieved February 12, 2022, from <https://www.mpsr.sk/aktualne/vlada-schvalila-dokument-narodneho-vyznamu/17505/>
- [11] Oznámenie MPSR. (2022). *Oznámenie SEA SP SPP 2023 – 2027*. Retrieved February 12, 2022, from <https://www.mpsr.sk/oznamenie-sea-sp-spp-2023-2027/1504-43-1504-17387/>
- [12] RTVS. (2021). *Európska únia prichádza so stratégiou pre zdravšie a udržateľné potraviny*. Retrieved April, 27, 2022, from <https://spravy.rtv.s.sk/2021/10/europska-unia-prichadza-so-strategiou-pre-zdravsie-a-udrzatelne-potraviny/>
- [13] Sklenka, M., Šlosárová, A., Hornická, R. & Blahušiaková, M. (2019). *Účtovníctvo podnikateľských subjektov II* (2nd ed.). Bratislava, Walters Kluwer.
- [14] Strategické priority. (2020). *Strategické priority na rozvoj výroby potravín v Slovenskej republike*. Retrieved April 28, 2022, from https://www.potravinari.sk/files/PKS_brozura_final.pdf
- [15] Soerwarno, N., Tjahjadi, B. & Fithrianti, F. (2019). Green innovation strategy and green innovation: The roles of green organizational identity and environmental organizational legitimacy. *Management Decision*, 57(11), 3061-3078. doi: 10.1108/MD-05-2018-0563

Work Team Performance: Role of Team Diversity

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Abstract

The paper deals with the topic of impact of team diversity on the team performance. A set of variables related to the team characteristics and team managers were used to evaluate their impact on the team performance measured as average country performance ranking of work teams from all the countries in scope. Country performance ranking was based on the achieved revenue of work teams from selling company products in certain country. The authors were able to collect data about 948 work teams from a global multinational enterprise (referred as MNE) from all around the Globe. The results of the linear regression show that the overall team performance was apart from the gender diversity of the team further determined by its national diversity, first language, structural stability and seniority score.

Keywords: work team diversity, work team performance, gender diversity

JEL Classification: J16, L25, M14

1. Introduction

With the increasing diversity of the workforce and the prevailing affirmation of the value of diversity in company performance, many organizations are changing their human resource strategy to achieve greater diversity among their employees (Kossek, Markel, & McHugh, 2003). A growing number of literature and studies are focusing on the relationship between diversity and performance. From the information/decision-making perspective, the academic literature has advocated positive effects of diversity on performance (Williams & O'Reilly, 1998). Competitive advantages can be obtained from the variation in knowledge and perspectives that result from diversity (Herring, 2009). Team members who share similar values communicate more frequently, helping to reduce conflict and increase the efficient use of knowledge (Mitchell, Nicholas, & Boyle, 2009). However, based on the similarity-attraction paradigm, other studies suggest that diversity may have trade-offs such as reduced and constrained communication and coordination (van Knippenberg, De Dreu, & Homan, 2004).

According to information processing theory, diversity can foster creativity, performance, and innovation, by providing informational cues and diverse cognitive resources. In contrast, self-categorization theory states that diversity creates social divisions and interpersonal conflicts that have negative effects on different outcome (Van der Vegt, 2002). Using these two different perspectives, previous studies have distinguished the roles of relational or social-category diversity from informational or task related diversity (Choi, 2007). However, there is not a clear pattern regarding the performance effects of diversity on various personal characteristics (Webber & Donahue, 2001). The potential reason could be that the typical social category variables such as gender and age also imply a diversity of information due to different experiences and perspectives (Ali, Kulik, & Metz, 2011). Considering this assumption, typical task-related variables such as functional background and length of service also activate social

categorization processes and stereotypes based on in-group and out-group perceptions (Van der Vegt, Vliert, & Oosterhof, 2003).

To social categorization and information processing functions of diversity, can be added also its status-related implications. The status characteristics theory (SCT) emphasizes the role of status differences between individuals, which often leads to lower performance (Berger, Fişek, Norman, & Zelditch, 1977). The process of social categorization can have a greater impact on individual behaviour when the social category clearly implies differentiated status. Diversity researchers have recently begun to adopt SCT as a central theoretical foundation that provides complementary explanations for diversity effects at the group level of analysis (Chatman & O'Reilly, 2004). The status-related process appears particularly critical at the organizational level, as it can set the general climate for employee interactions and provide an institutional signal regarding the social structure of the organization.

According to SCT different individual characteristics such as gender, age, ethnicity, education, and experience lead to different perceptions of job competence and execution expectations for others. Such expectations automatically shape the status structure in the workplace, leading to discrimination between higher and lower status members (Amoroso, Loyd, & Hoobler, 2010). Status differences lead to reduced communication and interpersonal undervaluation, which negatively impact creativity and performance (Harrison & Klein, 2007). Diversity in the hierarchical positions of organizational members should reduce both the qualitative and quantitative performance of working team by creating an institutional context that supports and strengthens divisive formal and informal organizational structures (Choi, Sung, & Zhang, 2017). On the other hand, diversity characteristics such as gender, age, and education, that are less related to status of team members, may not create significant social divisions between employees. Therefore, informational benefit is more likely to be achieved by employees of different age, gender, and education (Choi et al., 2017). Diversity in gender, age and education promotes the distribution of work among team member, which can be done more effectively because of the less significant impact of these characteristics on status and social differences between employees. Gender diversity is a source of intangible and socially complex resources that improve creativity, problem-solving, and overall team performance (Ali et al., 2011).

Gender diversity of work teams has positive impact on the performance because of complementarity between men and women in terms of skills and abilities (Ali et al., 2011). Similarly, work teams may be more effective and productive when consisting of employees of different age, because of the potential complementarity and distribution of work between younger and older team members based on their social experiences, skills, and different backgrounds (Bantel & Jackson, 1989). In addition, age diversity of work teams also decreases interpersonal tension and redundant competition. This is because employees at the same stages of life and career tend to seek the same resources and positions in organizations, leading to potential tension and destructive competitive behaviour (Choi, 2007). Companies consciously diversify the age structure of their workforce in order to maintain long-term continuity with a corresponding transfer of knowledge from the older to the younger generation of employees (Choi et al., 2017).

Diversity of workforce from the perspective of different educational qualifications can also improve the distribution of work by bringing heterogeneous skills and experiences to work teams. Companies require employees for a range of different functions with different levels of complexity and skill requirements (Nagel & Bhargava, 1994). In this respect, it is important to have employees with different skills and levels of education in order to avoid underutilizing high-skilled employees on routine tasks or assigning low-skilled team members with

complicated problems (Peri & Sparber, 2009). The relatively small impact of gender and education on status increases the potential performance gain from gender and education diversity. This is caused by distribution of work and specific tasks based on these criteria, which helps companies to solve even complex problems more creatively and to use internal resources more efficiently (Choi et al., 2017).

Considering this background, the main goal of this paper is to analyse the impact of team diversity on the team performance. A set of variables related to the team characteristics and team managers are used to evaluate their impact on the team performance as well. The presented study is performed on the sample of 948 work teams from a global multinational enterprise from all around the Globe.

2. Data and Methods

For the purpose of this research were used two main sources of data. First set of data was internal global employee headcount report of analysed MNE. Based on this dataset it was possible to identify following team diversity characteristics, whose impact on team performance was subsequently measured. *Gender Diversity* variable on a scale 0% to 100% measures percentage of female team members. *Gender of Team Manger* provides information if team manager is male or female. *Nationality Diversity* on a scale 0% to 100% measures different nationalities represented within the work team. Number of different mother languages of team members is represented by variable *First Language*. *Seniority Score* measures average work experience of team members. Score 1 within this variable is assigned to employees being on entry level position within the company with the lowest required qualification for the job. Score 10 is the highest possible career level team member can achieve as individual contributor within the company hierarchy (i.e., not being on manager position). *Working Area* is quantifying different job specialization areas of team members. *Team Size* quantifies number of team members, considering that for the purpose of this research were selected only work teams with at least 5 team members. *Team Structure Stability* variable measures how many years on average are employees part of their current work team. *Time in Management Level* quantifies how many years is current team manager on people managerial position in the company.

Second main source of data was internal sales performance report of analysed MNE. As performance indicator from this report was used achieved revenue on work team level during calendar year 2020. Based on the achieved revenue of work teams in particular country, the country performance ranking of work teams was constructed. The final performance ranking of all 948 sales work teams in scope was calculated as the average performance ranking of work teams from all 39 countries in scope.

Table 1: Variables explained

Variable	Measurement
Gender Diversity	1=0% (no female team members); 2=1%-20%; 3=21%-40%; 4=41%-60%; 5=61%-100%
Gender of Team Manger	1=female; 2=male
Nationality Diversity	1=0% (all team members have the same nationality); 2=1%-20%; 3=21%-40%; 4=41%-60%; 61%-100% (each team member has different nationality)
First Language	1=1 language; 2=2 languages; 3=3 languages; 4=4 and more languages
Seniority Score	1=up to 6 (incl.); 2=6 to 7 (incl.); 3=over 7
Working Area	1=1 working area; 2=2 working areas; 3=3 and more working areas
Team Size	1=5 to 7; 2=8 to 9; 3=10 to 11; 4=12 and more team members
Team Structure Stability	1=up to 2 years (incl.); 2=2 to 3 years (incl.); 3=3 to 4 years (incl.); 4=over 4 years
Time in Management Level	1=up to 2 years (incl.); 2=2 to 3 years (incl.); 3=3 to 4 years (incl.); 4=more than 4 years

Source: MNE` s documentation

Linear regression was used to verify the impact of selected variables on work team performance. The dependent variable was the performance of the team. The independent variables were the team gender diversity, the gender of the team manager, nationality diversity, first language, work experience, seniority score, team working area, team size, team structure stability and team manager` s time in management level.

3. Results and Discussion

Results show that not all the variables examined had a statistically significant effect on the performance of the work teams in the evaluated organization (Table 2). Gender of team manager, size of the team and the working area seem to be without a significant effect on the work team performance. On the other hand, team gender diversity, team nationality diversity, first language used in team, seniority score and team structure stability seem to improve the work team performance.

Table 2: Linear Regression Results

	Unstandardized Coefficients		St. Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	549.847	68.505		8.026	0.000
Gender Diversity	36.385	8.379	0.146	4.342	0.000***
Gender of Team Manager	-36.136	22.019	-0.053	-1.641	0.101
Nationality Diversity	44.837	15.888	0.193	2.822	0.005**
First Language	-75.539	20.707	-0.250	-3.648	0.000***
Seniority Score	-50.709	13.699	-0.127	-3.702	0.000***
Working Area	-8.972	14.059	-0.021	-0.638	0.524
Team Size	7.831	8.375	0.031	0.935	0.350

Team Structure Stability	27.279	10.241	0.096	2.664	0.008**
Time in Management Level	-14.252	10.333	-0.043	-1.379	0.168

Note $R^2=0.176$; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Source: authors' calculations

Our study confirmed the important role of gender and nationality diversity of the work teams when the work team performance's considered. Similar results were confirmed by several previous studies (Gomez & Bernet, 2019; Fine, Sojo, & Lawford-Smith, 2020).

The results are also in line with those of Bell, Brown, Colaneri, and Outland (2018) and Greer de Jong, Schouten, and Dannals (1999) who both in their studies also confirmed the team hierarchy and team structure stability contribute to its improved performance.

4. Conclusion

Based on the results we conclude the gender diversity of the work team indeed impacts its performance. With higher share of women in the work team structure the performance improved. However, further significant determinants of the work team performance were its structure stability and seniority score. Therefore, the results should be approached with due caution since there are several factors accounting for the improved work team performance and, in this context, the sole role of the gender diversity calls for further evaluation and more in-depth research. There are also other limitations to our research. Above all the work team performance was evaluated in one global enterprise and the results might be different in other type of firm.

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References

- [1] Ali, M., Kulik, C. T., & Metz, I. (2011). The gender diversity–performance relationship in services and manufacturing organizations. *The International Journal of Human Resource Management*, 22(07), 1464-1485. doi:10.1080/09585192.2011.561961
- [2] Amoroso, L. M., Loyd, D. L., & Hoobler, J. M. (2010). The diversity education dilemma: Exposing status hierarchies without reinforcing them. *Journal of Management Education*, 34(6), 795-822. doi:10.1177/1052562909348209
- [3] Bantel, K. A., & Jackson, S. E. (1989). Top management and innovations in banking: Does the composition of the top team make a difference?. *Strategic management journal*, 10(S1), 107-124.
- [4] Bell, S. T., Brown, S. G., Colaneri, A., & Outland, N. (2018). Team composition and the ABCs of teamwork. *American Psychologist*, 73(4), 349. doi:10.1037/amp0000305
- [5] Berger, J., Fisek, M. H., Norman, R. Z., & Zelditch Jr, M. (1977). Status characteristics and expectation states: A graph-theoretical formulation. *Status characteristics and social interaction: An expectations states approach*, 91-134.
- [6] Chatman, J. A., & O'Reilly, C. A. (2004). Asymmetric reactions to work group sex diversity among men and women. *Academy of management Journal*, 47(2), 193-208. doi:10.2307/20159572

- [7] Choi, J. N. (2007). Group composition and employee creative behaviour in a Korean electronics company: Distinct effects of relational demography and group diversity. *Journal of Occupational and Organizational Psychology*, 80(2), 213-234. doi:10.1348/096317906X110250
- [8] Choi, J. N., Sung, S. Y., & Zhang, Z. (2017). Workforce diversity in manufacturing companies and organizational performance: the role of status-relatedness and internal processes. *The International Journal of Human Resource Management*, 28(19), 2738-2761. doi:10.1080/09585192.2016.1138315
- [9] Fine, C., Sojo, V., & Lawford-Smith, H. (2020). Why Does Workplace Gender Diversity Matter? Justice, Organizational Benefits, and Policy. *Social Issues and Policy Review*, 14(1), 36-72. doi:10.1111/sipr.12064
- [10] Gomez, L. E., & Bernet, P. (2019). Diversity improves performance and outcomes. *Journal of the National Medical Association*, 111(4), 383-392. doi:10.1016/j.jnma.2019.01.006
- [11] Greer, L. L., de Jong, B. A., Schouten, M. E., & Dannals, J. E. (2018). Why and when hierarchy impacts team effectiveness: A meta-analytic integration. *Journal of Applied Psychology*, 103(6), 591. doi:10.1037/apl0000291
- [12] Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of management review*, 32(4), 1199-1228. doi:10.5465/amr.2007.26586096
- [13] Herring, C. (2009). Does diversity pay?: Race, gender, and the business case for diversity. *American sociological review*, 74(2), 208-224. doi:10.1177/000312240907400203
- [14] Kossek, E. E., Markel, K. S., & McHugh, P. P. (2003). Increasing diversity as an HRM change strategy. *Journal of Organizational Change Management*. doi:10.1108/09534810310475550
- [15] Mitchell, R., Nicholas, S., & Boyle, B. (2009). The role of openness to cognitive diversity and group processes in knowledge creation. *Small Group Research*, 40(5), 535-554. doi:10.1177/1046496409338302
- [16] Nagel, R. N., & Bhargava, P. (1994). Agility: the ultimate requirement for world-class manufacturing performance. *National Productivity Review*, 13(3), 331-340. doi:10.1002/npr.4040130304
- [17] Peri, G., & Sparber, C. (2009). Task specialization, immigration, and wages. *American Economic Journal: Applied Economics*, 1(3), 135-69. doi:10.1257/app.1.3.135
- [18] Van der Vegt, G. S. (2002). Effects of attitude dissimilarity and time on social integration: A longitudinal panel study. *Journal of Occupational and Organizational Psychology*, 75(4), 439-452. doi:10.1348/096317902321119592
- [19] Van Der Vegt, G. S., Van De Vliert, E., & Oosterhof, A. (2003). Informational dissimilarity and organizational citizenship behavior: The role of intrateam interdependence and team identification. *Academy of Management Journal*, 46(6), 715-727. doi:10.2307/30040663
- [20] Van Knippenberg, D., De Dreu, C. K., & Homan, A. C. (2004). Work group diversity and group performance: an integrative model and research agenda. *Journal of applied psychology*, 89(6), 1008. doi:10.1037/0021-9010.89.6.1008
- [21] Webber, S. S., & Donahue, L. M. (2001). Impact of highly and less job-related diversity on work group cohesion and performance: A meta-analysis. *Journal of management*, 27(2), 141-162. doi:10.1177/014920630102700202
- [22] Williams, K. Y., & O'Reilly, C. A. (1998). Demography and diversity in organizations: A review of 40 years of research. *Research in organizational behavior*, 20(20), 77-140.

Comparison of Public Expenditure for Agriculture in Selected EU Countries

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Abstract

A specific part of each country's economy is the public sector, through which public services are provided. The structure of government expenditures in individual countries is different and the method of allocating funds to individual areas is also different, which is conditioned by a number of factors. The aim of the paper is to compare public expenditure related to agriculture in selected EU countries. The surveyed government expenditures are broken down according to the international functional classification COFOG. To compare the development of expenditures, whether total or individual components, the basic characteristics of time series are used. Based on the above analyses, we can state that the percentage of Total general government expenditure (COFOG) on gross domestic product in Slovakia (18.33%) has long been below the EU-27 average (19.10%). Similarly, the ratio expenditure of group 04.2 Agriculture, forestry, fishing and hunting (COFOG) in 04 Economic affairs in Slovakia 5.24% had a lower level than average ratio countries EU-27 (5.95%).

Keywords: agriculture, public expenditures, COFOG, time series

JEL Classification: E01, H50, Q10

1. Introduction

According to Sivák (2007), public expenditures are a macroeconomic category that also affects other macroeconomic indicators. The existence of public expenditure is related to the nature and functioning of the public sector and its relationship to the private and non-profit sectors. Hamerníková, Maaytová et al. (2007) define public expenditures as the flow of funds that are allocated within the public budget system for the implementation of the state's fiscal functions on the principle of irreversibility and non-equivalence. There is no uniform definition of public expenditure, as the definitions used are often based on the current need, or the analytical view of the individual dealing with the issue. Paulík et al. (2012) stated in their publications the reasons for the growth of public expenditures, further emphasizing that governments' approaches to the extent of public expenditures are influenced by the ruling political establishment. Socially oriented governments allocate a large part of financial resources to areas that provide social security for the population, while conservative governments, in turn, reduce public spending and emphasize greater individual responsibility of each individual. Papcunová et al. (2021) adds that the expenditures which the municipalities incur to ensure, in particular, the delegated competences exceed the incomes which the municipalities receive from the State in the form of subsidies. Municipalities finance this difference from their own resources, from current expenditures in their budgets. Potrafke (2006) examined how political factors affect the allocation of public expenditure, specifically in OECD countries in the period 1990-2004. The results show that left-wing governments set different priorities for public spending than right-wing governments. Left-wing governments spend more on environmental

protection, recreation, culture and religion, and education. Vavrek et al. (2020), however adds that although policy cycles affect public expenditures at the state level, the increase in local government expenditures is not always linked to the policy cycle. In his publication, Freysson (2011) analyzed the main trends in public government expenditure, especially in terms of function (purpose), i.e. the socio-economic goal of the relevant government expenditure. The author analyzed expenditures in the period 2005-2010 in the 27 EU member states. The results show that in 2010, after the financial crisis, public spending in the EU fell only slightly in absolute terms. A record increase in expenditure was recorded between 2007 and 2009. Government expenditure gradually declined in 2003-2007, followed by an increase in 2008, and increased even more sharply in 2009. The trend is also similar in the euro area countries. Bielik et al. (2014) identify the relationship between government expenditures development on one side, and agrarian sector performance (the value of production) in selected member states on the other. The conducted analysis provides a basic overview of the development of government expenditures value development on one side and agricultural sector and its performance on the other, in the period 2001 – 2011. The aim is to identify the level of dependency and sensitivity existing between public expenditures and the development of the agricultural sector structure and performance (gross agricultural production value). Szarowska (2013) analyzed public expenditure based on COFOG in 15 member countries in the period 1995-2010. On average, total public expenditures were 48% of GDP during the period under review. Two thirds of this expenditures were spent on social security, health and general public services. A proportion of the expenditures also covered education and the economy. The remaining expenditure related to defense, public order and security, environmental protection, housing and culture and represented on average only 12.5% of total expenditures. Based on the results of the study, Lupu et al. (2018) show that expenditures on education and health care have a positive impact on the economy, while expenditures on defense, economic affairs, general public services, and social welfare have a negative impact. Leitner and Stehrer (2016) focused their analysis on the development of the public sector in the EU Member States in the period 1995-2013. They examined the development of social public spending, which the European Commission identified as important for social cohesion and growth in the EU in the Europe 2020 program. These are public spending on health, education and social security. They found that in terms of COFOG distribution, there are large differences in the public expenditures levels between countries. Alataş and Sarı (2021) empirically investigated convergence in per capita public expenditures and its sub-categories classified according to the classification of the functions of government (COFOG) across 81 provinces of Turkey for the period between 2004 and 2018.

2. Data and Methods

The data analyzed in this paper are obtained from publicly available Eurostat databases. The comparability of data for individual countries is ensured, as their content is clearly defined in the ESA 2010 system of national accounts. The functional breakdown is done according to the United Nations Classification of the Functions of Government (COFOG) (SO of SR, 2016). Developed by the OECD classifies government expenditure data from the System of National Accounts by the purpose for which the funds are used. (OECD, 2021) The subject of analyzes was the examined share of total public expenditure in GDP as a basic indicator both in individual countries and in the EU-27. Subsequently, the analysis of the share of expenditures defined in COFOG in division 04 Economic affairs in Total government expenditures was the subject of analyzes. Lastly, the development of the share of the expenditure group was examined group 04.2 Agriculture, forestry, fishing and hunting in division 04 Economic

affairs. The values of individual indicators in the time horizon of 2011-2020 were obtained from the mentioned sources. Data on the share of government expenditure in GDP in the observed time in individual European countries and also in total for the 27 countries of the European Union (EU 27) were used as the basic data for the analysis. Standard descriptive characteristics of the time evolution analysis were used to assess the development of the values of the monitored indicators. (Pacáková, 2009) The analyzes were carried out on the basis of the calculation of year-on-year changes in the values of individual indicators individually in all European countries and together for the EU-27 countries. The article describes in more detail and subsequently they are also the subject of a graphical representation of the development trends for the group of EU-27 countries, Slovakia and for comparison countries reaching the minimum (maximum) resp. with high volatility of the values of the surveyed indicators.

3. Results and Discussion

The share of Total government expenditure in GDP, as one of the basic macroeconomic indicators, generally had a growing trend in 2011-2020, increasing by 0.39% year on year in the EU-27 country. In most countries, this share had an oscillating trend at the EU-27 average (19.10%) (Figure 1) over the period under review, with the exception of Ireland, which, in addition to being the country with the lowest share of government spending on GDP, so for the entire period under review, their average year-on-year decline of up to 5.18% was found. The average year-on-year decrease in the values of the surveyed indicator was found in both the original and the new member states. Countries with a year-on-year decline in the share included Denmark and Cyprus (-0.8%), respectively. The Netherlands and Slovenia (-0.3%). On the other hand, the highest average year-on-year increase in the share of government expenditure in GDP was recorded in the new EU member states Romania (2.9%) and Slovakia (1.9%).

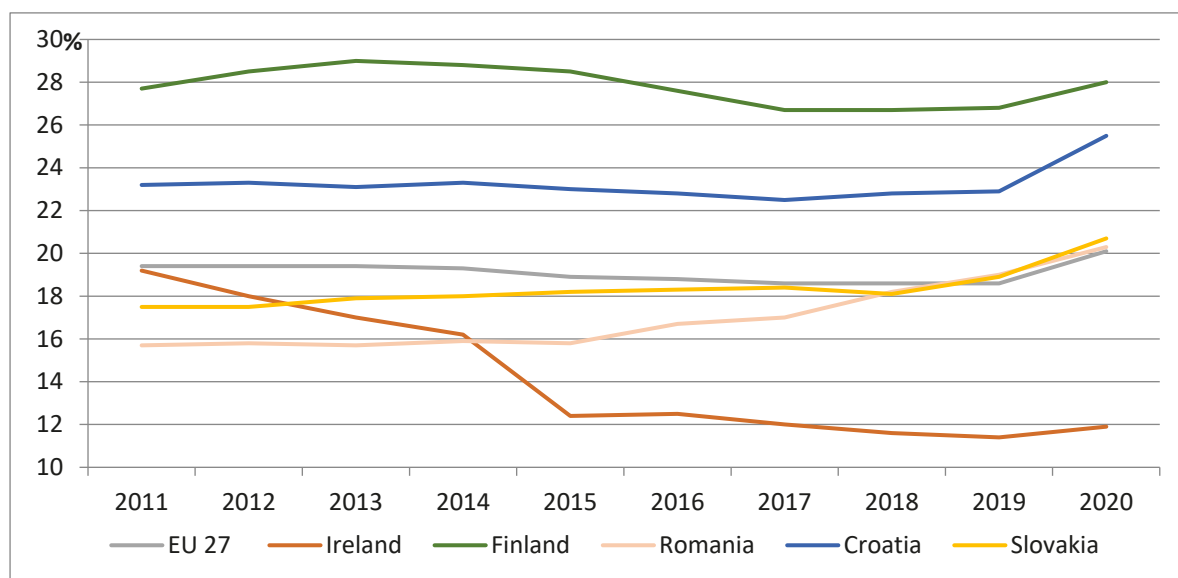


Figure 1: Development of the share of Total government expenditure (COFOG) in GDP in selected EU countries

Zdroj: Eurostat; autor

In accordance with the international classification COFOG, government expenditures are further divided into 10 divisions and subsequently into 69 groups. The subject of further

research is the share of expenditures included in division 04 of the Economic affairs in total public expenditures in EU countries. Figure 2 shows the average value of this share in the observed period for the mentioned countries. The average share of Economic affairs expenditures in total government expenditures was 9.63% for the EU-27, with eight of the thirteen newly admitted countries reaching the highest values within the countries under comparison the very development of this indicator for the EU-27 countries as a whole is presented in Figure 3 in comparison with Croatia as the economy with the highest value, which ranges from 13.85% (2017) to 20.71% (2020) in the observed period, and Denmark as the country with the lowest long-term share of Economic affairs in total government expenditure, which ranges from 6.04% (2011) by 9.53% (2020). The graph also shows the development of the indicator in the conditions of Slovakia, which fluctuates in values between 11.05% (2013) and 17.00% (2015). (Figure 3)

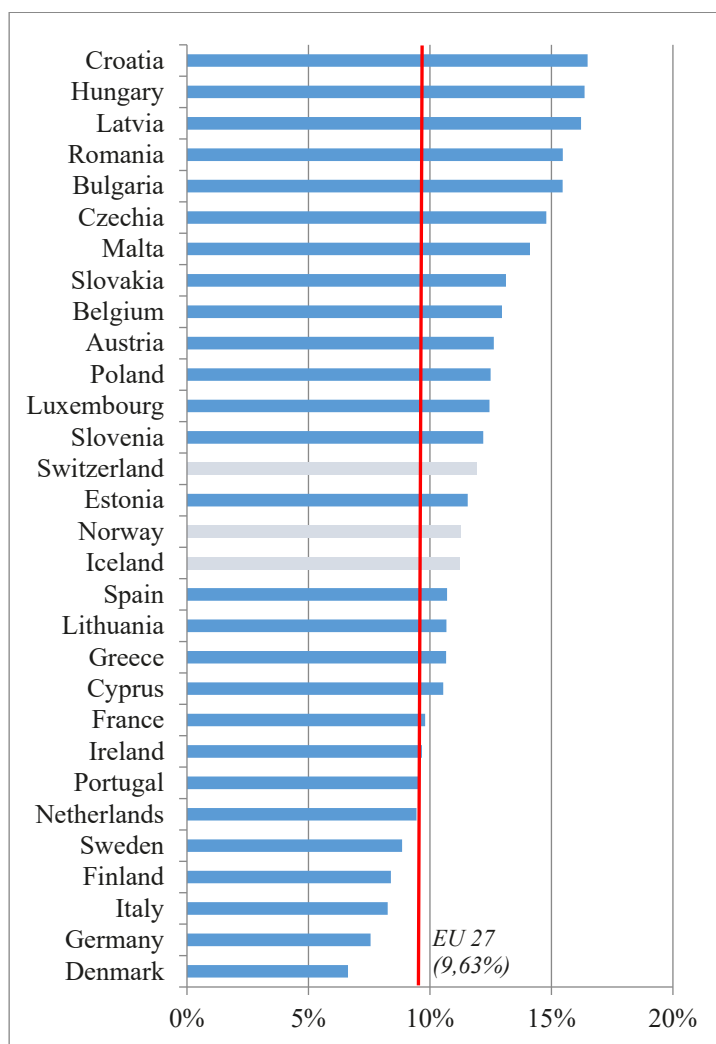


Figure 2: Development of the share of division 04 Economic affairs in Total government expenditure (COFOG) in Europe countries

Zdroj: Eurostat; autor

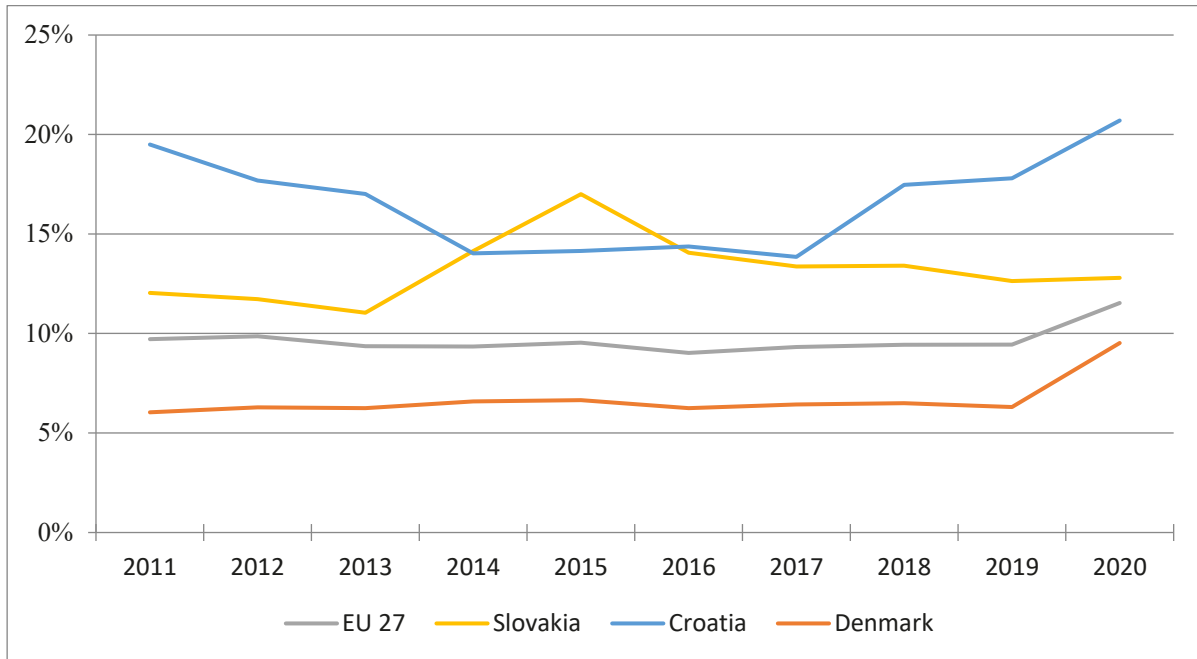


Figure 3: Development of the share of 04 Economic affairs in Total government expenditure (COFOG) in selected Europe countries

Zdroj: Eurostat; autor

Within economic affairs, expenditures in the field of agriculture form a separate group 04.2 Agriculture, forestry, fishing and hunting. In the period under review, the share of agricultural expenditure in economic expenditure ranges from 0.89% (Belgium, 2013) to 28.74% (Cyprus, 2016) (Figure 4). The long-term average share in EU countries is 5.95%. The lowest share of expenditure in the field of agriculture in the whole examined period is characteristic for Belgium with an average share (1.17%) and Sweden, the Netherlands with a share of 3.27% resp. 3.5%. The highest share in the whole observed period was recorded in Lithuania (19.23%). The stated share of expenditures in Slovakia ranged from 4.02% (2018) to 7.66% (2013), on average this share reached 5.24%. Figure 4 shows the development of the share of expenditure in group 04.2 agriculture in the expenditure included in division 04 Economic affairs for Cyprus, which is characterized by the highest variability (398.76%), Lithuania (152.58%) with the sharpest decline and Belgium, which has the lowest and most stable share of this expenditure (average 1.17%; volatility 1.02%).

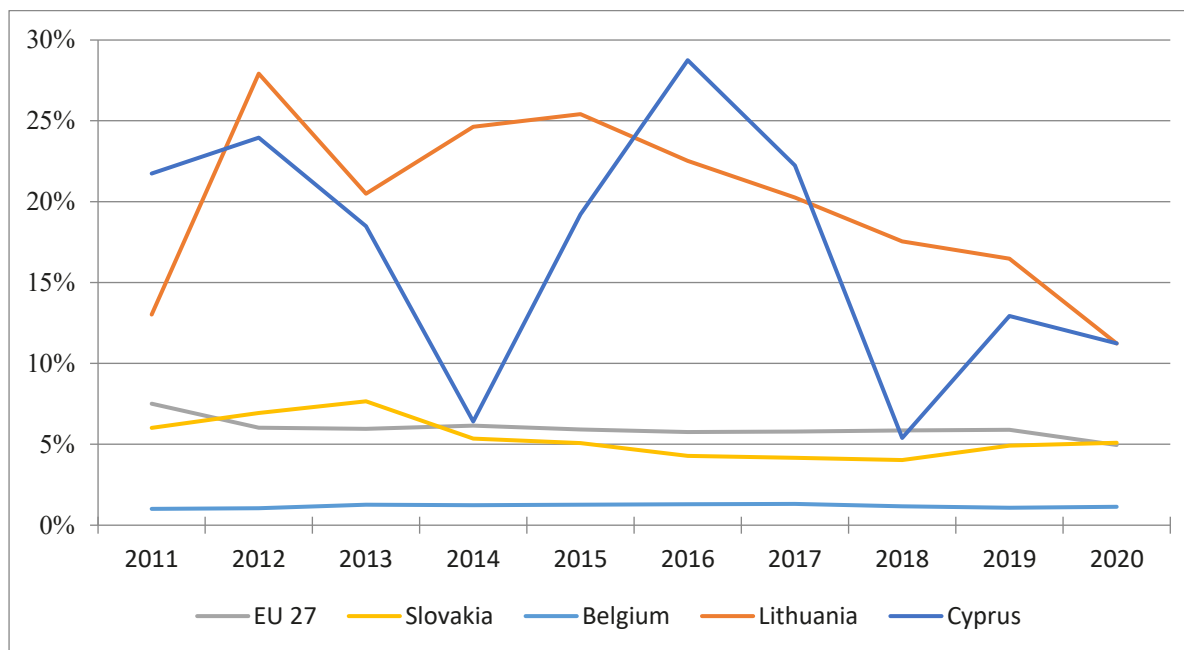


Figure 4: Development of the share of 04.2 Agriculture, forestry, fishing and hunting in 04 Economic affairs in selected Europe countries

Zdroj: Eurostat; autor

As already mentioned, the average share of expenditures in group 04.2 Agriculture, forestry, fishing and hunting in 04 Economic affairs in the conditions of Slovakia was monitored at the level of 5.23%, which is less than the EU average (5.95%). This share is even the 7th lowest share within the EU countries and lower than the newly admitted countries. A lower share, which is a long-term trend, was found in Belgium (1.17%), Sweden (3.27%), the Netherlands (3.5%), France (4.2%) and Denmark (4.99%). with the exception of Greece (3.6%), where it has a growing trend. The share of researched expenditures increased from 2.36% (2011) to more than double 4.83% (2020). In addition to the average value of this share, its volatility is also important. For Slovakia, the variability of this indicator, measured by the ratio of the standard deviation and the average, reaches the level of 22.90%, which is the tenth highest value within all countries of the European Union. This level of variability is twice as high as the variability in other V-4 countries, reaching 11.13% in the Czech Republic, 11.47% in Hungary and 14.20% in Poland.

3. Conclusion

Based on the above analyzes, we can state that the percentage of Total general government expenditure (COFOG) on gross domestic product in Slovakia (18.33%) has been long time below the EU-27 average (19.10%) and similarly the percentage expansions of group 04.2 Agriculture, forestry, fishing and hunting in expansions division 04 Economic affairs (COFOG). In addition to the above, we also consider the finding that the variability of this indicator is the highest in Slovakia within the V4 countries and is the tenth highest in the EU-27 countries. The main conclusion of this survey is that the percentage of expansions of the group 04.2 Agriculture, forestry, fishing and hunting in the expansions division 04 Economic affairs in Slovakia is the lowest within the V-4 countries and at the same time the variability of the values of this indicator is the highest in the V-4 countries.

Acknowledgements

This article presents an introduction to the issues that are addressed in more detail in the project *Analysis of the Development of Public Expenditure in the European Regions* (GA FEM).

References

- [1] Alataş, S., & Sarı, E. (2021). An Empirical Investigation on Regional Disparities in Public Expenditures: Province Level Evidence from Turkey. *Soc Indic Res* 158, 217-240. <https://doi.org/10.1007/s11205-021-02691-x>
- [2] Bielik, P., Smutka, L., Horská, E., & Selby, R. (2014). Agricultural development and government expenditures in the new EU countries. *APSTRACT*. 10, 1 (2014), p. 21-35. DOI: 10.19041/Apstract/2014/1/3.
- [3] EUROSTAT. Database. (2022). *General government expenditure by function (COFOG)*. Retrieved February, 28, 2022, from https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_exp&lang=en
- [4] Freysson, L. (2011). General government expenditure trends 2005-2010: EU countries compared. *Statistics in focus* 42/2011. Retrieved February, 20, 2022, from <https://ec.europa.eu/eurostat/documents/3433488/5579372/KS-SF-11-042-EN.PDF>.
- [5] Hamerníková, B., Maaytová, A. et al. (2007). *Public finances*. Praha: ASPI.
- [6] Leitner, S., & Stehrer, R. (2016). Development of Public Spending Structures in the EU Member States: Social Investment and its Impact on Social Outcomes (online), *Wiiw Working Paper No. 128*. Retrieved February, 20, 2022, from <https://wiiw.ac.at/development-of-public-spending-structures-in-the-eu-member-states-social-investment-and-its-impact-on-social-outcomes-dlp-3970.pdf>
- [7] Lupu, D., Petrisor, M., Bercu, B.A., & Tofan, M. (2018) The Impact of Public Expenditures on Economic Growth: A Case Study of Central and Eastern European Countries. *Emerging Markets Finance and Trade*, 54:3. p. 552-570, DOI: 10.1080/1540496X.2017.1419127
- [8] OECD. (2021). *Classification of the Functions of Government (COFOG)*. Retrieved February, 20, 2022, from https://www.oecd-ilibrary.org/governance/government-at-a-glance-2021_95603f6f-en
- [9] Pacáková, V., et al. (2009). *Štatistické metódy pre ekonómov*. Bratislava : Iura Edition.
- [10] Papcunová, V., Vavrek, R. & Dvořák, M. (2021). Role of Public Entities in Suitable Provision of Public Services: Case Study from Slovakia. *Administrative Science* 11(4), p. 1-18.
- [11] Paulík, D. et al. (2012). *Basics of finance and currency*. Trenčín: Institute of Applied Management.
- [12] Potrafke, N. (2006). Political Effects on the Allocation of Public Expenditure: Empirical Evidence from OECD Countries. *Discussion Papers of DIW Berlin 653*, DIW Berlin, German Institute for Economic Research. Retrieved February, 20, 2022, from <https://ideas.repec.org/p/diw/diwwpp/dp653.html>.
- [13] Sivák, R. et al. (2007). *Public finances*. Bratislava: Iura Edition.
- [14] Szarowská, I. (2013). Trends of COFOG Government Expenditure in the EU15. In Proceedings of the 10th International Scientific Conference: Economic Policy in the European Union Member Countries: *Selected Papers*. Karvina: Silesian University, p. 280-290.
- [15] Statistical office of the Slovak Republic. (2016). *COFOG = Classification of Functions of Government*. Retrieved February, 20, 2022, from <https://slovak.statistics.sk/wps/portal/ext/metadata/cofog/>
- [16] Vavrek, R., Papcunová, V. & Tej, J. (2020). Evaluation of Financial Management of Towns in relation to Political Cycles using CV-TOPSIS. *Lex Localis - Journal of Local Self-government*. 18 (2). p. 231-252, DOI <https://doi.org/10.4335/18.2.231-252>.

The Impact of Emotional Intelligence of Managers on State Regulation, Functioning, and Development of State Investment Strategy in Agriculture under Covid-19

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Abstract

The concept of emotional intelligence and its importance for management staff is considered in this paper. The necessity of state regulation and development of investment activity in agriculture is substantiated. A comparative analysis of state regulation and development of investment activity in the world's leading countries is carried out. The institutional and organizational model of state regulation of investment activity and parameters of investment strategy in agriculture for the developing country is developed. The influence of managers' emotional intelligence on state regulation, functioning, and development of investment activity in the difficult conditions of the Covid-19 pandemic has been studied.

Keywords: Covid-19, investment activity, emotional intelligence, investment strategy, model of state regulation

JEL Classification: M12, M19, P24, P32

1. Introduction

In the XXI century, emotional intelligence has become one of the 10 essential skills for the successful work of staff, especially for managers of public administration. The other nine are the ability to solve a problem comprehensively; critical thinking; creativity; high level of management skills; effective interaction with people; quick analysis and making the right decision; customer orientation; flexible thinking; skills of effective negotiations. As IQ increases, the chances of a good job with a decent salary increase. High EI level facilitate career advancement and work efficiency increasing significantly. After all, the managerial activity is inextricably linked with interaction in a group that includes people with different personalities and worldviews. According to researchers, a high level of EI is up to 85% of the required skills of a successful manager in the business. Because in this case, he is much faster to make the right decisions, especially in critical situations. Also, the manager can accurately analyze and predict the behaviour of individuals and groups of staff in general (“Top 10 skills that will be valued by employers in 2020”, 2019; Antoniuk, Piekut & Perkhach, 2021).

The functioning of the state is inextricably linked with the activities of managers from the lowest to the highest levels of government. One of the important areas of their activity is the agro-industrial sector. In 2021, it was 0.7% of GDP in the world's leading and developing

countries. For example, in Germany it was 2%, in France – 2.4 %, in the UK – 0.7%, in the US – 1%, in Poland – 2.7%, in Ukraine – 10.8%. At the same time, the percentage contribution to the world GDP of these countries in 2021 was: in Germany – 4.2%, in France – 2.9%, in the UK – 3.1%, in the USA – 22.9 %, in Poland – 0.69%, in Ukraine – 0.14 % («Projected GDP Ranking», 2021; «Ukraine GDP», 2022). As the pandemic continues to deal devastating blows to the state's economy, mental health, and staff efficiency, it has become extremely important to study the impact of managers' emotional intelligence on the functioning of the state's investment strategy in agriculture in the conditions of Covid-19. The high level of emotional intelligence of managers helps to withstand the negative manifestations and consequences of stress in staff and improve their efficiency.

1.1 Literary review

The topic of this paper is related to the emotional intelligence and investment strategy of the state in agriculture, which is why it is important to inquire into these questions in studies.

The authors of the research (Shpak et al., 2021) pointed out that agriculture is the basis for economic growth in many countries and conducted research based on clustering and parent analysis. Based on this, strategies for the development of the country's regional agricultural sector were formulated and a 3D matrix was built to select an investment strategy. However, the study did not highlight the impact of human resources on the efficiency of the agricultural sector.

The authors of the research (Trofimov et al., 2019) proved that whether the leader is focused only on achieving goals without taking into account the emotional needs of subordinates, then the level of organizational loyalty of subordinates will decrease. If emotional needs are taken into account, then the level of loyalty and satisfaction of employees would be higher. However, the research did not take into account the impact of certain components of the emotional intelligence of the head on the effectiveness of staff. The authors explored this issue (Mohamad, & Jais, 2016). They showed the relationship between the components of emotional intelligence of teachers, the effectiveness of their work, and the overall level of satisfaction with the achieved results. In particular, components such as self-regulation, self-motivation, self-awareness, and social skills were studied and their correlation with work efficiency and satisfaction level was shown. The authors (Mayer et al., 2018) proved the dependence of staff efficiency on perceptions and behavior in the workplace. Top staff showed higher results of emotional intelligence passing the test. However, emotional intelligence on staff efficiency and resilience to stress has not been studied.

Well-known authors of the MSCEIT-v.2.0 test (Mayer, Caruso, & Panter, 2019), which is the most widely used in the world to determine the level of emotional intelligence, examined the relationship between emotional, personal, and social intelligence, which also affect personal performance. In addition, they stressed the necessity for an in-depth study of emotional intelligence as a mental ability.

In the field of agriculture, the authors (Huang et al., 2021) developed a psychological model involving emotional intelligence components to describe the possibilities of leadership to combat psychological burnout in the agricultural sector. However, the impact of emotional intelligence on overall performance was not considered. The influence of the emotional intelligence of staff on the state investment strategy in agriculture was not explored.

The authors (Kravchenko, Bukhvostov, Minakova, & Bukreeva, 2021) concluded that investments in agriculture are characterized by a long payback period, and therefore require

competent management to control the resources involved in the small agribusiness sector. They developed a phased investment management mechanism taking into account the factor characteristics of agricultural production. The strategy of selecting farms for state support based on the cluster analysis method, regional strategic interests, and competitiveness assessment of small agribusiness in the agricultural market, is proposed. However, the emotional intelligence of managers was not taken into account.

Investments are one of the ways to increase the efficiency of agricultural enterprises (Zakharin et al., 2021). Rapid adaptation of the enterprise to changes in the external environment determines its success. This is possible under the condition of the most optimal use of the resource potential of the enterprise. The impact of emotional intelligence on the effectiveness of investment activities of staff also was not considered. The authors (Onegina, & Vitkovskiy, 2020) indicate the main factors that affect the investment process: rising prices for agricultural products, the low disparity in prices for agricultural products and material and technical resources, the export orientation of production, and favorable for exporters dynamics of the national currency, agricultural innovation, profitability of agricultural production. The influence of the human factor is not considered. This is done by the authors (Wołowiec, Szybowski & Bogacki, 2019), who consider the advantages and disadvantages of the impact of the personal characteristics on the effectiveness but do not emphasize the emotional intelligence of the staff.

Therefore, the literature review showed the lack of information on the impact of emotional intelligence on government regulation, functioning, and development of state investment strategy in agriculture. At the same time, the global pandemic Covid-19 affects activities in all areas. In this case, the research of emotional intelligence on the overall efficiency of task performance becomes important. So, this study is acute, relevant, and unquestionable.

2. Data and Methods

To study the impact of emotional intelligence of managers on the functioning of the state investment strategy in agriculture under the conditions of Covid-19 were used:

- general theoretical research methods (analysis, synthesis, concretization, generalization, analogy) to conduct a scientific comparison of data (literature resources and statistics);
- the test of emotional intelligence (the technique of Nicholas Hall) for a sample of 100 managers who are directly involved in the development and operation of the state investment strategy in agriculture;
- GAD-7 test with a sensitivity of 89% for early assessment of generalized anxiety in a pandemic for a sample of 100 managers who are directly involved in the development and operation of the state investment strategy in agriculture;
- factor analysis to identify the main components by the method of chain substitutions for the development of the institutional and organizational model of state regulation of investment activities and parameters of investment strategy in agriculture for the developing country.

Statistical services data and literature review from the last three years were used in this study («Projected GDP Ranking», 2021).

3. Results and Discussion

The analysis of Hall's test and GAD-7 test were conducted on management staff, which is directly involved in the development and operation of the state investment strategy in agriculture. The high level of emotional intelligence of managers directly proportionally affects their performance and reduces anxiety during world pandemic Covid -19 (Fig. 1).

In the management staff with the degree of task performance from 90 to 100% the integrative level of emotional intelligence ranges from 70 to 88 units (maximum EI scale is 90) with an anxiety level of 0-0.1 units (maximum alarm scale is 1). Such influence of emotional intelligence on work efficiency is quite logical because as a consequence of this managers can:

1. Determine in what ways it is expedient to present information to subordinates so they apprehend it as effectively as possible;
2. Understand how the provided information is conceived by the staff;
3. Facilitate the regulation of work in the process of its implementation.

Managers' work concerning the functioning of the state investment strategy in agriculture becomes extremely difficult without these skills. Because it involves the constant implementation of five managerial functions in continual interaction with staff: planning; organization; motivation; regulation and coordination; control.

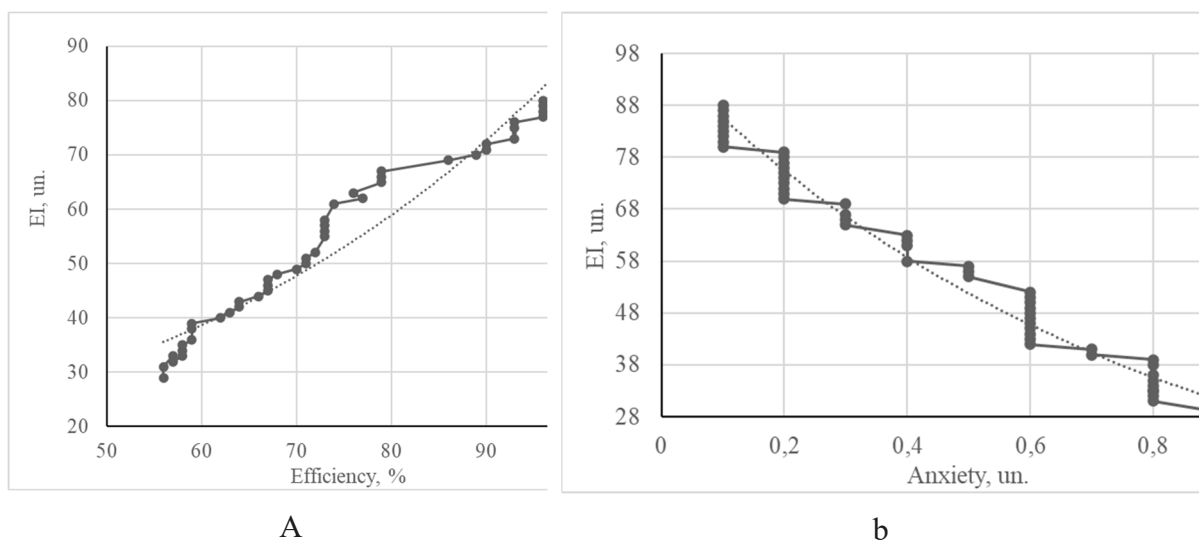


Figure 1: The influence of the level of emotional intelligence on: the effectiveness of management staff (a); anxiety level (b)

Source: developed by the authors

The world policy of state regulation of agricultural investment development is multi-format. First of all, it takes into account the possibility of using various means of financial and non-financial incentives for agricultural producers. The main trends in the development and implementation of investment assistance programs largely depend on the trends of food and agricultural raw materials in the world, as well as the international market of capital, labor, energy, and technology. The results of the literature sources analysis (Djokoto et al., 2022) on the priority of measures of state regulation of investment activities in agriculture around the world are given in table 1.

Table 1: Priority measures of state regulation of investment activity in agriculture of the world

Category of countries of the world	Priority measures of state regulation of investment activity
Developed countries (Germany, France, USA, UK, Poland)	<ul style="list-style-type: none"> - formation of institutions that provide advisory support to investors; - establishment of tax benefits; -state programs of financial support for farming; - development of public-private partnership in the investment sphere
Developing countries Ukraine	<ul style="list-style-type: none"> -reduced taxation for farms; - lending to small businesses in the agricultural sector; -customs benefits for the export of agricultural raw materials; -implementation of state programs for integrated development of agricultural areas; -government procurement.

Source: developed by the authors according to the data (World Investment Report / UNCTAD, 2021; Investment activity in Ukraine / Ministry of Economy of Ukraine official website, 2022)

It should be noted that the measures listed in the table most fully reflect the specifics of state regulation of investment policy in developed and developing countries, but they are broader for each country. At the same time, in developed countries, more liberal measures of state regulation are mostly used, thus increasing the importance of private capital.

Developing countries need to choose the right direction for the development of the agricultural economy to avoid a financial and economic crisis in the future. Therefore, an institutional and organizational model of state regulation of investment activities in agriculture was developed, in which the negative impact of factors (in this case – Covid-19) is offset by a high level of emotional intelligence of managers (Fig. 2).

The experience of state regulation of investment activity in agriculture of developed countries (Germany, Great Britain, France, and Poland) was chosen as a basis. In addition, the prospects for the development of investment activity in the developing country soon and factor analysis by the method of chain substitutions were taken into account to identify the main components. In the developed model, the subjects and objects of activation of investment activity are elements of the first order and determine its functional content. Dotted lines indicate the coordination of actions between single blocks. The solid line indicates the cause-and-effect relationships by the type "control element-dependent element". The subject of investment activity is the bodies of state regulation of investment processes, which are represented by managers. Therefore, one of their most important skills should be a high level of emotional intelligence at this stage. The success of the further functionality of the whole model will depend on this. And so, when selecting managers who will coordinate activities in this area, special attention should be paid to determining the level of their emotional intelligence (it is recommended to use the generally accepted Mayer-Salovey-Caruso Emotional Intelligence Test MSCEIT and Hall Test). The objects of the model are the processes of state influence by public authorities on investment activity and the development of entrepreneurial initiatives in agriculture.

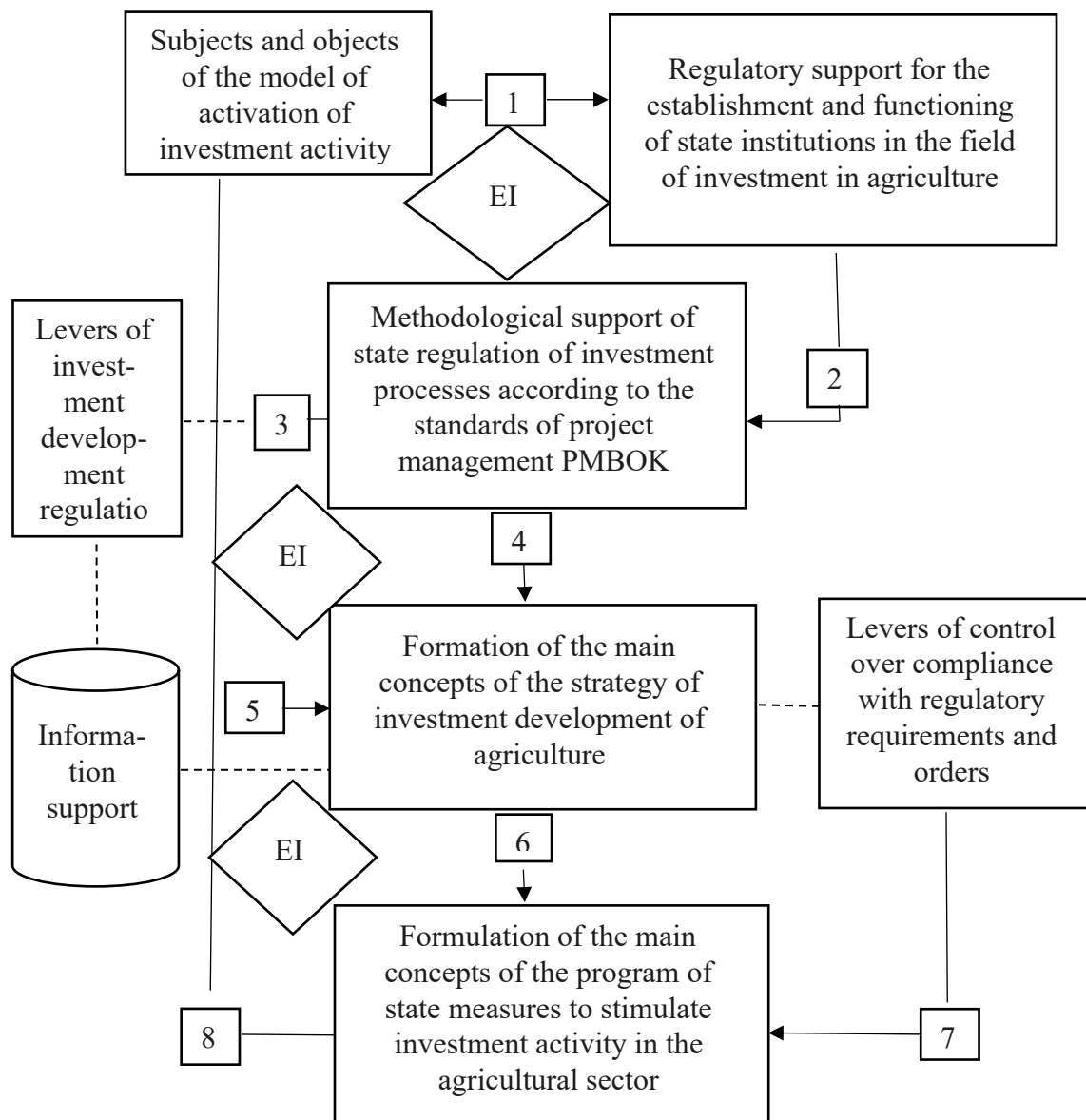


Figure 2: Institutional and organizational model of state regulation of investment activities in agriculture

Source: developed by the authors

It should be noted that the subjects in this model operate based on appropriate regulatory and methodological support. This is what makes it different from the classical approaches to the formation of the mechanism of state investment regulation. Methodological support of state regulation of investment processes in the model is proposed to be implemented according to the standards of project management PMBOK, developed and constantly improved by the international organization Project Management Institute.

To achieve maximum efficiency in the application of the model, special attention should be paid to the need for a high level of emotional intelligence of managers who are engaged in:

- development of normative support for the establishment and functioning of state institutions in the field of investment in agriculture;

- methodological support of state regulation of investment processes according to the standards of project management PMBOK;
- formation of the main concepts of the strategy of investment development of agriculture;
- formulation of the main provisions of the program of state measures to stimulate investment activity in the agricultural sector.

4. Conclusion

The influence of emotional intelligence of managers on state regulation, functioning, and development of the state investment strategy in agriculture in the difficult conditions of the Covid-19 pandemic has been established. In particular, it has been shown that emotional intelligence is extremely important for management staff. After all, it directly affects the effectiveness of the tasks in complicated Covid -19 working conditions, when the level of staff stress is higher than the established average. According to the results of the assessment of emotional intelligence by the Hall scale in the management staff with the degree of performance of tasks from 90 to 100% the integrative level of emotional intelligence varies from 70 to 88 units (maximum EI scale is 90 un.). The level of anxiety is 0-0.1 units (maximum alarm on a scale is 1). Staff with a high level of performance of tasks has a high level of emotional awareness, managing of their emotions, empathy, and the ability to recognize the emotions of different people. In addition, it has a high threshold of anxiety, it is more resistant to stress.

Investment activity in agriculture must be regulated at the state level. It is established that in the developing countries the priority measures of state regulation of investment activity in agriculture are: preferential taxation for farms; small business lending in the agricultural sector; customs benefits for the export of agricultural raw materials; implementation of state programs of integrated development of agricultural areas; government procurement. The institutional and organizational model considering the impact of emotional intelligence of management staff on its functioning is developed for state regulation of investment activity in agriculture of the developing country. Factor analysis to identify the main components by the method of chain substitutions was used for this model.

The impact of staff losses during the Covid-19 pandemic will be explored in further study. For this purpose, a method of artificial neural networks (Podolchak et al., 2021) will be used.

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References

- [1] Antoniuk, N., Piekut, M., Perkhach, O. (2021). Anti-Crisis Management of Rural Areas Under Conditions of Decentralization (By the Example of Ukraine). *Problemy Zarzadzania*, 4(90). 178–191.
- [2] Bilyk, O., Karkovska, V., Khim, M. (2021). Gender budgeting: a vital element for ensuring sustainable development. *Sustentabilidade em Debate*, 12(3), 305–323.
- [3] Djokoto, J. G., Gidiglo, F. K., Srofenyoh, F. Y., Agyei-Henaku, K. A. A. , Badu Prah, C., & Afrane Arthur, A. A. (2022). Agricultural development in the presence of foreign divestment: Policy options. *Journal of Agriculture and Food Research*, 7 doi:10.1016/j.jafr.2021.100250

- [4] Huang, S. Y. B., Li, M. W., & Lee, Y. S. (2021). Transforming the Emotional Intelligence of the Feeders in Agribusinesses into the Development of Task Performance and Counterproductive Work Behaviors during the COVID-19 Pandemic. *Animals*, 11(11), 3124. <https://doi.org/10.3390/ani11113124>
- [5] Isaeva, O., & Savinova, S. (2021). Development of Emotional Intelligence: Review of Studies. *Sovremennaiia Zarubezhnaia Psikhologiya*, 10(2), 105–116. <https://doi.org/10.17759/jmfp.2021100211>
- [6] Kravchenko, T. S., Bukhvostov, Y. V., Minakova, I. V., & Bukreeva, T. N. (2021). Investment management of a small business in the agro-industrial complex. *IOP Conference Series: Earth and Environmental Science*, 839(2), 022066. <https://doi.org/10.1088/1755-1315/839/2/022066>
- [7] Mayer, J., Caruso, D., & Panter, A. (2019). Advancing the Measurement of Personal Intelligence with the Test of Personal Intelligence, Version 5 (TOPI 5). *Journal of Intelligence*, 7(1), 4. <https://doi.org/10.3390/jintelligence7010004>
- [8] Mohamad, M., & Jais, J. (2016). Emotional Intelligence and Job Performance: A Study among Malaysian Teachers. *Procedia Economics and Finance*, 35, 674–682. [https://doi.org/10.1016/s2212-5671\(16\)00083-6](https://doi.org/10.1016/s2212-5671(16)00083-6)
- [9] Mayer, J. D., Lortie, B., Panter, A. T., & Caruso, D. R. (2018). Employees High in Personal Intelligence Differ From Their Colleagues in Workplace Perceptions and Behavior. *Journal of Personality Assessment*, 100(5), 539–550. <https://doi.org/10.1080/00223891.2018.1455690>
- [10] Onegina, V., Vitkovskiy, Yu. Investments and land reform in agriculture of Ukraine (2020) *Agricultural and Resource Economics: International Scientific E-Journal*, 6(4), 187-210. <https://doi.org/10.51599/are.2020.06.04.10>
- [11] Podolchak, N., Tsygulyk, N., Martyniuk, V., Sokil, O. Predicting Human Resource Losses due to the COVID-19 Pandemic in the Context of Personnel Security of Organizations. 2021 11th International Conference on Advanced Computer Information Technologies, ACIT 2021 - Proceedings, 2021, pp. 333–336.
- [12] *Projected GDP Ranking*. (2021, October 26). StatisticsTimes. Retrieved January 29, 2022, from <https://statisticstimes.com/economy/projected-world-gdp-ranking.php>
- [13] Silske gospodarstvo Nimechchyny: klimat, roslynyntstvo, tvarynyntstvo, syrovyna, pererobka ta zbut — Latifundist.com. (2020). Spetsproiekt. Retrieved February 5, 2022, from <https://latifundist.com/spetsproiekt/950-nimechchina-ta-ukrayina-porivnyannya-apk-krayin>
- [14] Trofimov, A., Drobot, O., Kokarjeva, A., Maksymova, N., Lovochkina, A., & Kozytska, I. (2019). The influence of management style and emotional intelligence on the formation of employees' commitment and loyalty. *Humanities & Social Sciences Reviews*, 7(5), 393–404. <https://doi.org/10.18510/hssr.2019.7544>
- [15] Shpak, N., Kulyniak, I., Gvozd, M., Vveinhardt, J., & Horbal, N. (2021). Formulation of development strategies for regional agricultural resource potential: The Ukrainian case. *Resources*, 10(6)57. DOI: <https://doi.org/10.3390/resources10060057>
- [16] Wołowiec, T., Szybowski, D., & Bogacki, S. (2019). THE CONCEPT OF CSR AS AN ELEMENT OF BUILDING ECONOMIC AND SOCIAL RELATIONS WITH THE EXTERNAL ENVIRONMENT OF THE ORGANIZATION (OUTLINE OF THE PROBLEM). *International Journal of New Economics and Social Sciences*, 10(2), 95–114. <https://doi.org/10.5604/01.3001.0013.8091>
- [17] Zakharin, S., Stoyanova-Koval, S., Kychko, I., Marhasova, V., & Shupta, I. (2021). Strategic management of the investment process in the agricultural sector (for example, agricultural enterprises and the food industry). *Journal of Optimization in Industrial Engineering*, 14(1), 209-218. doi:10.22094/JOIE.2020.677867

The Impacts of COVID-19 on the Real Sector of Economy and Anticrisis Measures Effectiveness in the Republic of Armenia

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Abstract

In response to the economic and social impact of COVID-19 pandemic, the Government of Armenia launched the anti-crisis support economic and social programs, which level of effectiveness are questionable, despite the fact that they contributed to averting the deep economic recession and avoiding grave social challenges that might have emerged. Thus, in order to face more serious challenges in the future, it is necessary to reconsider the scope of anti-crisis measures, allocations and the scope of their beneficiaries. One of the most effective ways to overcome such economic crisis could be the provision of sufficient liquidity into the economy, which could help avoid a sharp decline in both aggregate supply and aggregate demand, otherwise the economy would inevitably enter a long-term downturn. As we can see, the volume of these injections in Armenia was far from sufficient, as a result of which the deep decline amounting to -7.6% was registered.

Keywords: anti-crisis measures, coronavirus pandemic, economy

JEL Classification: H12

1. Introduction

The openness of national economies and the globalization of world economic processes contributed to the fact that in the shortest possible time any manifestation can rapidly spread economic instability in one country and around the world, and taking more and more complex forms, turn into a global economic crisis. Their seriousness and the negative consequences of the crises on each national economy largely depends on the economic policy conducted by the given state and the anti-crisis policy efficiency [4, p.4].

The new coronavirus pandemic, called COVID-19, originated in Wuhan, central China's Hubei province, in late 2019 and has spread rapidly to more than 200 countries in Europe, Asia, the United States, and Africa (McKibbin W. J., Fernando R 2020). On January 30, 2020, the World Health Organization (WHO) declared the outbreak of COVID-19 as a global emergency, given the risk it poses to public health (Nicola M., et al, 2020). In fact, the rapid spread of the virus led to the new coronavirus becoming an unprecedented global infection in the first three months of 2020, and on March 11, 2020, the WHO announced the COVID-19 outbreak global pandemic. However, some experts believe that although the COVID-19 virus is highly contagious, in many cases, its death rate is still no higher than that of any seasonal flu (Weder di Mauro B 2020).

As early as March 2020, it was clear that COVID-19 would cause a global crisis that could be contagious both economically and medically (Baldwin R., Weder di Mauro B., 2020) Indeed, the coronavirus pandemic, along with the health crisis, caused an economic crisis, disrupting the normal course of the world economy and causing it to stagnate, which in turn provoked uncertainties about the expected further effects of the pandemic on the world economy (Salisu A. A., et al.).

In most places, whereas the incidence of the virus is still prevalent, Governments face the difficult choice between public safety and reviving the economy. This is particularly prominent in countries with workforces comprised largely by informal workers, where (rather than whereas) countries lack in capacities to economically balance the effects of the lockdown, and with the vulnerable and marginalized communities bearing the negative impacts of the economic and the health losses.

Naturally, the levels of economic decline varied from country to country, depending on the nature of the economy, the impact factors and level of the pandemic, the nature of the restrictions applied, the scope of support measures and targets. In particular, the average decline in Central and East Asia in 2020 was -2.9%, and the decline in global GDP was -3.1%. As for the European countries, the level of economic decline in some countries was quite high. Thus, in the United Kingdom in the second quarter of 2020, there was a sharp decline of -21.7%, and in France, where the lockdown measures were considered the most severe, GDP fell by -13.8% after a decline of -5.9% in the previous quarter. In the second quarter of 2020, GDP in Italy, Canada, and Germany also fell sharply by -12.4%, -12.0%, and -9.7%, respectively, compared to -5.4%, -2.1%, and -2.0% in the previous quarter. In Japan, where restraint measures were relatively mild, GDP shrank by -7.8% in the second quarter of 2020 from 0.6% in the previous quarter (International Monetary Fund (2020) World Economic Outlook, April 2021. Available from <https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021>).

It is clear that the longer and more severe the restriction measures, the higher the risk for regional economies. Realizing this, the countries were trying to ease the general restrictions as soon as possible. Against the further mitigation context, in the summer of 2020, targeted (localized) restrictions were already applied in several countries to mitigate the negative impacts on the economy as much as possible. However, already in the fall of 2020, some countries around the world returned to strict national restrictions from time to time to mitigate the negative effects of the second wave of the pandemic before the launch of large-scale vaccinations.

Because of COVID-19 crisis governments around the world were operating in a context of radical uncertainty, and faced with difficult trade-offs given the health, economic and social challenges it raises. More than half of the world's population has experienced a lockdown with strong containment measures –the first time in history that such measures are applied on such a large scale. Stringent containment measures and non-pharmaceutical interventions were effective in containing the spread of the coronavirus disease (COVID-19) and limiting fatalities, ensuring that the medical systems around the world were not overwhelmed[3]. It should be noted that the coronavirus itself is not as terrible for the economy, as the steps that almost all countries in the world have to take to protect themselves from it. While the lives saved have laid the foundation for a resumption of growth in the medium term [2] the Great Lockdown resulted in large short-term economic losses and a decline in global economic activity not seen since the Great Depression[1]. Beyond the health and human tragedy of COVID-19, the latter caused global economic challenges for almost all

countries of the world. It should be noted, that the regional and local impact of the crisis is highly asymmetric within countries. Some regions, particularly the more vulnerable ones, such as deprived urban areas, have been harder hit than others. Certain vulnerable populations, too, have been more affected. In economic terms, the impact of the crisis is differing across regions, at least in its initial stages. Differentiating factors include a region's exposure to tradable sectors, its exposure to global value chains and its specialisation, such as tourism.

It should be noted that the stock market situation was directly affected by external factors, as was the case with the 2008 global financial crisis. The stock market fluctuated sharply in response to the news of COVID-19 outbreaks in the United States from mid-February to early March 2020. The further fluctuations recorded in March-April 2020 were related to the policy decisions made by the US Government regarding the spread of the pandemic, which primarily concerned monetary and fiscal policy measures. In the United States, which is considered the center of the global financial markets - the S&P 500, Dow Jones, and NASDAQ stock indexes fell sharply in early 2020, reaching their lowest level in March. In March 2020, the US stock market stopped trading four times in just ten days, which has been unprecedented since 1997 (Zhang D., et al., 2020).

The crisis' impact on regional employment may also vary significantly across regions within countries. Regions with large shares of non-standard employment can help explain within-country differences arising from the COVID-19 crisis. Evaluating the share of jobs potentially at risk from a lockdown is one way to assess the territorial impact of the COVID-19 crisis. Capital regions or other metropolitan regions show a relatively higher risk of job disruption than other regions (Organisation for Economic Cooperation and Development (2020) Coronavirus/policy-responses in EU eastern partner countries. Available from <http://www.oecd.org/coronavirus/policy-responses/covid-19-crisis-response-in-eu-eastern-partner-countries-7759afa3/>).

2. Data and Methods

The Republic of Armenia, like many countries around the world, has been seriously affected by health and economic challenges due to Covid-19 pandemic. In the early stages of the pandemic, there was a sharp increase in the number of COVID-19 cases in our country, with a fairly high level of infection per capita. The situation was fraught with negative consequences for the economy of the country. The first negative signals were seen on February 24, 2020, when the Government of Armenia decided to suspend land communication with the Islamic Republic of Iran for two weeks. This period coincided with the pre-holiday period of Nowruz celebrated by Iranians, when a large number of Iranian tourists usually arrive in Armenia, the number of which, according to some estimates, averaged between 25 and 45 thousand people from mid-March to early April. This, indeed, had already a certain negative impact on such sectors of our country's economy as tourism, trade and services. Naturally, this was only one of the directions in which the pandemic affected the Armenian economy. This was followed by the fall in international commodity prices, export restrictions, and the forced lockdown of the economy.

The first confirmed case of coronavirus infection in Armenia was registered on March 1, 2020, after which the cases began to increase quite sharply. On March 16, 2020, the Government declared a two-month state of emergency, which was later extended three times until September 11, 2020. At the same time, the Government imposed a number of restrictive measures, including the mandatory wearing of masks, self-isolation, curfew, closure of

schools, and the ban on the arrival of foreign nationals from high-risk countries. Fines were imposed for violating the requirements of the state of emergency.

Due to the economic impacts caused by the pandemic, for the first time since 2009 a grave decline was registered in the Armenian economy. According to the press release of the National Statistical Committee of Armenia, in 2020 the volume of Armenia's gross domestic product amounted to 6 trillion 183 billion 742 million AMD (about 12 billion 645 million USD) when a 7.6% economic decline was registered (Central Statistics Committee of the Republic of Armenia (2020). Gross domestic product 2020 [statistics]. Available from <https://armstat.am> database). This was the sharpest decline in the country's economic activity since 2009. At the same time, according to quarterly data, the deepest decline was recorded in the second quarter of 2020 amounting to 13.7%, when the general economic restrictions were applied.

At the same time, the trade and service sectors contributed the most to the economic downturn with 5.02 percentage points, industry with 0.27 percentage points, construction -0.41 percentage points, agriculture with 0.48 percentage points (Statistical Committee of the Republic of Armenia (2020). Social-economic situation in Armenia 2020 [statistics]. Available from <https://armstat.am> database). In the peak of the lockdown, in April 2020, the economic activity fell by 16.4% compared with the previous year. At the same time, the decline in construction was 51%, in the trade sector - 33%. Though during the summer months, the economic activity gradually began to recover, but as of August, the latter was 9.8% lower than in the same period last year.

In 2020 according to the annual results, the mining industry increased by 12.0%, the processing industry decreased by 3.4%, the accommodation and catering organization by 45.1%, the retail and wholesale trade by 11.7%, the information and communication sector increased by 6.2%, while financial and insurance activity by 7.8% (Statistical Committee of the Republic of Armenia (2020). Social-economic situation in Armenia 2020 [statistics]. Available from <https://armstat.am> database).

Due to the spread of the economic effects of the pandemic, at the end of April 2020, the Government of Armenia revised the key indicators of the 2020 state budget. In particular, the state budget deficit was increased from 160.7 billion AMD to 324 billion AMD. In addition, the previously projected 4.9% economic growth forecast was reduced to 2%. Two months later, according to the July data of the Central Bank of Armenia, instead of economic growth in Armenia, a 4% decline was forecasted, and later, according to the Central Bank's forecast, the decline was to reach 6.2% by the end of September. However, the actual economic downturn exceeded the forecast by 1.4%.

In response to the economic and social impact of COVID-19, the Government of Armenia launched the anti-crisis support program amounting to 150 billion USD, which constitutes about 2.3% of Armenia's GDP. The anti-crisis package included 25 measures aimed at alleviating the socio-economic problems caused by the pandemic crisis. Taking into account the impact of the economic consequences of the pandemic on the Armenian economy and the restrictions, the anti-crisis measures were divided into three main directions:

- Subsidizing loans for 2-3 years to provide short-term assistance to affected organizations;
- Providing direct subsidies to businesses to support jobs;
- Provide one-time compensation to vulnerable groups, including those who have become unemployed, families with or expecting children, micro-enterprises after the outbreak of COVID-19, as well as support for utility expenses.

Out of 25 anti-crisis measures adopted by the Government of the Republic of Armenia, 12 were of economic and 13 - of social character (The Government of the Republic of Armenia (2020). Support Programs. Available from <https://www.gov.am/en/covid19./> database).

Volumetric distribution of anti-pandemic measures in Armenia in 2020 as of April 25, had the following image .

- 25 billion AMD (0.38% of GDP) for economic programs,
- 25 billion AMD(0.38% of GDP) for social programs,
- 80 billion AMD (1.22% of GDP) for long-term development programs,
- 20 billion AMD(0.31% of GDP) - reserve funds for redistributions in case of necessity.

Although the total budget of the anti-crisis package was initially set at 150 billion AMD (about 313 million USD), as of September 10, 2020, the Government had spent 163.4 billion AMD (340 million US dollars or 2.5% of GDP) - 13.4 billion AMD more than the approved initial support volume[4 p.99].

Measures to support enterprises included mitigation of liquidity risks through co-financing of loans through refinancing, as well as interest rate subsidies. Entrepreneurs could apply for soft loans to be able to provide salaries and pay for equipment, raw materials, as well as taxes, duties, and utilities. The maximum amount of financial support for the business sector for one organization was 500 million AMD(about 1 million USD).

An additional program was introduced for SMEs operating in the fields of tourism, agriculture, food and manufacturing, which allowed them to receive loans in the amount of 2.5 to 50 million AMD, with a six-month privileged period, without interest rates for the first two years, and with the application of 12% interest rate from the third year. As of mid-May, loan application amounting to 17 million USD were approved for 744 entities.

Special measures to support other areas were also adopted. Although the sector of agriculture was not considered to be directly affected by the pandemic due to the lack of compulsory restrictions and social distance requirements, agricultural companies suffered significant losses due to the sharp decline in demand for their products, which in turn caused serious financial difficulties for organizations and individuals engaged in the field. In view of this, the Government of Armenia approved a specific support program for agricultural organizations and cooperative farms in the form of interest rate subsidies and co-financing mechanisms. In addition, a special measure was adopted, under which grape producers, wine and brandy companies had the opportunity to apply to banks for soft loans, the interest rates for which would be fully subsidized by the Government.

The anti-crisis measure adopted by the Government to support transport companies in the tourism sector aimed to support the repayment of 75% of the debt on current loan interest rates for the period from April 2020 to March 2021.

Further, to promote the entrepreneurship sector, the Government promoted entrepreneurship in IT sector through interest-free one-time grant loans to help individuals start their own businesses. To encourage job retention, the Government of Armenia adopted a wage subsidy program, in the frames of which enterprises with 2 to 50 employees received one-time grants to pay the salaries of every fifth employee (support for enterprises with less than five employees was equal to the ration between the monthly salary fund and the number of employees). At the same time, a similar measure was introduced in May for enterprises with up to 100 employees, provided that the latter have not laid off their staff since February 2020.

Tourism companies that retained more than 70% of their staff would receive wage compensation for every third employee for nine months (The Government of the Republic of Armenia (2020). Support Programs. Available from <https://www.gov.am/en/covid19./database>).

The Government of Armenia also adopted social assistance measures, such as one-time payments amounting to 68,000 AMD (approximately 140 USD) for low-income citizens who lost their jobs between mid-March 2020 and June 1, 2020. The anti-crisis measures provided additional financial support to pregnant women, low-income families, students, and citizens who worked in areas significantly affected by the crisis (including hospitality industry, tourism, and retail).

As part of employment assistance, the Government of Armenia also approved an additional assistance package to create 1,000 temporary jobs in agriculture.

On April 13, 2020, the Government began to gradually reopen the economy, allowing certain sectors to resume operations, including industry and construction. One week later, the activities of the wholesale-retail trade, information-communication services, professional-administrative spheres resumed. Restrictions on free movement were lifted in May, restaurants and cafes, parks and beauty salons reopened, and public transport was fully restored. However, the state of emergency remained in force until September 11, 2020. After, it was replaced by a quarantine regime, which was extended until January 11, 2021. This allowed the Government to continue to implement safety measures and restrictions in the field of public health against the pandemic.

3. Results and Discussion

The effectiveness of the anti-crisis economic and social measures implemented by the Government of the Republic of Armenia to overcome the socio-economic impacts of the pandemic can be assessed through the following three criteria:

- financial allocations volume and GDP ratio,
- Stakeholders circle,
- Efficiency and ease of organization.

As about of the volume of anti-crisis measures announced by the Armenian government amounted to 163.4 billion AMD, the ratio of which to the country's GDP is 2.5%. If we consider only the actual support without banking loans, the latter is much lower. Indeed, these measures made it possible to partially neutralize the initial effects of the crisis by solving certain economic and social problems, but the volume of the latter was obviously small enough to speak about the complete neutralization of the economic consequences of the pandemic. For comparison, this figure was much higher in most post-Soviet countries, for example, Estonia - 8%, Lithuania - 4.7%, Georgia - 7.1%, Azerbaijan - 4%, Belarus - 4%. And if we compare with developed countries, where in some cases this index exceeded 20%, the difference is more obvious. These figures make it impossible to speak about the high efficiency of anti-crisis measures.

Another criterion for assessing the effectiveness of anti-crisis measures is the involvement of the circle of beneficiaries of anti-crisis measures. In this regard, it should be noted that many areas affected by the pandemic, economically affected organizations and many low-income families were left out of the scope of these programs. The restricted economic sectors covered

a much larger numbers of potential beneficiaries than those of the Government-approved economic response measures to the pandemic. It is true that this framework had been regularly reviewed by the Government, but nevertheless a certain circle of businesses and citizens were left out of the support programs. In particular, the families supported by family members working abroad did not benefit from any support measures while such families are especially numerous in many regional settlements of Armenia.

The above-mentioned problems are a consequence of the fact that from the very beginning, prior to the adoption of the anti-crisis measures by the Government, the spheres which have undergone crisis impact were not thoroughly and comprehensively analyzed. Neither has the circle of all vulnerable groups of businesses and population in terms of the impacts of the crisis been identified.

And finally, the third criterion by which the effectiveness of the Government's anti-crisis measures can be assessed is the efficiency and ease of the latter. In this regard, there have been a number of problems. First of all, it should be noted that since March 16, 2020, the economy has been in a forced lockdown, the population was self-isolated, but the main measures of anti-crisis support were adopted only in April. As for the accessibility of these measures, rather complex procedures established by the Government should be mentioned. On the other hand, the shortcomings of the online support platform for the implementation of the programs, have significantly reduced the effectiveness of the anti-crisis measures. In particular, the scope of activities of the online support platforms was quite complex, to use them required to download large amounts of data, the requirements of which in some cases were quite incomprehensible to the beneficiaries. Moreover, serious technical problems emerged due to the significant workload of the latter, which often created a number of difficulties for the beneficiaries. Therefore, it was necessary to simplify the online application procedures as much as possible and to provide the population with a more user-friendly platform with technical assistance.

Given the above mentioned, the level of effectiveness of anti-crisis measures in Armenia are questionable, despite the fact that they contributed to averting the deep economic recession and avoiding grave social challenges that might have emerged.

4. Conclusion

The main feature of the crisis caused by the Pandemic is the emergence of a dual shock, both in terms of supply and demand. This is truly unprecedented for the global economy, resulting in an unusual amount of economic turmoil and unpredictability of future developments.

Naturally, the levels of economic decline varied from country to country, depending on the nature of the economy, the impact factors and level of the pandemic, the nature of the restrictions applied, the scope of support measures and targets.

As for Armenia, the effectiveness of the anti-crisis economic and social measures implemented by the Government to overcome the socio-economic impacts of the pandemic, which was assessed through the following three criteria: financial allocations volume and GDP ratio, stakeholders circle, efficiency and ease of organization of Assistance is rather low, despite the fact that they contributed to averting the deep economic recession and avoiding grave social challenges that might have emerged.

Thus, in order to face more serious challenges in the future, it is necessary to reconsider the scope of anti-crisis measures, allocations and the scope of their beneficiaries. One of the most

effective ways to overcome such economic crisis could be the provision of sufficient liquidity into the economy, which could help avoid a sharp decline in both aggregate supply and aggregate demand, otherwise the economy would inevitably enter a long-term downturn. As we can see, the volume of these injections in Armenia was far from sufficient, as a result of which the largest decline amounting to -7.6% in the region was registered in Armenia.

Based on the above-mentioned, it is quite obvious that in order to overcome the effects of the Covid-19 economic crisis and increase the effectiveness of anti-crisis measures, it is necessary to clearly define the specific goals of these measures, as well as develop clear criteria for choosing the main directions of anti-crisis measures. In our view, the following can be the main directions:

- Stimulation of the real sector of the economy,
- Support for job maintenance,
- Promotion of general demand,
- Financial support to companies affected by the crisis,
- Ensuring access to credit resources,
- Improvement and expansion of the state guarantee system,
- Protection of the internal market and national producers,
- Increasing the level of social protection of the population,
- Development of scientific and technical potential and the human capital.

References

- [1] Baker, S, N Bloom, S Davis and S Terry (2020), “COVID-induced economic uncertainty and its consequences”, VoxEU.org, 13 April.
- [2] Baldwin R., Weder di Mauro B. Economics in the Time of COVID-19. – London, CEPR Press, 2020.
- [3] Barro, R J, J F Ursúa and J Weng (2020), “The coronavirus and the Great Influenza Pandemic: Lessons from the ‘Spanish Flu’ for the coronavirus’s potential effects on mortality and economic activity”, NBER Working Paper 26866.
- [4] Deb, P, D Furceri, J Ostry and N Tawk (2020a), “The effects of containment measures on the COVID-19 pandemic”, Covid Economics: Vetted and Real-Time Papers 19: 53–86.
- [5] McKibbin W. J., Fernando R. The global macroeconomic impacts of COVID-19: Seven scenarios // CAMA working paper. – 2020. – № 19. – doi: 10.2139/ssrn.3547729
- [6] Nicola M., et al. The socio-economic implications of the coronavirus and COVID-19 pandemic: A review // International Journal of Surgery. – 2020. – № 78. – p. 185–193
- [7] . Salisu A. A., et al. Revisiting oil-stock nexus during COVID-19 pandemic: Some preliminary results // International Review of Economics and Finance. – 2020. – № 69. – p. 280–294
- [8] Sargsyan K.S. Covid-19:Economic Challenges and overcoming issues/ Monograph-Yereva, “TIR” publishing house, 2021, 124p.
- [9] Weder di Mauro B. Macroeconomics of the flu. Economics in the Time of COVID-19. / R. B. Baldwin and B. Weder di Mauro (eds). – London, CEPR Press, 2020.
- [10] Zhang D., et al. Financial markets under the global pandemic of COVID-19 // Finance Research Letters. – 2020. – № 36. – p. 101528.

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- [11] International Monetary Fund (2020) World Economic Outlook, April 2021. Available from <https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021>
- [12] Statistical Committee of the Republic of Armenia (2020). Gross domestic product 2020 [statistics]. Available from <https://armstat.am> database
- [13] Statistical Committee of the Republic of Armenia (2020). Social-economic situation in Armenia 2020 [statistics]. Available from <https://armstat.am> database
- [14] Organisation for Economic Cooperation and Development (2020) Coronavirus/policy-responses in EU eastern partner countries. Available from <http://www.oecd.org/coronavirus/policy-responses/covid-19-crisis-response-in-eu-eastern-partner-countries-7759afa3/>
- [15] The Government of the Republic of Armenia (2020). Support Programs. Available from <https://www.gov.am/en/covid19/> database

Evaluation of factors causing employees' fluctuation

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Abstract

Nowadays, the situation with employment is very changeable and people working at Human Resources departments in many companies should know how to react to these changes. These employees are responsible to ensure that the company has enough employees to carry out all requirements and fulfill long-term objectives and goals a company has set up. When a worker is not satisfied with his employer anymore or vice versa, they start looking for a new workplace. This phenomenon, when people „job-hop" from one company to another for various reasons is called fluctuation. The low rate of turnover can be even beneficial for a company because new staff can bring new know-how. However, an excessive rate of releases can cause dysfunction in a company. Various companies have problems with employee turnover and this is the reason why we wanted to examine causes why people change their workplaces, we wanted to analyze factors that have a significant impact on fluctuation rate, explain this term and give information of its development. Our goal was to analyze this questionnaire based on the satisfaction and dissatisfaction of employees working in a chosen company, not fluctuation itself. As a methodology, we conducted a survey among employees to find out what are their reasons to change a workplace. In the end, we provided solutions suggestions that can be implemented by the company.

Keywords: *employee, employment, factors, fluctuation,*

JEL classification: *E24, J33, M5*

1. Introduction

Employees are stakeholders who take a pivotal role in achieving organizational success, competitive advantage and effectiveness (Kang & Sung, 2019). Employee fluctuation nowadays is seen as one of the foremost challenges for managers and a vital factor in achieving the organization's goals (Tseng & Wu, 2017; Ruso et al., 2021). According to Vojtovič (2013), fluctuation is defined as the loss of employees. According to Werther and Davis (1992, p. 328), it is the total amount of departures and arrivals of employees in a company. Departures can be voluntarily initiated by employees, which we call leaving from work based on Bares (2016). Also, can be initiated by employers – release from work. or degraded. (Sirota, 2017).

Fluctuation can be divided according to different criteria as stated in a book written by Koubek (2015). The fundamental classification of fluctuation is natural (objective, forced), and undesirable, whereas the fluctuation that is objectively necessary, such as retirement, maternity leave, basic military service, or health reasons, is considered to be natural (Koubek, 2015). When we talk about natural fluctuations, it means a situation when a worker reaches retirement age and is no longer able to work. A natural fluctuation is also considered to be the death of a worker or the entry into employment immediately after leaving school. If a worker has difficulties with work ethic and is fired, this fact is evaluated as an unnatural form of turnover (Harpelund, 2019). There are other reasons, that are subjective and very individual, for which we consider fluctuation undesirable, such as dissatisfaction with salary and remuneration, working environment, workplace relationships, etc, according to Papulová and Papula (2011).

We differ 3 types of factors, which influence turnover: corporate, personal, and social causes according to Baumgartner (2015). Corporate causes of fluctuation, based on Bednář (2017) are those that relate to the company and performing of work therefore they are affectable by a company itself. Personal causes relate to employees as individuals and only a person who is affected by one of these factors can change the situation, company is hardly included according to Šikýř (2016). While the abovementioned factors may be changed by the company itself or by an individual employee, the social causes cannot be affected by either of them based on author Tegze (2018).

According to Horváthová (2011), turnover is a very negative occurrence for every organization, because it can lead to costs for recruitment of new employees. These costs are estimated to be 100%, almost 150% of the annual salary of the top employee. Author Meifert (2013) stated that organizations are losing due to fluctuation, because employees are holders of human capital, including their knowledge and know-how specific for a particular organization, which they take with them away while leaving, contributing to the know-how of their new employer. Moreover, employees' turnover could lead to the loss of business opportunities (Yang et al., 2020). Due to significant losses caused by fluctuation, employee retention should be the key question in defining strategies of every organization (Campbell et al., 2017; Scheidler et al., 2018).

2. Data and Methods

The main aim of the research was to analyze the factors influencing the fluctuation of the employees in the selected company based on a questionnaire survey of employee satisfaction. Via questionnaire, we wanted to find and analyze reasons, why people want to change their current work according to their satisfaction/dissatisfaction, not fluctuation itself. Based on the results obtained from the survey, we wanted to propose recommendations for the human resources manager in the given company. The information was collected and obtained by studying the available Slovak and foreign literature, from professional articles available on the Internet or in the university library. For more information, we've studied textbooks and scripts, fluctuation statistics, job portals, and employment agencies reports.

As a methodology, we conducted a questionnaire survey on a sample of 113 employees working in all departments of the company, including agency workers. The questionnaire focuses on employee satisfaction and contains 17 questions. The anonymous questionnaire was provided in the online form and all questions were formulated so that the respondent could answer clearly. The questionnaire was realized during January 2020 and finished in June 2020 during the starting period of coronavirus pandemic and first lockdown.

To find out which factors are influencing the fluctuation in the studied company, we used Likert scales. Respondents had to choose the reasons that would cause them to leave the company. We used center measures for evaluation, so we calculated arithmetic mean, median and modus.

3. Results and Discussions

Questions were focused on various areas. One of them was aimed at the work loading of employees. Results from the graph are saying that majority of employees are not satisfied (48%) with their work loading, or they are even overloaded with tasks (24%). Only 18% of respondents are satisfied with the loading and just 10% are very satisfied.

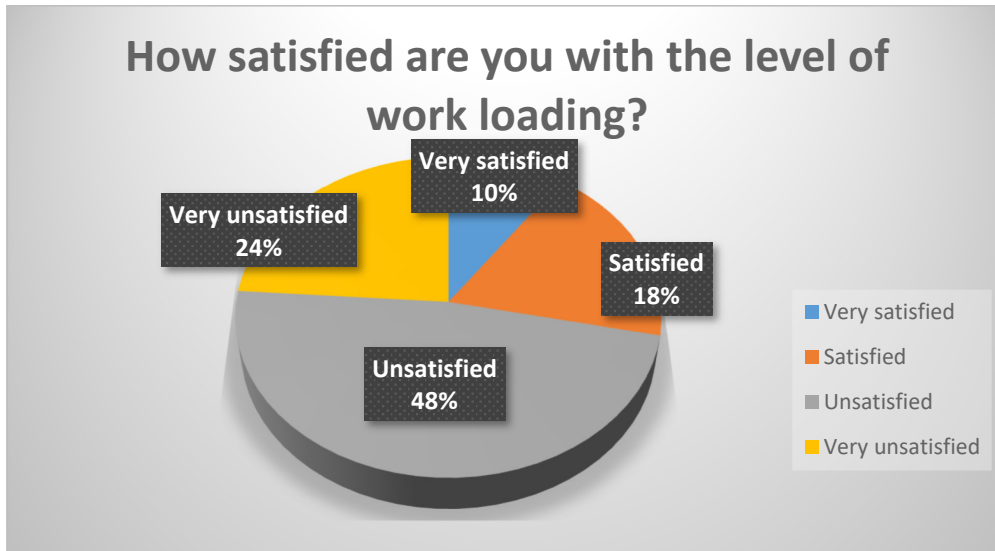


Figure 1: Work loading satisfaction

Source: Own elaboration

The following question focused on the company social program, where various events organized by the company and benefits are included. 43% of respondents expressed that they are satisfied with this program and a small portion of workers (10%) are even very satisfied with offered benefits. However, some respondents stated they are not very happy about this program (36%) and 12 people are very unsatisfied (11%) with the social benefits offered by the company.

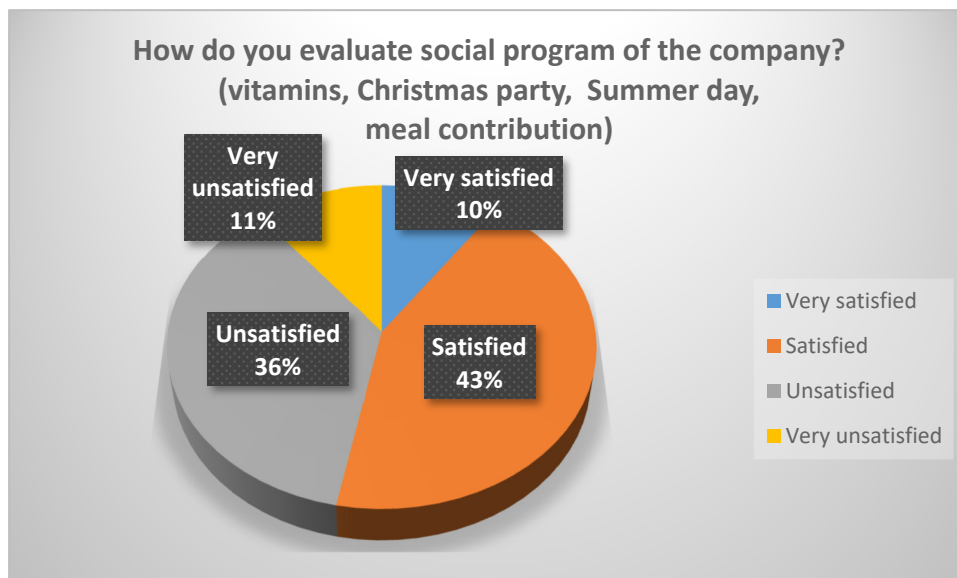


Figure 2: Social company program satisfaction

Source: Own elaboration

The following graph is analyzing answers, to whether employees can fully use their qualifications within the tasks they receive in the company. According to the graph, we assume that majority of respondents 53% are unsatisfied with the usage of their qualifications in their workplace and 10% are very unsatisfied with this issue. Only 3% of employees are fully able to embrace their competence and 34% of workers are partially satisfied.

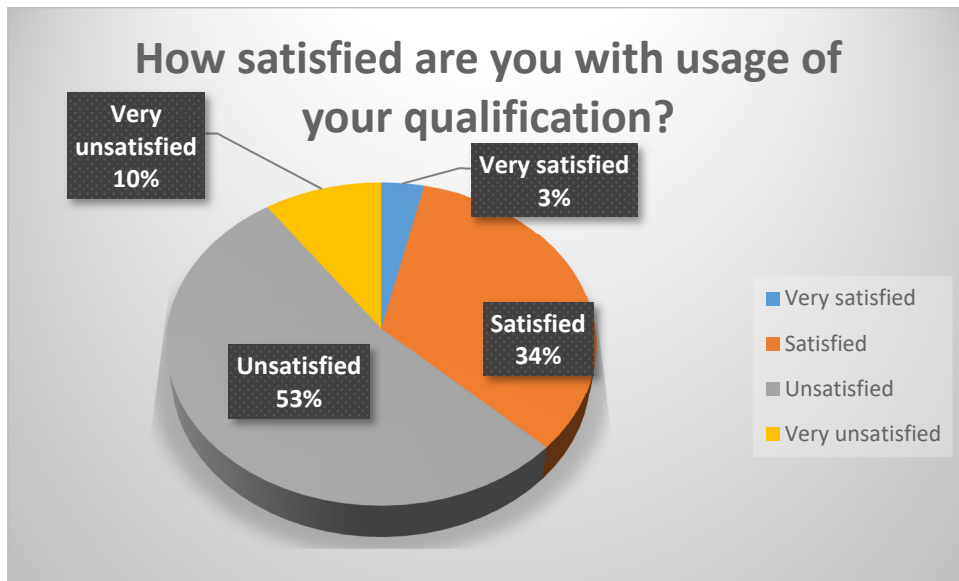


Figure 3: Usage of employee qualification satisfaction

Source: Own elaboration

In another question, we asked if respondents are planning to leave the company in the near future. In a graph, we can see that 38% of people are not currently planning to leave and 37% are satisfied with their workplace. 13% of our respondents are considering leaving, but they have not started any action. However, 12% of people want to leave and they have started to look for another company.



Figure 4: Consideration of leaving the company

Source: Own elaboration

One question in the survey focused on satisfaction with working conditions, like cleanliness, lighting, temperature, or noise. In the graph below, we can see that majority of people are very (30%) or just unsatisfied (42%) with working conditions in the company. Only 5% of employees are very satisfied and 23% are satisfied with the working conditions provided by

the company. In addition to the mentioned factors of working conditions in the workplace, another factor appeared during the pandemic: the home office. The coronavirus has changed the attitude of employees to perform work during the home office, which requires a higher work commitment. Employees had to face the challenge of reducing their work time due to a large number of online meetings. The employees thus had to work overtime, especially administrative staff.

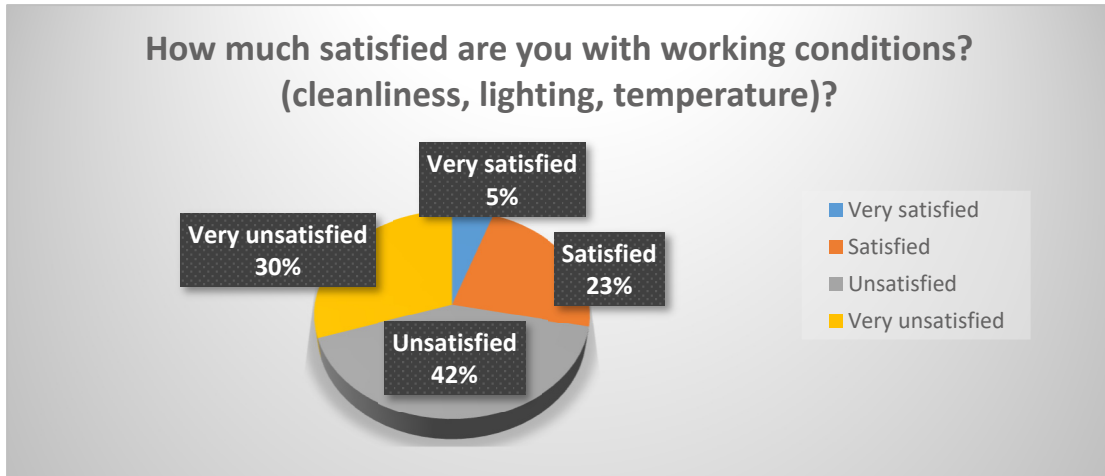


Figure 5: Working conditions

Source: Own elaboration

The next question focused on job security provided by the company. From graph 16, we can assume that more than half (52%) are mostly secured with their job and 22% have absolutely no doubts about their workplace. 17% feel insecure and 9% stated that they do not have a sense of job security at all.

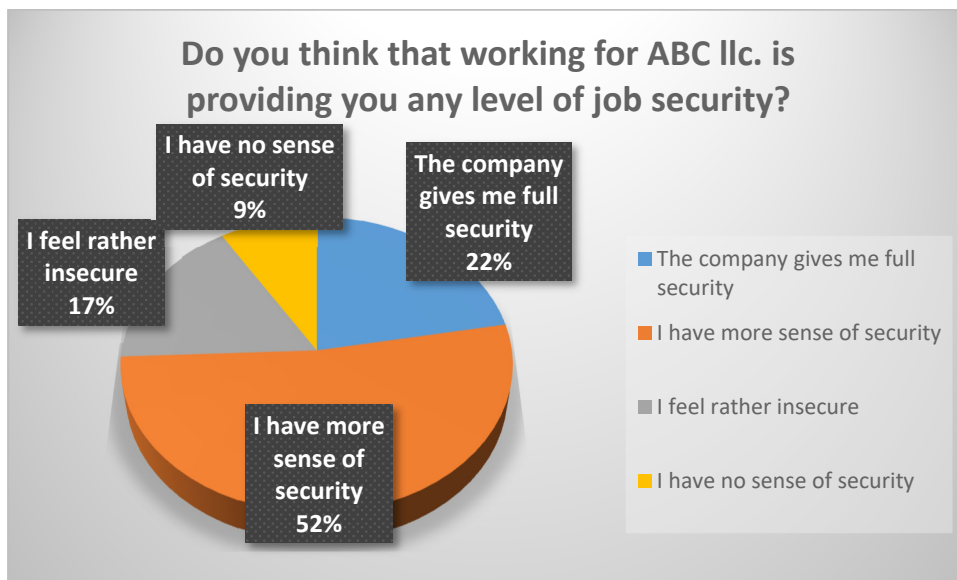


Figure 6: Job security

Source: Own elaboration

Among the last questions, respondents had to rank which factors may influence their decision to leave the company where the research had been conducted. The subject of questioning was factors influencing the fluctuation of employees. Respondents evaluated the significance of individual factors using the Likert scale. Respondents had to choose on a scale from 1 to 5, where 1- strongly disagree, 2 – disagree, 3 – neither agree nor disagree, 4 – agree and 5 – strongly agree. According to table 1, one of the most important factors is unsatisfactory

remuneration, followed by job security and impossibility of education. Then a little bit less important factors, but still should be considered by the company are bad working conditions bad relationships among colleagues, the impossibility of promotion and recognition of personal success by the manager.

Table 1: Factors influencing turnover of employees

Factors influencing turnover of employees							
	Unsatisfactor y Remuneratio n	Impossibilit y of promotion	Impossibilit y of education	Bad relationship s among colleagues	Bad working condition s	Recognitio n of personal success	Job securit y
Arithmeti c mean	4,10	2,17	2,94	2,25	2,75	1,67	3,50
Median	4,00	2,00	3,00	2,00	2,50	1,00	3,00
Modus	4,00	3,00	4,00	2,00	2,00	1,00	3,00

Source: Own elaboration

4. Conclusion

The main goal of this research was to analyze how a particular company is dealing with fluctuation. We had to find and analyze reasons, why people want to change their current work according to their satisfaction/dissatisfaction, not fluctuation itself. The practical part of this work focused on the analysis of the questionnaire about employee satisfaction. We created an anonymous questionnaire for employees with various questions, focused on working conditions, job security or social program of the company, and many others.

Huge dissatisfaction is connected with work loading which can lead to the decision of workers to leave the company due to overloading. We would suggest making an analysis, what is the average loading per worker if there is enough technological equipment to fulfill the tasks and if needed reorganize tasks between employees.

When it comes to benefits offered by the company, there is a dispute about whether the money used for these events should not have been used for higher wages of employees. From the general point of view, there are not many companies offering such opportunities. The social program should continue within the company because it is one of the biggest advantages with the possibility to keep the current employees and attract new ones for open positions. Improvement of this program depends on the budget. When it comes to health, it is the multinational companies, where we also include our researched company, that have provided their employees with more health benefits. In many cases, they cared not only for them but also for their families during the outbreak of the pandemic. It is our researched company that has provided and still provides drapes, respirators or disinfection, bought germicidal radiators in the production hall, overpaid tests for employees, or expanded vitamin packages, which already had a tradition in the company. This health care offered to employees is quite rare and the company worked hard to secure their employees during such difficult times.

Usage of qualifications is another big issue in the company. Workers stated that they do not use it fully, which can lead to a higher turnover of employees. Usually, if workers think they

are overqualified for the job and they agreed to work in such a position, it is connected only with their individual decision to do so. The company has no power to change it, even when there is a possibility that these workers will leave one day for a more suitable job.

When it comes to factors why employees would be willing to leave, remuneration is the most important. The level of salaries has a significant impact on the personal decisions of workers whether to stay or not. Some companies can solve this problem by providing an extra salary payment, the so-called „13th salary”. Others with lower income may refinance transport costs or offer meal vouchers at least once a year. However, this company should think about the option of a 13th salary or annual percentage increase based on revenues of the company. Remuneration is followed by job security. People want to be sure they have a stable job and a stable income. Another important factor is education. A possibility for workers to learn new things and gain new knowledge is very important, so the company could provide workshops and training not only for administrative workers but also for employees in production to decrease the fluctuation.

Another big problem is working conditions. Employees must work under harsh conditions, such as big noise, dust, or high temperatures in the summer, so more equipment for their employees should be implemented: using earphones against excessive noise, a dust-proof respirator and to equip individual workplaces with air-conditioning to allow employees to perform better work, what can lead to an increase of production. If these conditions improve, the general public opinion about the company will change for the better, and overall fluctuation will decrease as well.

The Covid-19 pandemic highlighted new factors that are causing employee turnover: employees had to acquire new technical skills and learn to work with systems such as Zoom, MS Teams, Webex, and others. The employees had to learn self-discipline within the work at home office, where no one checked them and it was up to them how to assign working hours and work tasks. As the research was launched before the start of the pandemic in January 2020 and took place during the first lockdown until June 2020, we would like to continue the research on staff turnover now at the time of the pandemic and compare these results from both surveys.

To sum up, we would recommend that the company should focus on areas where dissatisfaction of respondents has been noted, or that suggestions, that have been proposed to improve individual areas, will be also applied in practice. This would prevent unwanted employee turnover from the company, decrease costs related to the recruitment of new staff and training of new staff.

References

- [1] Baumgartner, P. 2015 *Lead to succeed*. Berlin: Colorama, 2015. ISBN 978-39-0301-114-4
- [2] Bednář, V. 2017. *Jak omezit fluktuaci a udržet si zaměstnance manažerskými nástroji*. Praha: Grada Publishing, 2017, 26 p. ISBN 978-80-271-0648-6
- [3] Bares, A. 2016. 2015 Turnover Rates by Industry. In *Compensation Force*, 8.4. 2016 Retrieved from: <http://www.compensationforce.com/2016/04/2015-turnover-rates-by-industry.html>
- [4] Campbell, B. A., Kryscynski, D., & Olson, D. M. (2017). Bridging strategic human capital and employee entrepreneurship research: A labor market frictions approach. *Strategic Entrepreneurship Journal*, 11(3), 344-356. <https://doi.org/10.1002/sej.1264>
- [5] Harpelund, CH. 2019. *Onboarding: Getting New Hires Off to a Flying*. Publisher: Emerald Publishing Limited (January 21, 2019). 272 pages. ISBN 1787695824.
- [6] Horváthová, P. 2011. *Talent management*. Praha: Wolters Kluwer, 2011, p. 45. ISBN: 978-80-735-7665-3

- [7] Kang, M., & Sung, M. (2019). To leave or not to leave: the effects of perceptions of organizational justice on employee turnover intention via employee-organization relationship and employee job engagement. *Journal of Public Relations Research*, 31(5-6), 152-175. <https://doi.org/10.1080/1062726X.2019.1680988>
- [8] Koubek, J. 2015. *Řízení lidských zdrojů*. Praha: Management Press, 2015, 210 p. ISBN 978-80-726-1288-8
- [9] Meifert, M.T. 2013. Stage 7: Retention Management. In: *Meifert M. (eds) Strategic Human Resource Development. Management for Professionals*. Springer, Berlin, Heidelberg, 2.3.2013. ISBN: 978-3-642-31473-5 Retrieved from: https://doi.org/10.1007/978-3-642-31473-5_11
- [10] Papulová, Z. & Papula, J. 2011. *Strategické myslenie manažérov*. Bratislava: Kartprint, 2011, p. 213-215. ISBN: 978-80-8887-086-9
- [11] Richterová, N. 2017. Fluktuácia na Slovensku rastie. In *profesia.sk*, 7.11. 2017 Retrieved from: <http://firma.profesia.sk/vysec-30-percent-zamestnancov-v-marketingu-cestovnom-ruchu-ci-prekladatelstve-zmenilo-za-posledny-rok-pracu-fluktuacia-na-slovensku-rastie/>
- [12] Ruso, J., Glogovac, M., Filipović, J., & Jeremić, V. (2021). Employee Fluctuation in Quality Management Profession: Exploiting Social Professional Network Data. *Engineering Management Journal*, 1–15. <https://doi.org/10.1080/10429247.2021.1952022>
- [13] Sirota, L. 2017. Čo ovplyvnilo trh práce v roku 2017: Zarábame čoraz viac, firmám chýbajú ľudia. In *Nový Čas*, 21.12.2017 Retrieved from: <https://www.cas.sk/clanok/635087/co-ovplyvnilo-trh-prace-v-roku-2017-zarabame-coraz-viac-firmam-chybaju-ludia/>
- [14] Scheidler, S., Edinger-Schons, L. M., Spanjol, J., & Wieseke, J. (2018). Scrooge posing as Mother Teresa: How hypocritical social responsibility strategies hurt employees and firms. *Journal of Business Ethics*, 2, 1–20. [10.1007/s10551-018-3788-3](https://doi.org/10.1007/s10551-018-3788-3)
- [15] Šikýř, M. 2016. *Personalistika pro manažery a personalisty*. Praha: Grada Publishing, 2016, p. 35-41. ISBN: 978-80-2475-870-1
- [16] Tegze, J. 2018. *Jak hledat zaměstnance v 21. Století*. Praha: Grada Publishing, 2018, p. 260-271. ISBN: 978-80-2710-551-9
- [17] Tseng, L. M., & Wu, J. Y. (2017). How can financial organizations improve employee loyalty? The effects of ethical leadership, psychological contract fulfillment and organizational identification. *Leadership & Organization Development Journal*, 38(5), 679-698. <https://doi.org/10.1108/loj-07-2015-0142>
- [18] Vojtovič, S. 2013. *Personálny manažment v organizácií*. Plzeň: Aleš Čenek, s.r.o.; 2013, p. 11. ISBN 978-80-7380-483-1
- [19] Werther, W. & DAVIS, K. 1992. *Lidský faktor a personální management*. Praha: Victoria Publishing, 1992, 328 p. ISBN 80-85605-04-X
- [20] Yang, C. C. (2020). The effectiveness analysis of the practices in five quality management stages for SMEs. *Total Quality Management & Business Excellence*, 31(9-10), 955-977. <https://doi.org/10.1080/14783363.2018.1456010>



SESSION 2

**BIOECONOMY, RESOURCE MANAGEMENT AND SUSTAINABLE
DEVELOPMENT**

Mediation in Collective Disputes in Healthcare System

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Abstract

This article focuses on collective disputes in the public health care system. Due to their specific nature, collective disputes in the health care system deserve a separate analysis and require taking a special approach to be resolved. The article will deal with issues such as conflict, collective labour relations, and, in particular, the issue of collective labour disputes, to finally focus on collective disputes in health care. Due to its limited volume, the article does not exhaust the entire issue, and the issues raised will be outlined only briefly.

Keywords: *Collective Disputes, Healthcare Management, Mediation*

JEL Classification: *I18, J52, M54*

1. Introduction

The issue of organizational conflict has already been extensively described in scientific and popular literature (Deutsch, Coleman 2005; Mucha 2014). Conflicts can be analysed from various perspectives, therefore, due to the limited space, the paper will present the following typology of approaches towards the understanding of conflict: "The first can be described as structural. There is a conflict when, in a given social system and at a given time, we perceive objectively existing (that is, the ones that can be proven by methods considered to be scientific but not necessarily known by social actors) conflicts of interest. The terms <conflict of interest> or <clashing interests> are often used. This contradiction lies in the fact that, due to the limited number of demanded goods, it is impossible to fully satisfy the interests or goals of the groups that make up a given system at the same time. The second concept is of a behavioural or interactive nature. The term <conflict> is often used here. A conflict is a system of interactions, usually organized or intentionally related to one another, where the goal of social actors is to achieve their own interests or goals at the expense of other participants of the interaction. (...) The third concept of conflict is psychosocial. A conflict can be regarded as a state of hostility (or at least aversion) between the (individual or collective) participants of a given social system. A term often used here is <antagonism>. Such a conflict may (but does not necessarily have to) be based on an objectively existing conflict of interest, may (but does not have to) lead to a fight, and thus a behavioural conflict." (Harvard Business Review 2005). As a general rule, in the case of collective disputes, the structural approach should play a key role in the resolution of such conflict, but in practice, the difference between the real conflict of interests and the conflict of perception is extremely difficult to determine. In the following sections, however, we will mainly deal with a structural conflict resulting from the differences in the bargaining power of individual actors.

1. The causes of the conflict

Further issues that need to be addressed are the causes of the conflict. There are three factors that cause conflict between groups within organizations:

1. The need for shared making - particularly risky in the circumstances of interdependence and limited resources. (e.g. dislocation of budget funds) and interdependence while coordinating activities, when the most important commodity to be distributed is time.
2. Differences in goals - when two groups want to achieve mutually exclusive goals.
3. Differences in perception - resulting, for example, from differences in the flow of information between individual organizational units (Organ, Bateman 1991)

2. Collective labour relations

Another issue that needs to be addressed is the position of collective disputes within the realm of considerations on collective labour relations. Collective disputes fall within the area known as industrial conflict, which is part of the industrial relationship. Although the word "industrial" is used in the discussed term, it does not mean that these phenomena are related only to industry. The term encompasses all types of organizations where employee interests are represented collectively, i.e. by trade unions. The industrial conflict is thus an element of a complex system of relations that can be defined as "relations between the main actors operating in the sphere of the economy". In terms of the actions undertaken by collective actors, the subjects of these relations are the organizations of employees and employers as well as state authorities. These relations consist in adopting various strategies of action and mutual impact within the framework of the rules of the socio-economic order as well as the specific properties of economic organizations. These relations can be divided into: a) relations of power, b) tender and negotiation, c) conflict and d) cooperation - participation. " (Gilejko 1994)

3. Collective dispute

The resolution of labour conflicts in Poland was legally codified in 1991 by the Act on Resolution of Collective Disputes, thanks to which mediation entered Polish legislation. The institution of mediation in collective disputes was established to efficiently resolve conflicts between employers and employees represented by trade unions. Since the interests of employees are represented collectively, not individually, this procedure is known as a collective labour dispute. (Cichobłaziński 2014)

According to this Act, a collective dispute has the following stages:

1. Submission of the trade union's list of demands to the employer. These demands may only refer to the issues enumerated by the Act and are as follows: work and pay conditions, social benefits, and trade union's rights and freedoms. As far as the dynamics of the conflict are concerned, it is extremely important to have a regulation that allows only the employee side to initiate a dispute, while the employer does not have such a right. Thus, the initiative in a collective dispute always belongs to the employees, while the role and position of the employer in a collective dispute is, by definition, defensive.
2. The employer's reply. The further course of the dispute depends on the employer's reaction. It can be twofold:
 - a) positive - all requests have been met

- b) negative - at least one request has not been met
3. If the employer's answer was negative, a collective dispute begins in the sense defined by the Act, and the employer is obliged to report the dispute to the District Labour Inspectorate.
 4. Negotiations - bilateral talks between the employer and trade unions aimed at resolving disputes.
 5. Mediation - if the negotiations have resulted in a resolution to the conflict, the collective dispute is ended. If the negotiations did not lead to an agreement, the next obligatory stage is mediation, which constitutes a separate institution and consists of several phases. Their type and number depend on the path chosen by the parties to the dispute, as the Act leaves them a certain amount of discretion in this respect. (Cichobłaziński 2010)
 6. If, as a result of the mediation procedure, a protocol of discrepancy is drawn up, the parties to the dispute have two options. One is arbitration conducted before the Social Arbitration Board, and the other is a strike. The first solution is rarely used because the judgment of the board is binding on the parties if they so agree. In turn, a strike requires satisfying additional requirements, the most important of which is the strike referendum.

Conflicts in health care

The most important type of conflict referred to in the context of public health care is the conflict that arises between the service provider and the payer, i.e. the National Health Fund [NFZ]. The negotiations between the managers of health care institutions and the NFZ officials are among the most difficult due to the very unequal bargaining power of the parties. Sometimes, the position of the National Health Fund in negotiations with health care institutions is referred to in relevant literature as a quasi-market position (Panteli, Sagan 2011). This position is also referred to as monopsony (Mądrala 2013).

Conflicts of interest between health care institutions and the National Health Fund cannot cause collective disputes directly but have a huge indirect impact on their course. Collective disputes most often concern remuneration, and these will depend to a large extent on the results of the negotiations with the NFZ. The relations between the trade unions and the employers are extremely important in light of organizational effectiveness in public health care. However, these are very difficult and complicated. This state of affairs has several causes. In this sector, direct employers, i.e. managers who are legally a party to a collective dispute and a partner for trade unions, have limited influence on the budget, as it is passed by the controlling entity - city or voivodship self-government authorities. The managers have a certain budget approved by the ownership body and cannot freely raise wages without violating budgetary discipline. Therefore, the employer's discretion is very limited, especially in financial matters, which are most important to trade unions. This causes a number of difficulties and non-standard actions by trade unionists.

The second aspect of collective labour relations in health care that proves their specificity is the relatively large number of trade unions operating in this sector. In addition to NSZZ "Solidarność", with the National Secretariat for Healthcare representing all health care workers, there are also trade unions such as: the National Trade Union of Nurses and Midwives, the National Trade Union of Midwives, the National Trade Union of Administration and Service Employees of the Health Service (all associated in the Trade Union Forum). Moreover, in many health care units, especially hospitals, there are trade unions established exclusively by the employees of that very unit. All of this makes the negotiations often extremely complex, as there are many trade unions participating. The specificity of labour

conflicts in public health care is also due to the character of the work in this sector. Healthcare professionals follow a code of ethics that puts the patient's best interests first. Therefore, strikes in health care occur less frequently than in other organizations, and if they do occur, they are often more like protests than strikes typical in, for example, industry. Of course, there are strikes *sensu stricto*, but even in such cases, the strikers provide care for the sick for the duration of the strike. (Cichobłaziński 2014; Albrychiewicz-Słocińska 2021)

4. Case study – Methodology and Data Analysis

The mediations in question took place at the Provincial Specialist Hospital in central Poland, employing approximately 1,000 employees. The employer was represented by the hospital director accompanied by the head of the personnel department, the chief accountant and a legal advisor. The trade unions consisted of several trade union organizations operating on the hospital's premises. Apart from the largest organization i.e. NSZZ "Solidarność", the mediation was also attended by the Trade Union of Nurses and Midwives, the Union of Medical Analysts and the trade union of employees of the hospital in question. In the negotiations with the employer, the union side was represented by the president of the largest union, that is NSZZ "Solidarność". There were three mediation sessions at intervals of several days.

The mediations concerned the following issues:

1. Introducing new regulations regarding remuneration.
2. Awarding Hospital employees with bonuses for the previous year under the Bonus Regulations, i.e. 5% of the personal wage bill and payment of these arrears to employees.

It should be emphasized that certain employees took legal action, wanting to obtain due pay raises, but not all of them wanted to expose their employers to court proceedings, and therefore the trade unions wanted to resolve the matter systemically. The mediator was proposed by the trade unions, but the employer approved. The unions asked the Ministry of Labour and Social Policy to appoint a mediator, and the Ministry did as requested. On the first day, the mediator interviewed each party to the dispute separately. The employer presented their position, blaming the trade unions for the dispute. The director of the hospital refused to comply with the demands, arguing that there was a new regulation under which the thirteenth salary was to be paid within the guaranteed funds. Moreover, the employer argued that a new remuneration regulation was being prepared, which was to be presented to the unions shortly. The employer tentatively agreed to begin talks on the same day. However, due to the absence of some persons, these talks were postponed to the next week with the approval of the trade unions.

The second meeting was already a tripartite one. The union side was represented by the president of the largest union operating in the hospital and two members of the Works Council, and the employer's side was represented by the hospital's director, attorney-at-law and chief accountant. After the routine commencement of the meeting by the mediator, consisting in explaining to the parties the rules of mediation and the role of the mediator, the chairman of the workplace trade union organization was the first to speak. The talks took place in an atmosphere of increasing hostility. After less than thirty minutes, the parties stopped listening to one another and the talks focused only on personnel issues and allegations regarding previously unregulated problems. The current substantive issues have not only been relegated to the background, but have ceased to be the subject of analysis at all. Attempts by the mediator to break the deadlock, consisting mainly in reducing the level of agitation and later even aggression, were unsuccessful. This was reflected, among others, in the protocol of discrepancies, in which "the employer undertakes to negotiate an increase in remuneration at

a time when the interpretation of the relevant legal provisions is known and when he obtains funds as a result of renegotiating the contract with the National Health Fund".

In response, trade unions stated that "it is possible to start determining the amount of pay rises now" and that "proposals for salary increases should be prepared by the employer and presented to the trade unions for approval". The employer replied that it was not possible, because they did not have the data that, at that time, would allow for an adequate assessment of the hospital's future financial situation, and any provisions passed now will have to be respected later, regardless of the financial capacity of the hospital.

The mediations ended with a discrepancy protocol. However, the parties reached an agreement on one point. It was a matter of the annual salary, i.e. the "thirteenth salary" that the employer agreed to pay.

5. Case study – Discussion

When analysing the presented case, attention should be paid to the specificity of collective disputes in health care. Solving them using the mediation procedure is fundamentally different from similar actions taken in other organizations, such as in enterprises. The conducted analysis allows to distinguish the following issues:

1. Conducting mediation in an institution whose budget depended on the controlling authority (in this case, the voivode) was difficult due to the limited resources available to the organization for distribution. The employer was limited by the size of the budget received from the controlling authority. Secondly, the employer was also limited during negotiations with the recipient of services (the NFZ), acting as a monopsony in the negotiations with health care units. (It should be added that in such a situation the trade unions are resorting to accusing the management of the inability to negotiate with the NFZ. This argument is most often of a personal nature and cannot be verified.)
2. In such circumstances, we can point to the unwillingness to cooperate, resulting from the lack of trust (otherwise based on real premises) in possible agreement. Lack of "faith" is nothing but a low level of trust. The second variable negatively influencing the possibility of reaching an agreement was the high level of reluctance between the parties, especially between the president of the trade union and the hospital director. In such circumstances, the mediator could not influence the parties to change the way they communicated. Even individual sessions, during which the parties did not show a willingness to cooperate, did not help, much like during the tripartite meetings. Only the level of negative emotions was lower.
3. In such situations, mediation very often serves as a tool for trade unions to put pressure on the founding body to increase the budget, and if this is impossible, at least to change the director. Such attempts take place despite the fact that the change of the employer - under the Act on Resolution of Collective Disputes - may not be the subject of a dispute.
4. In undertaking his mission in these circumstances, the mediator can only ensure that the negative result of mediation is achieved at the lowest possible cost in the form of destruction of mutual relations between the parties to the dispute, which are already very bad anyway.

6. Conclusions

The specificity of collective labour relations in public health care outlined above highlights the need to develop a special approach to resolving them, especially at the stage of the mediation procedure. A mediator in health care does not only face a conflict of interest between the employer and employees represented by trade unions. Such disputes are conditioned by many factors not found in other sectors of the economy, e.g. in the industry. These include the interests of actors such as the state with its legislation, founding bodies in the form of local governments, a large number of professional groups with various interests, and a particularly important actor in this complex system of interests - the patient.

References

- [1] Albrychiewicz-Słocińska, A. (2021). Knowledge and Medical Worker Health Security Management During a Pandemic COVID-19. *Proceedings of the 22nd European Conference on Knowledge Management ECKM 2021*. eds.: A. Garcia-Perez and Lyndon Simkin, Reading, UK: Academic Conferences International Limited, 20-28. DOI: 10.34190/EKM.21.072
- [2] Cichobłaziński, L. (2014). Zarządzanie konfliktem w ochronie zdrowia na przykładzie mediacji w sporach zbiorowych. *Przegląd Organizacji* no. 9, 19 – 25.
- [3] Cichobłaziński, L. (2010). *Mediacje w sporach zbiorowych*. Częstochowa: Wydawnictwo Politechniki Częstochowskiej.
- [4] Deutsch, M. & Coleman, P.T. (2000). *The Handbook of Conflict Resolution. Theory and Practice*, San Francisco: Jossey Bass Inc. Publishers, Polish edition, (2005) *Rozwiązywanie konfliktów. Teoria i praktyka*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
- [5] Gilejko L. (1994) *Spółeczeństwo a gospodarka. Socjologia ekonomiczna*. Warszawa: Szkoła Główna Handlowa.
- [6] Mądrała, A. (ed.) (2013). *System ochrony zdrowia w Polsce. Diagnoza i kierunki reformy*. Warszawa: Akademia Zdrowia 2030. http://www.pracodawcyrp.pl/download/gfx/kpp/pl/defaultaktualnosci/14/1275/1/system_ochrony_zdrowia_akademia_2030.pdf Mucha, J. (2014). *Socjoterapeutyczne aspekty zarządzania sytuacją konfliktową w wymiarze jednostkowym i społecznym. Kilka uwag wprowadzających*, [in]: *Rozwiązywanie sytuacji konfliktowych w wymiarze jednostkowym i społecznym* (ed.) M. Plucińska. Poznań: Wydawnictwo Naukowe Wydziału Nauk Społecznych Uniwersytetu im. Adama Mickiewicza w Poznaniu, 15-16.
- [7] *Negocjacje i rozwiązywanie konfliktów – Harvard Business Review* (2005). Gliwice: Wydawnictwo Helion.
- [8] Organ D.W. & Bateman T.S. (1991). *Organizational Behavior*. Boston: IRWIN.
- [9] Panteli, D. & Sagan A. (eds.) (2011). Poland Health Care Review, European Observatory on Health Systems and Policies. Health System in Transition Vol. 13, http://www.euro.who.int/__data/assets/pdf_file/0018/163053/e96443.pdf

Developing a Sustainable Agricultural System in the Context of Sustainable Development Goals and Demands in Germany

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Abstract

Agriculture is one of the areas that is significantly contributing to deepening environmental problems and the environmental crisis itself. Therefore, the need to transform agriculture into a sustainable one is still very relevant. The international community has already confirmed this position, as well as the need to transform agricultural systems across the globe, by adopting the 2030 Agenda and the Sustainable Development Goals (SDGs). By this, countries have committed themselves to active solutions at national levels in order to come as close as possible to achieving this ambition. The aim of this paper is to examine in particular the Goal 2 "Zero Hunger" and to look more closely at the commitments that countries in the global community have made. The main part of this paper is then to examine and analyse how these commitments to transform agriculture into a sustainable one have been reflected in the national policies of Germany as a country that is one of the most important agricultural countries in the world and thus potentially one of the biggest environmental harms in this context. Our study will present particular steps and actions taken by the country since 2015 and will assess how the 2030 Agenda's agricultural intent has been fulfilled so far by this country in the almost 7 years since the adoption of the SDGs.

Keywords: 2030 Agenda, Germany, SDGs, sustainable agriculture, sustainable development

JEL Classification: Q01, Q15, Q18

1. Introduction

Sustainable development (SD) is an increasingly relevant and important concept that is gaining a growing position throughout the international community. A number of problems have already taken on a global character and threaten the whole world, but to different levels and in varying strengths. One of these problems is the growing population and the need to feed an increasing number of people, on the one hand, and the environmental crisis, on the other. This is why, particularly over the last two decades, there has been an increasing effort to develop and implement global rules and goals to promote and ensure sustainable development, combined with sustainable agricultural production and environmental protection. However, this is not an easy task. The aim of the international community is therefore to find a way how to solve or at least mitigate the aforementioned problems, as well as to achieve sustainability in development and to preserve the world in an appropriate form for future generations. However, industrial agriculture is a significant factor in intensifying a number of environmental problems and it is a major contributor to pollution, which needs to be dramatically reduced in order to bring the world closer to sustainability. In this respect, the concept of sustainable agriculture and its promotion and implementation in particular countries is becoming increasingly important as *"the growing sociocultural burden of nature connected mainly with the development of consumption economy seriously threatens lives of future generations"* (Svitačová & Moravčíková, 2017, p.196).

Due to the urgency of the situation and the failure of previous sustainable strategies, the international community has collectively and unanimously adopted the 2030 Agenda for Sustainable Development (UN, 2015c) together with the new Sustainable Development Goals – SDGs (UN, 2015b) and set clear ambitions on how to achieve sustainability, not excluding the support of sustainable agriculture. The situation is more complex in less developed countries because, although they contribute much less to global problems than more developed countries, they suffer more from their consequences. They are also mostly more populated, so they are dependent on agriculture, thus its transformation to sustainable one is necessary to protect the environment. However, we also know many developed countries in the world that are among the global leading countries in agricultural production, and therefore, even in these countries, the transformation of agriculture is actually even more urgent. The reason is that we assume that these countries, despite being less populated than most developing countries, by their share of agricultural production and their use of various environmentally harmful techniques and facilities, pose a much greater threat to the environment. The responsible approach of governments and applying effective solutions to adapt to the 2030 Agenda and SDGs is of crucial importance in this case. However, the dissemination of knowledge in the field of agriculture and sustainable development has also attained considerable importance, as has the promotion of young people in the field of agriculture and a real effort by all those involved, so that the objective can be effectively achieved.

The aim of this paper is to examine the term sustainable agriculture and in particular Goal 2 "Zero Hunger" (The Global Goals, 2022), as well as to look more closely at the commitments that countries in the global community have agreed on. The main part of this paper is then to examine and analyse how these commitments to transform agriculture into a sustainable one have been reflected in the national policies of Germany as a country that is one of the most important agricultural countries in the world and thus potentially one of the biggest environmental harms in this context. Our study will present the development actions taken by the country since 2015 and will assess how the 2030 Agenda's agricultural intent has been fulfilled so far by this country in the almost 7 years since the adoption the SDGs.

1.1 Sustainable agriculture and the concept of sustainable development

The concept of sustainable development – which means the “development that enables to meet the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p.43) – is becoming increasingly important, and have led to ever more sophisticated strategies for achieving it at the level of the international community, but also particular countries. The issue of sustainable development has undergone a considerable evolution since it was first defined. It is now represented by various international documents, and in particular by the 2030 Agenda for Sustainable Development (United Nations Knowledge Platform, 2015) and Sustainable Development Goals (SDGs) as part of it, which draw together all the experiences from previous successful and unsuccessful efforts in achieving it. Those were adopted by the international community in September 2015. The 2030 Agenda and 17 goals with 169 targets (see Figure 1) reflect the world community's efforts to achieve sustainable development and, currently they represent one of the highest priorities for the world. In their content, the SDGs are defined in a quite detailed way and each one is strongly linked to the biggest challenges, which influence (although differently) all the countries of the world.

SUSTAINABLE DEVELOPMENT GOALS



Figure 1: Sustainable Development Goals

Source: UN, 2015a

When we look at the issue of sustainable development and the particular goals, based on the current and most significant global problems of mankind, we can see that the environmental problems can be considered to be the most critical ones today. Many of these problems are greatly intensified by industrial agriculture. Therefore, there is a strong emphasis on transforming agriculture into a sustainable one, and this specifically represents the content of the SDG 2 (Zero hunger); as well as to achieve food security, improve nutrition, and promote sustainable agriculture. Particularly important is the target 2.4 – *By 2030, ensure sustainable food production systems and adopt resilient agricultural practices that increase productivity and production, help sustain ecosystems, strengthen adaptive capacity to climate change, extreme weather, drought, floods and other disasters, and progressively improve soil and land quality* (UNDP, 2015). Within this also the **Indicator 2.4.1** – Proportion of agricultural area under productive and sustainable agriculture is important. The basis of this indicator is to measure the progress in reaching more productive and sustainable agriculture. It is made up of relevant sub-indicators that should provide governments with strategic information for evidence-based policies. This indicator was developed through a multi-stakeholder process involving statisticians and technical experts from particular countries, international organisations, national statistical offices, civil society, and the private sector. It brings together the issues of productivity, profitability, resilience, land and water, decent work, and well-being to reflect the multidimensional dimension of sustainable agriculture (FAO, 2022b).

1.1.1 The importance of sustainable agriculture

Agriculture changed its character especially after World War II. Modern technologies, mechanisation, the use of chemicals, specialisation, and a policy that favoured the maximisation of production emerged. Industrial agriculture produces huge quantities of food at low prices. However, this is only possible through the practices that endanger the environment, health, rural communities, animals, etc. We agree with the opinion that the global environmental crisis as a whole is a consequence of the human strategy of overproduction, accumulation and consumption, the implementation of which is now reaching the limits of natural resources and nature's ability to absorb the pollution created by this overproduction and consumption (Sťahel, 2016). Thus, despite the positives of industrial agriculture, there are significant associated costs that affect the possibility of reaching SD. The most serious impacts of industrial agriculture on the environment are: depletion of topsoil, contamination of groundwater, degradation of rural communities, worsened conditions for farm workers, increased production costs, etc. Sustainable agriculture not only addresses many environmental and social issues, but offers innovative and economically viable opportunities for farmers,

workers, consumers, policy makers, and many others throughout the food system to grow their crops and produce (UC Davis, 2021). Therefore, today we can see the promotion of "apparent changes in land use and the impact of human activity on the planet's ecosystem and the limitations of human activity that result from the limits of the system" (Šeben-Začková, 2015, p.1144).

Especially in recent decades, the increase in world population and the consequent growth in demand for animal products has led to the intensification of farming systems, which leave a huge footprint and cause considerable environmental harm. Sustainable agriculture and food production systems that promote climate-resilient and environmentally friendly practices have significant potential to preserve our valuable natural resources. By following simple practices such as nutrient recycling and not using agricultural chemicals, sustainable farming systems can have a wide reach, allowing countries to feed a growing population without causing irreversible environmental change (Friend of the Earth, 2022b). The basic principle of sustainable agriculture is to maintain a balance between the demands of food production and the preservation of the environment. Sustainable agriculture is therefore a type of agriculture that focuses on the production of sustainable agricultural products without compromising the ability of present or future generations to meet their needs. Furthermore, the use of sustainable agriculture standards and certificates is important here as it is a way of communicating to customers that a product is sustainably produced or grown (Friend of the Earth, 2022a).

Thus, in the areas of food security, nutrition, land degradation, desertification, and drought, a strong SDG on food security and agriculture was considered to be crucial to poverty eradication and achieving sustainable development (*UN Sustainable Development, 2015*). In this respect, within the SDG 2 we can also find a specifically described topic about "Food security and nutrition and sustainable agriculture". To achieve this, it is really important that agriculture systems globally become more productive and less wasteful. Land, healthy soil, water, and plant genetic resources are key inputs for food production and their increasing shortage requires their sustainable use and management. For example, the restoration of degraded land through sustainable agricultural practices would reduce the pressure to cut down forests for agricultural production. Similarly, the potential benefits of soil restoration for food security and climate change mitigation are huge. Moreover, traditional knowledge of farmers can support productive food systems through wise and sustainable management of soil, land, water, nutrients, and greater use of organic fertilizers (UN, n.d.). Reducing food waste is also key to ensure food security and sustainable agriculture. Because the more food people waste, the more needs to be produced, which puts a burden on soil, water, and ecosystem resources (*UN Sustainable Development, 2015*). Last but not least, it is the high intention of countries and the whole global community to increase investments in research, development, and technology demonstration to improve the sustainability of food systems worldwide (UN, n.d.).

We agree that industrial agricultural production is highly unsustainable in the context of environmental impact. Thus, the above-mentioned problems in this area can be mitigated through the following principles to guide the strategic development of new approaches and the transition to sustainability:

- 1) Improve efficiency in the use of resources;
- 2) Direct action to conserve, protect and enhance natural resources;
- 3) Promote agriculture that protects and improves rural livelihoods and social well-being;
- 4) Promote agriculture that enhances the resilience of people, communities and ecosystems, especially to climate change and market volatility;

5) Good governance is essential for the sustainability of both the natural and human systems (FAO, 2022a).

In general, the concept of sustainable agriculture integrates several main objectives – environmental health, economic profitability, social and economic justice. Achieving the goal of sustainable agriculture is the responsibility of all actors in the system. Every person involved in the food system can play a role in ensuring a sustainable agricultural system (UC Davis, 2021). In this context, sustainable agriculture in its simplest sense means the production of food, fibre, or other plant or animal products using agricultural techniques that protect the environment, people, and animals (Grace Communication Foundation, 2021).

Agricultural sustainability is a complex goal with all three dimensions of SD: environmental (good management of the natural systems and resources on which farms depend), economic (a sustainable farm should be a profitable enterprise that contributes to a strong economy), and social (it should treat its workers fairly and have a mutually beneficial relationship with the surrounding community). These include: building and maintaining healthy soils, wise water management, minimising air, water and climate pollution, promoting biodiversity, etc. By following these, farms can avoid harmful impacts without sacrificing productivity or profitability (Union of Concerned Scientists, 2021).

In the context of achieving sustainable agriculture, many new documents and standards have been adopted on international or national level. An important one is, for example, the 2020 Sustainable Agriculture Standard: Farm Requirements. We can agree that the need for sustainable agriculture has never been bigger. By providing a practical framework for sustainable agriculture and a devoted set of innovations, the farm requirements can help farmers develop better crops, adapt to climate change, increase their productivity, set targets for sustainable outcomes, and focus investments to address the biggest threats of the current world (Rainforest Alliance, 2022).

2. Data and Methods

The present work is based on qualitative research that draws on a theoretical analysis of the current status and prospects for achieving sustainable agriculture in the world and the goals that the international community has set and unanimously adopted for this purpose.

The study was carried out within the framework of the Erasmus+ KA2 Strategic partnership project SUSTA (2020-1-PL01-KA203-081980), which aims to create an involving concept of teaching sustainability for students of business related studies which will result in raising the awareness and involvement in the problems of sustainability. The aim of the research in the present study is to theoretically examine the main purpose, particular plans, and the possible outcomes in the direction of achieving sustainable agriculture aimed at significant reduction of the global environmental burden. Consequently, the study focuses on Germany as a highly developed country, which also belongs to the most important and largest agricultural entities in the global community. The next step is then to examine how this country has changed its agricultural practices since 2015 and the adoption of the 2030 Agenda, and how it is progressing towards the SDG 2 Zero Hunger (End hunger, achieve food security and improved nutrition and promote sustainable agriculture).

For this purpose, we used several scientific methods. First, we aimed to map, describe, and identify the importance and essence of sustainable agriculture concept generally and within the 2030 Agenda, as well as the set global goals for achieving sustainable development adopted within this agenda. We then explored, analysed and identified specific mechanisms to promote sustainable agricultural practices in Germany, as one of the most important agricultural

countries globally, as well as the mechanisms that the country has adopted and implemented since 2015 and the adoption of the SDGs.

The results allowed us to assess the current state of the analysed area towards a realistic and effective implementation of SDG 2 in particular and the achievement of sustainability in agriculture, which is still one of the most important priorities towards reducing global environmental burdens and pollution.

For our scientific interest, we chose to work with the most commonly used worldwide scientific information databases and search engines, such as Google Scholar, SCOPUS, Web of Science and ResearchGate, as well as other available resources, especially the websites and data of the United Nations and various other global organizations focused on sustainable development and the sustainable agriculture model, as well as databases and websites containing information and data on Germany, its political practices and regulations set up to achieve sustainability in agriculture related to the SDGs.

3. Results and Discussion

According to BMEL (Federal Ministry of Food and Agriculture), Germany while being a land of engineering ingenuity and industry, has always maintained a strong agricultural sector. Despite a high population density, half of the land is farmed. Almost a million workers produce goods worth more than 50 billion euros a year in around 275,400 agricultural enterprises (BMEL, 2022a; BMEL, 2020c). The way in which agriculture and forestry (on more than 80% of land) are operated has a major impact on nature and the environment (BMEL, 2020b). Germany's farming sector is among the four largest producers in the EU, mainly due to animal husbandry. In order to feed the livestock (over 200 million animals), more than 60% of agriculturally used land is utilized for growing nourishment for them. Some of these and other crops are also dedicated to the production of renewable energy (BMEL, 2022a; BMEL, 2020c). Germany has for many years been the world's third largest exporter of agricultural goods, while one third of the agriculture goes into exports, and the food industry generates one third of its total revenue in export activities (BMEL, 2020a).

The national Sustainable Development Strategy of Germany (GSDS) created in 2002, with measures adopted in 2010 and regularly updated (indicators every two years and progress reports every four years), was radically revised in 2016 to align it with the 17 SDGs of the Agenda 2030, with additions and updates in 2018 and 2021 in response to the COVID-19 pandemic (The Federal Government, 2021b). Even before this agenda was adopted in 2015, the German Government was working on making the transformation of the agricultural and food sector more sustainable. Examples in agriculture include the development of strategies for arable and livestock farming, amendments to the Fertiliser Application Ordinance, the Strategy for the Future of Organic Farming, and the ongoing changes to the EU's Common Agricultural Policy (The Federal Government, 2021a, p.58).

The Federal Statistical Office (Destatis – Statistisches Bundesamt) evaluates the progress of GSDS national and international measures on the basis of 65 indicators and the country's sustainable development policy is regularly monitored by an international group of experts by peer review (Zech, 2019). In March 2021, Destatis checked to what extent the Federal Government achieved its goals for 2020. In the 72 DNS target areas, twelve goals were to be specifically achieved by 2020 (Destatis, 2021). In July 2021, Germany reported to the United Nations High-Level Political Forum on Sustainable Development (HLPF) on its national activities to implement the 2030 Agenda based on the GSDS (The Federal Government, 2021c). The new GSDS was refined assisted by all ministries and the public was involved

through an extensive dialogue process during several months. The updated strategy introduced six decisive transformation areas on which future sustainability politics will focus, including sustainable agri-food systems. Transformative measures have been established in this area, including soils and forests acting as carbon sinks, the 2035 arable farming strategy and the organic farming future strategy among others (BMEL, 2022a).

Within the focus of SDG 2, it is covered in the GSDS by three indicators in two categories (see Table 1 and details below; The Federal Government, 2021d).

Table 1: Indicators of SDG2 within GSDS

Field	Category	Indicator
Field 2.1	Farming (Environmentally sound production in our cultivated landscapes)	2.1.a Nitrogen surplus in agriculture
		2.1.b Organic farming
Field 2.2	Food security (Realising the right to food worldwide)	2.2 Support for good governance in attaining appropriate nutrition worldwide

Source: based on The Federal Government (2021d), Destatis (2022), The Federal Government (2021a)

Within initiatives for responsible agriculture, the GSDS sets a target of reducing the nitrogen surplus (which contaminates soils and groundwater) on agricultural land to 70 kilograms per hectare per year by 2030 (Umwelt Bundesamt, 2021). However, this development is heading in the wrong direction based on the GSDS update 2021, although the fertiliser legislation was already tightened in 2017 and further steps were taken in 2019 (BMEL, 2020b).

Organic farming, along with conventional farming, is considered an important pillar of the country's agricultural and food industries. The Federal Ministry of Food and Agriculture has therefore developed the Strategy for the Future of Organic Farming, which is to be used as a guideline to significantly improve the development opportunities for organic farming and food management and thus enabling also the participation of domestic agriculture in market opportunities (BMEL, 2020c). Although over the past few years the share of organically farmed area has steadily increased, its rate has not been fast enough (in 2020, only 9.6% of utilised agricultural land was farmed organically). In this case, the target of increasing the share to 20% by 2030 might not be achieved (BMEL, 2020b), therefore 24 measures along five pivotal lines of action are being implemented (designing a viable and coherent legislative framework; facilitating access to organic farming; fully utilizing the demand potential and expanding it further; improving the productivity of organic farming systems, and rewarding environmental services adequately (BMEL, 2020c).

As for food security, funds disbursed for the application of the guidelines and recommendations of the UN Committee on World Food Security (CFS) are to be increased appropriately as a percentage of total spending on food security by 2030 (The Federal Government, 2021a).

Agricultural production is also reliant on the availability of land. The GSDS goal of reducing daily land-take to less than 30 hectares by 2020 has so far been missed by a wide margin (currently at more than 50 hectares a day). Soil regeneration should also be promoted by means of appropriate funding (ZKL – Commission on the Future of Agriculture, 2021). In 2019, the European Commission's (2020) Farm to Fork Strategy set an ambitious target for 2030 of reducing nutrient losses by 50% and fertiliser quantities by 20% while maintaining soil fertility

levels (ZKL, 2021). The aim of the Federal Conservation Act in conjunction with the GSDS is therefore to reflect the special importance of soil (BMEL, 2020b).

The biodiversity and quality of life indicator surveyed as part of the GSDS is still far from the targeted 100% for 2030 for agricultural landscapes and currently stands at 59.2% (ZKL, 2021). On the other hand, among the renewable energy resources, bioenergy continues to play an important role (in 2019, about 15% of the primary energy used in the country originated from renewable energy resources). Of this, bioenergy alone supplied around 58%. It is forecasted that bioenergy from domestic sources alone would have sustainable potential to provide 17% of Germany's primary energy in 2050 (BMEL, 2020c).

4. Conclusion

We can summarize that there is high pressure for countries all over the world to transform their agricultural practices into sustainable ones. The international community have agreed on 17 SDGs and one of those is necessarily aimed at implementing sustainable agriculture in practice, with several particular targets to be achieved within this objective. Those are prepared and described in detail and represent the task and responsibility for each country. However, they have even greater importance when we are talking about the greatest agricultural countries in the world (including Germany), as those are harming the environment through industrial agricultural practices the most.

As for lessons learned, areas requiring action and anticipated priority areas, the Arable Farming Strategy (for making arable farming sustainable) and intensified efforts to make the transition to organic farming are identified as key ones by the German Government. On several requirements for the accelerated achievement of targets, there is added urgency due to the COVID-19 pandemic to combine economic recovery measures with specific actions, in order to foster the development of multi-stakeholder partnerships as well as to promote organic farming worldwide. The GSDS is designed to be continuously revised and further developed. The concept provides guidelines for viable policies for the future across the board. The ambitious update in 2021 adopted by the Federal Government was an important step for German sustainable development policy, as it clearly defines priority spheres of action in six areas of transformation. By late 2023/early 2024, it should be comprehensively updated in a process involving all society stakeholders.

The implementation of sustainable agriculture requires new efforts in development, research, and also implementation. One of the most important in this regard is specialized and wise management as well as commitment at the highest government levels. This must be connected with an action programme that addresses the needs of agricultural producers and farmers in the context of the environment and public awareness. There is a great need to promote sustainable agriculture, to create a market for sustainable food and to formulate demands for the reform of agricultural policy and regulation. Defenders of industrial agriculture claim that only this type of agriculture can feed such a huge world population, but this is not entirely true. According to the data and analyses, proper implementation of sustainable agriculture practices can be more effective in achieving this goal and can also protect and sustain the environment. It is therefore necessary to promote the dissemination of knowledge and information about this new strategy among people, groups, entire nations, and their decision-making bodies and adapt the national policies of particular countries to achieve this goal commonly in the highest extent as possible.

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References

- [1] BMEL. (2020a). *Facts and figures on German agricultural exports*. Retrieved from <https://www.bmel.de/EN/topics/international-affairs/foreign-trade-policy/facts-figures-german-agricultural-exports.html>
- [2] BMEL. (2020b). *Responsibility for Sustainable Development: Strategies for Food, Agriculture and Rural Areas*. 36 p. Retrieved from <https://www.bmel.de/SharedDocs/Downloads/EN/Publications/responsibility-for-sustainable-development.html;jsessionid=3D6C6DCEDE36604BB2707AAE755D8B72.live922>
- [3] BMEL. (2020c). *Understanding Farming: Facts and figures about German farming*. 36 p. Retrieved from <https://www.bmel.de/SharedDocs/Downloads/EN/Publications/UnderstandingFarming.html>
- [4] BMEL. (2022a). *Agenda 2030*. Retrieved from https://www.bmel.de/EN/topics/international-affairs/agenda-2030/agenda-2030_node.html;jsessionid=6E60E81CFB3BA9F62EEC339E3CCA52B9.live842
- [5] BMEL. (2022b). *Farming*. Retrieved from https://www.bmel.de/EN/topics/farming/farming_node.html
- [6] Destatis. (2021). *Federal Government achieved four of its twelve sustainability goals for 2020*. Pressrelease #121 from 10 March 2021. Retrieved from https://www.destatis.de/EN/Press/2021/03/PE21_121_325.html
- [7] Destatis. (2022). *Indicators of the German Sustainable Development Strategy*. Retrieved from <https://sustainabledevelopment-deutschland.github.io/en/>
- [8] European Commission. (2020). *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system* (Communication of 20 May 2020), COM/2020/381 final.
- [9] FAO. (2022a). *Sustainable agriculture*. Rome: FAO. Retrieved from <https://www.fao.org/sustainable-development-goals/overview/fao-and-the-2030-agenda-for-sustainable-development/sustainable-agriculture/en/>
- [10] FAO. (2022b). *Sustainable Development Goals*. Rome: FAO. Retrieved from <https://www.fao.org/sustainable-development-goals/indicators/241/en/>
- [11] Friend of the Earth. (2022a). *Sustainable Agriculture*. Milan. Retrieved from <https://friendoftheearth.org/standards-and-certifications/certification-of-products-from-sustainable-agriculture/>
- [12] Friend of the Earth. (2022b). *Sustainable farming*. Milan. Retrieved from <https://friendoftheearth.org/standards-and-certifications/certification-of-sustainable-farming-products/>
- [13] Grace Communication Foundation. (2021). *Sustainable Agriculture vs. Industrial Agriculture*. New York. Retrieved from <http://www.sustainabletable.org/246/sustainable-agriculture-the-basics>
- [14] Orth, M. (2019). *Ten facts about agriculture*. Retrieved from <https://www.deutschland.de/en/topic/environment/agriculture-in-germany-ten-facts>
- [15] Rainforest Alliance. (2022). *2020 Sustainable Agriculture Standard: Farm Requirements*. Retrieved from <https://www.rainforest-alliance.org/resource-item/2020-sustainable-agriculture-standard-farm-requirements/>
- [16] Šeben Zaf'ková, T. (2015). Global development education as a tool for professional development at faculties of economics. *ICABR 2015*. Brno: Mendel University, pp. 1143-1159.
- [17] St'ahel, R. (2016). Environmental Crises and Political Revolutions. In Arnason, J. P. – Hrubec, M. *Social Transformations and Revolutions*. Edinburgh: Edinburgh University Press, pp. 99-120.
- [18] Svitačová, A. – Moravčiková, D. (2017). Environmental responsibility of young people in the context of globalizing culture and economy. *Zeszyty Naukowe Politechniki Śląskiej*, pp.191-199.
- [19] The Federal Government. (2021a). *German Sustainable Development Strategy – Update 2021*. 388 p. Retrieved from

- <https://www.bundesregierung.de/resource/blob/974430/1940716/6a4acf041217d39bac6a81cce971381f/2021-07-26-gsds-en-data.pdf?download=1>
- [20] The Federal Government. (2021b). *Germany's National Sustainable Development Strategy*. Retrieved from <https://www.bundesregierung.de/breg-en/issues/sustainability/germany-s-national-sustainable-development-strategy-354566>
- [21] The Federal Government. (2021c). *Making transformation happen – Outlook for German Sustainable Development Policy*. State Secretaries' Committee for Sustainable Development. 14 June 2021. 6 p. Retrieved from <https://www.bundesregierung.de/resource/blob/974430/1939518/622a112ddc34ad8d43ec287fd8b10cf2/perpektivenbeschluss-nachhaltigkeitspolitik-engl-data.pdf?download=1>
- [22] The Federal Government. (2021d). *Report on the implementation of the 2030 Agenda for sustainable development. German Voluntary National Review to the HLPF 2021*. 144 p. Retrieved from https://sustainabledevelopment.un.org/content/documents/279522021_VNR_Report_Germany.pdf
- [23] *The Global Goals*. (2022). *2 Zero Hunger*. Retrieved from <https://www.globalgoals.org/2-zero-hunger>
- [24] UC Davis. (2021). *What is Sustainable Agriculture?* Davisville: University of California. Retrieved from <https://sarep.ucdavis.edu/sustainable-ag>
- [25] Umwelt Bundesamt. (2021). *Stickstoffeintrag aus der Landwirtschaft und Stickstoffüberschuss*. Retrieved from <https://www.umweltbundesamt.de/daten/land-forstwirtschaft/stickstoffeintrag-aus-der-landwirtschaft#stickstoffuberschuss-der-landwirtschaft>
- [26] *UN Sustainable Development*. (2015). *Food Security and Nutrition / Sustainable Agriculture*. New York: United Nations. Retrieved from <https://sustainabledevelopment.un.org/index.php?page=view&type=9502&menu=1565&nr=1>
- [27] UN. (2015a). *Sustainable Development Goals (SDGs) and Disability*. New York: United Nations. Retrieved from <https://www.un.org/development/desa/disabilities/about-us/sustainable-development-goals-sdgs-and-disability.html>
- [28] UN. (2015b). *The 17 Goals*. New York: United Nations. Retrieved from <https://sdgs.un.org/goals>
- [29] UN. (2015c). *Transforming our world: the 2030 Agenda for Sustainable Development*. New York: United Nations. Retrieved from https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E
- [30] UN. n.d. *Food security and nutrition and sustainable agriculture*. New York: UN. Retrieved from <https://sdgs.un.org/topics/food-security-and-nutrition-and-sustainable-agriculture>
- [31] UNDP. (2015). *Sustainable Development Goals*. New York: United Nations Development Programme. Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html>
- [32] Union of Concerned Scientists. (2021). *What is Sustainable Agriculture?* Cambridge: UCS Organization. Retrieved from <https://www.ucsusa.org/food-agriculture/advance-sustainable-agriculture/what-is-sustainable-agriculture#.WmXRnXkViUk>
- [33] World Commission on Environment and Development. (1987). *Our Common Future*. Oxford: Oxford University press.
- [34] Zech, T. (2019). *17 goals for a better world*. Retrieved from <https://www.deutschland.de/en/topic/environment/germanys-sustainable-development-strategy-national-and-global-goals>
- [35] ZKL. (2021). *The Future of Agriculture – A common agenda*. 136 p. Retrieved from <https://www.bmel.de/SharedDocs/Downloads/EN/Publications/zukunftskommission-landwirtschaft.html>

The Potential of Energy Recovery of Waste in EU countries in Sustainable Waste Management

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Abstract

This paper provides an overview of waste management and its importance in waste management in the EU. High waste production has long been a global problem. Sustainability is currently a critical goal of human activity and development of countries. The increasing population and waste generation without the proper measures of waste mitigation lead to the major challenge of environmental sustainability. Energy sustainability is important for any plans that concern overall sustainability in the future. Any form of development can only be sustainable if the waste it generates does not accumulate, but is properly recovered. Strategies to achieve this goal have included attempts to obtain energy from waste. In the first part of paper we discuss the importance of sustainable waste management, issue of sustainable energy recovery from waste, the advantages and disadvantages of selected waste management operation. In the second part of the paper, we paid attention to the analysis of waste management as an energy source in selected countries of European Union and the potential of this method of waste management.

Keywords: energy recovery, sustainability, waste, waste management, rationality, consumer behaviour

JEL Classification: O13, M30, Q40

1. Introduction

Waste management has become the focus of European Union environmental policies since the 1970s. In terms of resource use, their goal is to become the most efficient economy in the world through the set strategic goals, which want to work towards more sustainable patterns of production and consumption with regard to those resources and waste production that have negative impacts on the environment (Báreková, 2014). The aim of the current European Union directives on waste management is to promote the prevention and generation of waste and the application of the waste hierarchy: preparation for re-use, recycling, other recovery (energy recovery), disposal (Pires & Martinho 2019).

The increasing production of waste can be considered as an opportunity for sustainable development in European Union countries (Zhoud & Zhang, 2022). End users or consumers are the starting point where waste starts its journey into several paths within the circular economy, such as repair, reuse, remanufacturing, and recycling. It is also necessary to monitor consumer behavior, which can also be influenced in favor of sustainable waste management (Islam, et al. 2021). Food waste has a great significance in this context. Achieving food sustainability and reducing food waste are among the top challenges for achieving global sustainable development and waste management (Dinu, 2020).

The waste hierarchy is a key indicator of EU waste policy and legislation and a key to the transition to a circular economy. Its primary purpose is to prioritize that minimizes adverse environmental impacts and optimizes resource efficiency in waste prevention and management

(European commission, 2017). Waste generation has rapidly increased due to the worldwide population, urbanization, and industrialization. Waste management is a significant challenge for a society that arises local issues with global consequences (Khan, et al. 2022). The serious environmental impacts includes environmental contamination, methane gas generation which leads to global warming and other labour issues (Amulen et al. 2022). In the hierarchy of sustainable waste management, the energy recovery as part of a holistic solution will lead to a zero waste scenario (Zero Waste Europe, 2019). Redirecting the non-recyclable part of waste from landfills to a higher hierarchical level, such as recovery, is an energy tool for building an integrated waste management system (TASR, 2022).

Figure 1 presents that once reduction, reuse, and recycling have been deployed, the remaining waste should be processed for energy recovery. The energy recovery from waste is consistent with the hierarchy and provides an opportunity for additional recovery of materials such as aluminum, iron, copper. Reduce, reuse and recycle are generally recognized by the public, however, there is less awareness and knowledge of recovery of waste (Castaldi, 2021).

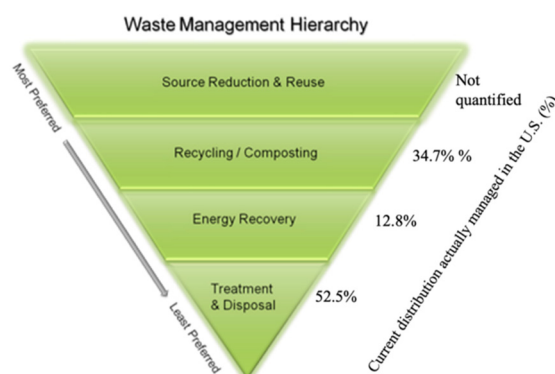


Figure 1: Waste management hierarchy
Source: Castaldi (2021)

1.1 Definiton of Waste

An important feature of people's use of natural resources is the production of waste. Every production and consumer activity is always associated with the production of waste. Waste is often characterized by a substance that cannot be reused for economic reasons. Although waste is defined as a substance that can be further recovered (Pánik & Jantová, 2019). Countries that seek to minimize waste generation should also pay more attention to promoting sustainable consumption. In addition, only recycling behavior has had a significant impact on waste reduction efforts, while resource efficiency attitudes have insignificantly determined all ways of managing waste, revealing that people in the EU lack knowledge of the relationship between waste reduction and recovery and recovery as a source of energy. The level of waste production depends mainly on economic development (Minelgaitė & Liobikienė, 2019).

Waste is not a substance or movable property that is a by-product, specific waste that has reached the end-of-waste status, waste that has undergone a process for preparation for re-use and meets the requirements for a marketed product set out in a special regulation, or waste handed over for domestic use. The waste is divided into:

- Biodegradable waste
- Biodegradable municipal waste
- Dangerous waste (European commission, 2017)

1.2 Energy recovery from waste

The main effort and premise of modern waste management, in addition to preventing waste and reducing the amount of waste deposited in landfills, is the use of raw materials and energy from waste. In this context, it is important to specify the so-called energy potential of waste, in this case municipal waste (Bilík et al. 2010).

Energy recovery is one of the circular economy solutions that can have economic, social, and environmental co-benefits through efficient use of natural resources, reduced emissions, job creation, and fostering innovation. As such, the emergence of the circular economy has changed the way governments think about waste (European Commission, 2017). The utilisation of energy recovery has become an integral part of sustainable waste management (Hasan et al. 2021).

Waste recovery for energy is an important part of a strong and sustainable waste management chain. Fully complements recycling. This chosen method of waste management is an economically and ecologically reasonable way to secure a renewable energy source and at the same time divert waste from landfills. Energy recovery from waste is one of the most robust and efficient energy options for waste generation and emission reduction as an alternative to fossil fuels (Babcock & Wilcox, 2022).

Energy recovery from waste is not a new concept, as it is an important area that requires serious attention. Various waste-to-energy technologies are available. However, the choice is based on the physico-chemical properties of the waste, both on the type and amount of waste available, as well as on the form of energy required. The conversion of solid waste into energy can take place through three main process technologies: biochemical extraction, thermochemical extraction and mechanical extraction (Hamad et al. 2014)

Energy recovery has the potential to become an important component in Europe's renewable energy sector (Scarlat et al. 2017). Energy recovery is not just a way of disposing of waste. It's a way to get valuable resources back. Today, it is possible to reuse 90% of the metals contained in the bottom ash. And the remaining clinker can be reused as road material. This waste recovery method prevents methane emissions from landfills, compensates for greenhouse gas emissions from fossil fuel power generation, recovers / recycles valuable resources such as metals, produces clean, reliable base energy and steam, and is a sustainable and stable renewable fuel source (compared to wind and solar energy) (Babcock, 2022).

Advantages of energy recovery of waste:

- obtaining the so-called "Alternative energy", which saves primary energy sources,
- the possibility of excluding mixed household waste from landfills,
- options for disposal of residual municipal waste (waste after separation of secondary raw materials and bio-waste),
- minimization of the volume of waste at final disposal (10-15% of ash remains from the waste),
- perfect waste sanitation,
- detoxification of organic pollutants (Jandačka et al. 2014).

Disadvantages of energy recovery of waste:

- the waste must be treated according to the technology used,
- in energy recovery of mixed and municipal waste it is necessary to ensure continuous measurement of the composition of the waste,

- investment-intensive additional equipment must be used for the disposal of harmful components of emissions (Jandačka et al 2014).

2. Data and Methods

The main aim of this paper is to evaluate the potential of waste as an energy source and to compare trends / developments and see if there is a difference in selected EU countries. To meet this goal, we will use selected statistical methods such as Shapiro-Wilk test, Kruskal Wallis test and Pairwise comparison of selected countries with Bonferroni correction.

Selected data show energy recovery of waste in Slovakia, the Czechia, Hungary and Austria for the period from 2012 to 2020. The data in the following table 1 are expressed in tonnes / capita. In this part of the paper, we paid attention to waste management and the use of waste as an energy source in selected EU countries.

Table 1: Energy recovery of waste in selected EU countries

TIME/COUNTRY	Czech R.	Hungary	Austria	Slovakia
2012	0,078	0,085	0,253	0,044
2013	0,078	0,096	0,252	0,049
2014	0,077	0,107	0,25	0,054
2015	0,078	0,097	0,247	0,071
2016	0,079	0,087	0,244	0,088
2017	0,084	0,085	0,243	0,088
2018	0,09	0,084	0,241	0,088
2019	0,09	0,078	0,24	0,097
2020	0,093	0,073	0,239	0,103

Source: Eurostat (2021)

3. Result and discussion

Table 2: Average abs.difference and Average growth rate

	Czech R.	Hungary	Austria	Slovakia
Average abs. difference t / capita	0,0019	-0,0015	-0,0018	0,0074
Average growth rate	1,0222	0,9812	0,9929	1,1122

Source: Author's calculations

The table 2. represent that the best disposal of waste for energy is in Austria , where the usability of waste is in the range of 0.239-0.253 tons per capita. Despite the highest values, the recovery of waste to energy per capita has a declining trend, similar to that in Hungary. In the country, there was an average year-on-year decrease of 0.0018 tons, respectively. 0.71%. Even worse is Hungary, which among the V4 countries started in 2012 at 0.085 tonnes / capita, but despite growth in 2013 and 2014, since 2015 it has gradually reached a downward trend of 0.073 tonnes / capita. and since 2018 it is the worst of the countries monitored. The most significant decline is recorded in the last 2 years. The average relative change represents a decrease of 1.88%. Slovakia represents a different picture. The country was the worst of the 4 countries monitored in 2012 (0.044 t / inhabitant), but it recorded a significantly growing trend and already in 2016 it was better than Hungary or the Czech Republic with a value of 0.103 t / inhabitant. In Slovakia, the average year-on-year usability increased by 7.4 kg or 11.22%, which is the fastest growth of all countries monitored. The country

has increased its usability more than 2.3 times. The most significant increase is in 2015 and 2016, when the country used 17 kg of waste per capita more than in the previous year. Higher usability also occurs in the Czech Republic, but not to the same extent as in Slovakia. The highest increase occurred in 2018, when 6 kg more waste was used per capita. Utilization increased by an average of 1.9 kg / inhabitant - 2.22%.

In this part of paper we compare trends/development to found out the difference between selected countries. For this reason, we have decided not to work with the original values, which may be influenced mainly by higher (Austria) or lower (Slovakia) values at the beginning of the observed period and not to take into account the development itself but to compare the average absolute differences. As we want to compare 4 averages of independent groups, the most appropriate method seems to be the analysis of variance, but this method is one of the parametric tests and assumes normality in each group.

Table 3: Shapiro-Wilkov normality test

Country	Shapiro-Wilk test for normality		
	Statistic	df	Sig.
Austria	0,782	8	0,018
Czech R.	0,896	8	0,268
Hungary	0,849	8	0,093
Slovakia	0,870	8	0,151

Source: Author's calculations

Table 3 shows that Shapiro Wilk's test did not confirm normality in the case of Austria, so we will use a non-parametric analogy of the one-way analysis of variance, which is the Kruskal Wallis test. The test, unlike the anova, compares medians.

Table 4: Kruskal Wallis test

	Null Hypothesis	Test	Sig.	Decision
1	The medians of absolute differences are the same in all countries.	Independent-Samples Kruskal-Wallis Test	0,0019	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is 0,05.

Source: Author's calculations

Based on the p value (<0.05) of the Kruskal Wallis test, which is represented in table 4, we can state that there are differences between countries in the trend of energy waste valuation - changes in countries vary.

Table 5: Pairwise comparison with Bonferroni correction

Sample1 - Sample2	Test Statistic	St. Error	Std. Test St.	Sig.	Adj. Sig.
Austria-Hungary	-1,562	4,665	-0,335	0,738	1
Austria-Czech R.	-10,5	4,665	-2,251	0,024	0,146
Austria-Slovakia	-15,438	4,665	-3,309	0,001	0,006
Hungary-Czech R.	8,938	4,665	1,916	0,055	0,332
Hungary-Slovakia	-13,875	4,665	-2,974	0,003	0,018
Czech R. - Slovakia	-4,938	4,665	-1,058	0,29	1

Source: Author's calculations

The table 5 shows that there are statistically significant differences based on the Bonferroni correction between Austria and Slovakia and Slovakia and Hungary.

While in Slovakia the trend is positive and the country increased the amount of waste used for energy in the years 2012-2020 by an average of 7.4 kg in Austria and Hungary the opposite trend occurs and the amount of waste used for energy production is declining. In Hungary, an average of 1.5 kg / capita per year. , in Austria even by 1.8 kg / inhabitant.

4. Conclusion

At present, we cannot separate the generation of waste from the existence of mankind. Its volume is mainly influenced by human activity such as production and consumer behaviour, maturity and lifestyle. It is important to monitor its development, structure, so that we can subsequently evaluate the waste, or even minimize its volume. Waste minimization is a new philosophy adopted by the European Commission along with the whole waste hierarchy.

The aim of this paper was to clarify the current issues of waste management and methods of waste recovery, namely the specific identification of waste as a source of energy. We also focused on waste management as an energy source in selected EU countries. Based on statistical methods, we found out what is the economic potential of waste as an energy source and the development of energy waste consumption in a selected period of time in the countries. Based on the results, we came to the conclusion that the largest energy recovery of waste is in Austria, although the trend is declining there, similar to Hungary, and the last place in energy recovery of waste is Slovakia. Although Slovakia is in last place among the selected countries, the growing trend is positive. In conclusion, it is clear that waste recovery is becoming increasingly popular in selected countries and is of importance. There is a need for EU citizens to be more informed and educated about waste management, waste management but also waste recovery in general.

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References

- [1] Amulen J., et al (2022). The potential of energy recovery from municipal solid waste in Kampala City, Uganda by incineration. *Energy Conversion and Management: X*, Volume 14, 100-204. <https://doi.org/10.1016/j.ecmx.2022.100204>
- [2] Babcock & Wilcox. (2022). What is Waste-to-Energy. Retrieved Feb. 13, 2022, from <https://www.babcock.com/home/renewable/waste-to-energy/waste-to-energy-technology>
- [3] Bářeková, A., (2014) . *Odpadové hospodárstvo*. Nitra : SPU.
- [4] Bilík, J., et al. (2010). *Energetické využití odpadu*. Retrieved Feb. 11, 2022, from <https://www.evokomorany.cz/files/Ke-stazeni/Energeticke-vyuziti-odpadu-2010.pdf>
- [5] Castaldi, M., (2021). *Scientific Truth about Waste to Energy*. New York: The City College of New York. Retrieved Feb. 13, 2022, from <https://cnyeec.org/wp-content/uploads/2021/05/WTE-REPORT7603.pdf>
- [6] Dinu, M., et al (2020) Empowering sustainable consumer behaviour in the EU by consolidating the roles of waste recycling and energy productivity. *Sustainability*, Volume 12, 12(23). <https://doi.org/10.3390/su12239794>

- [7] European Commission. (2017). *The role of waste-to-energy in the circular economy*. COM(2017) 34 final. Brussels. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0034&from=EN>
- [8] Eurostat. (2021). *Management of waste by waste management operations and type of material-Sankey diagram data*. Available from Eurostat.
- [9] Hamad, A., Agll, A., Hamad, Y., , Sheffield, J. (2014). Solid waste as renewable source of energy: current and future possibility in Libya. *Case Studies in Thermal Engineering*, Volume 4, 144-152. <https://doi.org/10.1016/j.csite.2014.09.004>
- [10] Hasan, M., et al (2021). Energy recovery from municipal solid waste using pyrolysis technology: A review on current status and developments. *Renewable and Sustainable Energy Reviews*. Volume 145, 111-073. <https://doi.org/10.1016/j.rser.2021.111073>
- [11] Islam, M., et al. (2021). A global review of consumer behaviour towards e-waste and implications for the circular economy. *Journal of Cleaner Production*, Volume 316, 128-297. <https://doi.org/10.1016/j.jclepro.2021.128297>
- [12] Jandačka, J., et al (2014). *Energetické využitie komunálneho odpadu*. Retrieved Feb. 14, 2022, from http://ket.uniza.sk/images/fotogaleria/projekty/dokumenty/Energeticke_vyuzitie_komunalneho_odpadu_2014.pdf
- [13] Khan, A., et al (2022). Current solid waste management strategies and energy recovery in developing countries – State of art review. *Chemosphere*, Volume 291,133-088. <https://doi.org/10.1016/j.chemosphere.2021.133088>
- [14] Minelgaité, A., & Liobikiené, G. (2019). Waste problem in European Union and its influence on waste management behaviours. *Science of The Total Enviroment*, Volume 667, 86-93. <https://doi.org/10.1016/j.scitotenv.2019.02.313>
- [15] Pánik, M., & Jantová, S. (2019). *Bioekonomika*. Bratislava: Spektrum STU
- [16] Pires, A., & Martinho, G. (2019). Waste hierarchy index for circular economy in waste management. *Waste Management*, Volume 95, 298-305. <https://doi.org/10.1016/j.wasman.2019.06.014>
- [17] Scarlat, N., Fahl, F., Dalleman J. (2017) Status and Opportunities for Energy Recovery from Municipal Solid Waste in Europe. *Waste and Biomass Valorization*, 2425-2444. <https://doi.org/10.1007/s12649-018-0297-7>
- [18] TASR. (2020). *Nová publikácia sa zameriava na energické zhodnotenie odpadov*. Retrieved Feb. 11, 2022, from <https://www.enviroportal.sk/clanok/enviro-nova-publikacia-sa-zameriava-na-energeticke-zhodnocovanie-odpadov>
- [19] Zero Waste Europe. (2019). *A Zero Waste hierachy for Europe*. Retrieved Feb. 12, 2022, from <https://zerowasteurope.eu/2019/05/a-zero-waste-hierarchy-for-europe/>
- [20] Zhou, Z. & Zhang, L. (2022). Sustainable waste management and waste to energy: Valuation of energy potential of MSW in the Greater Bay Area of China. *Energy policy*. Volume 163, 112-857. <https://doi.org/10.1016/j.enpol.2022.112857>

Soil Market and Soil Fund Analysis in Slovakia

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Abstract

Soil is considered an irreplaceable factor of production. Its properties are important for life on the Earth. The main goal of the paper is to analyze the development of individual components of the soil fund in the Slovak Republic in the period 2014-2020, to quantify indicators related to the production factor of soil and evaluate the development and structure of organically farmed agricultural land. The soil fund is divided into two categories, namely agricultural land, and non-agricultural land. From the point of view of the soil market, we will focus on the development of soil prices, the evaluation of land sales, and land lease. The area of agricultural land as well as its individual components decreased by 2020, except for the area of orchards, which increased by 3.55%. On the contrary, by 2020, the area of non-agricultural land increased, which was affected by the growing areas of its individual components. Arable land is 59% from all agricultural land. Agricultural land makes up about 49% of the total land area. There was an average of 0.438 ha of agricultural land and 0.035 ha of organically farmed agricultural land per capita for the whole period. The price of agricultural land has a growing trend from year to year. The rental price for agricultural land increased by 18% over the period under review. From the point of view of this indicator, Slovakia has the largest share of leased land in the total land area within the entire EU, at the level of about 90%. The area of ecologically farmed agricultural land is increasing from year to year, the support from the Rural Development Program of the Slovak Republic has a positive effect on the increase of its area.

Keywords: soil fund, soil market, soil price, soil lease

JEL Classification: Q11, Q15, Q57

1. Introduction

(Azul & Aragão, 2020) define soil as a natural non-renewable resource with a diverse composition and structure influenced by geographical factors, climatic factors, rock, and the activity of living organisms, including humans. In these last decades, the awareness that soil is a very important resource for humans has noticeably increased ((Dazzi & Lo Papa, 2021)).

According to (Brevik & Arnold, 2015), the pedological definition of soil contains key elements:

- soil is a natural formation,
- soil is spatial and temporal,
- soil is formed on the Earth surface,
- soil is the result of complex biochemical and physical processes,
- soil can support a life,
- soil can be mapped to appropriate scales.

Soil functions are important for society in ensuring food production and safety and in protecting natural resources (Bamba et al., 2019). Soils play a key role for the functioning of terrestrial ecosystems. Thus, soils are essential for human society not only because they form the basis for the production of food (Vogel et al., 2019). This has long been recognized, and during the last three decades the need to establish methods to evaluate the ability of soils to provide soil functions has moved toward the top of the agenda in soil science. According to (European Commission, 2006) soil functions include a) production function - biomass production; b) filtration and transformation function - collection, filtration and conversion of nutrients, substances and water; c) source of biological diversity as biotopes, species and genes; d) physical and cultural environment for humans and their activities, landscape environment; e) source of raw materials; f) carbon storage; g) preservation of geological and cultural heritage.

From an economic point of view, the soil fertility is considered as the basic property of soil. It is defined as the ability of soil to supply plants with nutrients, the necessary amount of water and air during vegetation (Zoborský, 2006). It is affected by soil fund, soil type, soil and topsoil depth, soil structure, content of available nutrients, favorable soil water, air and heat regime, soil reaction, humus content and its quality, biological activity, and content of harmful compounds in soil (Kime, 2012). To increase soil fertility are important e.g.: proper use and tillage, crop rotation, weeds killing, maintenance of optimal soil moisture, control of soil erosion, removal of surplus water or maintenance of proper soil reaction (Berner et al., 2013).

The structure of the soil fund is divided according to the way it is used into agriculture land (arable land, hop garden, vineyards, gardens, orchards, permanent grassland) and non-agricultural land (forest land, water areas, built-up areas, and other areas) (Geodesy, 2020), (Koreňová, 2020).

Organic farming is becoming more popular and contributes to the sustainability of the Earth. (Kročková, 2020) processed information concerning the state of organic farming in the Slovak Republic. There has been a gradual increase in organic farming and land use. Slovakia is succeeding in approaching the goal of the "Strategy of the Environmental Policy of the Slovak Republic until 2030" - to increase the share of area under cultivation in an ecological way to at least 13.5 % of the total land area. Organic farming depends (among other things) on equitable access way to land and natural resources. One of its goals is therefore to create a sustainable system which respects natural systems and increases the health of water, soil, animals, and plants. It must responsibly use natural resources and respects the needs of animals (Schlosserová, 2012). The (Council of the European Union, 2007) has issued a decree on organic farming (we selected examples that focus of the production factor of soil):

- the use of practices that maintain or increase the organic matter content of the soil while preventing soil erosion and soil compaction,
- maintain of soil fertility without contamination of the environment.

The main goal of the paper is to analyze the development of individual components of the soil fund in the Slovak Republic in the period 2014-2020, to quantify indicators related to the production factor of soil and evaluate the development and structure of organically farmed agricultural land.

2. Data and Methods

The basis for processing of the contribution is the Statistical Office of the Slovak Republic database, the Eurostat database, the task of which is to prepare statistical data for the needs of the EU from all member countries and data from the Central Inspection and Testing Agricultural Institute in Bratislava. The time period which goes under analysis is 2014 - 2020.

To assess the development, we will use index series formed by basic indices. In the case of calculation of increments and quantities of individual components of the land fund, we will use the calculation of absolute changes.

$$\text{Degree of ripening (\%)} = \frac{\text{arable land in ha}}{\text{agricultural land in ha}} \cdot 100 \quad (1)$$

$$\text{Degree of agricultural use (\%)} = \frac{\text{agricultural land in ha}}{\text{total land area in ha}} \cdot 100 \quad (2)$$

$$\text{Coefficient of ecological stability (CES)} = \frac{\text{acreage of relatively stable areas}}{\text{acreage of relatively unstable areas}} \quad (3)$$

Relatively stable areas are orchards, vineyards, permanent grasslands, forest land and water areas. Relatively unstable areas are arable land, built-up area, other area. If the $CES < 0,10$ we are talking about areas with maximum disruption of natural structures, if the $CES > 1$, the country is balanced, natural structures are preserved in it.

3. Results and Discussion

Based on the data in tab. 1 we see that agricultural land has a smaller share on the total land area than non-agricultural land. Agricultural land is registered in the cadaster and is used exclusively for agricultural production. The owner of such land is obliged to protect it, and this protection consists of the use of land that does not endanger its ecological stability, of the implementation of agrotechnical measures to maintain soil quality, it should protect it from erosion, compaction, etc.

Table 1: Development and structure of the land fund in Slovakia in the period 2014 – 2020 (in ha)

Acreeage/year	2014	2015	2016	2017	2018	2019	2020	Index (20/14)
Agric. land	2397041	238961 6	2385328	238195 3	2379101	2376712	2375025	0,9908
Arable land	1412228	141129 4	1409778	140866 0	1407729	1406399	1405263	0,9951
Hop garden	512	511	511	510	503	503	503	0,9824
Vineyards	26513	26359	26266	26258	26237	26216	26080	0,9837
Gardens	76362	76287	76206	76111	75996	75890	75763	0,9922
Fruit orchards	16793	16565	16685	16658	16951	17101	17389	1,0355
Permanent grassland	861681	858601	855882	853757	851685	850600	850027	0,9865
Non-agric. land	2506450	251384 3	2518107	252146 7	2524306	2526694	2528380	1,0087
Forest land	2017105	202011 6	2022522	202437 4	2026027	2027099	2027852	1,0053

Water areas	95250	95278	95257	95256	95296	95311	95250	1,0000
Built-up areas and courtyard	234416	235511	236281	236979	237889	238720	239447	1,0215
Other areas	159679	162937	164046	164858	165094	165564	165831	1,0385
Total area	4903491	4903491	4903435	4903420	4903407	4903407	4903405	1,0000

Source: DATAcube, author's calculations

The area of agricultural land had a declining trend until 2020 compared to 2014 by 0.92%. This is due to the loss of almost all components of agricultural land except orchards. We recorded a growing trend by 3.55%, which represents 596 ha. The area of arable land is decreasing from year to year, for the whole monitored period it decreased by 6,965 ha. In the last three years analyzed, hop gardens have reached a constant area of 503 ha. Overall, its area felt down by 1.76% by the end of 2020. The area of vineyards is decreasing from year to year, overall, we record a decrease in the area of vineyards by 1.63%. The area of gardens decreased by 0.78% by 2020 compared to 2014. The highest decrease within the area of gardens can be seen between 2019 and 2020 by 127 ha. Permanent grasslands reached the highest area in 2014, namely 861,681 ha. Subsequently, by 2020, it fell to 850,027 ha, which represents a reduction of 11,654 ha. Non-agricultural land consists of forest land, water areas, built-up areas, and other areas. It represents approximately 51% of the total land area. Compared to agricultural land, we record the opposite trend in non-agricultural land, and this is growing. The area of non-agricultural land increased by all the categories that make it up. By 2020, compared to 2014, its area increased by 21,930 ha. The highest item of non-agricultural land is forest land. Its share of non-agricultural land was about 80%. The area of forest land increased by 0.53% by 2020 compared to 2014. Water areas have been gradually increasing, but in comparison with the years 2020 and 2014 we record the same area, namely 92,250 ha. Built-up areas and courtyards reached their highest value in 2020, increasing by a total of 2.15%. Other areas, similarly, to the previous categories forming non-agricultural land, grew slightly from year to year, in 2020 they reached the highest area of individual years, namely 165,831 ha, which is an increase by 267 ha compared to 2014.

Table 2: Decreases and increases in selected categories of land in Slovakia in the years 2014 - 2020

Acreeage/year	2015	2016	2017	2018	2019	2020
Agric. Land	↓7425	↓4288	↓3375	↓2852	↓2389	↓1687
Arable land	↓934	↓1516	↓1118	↓931	↓1330	↓1136
Vineyards	↓154	↓93	↓8	↓21	↓21	↓136
Gardens	↓75	↓81	↓95	↓115	↓106	↓127
Fruit orchards	↓228	↑120	↓27	↑293	↑150	↑288
Permanent grassland	↓3080	↓2719	↓2125	↓2072	↓1085	↓573
Non-agric. land	↑7393	↑4264	↑3360	↑2839	↑2388	↑1686
Forest land	↑3011	↑2406	↑1852	↑1653	↑1072	↑753
Water areas	↑28	↓21	↓1	↑40	↑15	↓61
Built-up areas and courtyard	↑1095	↑770	↑698	↑910	↑831	↑727
Other areas	↑3258	↑1109	↑812	↑236	↑470	↑267

Source: author's calculations

Table 2 shows the calculation of decreases and increases of individual components of the land fund in Slovakia in the years 2014 - 2020. The highest decrease of agricultural land was in 2015, almost 7,425 ha. This year we also recorded the highest increase in non-agricultural land (7,393 ha). From the point of view of individual components of agricultural land, we record it year-on-year decline. The most significant decrease in area of arable land was in 2019, namely 1,330 ha. From the point of view of vineyards, the years 2015 and 2020 can be considered as years when the vineyards limit was reduced by more than 100 ha. Orchards showed a fluctuating trend of decreases and increases in their acreage. Permanent grasslands reached from all the individual components of the agricultural land fund the most significant decrease in acreage in the years 2015 - 2018. They play an important role in landscaping, preserve and restore biodiversity, increase anti-erosion function, protect against floods.

In 2015, the highest increases in forest land, built-up areas and other areas occurred at the expense of agricultural land. Slovakia is among the European countries the country, with the highest forest cover. The share of forest land in the total land area is 41%. The gradual increase in the area of forest land is mainly due to afforestation of areas, the transfer of agricultural land covered with forest stands and the adoption of forest management programs. The increase in the area of built-up areas is mainly due to civil and housing construction, as well as industrial construction, construction of roads and motorways.

Table 3: Development of soil fund indicators in Slovakia in the years 2014 - 2020

Indicator	2014	2015	2016	2017	2018	2019	2020
Degree of ripening (%)	58,92	59,06	59,1	59,14	59,17	59,17	59,17
Degree of agric. use (%)	48,88	48,73	48,65	48,58	48,52	48,47	48,44
CES	1,672	1,667	1,667	1,666	1,667	1,666	1,666
Share agric. land/inhabitant	0,442	0,441	0,439	0,438	0,437	0,436	0,435
Share ecolog. agric. land/inhabitant	0,033	0,034	0,034	0,035	0,035	0,036	0,036

Source: author's calculations

In tab. 3 are quantified individual indicators related to the land fund, according to the formulas given in the methodology. The degree of ripening compares arable and agricultural land. Based on the results of the calculations, we can state that the share of arable land in agricultural land is about 59%. The degree of agricultural use describes the ratio of agricultural land and the total area of the land fund. Agricultural land accounts for about 48-49% of the total area. The coefficient of ecological stability has reached values higher than one, which means that our country is a balanced country with predominant natural components. The share of agricultural land per capita has a declining trend. In 2014, there were 0.442 ha of agricultural land per capita, while in 2020 it was 0.435 ha. In terms of the share of organically farmed agricultural land, its share per capita increased slightly. In 2014, this share reached 0.033 ha and in 2020 there was 0.036 ha ecologically farmed agricultural land per capita in the Slovak Republic.

Table 4: Development of the average market price of agricultural land and rental price per 1 ha

Indicator/year	2014	2015	2016	2017	2018	2019	Index
Soil price	1 442	2 175	2 217	3 009	3 432	3 789	2,6276
Rental price	44	44	50	48	54	52	1,1818

Source: EUROSTAT, author's calculations

At the beginning of the period under review, the average price of agricultural land reached 1,422 € / ha. Subsequently, the price of land increased by 2019 € by 2019 compared to 2014. There are large price differences in Slovakia between individual regions. The most is paid for the land in the southwest of the country and, conversely, the least in central and northern Slovakia. The most significant obstacle for young farmers is access to land, as it is fragmented. This is mainly related to past events that are associated with collectivization. Acquisition of land in Slovakia is regulated by Act no. 140/2014 Coll. on the acquisition of ownership of agricultural land and on the amendment of certain laws. The main bodies that ensure the protection of agricultural land include: Ministry of Agriculture and Rural Development, District Land Office. The agricultural land market is liberal and does not contribute to the protection of land and its proper management, that is why this law has been adopted. In addition to the legislation at the time, it was necessary to pass a law that would focus on regulating the acquisition of agricultural land and preventing their speculative purchase or change in the type of land and possible misuse of property (e.g., by requiring disproportionate rent). Pursuant to the legislation in force until 11th of February 2019, the conditions for the transfer of agricultural land were laid down in §4, which stated that the owner or another person authorized to transfer ownership of agricultural land may transfer this land to a person carrying out agricultural production, is a co-owner of agricultural land, a close person and a relative. This has been abolished by the Constitutional Court, and at the present a non-agricultural person can now acquire agricultural land. The prepared amendment from the workshop of the Ministry of Agriculture should limit the acquisition of land ownership. The aim is to prevent the speculative purchase of agricultural land. An individual could not acquire more than 300 ha and a legal person more than 1200 ha of land. The amendment should stipulate a pre-emption right for the state and self-government. The low price is the driving force behind the interest in buying land, especially by foreigners. Citizens from Denmark, the Netherlands, Italy, and China are interested in our agricultural land. There is no limit to how agriculture land foreigners can buy.

The rental price for agricultural land increased by 18% over the period under review. From the point of view of this indicator, Slovakia has the largest share of leased land in the total land area in the entire EU, at the level of about 90%. In 2020, it is assumed that the lease price will increase due to the increase in the lease prices of agricultural land by the Slovak Land Fund, which leases approximately 453,000 ha of agricultural land. Farmers who rented land from the Slovak Land Fund paid a price in the period 2014 - 2019, which was calculated from the creditworthiness of the land in individual regions of the Slovak Republic. The minimum rent was adjusted for year-on-year average inflation. The lease of land with lower production potential was lower than the lease of land at the highest credit rating. Since 2020, the rental price is determined in the amount of the so-called usual rent, which represents the average amount of rent per 1 ha of agricultural land used as determined by the district authorities from data provided by tenants. If the district office does not provide data, the usual amount of rent is calculated as 2% of the value of arable land, regardless of whether it is a specific type of land or permanent grassland, respectively, for land that does not generate such yields as arable land.

Table 5: Development of acreage of organically farmed agricultural land and its selected categories (in ha)

Acreage/year	2014	2015	2016	2017	2018	2019	2020	Index
Ecolog.agric. land	180	186	187	189	192	196	22289	1,235
	365	483	010	147	143	210	6	8
Arable land	62279	60890	60302	62978	64821	66560	75592	1,213 8

Permanent grasslands	11652 8	12385 5	12480 7	12423 0	12536 6	12761 2	14520 9	1,246 1
Orchards	1448	1613	1778	1807	1810	1866	1829	1,263 1
Vineyards	109	124	123	132	147	172	266	2,440 4

Source: The Central Control and Testing Institute in Agriculture, author's calculations

The support from the RDP of SR 2007 - 2013 in the sub-measure Organic Agriculture had a positive effect on increasing the area of registered agricultural land in organic agricultural production. In the years 2014-2020, farmers had the opportunity to participate in the RDP within Organic Farming, which is part of the RDP of SR 2014-2020. Their role is to promote environmental protection, preserve biodiversity and build consumer confidence in organic products. The area of organically farmed agricultural land is growing from year to year. Overall, it increased by 23.58% during the period under review. Approximately 65% of organically farmed agricultural land consists of permanent grassland where sheep and cattle are raised. Arable land accounts for approximately 32-35% of the total area of organically farmed agricultural land. Orchards (0.8 - 1%) and vineyards (0.1%) are also slightly represented. Ecologically managed land predominates mainly in the eastern part of Slovakia, namely in the Prešov region. Soil protection in Slovakia is stipulated in Act no. 220/2004, which states that the landowner is obliged to implement permanent and effective protection of agricultural land against its degradation by implementing effective protective agrotechnical measures, which include planting greenery, crop rotation, no-plow agrotechnics or the correct choice of crops.

4. Conclusion

Physiocrats already considered soil to be a real factor of production. Soil is a basic factor of production, it is a creation of nature. Agricultural production is dependent on land. Therefore, it is necessary to pay attention to its protection, maintaining quality, production capabilities. Agricultural land consists of several components, arable land, vineyards, hop gardens, orchards, gardens, permanent grasslands. The acreage of agricultural land has been declining from year to year since 2014. The acreage of all its components except orchards has fallen by 2020. Arable land (average 49%) and permanent grassland (average 36%) have the largest share on agricultural land. The share of agricultural land in the total land area is at the level of 49% on average. Non-agricultural land, on the other hand, increases its area every year, which is influenced by the increase in the area of the items that make it up, namely: forest land, water areas, built-up areas and courtyards, other areas. The share of agricultural land per capita is declining from year to year. On the contrary, the share of organically farmed agricultural land per capita is growing, which is due to the increase in the area of this type of land. Organic farming is a form of land management without industrial fertilizers, sprays, chemicals. The share of organically managed land in the total area of agricultural land within the analyzed period was 8-9%. By 2030, one of the goals of the Environmental Policy Strategy 2030 is to increase this share to the level of 13.5%. Most of the agricultural land is leased. In Slovakia, the fragmentation of land ownership is characteristic, which results from the historical development. Fragmentation hinders various investments. Land rents are growing every year. Since May 2018, the amendment to Act no. 504/2003 introduced the concept of usual rent. This is focused to the price for the use of agricultural land in the operation of the holding per 1 ha, which is published each year by the relevant district office for each cadastral area.

References

- [1] Azul, A. M., & Aragão, A. (2020). Natural and Sociolegal Dimensions of Soil for Ecosystems Sustainability and Human Health. *Life on Land. Encyclopedia of the UN Sustainable Development Goals*.
- [2] Bamba et al. (2019). Harvesting European knowledge on soil functions and land management using multi-criteria decision analysis. *Soil Use and Management*, 35(1), pp. 6-20.
- [3] Berner et al. (2013). *Basics of soil fertility. Forming the relationship to the soil. Practical guide*. Olomouc: Bioinstitut.
- [4] Brevik, C., & Arnold, W. (2015). *Is the Traditional Pedologic Definition of Soil Meaningful in the Modern Context?* (Zv. 56). *Soil Horizons*.
- [5] Council of the European Union. (2007). Retrieved from <https://www.consilium.europa.eu/sk/policies/organic-farming/>
- [6] Dazi, C., & Lo Papa, G. (2021). A new definition of soil to promote soil awareness, sustainability, security and governance. *International Soil and Water Conservation Research*(10), s. 99-108.
- [7] European Commission. (2006). *Thematic strategy for soil protection*. Retrieved from <<https://eur-lex.europa.eu/legal-content/SK/ALL/?uri=CELEX:52006DC0231>>
- [8] Geodesy, C. a. (2020). *Statistical Yearbook of the Land Fund in the Slovak Republic according to the data of the Real Estate Cadastre*. Retrieved from <http://www.skgeodesy.sk/files/slovensky/ugkk/kataster-nehnutelnosti/sumarne-udaje-katastra-podnom-fonde/statisticka-rocenka-2019.pdf>
- [9] Kime, L. (2012). *Soil Quality Information*. Retrieved from <https://extension.psu.edu/soil-quality-information>
- [10] Koreňová, Ľ. (2020). *Land occupation by transport infrastructure*. Retrieved from: <https://www.enviroportal.sk/indicator/detail?id=941&print=yes>
- [11] Kročková, B. (2020). *Organic agricultural production*. Retrieved from: <https://www.enviroportal.sk/indicator/detail?id=3781&print=yes>
- [12] Schlosserová, J. (2012). *Management in organic farming* (1st edition). Nitra.
- [13] Vogel, H.J.et al. (2019). Quantitative Evaluation of Soil Functions: Potential and State. *Frontier in Environmental Science*(7), s. 1-15.
- [14] Zoborský, I. M. (2006). *Agriculture economics* (1st edition). Nitra: Slovak University of Agriculture in Nitra.

Human Resources as a Factor of the Development and Sustainability of Businesses

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Abstract

In order to ensure sustainability, it is essential for companies to have high-quality human resources, which are a basic prerequisite. By developing them and ensuring suitable working conditions, it is possible to move the company forward to meet the set goals, achieve profit, and sustainable development. The aim of the paper is, based on the chosen identification factors, to evaluate the role of human resources as a basic factor of development and sustainability in different types of companies. Based on our findings, small businesses in particular, companies with exclusively domestic equity and companies in the legal form of cooperatives face many challenges in the field of human resources. Positive strategic planning and organization of activities in this area should gradually lead to positive changes.

Keywords: *businesses, development, human resources, sustainability*

JEL Classification: *M12, Q01, L2*

1. Introduction

Ensuring development for business sustainability requires the implementation of new trends and innovative approaches in all areas of business management, the same in the area of human resources management. It is human capital, i.e. human resources, that are, thanks to their abilities and knowledge, the fundamental and most important sources of the company's values. Realizing their value is important for the successful running of the business now, but also in the future. Qualified employees are a factor in the development and sustainability of the company, so their support and growth should be one of the primary activities of managers.

The whole world is changing to meet the needs and interests of individuals, organizations and society. For this reason, it is necessary to know and to use effectively all the resources and possibilities available to the organization, from which the rationalization and modernization of human resource management takes on new dimensions and special meanings (Muscalu & Muntean, 2014). Innovation in organizations is primarily a human issue. Because people are those, who develop and implement ideas (Kianto et al., 2017). Human resources in the enterprise form the most complex management social system, which has a unique capacity for self-regulation and development. This system is extremely sensitive to the influence of managers. If such an impact is carried out using rough and outdated procedures, the efficiency of human resources will decrease faster and more sharply than for other types of resources (Mikhaylov et al., 2014). Traditionally, human resources have been seen as a source of strategic methods and values that can have significant economic effects on an organization's performance. Today, organizations are

increasingly willing to invest into the human resources and want to provide opportunities for their employees to further develop their skills (Paşaoğlu, 2015).

Human resources development is a process that helps employees of an enterprise systematically and plannedly acquire or improve qualifications for current and future tasks, develop their general qualifications and potential for their own or business development needs. It helps to develop corporate culture, workplace relationships, teamwork, motivation and pride of all employees. It is essential for all businesses that strive to be dynamically and growth-oriented (Subba Rao, 2010). Soltani compiled a human resource development model composed of several elements: knowledge, expertise, experiences, attitude, work, creativity and performance. At the same time, all these elements affect the development of human resources, while at the same time human resources affect each of these elements and increase their level (Najafi et al., 2012).

The task of HRM department is to create conditions to form an appropriate organizational culture and a positive climate in the organization for employees. It is essential that the organization has a thorough strategy for the development of human resources. Also, the organization should have a quality incentive system created on the basis of measurable criteria, which are shown in the company's strategy and are the driving force behind the development of the company (Skoludova & Brodsky, 2015). Businesses should create the continuous development and continuity of their employees' training activities. There should be a separate department for the implementation of training programmes and activities. Education could take place within a systematic programme and, in particular, should focus on improving quality (Ozkeser, 2019). Businesses use technology to provide training programs for their employees because of the effects on the recipient, such as reducing travel and training time costs, flexibility in pace, diversity of available content, permanent use of material in society, increased worker productivity, increased number of trained people, maintaining competitiveness (Ozturan & Kutlu, 2010). Many scientists and experts argue that a work environment that encourages creativity contributes to the development and performance of business employees. Such an environment increases creative behavior on an individual level. Businesses with a creative work environment are introducing more new products to the market and are more successful in selling new products (Dul & Ceylan, 2014).

Research by Zak (2004) from Claremont Graduate University shows that creating a human-centered workplace in which colleagues trust each other is a very useful way to improve engagement, productivity, innovation, and more. Trust and recognition of excellence and information sharing are essential factor for the organization. According to this research, people in high-trust companies report (compared to people in low-trust companies):

- 106% more energy at work;
- 76% more engagement;
- 74% less stress;
- 50% higher productivity;
- 40% less burnout syndrome;
- 29% more satisfied employees with their lives and others.

The implementation of innovative practices is crucial to success and should be supported by organisations. In today's uncertain and changing markets, businesses need to own critical factors that enable them to create value and gain a competitive advantage. This also applies to human resources management. Human capital provides value to the company and includes a

number of characteristics that make it valuable, precious, difficult to imitate and impossible to replace. A human resource management system focused on change and creativity has a positive impact on company as a whole (Barba-Aragón & Jiménez, 2020). The reason for the sustainable management of human resources should be the creation of sustainable work of the enterprise as a whole. Employers should create the conditions for continuous development of employees' knowledge, prosperity and use of energy to achieve career and non-career achievements, as well as create conditions for improving employment (Sakál et al., 2013). The challenge for businesses is to focus their efforts on ensuring efficiency gains, in particular through innovation, and the gradual transition of outdated knowledge to new knowledge (Lendzion, 2015).

Demographic and social development in the near future is expected to result in a shortage of professionals in certain sectors, professions and regions. Businesses will therefore have to face two major challenges in this regard. On the one hand, formulate strategies for competition in the labour market, on the other hand, increase the potential of employees for further competitive performance by implementing innovations (Joniaková & Blštáková, 2015).

2. Data and Methods

The aim of the article is to evaluate the role of human resources as a factor in the development and sustainability of enterprises in Slovakia and to propose possible solutions to improve the current situation. Out of almost 700 asked companies, 404 manufacturing companies of various sizes, legal forms and origins of capital operating in the Slovak Republic took part in the survey. As part of the questionnaire survey, respondents were given the opportunity to agree or disagree with the 5 degree Likert scale and could further specify their position verbally.

MS Excel and SAS Enterprise Guide 7.1 were used to process the data. As part of the evaluation of the findings and presentation of the results of the work, a cluster analysis was applied, which can be defined as a logical procedure, a procedure by which objects are merged into groups - clusters, based on their similarity and difference (Feldman & Sanger, 2007). The Cronbach Alpha coefficient was applied to verify the reliability of the questionnaire. After the verification of the validity of the subsidy by means of the Fleiss Kappa coefficient, the most common and average response (modus and average) was evaluated. The Chí quadrant of good match test was used to verify the representativeness of the research sample (Benda-Prokeinová, 2014). The existence of statistically significant differences in respondents' attitudes, given their identification features, was verified within questions using the Kruskal-Wallis test.

Scientific assumption: *We assume existence of statistically significant differences between the answers to the question and chosen identification features - the size of the company, the legal form and the origin of the capital.*

Depending on the results of the Kruskal Wallis test, a Tukey HSD test was carried out to verify between what levels of individual factors were statistically significant differences in respondents' attitudes.

Scientific assumption: *We assume existence of statistically significant differences between specific pairs within the groups of each identifier*

3. Results and Discussion

From the point of view of Gejdoš (2008), paying attention to human resources is also the primary and most important task of management, as the human factor is a key capital of the organization's success. Only a systematic and consistent approach can ensure the achievement of goals, the achievement of profit and also sustainability.

The results of the authors' survey suggest that up to 80% of the companies in the survey declare a positive attitude of the company's management to support innovative human resources activities in order to ensure the sustainability of the company.

Respondents (representatives of the company's management in the Slovak Republic) involved in the survey expressed their position on a scale from 1 (absolutely disagree) to 5 (absolutely agree) to the statement "human resources by implementing innovative procedures actively ensure systematic development and sustainability of the company". The most common and at the same time average answer of all respondents involved in the survey was "I rather agree with the statement".

Within the interpretation of the results of the applied method of cluster analysis, we focused on the analysis of the answers of the respondents, who were based on similarities in the answers included in 5 clusters - C1, C2, C3, C4 and C5 (Fig. 1).

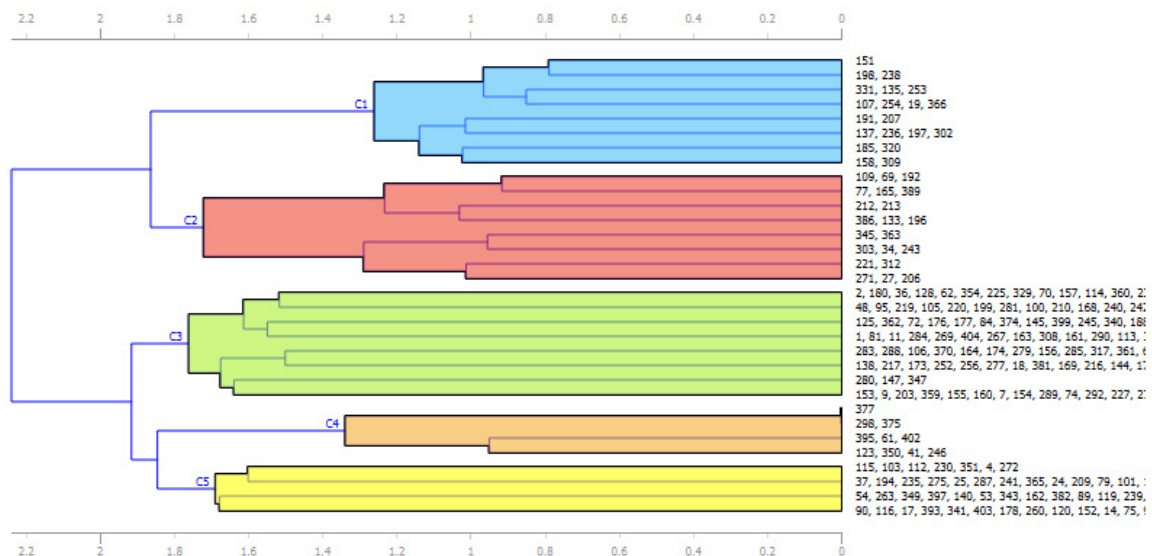


Figure 1: Groups of respondents based on the similarity of their answers

Source: own research and processing

Group C1 consists mostly of large companies. Businesses in cluster C1 are aware that innovative practices increase work efficiency and also lead to employee satisfaction as well as business management. These companies are actively involved in the implementation of innovative practices. They realize that employees are the capital they need to develop in order to develop the whole company and its sustainability.

The C2 cluster is made up of small and medium-sized enterprises. Category C2 companies support innovations, especially in the area of production, and are also open to innovations in other areas of management. They try to introduce innovations and also give space and reward employees with innovative ideas. Companies also try to develop their employees, especially through various trainings.

Group C3 includes mainly small and medium-sized enterprises, mostly in the correct form a limited liability company. Businesses in this category are of the opinion that innovative approaches belong to the activities of large companies. Businesses are trying to introduce innovations, but not on a large scale, these are smaller innovations that are relevant to them at a given time.

The C4 cluster made up the smallest number of companies in the whole group. Businesses were mostly small and medium-sized. The least represented category focuses on introducing innovations into production. Businesses focus on running the business as a whole.

Group C5 is characterized by a predominance of large and medium-sized enterprises. The last category consists mainly of companies that do not very much implement innovation in any area of management. One of the reasons is the high costs that companies do not want to pay. However, both companies and employees are interested in following the path of innovation.

The application of the Kruskal Wallis test confirmed the existence of statistically significant differences between the answers of the respondents to the question with respect to the three chosen identification features - the size of the company, the legal form and the origin of the capital. The test results are documented in Table 1.

Table 1: The result of the Kruskal - Wallis test

<i>Identification value</i>	<i>P value</i>
Business size	<0,0001
Legal form of business	<0,0001
Capital participation of the company	<0,0001

Source: own research and processing

In next steps we tested the differences in the respondents' answers with the Kruskal Wallis test and analyzed them further. Using Tukey's HSD test, we found differences in specific pairs within the groups of each identifier. The values obtained are summarized in Table 2, 3, 4.

Table 2: The result of Tukey's HSD test - statistically confirmed differences between size groups of companies

Business size/Size of the enterprise		Difference in averages	95% confidence interval	
			Lower limit	Upper limit
Large enterprise	Medium enterprise	0,22	0,08	0,42
Large enterprise	Small enterprise	0,31	0,19	0,55

Source: own research and processing

Table 3: The result of Tukey's HSD test - statistically confirmed differences between groups of companies in terms of their legal form

Legal form		Difference in averages	95% confidence interval	
			Lower limit	Upper limit
Joint stock company	Limited company	0,29	0,11	0,47

Source: own research and processing

Table 4: The result of Tukey's HSD test - statistically confirmed differences between groups of companies with different origins of capital

Equity participation		Difference in averages	95% confidence interval	
			Lower limit	Upper limit
Combined equity participation	Exclusively domestic	0,43	0,26	0,61
Exclusively foreign	Exclusively domestic	0,28	0,09	0,46

Source: own research and processing

At the significance level of 0.05, statistically significant differences in the responses between the two pairs of size groups of enterprises were confirmed (Table 2), specifically between the groups of large and medium-sized enterprises, as well as between large and small enterprises. Due to the setting of the scale in the questionnaire, with the increasing value of the average answer, the respondents' agreement on the formulated statement also increases. From the average responses of all three enterprise size groups, which reached 3.84 for small enterprises, 3.95 for medium enterprises and 4.2 for large enterprises, it is clear that human resources in large enterprises ensure systematic development and sustainability of the company by implementing innovative procedures more actively than in small and medium-sized enterprises.

Joint stock companies are a group of companies that (like the group of large companies in the previous case) in more than 83% clearly declare a positive opinion on the active implementation of innovative procedures, which actively ensure systematic development and sustainability of the company. Even more than 43% of respondents from joint stock companies expressed absolute agreement. The percentage of positive attitudes in the other three groups of companies is in the range of 72.5 - 80%. At a significance level of 0.05, Tukey's HSD test confirmed statistically significant differences in responses between a single pair of companies with different legal forms of business. Specifically, these are joint stock companies and limited liability companies (Table 3). The average responses of enterprise groups, the combination of which showed statistically significant differences in responses within the legal form of business identification, reached 4.2 for a joint-stock company and 3.92 for a limited liability company. We state that in joint-stock companies, human resources ensure the systematic development and sustainability of the company by implementing innovative procedures more actively than in limited liability companies.

The origin of capital was the last identifying feature in which highly significant statistical differences in responses were found between groups. While only domestic companies in the overwhelming majority of cases took a partially positive position, with exclusively foreign capital participation of companies, this was the exact half of respondents, but more strongly supported by absolutely positive answers, which together accounted for almost 85%. Tukey's HSD test was applied again. The values found are summarized in Table 4. At a significance level of 0.05, statistically significant differences in responses were identified between two different pairs of enterprise groups in terms of capital origin, specifically between groups of exclusively domestic enterprises and enterprises with combined capital participation and again exclusively domestic enterprises but in combination with exclusively foreign enterprises. The average responses of all three groups of enterprises in terms of legal form of business, which reached 3.8 for exclusively domestic enterprises, 4.07 for enterprises with exclusively foreign capital participation and 4.23 for enterprises with combined capital participation, show that in enterprises with combined capital participation, as well as in companies with exclusively foreign capital participation, human resources, by implementing innovative procedures, approach the provision of systematic development and sustainability of the company more actively than in companies with exclusively domestic capital.

Research made by Taiwo and Omojaro (2019) shows, that performance management has a significant positive impact on employee development in the organization. The study by Maley et al. (2020) focuses in particular on the weak "acceptability" of the employee performance management process, to which scientists have paid limited attention. According to Šulc (2018), employee education and development is one of the determinants of long-term prosperity and competitiveness of companies and organizations. Education is an investment in the future. Companies that support the training and development of their employees achieve, in addition to better economic results and increased value, a better image - both for the employees themselves and for customers and potential job seekers. Stachová and Stacho (2018) recommend creating specific processes aimed at realistically increasing employee involvement in finding and solving problems related to the company's activities and the subsequent implementation of submitted proposals.

4. Conclusion

As our findings show, the role of human resources in the interest of development and sustainability of companies in Slovakia is irreplaceable. It has its limitations, shortcomings and it is necessary to pay due attention to it, time, space and especially support. If we found out, the big challenge is especially the activities of human resources in smaller companies and in companies that do not have a foreign investor behind them. It is therefore up to the owners, but also the business managers, to look for resources, procedures and solutions to involve their employees in the activities necessary to maintain continuity in their business.

We recommend the company's management to actively involve employees in solving tasks related to the company's activities within the practical implementation of innovative procedures. And not only by comprehensible, clear and at an appropriate level by presenting the intention to implement changes, but also by encouraging and motivating employees to be creative and present proposals, e.g. in the form of a reward for the completed proposal.

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References

- [1] Barba-Aragón, M. I., & Jiménez-Jiménez, D. (2020). HRM and radical innovation: A dual approach with exploration as a mediator. *European Management Journal*, 38(5), 791-803. doi:10.1016/j.emj.2020.03.007
- [2] Benda-Prokejinová, R. (2014). *Štatistika v SASe, SAS v štatistike*. ASPA. 214 s. ISBN 978-80-89477-20-3.
- [3] Dul, J., & Ceylan, C. (2014). The Impact of a creativity-supporting work environment on a firm's product innovation performance. *Journal of Product Innovation Management*, 31(6), 1254-1267. doi:10.1111/jpim.12149
- [4] Feldman, R., & Sanger, J. (2007). *The text mining handbook: advanced approaches in analyzing unstructured data*. Cambridge University Press, 2006. ISBN 978-11-39457-83-5

- [5] Gejdoš, P. (2008). Význam a úloha ľudského faktora v manažérstve kvality. *Human Resources Management & Ergonomics* 2/2008. Retrieved from: frcatel.fri.uniza.sk/hrme/files/2008/2008_2_02.pdf
- [6] Joniaková, Z., & Blštáková, J. (2015). Age management as contemporary challenge to human resources management in Slovak companies. *Procedia Economics and Finance*, 34, 202-209. doi:10.1016/S2212-5671(15)01620-2
- [7] Kianto, A., Sáenz, J., & Aramburu, N. (2017). Knowledge-based human resource management practices, intellectual capital and innovation. *Journal of Business Research*, 81, 11-20. doi:10.1016/j.jbusres.2017.07.018
- [8] Lendzion, J. P. (2015). Human resources management in the system of organizational knowledge management. *Procedia Manufacturing*, 3, 674-680. doi:10.1016/j.promfg.2015.07.303
- [9] Maley, J. F., Marina, D., & Moeller, M. (2020). Employee performance management: charting the field from 1998 to 2018. *International Journal of Manpower*, 42 (1), 131-149. doi: 10.1108/IJM-10-2019-048
- [10] Mikhaylov, F., Julia, K., & Eldar, S. (2014). Current tendencies of the development of service of human resources management. *Procedia-Social and Behavioral Sciences*, 150, 330-335. doi:10.1016/j.sbspro.2014.09.072
- [11] Muscalu, E., & Muntean, S. N. (2014). Aspects regarding human resources management streamlining within national and international organizations. *Procedia Economics and Finance*, 16, 173-181. doi:10.1016/S2212-5671(14)00789-8
- [12] Najafi, H., Farajollahi, M., Noruzzadeh, R., & Sarmadi, M. R. (2012). A Conceptual Model for Human Resource Development in Iran's Distance Education System. *European Journal of Experimental Biology*, 2(6), 2320-2324.
- [13] Ozkeser, B. (2019). Impact of training on employee motivation in human resources management. *Procedia Computer Science*, 158, 802-810. doi:10.1016/j.procs.2019.09.117
- [14] Ozturan, M., & Kutlu, B. (2010). Employee satisfaction of corporate e-training programs. *Procedia-Social and Behavioral Sciences*, 2(2), 5561-5565. doi:10.1016/j.sbspro.2010.03.907
- [15] Paşaoğlu, D. (2015). Analysis of the relationship between human resources management practices and organizational commitment from a strategic perspective: Findings from the banking industry. *Procedia-Social and Behavioral Sciences*, 207, 315-324. doi.org/10.1016/j.sbspro.2015.10.101
- [16] Sakál, P. et al. (2013). *Sustainable socially responsible entrepreneurship*. Trnava: AlumniPress. 367 s. ISBN 978-80-8096-186-2
- [17] Stachová, K. & Stacho, Z. (2018). Podpora riadenia inováčných procesov inšpirovaním zamestnancov k tvorivosti. *Human potential development- proceedings of Scientific Papers: 15th International Scientific Conference*. Kaunas, 29 – 31 May, 2018. Retrieved from: frcatel.fri.uniza.sk/hrme/ConfHPM2018/subory/Conf-HPD-2018.pdf#page=93
- [18] Subba Rao, P. (2010). *Human Resource Management: Text and Cases*. Mumbai: Himalaya Publishing House. 415 s. ISBN 978-81-8488-806-5
- [19] Školudová, J. & Brodský, Z. (2015). Current Trends of Selected Aspects of Human Resource Management in the Czech Republic. *Procedia Economics and Finance*. 26, 603-608. doi:10.1016/S2212-5671(15)00961-2.
- [20] Šulc, V. (2018). Nové výzvy a trendy v řízení lidských zdrojů v oblasti řízení informační bezpečnosti. *Human Potential Development - 15th International Scientific Conference, Kaunas, 29 – 31 May, 2018*. Retrieved from: frcatel.fri.uniza.sk/hrme/ConfHPM2018/subory/Conf-HPD-2018.pdf
- [21] Taiwo, A. A., & Omojaro, A. O. (2019). Performance Management and Employee Development. 83-92. Retrieved from: <http://eprints.federalpolyilaro.edu.ng/id/eprint/1106>
- [22] Zak, P. J. (2004). Neuroeconomics. *Philosophical Transactions of the Royal Society London. Biological Sciences*, 359, 1737-1748. doi: 10.1098/rstb.2004.1544

Aroma in the Business Environment of Selected Global South and Global North Country and its Potential in Sustainable Development

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Abstract

The aim of this paper is to examine and compare the use of aroma in the business environment, in particular agribusiness, of one African country, which belongs to the so-called Global South, and one European country, which is part of the Global North. African countries are still known as developing countries with weaker economies and many problems compared to European countries. However, people also in this part of the world want to obtain a standard of living comparable to the developed part of the world. In these countries there are also large companies that promote their products and use various modern tools to attract customers. Therefore, this paper pays attention to analysing, describing, and identifying the basics and importance of aroma marketing as a part of consumer neuroscience. Subsequently, we map, examine, and identify differences between the use of this modern marketing phenomenon in selected countries – South Africa and Slovakia – and compare the data we have collected. This study is primarily of theoretical interest and shows whether there is a significant difference between the use of aroma in marketing of the selected Global South and Global North country to influence consumer decision-making during the shopping and also the potential of aroma marketing in supporting sustainable development.

Keywords: *aroma, aroma marketing, business environment, South Africa, Slovakia, sustainable development*

JEL classification: *M21, M31, O31, Q01*

1. Introduction

If we want to understand what guide consumers' steps and behaviour during the shopping, we need to use not only traditional research methods and tools (surveys, focus groups, etc.) but also new neuromarketing tools as most people's thoughts are in the *subconscious mind*. We can say that consumers do not choose products mostly rationally. Neuromarketing as still developing science uses neuroscience to reveal subconscious consumer decision-making processes. Thus, neuromarketers study human brain (its biometric responses and human behaviour) to understand how consumers feel, think and act (NMSBA, n. d.).

Neuromarketing is used in business environment to measure buyer's preferences, with focusing also on human senses. The knowledge acquired through these methods helps marketers create marketing campaigns more effectively, and design products and services focused more on the brain's response (Neuroscience marketing, 2019). Our smell and aromas play important role here and we agree that there are many new challenges hidden under the development of neuromarketing branch known as aroma marketing (or scent marketing, olfactory marketing) – a part of sensory marketing field. We can say that it is still not fully discovered area, however, it can play an enormous role in supporting shopping processes and behaviour of people, as the smell has an advantage over other senses, that it is able to stimulate human emotions immediately. Using aromas, marketers can comprise the connection with customers at a deeper

emotional level, which will bring them a memorable experience. By this, they are also able to support sustainable products and services, and therefore aroma marketing can have its important potential in supporting sustainable development across the business environment too.

In the world overfilled with advertisements, traditional marketing tools seem to be still less effective, and the current trend is the communication simultaneously oriented on several human senses, which is also represented by this modern developing phenomenon – aroma marketing (more in Berčík, et al. 2018). However, we can see that neuromarketing and especially sensory marketing tools and methods – including aroma marketing – are often covered by pessimistic views of many researchers as they are quite expensive, and they promote increasing the consumption in the world threatened by number of environmental, economic, and social problems. We can say that mainly because of their cost, these methods have not been used so widely up to now. All people in a civilized world, without the distinction whether they belong to the global North or South part of the world, have similar needs and desires. Everywhere, there are big companies promoting their products with utilization of various modern tools and are actively fighting for consumers. This study pays attention to the importance and utilization of aroma marketing in the business environment generally, where we analyse, describe, and identify its basis. After this, we map, examine, and determine the difference among its utilization in selected countries and compare our collected data. For our research, we chose South Africa as the country of global South, belonging among the stronger ones in this group and Slovakia as the global North country, belonging to the weaker ones in this group. Although, there is not such a big difference among the development level of selected countries, we assume that these marketing tools are more common for the examined European country as we assume that there are much more opportunities and willingness for utilization of this modern marketing tool in the countries of global North which usually do not have to daily fight with most of the problems that people in developing part of the world must live with, that in our opinion makes the interest in these marketing tool lower. However, we are going to point out also the new potential of aroma marketing in supporting and achieving sustainable development.

1.1 Neuroscience usage in marketing

Neuromarketing is the application of neuroscience to the marketing. It is known as consumer neuroscience, which refers to the measurement of physiological and neural signals to gain insight into customers' motivations, preferences, and decisions, which can help improve creative advertising, product development, pricing, and other marketing areas (HBR, 2020; see more also in Agarwal & Dutta, 2015; Plassmann, et al., 2015; Venkatraman, et al., 2012; Madzharov et al., 2015). By this, marketers learn why consumers make the decisions they do, and what parts of the brain are motivating them to do so. It can be very useful because about 95% of thoughts occurred in the unconscious mind cannot be measured by traditional research methods (Marketing-Schools.org, 2012). Neuromarketing uses brain imaging, scanning, or other brain activity measurement technologies to measure the response to specific product, pack, advertisement, etc. (Neuroscience marketing, 2019). Neuromarketing is focused on understanding thoughts and behaviour of consumers. Its aim is to study how the brain is physiologically affected by advertising and marketing strategies and how to improve their effectiveness (Miljković & Alčakovič, 2010, pp.275-276).

We can say that the smell is being one of the most sensitive and emotional senses, with a great ability to associate certain aromas with specific situations. Various studies affirm that 75% of our emotions which are experienced during the day, are related to aromas and human can

recognize up to 10 000 different aromas (more in Jiménez-Marín, 2016; Erenkol, 2015). They strongly influence the buying behaviour because, while humans are only able to remember 50% of the things they have seen after three months, in the case of aromas it is up to 65% after one year (Mukherjee, 2015, p.1294; see also Herz & Cupchik, 1992). Thus, we consider significantly important to pay attention to the smell and aromas in the marketing and its utilization in the business environment.

1.1.1 Importance of aroma in the business environment

Smell is one of our most primal and deeply ingrained senses. With all other senses, a person thinks first before reacting, but with smell, their brain reacts before they think (Vlahos, 2007). Marketers are interested in the smell because it has great potential to generate direct responses to marketing stimuli, as this sense is considered to be most closely linked to emotional responses. Therefore, it is so important for the business environment which constantly requires changes that promote growth and customer satisfaction. The main importance of the smell is that it is the only sense directly linked to the limbic system, which controls memory and emotion. People react emotionally to a scent even before they can identify it. This has a subconscious effect on their behaviour and spending patterns (Spectrio, 2020; see more also in Berčík, et al. 2020). In today's business environment full of tough competition, it is important to attract customers by creating memorable experiences and emotional connections (Air/Aroma, 2020). However, the perception of scents is individual and involves many factors, such as individual preferences. Therefore, the most important thing is to find scents that appeal to as many potential consumers as possible (more in, Virkkunen, 2015). This makes aroma marketing an essential part of marketing communication (Sikela, 2015). Conick (2017) states that customers influenced by a pleasant scent stay in the store 44% of the time longer than they would without it (Conick, 2017), and this significantly increases the impact of aroma marketing on sales (see more also in Herz, 2009; Spence, 2015).

All senses trigger memories, but the smell triggers more emotions. Therefore, "customers' satisfaction can be enhanced by thoughtful manipulation of environmental stimuli (Bradford & Desrochers, 2010, p.144). An important task for marketers and store owners is therefore to find the right scent and the right intensity. Many scent companies have been established for this purpose, as scent links the aroma to the brand (see also Errajaa, et al., 2021; Hussain, 2018).

2. Data and methods

The present work is based on qualitative research that draws on a theoretical analysis of the current status of the use of aroma marketing in the business environment in South Africa and Slovakia – as selected countries of the global South and North. As far as economic characteristics are concerned, we can say that South Africa is one of the most developed and one of the richest countries in the given group with a relatively prosperous economy. On the other hand, Slovakia is one of the not so rich and most developed global North countries and has a weaker economy.

The study was carried out within the framework of the APVV project NEUROSMELL (no APVV-17-0564), which aim is to systematically examine the synergistic link between brain, physiological and psychological processes and aromachology, as well as their economic efficiency and effectiveness in selected sectors of the national economy: manufacturing, trade, and services, through innovative research solutions of aromachology and consumer neuroscience. Emphasis is placed on exploring the targeted impact of indoor aromas on the behaviour of visitors, customers, and employees, as the number of companies using

aromachology continues to increase in national and international markets. The aim of the research in this study is therefore to explore the potential of consumer neuroscience and aroma marketing in the national markets of selected countries and to highlight providers and focus on the new marketing tools using opportunities for influencing human emotions and behaviour, as well as to explore the disparities between their uses in these countries.

We use various research methods to comprehensively achieve the main objective:

First, the aim of the study is to highlight this modern marketing phenomenon – aroma marketing – a part of consumer neuroscience, as it is still relatively new and developing phenomenon.

Subsequently, we map, describe, and identify the place and importance of aroma marketing in the current world markets in general, then we deeply map, examine, and identify the differences between the use of this phenomenon in the business environment of the selected countries – South Africa and Slovakia – and compare the data obtained, as these two countries belong to differently developed parts of the world divided to the so-called global South and global North.

In the end, we determine the importance of the examined phenomenon and its potential in supporting and achieving sustainable development. The results of our research will allow us to assess the current state of the analysed area, as well as to draw our own conclusions.

For our scientific interest, we chose to work with the most commonly used worldwide scientific information databases and search engines, such as Google Scholar, SCOPUS, Web of Science and ResearchGate, as well as other available resources, especially the websites and data referring to the aroma marketing providers in selected countries. The contribution of this detailed analysis is to point out the usage of various aroma marketing tools in those countries and compare it in a wider context of national markets, their development classification and importance for achieving sustainability in development.

3. Results and discussion

3.1 Using aroma in marketing of selected countries and its potential for sustainable development

As mentioned earlier, scent can evoke emotional responses because it is first processed in the limbic system of the human brain (Doucé et al., 2014). Thus, aroma marketing uses scents to trigger mood, promote products and brands and attract customers. It can establish brand identity, create, and support customer loyalty (Schutte, 2016).

From the economic point of view, we must note that aroma marketing and aroma devices are expensive. However, from a global perspective, we can state that the use of aroma marketing tools (biometric and neuroimaging) is increasing. It is also because in many countries, especially of the Global North, it has come to be considered as a necessary standard (Berčík et al., 2017). We also assume that the investment in this research is generally higher in the Global North than in the Global South, due to opportunities, availability of funding and other resources. Aroma marketing is more than just spreading a pleasant aroma in a space. It creates a company's marketing message which can build a continuous connection with consumers (Air/Aroma, 2020). Therefore, aroma marketing has growing importance in the business environment (see more in Goldkuhl & Styvén, 2007; Berčík et al., 2016; Proserpio et al., 2017).

Given the above facts, we believe that it is spreading in the Global South as well. In doing so, we examine whether the use of aroma marketing in the Global North and the Global South differs significantly, as it is mostly about investing and spending money, increasing consumption, and maximizing profit and people's wellbeing.

3.2 South Africa

South Africa is the southernmost country in Africa. It has over 59 million inhabitants and covers an area of around 1 221 037 km². South Africa is a global South – developing – country and ranks 113th on the Human Development Index (7th highest in Africa). By the World Bank, it was marked as a newly industrialized country, with the upper-middle-income economy, the second largest economy in Africa (after Nigeria), and the 32nd largest in the world. It is also the most industrialized and diversified economy in Africa. The country represents a middle power in international relations as it has significant regional impact. It is also a member of the G20 (the only African member). But, corruption, crime, poverty and inequality are still a big issues there, along with a high unemployment. South Africa has developed banking sector rated as a strongly positive feature of its economy (Encyclopædia Britannica, 2020b).

3.2.1 Aroma marketing companies

The most popular and active companies promoting aroma marketing in South Africa you can see in Table 1. ScentAir, SOH scent marketing, Scentology, Scent Solutions, BrandScents, SAAFFI, DMX.

Table 1 Companies promoting aromas for business environment in South Africa

Company name	Main business focus	Description of their business
ScentAir	Aroma marketing	Enables businesses to create in-store experience by engaging memory and emotions through scent systems
SOH Scent Marketing	Aroma marketing	Promises creating a sense of prestige for the business's office or store
Scentology	Aroma marketing, scent solutions for businesses	Provides wide range of aromas and selection of scent delivery systems to find scent solution for various businesses
Scent Solutions	Aroma marketing	Declares proficiency and experience which enable its experts to create perfectly scented environment for their clients and their customers
BrandScets	Aroma marketing	Works directly with brand owners to design and blend brand aromas
Initial	Hygiene Services and Scenting	Creates and enhances customers' experience with scenting and choosing the right aroma
DMX	Sensory marketing	Creates engaging customer environments, motivates staff and builds brands

Source: Own processing using the information from the companies' websites

ScentAir Technologies is the company settled in Johannesburg. It was founded in 2000 and it seems to be the leading provider of aroma marketing solutions for brands and retailers in this country. It enables businesses to create in-store experience by engaging memory and emotions via the scent delivery systems. Their scent machines can be customised to cover every even challenging spaces and brands (Allsense, n. d.). They use three systems: ScentWave – ideal for any business environment and uses dry-air technology; ScentDirect – features advanced diffusion technology that converts liquid aroma into a dry invisible mist, then releases it into the space; ScentStream – for creating long-lasting environment aroma in the large space. This company offers wide range of technologies and solutions that can help businesses to aromatize the smallest spaces up to the largest ones (stadiums, etc.). It is a part of AllSense Group – the multinational organization which main product line is providing environmental scent services leading brands, hotels, and retailers around several countries where it operates: Australia, New Zealand, Singapore, Malaysia, and South Africa (Allsense n. d. <https://allsense.co.za/>).

BrandScents was created in 2005, so it also belongs among the forerunners in this field in South Africa. It works with brand owners to design and blend brand aromas, as well as to implement and install the required hardware to diffuse the aroma. Their aim is to fit physical foundations without being invasive to the structure and fit to the marketing budget without causing stress. They use scent technologies that diffuse aromas through the HVAC (heating, ventilation, and air conditioning) or ducting systems in the business (appropriate especially for aromatizing large spaces while the Plug and Play units are used for smaller spaces) (BrandScents, n. d.).

Scent Solutions – it delivers cutting-edge scent systems and provides aroma signature scents for combatting malodours, as well as provides a wide range of aromas with germ-killing properties. They state that their proficiency and experience enable them to create perfectly scented environment for their clients and their customers. Their scent systems use technology ensuring effective, longest lasting, and safe scent diffusion suitable for scenting both private and public areas. They use mainly free-standing and HVAC (aircon) and modular (wall-mounted) units. Free-standing systems are effective in aromatizing both small and larger spaces. Their HVAC systems are effective mainly in large areas. Modular units are designated for areas where free-standing or HVAC aircon units are not suitable (Scent Solutions, 2016).

Scentology is another aroma marketing company. It provides broad range of aromas and selection of scent delivery systems to find scent solution for various businesses. It works with several tools, mainly: Aircon unit – out of sight system diffuses liquid aromas into a dry mist before it is integrated into the existing air conditioning or ventilation system. It can be modified for any space of any size. It offers also other systems – Scentology’s stand-alone diffusion system (small, quiet and efficient system); Small area battery operated systems; and also Reed diffusers, room fragrance sprays; and oil burners for smaller spaces (Scentology, 2016).

Another company is *SOH Scent Marketing*. It uses the power of scent to help businesses create a brand presence and increase it in the eyes of their customers. It uses cutting-edge technology to create scenting solutions in aesthetics and diffusion. It promises creating a sense of prestige for the business’s office or store. Their technology, modern designs and wide range of aromas create scent solutions for different brands and spaces. They also offer diffusing systems for any space and provide systems with programmable and innovative cold air micro-mist diffusion systems with timer and back up battery built in HVAC adaptor. Company also provides full service for businesses (SOH Scent Marketing, 2018).

Another one is *Initial* that offers to create and enhance customers’ experience with scenting and accents that the right scent can set the business apart from the competition, create an inspiring ambience and increase engagement with the brand. They offer help clients to select the aroma that matches their needs and best reflects the brand identity, objectives, and the customer experience that they wish to create. It offers aromatization of spaces of any size – from small rooms to whole buildings. Together with professional air-flow assessment, expert installation, and servicing, they offer to create a relaxing and inviting environment for customers who will stay longer and return more frequently, as well as for the employees (Initial, 2020).

DMX is another company dealing also with aroma marketing. It marks itself as a global leader in audio and visual branding and experiential marketing. It creates engaging customer environments, motivates staff, and builds brands. They want to create extraordinary experience through aromatizing, music, messaging, and digital signage in the businesses, and help them develop the aroma marketing and branding strategy that captures the essence of their brand (DMX, 2020). The systems for aromatization are chose based on further consultancy with their experts and their potential customers.

3.3 Slovakia

Slovakia is a Mediterranean country in Central Europe. It covers territory of about 49 000 km² and is mostly mountainous. The population is over 5, 4 million. The Slovak economy is marked as developed, high-income economy. It ranks 36th on the Human Development Index and it is the 64th largest in the world. In 2020, Slovakia was ranked by the IMF as the 38th richest country in the world. The country was successfully transformed from a centrally planned economy to a market-driven economy. Major sectors and spheres are privatized and foreign investments have risen. However, the country has strong regional imbalances in wealth and employment (Encyclopædia Britannica, 2020a).

3.3.1 Aroma marketing companies

In Slovakia, the using of aroma marketing tools has starting to be popular few years ago. As most important in this field are the companies shown in the Table 2.

Table 2 Companies promoting aromas for business environment in Slovakia

Company name	Main business focus	Description of their business
Store Media	Sensory marketing	Helps to aromatize clients' space to make their stores different from the competitive ones
Aroma marketing	Aroma marketing	Engages in aroma marketing with offering complex aromatizing of places
New Aroma	Aroma marketing – Aroma logo creation	Creates Aroma logo as an effective tool that helps clients build an emotional relationship with the company or brand
Aroma One	Aroma marketing	Offers professional places aromatization
LORIKA	Cleanliness – hygiene – health – Scent marketing	Offers to present the strength and beauty of aromas that support the business
Profichemia	Disinfection – Scent marketing	Offers made-to-measure solutions of aromatizing the spaces for their clients
QEX	Disinfection – Scent marketing	Presents natural scents developed especially for the purpose of neutralizing bacteria and viruses in space and for better breathing

Source: Own processing using the information from the companies' websites

Store Media is company established in 2002. It offers clients to make their businesses different from the competitive ones. They highlight that the right scent perfectly separates the space of their clients and creates the desired atmosphere, brings uniqueness to the space, and gives their customers an extraordinary experience that they will want to come back and spend more time in this pleasant environment. The company looks at clients' businesses through their eyes to know their business intention. They present the world trends and together they can choose the right scent. They present their clients the ways that aroma marketing can be applied in practice and together they choose the right technology. The type of device is chosen according to the size of the space (they offer scents for any store or service from smaller (boutiques, banks, etc.) to bigger size (shopping centres, clubs, etc.)), as well as the right intensity and time when the device shall be in operation. They take care of servicing their devices and provide a test directly in the operations when potential clients want to try the aromatization (Store Media, 2020).

Aroma Marketing – was founded in 2013. It is an innovative company that works with laboratories and marketers to bring new and unrivalled solutions in the field of aroma marketing to the market. It offers professional advice on aroma marketing and aroma branding

and the complex and carefree aromatization of spaces with professional facilities without entrance fees that provide an effective and long-term way to remove odours (from cigarettes, toilets, sweat, etc.). They offer 250 different scents, as well as to mix own unique scent that reflects the brand's vision – the so-called aroma logo. They also offer short-term rental of equipment for events, conferences, sales events etc. and provide cost-effective measurement and evaluation of customer satisfaction through the Aroma kiosk, as well as the possibility of designing short-term targeted campaigns to support sales, PR, etc. They provide also additional goods, such as fragrant promotional and gift items, car perfumes, car cosmetics, cleaning products, etc. Their devices are suitable for scenting small as well as large spaces (Aroma Marketing, 2020).

New Aroma is a company focused on creating aroma logo for the clients. Aroma Logo is an effective tool that helps to complete the overall image of the brand and the emotional relationship to the company or brand. The scent becomes a memorable part of the brand identity when used. *New Aroma* provides an analysis of the needs of their clients and their subject of business, as well as assistance in selecting a suitable aroma. It provides free sample preparation, installation of flavouring equipment and staff training. They use specialized diffusers and work with specialized team of perfumers, professionals, and designers to create the scents for perfect atmosphere for their customers' businesses. They provide professional fully automatized scenting of any space, large selection of quality scents and the ability to create own Aroma logo according to customer requirements. They also rent their equipment (New Aroma, 2020).

Aroma One is company focused on aromatization of spaces as well as the use of aromas to neutralize odours. It aromatizes the space for various operations as well as prestigious brands and focuses on creating emotion associated with the aroma. As stated – they add more emotion to their clients' spaces. As part of their services, they offer a variety of diverse and non-standard fragrances for various types of businesses. They have a wide selection of highly professional aromatizing equipment, which they choose for each client individually (Aroma One, n. d.).

Then we examined three companies that provide the aromatization as a side activity or in a different way. The first is *Profichemia* which purpose in the field of aroma marketing is to differentiate the client's operation, office, or retail space from the competition. For this purpose, it promises to mix together with the client a unique scent that will represent the company best. They provide a made-to-measure solution, choice from a wide range of scents, free aromatization test for 10 days and service for their devices (Profichemia, 2020). Another one is *Lorika*, focused on attracting clients to the potential of aroma marketing for the business environment. They help clients create their Aroma Logo, which they do based on the analysis of brand's or company's history, philosophy, vision, space characteristics, and moreover how the brand wants to communicate through the scent and what it wants to achieve with the scent in its stores – determine exactly what the scent shall say about the brand. In combination with know-how and technologies, they provide quality and professional aromatization of various spaces with the possibility of using three different devices (Lorika, n. d.). Last one is *QEX*. The company is slightly specifically in focus. It promotes natural scents developed for the purpose of neutralizing bacteria and viruses in the store area and for better breathing (QEX, 2020).

3.4 The potential of aroma marketing for supporting sustainable development

According to various research, aroma marketing can contribute to sustainability in different ways, for example sustainable consumption, better awareness of the need for environmental management or the adoption of green technologies, etc. One of these possibilities is a better understanding of how to increase people's emotional engagement through their scents and

olfactory memories in favour of sustainable choices. Aroma marketing can act as a link between people and the right decisions in favour of, for example, the use of green technologies, sustainable consumption, awareness of environmental issues such as the importance of recycling, etc. (Caldeira Oliveira, 2014). It is important to understand that environmental innovations must be linked to human aspects in order to be successful, and it is the aroma marketing that explores the factors that motivate people's behaviour and the reasons why they make certain decisions instead of others. In this respect, these marketing tools can also be used effectively because they can encourage a new perspective on how we react to different environmental campaigns and why we still often do not take into account the environmental impact of what we buy and how much waste we produce.

It can be used to promote products and services that help sustainable development, or just to promote sustainable consumption, green products, etc. These are just some of the possibilities of aroma marketing promoting sustainability. Aroma marketing tools can also contribute to various research and studies on how to promote sustainability through consumer decision-making or how to influence them through scents and emotions to buy environmentally friendly products, etc. They can help in assigning sustainable attributes that evoke positive emotions in people in favour of selected environmental products or environmental feelings, raising awareness towards sustainable choices, etc. They can make environmental products more attractive through selected aromas or intensify customers' perception of sustainable products (Caldeira Oliveira, 2014). The possibilities and potential of aroma marketing for sustainable development and consumption are much broader.

4. Conclusion

The effects of aroma on human behaviour have shown that beyond making a pleasant and memorable experience, smart use of aromas can lead to several substantial benefits for businesses but also to environment. The right aroma can make the business warm, welcoming, and memorable by associating the scent with a good experience. Some aromas can evoke reactions before the consumer even perceives their presence. This stimulation of certain behaviours is therefore a growing trend in marketing, and it is a promising industry that is experiencing growing success and innovation. There is an intensive call for more attention to this method in order to discover new opportunities and implement them into the practice.

Considering our research results we can say that in both countries the aroma marketing has raising importance and utilization in practice. Both started to practice it long time ago. South Africa belongs even among the most active in this within the African region. There are many aroma marketing companies, using sophisticated methods, covering all types of businesses and spaces. We believe that there may operate also other companies besides the analysed ones, which are in some way also offering aroma marketing solutions, but we considered the mentioned ones as the most important in both countries. We can say that the examined companies in both countries are operating highly professional and providing all modern tools of this raising phenomenon for the business environment. The possibilities of businesses for choosing among this type of services and products is comparable in both countries.

We can say that our selected countries can be characterized with quite equal economies, and both are characterized by growing popularity of this phenomenon and its raising active utilization in the business environment. From the results, it might be seen that South Africa is more active in this sphere, at least in the number of companies, but considerable differences in size and population need to be considered. Those add more to the activism of Slovakia. However, we also expected this due to a more efficient economy, division of the world and

surrounding by countries with highly professional aroma marketing companies and systems. Of course, we can see the differences in ability of using the aroma marketing potential in business environment in the different parts of the world. The affiliation to the global North or South part is quite important and sometimes maybe determining but the active and successful using of aroma marketing in business environment depends on many other factors that are important as, for example, the placement and surrounding. Here we can see many disadvantages (in surrounding countries there are not operating aroma marketing companies in such a wide extent) and worse conditions on the side of South Africa.

We assume that providing and using of these new methods and tools in the business environment is going to raise in a near future in the whole world, as it has enormous perspective and potential for marketers to rise number of customers. However, it has perspective also for national economies to promote sustainable services and products to people, as well as to support sustainable consumption patterns within the nations which is an important goal with growing urgency, identified in countries all over the world.

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References

- [1] Agarwal, S. & Dutta, T. (2015). Neuromarketing and consumer neuroscience: Current understanding and the way forward. *Decision*, 42, 457-462. doi: 10.1007/s40622-015-0113-1
- [2] Air/Aroma (2020). *Scent Marketing*. Retrieved from <https://www.air-aroma.com/scent-marketing>
- [3] AllSense. *Scent Marketing*. Retrieved from <https://allsense.co.za/scent-marketing/>
- [4] Aroma Marketing. (2020). *O nás*. Retrieved from <https://www.aromarketing.sk/o-nas>
- [5] Aroma One. *Profesionálne aromatizovanie priestorov*. Retrieved from <http://www.aromaone.sk/aromatizovanie/>
- [6] AromaTech. (2020). *AromaTech Scent Diffusers & 100% Pure Essential Oils & Aroma Oils For Home & Business*. Retrieved from <https://aromatechscent.com/>
- [7] Berčík, J., Paluchová, J., Vietoris, V., & Horská, E. (2016). Placing of aroma compounds by food sales promotion in chosen services business. *Potravinárstvo*, 10, 672-679. doi: <https://doi.org/10.5219/666>
- [8] Berčík, J. et al. (2017). Innovative Research Tools for Retail and Services. *Managerial Trends in the Development of Enterprises in Globalization Era*. Nitra: SUA, pp.734-741.
- [9] Berčík, J. et al. (2018). Aroma Marketing – a Modern Marketing Phenomenon. *International Scientific Days*. Prague: Wolters Kluwer, pp.586-598, doi: <https://doi.org/10.15414/isd2018.s2-3.02>
- [10] Berčík, J., Mravcová, A., Gálová, J., & Mikláš, M. (2020). The use of consumer neuroscience in aroma marketing of a service company. *Potravinárstvo*, 14, 1200-1210. doi: <https://doi.org/10.5219/1465>
- [11] Bradford, K. D. & Desrochers, D. M. (2010). The Use of Scents to Influence Consumers: The Sense of Using Scents to Make Scents. *Journal of Business Ethics*, (2009)90, 141-153. doi: <https://doi.org/10.1007/s10551-010-0377-5>
- [12] BrandScents. *Scent your space*. Retrieved from <https://brandscents.co.za/>
- [13] Caldeira Oliveira, J. H. (2014). Neuromarketing and sustainability: challenges and opportunities for Latin America. *Latin American Journal Management for Sustainable Development*. 1(1), 35-42. Retrieved from https://www.researchgate.net/publication/264439189_Neuromarketing_and_sustainability_challenges_and_opportunities_for_Latin_America

- [14] Conick, H. (2017). Good Smells Are Good Marketing: How to Use Scent to Your Advantage. *American Marketing Association*. Retrieved from <http://www.amapittsburgh.org/2017/08/08/good-smells-are-good-marketing-how-to-use-scent-to-your-advantage/>
- [15] DMX. (2020). *We make scent branding*. Retrieved from <https://www.dmx.co.za/scent/>
- [16] Douc e, L. et al. (2014). Influencing consumer reactions towards a tidy versus a messy store using pleasant ambient scents. *Journal of Environmental Psychology*, 40, 351-358. doi: <https://doi.org/10.1016/j.jenvp.2014.09.002>
- [17] Encyclop dia Britannica. (2020a). *Slovakia*. Retrieved from <https://www.bbc.com/news/world-europe-17847682>
- [18] Encyclop dia Britannica. (2020b). *South Africa*. Retrieved from <https://www.britannica.com/place/South-Africa>
- [19] Errajaa, K., Legoh rel, P., Dauc e, B., & Bilgihan, A. (2021). Scent marketing: Linking the scent congruence with brand image. *International Journal of Contemporary Hospitality Management*, 33, 402-427. doi: <https://doi.org/10.1108/IJCHM-06-2020-0637>
- [20] Erenkol, D. A. (2015). Sensory marketing. *Journal of Administrative Sciences and Policy Studies*, 3(1), 1-26. doi: <http://dx.doi.org/10.15640/jasps.v3n1a1>
- [21] Goldkuhl, L. & Styv n, M. (2007). Sensing the scent of service success. *European Journal of Marketing*, 41, 1297-1305. doi: <https://doi.org/10.1108/03090560710821189>
- [22] HBR. (2020). Neuromarketing: *What you need to know*. Retrieved from <https://hbr.org/2019/01/neuromarketing-what-you-need-to-know>
- [23] Herz, R.S. (2009). Aromatherapy facts and fictions: A scientific analysis of olfactory effects on mood, physiology and behavior. *International Journal of Neuroscience*, 119, 263-290. doi: <https://doi.org/10.1080/00207450802333953>
- [24] Herz, R.S. & Cupchik, G.C. (1992). An experimental characterization of odor-evoked memories in humans. *Chemical Senses*, 17, 519-528. doi: <https://doi.org/10.1093/chemse/17.5.519>
- [25] Hussain, S. (2018). Brand Image and Customer Loyalty Through Sensory Marketing Strategies—A Study on International Fast Food Chain Restaurants. *International Journal of Management Studies*, 2(7), 32-39. doi: [10.18843/IJMS/V5I2\(7\)/05](https://doi.org/10.18843/IJMS/V5I2(7)/05)
- [26] Initial. (2020). *Scenting*. Retrieved from <https://www.initial.co.za/scenting/>
- [27] Jim nez-Mar n, G. (2016). *Merchandising & Retail, Comunicaci n en el punto de venta*. Sevilla: Advook. 200 p.
- [28] LORIK.A. *V ne, ktor e podporia vaše podnikanie...* Retrieved from <http://www.vonnymarketing.sk>
- [29] Madzharov, A.V. Block, L.G., & Morrin, M. (2015). The cool scent of power: Effects of ambient scent on consumer preferences and choice behavior. *Journal of Marketing*, 79, 83-96. doi: <https://doi.org/10.1509/jm.13.0263>
- [30] Marketing-Schools.org. (2012). *Neuromarketing*. Retrieved from <https://www.marketing-schools.org/types-of-marketing/neuromarketing.html>
- [31] Miljkovi , M. & Al akovi , S. (2010). Neuromarketing: Marketing Research Future? *Menad ment, Marketing. Trgovina*, 25.05.2010, pp.274-283
- [32] Mukherjee, S. (2015). Brainfluence?—The Effectual Appeal to Customer Psyche. *Advances in Economics and Business Management*, 2(13), 1291-1295
- [33] Neuroscience marketing. (2019). *What is neuromarketing?* Retrieved from <https://www.neurosciencemarketing.com/blog/articles/what-is-neuromarketing.htm>
- [34] New Aroma. (2020). *Marketing v ni*. Retrieved from <http://www.newaroma.sk/scentmarketing/>
- [35] NMSBA. *What is neuromarketing*. Retrieved from <https://www.nmsba.com/neuromarketing/what-is-neuromarketing>
- [36] Plassmann, H., Venkatraman, V., Huettel, S., & Yoon, C. (2015). Consumer neuroscience: Applications, challenges, and possible solutions. *Journal of Marketing Research*, 52, 427-435. doi: <https://doi.org/10.1509/jmr.14.0048>

- [37] Profichemia. (2020). *Aróma marketing*. Retrieved from <http://profichemia.sk/aroma-marketing/>
- [38] Proserpio, C., de Graaf, C., Laureati, M., Pagliarini, E., & Boesveldt, S. (2017). Impact of ambient odors on food intake, saliva production and appetite ratings. *Physiology & Behavior*, 174, 35-41. doi: <https://doi.org/10.1016/j.physbeh.2017.02.042>
- [39] QEX. (2020). *Aroma marketing*. Retrieved from <http://qex.sk/aroma-marketing/>
- [40] Scent Solutions. (2016). *Scent marketing for your business*. Retrieved from <https://www.scentsolutions.co.za/>
- [41] Scentology. (2016). *Scent branding for your business*. Retrieved from <https://www.scentology.co.za/>
- [42] Schutte, S. (2016). The importance of scent marketing for retail and hospitality sectors. *Real Business*. Retrieved from <https://realbusiness.co.uk/the-importance-of-scent-market-ing-for-retail-and-hospitality-sectors/>
- [43] Sikela, H. (2015). Vôňa ako súčasť identity firmy. *Instoreslovakia*, 2(13), 14-15.
- [44] SOH Scent Marketing. (2018). *Your message, your brand, loud and clear*. Retrieved from <http://www.sohgroup.co.za/soh-scent-marketing>
- [45] Spectrio. (2020). *Engage Your Customers*. Retrieved from: <https://www.spectrio.com>
- [46] Spence, C. (2015). Leading the consumer by the nose: On the commercialization of olfactory design for the food and beverage sector. *Flavour*, 4, 31. doi: 10.1186/s13411-015-0041-1
- [47] Store Media. (2020). *Aróma marketing*. Retrieved from <https://www.storemedia.eu/sluzba/aroma-marketing/>
- [48] Venkatraman, V., Clithero, J.A., Fitzsimons, G.J., & Huettel, S.A. (2012). New scanner data for brand marketers: How neuroscience can help better understand differences in brand preferences. *Journal of Consumer Psychology*, 22, 143-153. doi: <https://doi.org/10.1016/j.jcps.2011.11.008>
- [49] Virkkunen, I. (2015). *Consumers' opinions on scent marketing usage in retail environment*. Lappeenranta: LUT University. 90 p. Retrieved from <http://www.doria.fi/handle/10024/103784>
- [50] Vlahos, J. (2007). Scent and Sensibility. *The New YorkTimes*, September 9. Retrieved from <https://www.nytimes.com/2007/09/09/realestate/keymagazine/909SCENT-txt.html>

Sustainability of Food Quality in Connection with the Quality of Life and the Environment

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Abstract

Quality of life is one of the most important and extremely discussed concepts in Europe today. It is used primarily as a target value for the economic development of society, but it has also become a new challenge to ensure a dignified life for EU citizens. Last but not least, the quality of life is also mentioned in connection with the promotion of the concept of sustainable development and sustainable consumption. The content of our contribution will point out hazardous substances that can have an impact on the food chain.

Keywords: *quality of life, sustainable, food chain, environment, nutrition*

JEL Classification: *Q01, Q51, Q56*

1. Introduction

The terms sustainability and sustainable development began to be used in the early 1970s, especially in the context of the recognition that any uncontrollable growth (population, production, consumption, pollution, etc.) is unsustainable in resource-constrained environment. Sustainable development in the Slovak Republic is legally defined by § 6 of Act no. 17/1992 Coll. on the environment. According to him, this is a development that preserves the ability of current and future generations to meet their basic living needs and at the same time does not reduce the diversity of nature and preserves the natural functions of ecosystems (National Strategy for Sustainable Development of the Slovak Republic, 2001).

In the EU, the Hazard Analysis and Critical Control Point (Regulation (EC) 852/2004 on the hygiene of foodstuffs, 2004) was enacted in 1997 as a tool to identify risks related to the production, storage, distribution and preparation of food, including beverages and condiments. It became mandatory in Slovakia from 1.1. 2020 and is modified VIII. head of the Food Codex. It must be said that most quality systems are focused on quality control. The motto of the HACCP system is that it is based on prevention. Its importance is declared by non-destructive continuous inspection of materials, conditions, processes and their parameters, instead of extensive laboratory inspection of products. HACCP is applied throughout the food chain from primary production to final consumption. This means that food safety should be a joint effort of all organizations in the food chain, from feed manufacturers, primary producers, transport and storage operators to subcontractors, retail establishments and catering establishments. Other partners must be involved in the quality system, such as suppliers of packaging materials, cleaning agents, additives and other ingredients needed in food production. Non-profit organizations are also expected to be responsible for food safety.

However, less attention is paid to the impact of the environment and its possible contamination as a source of poor quality raw materials. However, many companies are increasingly using as a

marketing distinction from the competitive environment and demonstrating the whole system of transformation of inputs to outputs. So, we can notice e.g. on chocolate packaging that companies accurately identify all the circumstances and inputs to the value chain of the final product. However, this fact is rather exceptional in our country and applies to the so-called Luxury products imported from abroad, or traditional foods, where it is easier to identify their origin.

This is the reason why we have focused on substances that can have a very significant impact on the quality of the final product and are not directly related to any circumstance concerning the transformation process as such, but are directly related to the inputs to it.

1.1 Food chain

Food has been a staple source of human nutrition for centuries, as it supplies energy and essential nutrients (proteins, carbohydrates, minerals, fats). Due to the presence of contaminants that enter food from exogenous environments during processing, it is necessary to systematically address their composition.

The food chain is a complex chain of relationships between food producers, producers, retailers and consumers. It is influenced by all stakeholders through their activities and may pose a potential risk to the final consumer. Food can be exposed at several stages of the chain to toxic amounts of various chemicals that enter them through agricultural practices, industrial processing, inappropriate storage or environmental contamination (European Court of Auditors, 2019).

Therefore, the issue of limiting the penetration of foreign substances into the food chain is not only a matter for the Ministry of Agriculture and Nutrition, but the implementation of this task is unthinkable without the clear co-responsibility of other ministries.

Foods themselves consist of chemicals, but those that have the potential to cause adverse health effects are considered dangerous. About 75% of new diseases that have affected humans since 2000 come from animals or products of animal origin (European Food Safety Authority, 2013)

Food safety is a top priority in the EU to ensure that people are protected from food-borne diseases. In this regard, it is gratifying that, according to WHO estimates of the global burden of food-borne diseases, Europe is one of the safest places in the world (European Court of Auditors, 2019).

1.1.1 Environmental hazardous substances with an impact on the food chain

According to §2 of Act No. 17/1992 Coll. on the environment, the environment means everything that creates the natural conditions for the existence of organisms, including humans, and is a prerequisite for their further development. The quality of the environment is then reflected in the quality of life of all living organisms that are part of it.

The deteriorating quality of the environment in some regions of the Slovak Republic affects the unfavourable health status of the Slovak population. The morbidity structure of the Slovak population has not changed significantly for a long time, the most important groups of diseases are chronic non-infectious diseases, cardiovascular and cancer diseases. However, these diseases are already threatening the younger population and their share is gradually increasing.

The area of nutrition is also closely connected with the health status of the population. Therefore, stable food security is of strategic interest. One of the eight basic goals of the agricultural and food policy of the Slovak Republic is the adaptation of agriculture to environmental requirements for the protection of soil, water, air, the preservation of species diversity and the protection of traditional gene resources (National Strategy for Sustainable Development of Slovak Republic, 2001).

In connection with the quality of the environment and its impact on the food chain, several chemicals are known which, when incorporated into food, pose a health risk. Their toxic effect and subsequent effect on health is determined not only by their presence in food, but also by the amount that enters the body (dose and frequency) and the duration of exposure. Foreign substances have effects often specific only to certain organs, can affect immune responses, integrate with food nutrients and worsen their biological values. Their late (genotoxic, carcinogenic, embryotoxic, teratogenic) effects have a serious impact with the possibility of influencing future generations.

The intensification of agriculture, especially the use of fertilizers, has a major impact on the environment. Substances that enter the soil from fertilizers leak from it and have a negative impact on water and air quality, threaten biodiversity, deplete the ozone layer and contribute to climate change. Compared to EU countries, the soil in Slovakia contains relatively few nutrients, which leads to higher consumption of industrial fertilizers.

Persistent organic pollutants (POPs) are considered to be particularly feared and dangerous. They are known to be toxic even in minimal concentrations, do not decompose in the long term, persist in the environment for decades (they are persistent) and are capable of transmission over vast distances. They accumulate in the adipose tissue of most living organisms and subsequently in the food chain, so in the highest concentrations they occur at the top of the food chain in Under the 2001 Stockholm Convention (<http://www.pops.int>) on Persistent Substances, 12 POPs with the worst effects on human health have been identified. These are mainly by-products of combustion and chemical production (polychlorinated dibenzodioxins and polychlorinated dibenzofurans), industrial chemicals (hexachlorobenzene and polychlorinated biphenyls) and some pesticides (e.g. chlordane, aldrin and others) mammals, including humans.

Polychlorinated biphenyls (PCBs) are a dangerous chemical substance present in the environment in the Slovak Republic. In nature, they degrade very slowly, they most often get into food through feed, in living organisms they are stored in fat parts, resp. milk. They have been found to cause disorders of the nervous system, reproduction and carcinogenesis in humans (they are hepatotoxic). The zone of contamination with these substances is located in the Slovak Republic from Strážské to Michalovce and ends in the Zemplínska Šírava reservoir. There are almost 250,000 inhabitants living in the region, who are directly or indirectly endangered by contaminated water, soil, plants or animals. From the results of analysis of water from the stream in the vicinity of Strážské, at the bottom of which there are barrels with waste materials generated during production, the permitted limit of PCBs is currently exceeded 15 times (Blaščák, 2020).

Polycyclic aromatic hydrocarbons (PAHs, such as naphthalene, phenanthrene, benzo (a) pyrene) are also serious environmental contaminants. These are chemicals that can have a negative effect on humans, especially in individuals who are exposed to these substances for a long time. PAHs occur in almost all components of living nature, because they are constantly formed by the action of heat during the decomposition of living matter, especially under anaerobic conditions. The highest concentrations of PAHs and similar compounds were found in foods grown near large industrial factories or in foods that have been roasted, grilled, smoked, or otherwise heat-treated at very high temperatures (State Veterinary and Food Administration of the Slovak Republic, 2022).

The possibility of contamination of the environment with radioactive substances is also a serious problem. Various studies have shown that the general public has concerns and distrust of official statements and measures, especially in connection with the production of electricity in nuclear power plants, respectively. with the storage of radioactive waste. However,

agricultural land alone is not the primary source of radioactivity. Soil has a predominantly mediating role, because it captures and binds radionuclides from the atmosphere, surface and precipitation waters, while these radionuclides are subsequently involved in biological cycles through the plant root system (Ferdinandová, 2008).

As far as agricultural land itself is concerned, its contamination is caused by the above-limit content of some hazardous chemicals. From this point of view, some chemical elements (cadmium, lead, nickel, copper, arsenic, mercury, fluorine), as well as polycyclic aromatic hydrocarbons (PAHs) and also polychlorinated biphenyls (PCBs) are at risk. They occur in soils in different concentrations and in different forms and their increased content may be caused mainly by the influence of various anthropogenic activities (industry, energy, transport and agriculture), but it is often typical of mountain areas due to the so-called natural geochemical anomalies (Kročková, 2021).

Of all the chemical elements that enter the food chain from the environment, lead, cadmium, arsenic, and mercury are considered to be the most important (Zmetáková and Šalgovičová, 2006). For plants, the natural source of lead is its content in the soil, which is conditioned by the geological properties of the subsoil. Lead accumulates in the surface layers of the soil, which contributes to its greater cycle in ecosystems, thus significantly increasing its danger to humans and animals. One of the main sources of lead in contaminated soils is emissions from smelters, application of sewage sludge and fertilizers to the soil, transport and gravity deposition (rain, snow, hail) (Peltznerová et al., 2009).

Its residence time is so long that it can be considered a permanent part of the soil (Ďurža and Khun, 2002). Cadmium is an abiogenic element and is one of the most toxic chemical elements, especially in the form of its soluble compounds. Cadmium compounds are carcinogenic in some cases. The source of environmental pollution is metallurgical plants, it also enters the atmosphere by burning low-quality coal and oils. This element enters the soil through wastewater, the application of sewage sludge, compost and, in the past, the application of phosphorous industrial fertilizers made from apatite's imported from Tunisia, Algeria, Morocco, Togo and Senegal (Poláček et al., 2005).

Mercury enters food from natural and human sources. Mercury concentrations in food crops are generally low, with the largest dietary intake coming from eating seafood. Mercury levels in most field crops are low enough to have a detrimental effect on health. As for arsenic, some soils, vegetation and poultry may be contaminated with it because arsenic compounds have been used as insecticides, herbicides and as animal feed additives (Egyúďová and Šturdík, 2004).

The areas with the most contaminated soil in the Slovak Republic are marked in red in the following figure (Fig. 1), in these areas there are above-limit concentrations of hazardous substances in the soil (Kročková, 2021).

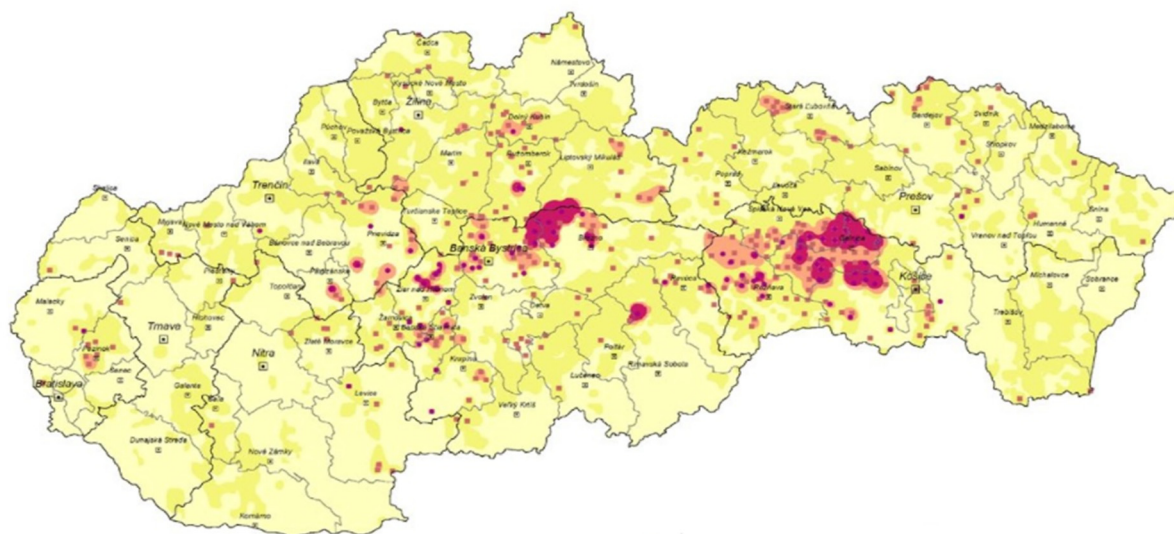


Fig. 1 The most contaminated soil in the Slovak Republic (Kročková, 2021)

1.2. The quality of milk in the context of negative environmental impact

Milk is a food with high nutritional value and is the natural and only food of newborn mammals. It can meet all the nutritional requirements of young during the first stages of their lives, including humans. Milk and dairy products are a key commodity that is crucially used to ensure the proper nutrition of the population. From high-quality milk proteins, a person obtains all the essential amino acids, fat and milk sugar are sources of energy for the body, and the content of water and micronutrients (mineral nutrients and vitamins) is also not negligible. The composition of milk differs qualitatively and quantitatively between individual mammal species (Pijanowsky, 1977).

Kubicová (2004) describe the benefits of milk not only in physiological but also in therapeutic nutrition. However, the diet must be limited, resp. completely eliminated in the absence of the enzyme lactase or when it causes other difficulties (meteorism, diarrhea, constipation, etc.). Health problems after consuming milk also arise in some diseases of the gallbladder, pancreas and intestines.

However, milk is a food that, due to its natural composition and origin, is easily accessible to environmental contaminants. Practically all serious environmental contaminants (pesticide residues, POPs, PCBs, PAHs, heavy metals - cadmium, arsenic, lead and mercury) are dangerous with the possibility of accumulation in milk, especially milk fat is prone to their occurrence.

Pesticides, as foreign substances, enter food by agricultural chemistry. If animals are fed feed that has been treated with pesticides, these hazardous contaminants can enter meat, milk and dairy products. Food can also be contaminated if it is treated with pesticides for long-term storage (Egyúdvová and Šturdík, 2004). Pesticide residues may be present in the milk, although the risk associated with consuming milk containing excessive amounts is currently low. However, even products that are no longer used persist in the environment and are consumed by dairy cows together with feed, thus passing into milk. Pesticides can also enter milk when used to kill insects in cowsheds. Prohibited pesticides that still persist in the environment include, for example, DDT (dichlorodiphenyltrichloroethane), HCB (hexachlorobenzene), HCH (hexachlorocyclohexane) and lindane (Komprda, 2004). Polychlorinated biphenyls

(PCBs) have not been produced for several decades, but their residues still persist in the environment, are transported dissolved or emulsified in water and thus enter the human food chain. PCBs enter the milk from a dairy cow that has ingested contaminated feed or drinking water. With longer intake, the balance between PCB intake and excretion from the dairy cow is stabilized and PCBs accumulate in its adipose tissue. From there, they are slowly released into the milk (Komprda, 2004). Contamination of milk with radionuclides is one of the physical hazards in food. Strontium passes from the slope into the soil and water, from there into the plants that are fed to the dairy cows, and is excreted in the milk. However, only 3% of the total strontium that the animal has received in the feed enters the milk. Another way strontium can get into the body of a dairy cow is through lung inhalation or skin resorption. Strontium has an affinity for the bones where it settles after ingestion (Pijanowski, 1977, Komprda, 2004).

1.3 Quality in relation to dairy products

Milk production takes place in all EU countries and represents a significant share of the value of agricultural production. Total EU milk production is estimated at around 155 million tons per year. The main producers are Germany, France, Poland, the Netherlands, Italy and Spain. However, there is also trade with non-EU countries. Import licenses and import duties shall apply to preferential imports.

The annual consumption of dairy products is also important information. In general, there is a pleasing growth trend in Slovakia. According to the WHO, each person should consume 220 kg of dairy products a year. Although this figure is not reached or exceeded in the territory of the Slovak Republic. The average annual consumption of dairy products in the Slovak Republic is at the level of 173.6 kg.

The reason may also be self-sufficiency in the production of raw milk in particular due to the decline of dairy cows and entire farms, and thus our producers are unable to compete with foreign producers. In August 2019, the 2muse agency (<https://www.2muse.sk>) conducted a survey of a sample of 1,019 respondents, where they were interested in which qualitative criteria of Slovak dairy products they are most interested in when buying.

61% of respondents identified quality as the most important factor, followed by price, third place of origin and third place freshness. The President of the Slovak Dairies, Mr. Voska, believes that the quality and freshness of the dairy sector's products should be a priority in the attention of consumers. In our opinion, and following previous findings from our contribution, this is also the country of origin. If the product names have a special link to the place where they are produced, a so-called geographical indication. Thanks to the recognition of a geographical indication, the consumer can distinguish a quality product and trust it. On the other hand, geographical indications help producers to sell products better. Such products are listed in the so-called register of quality products. The registers also contain information on the geographical and production specifications of each product.

It must be said that Slovak dairy products, unlike imported food, have not yet been the subject of any serious food scandal.

2. Data and Methods

In the processing of our contribution, secondary information sources from available surveys conducted by recognized authorities in the subject area were used. We also used searches from available literary sources, EU regulations, strategic documents of the Ministry of the Environment of the Slovak Republic and analysis of the Dairy Fund of the Slovak Republic.

We used the methods of comparison, induction and deduction and we used partial results of our own research.

3. Results and Discussion

The result of our findings is that food quality is closely linked to the environmental quality of a particular geographical area and that all parts of the food chain contribute to their quality. From its primary link to the finalization and distribution of food, the food chain is open to the penetration of contaminants from all material and intangible inputs into production (pesticides, fertilizers, biologically active substances, soil, air, water), which adversely affect on the plant and animal food raw materials. The most serious substances that are also found in the environment in the Slovak Republic include heavy metals (arsenic, cadmium, mercury and lead) and various organic substances belonging to the groups of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and persistent organic pollutants (POPs). All of them are characterized by a high degree of biotoxicity to warm-blooded animals and humans.

Milk and dairy products are examples of food endangered by environmental contaminants. We chose this example because milk has an exceptional position in the nutrition of humans (and mammals in general). It is a food of high nutritional value and is a natural and only food for new-born mammals. However, milk is a very "vulnerable" food, due to its origin, composition and technological processing possibilities within the food chain. Various environmental contaminants, especially from the group of organic substances (PCBs, PAHs, POPs) are concentrated in milk fat, in which they are well soluble and thus stable. In addition, milk can also be contaminated with radioactive substances that are present in the environment around nuclear power plants. From this point of view, isotopes of some elements, especially strontium, iodine and cesium, are dangerous. Therefore, the aim was to show, on the example of milk and dairy products, a close link with the geographical area, the quality of the environment and the quality focused on the whole transformation process from inputs to outputs.

With our contribution, we wanted to emphasize in the general and on the special example as well the importance and impact of the environment on the quality of human life in the context of the food base and products quality.

4. Conclusion

Nowadays places great emphasis on quality of life, good lifestyle, the prevention of diseases of civilization and new innovative forms of food processing. However, the environment will appear to be very important, which can significantly affect the quality of inputs into the transformation process. It is known in quality management that only quality inputs can mean quality output. When buying food products, customers will have to reconsider their usual habits and instead of price as the main attribute of product quality, they will have to take into account the geographical area or the quality of the environment from which the product they buy comes. Finding relevant information is sometimes impossible in a globalized environment. Deviations from quality will be detected in most cases only if a food scandal occurs. However, the subsequent quality control does not correspond to the HACCP philosophy, which focuses more on prevention.

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References

- [1] Blaščák, F. (2020). Nová nádej na likvidáciu nebezpečných PCB látok v Chemko Strážske. Retrieved from <https://spektrum.stuba.sk/sk/blogy/nova-nadej-pre-likvidaciu-nebezpecnych-pcb-latok-v-chemko-strazske>, 11.02.2022.
- [2] Ďurža, O. & Khun, M. (2002). Environmentálna geochemia niektorých ťažkých kovov. Bratislava: Univerzita Komenského, 1. vyd., 2002. 115 s. ISBN 80-223-1657-1.
- [3] Egyúdvová, I. & Šturdík, E. (2004). Ťažké kovy a pesticídy v potravinách. Retrieved from http://www.nbc-journal.fpv.ucm.sk/archive/revue_nova_biotechnologica_4_1/11_Egyudova.pdf, 21.02.2022.
- [4] European Court of Auditors (2019): *Chemical hazards in our food: EU food safety policy protects us but faces challenges*. Special Report No 02, 2019, Publications Office, retrieved from <https://data.europa.eu/doi/10.2865/621484>, 14.02.2022.
- [5] European Food Safety Authority (2013): *Science protecting consumers throughout the food chain: from field to table*. Official Journal of the European Communities, Publications Office, 2013, retrieved from <https://data.europa.eu/doi/10.2805/21109>, 14.02.2022.
- [6] Ferdinandová, L. (2008). Rádioaktívna kontaminácia životného prostredia. X. Banskštiavnické dni, 8. – 10. 2008, p. 181 – 189.
- [7] Komprda, T. (2004). *Obecná hygiena potravín*. Brno: Mendelova univerzita v Brně, 1. vyd., 2004, 148 s. ISBN 80-7157-757-X.
- [8] Kročková, B. (2021). Kontaminácia poľnohospodárskych pôd. Retrieved from <https://www.enviroportal.sk/indicator/detail?id=321&print=yeské>, 11.02.2022.
- [9] Kubicová, D. (2004). *Náuka o požívatinách*. Martin: Osveta, 1. vyd., 2004, 159 s. ISBN 80-8063-165-4.
- [10] Ministry of Environment (2001). *National Strategy for Sustainable Development of the Slovak Republic*, 2001, 235s. Retrieved from <https://www.minzp.sk/files/dokumenty/strategicke-dokumenty/narodna-strategia-trvalo-udrzatelneho-rozvoja.pdf>, 11.02.2022.
- [11] Official Journal of the European Union (2004). *Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs*, Retrieved from <http://data.europa.eu/eli/reg/2004/852/2009-04-20>, 21.02.2022.
- [12] Peltznerová, L., Tomáš, J., Musilová, J. & Szabóová, G. (2009). Olovo ako činiteľ vplývajúci na celkovú antioxidačnú kapacitu v hľuzách ľuľka zemiakového. *Acta fytotechnica et zootechnica*, 12, 2009. Mimoriadne číslo, s.538-539.
- [13] Pijanowski, E. (1977). *Základy chémie a technológie mliekárstva*. Bratislava: Príroda, 1. vyd., 1977, 506 s.
- [14] Poláček, Š., Kulich, J., Tomáš, J. & Vollmannová, A. (2005). *Anorganická chémie*. Nitra: Slovenská poľnohospodárska univerzita, 2. vyd., 2005, s. 369-383. ISBN 80-8069-580-6.
- [15] State Veterinary and Food Administration of the Slovak Republic (2022). *Polycyclic aromatic hydrocarbons*. Retrieved from https://www.svps.sk/potraviny/info_PAU.asp, 16.02.2022.
- [16] Zmetáková, Z. & Šalgovičová, D. (2006). Kontaminácia pôdy, obilia, hovädzieho mäsa a mlieka olovom v Slovenskej republike. Bezpečnosť a kontrola potravín, III. vedecká konferencia s medzinárodnou účasťou, Nitra, 5. - 6. 4. 2006, 6s.
- [17] HACCP Standards

CSR as a Model for Sustainable Development of Relations between Business and Universities

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Abstract

In the context of a mutual increase in distrust between society, government institutions and commercial structures, it is difficult to build a model of relationships based on responsibility. It is necessary to come to an understanding that the corporate social responsibility (CSR) of business will allow reaching a qualitatively new level of relations with society and partners for their sustainable development. Given the lack of public demand for the study of CSR, universities, usually, do not show their own initiative, because they are dependent on demand from applicants. The situation may change dramatically if there is a steady interest in CSR issues among businesses, which, as a future employer, will generate demand among applicants, to which universities will gradually respond. In this regard, we conducted a study of the role of agricultural holdings as the leading export-oriented enterprises of Ukraine in the development of CSR education in Ukraine. In our article we conducted research based on open access information and questionnaires of high rank universities of Ukraine about driven forces to develop CSR education.

Keywords: CSR, university, business, agroholdings, Ukraine, corporate social responsibility

JEL Classification: D21, D81, F29, Q13, Q16

1. Introduction

Ukraine is now in a state of large-scale economic reforms, which provide for the construction of qualitatively new relations between the state, society and business. The part of these reforms is The Strategy for Sustainable Development of Ukraine 2030 that declares the social responsibility of the business community, companies and individual business representatives, the measure of this responsibility and its essence. Historically, key role in times of USSR in social sphere regulation had played state. Paradox is that roles have changed, since Ukraine become independent, we have free market with private property and social responsibility has to be divided between state and corporate sector, but society expectations still lay on state. However, corporate social responsibility is perceived by the society in a very narrow way and essentially boils down to certain charitable activities that business is involved in. Such perception is largely due to the lack of both knowledge in this area and the positive experience of society as a whole. Future of CSR development in Ukraine depends on understanding by business, that CSR isn't costs, it's investment in generating stable profit. That is why we are deeply agreed with M. Hopkins (2004) definition that "CSR is concerned with treating the stakeholders of the firm ethically or in a responsible manner. 'Ethically or responsible' means treating stakeholders in a manner deemed

acceptable in civilized societies. Social includes economic responsibility. Stakeholders exist both within a firm and outside. The natural environment is a stakeholder. The wider aim of social responsibility is to create higher and higher standards of living, while preserving the profitability of the corporation, for peoples both within and outside the corporation.”

Development of CSR in Ukraine will allow the country's economy to a qualitatively new level and overcome the crisis trends that have been observed in recent years. In the context of a crisis of confidence in government institutions, in social infrastructure, in commercial organizations, a new generation of managers who will eventually come to leadership positions will have the opportunity to build a new model. And in understanding the effectiveness of building such a model, educational institutions can play a decisive role. Given the lack of public demand for the study of CSR, universities, as a rule, do not show their own initiative, because they are dependent on demand from applicants. International organizations have a certain influence on the study of these issues, which, with the help of grant projects, increase interest in the study of this area. These trends are confirmed by our study of institutions of higher education. The situation may change dramatically if there is a steady interest in CSR issues among businesses, which, as a future employer, will generate demand among applicants, to which universities will gradually respond. In this regard, we conducted a study of the role of agricultural holdings as the leading export-oriented enterprises of Ukraine in the development of CSR education in Ukraine using as an example the joint project of agribusiness and the university named “Agrokebety”.

1.1. Driven forces of CSR development in Ukraine

Based on own survey of educational institutions and business representatives, as well as our own observations, we believe that international organizations and international businesses have the greatest influence on the development of CSR in Ukraine. The active promotion of CSR by these stakeholders encourages other entities in the Ukrainian market to implement the best CSR practices and improve corporate culture in general.

The influence of society on the development of CSR is not, at the moment, significant in Ukraine. The influence of local civic organizations on the activities of companies in a particular territory is observed. But in general, civil society is just emerging in Ukraine. The level of awareness and interest in CSR is low, which is due to the low level of social protection of the population.

A small part of educational institutions promote the basic principles of CSR, this mainly concerns the largest classical universities in Ukraine. The implementation of such training programs and modules was mainly influenced by international organizations. Below in the article we will consider this issue in more detail.

On the basis of analyze of the report “The contribution of Ukrainian business in the implementation of Sustainable development goals 2016-2020” done by NGO Center “CSR Development” in Ukraine we can divide companies that promotes CSR in the following groups, such as:

- companies creating a good reputation that are engaged in “harmful production” (for example, metallurgical plants, manufacturers of chemical products);
- conditionally “socially obligated companies”, namely companies that are engaged in the production of tobacco products, alcohol and medicines;

- export-oriented companies that become major players in foreign markets and must meet certain standards (primarily, food and agro companies);
- international companies, that have already corporate standards and follows them (primarily, retail sphere).

O. Furrer et al (2010) investigate attitudes toward Corporate Responsibilities in Western Europe and in Central and East Europe. In these research CR observed in 3 directions: social, economic, environmental. Authors conclude that for the CEE region is common high importance of environmental responsibility that may be viewed as compatible with achieving economic objectives in transitional economies that have significant environmental problems. At the same time, social responsibility is less important. Ukraine is also CEE region country with transitional economy. It wasn't investigated in this survey, but over observations justifies the same tendencies in Ukraine.

Of course, for the further development of CSR, it is necessary, first of all, for companies to be aware of what it can give them and understand the essence of this concept. The driving force could be educational institutions that could disseminate the necessary knowledge about CSR for both the new generation of managers and the current one. But the level of inclusion of CSR and related disciplines with this area in educational programs remains extremely low. The main reason is that education, as a rule, reacts on changes to the already existing demand of applicants, less often employers. Moreover, as a rule, this happens with a large lag, dictated first by the need for demand and only subsequent educational decisions. Such behavior is quite adequate to the realities of the market, since the proactive position of universities on the implementation of, for example, CSR, if it does not find the right response from the applicant, will be a failure, and accordingly, it will require the early formation of demand through massive information support, which is financially beyond the power of an individual university.

1.1. Current Trends of Corporate Social Responsibility in Ukrainian Agribusiness

For countries in transition to a market economy as Ukraine is instrumental motivations take on a much broader meaning than a mere justification of immediate tangible benefits over costs. The scope and magnitude of the problems that Ukrainian agrohholdings face arise from bottlenecks in the institutional environment that often make market transactions not only costly but also impossible. Illegal takeovers, shareholder rights violations and uncertain access to land, finance and qualified labor are the repercussions of insecure property rights, weak contract enforcement, corruption and nepotism. These circumstances impel firms to opt for voluntary engagement in actions that go beyond legal prescriptions, in particular with regard to corporate disclosure. More importantly, these actions bear the potential to have positive spillover effects in the form of the institutionalization of transparent business practices and, in the context of a weak institutional environment, represent instrumental endeavors of firms. In this way, firms not only adapt to fluctuations in the business environment associated with information asymmetries and competition but also change the business environment through institution building. The likelihood of these processes spurring the design of robust institutional systems depends largely on the weaknesses, i.e. incompleteness, or capture of existing institutions (Gagalyuk et al., 2021).

In 2017 was carried out the complex research on CSR in Agribusinesses in Ukraine by Dr. Taras Gagalyuk and Dr. Franziska Schaft (Gagalyuk et al., 2016). On the basis of their survey they defined the main stakeholders of agrohholdings' CSR (Fig.1).

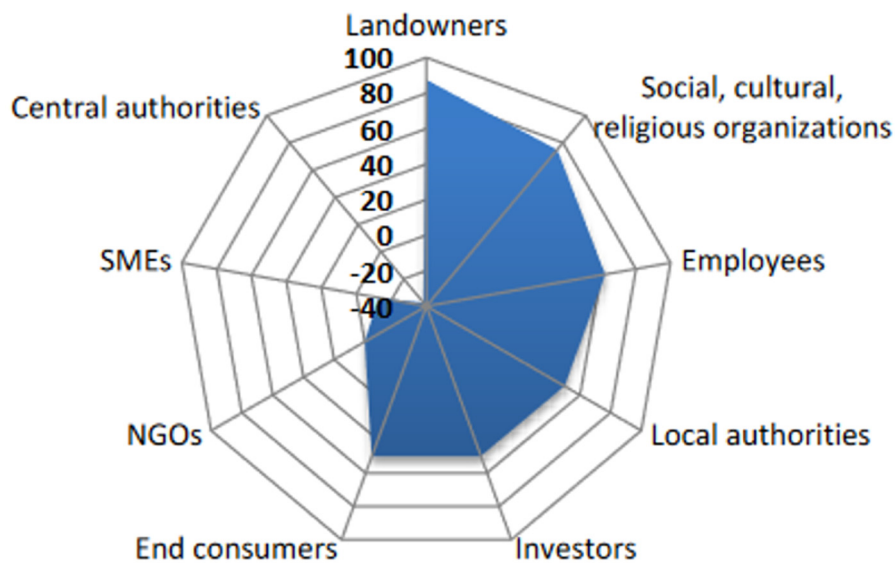


Figure 1: Main stakeholders of argoholdings' CSR in Ukraine

Source: Gagalyuk et al. (2016)

So, we can see that landowners has the biggest influence on CSR development in argoholdings and this trend is permanent till today because of opening land market. Social, cultural and religious organizations are the key instruments of setting the communication with local communities, that's why agrohholdings have to take into account their needs, the same reasons are common to the building strong relations with local authorities, that are driven force for argohholdings' CSR development. Employees have huge influence on agrohholdings' CSR, because there are deficits of qualified labour, since agrarian sphere doesn't belong to prestige profession among youth from the one hand, from another hand, there is a big damage of different kinds of frauds since quite low quality level of life in rural areas. The essential role in CSR development of agrohholdings plays investors and end consumers, it's obvious since these players are the key resource of any organization.

Nowadays, the main efforts of agrohholdings in Ukraine taken to the following areas of CSR as: community development, employee relations, environment protection and product quality. At the same time practically undeveloped have remained the areas of diversity, corporate governance, supplier management and transparency (Gagalyuk et al., 2016)

2. Data and Methods

With the aim to understand how CSR is represented in Ukrainian scientific society we analyzed scientific papers of Abramov R. (2005), Beljavsjska K.S. (2011), Berezina O.Ju. (2010), Ghrishnova O.A. (2011), Karlin M. et al (2007), Petrashko L. (2011). That is allowed us to make the conclusion of absence some joint view on this category. In the Ukrainian legislation field we also didn't find any common official definition. To understand how business and society determine CRS we use the results of sociological surveys of public opinion regarding, presented in the article Balakirjeva O.M., Ghalustjan Ju.M. (2007). That allows us to conclude about the very narrow way of understanding CSR as some charitable activity of business. To avoid such narrow understanding of CSR we decided to choose as the basic definition that will be used further in research the following definition: "CSR is concerned with treating the

stakeholders of the firm ethically or in a responsible manner. ‘Ethically or responsible’ means treating stakeholders in a manner deemed acceptable in civilized societies. Social includes economic responsibility. Stakeholders exist both within a firm and outside. The natural environment is a stakeholder. The wider aim of social responsibility is to create higher and higher standards of living, while preserving the profitability of the corporation, for peoples both within and outside the corporation.” (M. Hopkins (2004)).

To systemize driven forces of CSR development in Ukraine we analyzed the report “The contribution of Ukrainian business in the implementation of Sustainable development goals 2016-2020” done by NGO Center “CSR Development”. In this report, in spite of successful companies’ case studies, can be found the list of Ukrainian companies that make public reports about their CSR strategies. NGO Center “CSR Development” focused on implementation of sustainable development goals into companies’ strategies. We decided to look on core activity, operation industry and motivation of CSR implementation. Such analyze allows us to divide Ukrainian companies that implemented CSR in 4 groups.

For making conclusions about attitudes to CR in business and society we use methodological approach of O. Furrer et al (2010). Analyze of the results of their survey and reports about CSR in Ukraine allow us to agree with the conclusion of authors about attitudes to CR common for the CEE region and Ukraine as a part of this region. Conclusions about the role of educational institution in CSR development in Ukraine we made on the basis on own survey.

To describe current trends of CSR in Ukrainian Agribusinesses we used methodological approach of Gagalyuk, T et al (2016, 2021). Authors make survey on the basis of questionnaires of Ukrainian agroholdings. It gives us opportunity to analyze the main stakeholders of agroholding in their opinion and directions of priority CR implementation. We come to the conclusion that agribusiness could be the driven force to implement CSR, since they are very depend from local communities and feel permanent lack of qualified specialists. The same conclusion we can see in the published results of research «Future of Work 2030: how to prepare for change in Ukraine» that has been carried out by the Center for Corporate Social Responsibility (Career Hub, expert platform) within the UNITY program in Ukraine. Those were ensured us in the right way of building sustainable relations between agroholdings and universities.

Then, we decided to estimate the reediness of Ukrainian universities to develop CSR in our country by survey of inclusion of CSR and related areas in curricula. At the first stage we used approach of Christensen L. et al (2007). In this survey they used Financial Times ratings to choose business schools and their programs that further investigated. That gave us an idea to use all Ukrainian university rating “Top 200 Ukraine 2021”. For the fifteenth year in a row, this ranking has been developed by the Center for International Projects «EuroEducation» together with the international group of experts IREG Observatory on Academic Ranking and Excellence. We decided limit our survey by first 20 universities in the rating. For detecting existence of CSR in universities’ curricular we use approach of Matten and Moon (2004) when they took into account not only the exact title “CSR” in curricular, but related areas, as described in generic tables of labels of CSR programmes and modules. At the first stage of our research we decided to analyze education programmes that are at the official cites of selected universities in open access. Then, when we detected faculty/department that had CSR related programmes and/or modules in selected universities and contacted with their head directly through mails. We have done these with the aim to determine the motive for the inclusion of CSR and related areas in the curricula of educational institutions. The response rate was 88%. It allows us make the weighted conclusions.

The next stage of the research when studying the role of agricultural holdings in the study of CSR in higher education institutions, the authors studied the curricula for the master's program “Administrative Management” of the National University of Life and Environmental Sciences of Ukraine before and after the launch of the Agrokebety project jointly with agribusiness, conducted a comparative analysis. We believe that existence in the programmes compulsory and optional disciplines connected of CSR will reflect in the final students’ knowledge and deep understanding of CSR. Such hypothesis we examine through making questionnaires of students of Agrokebety project.

3. Results and Discussion

3.1. Inclusion of CSR in curricula at universities in Ukraine

Over the past decade, the question of the need to study the corporate social responsibility of business has been increasingly raised. There is widespread criticism in American literature of current business school curricula that do not pay attention to this area. In Ukraine, at the moment, the inclusion of corporate social responsibility (CSR) as a discipline, or at least an element of the traditional course, is targeted. Many people associate the study of CSR with some kind of charitable activities of the company, which significantly narrows the interest in studying this area in the conditions of an unstable external environment for the activities of business entities and a decline in the standard of living of the population. In fact, CSR is based primarily on responsibility, the company's responsibility to all stakeholders. A correct understanding of the basics will allow building a qualitatively new module of entrepreneurship, which will allow reaching the highest level of development of the Ukrainian economy. This understanding, first of all, should be laid at the level of education.

We studied the curricula of 20 leading universities in Ukraine, available on their official websites. Further, we sent out questionnaires to the departments that were engaged in the promotion of CSR in order to understand the reasons for including CSR in the curricula.

Before starting the study, the following hypotheses were made:

- (1) Ukrainian higher education institutions that are actively involved in corporate social responsibility issues have a higher level of graduate employment;
- (2) Institutions of higher education in Ukraine, which have specialties focused on the further employment of graduates in international companies, are likely to actively introduce CSR into the educational process.

A survey of both the management and the teaching staff of higher education institutions showed the fallacy of the first statement. Due to the non-prevalence of CSR in Ukraine and the lack of formed demand from companies for knowledge in this area, the presence or absence of CSR studies does not currently affect the level of employment of graduates in Ukraine.

The second statement turned out to be difficult both to refute and to confirm. The study found that graduates with majors that would typically lead to further employment in international companies rarely actually find jobs in such companies. Only 1% of graduates of such specialties later worked in international companies.

Also, it has been suggested that higher education programs that teach groups of foreign students are likely to include elements of CSR in their curricula, but this statement turned out to be only partially true, since it was very dependent on the country of origin of the student. Thus, students from African countries were generally not interested in studying disciplines in the direction of

CSR, while students from Asian countries were interested in the presence of CSR in their curricula, especially at the master's level.

We will pay special attention to the state educational institutions of Ukraine and the prevalence of their implementation of CSR in the educational process. It is these institutions that have become the driving force for introducing CSR into the educational process. According to the results of the study, no significant difference was found between the degree of implementation of CSR in classical and specialized universities.

In the course of the study, an unambiguous relationship began to be traced between the level of development of the international activities of the university and the study of CSR. Thus, it turned out those higher education institutions that have been or are participants in international cooperation projects over the past 10 years are actively introducing CSR and related areas into educational programs, holding specialized conferences, round tables, webinars, and choosing CSR as a direction for research. The more developed international cooperation, the greater the level of study of CSR at all levels, including in the publications of the teaching staff, and in thesis.

3.2. How agroholdings develop CSR training in Ukraine (on the example of the educational project “Agrokebety”)

In the previous part of the study, we concluded that, in general, Ukrainian universities are not yet interested in studying CSR. Usually, universities with the support of international organizations are the main driving force for the targeted development of this area. The lack of interest of applicants and the significant interest of business do not contribute to the popularization of CSR ideas.

However, since export-oriented enterprises are forced to comply with international business standards, their level of involvement and interest in CSR and related areas far exceeds the interest of companies that work exclusively for the domestic market. The strongest export-oriented industry in Ukraine at the moment is agriculture, which is beginning to form a request for the study of this area of large agricultural holdings.

In our opinion, the distinguishing features of agribusiness in Ukraine from companies in other industries are not only the need to comply with international standards in the field of corporate culture and CSR, in connection with integrating to the world markets, but also an exceptional understanding of the importance and necessity of developing a corporate social culture. It is agricultural holdings that are faced with high requirements and expectations in the local areas of doing business, which requires them to consider the costs of developing CSR rather as a necessary investment, especially in the context of the imperfection of the land and labor market in view of the institutional changes that are currently taking place in Ukraine.

Let's consider possible directions of influence of agroholdings on universities and content the curricula with elements in which agroholdings are interested (Fig.2).

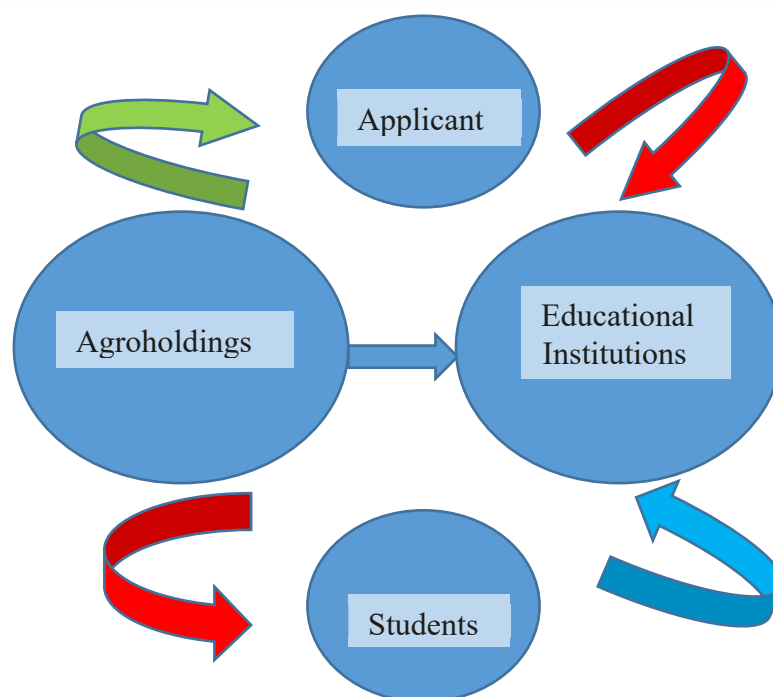


Figure 2: Scheme of agrohholdings' possibilities to influence on educational content for the students

Source: own research

Any enterprises, as well as agricultural holdings, have the greatest direct influence on the inclusion of certain competencies and on the content of curricula during direct work with the university, when representatives of agricultural holdings are included as consultants and / or coordinators of educational programs. Basically, such an initiative mainly comes from universities, as they want to graduate students who will easily find a job after graduation. The potential of agricultural holdings in this area has not yet been fully realized, but this could be a good basis for combating the shortage of highly qualified personnel in this area. It should be noted that a number of agricultural holdings, for example, MHP, cover the lack of specialists with the qualifications they need by opening their own training programs, bypassing universities, which as a long-term strategy requires much higher costs compared to the synergistic effect that can be achieved between business and universities when creating a common educational product.

Agricultural holdings have an indirect impact on the content of educational programs on students who undergo internship or practical trainings in agricultural enterprises. Throughout the practice, students directly see what knowledge and competencies are required of them and in the future make efforts to obtain them, thereby influencing the content of the programs when choosing disciplines and motivating universities to include certain courses for training specialists.

Also, agricultural holdings have an indirect impact on the content of educational programs on applicants when they choose a university, specialty, program content. Basically, this happens through the media by popularizing the agrarian sector in principle, highlighting the expectations of agricultural holdings from future graduates. An important role in the choice of applicants is played by parents, especially those who already work in the agricultural sector. The choice of applicants has the greatest impact on the offer of universities, but, unfortunately, at the moment there is no balance between the needs of the market and the prestige in the eyes

of society in the agrarian sector. Also, the opinion of applicants is influenced by the level of publicity and transparency of agricultural holdings, the vacancies they post, but this area is still underestimated by agricultural holdings, in the analysis of the main trends in the development of CSR of agricultural holdings, we mentioned that business transparency is not the key for agricultural holdings at the moment.

To understand the importance of including CSR components in educational programs for business and to assess the prospects for disseminating such experience for Ukraine, we conducted a study of the educational project of a number of universities and agricultural holdings – “Agrokebety”.

Partners of the Project from agrarian sphere are: agroholding Myronivsky Hliboproduct (MHP), New Holland Agriculture, «IMK», Bayer, «Gals Agro», Limagrain, group of companies HORSCH, LNZ Group, HarvEast, «Syngenta», company SE «Amazone – Ukraine», what is the subsidiary AMAZONEN-WERKE H. Dreyer GmbH & Co. KG, KUHN, “Avgust”, Lidea, Agrohub — platform for the development of agricultural innovations, NVC «Agroosvita», SmartFarming – integrator of technologies in the agricultural sphere, that specializes in improving the efficiency and competitiveness of the agricultural business, AgroPortal.ua - online resource about the agro-industrial complex of Ukraine, Destra - agency for internet marketing, that specializes in the promotion of agricultural products and businesses.

Partners of the Project from educational sphere are: Kherson State Agrarian and Economic University, National University of Life and Environmental Sciences of Ukraine, Sumy National Agrarian University, Tavria State Agrotechnological University, Lugansk National Agrarian University, Nikolaev National Agrarian University.

To assess the presence or absence of a CSR component in the educational program, we will use the manifestations of CSR in the external and internal environment.

As a basis for studying the impact of agricultural holdings on CSR education, we took the full-time educational program “Administrative Management”, which is the basis of the new educational project of cooperation between business and education “Agrokebety”, which was first introduced at the initiative of UCAB in 2019 at the National University of Life and Environmental Sciences of Ukraine. To understand the transformation of this program under the influence of agricultural holdings, we will compare the program of 2017 and 2020 and consider whether there have been changes in the program at the initiative of agricultural holdings related to the inclusion of CSR components in training.

In 2017, the full-time program “Administrative Management” included 27 disciplines, which were focused mainly on management, finance and economics. Of the 27 disciplines, 12 are compulsory and 15 are students' choice. According to the results of the study of discipline programs, it is obvious that the issues of sustainable development, ecology, relationships with stakeholders, the state, building relationships with personnel were practically not considered. As disciplines with separate topics in the field of CSR, only “International Agricultural Marketing Strategies”, “Management Consulting”, “International Agribusiness” and “HR Management” can be distinguished, which accounted for 14.8% of the total number of disciplines. Moreover, only one of them – “Strategies for International Agricultural Marketing” is compulsory, the rest are optional. Thus, only 8.3% of the compulsory block and 20% of the selective block relate to CSR issues. As a result of students' choice, only 1 out of 3 optional disciplines with elements of CSR was chosen by the majority of students - this is “International Agribusiness”, which reduces the level of final study of CSR issues.

In 2020, we see crucial changes in the Administrative Management program, as a result of the implementation of the Agrokebety project together with business on its basis. The program began to include 21 disciplines; the focus of the program has changed - now it is organizational behavior, smart technologies in agricultural management, business ethics. Of the 21 disciplines, 9 are compulsory and 12 are optional. Agricultural holdings have begun to consider the direction of CSR not as a cost that they must incur in the local areas of activity, but as an investment that will allow them to take a stable position in the future. Disciplines appear in the program, with separate CSR modules and the inclusion of CSR indicators in the system of key performance indicators of the enterprise, such disciplines include: “Team building and personnel management”, “Monitoring and evaluation of company performance”, “Business modeling and project management”, “Modern Approaches and Tools of Management”, “Organizational Behavior and Leadership”, - these are 5 disciplines of the compulsory block; “Smart technologies in agricultural management”, “Business planning”, “Business strategies and marketing solutions”, “Land-legal relations in agribusiness”, “Ethics of business communication and rhetoric”, “International agricultural marketing strategies”, “Management consulting”, “Cross-cultural management”, “Psychology of management and conflictology”, “Strategic management”. Thus, 55.6% of the block of compulsory disciplines affects different areas of CSR and 83.3% of the optional block, respectively.

Based on the results of the students' choice, 6 out of 10 optional disciplines with elements of CSR were chosen by the majority of students - these are “Smart technologies in agricultural management”, “Business planning”, “Land-legal relations in agribusiness”, “Cross-cultural management”, “Psychology of management and conflictology”, “Strategic management”.

At the end of the third semester, after completing training and a 6-month training and production practice in agricultural holdings under the guidance of mentors, representatives of the top management of companies, the authors conducted a survey to understand the importance of CSR by students and their conclusions about the importance of this area for agricultural holdings and their future work in them. The survey involved 26 students of this program.

22 students or 84.6% chose 5 or more components, which indicates a broad understanding of CSR. At the beginning of the training, the result of an oral survey showed that students perceived CSR as a company's charity and concern for the environment. Thus, their understanding of CSR and its components has expanded as a result of the training.

25 students or 96.1% believe that a company should be socially responsible. At the beginning of the training, the result of the oral survey showed that only 6 students believed that the company should be socially responsible. This change occurred due to the expansion of the understanding of a “socially responsible company”, the internship at agricultural holdings within the framework of the program, as well as the evolution of one's own convictions.

21 students or 80.7% believe that the company in which they did their internship is socially responsible. 24 students or 92.3% believe that CSR knowledge will be useful for their future career.

Thus, we can conclude that Ukrainian agricultural holdings understand the need to be socially responsible, special attention is paid to personnel policy and the development of local communities, because companies understand that this is their long-term investment. They also transfer this need as requirements for the knowledge of their future employees, which are reflected in the joint training program and are confirmed by the analysis of curricula and student surveys at the end of training.

4. Conclusion

The level of CSR study in higher education institutions of Ukraine remains quite low. The main reasons for this are the lack of demand in the national market for such education. The importance of CSR as a system of interaction between the state, the population and the commercial sector, enshrined in the Development Strategy of Ukraine, is still declarative.

Educational institutions can become the driving force behind the development and promotion of the main directions of CSR. At the same time, higher education institutions must respond to demand from applicants in order to remain competitive. A significant role is played by various international projects that increase the interest and the number of studies in the field of promoting CSR, but they are not enough.

The demand from applicants and the development of CSR education in Ukraine, both at public and private universities, will be quite strongly influenced by the demand for the study of this topic from businesses as future employers, which we showed on the example of a joint educational project of agricultural holdings and the National University of Bioresources and Nature Management of Ukraine.

Thus, given the formation of a specific demand from business for the training of specialists endowed with knowledge about CSR, the situation will change dramatically, which is confirmed by our research. In further studies, we will take a broader and deeper look at the role of educational institutions in the development of CSR in Ukraine.

At the moment, only the first stages of the study of the level of study of CSR and related areas in Ukraine have been carried out, the results of the study showed that if there is an interest in business in specialists with knowledge in the field of CSR, the offer of universities will change and they will begin to actively include CSR and related areas in training programs.

References

- [1] Abramov R. (2005) Korporativnaya sotsial'naya otvetstvennost' kak primer organizatsionnogo izomorfizma v usloviyakh globalizatsii [Corporate social responsibility as an example of organizational isomorphism in the context of globalization] *Zhurnal issledovaniy sotsial'noy politiki*, no 3., pp. 327–346.
- [2] *All Ukrainian university rating “Top 200 Ukraine 2021”* Access <https://ru.osvita.ua/vnz/rating/82821/>
- [3] Balakirjeva O.M., Ghalustjan Ju.M. (2007) Socialjno vidpovidaljnij biznes v Ukrajini: ponjattja ta osnovni chynnyky [Socially responsible business in Ukraine: concepts and main factors] *Ukrajinsjkyj socium*, no. 5–6, pp. 99–109.
- [4] Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- [5] Barney, J. B. (2001). Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view. *Journal of Management*, 27(6), 643–650.
- [6] Beljavsjska K.S. (2011) Socialjna vidpovidaljnistj biznesu: evoljucija poghljadiv na problemu [Corporate social responsibility: the evolution of views on the problem] *Visnyk Khmeljnycjkogho nacionaljnogho universytetu*. no 1, pp. 228–334.
- [7] Berezina O.Ju. (2010) Suchasni modeli korporatyvnoji socialjnoji vidpovidaljnosti [Modern models of corporate social responsibility] *Ekonomichnyj prostir*. – Dnipropetrovsjk : PDABA, no 41, pp. 194–202.
- [8] Bodnarchuk, O., Bodnarchuk, O., Ersozoglu, R., Kanishevska, L., Pet'ko, L., Turchynova, G., & Vyshnivska, N. (2019). Model of entrepreneurial corporate education and prospects of professional development of managers in Ukraine. *Journal of Entrepreneurship Education*, 22(2), 1–5.
- [9] Bourgeois, L. J. (1981). On the measurement of organizational slack. *Academy of Management Review*, 6(1), 29–39.

- [10] Carroll, A. B. (1999). Corporate social responsibility: Evolution of a definitional construct. *Business Society*, 38(3), 268-295.
- [11] Carroll, A. B., A (1979) “Three-dimensional conceptual model of corporate performance”, *Academy of Management Review*, Vol. 4 No. 4, pp. 497-505
- [12] Christensen, L. J., Peirce, E., Hartman, L. P., Hoffman, W. M., & Carrier, J. (2007). Ethics, CSR, and sustainability education in the Financial Times top 50 global business schools: Baseline data and future research directions. *Journal of Business Ethics*, 73(4), 347-368.
- [13] Furrer, Olivier & Egri, Carolyn & Ralston, David & Danis, Wade & Reynaud, Emmanuelle & Naoumova, Irina & Molteni, Mario & Starkus, Arunas & León-Darder, Fidel & Dabic, Marina & Furrer-Perrinjaquet, Amandine. (2010). Attitudes toward Corporate Responsibilities in Western Europe and in Central and East Europe. *Management International Review*. 50. 379-398. 10.1007/s11575-010-0034-3.
- [14] Gagalyuk, T., Chatalova L., Kalyuzhnyy O., and Ostapchuk I. (2021) Broadening the scope of instrumental motivations for CSR disclosure: an illustration for agroholdings in transition economies *International Food and Agribusiness Management Review* Volume 24, Issue 4, 2021; DOI: 10.22434/IFAMR2020.0210
- [15] Gagalyuk, T., Schaft, F. (2016) *Corporate Social Responsibility in Agribusiness* Agricultural Policy Report APD/APR/08/2016.
- [16] Gagalyuk, T., Valentinov, V., & Schaft, F. (2018). The corporate social responsibility of Ukrainian agroholdings: the stakeholder approach revisited. *Systemic Practice and Action Research*, 31(6), 675-698.
- [17] Ghrishnova O.A. (2011) Socialjna vidpovidaljnistj u konteksti podolannja systemnoji kryzy v Ukrajinii [Social responsibility in the context of overcoming the systemic crisis in Ukraine] *Demoghrfija ta socialjna ekonomika*, no. 1, pp. 39–47.
- [18] Hopkins, M. (2004) ‘*Corporate Social Responsibility: An Issue Paper*’, Working paper No. 27, International Labour Organization, Geneva.
- [19] Hrynkevych, O., Sorochak, O., Panukhnyk, O., Popadynets, N., Bilyk, R., Khymych, I., & Viktoriia, Y. (2020, February). *Competitiveness of higher education system as a sector of economy: conceptual model of analysis with application to Ukraine*. In International Conference on Intelligent Human Systems Integration (pp. 439-445). Springer, Cham.
- [20] Jones-Christensen, Lisa & Peirce, Ellen & Hartman, Laura & Hoffman, Michael & Carrier, Jamie. (2007). Ethics, CSR, and Sustainability Education in the Financial Times Top 50 Global Business Schools: Baseline Data and Future Research Directions. *Journal of Business Ethics*. 73. 347-368. 10.1007/s10551-006-9211-5.
- [21] Karlin M.I., Zvonar V.P. (2007) Korporatyvna socialjna vidpovidaljnistj u konteksti perspektyv socialjnoji polityky Ukrainy [Corporate social responsibility in the context of social policy prospects of Ukraine] *Demoghrfija ta socialjna ekonomika*, no 1, pp. 184–194.
- [22] Matten, D. and J. Moon: 2004, Corporate Social Responsibility Education in Europe, *Journal of business Ethics* 54, 323–337.
- [23] N.Zaitseva-Chipak, Ph.D., M.Saprykina, O.Hondiul. «*Future of Work 2030: how to prepare for change in Ukraine*» Access <https://csr-ukraine.org/wp-content/uploads/2021/07/Future-of-Work-research-Eng.pdf>
- [24] Petrashko L. (2011) Korporatyvna socialjna vidpovidaljnistj v ukrajinsjkij biznes-praktyci [Corporate social responsibility in Ukrainian business practice] *Mizhnarodna ekonomichna polityka*, no. 1-2, pp. 115–141.
- [25] Report “*The contribution of Ukrainian business in the implementation of Sustainable development goals 2016-2020*” done by NGO Center “CSR Development” in Ukraine <https://csr-ukraine.org/research/vnesok-ukrainskogo-biznesu-sdg/>

Organizational Barriers Towards Industry 4.0

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Abstract

In the last decade, researchers have given particular attention to the Fourth Industrial Revolution (4IR), also known as Industry 4.0 (I4.0), due to its potential to improve internal processes efficiency, real-time control of their supply chains and boost competitiveness of companies regardless of their industry and size. Even agricultural sector has been experiencing a transformation leading to automation and abandonment of traditional practices. Entities willing to embrace and enjoy the benefits of 4IR need to adapt to it. Those stuck with usual business and processes risk to be inadequate for a changing environment and misfit it: they are likely to run out of business. The 4IR represents an opportunity for companies as they can increase their profits and monitor their value chain entirely. However, challenges and obstacles more or less difficult to surmount can impede and slow down the digitalization introduced by 4IR. These hurdles are of different nature ranging from strategic, human resources and operational. Operational barriers are the focus of the present paper. Through the means of a questionnaire filled out by owners and employees with managerial and non-managerial functions it was investigated (among the others) what are in order of importance the perceived main barriers of this category that obstacle them from becoming highly digitalized and complete the digitalization process. The sample comprises Slovak and Italian companies from different industries and of diverse characteristics. The survey showed that data security and financial availability are perceived to be the most important barriers of the operational barriers.

Keywords: *challenges for companies, digitalization, Fourth Industrial revolution, Industry 4.0, operational barriers*

JEL Classification: *Q16, O30, O33*

1. Introduction

Starting from last decade, entities have been undergoing the digitalization process, continuation of a first generation of automation and of digital machineries introduced in the 1980s by the third industrial revolution, which was possible thanks to the rise of mass-market personal computer and the spread of connectivity infrastructure, the growing use of digital design tools in manufacturing and services. In 2011, during the Hannover fair (Germany), 4IR was labelled Industry 4.0 (I4.0) and, years after years, it has increased its popularity among scholars as well as among the general public, especially for its implications. To mention, Internet of Things (IoT) and Digital Public Identity systems are based on I4.0 technological principles. Not only is this revolution about automation, but also a radical transformation for what regards the industry structure through horizontal, vertical, and end-to-end digital integration of supply chain (Kagermann, Wahlster & Helbig, 2013). Every sector, industries, and companies regardless of their dimensions deal at different extents with the 4IR. Adapting to it can mean for them survival and boosted competitive position. Furthermore, the usage of advanced technologies and techniques improves internal process efficiency and cost reductions. Resource efficiency, quality, flexibility and sustainability can be reached through the

deployment of Industry 4.0 technologies (Mangla, Kusi-Sarpong, Luthra, Bai, Jakhar & Khan, 2019). In agriculture, Industry 4.0 is called Agriculture 4.0 and its implementation has the potential to increase the efficiency of production, reduce incurred costs and make practices more environmentally friendly.

Employing the novelties introduced by 4IR is often hindered by challenges and obstacles that vary from sector to sector, entity, and level of technological advancements of the latter at the time of the digital transformation. These challenges and obstacles are of different nature varying from strategic, human resources and operational (Marcon, Marcon, Le Dain, Ayala, Frank & Matthieu, 2019). The focus of this paper is on operational barriers. Based on previous explorative research, this study is quantitative and aims at identify the main barriers of this category in product and service industry. Partial objective aims at analysing the general rank of the main three classes of barriers.

1.1 Industry 4.0

Industry 4.0 integrates the latest technologies in the value creation, representing the result of technical progress information and communication technologies (ICTs) (Delera, Pietrobelli, Calza & Lavopa, 2022). It is an intelligent networking of machines and processes for industry aided by ICTs (Platform Industrie 4.0, n.d.). I4.0 is closely linked to Cyber-Physical Systems (CPS) (Deloitte, 2015), transformative technologies which manage interconnected systems between its physical assets and computational capabilities (PwC, 2016). In this setting, customers cover a central role, more active than the past: products are more precisely tailored according to their requirements and customization. This creates new business opportunities (Allmendinger & Lombreglia, 2005).

The application of I4.0 technologies in agriculture is often referred as Agriculture 4.0. In such a context, agriculture could be enhanced and multiple opportunities can be exploited (Spanaki, Karafili & Despouli, 2021). The identified benefits for I4.0 are valid for agriculture too (Bernhardt et al., 2021). Particularly, benefits come from the use of information, technology, equipment and a wide range of services (Spanaki, Karafili, Sivarajah, Despoudi, & Irani, 2021). Compared to traditional farming, farms may now exploit data, which can improve practices and operations of individual and large groups of farms. Besides, it can provide a way to ensure the transparency of the farming practices and sustainability of the agricultural sector and agrifood production processes (Spanaki et al., 2021).

Technologies such as artificial intelligence (AI), Internet of Things (IoT), cloud computing, advanced robotics, augmented reality, virtual reality, big data analytics and internet of things are examples of the arsenal a “smart” company possesses and that can use to its own advantage. In the specific case of Agriculture 4.0, example of technologies are parallel travel systems with GNSS for logistics on the field: all process data are recorded and analysed externally via data networks. Ready to improve the productivity and innovativeness of manufacturing [and service] firms, technologies 4.0 unlock new opportunities in the optimization of production processes and product functionality (Niebel, Rasel & Viete, 2019; Zabidin, Belayutham, & Che Ibrahim, 2020). According to the findings of Masood and Sonntag (2020) flexibility, cost, efficiency, quality and competitive advantage are the key gains that companies can experience from it. Other benefits for organizations regard cost reduction through their control, real-time control over the value chain and rapid adaptation to customers’ needs and demand. Moreover, faults in production processes can be identified quickly (Kaziboni, Nkhonjera, & Roberts,

2019). This leads to obvious cost saving. A machine monitoring the process reports the problem to specialized personnel so that they can promptly intervene.

I4.0 enhances sustainable and more environmentally friendly practices. Indeed, employing control software and hardware can provide efficient solutions for energy savings, control of emissions, machine maintenance (Garetti and Taisch, 2012). Green practices in turn are likely to award companies by attracting more customers and increase profits as they would pay more for a certain product in name of the environmental cause. In a fierce competitive environment and continuously changing customer needs, therefore, it becomes essential to adapt.

Not only is I4.0 relevant and interest topic in engineering, but also, in the last years, has gained relevance in management studies, where innovation is essential for the firm development (Malerba, 2007 cited in Piccarozzi, Silvestri, Aquilani & Silvestri, 2022) and survival. What is more, on the business level, I4.0 is expected to improve quality management processes (Herceg, Kuč, Mijuškovič & Herceg, 2020). The effective implementation of I4.0 initiatives indeed equips smart companies with a competitive advantage and novel business opportunities leading to a change in their business models. Entities stuck with the past and that refuse this innovation risk to lose contact with their environment, to be beaten by those “smarter” and to run out of their businesses.

The digital transformation of I4.0 is not always smooth, though. Barriers and challenges hinder entities and slow down their innovation process, to make a transition towards customized products, decrease lead times and implement more sustainable operations and products (Halse & Jæger, 2019). In this regard, the exploratory work of Marcon et al. (2019) contributed to define the main obstacles to overcome for manufacturing companies. Accordingly, the main categories of barriers are: strategical, operational and human resources. Organizational culture, psychological aspects and demanded competences (human resource aspects) should not be underrated because of the implications that they have for the actors within the organization. Financial constraints would limit entities to adopt the latest technologies to run their business and obsolescence of machineries and imply more expenses required to purchase new ones (some operational barriers). Lastly, a lack of digital vision and a strategy paving the way to I4.0, and the inability to forecast and adapt to changing customer needs are example of what constitute strategical barriers.

Depending on the sector and industry, barriers could vary as for what regards the difficulties to overcome them. For a company that carries out its operations in the high-tech industry is highly likely to have a smoother transition than a company doing its business in the construction one. Maturity and readiness models, beyond the scope of this research, are usually employed to test the readiness for initialization of the digitalization process (Herceg et al., 2020), i.e. the status of digital transformation of a company (Chanias & Hess, 2016).

1.2 Operational barriers towards I4.0

The main focus of this paper is on operational barriers: this subparagraph explores more in details this category.

According to Marcon et al. (2019), operational barriers regard all the aspects a company needs to consider in enabling a digital technology to work in both innovation process and outcome. Therefore, functional elements that make possible digitalization belong to this family of barriers and challenges. Always in their work, the specific ones are presented and described:

- *Obsolescence*: digital technology soon unusable after a relatively short period of time.
- *Compatibility*: with newly introduced technology with the already installed ones.

- *Resources*: lack of appropriate tools, resources and needed infrastructure.
- *Financial*: the actual costs and investments required to embrace the transformation.
- *Organization*: lack of operational processes and time to implement the digital technologies.
- *Data security*: fear of being hacked, lack of confidentiality and reliability, etc.
- *Life cycle barrier*: maintenance and support of the new technologies.
- *Industrial context*: company's environment and industrialization degree which determine the starting point of digitalization.

Bonamino and Frech (2020) found among the operational ones - that they classified under technologies - interoperability (compatibility of technologies), full guarantee of safety (i.e. data security) and “scalability” (i.e. capacity of a platform to provide all necessary resources for an application to run correctly). Moreover, Chang, Cheung, Cheng and Yeung (2008) found that the higher the compatibility with a newer technology, the likely that technology is adopted.

Data security is also one of the main concerns in the literature (e.g. Amaral & Peças, 2021; Majumdar, Garg & Rohan, 2021; Müller, 2019; Marcon et al., 2019), as the risk is represented by the disclosure of confidential information and the absence of rules that can guarantee protection. Transparency problems would even be related to it. With available information about the order data, customers could put pressure on a company and competitors could acquire know-how and use it at their own advantage. Furthermore, frightening of hacking attacks to their systems is very relevant. In the agricultural sector, this worry would make small and medium farms resisting Agriculture 4.0. They are indeed doubtful about data sharing concerns and access control policies of the parties' data (Angelopoulos, Brown, McAuley, Merali, Mortier, & Price, 2021; Ioannou, Tussyadiah & Lu, 2020).

2. Data and Methods

With this paper, the aim is to identify the most important operational barriers, in general, what companies that carry out their operations in different industries consider as most significant. For the analysis, it is important to define the different types of industries. They are classified in two major types: manufacturing (or product) and service industries. Service industries are usually involved with customers (final user or B2B), sometimes they deliver goods (e.g. FedEx), but they do not produce them. They deliver an intangible good “produced” at the time of the time of its consumption. For instance, the group comprises firms active in training, engineering, advanced diagnostics, ranging from basic after-sales services to complex solutions that combine products and services (Kowalkowski, Kindström & Brehmer, 2011; Gitzel, Schmitz, Fromm, Isaksson, & Setzer, 2016; cited in Bonamino & Frech, 2020). Firms belonging to product industries make tangible products instead: for example, car manufacturing, furniture and heavy machinery.

Taking into account Chang et al. results (2008), the same could perhaps hold in 4.0 technologies. In addition to this, Bonamino and Frech' study (2020) would suggest the importance of compatibility. Besides, the importance given to data security by several studies may suggest that data security as well will be so fundamental concern for entities. The following research hypothesis was assumed:

H1: Compatibility and data security are ones of the most relevant barriers for both manufacturing and service companies.

In management literature and in practices, financial resources - the available resources to purchase novel technologies - cover a key role for the digital transformation process. Probably, being manufacturing companies more capital intensive than service ones, they would require higher investments to pursue the I4.0 initiatives. Therefore, the postulation was:

H2: Financial availability will be one of the most relevant barriers for manufacturing companies; it will have lower importance for service companies.

To test the objectives, a questionnaire was sent by email to company's actors with managerial and non-managerial duties. The sample of respondents worked in Slovak and Italian companies. In total, 102 answers were collected divided as follows: 62 from Italy and 40 from Slovakia; 38 out of 102 had foreign participation in their capital structure and only 4 companies were publicly/state owned. They operated in 30 different sectors. In some sectors, only few operated, so they were grouped in two main groups (the risk of close to zero variances was avoided). This would have not allowed further analysis. As such, two main categories were identified, service and tangible products industries: 63 for the former and 37 for the latter (2 answers were removed as not classifiable). Of the product group, mechanical and electrical engineering (13) were the main companies belonging to this category, followed by commerce (5) and agriculture (4). For what regards service companies, financial and professional services are more than half in the industry (23 over 37).

Generally, the dimension of companies varied from very small (less than 10 employees) (26), to small (10-49 employees) (22), mid-sized (50-249 employees) (26), and large companies (over 250 employees) (28). Similarly, work positions of respondents were grouped under 5 labels: lower managers, middle managers, top managers, owners, and others (other positions).

The questionnaire, the basis of a larger study on barriers and challenges of all categories, foreseen 3 parts: classification of companies and employees, Likert scale and ranking questions. For the current, relevant are the first and third parts. The respondents had to rank operational barriers – among those identified by Marcon et al. (2019) - in order of importance according to those perceived as the main hindering the digitalization. Further task was to rank main categories of barriers: strategic, operational and human resources.

Garrett ranking method was chosen for the analysis of the ranking questions. To know more please refer to Garrett's publication "Statistics in Psychology and Education" (1926).

3. Results and Discussion

From the questionnaire, some important and unanticipated results can be observed. Interviewers ranked the main family of barriers. Regardless of their industry, it emerged the primary importance of strategic barriers (Table 1). Without a path to follow, an entity would be lost and its objectives would not be clear. Moreover, a strategy illustrates the organization's strategic actions aiming at gaining a competitive advantage in the market (Porter, 1980). As a result, the critical role played by it would justify the first position of strategic barriers in the ranking. Operational barriers assume a secondary importance in this context. Probably, in the analysed companies of the service industry, operations will not undergo the changes happening in the industry sector. The majority of the interviewed firms, which belongs to this group, are indeed involved in financial and professional services, and as such they would mostly have to continue to work with customers in "traditional ways" (online and offline service). Yet, AI may eventually overcome these ways making the customer service and the relationship with the customers different.

Table 1: Rank of group of barriers

Product Ind.	Rank	Service Ind.	Rank
Strategic	1	Strategic	1
Operational	2	Human resource	2
Human resource	3	Operational	3

Source: Author's processing

Analysing Table 2, the first positions in the two industries are occupied by data security and financial availability. This outcome corroborates hypothesis **H2** and rejects **H1**.

Table 2: Ranking of operational barriers per industry

A. SERVICE INDUSTRY		B. PRODUCT INDUSTRY	
1	Data security	1	Data security
2	Financial availability	2	Financial availability
3	Organization	3	Industrial context
4	Resources	4	Organization
5	Industrial context	5	Life cycle barriers
6	Compatibility	6	Resources
7	Life cycle barrier	7	Obsolescence
8	Obsolescence	8	Compatibility

Source: Author's processing

In a revolution like the 4IR, it is probably foreseen an entire restructuring of business models and as such technologies used. Therefore, compatibility would be of minor importance for companies involved in the digital transformation. The latest technologies would hardly be compatible with the company's ones: the principle that a certain technology will be likely to be adopted in case its compatibility with those already installed in a company does not hold. Looking again at Table 2, Compatibility appears in the last positions in service industries (sixth over eight) and the bottom for product industries. As debated in the literature, the latter is in some way forced to invest in and install it to be able to compete and improve its business processes, regardless of, once again, the compatibility degree with "old" technologies.

Data security ranked in the first position in both industries confirms other study's outcome of I4.0. Indeed, a gap in the legislation of rules aiming at protecting data and company's assets (e.g. intellectual property) so important for the preservation of its competitive advantage make the issue of data security such a priority. A security challenge companies face is due to the particular susceptibility of Industrial Control Systems (ICS) to cyberattacks. To solve bugs and flaw in - usually very complex - systems frequent upgrades are essential. A way to reduce the risk may be the training of employees because, if unexperienced, they may be the means through which a malicious software (e.g. malware) can get access and steal precious information. In the financial and professional sector, securing data of clients is a must due to their value and their sensitiveness.

Financial availability is the second challenge for significance in the groups of industries. This result is different than what foreseen in H2: the hypothesis is rejected. The availability of monetary resources therefore is equally crucial in the sample under analysis for a smooth transition and completion of 4IR. Not only has a company to invest in the actual equipment and technology, but also it should provide its actors with tools that enable their usage. Among these tools, a considerable weight is covered by training, required for employees to learn how to operate the technology and orientate in a "smart" company. In addition to training, Masood and Sonntag (2020) found that the investment covers hiring the "right people" too. These people should be compatible with company's culture and with the competences required and expected to be employed in the everyday business.

4. Conclusion

The current industrial revolution is bringing entities to experience improvements in their businesses and operations by digitalizing processes and integrating entire value chains. This trend regards not only manufacturing companies but also service ones. In agriculture, the set of practices linked to I4.0 are called Agriculture 4.0 and brings to it considerable advantages. I4.0 is characterised by cyber-physical systems in which large amount of information about a machine or process can be documented and analysed in real-time. Digital farming may improve practices and operations from gathered data as well as ensure transparency of the farming practices and sustainability.

This article has stressed the necessity for entities to become smarter (i.e. to introduce I4.0 initiatives). Indeed, those that will stick with current practices have high chances to lag behind competitors. In order to make the digital transformation brought by 4IR, barriers and challenges should often be taken into account. The main barriers hindering the transformation were identified to have a strategic, human resources and operational nature (Marcon et al., 2019). Here, the latter was analysed more in depth. According to the results of the questionnaire, the first two barriers for product and service industries are exactly the same: data security and financial availability, which would stress their central role. Due to its nature, technology 4.0 generates loads of data (Big Data), containing precious information that with lack of regulation could be stolen with no consequences. Financial availability, then, is the fuel of the 4IR, as without funds, the digitalization process cannot be implemented.

4.1 Limitations

The study has some limitations, concerning the geographic area and the generality of the result because of the sample size. The sample comprises companies of two European countries and only a hundred of answers collected. Future research may aim at analysing the results in other countries from other continents.

Potential shortcomings derive from the nature of close-ended questions as well. Certain features, for example certain barriers not in the list may affect the respondents or certain may not influence them.

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References

- [1] Amaral, A. & Peças, P. (2021). SMEs and Industry 4.0: Two case studies of digitalization for a smoother integration. *Computers in Industry*, 125. doi: 10.1016/j.compind.2020.103333
- [2] Angelopoulos, S., Brown, M., McAuley, D., Merali, Y., Mortier, R., & Price, D. (2021). Stewardship of personal data on social networking sites. *International Journal of Information Management*, 56, Article 102208. doi:10.1016/j.ijinfomgt.2020.102208, 11.
- [3] Bonamigo, A. & Frech, C.G. (2021). Industry 4.0 in services: challenges and opportunities for value co-creation", *Journal of Services Marketing*, Vol. 35, No. 4, pp. 412-427. doi:10.1108/JSM-02-2020-0073.

- [4] Chang, M., Cheung, W., Cheng, C. & Yeung, J. H.Y. (2008). Understanding ERP system adoption from the user's perspective. *International Journal of Production Economics*, Vol. 113, Issue 2, pp. 928-942. doi:10.1016/j.ijpe.2007.08.011.
- [5] Chaniyas, S. & Hess, T. (2016). How digital are we? Maturity models for the assessment of a company's status in the digital transformation. *Manag. Rep. Inst. Wirtsch. Neue Medien* 2016, 2, 1–14. Retrieved from <https://www.semanticscholar.org/paper/How-digital-are-we-Maturity-models-for-the-of-a-in-Chaniyas-Hess/591c21d32fb98d52e887d50d0a8e204a284afdfa>.
- [6] Garetti, M. and Taisch, M. (2012). Sustainable manufacturing: trends and research challenges. *Production Planning and Control: The Management of Operations*, 23(2-3), pp. 83-104. doi:10.1080/09537287.2011.591619.
- [7] Garrett, H.E. (1926). *Statistics in psychology and education*. New York, Longmans, Green and Co. GERA, Ishaan.
- [8] Halse L.L., Jæger B. (2019). Operationalizing Industry 4.0: Understanding Barriers of Industry 4.0 and Circular Economy. In: Ameri F., Stecke K., von Cieminski G., Kiritsis D. (eds) *Advances in Production Management Systems. Towards Smart Production Management Systems. APMS 2019. IFIP Advances in Information and Communication Technology*, vol 567. Springer, Cham. https://doi.org/10.1007/978-3-030-29996-5_16.
- [9] Herceg, I. V., Kuč, V., Mijušković, V.M., and Herceg, T. (2020). Challenges and Driving Forces for Industry 4.0 Implementation. *Sustainability*, Vol. 12, no. 10, 4208. doi:10.3390/su12104208.
- [10] Kagermann, H., Wahlster, W., Helbig, J. (2013). Recommendations for implementing the strategic initiative Industrie 4.0: final report of the Industrie 4.0 Working Group. *Acatech-National Academy of Science and Engineering, Germany*. Retrieved from <https://www.din.de/blob/76902/e8cac883f42bf28536e7e8165993f1fd/recommendations-for-implementing-industry-4-0-data.pdf>.
- [11] Kaziboni, L., Nkhonjera, M., & Roberts, S. (2019). Machinery, equipment and electronic control systems: Leading reindustrialisation in Southern Africa. CREED.
- [12] Kowalkowski, C., Kindström, D. and Brehmer, P.O. (2011). Managing industrial service offerings in global business markets. *Journal of Business & Industrial Marketing*, Vol. 26 No. 3, pp. 181-192. Majumdar, A., Garg, H. Rohan, J. 2021. Managing the barriers of Industry 4.0 adoption and implementation in textile and clothing industry: Interpretive structural model and triple helix framework. *Computers in Industry*, vol. 125. doi:10.1016/j.compind.2020.103372.
- [13] Malerba, F. (2007). *Innovation and the evolution of industries*. Innovation, Industrial Dynamics and Structural Transformation. Springer, Berlin, Heidelberg, pp. 7–27.
- [14] Mangla, S.K., Kusi-Sarpong, S., Luthra, S., Bai, C., Jakhar, S.K. & Khan, S.A. (2019). Operational excellence for improving sustainable supply chain performance. *Resour. Conserv. Recycl.* 142, 277–278. doi:10.1016/j.resconrec.2020.105025.
- [15] Masood & Sonntag (2020) Industry 4.0: adoption challenges and benefits for SMEs. Vol. 121. doi:10.1016/j.compind.2020.103261.
- [16] Niebel, T., Rasel, F., & Viète, S. (2019). BIG data – BIG gains? Understanding the link between big data analytics and innovation. *Economics of Innovation and New Technology*, 28(3), 296–316. doi:10.1080/10438599.2018.1493075.
- [17] Piccarozzi, M., Silvestri, C. Aquilani, B., Silvestri, L. (2022). Is this a new story of the ‘Two Giants’? A systematic literature review of the relationship between industry 4.0, sustainability and its pillars. *Technological Forecasting and Social Change*, Vol. 177, 121511. doi:10.1016/j.techfore.2022.121511.
- [18] Vuksanović Herceg, I., Kuč, V., Mijušković, V.M., Herceg, T. (2020). Challenges and Driving Forces for Industry 4.0 Implementation. *Sustainability*, 12, 4208. doi:10.3390/su12104208.
- [19] Zabidin, N., Belayutham, S., & Che Ibrahim, C. K. I. (2020). A bibliometric and scientometric mapping of Industry 4.0 in construction. *Journal of Information Technology in Construction*, 25, 287–307. doi:10.36680/j.itcon.2020.017.

Organizational Knowledge as an Element of Employer Branding: Example of Polish TOP 500 Enterprises

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Abstract

Studies developed by management practitioners and theoreticians suggest a growing interest in organizational knowledge (OK) and a broadening understanding of the term. Currently, the concept encompasses not only a set of codified data or information but also knowledge accumulated in the brains of employees. This knowledge poses a challenge for the processes of its positioning, processing and dissemination. This mainly concerns so-called tacit knowledge, i.e. hidden knowledge of which employees themselves may not even be aware. The method of processing such OK is significantly linked to subjective perception of employees, which, in turn, is currently an important element of employer branding (EB) communication. The purpose of this study is to analyze, on the basis of a research, the links between the approach to OK represented by the examined organizations and their EB activities in the context of transformations associated with the youngest employees of the generation Z entering the labor market. The research was conducted in 2019 among organizations ranked as the TOP 500 in Poland. The TOP 500 list includes the organizations that had the best market and financial performance in 2018 according to the methodology used by the Rzeczpospolita newspaper. The analyses use the STATISTICA program. The following tests were used: the Kruskal-Wallis ANOVA on ranks, the Mann-Whitney test, the median test and the Pearson's chi-square test. The strength of correlations between the variables was evaluated by means of the Spearman's rank correlation coefficient. The results of the research suggest that the leading market organizations still see OK in the traditional way, as a resource that should be protected both by individuals and by the organization. Consequently, the resource is not fully used or shared between employees what affect company's image.

Keywords: employer branding, organizational knowledge, generation Z

JEL Classification: M12; M31; M51

1. Introduction

Discussion on the importance of organizational knowledge in the area of management has continued for a number of decades, and its popularization may be attributed to the publications of Nonaka et al. (1995; 2006; 2007, 2009). What is innovative about them is that they highlight the role of so-called “silent knowledge” located in the brains of employees. Such approach in a way complements the so far dominant, also in Poland, conviction in the light of which organizations acquire knowledge mainly from the environment through the transfer and processing of data, information, technologies, patents or licenses (Nielsen, 2006). What is worth noting about deliberations on OK is the fact that knowledge and its acquisition may be treated both as the attribute of an organization and the attribute of an individual - employee. Currently, in an era of managing large data resources, knowledge management may be reduced to the availability of data or to technological capacities to process data (Hanisch et al., 2009). In the light of this approach, the terms: data, information, knowledge are sometimes connected and used interchangeably. The represented attitude dehumanizes knowledge, even though it is

a complex resource and its utilization is conditioned by the individual's ability to convert it, i.e. to receive it, process it and use it in action. Knowledge is a broader and deeper term and it develops as a result of the experience of practical application of information. It is linked with the cognitive and emotional sphere of the individual who has knowledge (Davenport & Prusak 2000, pp 2-5). If this is how we understand knowledge, then we must also assume that the term OK does not literally mean that an organization creates knowledge or owns knowledge (we do not discuss here the issue of intellectual property associated with patents, licenses or other legal marks for intellectual property). These are the people - the employees who create the organization who carry and administers knowledge. This viewpoint requires subjective treatment of employees and shifts the attention of organization managers, associated with knowledge, towards Human Resource Management (HRM) issues. In this study, the author discusses whether OK is something that distinguishes an employer and increases his attractiveness in the labor market. In the literature, this issue is called Employer Branding (EB). It is emphasized to be of key importance both for attracting and keeping an employee. In the last decade, also in Poland, the EB has been broadly discussed by management practitioners as a result of deep transformations taking place in the market. First of all, Poland, the same as other developed countries, experiences demo-graphic problems and the related generation gap in many areas of the economy. Secondly, the new generation of employees, so-called generation Z, is entering the labor market. They grew up in the era of the Internet and the ubiquitous modern technologies and their attitude to knowledge and information is different than that of the previous generations.

The purpose of this study is to analyze, on the basis of a research, the links between the approach to OK represented by the examined organizations and their employer branding activities. The first part of the study discusses the theoretical links between the abovementioned areas, the second part presents selected results of the research conducted in this field, while the third part discusses the results in the context of transformations associated with the youngest employees of the generation Z entering the labor market as well. This study compares selected results of the research conducted in 2019 among TOP500 Polish organizations and information from EB reports concerning the acquisition and keeping of employees.

2. OK as a factor that increases employer attractiveness

OK is understood as accumulation of basic knowledge, know-how and social skills (Słocińska, 2016). Thus, it is a combination of elements acquired in the process of learning and socialization and a result of the participation of individuals in various networks of relationships that give general or specialist knowledge. In this study, the author's attention focuses on the problem of explicit and implicit knowledge. The major problem with implicit knowledge is its verbalization. It needs to be verbalized in order to be transmitted and transformed into the implicit knowledge of the recipient/listener. The process is also called "the spiral of knowledge" (Nonaka, Takeuchi, 1995). In this process, individual knowledge expands by being shared with others - this is how individual knowledge transforms into OK. An organization does not generate knowledge on its own, without the individual initiative of the respective employees and mutual group relations. Problems associated with the transmission of internal knowledge in an organization are closely linked with the HRM, and in particular, which has been important in the last few years, with employee turnover (Soliman & Spooner, 2000). It concerns attracting and keeping not only employees who have specific knowledge resources but also employees who are able to learn, multiply and disseminate knowledge. For this, an employee must not only have specific skills but also, more importantly, social

competencies. If such an employee leaves, the organization loses the knowledge that is contained in their brain or body as well as a network of personal and professional relations that are sometimes hard to replace (McDermott, 1999, p. 105).

So far, Polish organizations, having a comfortable position on the labor market, focused mainly on preventing “knowledge leakage” by applying repressive HRM tools. These measures were not only inefficient but also harmful from the perspective of the knowledge management concept. Knowledge was perceived as a resource that gave individual competitive advantage to an employee (Słocińska, 2016). Consequently, employees did not want to share knowledge.

In the last two decades, the position of employees has been growing in many countries. Employers look for new HR tools to attract and keep new employees. One of such tools is the EB, which means various measures undertaken by organizations in order to create a positive employer brand. Such activities may be undertaken both within and outside an organization. The EB term was introduced to scholarly literature by Ambler and Barrow (1996). They defined the EB as a set of functional, economic and psychological advantages of working for and identifying with a specific employer. Many researchers (Barrow & Mosley, 2006, p. xvi; Berthon et al., 2005, Mosley 2007) also highlight a connection between the EB and internal marketing, internal branding and organizational brand (Lievens & Slaughter, 2016).

Regardless of EB direction, an important element of such activities is the Employee Value Proposition (EVP) (Backhaus & Tikoo, 2004), which is a description of the properties and attractiveness of jobs offered by a given employer. OK, which is a unique, typical of a specific employer, cumulative set of organizational and technical experiences, more and more often becomes an element of that proposition. Until recently, given the dominant employer market and rather high unemployment, it was quite easy to hire an employee at a relatively low cost in Poland. Today, the labor market is different - it is more difficult for an organization to acquire the right employee and recruitment costs are higher.

An analysis of 2012-2020 reports made by the HRM Institute (<http://www.hrminstitute.pl/raport-employer-branding/>) shows a growing importance of the EB in the policies of Polish enterprises. According to Eurostat data (<https://www.gov.pl/web/rodzina/eurostat-polska-wciaz-w-czolowce-krajow-z-najnizszym-bezrobociem>), the unemployment rate in Poland by the end of 2019 was 3.3%, which meant that employers were forced to fight to win the candidate’s attention. Although early HRM Institute reports showed that employers were quite ambivalent about the EB, now, most of them are aware that it is not an optional measure but a must in our times. According to the HRM Institute Reports concerning EVP, employers think that the most important in the process of attracting valuable candidates are: atmosphere at the company, salary and employee benefit system, work-life balance (WLB) measures, Corporate Social Responsibility (CSR) measures and possibilities for development.

There are several generations of employees on the labor market, although division into generations is of rather sociological nature. Currently, on the labor market, there are representatives of the Baby Boomers generation, the generations X and Y and the youngest generation Z. The Generation Z, although not very numerous on the labor market yet, already poses a special challenge for the HRM. There are not many reports concerning this generation (Sidorcuka & Chesnovicka, 2017), but the ones that are available suggest that the attitudes and behaviors of members of the Generation Z are different than other generations (Bejtkovský, 2016; Bencsik, et al. 2016; Dolot, 2018, Lazanyi, & Bilan, 2017). The generation Z is usually defined as persons born after 1995, although for some researchers, this generation starts with people born in 1990, while for others - in 2000 or later (Robak, 2017). It should also be noted

that, at the time when this generation is entering the labor market, work as such is undergoing major transformations. They are technical and technological changes and changes in the organization of the time and place of work (work from home, conditions and forms of employment, wellbeing or WLB). These transformations will probably progress as a result of the global COVID 19 experience.

3. Data and Methods

The survey results presented in this paper come from the nationwide quantitative survey of Polish companies under the project “New tendencies in HR management in large enterprises” carried out in 2019 with the participation of a specialist external partner: MRW Market Research World. The goal of the survey was to identify the social and psychological factors which support personnel development in organizations as well as to identify the non-financial values in organizations and processes of human capital and trust management in organizations.

The survey was made with the use of quantitative methods and mixed techniques: CAWI (Computer Assisted Web Interview) and CATI (Computer Assisted Telephone Interview). The combination of these two methods served to increase the response data and it is a commonly used approach. The survey started with CATI and in the case of refusal or interruption, the alternative way was suggested, i.e. to fill in/finish the interview on a dedicated Web platform. Alongside CATI, invitations to participate in the survey were distributed electronically and they allowed respondents to choose the method (online or by phone).

The survey operator was the database of the 500 largest companies in Poland (according to the 2018 ranking by the Rzeczpospolita portal). Random sampling was used. In the event of refusal to participate in the project, another entity was randomly selected. As a result, the survey of a representative sample was carried out according to the following parameters: general population= 500, error of estimation = 6%, confidence interval = 95%.

The survey tool was a standardized questionnaire containing closed questions. The form of the questions in the questionnaire included both questions and statements. Both contained answers in the Likert scale (the Likert scaling technique) that allowed to specify the relative intensity of various answers (Joshi, et al. 2015). The questions used predefined variants of the answers. The form of the predefined as specified conditions enables a reliable and quick analysis of the collected material as well as ensures its homogeneity and easy processing. The closed questions were constructed in such a way as to ensure their theoretical, logical and content-related correctness. The paper uses a fragment of the research concerning the EB and level of organizational climate in the examined enterprises. The demographic and EB questions are original and they were formulated by the members of the research team of the Department of Applied Sociology and Human Resource Management of the Faculty of Management of the Czestochowa University of Technology, whereas the questions concerning the OK were developed on the basis of a publication by Krot and Lewicka (2016).

The following research problem was formulated: are there links between the approach to organizational knowledge represented by the examined organizations and their employer branding activities? Any dependencies reported will be analyzed in the context of the expectations of employees of the generation Z from their employers.

The research covered 179 companies, of which 41.8% were manufacturing companies, 14.5% were manufacturing and service providing companies, 27.4% - service providing companies, 8.4% - trading companies and 7.8% - manufacturing and trading companies. Most of the responding organizations were in the revenue group ranging from 51 to 200 million PLN

(68.1%), the second most numerous group were organizations with revenue ranging from 5 to 50 million PLN (17.9%), and the least numerous group were organizations with income exceeding 200 million PLN (14%). In terms of the number of employees, most of the responding organizations employed 201 to 500 persons (73.18%) and the rest were organization employing more than 500 persons (26.82%).

The following areas were identified as EB proposition components: training and development, ethics and CSR, WLB, atmosphere at work (social working environment), wages and employee benefits. The indicators of organizational knowledge were: prosumer activities, free access to knowledge and information, cooperation between respective departments of an organization, encouraging employees to take on challenges, expecting employees to improve their skills, accepting employee ideas, accepting the risk associated with the use of knowledge, employees helping each other solve problems, expecting employees to be creative, appreciating employee engagement in the development of new ideas and manager's support in the search for innovative solutions.

4. Results

The significance of difference in the abovementioned EB indicators was assessed using the STATISTICA program, the Pearson's χ^2 test, the Kruskal-Wallis ANOVA on ranks test and the median test. The significance of differences was tested in order to verify the statistical hypotheses, i.e. to reject the null hypothesis of lack of differences between indicators regarding the independent variables, such as: the type of activity of an organization, the size of an organization and the annual revenue of an organization.

It was possible to assume alternative hypotheses of the existence of differences between indicators with respect to the type of activity of an organization. The size of an organization and the volume of annual revenue did not differentiate the responses concerning the EB on the level $p < 0.05$ (which, in social sciences, is considered to be the statistically significant level). The type of activity is a differentiating factor with respect to the importance of prosumer programmes in constructing the EB proposition for candidates (Pearson's χ^2 27.71549; $df=16$, $p=.03418$). An analysis of contingency tables revealed that production companies are the most negative about prosumer programmes, whereas service companies are the most positive about them.

The same as in the case of EB indicators, an attempt was made to determine how the OK indicators differ depending on the type of activity, the volume of annual revenue and the size of the organization. Here, the same statistics and statistical verification process were used as in the case of EB indicators. The analysis showed that the size of the organization did not cause statistically significant differences in responses concerning selected indicators. Concerning the volume of annual revenue, it was determined that the value of the Kruskal-Wallis test: $H(2, N= 179)=12,13484$ and the level of test probability $p = .0023$ as well as the median test ($\chi^2= 10.46024$ $df = 2$ $p = .0054$) make it possible to reject the null hypothesis and assume the alternative hypothesis of a dependency between the revenue volume and the declared acceptance of employee ideas. An analysis of contingency tables showed that organizations with the lowest and the highest indicators of annual revenue represented such approach. It was also determined that the type of activity of the examined companies affected their expectations of creativity and innovative thinking from employees (Pearson's $\chi^2= 42.36013$, $df=24$, $p=.01176$). An analysis of contingency tables showed that such expectations were particularly typical of production organizations.

The next step in the analysis of data obtained in the research was to correlate EB indicators and OK indicators. This was done using the Spearman's rank correlation coefficient (R).

When analysing Spearman's rank correlations, as many as four dependencies between the indicator of encouraging employees to take on challenges and the EB indicators were noted. The first dependency concerns the link between the abovementioned indicator of OK and activities undertaken by an organization for the sake of the local community ($R=0,157026$, $p=0,035801$). This dependency is somewhat unusual. It seems that organizations make a direct link between activities for the sake of the local community and the treatment of employees, who are probably recruited from the organization's most immediate surroundings. Thus, treating employees subjectively and encouraging them to take on challenges that may be beneficial for the organization is understood as fulfilling the mission of helping the local community. The other three regularities associated with the abovementioned indicator of organizational knowledge are closely linked with the social environment of work. Dependencies were reported between encouraging employees to take on challenges and promoting the caring-partnership style of management ($R=0.157222$, $p=0.035568$); accentuating the social competencies of managers ($R=0.163799$; $p=0.028456$) and recognizing healthy atmosphere at work to be an important element of the emotional EB communication ($R=0.176473$; $p=0.018124$). This group of dependencies suggests that organizations that place an emphasis of the social environment of work are aware of its impact both in terms of image and the effectiveness of employees. Another reported dependency is the relationship between creating optimum conditions for cooperation between departments and accentuating the WLB as one of the key difficulties in constructing the EB proposition ($R=0.183337$, $p=0.014027$). This relationship highlights the conflict that arises when trying to satisfy two seemingly contrary interests: on the one hand, optimizing the organization's operations and streamlining organizational processes as much as possible and, on the other hand, meeting the need for balance between the employee's professional and personal life. Optimization of the organizational process requires employees to be available and engaged and sometimes to devote their own needs for the sake of the organization. This affects the performance of social roles associated with motherhood, fatherhood, caring for dependents and involves temporary separation from the family or even inability to pursue one's passions or interests or to manage one's own time.

5. Discussion

An analysis of the research results and their comparison to reports concerning the EB and functioning of the generation Z in the labor market led to some observations and conclusions. The first concern the analysis of the functioning of the EB area and organizational knowledge in the examined organizations. Assuming that in 2019, those organizations, according to the methodology of the Polish economic and legal journal *Rzeczpospolita*, were the leaders of the Polish market in 2018, they should be expected to follow the latest trends in managing various areas of enter-prises. It should also be noted that in 2019, when the research was conducted, economic performance in Poland was very good and the unemployment rate was the lowest since 1989. For economically booming enterprises, it meant serious problems with finding and keeping employees. This problem was reported in every sphere of the economy. Unfortunately, the opinions expressed by representatives of the examined organizations present a picture of companies enjoying a strong market position which had no problems with recruiting employees or did not think it important to increase the attractiveness of their own image as an employer. The elements that attracted the most attention of EB specialists in the examined organizations were salaries and social benefits, training and development, work ethics and the

atmosphere of work - at the same time, those areas were the most problematic in the process of building the EB campaign. As far as the salaries are concerned, this factor was the most frequent reason for employee quitting. This could be a sign of an outdated perception of the EB, influenced by the past situation in the labor market, when the financial elements of the EVP constituted the basic factor in selecting an employer. Currently, however, other factors are also taken into consideration when choosing the place of work. Modern solutions presented by organizations in EB reports focus on such factors as onboarding activities (particularly important for young employees), CSR, ethics, building links with the local community, employee volunteering and charity, WLB and prosumer programs. In most cases, the organizations were ambivalent about those indicators. Somewhat better was the attitude of the examined employers to the social environment of work relationships with the superior, healthy atmosphere of work, proper social competencies of the managers. It seems that a strong market and economic positions releases an organization from the obligation to attract an employee and offer unique and specific benefits corresponding to his or her contemporary sensitivity to social aspects.

In terms of the OK indicators, it was observed that most organizations had a moderately positive attitude to the discussed issues. However, their declarations were somewhat inconsistent. Companies that claimed to offer open access to knowledge and promote proactive attitude to knowledge and creativity among employees at the same time did not fully support independent thinking or innovation. It seems that the examined organizations have a group of specialists whose knowledge is managed in an individual way, whereas workers are not believed to individually represent a specific knowledge potential that, if developed, could increase the level of OK.

The attempt to link the two research areas did not yield the expected results. This, however, is also important information for the researcher. The only significant dependency observed was the impact of the social environment of work on the employees' proactive attitude to using knowledge. This is a manifestation of the qualitative transformations in the workplace that increase the crucial role of social elements of work. Meanwhile, the general observation on the lack of dependencies between the analyzed areas leads to the conclusion that most of the examined organizations do not formulate or implement strategies reflecting the latest trends, either in the EB area or in the organizational knowledge management area. This is surprising, given the fact that they are leading organizations on the Polish markets and could be expected to establish new practical management solutions reflecting the social trends. Apparently, in the processes of attracting young candidates, companies focus mainly on the financial proposition, while knowledge and the possibilities of its development, as an element of the EB communication, are used more in connection with the existing employees. In a situation where organizations have to fight for employees, the fact that they do not use this additional advantage that could prove the uniqueness of their proposition may be considered as a loss they suffer.

6. Conclusion

Deliberations on the treatment of OK as a vital element of the EB communication were based on the assumption that leading Polish organizations are aware of the latest trends in those areas. Many organizations use OK as a distinguishing feature that could affect the candidate's potential evaluation of it as an employer. The research concerned a specific economic period, which was very good both for employees and for employers. The global COVID 19 epidemics in 2020 will probably significantly change the distribution of forces in the labor market and in economic markets. The unemployment rates are already growing both in Poland and across the world. However, according to the forecasts prepared by specialists concerning the EB after

COVID 19 (www.hrminstitute.pl/raporty) in the next 10 years, i.e. until 2030, Poland will acutely feel a shortage of laborers due to the demographic situation (outflow of workers from the East). Before the pandemics, one of the employers' major concerns was lack of an adequate number of job candidates. The way of layoffs that we are observing now could change this, but it seems the most probable that candidates looking for employment will have to retrain. The observed reduction of personnel also means outflow of OK, and it is not so obvious that this knowledge will ever return to organizations. Knowledge might undergo revaluation. On the one hand, employees with specialist knowledge will be highly desirable but, on the other hand, employees with basic technical knowledge and comprehensive skills will also be needed. Employees with professional experience who could give practical training to new workers will become valuable. However, the question is whether employees from the generation Z will be ready for such comprehensive learning. Undoubtedly, research in the analyzed areas conducted during the pandemic may yield new and surprising results.

References

- [1] Ambler, T. & Barrow, S. (1996). The employer brand. *Journal of Brand Management*, 3(4), 185-206.
- [2] Backhaus, K. & Tikoo, S. (2004). Conceptualizing and researching employer branding, *Career Development International*, 5 (9), 501-17.
- [3] Barrow S. & Mosley R. (2006). *The Employer Brand: Bringing the Best of Brand Management to People at Work*, John Wiley & Sons, Chichester.
- [4] Bejtkovský, J. (2016). The Employees of Baby Boomers Generation, Generation X, Generation Y and Generation Z in Selected Czech Corporations as Concoisseurs of Development and Competitiveness in their Corporation, *Journal of Competitiveness*, 8(4), 105-123. doi: 10.7441/joc.2016.04.07.
- [5] Bencsik, A.; Horvath-Csikos, G. & Juhasz, T. (2016). Y and Z Generations at Workplaces, *Journal of Competitiveness*, 3 (8), 90-106. doi: 10.7441/joc.2016.03.06.
- [6] Berthon, P., Ewing, M. & Hah, L. L. (2005). Captivating company: dimensions of attractiveness in employer branding, *International Journal of Advertising*, 2(24), 151-72.
- [7] Davenport, T.H. & Prusak, L. (2000). *Working Knowledge. How Organizations manage what they know*, Harvard Business School Press. Boston, Massachusetts.
- [8] Dolot, A. (2018). The characteristic of Generation Z, *e-mentor*, 2(74), 44–50. doi:10.15219/em74.1351.
- [9] *EB landscapes and trends after the coronavirus*, 2020/2022, www.hrminstitute.pl/raporty (access: 24.02.2022).
- [10] Eurostat: *Polska wciąż w czołówce krajów z najniższym bezrobociem* <https://www.gov.pl/web/rodzina/eurostat-polska-wciaz-w-czolowce-krajow-z-najnizszym-bezrobociem>, (access: 24.02.2022).
- [11] Hanisch, B., Lindner F., Mueller, A. & Wald, A. (2009). Knowledge management in project environments, *Journal of Knowledge Management*, 4 (13), 148-160. doi:10.1108/13673270910971897.
- [12] <http://www.hrminstitute.pl/raport-employer-branding/>, Employer Branding w Polsce 2012-2020, HRM Institute (access: 24.02.2022).
- [13] Joshi, A., Kale, S., Chandel, S., & Pal, D. K. (2015). Likert Scale: Explored and Explained. *Current Journal of Applied Science and Technology*, 7(4), 396-403. doi:10.9734/BJAST/2015/14975.
- [14] Kmiecik, R. (2020). Trust, knowledge sharing, and innovative work behavior: empirical evidence from Poland, *European Journal of Innovation Management*, 5 (24), 1832-1859. doi: 10.1108/EJIM-04-2020-0134.
- [15] Krot K. & Lewicka, D. (2016). *Zaufanie w organizacji innowacyjnej*, Wydawnictwo C.H. Beck, Warszawa.
- [16] Lazanyi, K. & Bilan, Y. (2017). Generation Z on the labour market - do they trust others within their workplace? *Polish Journal of Management Studies*, 16(1), 78-93. doi: 10.17512/pjms.2017.16.1.07.

- [17] Lievens, F. & Slaughter, J.E. (2016). *Employer Image and Employer Branding: What We Know and What We Need to Know*, FP, Book Series: Annual Review of Organizational Psychology and Organizational Behavior, 3, 407-440. doi: 10.1146/annurev-orgpsych-041015-062501.
- [18] McDermott, R.. (1999). Why information technology inspired but cannot deliver knowledge management, *California Management Review*, 3(40), 281-188.
- [19] Mosley, R.W. (2007). Customer experience, organizational culture and the employer brand, *Journal of Brand Management*, 2(15), 123-34.
- [20] Nielsen, A., P. (2006). Understanding dynamic capabilities through knowledge management, *Journal of Knowledge Management*, 4 (10), 59-71. doi:10.1108/13673270610679363.
- [21] Nonaka, I. & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, New York
- [22] Nonaka, I. & Toyama, R. (2007). Strategic management as distributed practical wisdom (phronesis), *Industrial and Corporate Change*, 3(16), 371-394. doi: 10.1093/icc/dtm014.
- [23] Nonaka, I., & von Krogh, G. (2009). Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organizational Knowledge Creation Theory, *Organization Science*, 3 (20), 635-652. doi: 10.1287/orsc.1080.0412
- [24] Nonaka, I., von Krogh, G. & Voelpel, S. (2006), Organizational knowledge creation theory: Evolutionary paths and future advances, *Organization Studies*, 8(27), 1179-1208. doi: 10.1177/0170840606066312.
- [25] Robak, E. (2017). Expectations of Generation Y Connected with Shaping the Work-Life Balance. The Case of Poland, *Oeconomia Copernicana*, 8(4), 579-594. doi: 10.24136/oc.v8i4.35.
- [26] Sidorcuka, I. & Chesnovicka, A. (2017). *Methods of Attraction and Retention of Generation Z*, Staff, International Conference of Central-Bohemia-University (CBUIC) - Innovations in Science and Education, Prague, Czech Republic, 807-814. doi: 10.12955/cbup.v5.1030.
- [27] Słocińska A. (2016). *Requirements of Improving Knowledge Sharing Behavior. Creativity Context* In: Ed Formankova, S., 6th International Conference on Management (ICoM) - Trends of Management in the Contemporary Society Location, Brno, Czech Republic, 124-127.
- [28] Soliman, F. & Spooner, K. (2000). Strategies for implementing knowledge management: role of Human resources management, *Journal of Knowledge Management*, 4(4), 337-345.
- [29] Tsai, M. & Lee, K.,W. (2006). A study of knowledge internalization: from the perspective of learning cycle theory, *Journal of Knowledge Management*, 3(10), 57-71. doi:10.1108/13673270610670858.



SESSION 3

HEALTHY AND SUSTAINABLE FOOD CONSUMPTION

Socially Responsible Consumer on the Food Market in Poland

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Abstract

The excessive consumption threatens further existence of the humankind, the natural environment is destroyed, and the natural resources are depleted. In response to these negative phenomena, critical attitudes appear, manifesting themselves in the pursuit of moderation in purchasing new goods and searching for and consuming products which do not damage the natural environment. This tendency is included in the idea of the socially responsible consumption. An important area thereof is the consumption of organic food. The aim of the article is to identify the range of the socially responsible consumer behaviors on the organic food market and the barriers to their implementation. The assumed goal was achieved thanks to the use of the method of critical analysis of the domestic and foreign literature sources related to the socially responsible consumption and the analysis of the results of the empirical studies on the range of its occurrence. The results of the empirical studies show changes in the attitudes of the consumers towards the organic food and forms of socially responsible consumption in Poland. The organic food consumption growth factors are: declarations that when buying food, the consumers pay attention to the ecological origin of the food; the frequency of purchasing organic products "at least once a week" and "at least once a month"; purchasing food products labeled with the ECO mark; variety of the food products bought; the consumption of local products associated with the local culture. On the other hand, the barriers to its development include the increase in consumption of red meat, wastage of organic food, too high a price thereof, limited availability and insufficient knowledge about the benefits of the organic food. A limited range of behaviors being typical of the socially responsible consumption in the area of the organic food in Poland. The results of the studies obtained, due to their diversified nature (surveys, quantitative studies), constitute the basis for the limited conclusions. Therefore, it is worth undertaking the qualitative study in order to learn the actual behavior of the socially responsible consumers.

Keywords: *ecological consumption, socially responsible consumption, socially responsible consumer, ecological food*

JEL Classification: *E21, M31, Q01*

1. Introduction

In the discussions and scientific debates on the directions of the changes in the consumption, the issue of taking actions to reduce the excessive consumption, which has a destructive effect on the natural environment, appears. It is believed that the excessive consumption may limit the access to the natural resources for the future generations. Some researchers suggest that one of the directions of the actions to reduce the excessive consumption is the promotion of the socially responsible consumption, the main being a conscious and well-thought-out decision to make consumption choices because of personal moral beliefs and ethical values (Crane & Matten 2004). The ethical behaviors include the type of conduct in which the consumer follows the ethical values in the process of purchasing, using and disposing of the products. It can manifest itself in limiting the consumption of goods related to the consumer's lifestyle, approving the concept of the sustainable development, caring for the natural environment, opposing the actions of the producers who do not respect the workers' rights, promoting fair trade, purchasing and

consuming organic food, etc. The idea of the ethical consumption is manifested, among others, by the concept of the organic food consumption. The organic food market in Poland is a market in the growth phase. The organic food turnover is growing dynamically, but its share in the total food sales is still small. In Poland, the value of the organic food market in 2020 is estimated at approximately PLN 1.36 billion, which is 0.5% of the value of the entire food market. Compared to 2019, in 2020 the market value increased by 10%. The organic food is produced by 18,575 farms which cultivate 509,291 hectares. Their share in the total agricultural area is 3.5% (Polska Izba Żywności Ekologicznej 2019). The further development of this market is related to the dissemination of the consumer's attitudes and behaviors typical of the socially responsible consumption.

The aim of the article is to identify the scope of the behavior of the socially responsible consumers on the organic food market and the barriers to their implementation.

2. Literature review - Socially responsible consumption

Socially responsible consumption as an area of the ethical consumption is manifested in the relations with other consumers, the ethical dimension of the products, and the impact on the natural and social environment. Relationships with other consumers may take an organised form, for example, as the consumer cooperatives focused on the food consumption. The purpose of such initiatives is to meet the needs and aspirations of the consumers. For them, the cooperation between the consumers means having a real influence on the supply chain, on the choice of products they buy. The consumer cooperatives take the form of institutionalised or informal groups. In the first case, they create their own stores or connect to the network, for example, in Spain there is the Eroski network, in Sweden (KF/Coop Sweden), in the Czech Republic (UCMCC), in Slovakia (Coop Jednota), in Denmark (FDB/Coop Denmark) and in Finland (S-Group) (European Community of Consumer Cooperatives. 2008). They offer high-quality products at a reasonable price, not only to their own members but to all of the customers. In such cooperatives, the social responsibility for the community's consumption undertakings rests on the consumers.

In the second case, the informal food cooperatives are established. In such organisations, all of the processes related to the food production, distribution and consumption are informal, therefore they do not pay value added tax, do not have permits to operate, do not comply with established sanitary standards and do not have official certificates (Dentoni & Lorenzo 2014).

The food cooperatives operate with different goals. One of the most important is to create the conditions for purchasing the healthy food and care for the natural environment. They are based on mutual, two-way relationships between the producers and the consumers. The purpose of the cooperative is to eat healthy food and care for the environment.

Another area of the social responsibility of the consumption is caring for the ethical dimension of the consumer's goods, which is related to their ethical production (consistent with the human rights, working conditions, environmental protection, etc.) (Doane 2001). The ethicality of a product is demonstrated by the range of the presence of an ethical element in a given product, including the "fair" production and the biological neutrality towards the natural environment. The ethical dimension of a product can be perceived in a broader dimension, that is, as a physical product, its marketing, manufacturing process, and even the country of origin (Brinkmann & Peattie 2008).

The natural environment is an important area of the socially responsible consumption. It is assumed that the consumers, as the users of the natural environment, are responsible for it, which involves predicting the effects of their activities and taking them into account when making purchasing decisions. The literature distinguishes four basic types of consumption which take

into account the sensitivity to the environmental problems. They are: eco-consumption (ecological consumption), ethical consumption, sustainable consumption and the anti-consumption. The eco-consumption means consuming goods and services of an appropriate quality, produced using as little toxic materials as possible and reducing waste and pollution. The eco-consumption is sometimes referred to as the green consumption, which includes the protection of the environmental resources by improving the quality of life, improving efficiency, minimising waste, extending the perspective of the product's life cycle and taking into account the justice system for both the present and future generations (Peattie 2010). On the other hand, ethical consumption is associated with the purchase of the products which have been produced with respect for the basic human rights and the environment. It includes the diverse practices as buying fair-trade, products-not-tested-on-animals, non-sweatshop brands, organic goods and avoiding the exploitative products or unnecessary purchases (Littler 2008). The key to its implementation is the growth of the rational and environmentally conscious attitudes and behavior based on deep values (Ottman 2003). The sustainable consumption, on the other hand, can be defined as "the use of services and related products which respond to basic needs and bring a better quality of life, while minimizing the use of natural resources and toxic materials as well as emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardize the needs of future generations" (Liu et al. 2017, 414). One of the important goals of the sustainable consumption is the consumption of ecological food.

When considering the socially responsible consumption, the term of the socially responsible consumer appears. A socially aware consumer is the one who takes into account the social consequences of their private consumption or seeks to use their purchasing power to cause social change (Webster 1975). In the process of purchasing and consuming or using a product, they aim to minimise or eliminate any harmful effects and maximise the long-term beneficial impact of the purchased consumer goods on the society (Mohr et al. 2001). A socially responsible consumer is characterised by thinking ahead and tempering one's desires by knowing that actions have to be morally justifiable and who has to sometimes be prepared to sacrifice personal action for the society (Gabriel & Lang 1995). Thus, a socially responsible consumer is a person whose actions on the market are morally justified and is ready to give up their consumption desires when they harm the natural and social environment. Such a consumer tries to purchase products or services of the companies deemed responsible for the social and natural environment.

The behavior of a socially responsible consumer towards the natural environment can take many forms, first of all, the purchase of the consumer goods which are produced in the least harmful way to the nature. Second, eating the so-called ecological goods (mainly food) without the artificial additives, preservatives, etc. Third, purchasing goods which are produced at the lowest ecological cost, such as purchasing cleaning products with low levels of hazardous chemicals, biologically neutral baby food. Fourth, promoting the environmentally friendly life styles, for example, a style of voluntary simplicity in consumption. Fifth, promoting awareness of the co-responsibility for excessive production of post-consumer waste among other consumers, for example, on social networks. Sixth, promoting the consumption of the local products linked to the local culture. The above set of forms of the action towards the natural environment which can be taken by the socially responsible consumers is not closed. It is only a suggestion for further discussion on the issue of the socially responsible consumption in today's society.

The areas of the socially responsible consumption presented do not constitute a closed entirety, they are a starting point to discuss the directions of changes in the behavior and activities of the consumers in today's society.

2. Data and Methods

For the purpose of the range of occurrence of socially responsible consumption on the ecological food market in Poland, the findings of research in the following databases were utilized: CBOS [the Centre of Research on Social Opinion] – this research was conducted within the framework of the mixed-mode procedures (CAPI, CATI and CAWI). A representative name-based sample of adult inhabitants of Poland, who were selected from the PESEL register (Personal Identity Number N=1133); IMAS International – this research was conducted with the aid of the survey method, whereby the Internet survey of CAWI was applied in a quota-random sample of Poles (N=1011) and in a research sample (N=1000); the Polish Chamber of Ecological Food – quantitative research conducted with the aid of the survey method, in which the technique of the electronic survey available online was applied, while also in the form of phone interviews (N=1000); the General Directorate for the Environment and co-ordinated by the Directorate General for EU Communication – quantitative research conducted on a sample of 27,881 people from all the EU member states. Likewise, statistical data in research reports was availed of from the following: Statistics Poland, , the United Nations Environment Programme, Food Waste Index Report, Koalicja na Rzecz Rozwoju Rynku Żywności Bio, the European Community of Consumer Cooperatives. The research conducted relates to the period of 2017 – 2021.

The research methods availed of in the research on socially responsible consumption was that of the induction method, which is based on perception leading from the individual facts observed in the process of analysing the results of empirical research to generalization and the method of desk research, which avails of the findings of primary research stipulated in research reports as the source of data for analysis.

3. Results and Discussion

A socially responsible consumer looks for ecological products which are produced in a way that does not endanger the natural environment. One of such products is the organic food. The potential of spreading the patterns of the organic food consumption is evidenced by the consumers declarations that they pay attention to the ecological origin of the products. In Poland, a relatively high percentage of the consumers declare that when buying food they pay attention to the ecological origin (69% of respondents). If we take into account the socio-demographic characteristics of the consumers, men (71%), aged 60 and more (81%), with secondary education (72%) pay attention to the ecological quality of products relatively more often. This attitude is the least frequently displayed by young people aged 18-29 (64%) and with higher education (65%). (Byłok 2021)

One of the indicators of the socially responsible consumption is the frequency of purchasing green products. In Poland, the group of regular consumers of the organic food includes slightly more than 32% of the consumers who declare that they purchase organic food "at least once a week" and "at least once a month". In turn, 20% eat organic food occasionally, and 48% never buy organic food (Koalicja na Rzecz Rozwoju Rynku Żywności Bio 2021).

When comparing the results of these two studies, discrepancies can be noticed. Lewicka-Strzałecka estimates that the discrepancy between the declared readiness to make ethical purchases and the actual purchasing is 30:3, i.e. 30% of people declare that they are willing to make such purchases and only 3% actually do them (Lewicka-Strzałecka 2003). One of the reasons for such a state of the affairs is a relatively higher price of the organic food than the traditional food. Even for the consumers who identify themselves as the socially responsible, the prices of the organic products are more important than the concerns about the unethicity of the products produced by producers deemed to be ethical. Shaw and Clarke concluded that although the consumers in the studies declare their willingness to support the ethical companies by

purchasing their products, ethical issues do not have such a large impact on their actual purchasing behavior. In most cases, the products with ethical characteristics are more expensive than the traditional products, which reduces the consumer's incentives to buy them (Shaw and Clarke 1999).

Another indicator of the socially responsible consumption is the purchase of the food products marked with the so-called green leaf. Most often, the consumer learns about whether a food product is ecological from its description on the label. The certification mark confirms its belonging to the organic food group. The certificates are a key factor influencing the choice of the organic products (Savelli et al. 2019). In Poland the majority of consumers know that organic food is certified (80%), and more women than men have such knowledge (84% vs 76%) Polish Chamber of Organic Food 2021). The question arises to what extent the labeling of the ecological products influences the purchasing decisions. The Eurobarometer surveys show that the attitudes towards eco-labels vary significantly from country to country. The majority of the consumers consider eco labeling when shopping in Sweden (70%) and Denmark (57%), while the least frequent is Bulgaria (12%), the Czech Republic and Portugal (both 17%). In Poland, 20% of the consumers believe that the "ECO" ecological label is important to them when shopping, 35% indicated that it does not play an important role, and 40% have never paid attention to the ecological signs. However, only 10% of the respondents bought a product marked with this sign. (European Commission 2017)

The final decision to buy an organic product is influenced by the reliance on the label indicating that the organic product is environmentally friendly. In the European Union, the Ecolabel is the most trusted by the consumers in Greece (95%), Cyprus, Denmark and Hungary (all 94%). In Poland, on the other hand, 81% of the respondents trust the eco-label on the product label European Commission. (2017). Thus, the majority of consumers recognising the eco-label on a product trust it, which may positively influence the purchasing decisions.

The variety of the purchased organic products is another indicator of the socially responsible consumption. The Polish consumers most often buy ecological fruit and vegetables from among the food products. Over 25% of the consumers admitted that they buy them "at least once a week". The organic eggs are another frequently purchased product, which almost 63% of the respondents buy regularly. Bread, dairy products and milk are purchased slightly less frequently. Relatively rarely, the consumers buy organic cold cuts (13%). The least frequent items in the shopping cart are snacks, herbs, spices, tea and coffee, nuts and dried fruit, as well as semi-finished products and ready-made meals. (Polish Chamber of Organic Food 2021).

Due to the negative impact of the cattle, pig and poultry farming on the production of the greenhouse gases, limiting the consumption of meat is one of the indicators of the socially responsible consumption. In Poland, the meat consumption is systematically growing. The meat consumption index per capita increased from 73.7 kg in 2010 to 77.1 kg in 2019, with the consumption of beef increasing the fastest by 58% (Statistics Poland 2020). The polls show that in Poland, only 8% of the consumers significantly limit their meat consumption (CBOS 2020). Thus, the observed increase in the meat consumption points to a negative trend limiting the development of the socially responsible consumption.

An important indicator of the socially responsible consumption is reducing the food waste. Food waste can be defined as "...any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)" (Aschemann-Witzel et al. 2015 , 2025). One of the behaviors of a socially responsible consumer is the rational purchase of the food products, i.e. he buys only those he needs at the moment. In Poland, with the opinion of *I buy as much food as I need without wasting food* , 56% of the respondents strongly agree (CBOS 2020). Other studies show that 8%

of the consumers sometimes waste half of the purchased organic products, and 6.3% waste most of the purchased eco-products. On the other hand, sometimes an ecological product is wasted (40%), and the purchased products are rarely wasted (30.1%). Only a little over 14.3% of the consumers never waste ecological products (Polska Izba Żywności Ekologicznej 2019). In general, the consumers consider it inappropriate to throw away food (Porpino et al. 2016). Despite the relatively frequent waste of food by the Polish consumers, its amount of 56 kg of wasted food per household per year is lower than in most of the EU countries. The most wasted food is in Greece (142 kg), Malta (129 kg) and Hungary (94 kg). On the other hand, the food waste is least wasted in Slovenia and Russia (33 kg per household) (United Nations Environment Programme. 2021).

There are many causes of food waste. In Poland, the most common are the loss of freshness or the expiry of the expiry date of the products (43.8% of indications), then the improper storage of the products (28.1%), too large purchases (21.9%) and inadequate quality, the appearance or the taste of the products (15.6%) (Polska Izba Żywności Ekologicznej 2019).

The consumption of the local food products related to the local culture is another indicator of the socially responsible consumption. The attributes of this food category confirm that the health awareness and the promotion of a healthy lifestyle, as values perceived by the consumers, are an element of building the product strategies of the entities related to the local food (Goryńska-Goldmann, E. (2019). Food is the product most strongly associated with the locality. The surveys show that the Poles pay attention to where the food products come from, 47% pay attention to it, while for 47% of the consumers it is of little importance. Only 4% of the consumers do not care where the food comes from (IMAS Agri 2018). The results of the subsequent studies indicate that 1/3 of the Poles eat local products at least twice a week, and approximately 70% eat these delicacies at least 2-3 times a month. About 40% of the consumers consume more local products than 3 years ago. The most commonly purchased local products are: cold cuts and processed meats, eggs and vegetables and fruit (Beeline Research 2017). The local food is most often purchased in bazaars, directly from the farmer or in specialised stores. In conclusion. Responsible consumers, who value the tradition and locality, have an impact on the greater production possibilities of the local food, which is the basis for the sustainable development of the local communities.

By analysing the results of the studies on the scope of the organic food consumption in Poland, it can be concluded that its further development encounters numerous barriers. In many studies, the three main barriers to the development which appear are: high prices, limited availability and consumer's knowledge (Grzybowska-Brzezińska & Grzywińska-Rapca 2018; Kulek & Michałowska 2018). This is confirmed by the analysis of the IMAS studies results, which show that the Polish consumers considered the high price (64%), no need to consume the organic food (23%), its unavailability (16%), the lack of trust in the certificates (15%), a too far way to an organic food store (13%), lack of knowledge of where to buy it (11%), no difference between the organic food and others (10%); low quality/taste (7%), as important reasons for not buying the organic food (IMAS International 2017). Overcoming these barriers requires a great deal of effort. One of the key activities is to increase the knowledge of the consumers about the advantages of the organic food and the knowledge about the certificates and labels of the organic food, which will allow the recognition of this food and its conscious choice. The consumers with such knowledge are able to accept higher prices.

4. Conclusion

In spite of the skepticism expressed by many researchers (Carrington et al. 2014, Devinney et al. 2006)- largely related to only some dimensions of the socially responsible consumption, i.e. the ethicality of the products, their environmental friendliness - the number of consumers who can be called the socially responsible is gradually increasing, in particular in the ecological food market. The organic food market offers a wide variety of products, enabling a lifestyle choice based on the ethical consumption. The studies conducted on the scope of the occurrence of the socially responsible consumption patterns in Poland shows that the consumers declare that they are used in practice to a limited extent. The analysed indicators of the socially responsible consumption, i.e. the frequency of purchasing the organic products "at least once a week" and "at least once a month; purchasing food products labeled with the ECO label; the variety of purchased food products and buying local food products related to the local culture indicate the potential of the organic food market in Poland. However, its further development depends on overcoming the barriers. The main obstacles are the too high price of the organic food, its limited availability, too little knowledge about its certified quality and too little knowledge about the benefits of the organic food. This is especially true for the group of consumers who purchase organic food inconsistently. The consumers need knowledge and arguments in favor of choosing organic products, in particular the knowledge about nutrition, organic food, labeling this product category, and the certification (Nestorowicz et al. 2016).

The results of the studies on the scope of the socially responsible consumption in the food market cited in the article indicate the growing interest in this form of consumption in Poland. For now, most of them are declarations, but some of them are made real in the actual consumer's decisions regarding the choice of the organic products. It is possible to forecast its gradual development, but it will not be a mass phenomenon.

References

- [1] Aschemann-Witzel, J., de Hooge I., Amani P., Bech-Larsen T. & Oostindjer M. (2015), Consumer-Related Food Waste: Causes and Potential for Action, *Sustainability*, 7, 6457-6477; doi:10.3390/su7066457
- [2] Beeline Research. (2017). *Jedz lokalnie, czyli Polacy o lokalnej żywności*. Retrieved January 20, 2022, from http://beeline-research.pl/aktualnosci/jedz_lokalnie/
- [3] Brinkmann, J., & Peattie, K. (2008). Consumer Ethics Research: Reframing the Debate about Consumption for Good. *Electronic Journal of Business Ethics and Organization Studies*, 13(1), 22-31.
- [4] Bylok, F. (2021). Patterns of Sustainable Consumption in High Consumption Societies. Case of Poland. In H. Stojanová, H. Chládková (Eds.), *Zero Waste Management and Circular Economy* (pp.119-128). Brno: Mendel University in Brno.
- [5] Carrington, M.J., Neville, B.A., & Whitwell, G.J. (2014). Lost in translation: Exploring the Ethical Consumer Intention-behavior Gap. *Journal of Business Research*, 67(1),2759–2768. doi:10.1016/j.jbusres.2012.09.022
- [6] CBOS. (2020). Świadomość ekologiczna Polaków. Komunikat z badań nr 163/2020. Retrieved January 24, 2022, from https://www.cbos.pl/SPISKOM.POL/2020/K_163_20.PDF
- [7] Crane, A., & Matten, D. (2004). *Business Ethics*. Oxford: Oxford University Publishing.
- [8] Dentoni, D., & Lorenzo, I. M. (2014). *Self-Organization in Food Consumer Groups: Microand Macro Transformative Roles of Sharing and Entrepreneurship*. Working Paper for Submission to the 17th Roundtable on Sustainable Consumption and Production, Theme 5: Results of Sustainability Innovations Research and Development. Retrieved from <https://conferences1.matheo.si/materialDisplay.py>.
- [9] Devinney, T.M., Auge, P., & Eckhardt, G. (2006). The Other CSR: Consumer Social Responsibility. Stanford Social Innovation Review, Fall 2006, Leeds University Business School Working Paper No. 15-04. Retrieved from <https://ssrn.com/abstract=901863> or <http://dx.doi.org/10.2139/ssrn.901863>
- [10] Doane, D. (2001). *Taking Flight: The Rapid Growth of Ethical Consumerism*. London: New Economics Foundation

- [11] European Commission. (2017). *Special Barometer, Attitudes of European citizens towards the environment. Survey requested by the European Commission*. Directorate-General for Environment and co-ordinated by the Directorate General for Communication. Retrieved from http://mehi.hu/sites/default/files/ebs_486_1.pdf
- [12] European Community of Consumer Cooperatives. (2008). *Consumer Cooperative Social Responsibility: Bringing Value into Retail Business. Production of Euro Coop*. Retrieved January 6, 2022 from <https://doczz.net/doc/4221599/consumer-cooperative-social-responsibility>
- [13] Gabriel, Y., & Lang, T. (1995). *The unmanageable consumer: Contemporary consumption and its fragmentations*. London: Sage Publications Inc., London.
- [14] Goryńska-Goldmann, E. (2019). Geneza i pojęcie żywności lokalnej w powiązaniu z ideą zrównoważonej konsumpcji. *Journal of Tourism and Regional Development*, 11, 23–35. doi: 10.22630/TIRR.2019.11.3
- [15] Grzybowska-Brzezińska, M., & Grzywińska-Rapca, M. (2018). Rynek żywności ekologicznej w aspekcie rozwoju zjawiska świadomej konsumpcji. *Handel Wewnętrzny*, 2, 168-177.
- [16] IMAS Agri. (2018). Pochodzenie ma znaczenie – rodzima żywność preferowana przez Polaków. Retrieved January 24, 2022, from http://imas.pl/wp-content/uploads/2018/09/IMAS_Agri-Pochodzenie-ma-znaczenie-rodzima-zywnosc-preferowana-przez-Polakow.pdf
- [17] IMAS International. (2017). Żywność ekologiczna w Polsce 2017. Retrieved January 24, 2022, from <http://imas.pl/blog/raport-zywnosc-ekologiczna-w-polsce-2017-juz-do-pobrania/>
- [18] Koalicja na Rzecz Rozwoju Rynku Żywności Bio (2021). Żywność ekologiczna w Polsce. Raport 2021. Warszawa: Nielsen IQ.
- [19] Kułyk, P., & Michałowska, M. (2018). Zachowania konsumentów na rynku żywności ekologicznej w świetle wyników badań empirycznych w województwie lubuskim. *Handel Wewnętrzny*, nr 2, 27-282.
- [20] Lewicka-Strzałecka, A. (2003). Konsumeryzm kontra konsumeryzm. *Etyka w życiu gospodarczym, Annales*, 6, 132-138.
- [21] Littler, J. (2008). *Radical Consumption. Shopping for Change in Contemporary Culture*. Mainsenhead: Mcgraw Hill/OU Press.
- [22] Liu, Y., Qu, Y., Lei, Z., & Jia, H. (2017), Understanding the Evolution of Sustainable Consumption Research. *Sustainable Development*, 25, 414–430, doi: 10.1002/sd.1671
- [23] Mohr, L.A., Webb, D.J., & Harris, K.E (2001). Do Consumers Expect Companies to be Socially Responsible? The Impact of Corporate Social Responsibility on Buying Behavior. *Journal of Consumer Affairs*, 35(1), 45-72. doi:10.1111/j.1745-6606.2001.tb00102.x
- [24] Nestorowicz, E., Pilarczyk, B., Jerzyk, E., Rogala A., & Disterheft A. (2016). *Raport z badań przeprowadzonych w ramach projektu „Postawy etnocentryczne konsumentów (w ujęciu lokalnym) a szanse i bariery rozwoju rynku żywności ekologicznej”*. Poznań: Uniwersytet Ekonomiczny w Poznaniu.
- [25] Ottman J.A (2003) *Green Marketing: Challenges and Opportunities for the New Marketing Age*. Lincolnwood: NTC Business Books.
- [26] Peattie, K. (2010). Green Consumption: Behavior and Norms. *The Annual Review of Environment and Resources*, 35, 195–228. doi: 10.1146/annurev-environ-032609-094328
- [27] Polish Chamber of Organic Food. (2021). Organic Farming and its Market in Poland from the Perspective of 2020. Current Status and Prospects. Warszawa. Retrieved January 24, 2022, from https://jemyko.com/wpcontent/uploads/2021/07/final_20_07_ORGANICFARMINGANDITSMARKETINPOLAND2020-1-scalone.pdf
- [28] Polska Izba Żywności Ekologicznej. (2019). Eko Jemy – Nie Marnujemy Raport nt. marnotrawienia żywności na tle rozwoju rynku żywności ekologicznej w Polsce. Warszawa. Retrieved January 23, 2022, from https://ksow.pl/files/Bazy/Biblioteka/files/Raport_eko-jemy.pdf
- [29] Porpino, G., Wansink, B., & Parente J. (2016). Wasted Positive Intentions: The Role of Affection and Abundance on Household Food Waste. *Journal of Food Products Marketing*, 22 (7), 733-751. doi: 10.1080/10454446.2015.1121433
- [30] Savelli, E.; Murmura, F.; Liberatore, L.; Casolani, N.; & Bravi, L. (2019). Consumer attitude and behaviour towards food quality among the young ones: Empirical evidences from a survey. *Total Quality Management & Business Excellence*, 30(1-2), 169-183. doi:10.1080/14783363.2017.1300055
- [31] Shaw, D., & Clarke, I. (1999). Belief Formation in Ethical Consumer Groups: An Exploratory Study. *Marketing Intelligence & Planning*, 17(2/3), 109–119. doi:10.1108/02634509910260968



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- [32] Statistics Poland (2020). *Statistical Yearbook of the Republic of Poland 2020*. Warszawa. Retrieved from <https://stat.gov.pl/en/topics/statistical-yearbooks/statistical-yearbooks/statistical-yearbook-of-the-republic-of-poland-2020,2,22.html>
- [33] United Nations Environment Programme. (2021), Food Waste Index Report 2021. Nairobi. Retrieved January 23, 2022, from <https://www.unep.org/resources/report/unep-food-waste-index-report-2021>
- [34] Webster, F. E. Jr. (1975). Determining the characteristics of the socially conscious consumer. *Journal of Consumer Research*, 2(3), 188-196. doi: 10.1086/208631

Theoretical Review of Selected Benefits of the New EU Food Strategy and Sustainability

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Abstract

Agriculture and the food industry face a challenge in 2022 in terms of the sustainability of production and manufacturing. The European Union has approached the issue of sustainability by creating a new food strategy - "Farm to Fork". The new food strategy provides a strategic plan to address the challenges of agriculture and food by 2030 and the gradual adaptation of the European Union's environmental objectives by 2050. Selected factors of the new food strategy are organic farming, which represents the biggest goal of the new food strategy because of its connection to the environmental changes in agriculture, the promotion of uniformed food labelling enabling consumer to make healthy food choices and supporting food safety, and the EU Code of Conduct on Responsible Food Business and Marketing Practices, addressing the objectives of the strategy at the level of the end seller and fair treatment of the consumer of European food.

Keywords: code of conduct, food, food labelling, new food strategy, organic agriculture, sustainability

JEL Classification: Q18, Q53, Q56,

1. Introduction

Climate extremes cause extensive economic damage each year and risks are expected to increase with continued socio-economic development and climate change. As the human population grows and the consumption of animal products increases, so does the pressure on natural resources. Natural resources need to be used with a view to sustainability, which includes the introduction of food systems and strategies that exploit production potential without affecting the long-term sustainability of consumption.

The United Nations 2030 Agenda for Sustainable Development is the most comprehensive set of global priorities to achieve sustainable development to date. Transformation, integration, and universality are key principles of the 2030 Agenda set out in a document approved by the UN General Assembly in September 2015. Agenda 2030 builds on the UN Millennium Declaration of 2000. The Millennium Development Goals (MDGs) were the first ever common vision and the first widely accepted framework for global development and development policy-making. The transformative power of Agenda 2030 is represented by 17 Sustainable Development Goals (SDGs), developed into 169 related sub-objectives, which aim to guide the structural political, economic and social transformation of individual countries in response to the threats facing humanity today. The integration element of the Agenda is reflected in the interconnection of all three dimensions of sustainable development: economic, social and environmental. As part of the new food strategy, the European Union has presented a set of objectives for a sustainable food system, also collectively referred to as the European Union's Farm to Fork Strategy.

Agriculture and food production may move in several directions in the near future. Continuation of the current model (business as usual) where environmental problems will be solved using technical solutions and the development of new varieties and agrochemicals. However, this model faces the difficult problem of increasing production while reducing the carbon intensity of production processes. The setting of the European subsidy policy currently leads to a reduction in biodiversity and the volume of ecosystem services provided does not correspond to the number of payments that enter into the Common Agricultural Policy. The model of optimizing ecosystem services, changing subsidy policies, and changing consumer behaviour is a prerequisite for channelling European taxpayers' money into measures to promote diversity and ecosystem services. However, this step is difficult to pass politically. It may slow down the trend of reducing the costs we pay for food and, ultimately, may lead to higher prices for some commodities. There is also a lack of a general system for assessing the environmental impact of individual products, so that the consumer can decide to buy suitable products. Retail chains are considered to be causing a great deal of environmental pressure in an effort to reduce the cost of products supplied. Organic farming, technologies based on new dominant crops and minor technologies, hobby farming, community farming and other forms of food production in ways that are environmentally and environmentally friendly also represent a development perspective.

2. Data and Methods

The aim of the presented article was a theoretical review of the objectives of the new food strategy, the determination of the points of the strategy related to sustainability and the theoretical definition of selected factors related to food production, trade, and consumption. Presented article is based on the pillars of food sustainability, the United Nations Sustainable Objectives for 2030 and the European Union's new food strategy - Farm to Fork, with the European Union document communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system- COM / 2020/381.

The authors of the article selected three benefits of the new food strategy - organic food production, food labelling and the EU Code of Conduct. Selected benefits play a significant role in food supply chain and affect consumers behaviour. Therefore, theoretical knowledge of the issue is the basis for future research in the field of consumer behaviour and changes in political and economic conditions in the food sector. To evaluate the research results, we used the methods of theoretical knowledge, comparison of findings with research of foreign and domestic authors, abstracting the facts important for the integration of the presented article into the food sector and summarizing the information being basis for the research of customers and retailers in the future.



Figure 1: Connection of world sustainable strategies

Source: author of the article

3. Results and Discussion

3.1 Organic food production

One of the priority areas of the European Union's new food strategy is to increase the share of organic farming. Organic farmers are not allowed to use chemical pesticides and synthetic fertilisers, the use of GMOs and ionising radiation is prohibited, and the use of antibiotics is severely restricted. All the restrictions that affect organic farming bring consumers healthier, environmentally friendly foods. Research results show statistically meaningful differences in composition between organic and non-organic crops/crop-based foods. Organic products have higher antioxidant activity, contain higher concentrations (18–69%) of a wide range of nutritionally desirable antioxidants/(poly)phenolics and other plant secondary metabolites (which have been linked to a reduced risk of chronic diseases, neurodegenerative diseases, and certain cancers), 75% lower concentrations of agrochemical residues and a 48% lower concentration of Cadmium (Cd), a toxic heavy metal. Concentrations of total nitrogen and toxic nitrogen-based compounds are also lower in organic crops compared to conventional crops (total nitrogen: –10%; nitrates: –30%; nitrites: –87%). Organic vegetables contain up to 50% less nitrates than their conventional counterpart. A higher dry matter content has also been reported for leafy, root and tuber vegetables (Gomiero, 2018). Consumption of organic foods is a positive choice for human nutrition. Also, the consumption of organic food leads to better consumer awareness of packaging solutions, better food choices and ultimately maintaining good health. Consumers look for recyclable packaging when considering buying organic foods (Canio, Martinelli, 2021). European Union citizens value organic products. Based on the 2020 Eurobarometer survey on European Union agriculture and the CAP, citizens believe that organic products are more likely to comply with specific rules on pesticides, fertilisers, and antibiotics (82% agreed), are more environmentally friendly (81%), and are produced with higher respect for animal welfare (80%). According to the survey, 56% of citizens recognise the organic logo, up from 27% in 2017 (eu. Europa, 2022). Proper nutrition of the population, including through organic farming, is therefore a priority of the European Union's new food strategy. The goal for 2030 is to increase the proportion of organic farming in the European Union to at least 25% of total agriculture. The increase in the proportion of organic farming after 2030 is expected to naturally influence the European Union's agricultural decisions, which will aim to further increase the share of organic farming and improve the nutritional capacity of the people of the Member States. The nutritional quality of fruits and vegetables is affected by several other parameters, including the weather conditions, the crop fertilization, or the plant genetic background (Giampieri et al. 2022). Therefore, increasing the share of organic farming also has an indirect effect on conventional farming and the quality of food for consumption by consumers.

3.2 Packaging labels and front-of-pack nutrition labelling

The nutrition of the population begins with the right decisions of the legislature, restrictive and supportive measures in the supply chain and growers who provide nutritionally balanced food. However, no initiative can decide for the consumer, who must take care of the right choice of nutritionally balanced foods to achieve a healthy and wholesome diet. The new food strategy aims to make it easier for consumers to make nutritionally balanced food choices. One of the tools to achieve food management decisions is to graphically engage consumers in nutritional management and healthy foods. Within Farm to Fork, the European Union has launched a debate on uniform food labelling. Food labelling has been used in the food industry for decades, but to date the European Union has not adopted a single labelling standard for all Member States. There are currently six labelling schemes in use in the European Union. As part of the new food strategy - Farm to Fork, the European Commission is proposing the introduction of a single food labelling system. The traffic light food labelling system involves labelling foods as red, amber, or green depending on the levels (i.e., amounts) of fat, saturated fat, sugars, and salt. By providing a color-

coding process, healthier food choices can be made by a customer. Customers can easily detect healthy food options by picking fewer red, fewer amber, and more green color-codes on the food packaging. (An, R et al., 2021). Although all front of pack information codes and signs are more efficient than no-label systems, study proves ‘high in’ labels using stop signs and other forms of intuitive symbols, are the most effective format for helping consumers identify foods high in nutrients of concern (Hock et al., 2021). The food industry likes to use food labels to encourage purchase, stimulate brand loyalty and to provide consumers with information about the health and safety aspects of their products. Consumers interested in origin, ingredients but also healthiness of the food like food labelling systems. Labels also provide consumers with information about production process of the food they consume. (Meijer, 2021). The European Commission as a part of new European food strategy supports actions which will lead to healthier food choices of consumers in the EU market. One of the proposed measures is front-of-pack nutrition label. Using a front-of-pack nutrition label is mandatory but there is no recommended type of label to be used by food producers. Initiative will require wider discussions involving stakeholders and impact assessment. The Commission will soon launch an impact assessment on different options for front-of-pack nutrition labelling. TAs indicated in the Farm to Fork action plan; the Commission intends to adopt a proposal by the end of 2022 (Europa.eu, 2022). Front-of-pack nutrition labelling is increasingly seen as a tool to support strategies for the prevention of diet-related non-communicable diseases. It is essential that any additional labelling on the front of the packaging does not diminish the consumer's interest in carefully reading the back of pack information label, which has an "educational" as well as an informative purpose by stating the true product composition, including its ingredients. (SINU 2021,). Research into consumer use of food labelling schemes has proven that if labelling information is to be useful, the same or similar format with the same underlying criteria should be used across all foods (Bunge, 2021). Easy and clear access to the correct information leads to better choices for consumers when following healthy and nutritional diet. Especially older and overweight consumers are more likely to report a need for a front-of-pack label. Nutrition profiling information (e.g. through colours, grading indicators or symbols) allow consumers to make informed nutritional and health conscious decisions. Given the political priority of the European Green Deal and the Farm to Fork Strategy to help consumers choose healthy and sustainable diets, the elements outlined in the Report and the potential of front-of-pack schemes to help consumers make health-conscious food choices, it seems appropriate to introduce a harmonised mandatory front-of-pack nutrition labelling at EU-level. The Commission will prepare a legislative proposal (Europa. Eu, 2022). Even European Code of Conduct objective “a food environment that makes it easier to choose healthy and sustainable diets” presents transparent, voluntary product information to consumers, apply responsible food marketing and advertising practices, promote healthy and sustainable food service practices as a key objective. Easier access to right information for consumer means consumer better choices when following healthy and nutritional diet.

3.3 EU Code of Conduct on Responsible Food Business and Marketing Practices

The EU Code of Conduct on Responsible Food Business and Marketing Practices is one of the first deliverables of the Farm to Fork Strategy and an integral part of its action plan. The Code of Conduct developing process started back in December 2020. The document specifies how diverse types of organisations in the supply chain can improve and communicate their performance of sustainability in the organisation. There are 7 aspirational objectives described, they all are voluntary obligations with actions and monitoring with process to measure progress. In the case of insufficient progress the European Commission will consider legislative measures to be placed in the Code of Conduct. (Europa.eu, 2022). Aspirational objective 1 of EU Code of Conduct is healthy, balanced, and sustainable diets for all European consumers. Aspirational targets have been set for objective No. 1: improved food consumption patterns in the EU and a food

environment that makes it easier to choose healthy and sustainable diets. The following indicative actions have been identified for “improved food consumption patterns in the EU” objective:

a) encourage increased consumption of fruits and vegetables, wholegrain cereals, fibre, nuts and pulses, including locally produced varieties, provide/promote more sustainably produced food products/meals (e.g. sustainably produced organic food; higher animal welfare standards; sustainable fisheries, aquaculture and algae products). Adopting plant-based, or vegan, diets can have a number of benefits, including mitigating climate change, promoting animal welfare, or improving public health (Judge, 2022). The new Food Strategy of European Union is supporting whole supply chain into promoting more vegan diets, which has positive effect on the nutrition of the population.

b) improve the nutritional composition and environmental footprint of food products/meals, e.g., through product reformulation and new product development/ innovation, review and/or offer a range of appropriate portion and serving sizes aimed at sustainable food consumption. In order to more effectively assess the sustainability implications of new food products, sustainability methodologies and tools should be applied at the beginning of the new food product development process, and then be continuously used as more information becomes available and data varies over time due to changes in the production processes or the wider food supply chain (Garcia, 2021). More new product development processes that use sustainable organic ingredients directly affects the nutrition of the population through better processed foods. The use of organic ingredients in the preparation of food products directly affects the nutrition of the population through better processed foods. Therefore, consumers who have eating habits based on ready-to-eat products receive fully nutritious foods, in a similar way to the choice of ingenuity of consumers who prefer a home-cooked diet.

c) promote consumer awareness of healthy, balanced, and sustainable diets, including sustainable food consumption, as part of healthy & sustainable lifestyles. Global initiatives to support sustainable healthy diets increasingly focus on integrated actions addressing food systems, food environments, and their influence on diets, nutrition, and health (Reyes, 2021). Stakeholders have opportunities to use behavioural, marketing, or communication theories and conceptual frameworks to guide the design, implementation, and monitoring and evaluation of future diet-related marketing and media campaigns to promote healthy eating patterns (Englund, 2020). Promoting a healthy diet at the time of purchase plays an important role and stakeholders’ involvement through the Code of Conduct is a key. A uniform system for the use of marketing tools in the sale of food with a consideration of a healthy lifestyle is a positive step in a coherent European strategy in the sustainability of agriculture and the support of food businesses.

4. Conclusion

Demands on world agriculture will increase with a growing population. This is a complex socio - economic issue. In essence, the goal of global agriculture in the future will be to produce nutritionally balanced food while reducing the negative effects of agriculture, excessive water consumption, environmental degradation, increased use of agrochemicals and air pollution by greenhouse gases. The global food production system should contribute to reducing greenhouse gas emissions through mitigation measures. The basic principles of mitigation include increased efficiency of crop production, increased efficiency of animal production, use of residual fertilizers, improved food utilization and a lower proportion of animal protein in the diet.

The European Union's new food strategy faces a major challenge to the sustainability of the food system. Before setting the objectives of the strategy, the countries of the European Union considered the starting position for the new strategy. The diversity of the European Union is also reflected in the ambitions of individual countries in meeting the objectives of the new food

strategy, but each of them sees the strategy as a challenge at some point. Sustainable agriculture, uniform food labelling and code of conduct demonstrate the Union's broad-based approach to the new food strategy. It is a strategy that has a solid foundation in agriculture, defines food security, distribution, stimulates population health and fair trade. All this with a view to reducing the impact of food production on the environment, thus supporting SDG 2030 in the field of sustainability.

Before continuing to research the benefits of a new food strategy with consumers and supply chain, it is important to realize that the benefits of the new food strategy are still not uniformed across the Union. This is due to the complexity of implementing the new food strategy, which will have a clear positive effect on agriculture and food industry in the future but is now a challenge for every country in the European Union. In the future, research into the benefits of new food strategy therefore needs to focus on the consumer and his understanding of the benefits of the new food strategy. It will also be important to explore the priorities of the new food strategy for retailers and the whole supply chain.

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References

- [1] Anne Charlotte Bunge, Kremlin Wickramasinghe, Jessica Renzella, Michael Clark, Mike Rayner, Holly Rippin, Afton Halloran, Nia Roberts, João Breda (2021). Sustainable food profiling models to inform the development of food labels that account for nutrition and the environment: a systematic review, *The Lancet Planetary Health*, Volume 5, Issue 11, Pages e818-e826, ISSN 2542-5196, [https://doi.org/10.1016/S2542-5196\(21\)00231-X](https://doi.org/10.1016/S2542-5196(21)00231-X)
- [2] European Commission. (2022). *Code of Conduct*. Retrieved February 2022, from https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy/sustainable-food-processing/code-conduct_en
- [3] European Commission. (2022). *EU CODE OF CONDUCT ON RESPONSIBLE FOOD BUSINESS AND MARKETING PRACTICES*. Retrieved February 2022, from https://ec.europa.eu/food/system/files/2021-06/f2f_sfpd_coc_final_en.pdf
- [4] European Commission. (2022). *Nutrition labelling*. Retrieved February 2022, from https://ec.europa.eu/food/safety/labelling-and-nutrition/food-information-consumers-legislation/nutrition-labelling_en
- [5] European Commission. (2022). *Organic action plan*. Retrieved February 2022, from https://ec.europa.eu/info/food-farming-fisheries/farming/organic-farming/organic-action-plan_en
- [6] Francesca De Canio, Elisa Martinelli (2021), EU quality label vs organic food products: A multigroup structural equation modeling to assess consumers' intention to buy in light of sustainable motives, *Food Research International*, Volume 139, 109846, ISSN 0963-9969, <https://doi.org/10.1016/j.foodres.2020.109846>
- [7] Francesca Giampieri, Luca Mazzoni, Danila Cianciosi, José M. Alvarez-Suarez, Lucia Regolo, Cristina Sánchez-González, Franco Capocasa, Jianbo Xiao, Bruno Mezzetti, Maurizio Battino (2022), Organic vs conventional plant-based foods: a review, *Food Chemistry*, 132352, ISSN 0308-8146, <https://doi.org/10.1016/j.foodchem.2022.132352>
- [8] Gert W. Meijer, Patrick Detzel, Klaus G. Grunert, Marie-Claude Robert, Violeta Stancu (2021). Towards effective labelling of foods. An international perspective on safety and nutrition, *Trends in Food Science & Technology*, Volume 118, Part A, Pages 45-56, ISSN 0924-2244, <https://doi.org/10.1016/j.tifs.2021.09.003>
- [9] Guillermo Garcia-Garcia, Lucia Azanedo, Shahin Rahimifard (2021), Embedding sustainability analysis in new food product development, *Trends in Food Science & Technology*, Volume 108, Pages 236-244, ISSN 0924-2244, <https://doi.org/10.1016/j.tifs.2020.12.018>
- [10] Karen Hock, Rachel B. Acton, Alejandra Jáuregui, Lana Vanderlee, Christine M. White, David Hammond (2021), Experimental study of front-of-package nutrition labels' efficacy on perceived healthfulness of sugar-

- sweetened beverages among youth in six countries, *Preventive Medicine Reports*, Volume 24, 101577, ISSN 2211-3355, <https://doi.org/10.1016/j.pmedr.2021.101577>
- [11] Ligia I. Reyes, Shilpa V. Constantinides, Shiva Bhandari, Edward A. Frongillo, Pepijn Schreinemachers, Sigrid Wertheim-Heck, Helen Walls, Michelle Holdsworth, Amos Laar, Tuan Nguyen, Christopher Turner, Kate Wellard, Christine E. Blake (2021), Actions in global nutrition initiatives to promote sustainable healthy diets, *Global Food Security*, Volume 31, ISSN 2211-9124, <https://doi.org/10.1016/j.gfs.2021.100585>
- [12] Madeline Judge, Julian W. Fernando, Christopher T. Begeny, Dietary behaviour as a form of collective action: A social identity model of vegan activism, *Appetite*, Volume 168, 2022, 105730, ISSN 0195-6663, <https://doi.org/10.1016/j.appet.2021.105730>
- [13] R. An, Y. Shi, J. Shen, T. Bullard, G. Liu, Q. Yang, N. Chen, L. Cao (2021). Effect of front-of-package nutrition labeling on food purchases: a systematic review, *Public Health*, Volume 191, 2021, Pages 59-67, ISSN 0033-3506, <https://doi.org/10.1016/j.puhe.2020.06.035>
- [14] SINU Scientific Board (2021). SINU Scientific Committee, “Front-of-pack” nutrition labeling, *Nutrition, Metabolism and Cardiovascular Diseases*, Volume 31, Issue 11, Pages 2989-2992, ISSN 0939-4753, <https://doi.org/10.1016/j.numecd.2021.07.021>
- [15] Tessa R. Englund, Mi Zhou, Valisa E. Hedrick, Vivica I. Kraak (2020), How Branded Marketing and Media Campaigns Can Support a Healthy Diet and Food Well-Being for Americans: Evidence for 13 Campaigns in the United States, *Journal of Nutrition Education and Behavior*, Volume 52, Issue 1, Pages 87-95, ISSN 1499-4046, <https://doi.org/10.1016/j.jneb.2019.09.018>
- [16] Tiziano Gomiero (2018), Food quality assessment in organic vs. conventional agricultural produce: Findings and issues, *Applied Soil Ecology*, Volume 123, Pages 714-728, ISSN 0929-1393, <https://doi.org/10.1016/j.apsoil.2017.10.014>

Consumer Behaviour of Young People towards Food

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Abstract

In recent years the topic of food waste became one of the crucial subjects when it comes to environment. Food waste is one of the sustainability problems that needs to be talked about and society should pay more attention to. In general, consumers are one of the largest sources of this waste, which is the reason why reducing food waste should be seen mainly as societal issue. Even though food waste occurs in every stage of the food supply chain, food waste of households had been identified as one of the key and most important factors of food waste generation. That is also why food waste from households creates a considerable part of the total waste generated throughout the food supply chain. According to recent statistics, approximately one quarter of the food supplied for consumption for people is wasted all over the world. Understanding the factors affecting consumer perceptions and behaviour connected with food waste is one of the crucial efforts that should be made to reduce consumer-related food waste. The research paper presents the overview of the literature and views of wide variety of authors on factors causing food waste related to consumers in households as well as supply chains. To find out more about the consumers in Slovakia and their behaviour towards the food waste was used questionnaire survey aimed mainly on young people.

Keywords: consumer behaviour, food waste, household consumption of food

JEL Classification: D10, D19, Q56

1. Introduction

Food waste can be defined as fractions of food and inedible parts of food removed from the food supply chain to be recovered or disposed, including anaerobic digestion, composted, crops ploughed in/not harvested, bioenergy production, incineration, cogeneration, disposal to sewer, landfill or discarded to sea (Stenmarck et al., 2014). Food waste can be sometimes mistaken for food loss. However, it is necessary to differ between these two concepts. Food losses refer to losses in production, post-harvest and processing of food, while food waste represents losses at the distribution and consumption stages. (Gustavsson, J., et al., 2011, Kummu, M. et al., 2012). Every year large amounts of the food available for human consumption are lost or wasted in the different stages of the food supply chain (Kummu, M. et al., 2012). In numbers that means one third of food produced for human consumption, the equivalent of 1.32 billion tonnes of food is wasted globally (Gustavsson, J., et al., 2011). Food waste generated by consumers amounts 163 kg in a year per capita in Slovakia. Thus, a good understanding of factors that contribute to the amount of food waste generated by consumers is crucial. Yet, there is a surprising lack of studies investigating food waste disposal from the household food choice and consumer behaviour perspective. Most of the existing academic literature on food waste has focused on estimating the amount of food losses with only little attention to the factors driving these food losses. Scenarios for Europe indicate a considerable potential for reducing emissions through the reduction of food waste along the stages of the food production and consumption chain (Rutten, M., et al., 2013). Households are considered to be the biggest contributors to food waste (BIOIS, 2010). Therefore, it is crucial, if we want to reduce pollution of environment and decrease the

rate of climate change to solve the problem of food waste in the household level (Parfitt, J. et al., 2010). The energy and greenhouse emissions that was put into production of food is totally useless if the food is wasted by households. According to Stancu, V. et al. (2016) planning of food purchase did not make a direct contribution to the amount of the wasted food. On the other hand, Stefan, V. et al. (2013) argue there is direct connection of planning purchases of food with lower rates of food waste of households. Moreover, Romani, S. et al. (2018) considers insignificant factor the consumption of leftovers when dealing with food waste. Stancu, V. et al. (2016) however pointed out that the consumer behaviour related to leftovers describes 1/3 of the variance in food waste that was reported. Holt, A.R. et al., 2016 see production of food, consumption of food as well as waste of food as the great contributor to the bad state of the environment. Since food production is linked to using many various resources it is even more alerting that food waste is related to environmental problems and probably one of the reasons of pollution of air, water, or even issues like deforestation or soil erosion. Some efforts of companies to contribute to reduction of food waste can be welcoming innovations in form of technical development, such as new products development, or using technology of packaging that is more environmentally-friendly. These can have significant outcome only if they are also accepted and supported by consumers that get to actually choose the product. Both producers and consumers should pay much more attention to reducing food waste minding all the negative effects of food waste. Some of the possibilities that are offered regarding to reducing food waste are for instance working on changing perceptions of consumers about food and food waste, reducing sizes of portions in restaurants, overstock reduction (Niles, M., 2018), utilizing packaging and processing technologies that help keep food fresh for longer (Blanke, M., 2015), and clarifying the meaning of sell-by and use-by dates for consumers (Wilson, N.L.W. et al., 2017).

2. Data and Methods

The main aim of this research paper is to observe mainly the behaviour of young consumers in Slovakia related to food waste as well as purchasing food. The primary data were collected in January 2022 using the questionnaire survey in the electronic written form via Google Forms. Afterwards was acquired information in form of answers of 295 respondents coded into the program Microsoft Excel. Evaluation of results of this survey creates also the main part of presented research paper. For this research paper are used following procedures:

1. Related literature as well as scientific articles to the topic of the research determinants studying, along with data available related to the topic and subsequent processing of these data on the theoretical level,
2. Methods that were used for evaluation and interpretation of results:
 - Analysis: examined issues are resolved into elementary components to examine relations between these components based on particular indicators
 - Comparison: answers of respondents of the questionnaire survey are compared
 - Synthesis: answer of each respondent was evaluated to help us create a whole picture on the subject of matter

Answers were processed into the graphs to show the ratios as well as percentages of respondents' answers. Data collection method choice is important related to costs, question formulation and quality of data. Several years ago, the only choices that were available were between personal interviews, also called face-to-face interviews, telephone interviews and mail surveys, all using paper questionnaires. The biggest difference in these methods is the presence of the interviewer in the data collection process, since in personal interviews as well as telephone interviewing, the interviewer is present at a distance or physically, while in mail surveys, or any kind of online surveys, the interviewer is not present at all (Willem E. Saris, Irmtraud N. Gallhofe,

2014). One of the benefits of using online, digital survey method are connected to desired sample size, geographical sample distribution, and therefore cost-effectiveness, since larger number of participants in survey can be reached, also, distance is no problem in this case, as well as online survey is not too costly. Also, digital surveys have potential for fast turnaround, anonymity is as well great advantage for participants if does the questionnaire contain a sensitive or more personal information and respondents tend to feel safer providing honest answers in an online environment. And finally, according to our target – young people – digital survey is considered to be a good choice, since young generation has no problem with technology and working in online space and having access to the survey. (Valerie M. Sue, Lois A. Ritter, 2012). Respondents were chosen randomly, however, we wanted to aim the research mainly on young generation, therefore was the questionnaire sent on websites that are followed mostly by young people.

3. Results and Discussion

Around 931 million tonnes of wasted food were generated in 2019 according to UNEP Food Waste Index (2021). From these 931 million tonnes, as illustrated in Fig. 1, 61% food waste was generated in households, 26% from food service and 13% from retail. What is more, in the European Union, households generate more than half of the total food waste of the European Union, which makes 47 million tonnes, with 70% of food waste generated at households, food service and retail. That is also the main reason, why is this research paper aimed on households and their behaviour towards food and food waste.

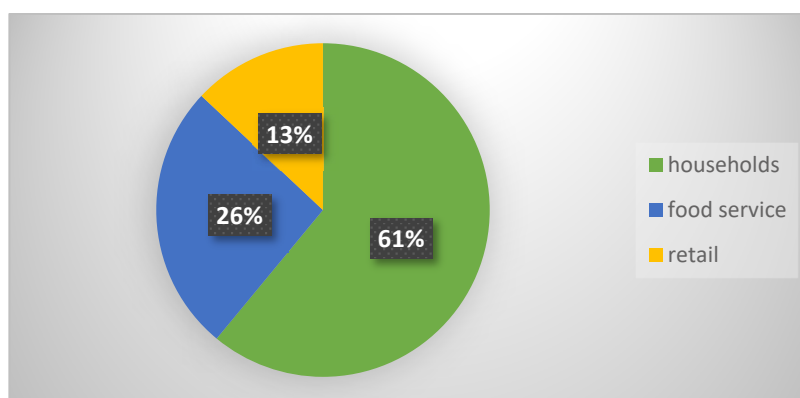


Figure 1 Global food waste in 2019 (in %)

Source: Own proceeding based on United Nations Environment Programme, 2021

According to our evaluation of the questionnaire survey aimed mostly on young people belonging to age group 18 – 30 (90,5 %). Out of the 295 respondents 74,6 % were represented by female respondents and 25,4 % by male respondents. The most of the respondents live in the city (53,2% of respondents) and 46,8 % live in a village. The most frequent answer to the question “What is your economic status?” was student, which makes 69,2 %, employed were 24,1 % of respondents, and others were either unemployed, entrepreneurs, retired or on maternity leave. The highest education level of respondents was for 48,1 % of respondents, 45,6 % of respondents graduated either first or the second level of university. The monthly family income of respondents was mostly more than 1800 EUR, represented by 28,5%. 19,7% of respondents stated their monthly family income vary from 901 to 1200 EUR, 25 % of respondents stated their income is either in the range from 646 to 900 EUR (12,5 % of respondents) or 1201 – 1500 EUR (also 12,5 % of respondents). The least frequent monthly income according to responses in our questionnaire is less than 646 EUR (9,2%). Utmost of respondents pay monthly for groceries 200 – 300 EUR (36,3%), almost 30 % of respondents spend 301 – 400 EUR, 16,3 % spend monthly less than 200 EUR. Nearly 14 % pay 401 – 500 EUR and less than 5 % of respondents pay more than 500 EUR. What was interesting was finding, that 64,4% of respondents do grocery shopping a few times in a week, 25,4 % shop groceries once per week, 8,5 % of respondents buy groceries daily, and only

less than 2 % of respondents buy groceries less frequently. 5,1 % of respondents live alone, almost 25 % live in a household where live two people, 23,1 % of respondents live in a household with two more people. The most of respondents live with three more people (33,2%) and less than 15% live with more people. When we asked our respondents whether they consider food waste environmental issue the vast majority of them answered yes (95,9%). However, nearly 55 % do not think their household generates food waste. Our respondents ranked frequency of wasting food because of following reasons in their households:

- a) It is after expiration date – 115 respondents stated their frequency of wasting food because of this reason as not very often, 87 respondents sometimes waste food because of expiration date, 43 respondents waste food because of this reason often and 27 respondents very often.
- b) Food is spoiled – 86 respondents stated their frequency of wasting food because of this reason as not very often, 85 respondents stated frequency as sometimes. 16 respondents never waste food because it is spoiled, on the contrary, 59 waste it often and 49 very often because of this reason.
- c) It does not taste good – 155 respondents stated they never waste food because of this reason, 87 respondents stated they do not waste food very often because of its taste, 39 respondents sometimes waste food because it does not taste as they wish, 9 respondents waste food often and 5 very often because of its taste.
- d) It does not look good – 164 respondents never waste food because of its appearance, 76 respondents do not do it very often, 43 respondents do it sometimes. 8 respondents often do not consume and waste food because of this reason and 4 do it very often.

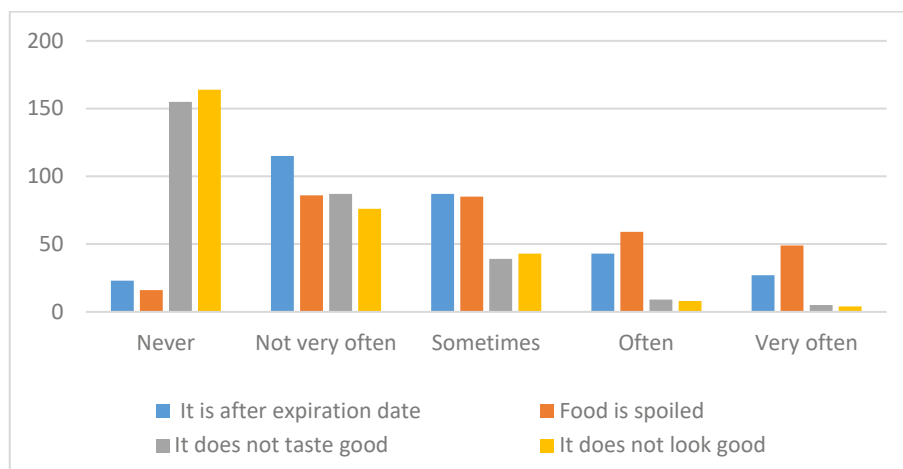


Figure 2 How often you waste food because of these reasons (in pcs)

Source: Own proceeding based on questionnaire survey

Respondents were also asked what do they do with food they do not consume. They chose on the scale from never to very often for each of these reasons, as it is also illustrated in Fig. 2:

- a) I put it into municipal waste – 78 respondents never put food into municipal waste, 60 respondents put it into municipal waste not very often, 50 respondents sometimes, 48 often and 59 puts food into municipal waste very often.
- b) I put it into bio waste – 120 respondents never put food into bio waste, 43 do not put it into biowaste very often, 57 respondents sometimes do, 35 do it often and 40 respondents do it very often.

- c) I put it into composter – 123 respondents never put food that they do not consume into composter, 44 respondents do it but not very often, 38 do it sometimes, 36 respondents often put food that was not consumed into composter and 54 do it very often.
- d) I give it to animals – 65 respondents never give their food to animals, 39 do it not very often, 69 respondents sometimes give their food to animals, 49 do it often and 73 do it very often.

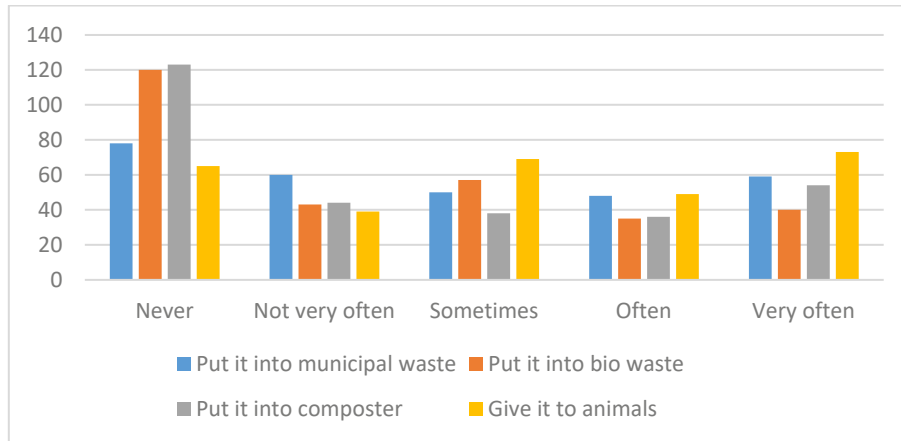


Figure 3 What do you do with food you have not eaten (in pcs)
Source: Own proceeding based on questionnaire survey

In the Fig. 3 we can see that less than 2 % of respondents waste food every day and not even 4 % of respondents never waste food. 13,2 % of respondents waste food a few times per week, almost 27 % every week, 24,1 % do every month. 30,5 % of respondents generate food waste less often.

Respondents were also asked to choose number on the scale from 1 to 5 for each type of food depending on the frequency of wasting it in their households. Results were, as it can be also seen from the Fig. 4 the most frequently wasted commodity is pastry, the least wasted commodity are durable goods.

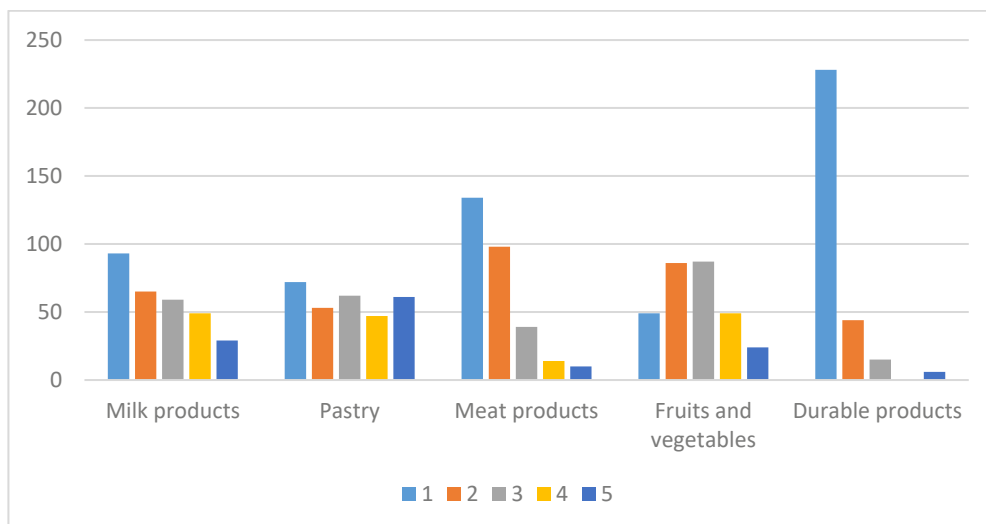


Figure 4 Frequency of food waste
Source: Own proceeding based on questionnaire survey

In the following figure (Fig. 5) it can be seen how large the food wastage of each commodity was in 2011 globally along with the size of carbon footprint for each commodity.

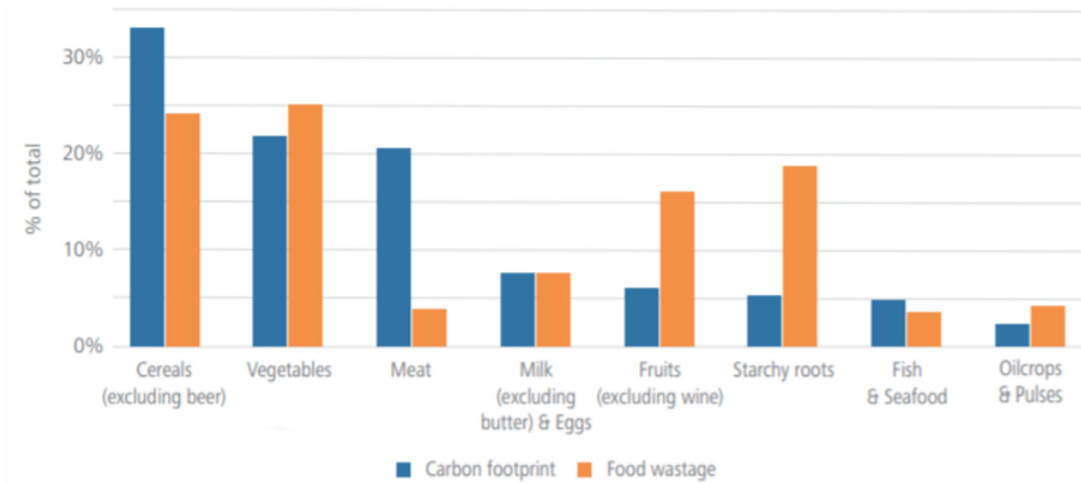


Figure 5 Carbon footprint and wasted food contribution of commodities in percentage
Source: FAO, 2015

According to the Fig. 5 we can see that meat is one of the lowest contributing commodities from selected commodities in terms of volume, however, it generates over 20 % of carbon footprint, so we can say that even the smaller amount of wasted meat contributes significantly to the climate change and environmental problems. For instance, milk and eggs are wasted more but have lower carbon footprint percentage that meat. Most wasted commodity here is vegetables followed by cereals and starchy roots. When we compare Fig. 4 and Fig. 5 we can see some similarities. (FAO, 2015).

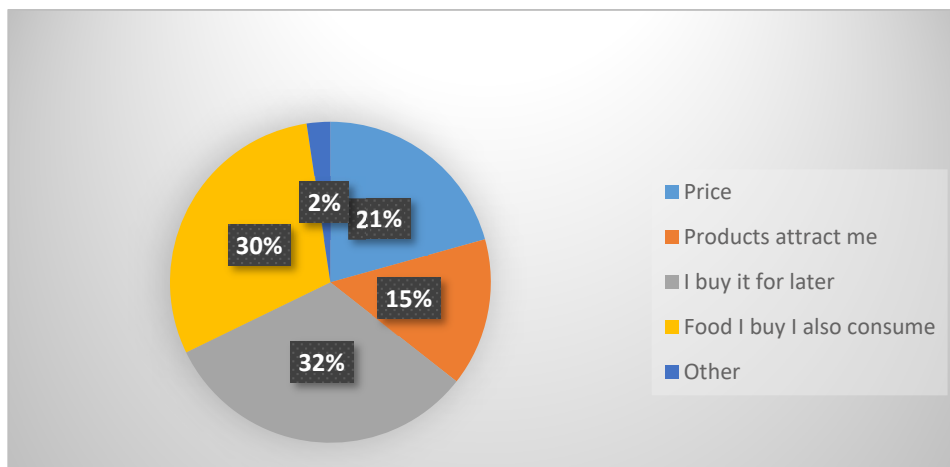


Figure 6 What does motivate you to buy food that you do not consume?
Source: Own proceeding based on questionnaire survey

We wanted to find out what is the most common motivation for customers to buy food and then wasting it and according to our results it is mostly because they buy it for later (32,2%) and the second most frequent reason was low price of the food, discounts, etc. (20,7%). However, we see in the Fig. 6 that almost 30 % of respondents stated they only buy as much food as they consume.

The final question that respondents answered was whether they usually plan their grocery shopping, which is one of the ways of possible reduction of food waste in households. Nearly 70 % of respondents actually plan their grocery shopping, others do not.

4. Conclusion

To conclude, it was found, that even though households create considerable part of food waste, in general, young generation does consider itself a sizeable contributor to food waste in Slovakia. However, people in Slovakia see food waste as a major issue for environment of this country and countries all over the world. The research presented in this paper was aimed mostly on young generation of Slovak republic, belonging to age group from 18 to 30. The main goal was to understand the perceptions and behaviour of young people towards food and food waste. Research of this paper is backed by reliable literature, presenting ideas, perceptions and views of different authors related to topic of food waste. It was done using online written questionnaire survey via Google Forms. According to results of our survey we found out that most of young people generate food waste in their households less often than every month and only 2% waste food every day. The most frequently wasted food is pastry, the least wasted foods are durable goods. The majority of respondents waste food because they buy more to save for later, which ends up in not consuming what they bought (Blanke, M., 2015). Most of respondents that were asked, usually plan in advance what they want to buy. According to Davenport M. L. et al. (2019) the struggle of young consumers when it comes to managing leftovers and potential food waste is bigger than that of older people because of their experience of using leftovers. As Bravi, L. et al. (2020) observed, the habit of not eating leftovers and preparing portions that are too large is linked mainly to younger people, according to which we can confirm it is more difficult for young people to cook appropriate portions and manage leftovers somehow.

The solution that could be applied anytime is better measurement of food waste, which may rise the level of consciousness of people, along with encouragement of policy interventions with the objective of helping with the change of consumer behaviour. (Gaiani, S. et al., 2018).

Circular economy could be the solution for the future, how to deal with the problem of food waste, since it measures optimizing the use of resources, optimizing the use of products and increasing the number of material cycles and that can also lead to energy savings and thus reducing emissions (Svetlanská, T. et al., 2017).

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References

- [1] BIOIS. (2010). Preparatory Study on Food Waste across EU 27. European Commission (DG ENV) Directorate C-Industry. Final Report. ISBN: 978-92-79-22138-5. Google Scholar
- [2] Blanke, M. (2015). Challenges of reducing fresh produce waste in Europe—From farm to fork. *Agriculture*, 5, 389–399. doi: <https://doi.org/10.3390/agriculture5030389>.
- [3] Bravi, L. Francioni, B., Murmura, F., Savelli, E. (2020). Factors affecting household food waste among young consumers and actions to prevent it. A comparison among UK, Spain and Italy. In *Resources, Conservation and Recycling*. vol. 153, no. 1, pp. 1-13. ISSN 0921-3449. doi: <https://doi.org/10.1016/j.resconrec.2019.104586>.
- [4] Davenport, M.L., Qi, D., Roe, B. E. (2019). Food-related routines, product characteristics, and household food waste in the United States: A refrigerator-based pilot study. In *Resources, Conservation and Recycling*. [online], vol. 150, no. 1, pp. 1-16. ISSN 0921-3449. doi: <https://doi.org/10.1016/j.resconrec.2019.104440>.

- [5] FAO. (2015). Food waste footprint and climate change. Retrieved from: <<https://www.fao.org/3/bb144e/bb144e.pdf>>
- [6] Gaiani, S., Caldeira, S., Adorno, V., Segré A., Vittuari, M. (2018). Food wasters: Profiling consumers' attitude to waste food in Italy. In *Waste Management*. vol. 72, no. 1, pp 17-24. ISSN 0956-053X. doi: <https://doi.org/10.1016/j.wasman.2018.05.021>
- [7] Gustavsson, J., Cederberg, C., Sonesson, U., VAN Otterdijk, R., Meybeck., A. (2011). *Global food losses and food waste: Extent, causes and prevention* Food and Agriculture Organisation of the United Nations (FAO), Rome, ISBN 978-92-5-107205-9
- [8] Holt, A.R., Alix, A.; Thompson, A.; Maltby, L. (2016). Food production, ecosystem services and biodiversity: We can't have it all everywhere. *Sci. Total Environ.*, 573, 1422–1429. doi: 10.1016/j.scitotenv.2016.07.139
- [9] Kumm, M., DE Moel, H., Porkka, M., Siebert, S., Varis, O. P.J. (2012). *Ward Lost food, wasted resources: global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use* *Science of the Total Environment*, 438 (0), pp. 477-489. doi: 10.1016/j.scitotenv.2012.08.092
- [10] Niles, M.; Ahuja, R.; Barker, T.; Esquivel, J.; Gutterman, S.; Heller, M.; Vermeulen, S. (2018). Climate change mitigation beyond agriculture: A review of food system opportunities and implications. *Renew. Agric. Food Syst.*, 33, 297–308. doi: 10.1017/S1742170518000029
- [11] Parfitt, J., Barthel, M., Macnaughton, S. (2010). Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365 (1554), pp. 3065-3081. doi: <https://doi.org/10.1098/rstb.2010.0126>
- [12] Quested, T.E., Marsh, E., Stunell, D., Parry, Spaghetti, A.D. (2013). *soup: the complex world of food waste behaviours*. *Resour. Conserv. Recycl.*, 79, pp. 43-51, doi: 10.1016/j.resconrec.2013.06.001
- [13] Romani, S.; Grappi, S.; Bagozzi, R.P.; Barone, A.M. (2018). Domestic food practices: A study of food management behaviors and the role of food preparation planning in reducing waste. *Appetite*, 121, 215–227. doi: 10.1016/j.appet.2017.11.093.
- [14] Rutten, M., Nowicki, P., Bogaardt, M.-J., Aramyan., L.(2013). *Reducing Food Waste by Household and in Retail in the EU: a Prioritisation Using Economic, Land Use and Food Security Impacts* LEI Wagenigen UR. Doi: <https://edepot.wur.nl/290135>
- [15] Saris, W. E., Gallhofer, I.N. (2014). *Design, Evaluation, and Analysis of Questionnaires for Survey Research*. New Jersey: John Wiley & Sons. 384 p. ISBN 978-11-186-3461-5.
- [16] Schanes, K., Giljum, S., Hertwich., E. (2016). Low carbon lifestyles: a framework to structure consumption strategies and options to reduce carbon footprints. *J. Clean. Prod.*, 139, pp. 1033-1043. Doi: <https://doi.org/10.1007/s11625-021-01018-6>
- [17] Stancu, V.; Haugaard, P.; Lähteenmäki, L. (2016). Determinants of consumer food waste behavior: Two routes to food waste., 96, 7–17. doi: 10.1016/j.appet.2015.08.025
- [18] Stefan, V.; VAN Herpen, E.; Tudoran, A.A.; Lähteenmäki, L. (2013). Avoiding food waste by Romanian consumers: The importance of planning and shopping routines. *Food Qual. Prefer.*, 28, 375–381. doi: 10.1016/j.foodqual.2012.11.001
- [19] Stenmarck, B. Å., Jensen, C., Quested, T., Moates, G. (2014). Estimates of European food waste levels. ISSN 0962-8436
- [20] Svetlanská, T., Turčeková, N., Adamičková, I. Skalský, R. (2017). Food security facets: Case of Slovakia regions. In *Journal of security and sustainability issues*. vol. 7, no. 4, pp 1-10. ISSN 2029-7025.
- [21] United Nations Environment Programme. (2021). *Food Waste Index Report 2021*. Retrieved from: <<https://www.unep.org/resources/report/unep-food-waste-index-report-2021>>.
- [22] Valerie, M. S., Lois, A. R. (2012). *Conducting Online Surveys*. New York: SAGE. 242 p. ISBN 978-141-29-9225-1.
- [23] Wilson, N.L.W.; Rickard, B.J.; Saputo, R.; HO, S.T. (2017). Food waste: The role of date labels, package size, and product category. *Food Qual. Prefer.*, 55, 35–44. doi: <https://doi.org/10.1016/j.wasman.2018.05.021>

Exploring Wine Consumer's Behaviour of Slovak and Czech Z Generation: a Pilot Study

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Abstract

The article presents results and findings from the pilot study realized in the Slovak and Czech young generation. It endeavours to answer how Z Generation consume wine, explore actual consumer behaviour, and whether there exist some dependencies between their behaviour and regular habits. The methodology includes questionnaire survey with a sample of 789 wine consumers (400 Slovak; 389 Czech). Most young people indicated 2-3 times per month consumption with 10-15 litres overall consumption. Respondents' motives for drinking wine are largely driven by taste and relaxation. Further, our survey shows that young consumers of both countries have very similar personal habits for drinking occasions and drinking frequency. Lastly, results also show the level of education should be a vital aspect for specific drinking locations. To connect young generation and increase wine consumption, wineries should focus on understand market behaviour, preferences and attitudes.

Keywords: wine consumers, Z generation, behaviour, viticulture

JEL Classification: M30, M31, Q13

1. Introduction

We are at a time when the Z generation is coming to the forefront over time. The market power purchase is more remarkable as the Millennial generation moves to the background. Retailers and manufacturers need to adapt to this generation's consumer behaviour, attitudes, and habits. Generation Z represents for our research the target group on the wine market in Slovakia and the Czech Republic, and we can say that the Millennial generation has also experienced the times of these mergers of two countries. Drinking wine has a long tradition in both countries, but wine consumption and wine sales are adapted not only to the time but also to the mentioned Generations.

1.1 Generation Z

Generation Z precedes Millennial Generation, and it should be analytically limited and meaningful for the identification of a new generation. The Millennials are people born between 1981 and 1996. Therefore, the new Generation Z is said to be a people born between 1997 and 2012. This generation is growing up in a technological environment, which is mainly reflected in behaviour, attitudes, and lifestyle (Pew Research Center, 2019). So let us express these generations in a range of years, even though generation cut-off points are not an exact science. Naturally, another generation has already been added, namely Generation A or Alpha, which is currently in a phase where people born from 2012 to 2025 are still children (Kasasa, 2021). Thus, we can say that Generation Z in consumer or user behaviour uses mainly user-oriented applications with high availability and especially security, considering humanizing technology in lifestyle (Krüger, 2021). This generation will soon become the most influential future in the retail

sector and will form until 2026, when they introduce their enormous purchasing power. They differ from the old generation mainly because first consumers grow up in a wholly digital era and they are very technically proficient. Particularly, Z generation has a mobile standard with a high basis for the online sphere. We can also argue that research has shown that this generation is even more acceptable than the previous (Insider Intelligence, 2022). Therefore, the retail sector must start adapting to this new generation now.

1.2 Viticulture and wine-making in the Slovak Republic and the Czech Republic

Slovakia has six wine-growing areas in the whole territory of Slovakia. In addition, the total area of vineyards in 2020 was 11,248 hectares, which increased year-on-year compared to 2019 (10,927 hectares). Within the production in Slovakia, we can say that the production of wine for 2019 (43,044 tons) to 2020 (46,918 tons) also increased by 9 %. The total consumption of wine in Slovakia in 2019 (77,977 thousand litres), and the coming year, 2020 is recorded the increased consumption, up to 78.513 thousand litres of wine. If we consider, the consumption of wine per capita in 2020 is 14.4 litres, which also represents an increase compared to 2019, when the consumption was 14.3 litres per capita (Research Institute of Agricultural and Food Economics, 2021). Between 1990 and 2006, some studies point to a decreasing trend in vineyards in favour of arable land. The primary reason was higher subsidies for standard crop production than grape growing. The secondary reason for reduction of vineyard areas was the dynamic growth of cities and population preference for city life. (Lieskovský et al. 2013).

The Czech Republic has seven wine-growing areas, mainly in Moravia, two of them are in northwest Bohemia. The total area of vineyards in the Czech Republic represents 17,924.90 hectares in 2020, while in 2019, the total area of vineyards was 18,189.22 hectares, which ultimately represents a decrease in vineyards. The total production of grapes in the Czech Republic amounts to 90,376 tons in 2020 and 67,956 tons in 2019, which means that production has increased despite the reduction of vineyards. The overall wine consumption in the Czech Republic in 2019 reached the level of 199,200,000 litres and for the year 2020 to 217,400 litres. Consumption per capita reached the level of 18.66 litres in 2019, and 2020 consumption increased to 20.31 litres per capita (Institute of Agricultural Economics and Information, 2021).

1.3 Consumer behaviour

As early as 1996, Dodd et al. (1996) suggested that wine consumers were looking for information and useful sources about style or type of wines, mainly from newspapers and friends' references. In this way, for the wine consumers to be able to discuss among themselves, they ought to be more likely to engage in wine. Since then, we can say that consumers have preferred wine tastings directly visiting wineries and perceive this place as a place where they can buy high-quality wines. One study by Schaelef et al. (2018) says that wine researchers have a positive attitude towards exploratory behaviour. Consumers, in particular, consult this behaviour, with creativity, entertainment, and the afterlife being an important aspect. Consumption showed the excitement of new and unexplored tastes in connection with wine consumers. Obviously, consumers were also found in the survey by a lower or intermediate test of the survey behaviour and did not show the already mentioned personal values. As part of the survey behaviour, it was found that higher-involvement consumers can also contribute to improving wine consumers who reach only a medium or level of involvement. As such, wine is most often consumed with food, unlike other alcoholic beverages, consumed only in regular social contacts. Due to the different traditional values and cultures, alcohol consumption varies within a country (Heath, 2000). However, according to Smith & Mitry (2007), wine consumers not only rely on cultural differences but are also affected by the economic environment and lifestyle. Nevertheless, the study shows that it will exceed the level of tradition in the culture and its preservation and continue, as evidenced by the fact that wine is one of the consumed alcoholic beverages in the European Union, representing up to one-third of wine preferences. When comparing individual generations and wine

consumption, they differ slightly. At the same time, we can say that the study makes a difference especially in a certain type of wine, although there is no difference in the preference for drinking wine. According to the latest study, we can state that consumers also make decisions depending on the variety of wines and loyalty to certified wines such as PDO, PGI, which reflect the quality of individual wines. The study also showed that a wine-oriented consumer increases his quantity of wine purchased and its consumption (Caracciolo et al., 2022). The older Generation X has been shown to prefer drinking red wine more than others, and in contrast, Generation Z has preferred drinking white wine. The results show that Generation Z is a technological generation influenced mainly by social media marketing and online references. Since the subject of the study is Generation Z, it is also evident from the preference to buy wine that the most substantial price factor proved to be logical if we place Generation Z in the middle grade. However, wine consumption also involves the image of wine and its promotion (A Glimpse of iGeneration Wine Preferences, 2016). There may exist different preferences when consuming wines of different generations. The new era brings new knowledge and lifestyles, which can affect wine consumption. Health aspects can lead consumers to buy wines with health innovations, such as wines with reduced alcohol, non-alcoholic wines, or wines without added sulphites. These are often perceived as healthier or wines with characteristics of sustainability to nature (Deroover et al., 2021). Another study speaks of the fact that there are significant differences between Generation X and Generation Z, especially in terms of the frequency of wine consumption, mainly due to the individual's monthly income. The study showed that Generation X consumes wine at least once a week or on special occasions compared to Generation Z. These findings favour more modern drinks (Wine market council, 2017; Chivu-draghia & Antoce, 2016). Other studies also report that young generations do not have such involvement in wine and, in particular, do not have sufficient wine expertise; it said that neither Generation X, but only Generation of Baby Boomers (Kennett-Hensell et al., 2011; Barber et al. al., 2008). According to Koksál (2019), the biggest problem is that Generation Z currently represents adolescents or single students without a fixed income compared to Generation X and a baby boomer, where these people represent married people with a higher fixed income and background. On the other hand, there is a difference in motivation, attributes, and consumer wine behaviour. The only common aspect is compelling generational marketing, which will appeal to all these generations if marketing strategies are designed correctly.

2. Data and Methods

The aim of the paper is to explore the consumption of wine consumers, whether there are differences in the Z generation, and to compare them between Slovakia and the Czech Republic. During the months of November and December 2021, an online questionnaire survey was conducted. The survey was later distributed through social media. The survey was designed exclusively for regular wine consumers of Generation Z (18-25 years) as a pilot study. The inclusion criteria were to be of legal drinking age. Survey was administered using Google Forms. The same method was used in both countries and then carried out simultaneously. We used the snowball sample technique method to collect data. It is a standard method of sampling in qualitative research, where we posted a link on Facebook and Instagram for fan pages to answer the online questions. As it shows, a total of 789 respondents took part in the survey (SK-400; CZ-389).

The survey was divided into two main sections. First section informed respondents that the aim of the survey was to examine their consumer wine behaviour, which would identify the basic characteristics for the needs of deeper research, which will be carried out later. First part of the survey was related to wine involvement: how often they consume wine, the amount of wine and what kind of (bottle wine, cask wine) wine they consume per year approximately. Respondents

were asked where they most often consume wine, on what occasion and what is their most common reason. All questions were formulated as open closed questions. The second section of the survey included socio-demographic profile of respondents. Data distribution is standard in Central Europe, as its preponderance are mainly young people under the age of 25, and the preference for wine consumption is also confirmed by the Polish survey (Schaefer et al., 2018), where women prefer wine consumption over men due to lower alcohol content and milder taste compared to spirits.

Table 1 The overall profile of the respondents

		N = 400	N = 389
Characteristics	Description	SK (%)	CZ (%)
Gender	Man	26.2%	15.9%
	Woman	73.8%	84.1%
Family status	Single	96.2%	96.1%
	Married	3.8%	3.9%
Education	Secondary education	44.0%	60.7%
	University education	56.0%	39.3%
Place of residence	Village	48.5%	37.0%
	Town (till 30 000 inhabitants)	21.0%	15.7%
	Town (from 30 000 till 100 000 inhabitants)	23.0%	28.5%
	City (above 100 000 inhabitants)	7.5%	18.8%
Economic activity	Employed	11.3%	11.1%
	Entrepreneur, Self-employed person	1.5%	1.5%
	Student	87.3%	87.4%
Net monthly income (includes pocket money)	less than €300	50.0%	48.9%
	€300-500	22.0%	29.0%
	€501-750	11.3%	6.7%
	€751-1000	9.5%	5.4%
	€1001-1250	3.0%	5.4%
	€1251-1500	2.5%	2.8%
	More than €1500	1.8%	1.8%

Source: own processing

The majority of respondents are women (78.8%), single (96%), but the ratio of education between secondary education (44%) and higher education (56%) is balanced. Other identifiers observed included place of residence, economic activity and income. As 87% are high school and university students, direct categories are mostly low and the highest proportion (50%) of students' monthly income is below 300€. Almost 50% of respondents from Slovakia came from rural areas, another 40% from smaller towns and only 7.5% representation within big cities. On the other hand, the Czech representation of the rural environment is at the level of 37%.

We formulated the following hypotheses for statistical evaluation:

H1: It is assumed that there exist differences between nationality and preferred wine.

H2: It is assumed that there exists dependency between nationality and drinking wine occasions

H3: It is assumed that there exists dependency between the level of education and specific place, where the Slovak people drink wine

H4: It is assumed that there exists dependency between the level of education and specific place, where the Czech people drink wine

Dependencies in responses to consumer behaviour across both countries were analyzed by Crosstab analysis and Chi-square test with Cramer V-coefficient to determine the intensity of the thread. The same approach was used to analyze dependencies in consumer behaviour within each country. The statistical analyses were performed with MS Excel as a tabular and graphical data display and IBM SPSS software at a 5 % of significance.

3. Results and Discussion

The results showed us that mostly bottled wine was preferred by younger people (59.8%) or do not have any specific preferences (34.3%). The first hypothesis assumes differences between nationality and wine preference. Using the Fisher exact test, these differences were not confirmed (p -value = 0.133). Slovaks and Czechs have a very similar frequency of drinking wine, and this finding is in line with research (Smith, Mitry 2007), which showed that the countries of the European Union are increasingly similar in drinking habits. More than half of young people consume wine at least 2-3 times a month. The results showed us that the average amount of wine consumed per year is on average 10-15 litres in both countries, which also correlates with official statistics on consumption per capita.

For a deeper analysis, we have formulated a hypothesis that assumes a dependence between nationality and drinking occasion. This hypothesis was confirmed by the Chi-square test (p -value = 0.001). Czechs drink most often at home (45.2%), at celebrations (30.1%) and attend events such as wine routes more often. Meanwhile, Slovaks take the opportunity to drink, especially at home, to celebrate, but also just while sitting with friends at the bar. However, what is important to note is that Cramer's contingency coefficient is 0.177, which is a relatively weak correlation.

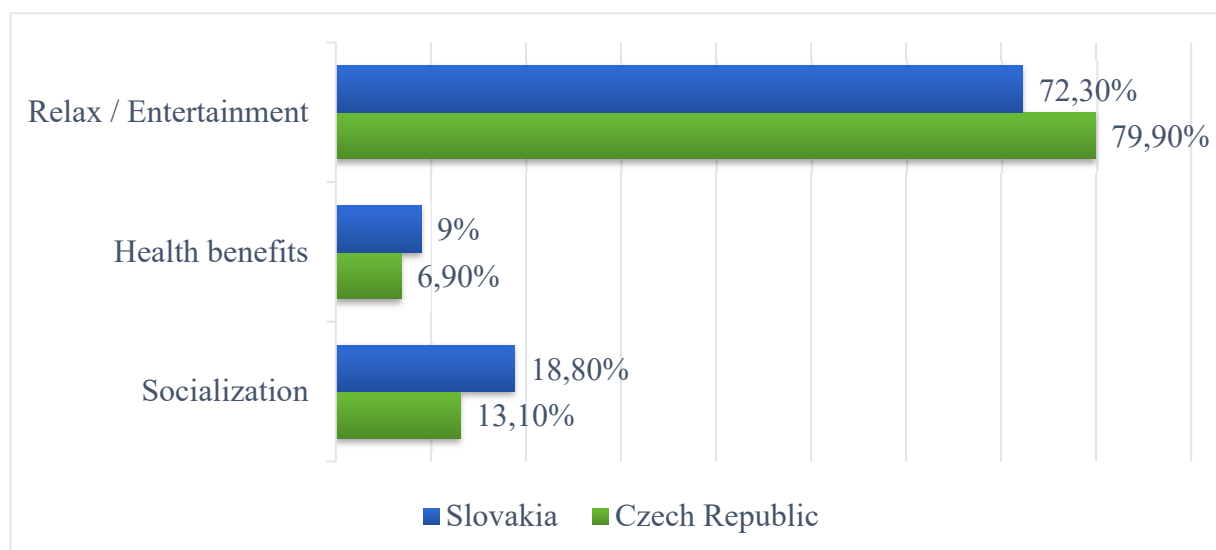
Table 2 Statistical dependence of wine consumers between the occasion to drink wine and nationality

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22.809a	6	.001
Likelihood Ratio	23.733	6	.001
Linear-by-Linear Association	8.458c	1	.004
Cramer's V	0.170		.001

Source: own research, output of IBM SPSS

As indicated above, in the questionnaire survey, we also focused on issues related to the reasons for wine consumption among young people. As can be seen from Figure 1, we can basically discuss similar views as to the most common reason young people consume wine. Relaxation and entertainment (mean - 75%) recorded the highest share of answers, other less significant answers were socialization and health benefits. In the context mentioned above, according to Thach (2012), is the primary motivation for drinking wine is enjoying the taste or inspiring feeling of relaxation. However, they see the difference in that women drink more wine for social and entertainment reasons, whereas men's reasons are health and sophistication.

Figure 1 Most common reason for consuming wine



Source: own processing

In the next analysis, we analyzed the countries individually. Regarding the identification of consumer behaviour of generation Z, specifically in the conditions of the Slovak Republic; the results showed us that there is a statistical correlation between education and the place where they most often consume wine (p-value = 0.004). Based on the results, we can evaluate that people with a university degree drink wine mostly at home or while visiting friends. Among high school students, the largest share of consumption was at home, but nevertheless we recorded an increase in this segment and in restaurants. However, even in this case, the Cramer V test has a weak correlation.

Table 3 Statistical dependence for wine consumers between place of drinking and level of education – Slovakia

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.401	6	.004
Likelihood Ratio	18.201	6	.003
Linear-by-Linear Association	9.338	1	.002
Cramer's V	0.209		.004

Source: own research, output of IBM SPSS

Table 4 Statistical dependence for wine consumers between place of drinking and level of education – Czech Republic

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.239	5	.284
Likelihood Ratio	6.652	5	.248
Linear-by-Linear Association	1.420	1	.233
Cramer's V	0.127		.284

Source: own research, output of IBM SPSS

The COVID-19 crisis has caused profound changes in consumer behaviour that are linked to individual characteristics. According to Schmits and Glowacz (2021), it has been shown that people working from home with higher education tend to consume alcoholic beverages more often and in larger quantities. However, a study by Callinan et al. (2021), where young women reduce alcohol consumption during a pandemic due to a worse social life. It is clear that wine consumption at home is higher than "on-premise consumption", but another study revealed that younger generations are more open to visiting restaurants and tasting rooms. Therefore, based on our results compared to other studies, we can assume that the current state of the pandemic and geography may have a significant impact on conflicting conclusions.

4. Conclusion

Gen Z represents a valuable population with strong purchasing power in the future. The findings from the pilot study indicate that the Slovak and Czech young generation has similar social habits in wine consumption and their frequency. Drinking wine was previously described as a form of entertainment or relaxation, especially at home and at celebrations. The overall wine consumption of young people is from 10-15 litres per month, while the frequency of drinking is 2-3 times a month. We can state that there have been different reasons for drinking wine from women who drink more wine for relaxation and fun. Men drink more wine for health and social benefits. However, the survey revealed that the level of education associated with specific wine-drinking areas is significant. Winemakers should focus on great concepts and top marketing to reach young people, considering modern times' preferences and adapting to everyday challenges. To summarise, wine consumption has been affected by the COVID-19 crisis, and our pilot survey has revealed important aspects of wine drinking during the ongoing pandemic, which require a deeper examination of the issue in the future.

References

- [1] A Glimpse of iGeneration Wine Preferences. (2016) *Wine business*. Retrieved May 9, 2016, from <https://www.winebusiness.com/news/article/168471/>
- [2] Barber, N., Dodd, T., & Ghiselli, R. (2008). Capturing the Younger Wine Consumer. *Journal of Wine Research*, 19(2), 123–141. doi:10.1080/09571260802622225
- [3] Callinan, S., Smit, K., Mojica-Perez, Y., D'Aquino, S., Moore, D., & Kuntsche, E. (2021). Shifts in alcohol consumption during the COVID-19 pandemic: early indications from *Australia*. *Addiction*, 116(6), 1381–1388.
- [4] Caracciolo, F., Furno, M., D'Amico, M., Califano, G., & Di Vita, G. (2022). Variety seeking behavior in the wine domain: A consumers segmentation using big data. *Food Quality and Preference*, 97, 104481. doi.org/10.1016/j.foodqual.2021.104481
- [5] Chivu-draghia, C. and Antoce, A.O. (2016), “Understanding consumer preferences for wine: a comparison between millennials and generation X”, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol. 16 No. 2, pp. 75-83
- [6] Deroover, K., Siegrist, M., Brain, K., McIntyre, J., & Bucher, T. (2021). A scoping review on consumer behaviour related to wine and health. *Trends in Food Science & Technology*, 112, 559–580. doi:10.1016/j.tifs.2021.03.057
- [7] Dodd, T.H., Pinkleton, B.E., Gustafson, A.W. (1996). External information sources of product enthusiasts: differences between variety seekers, variety neutrals, and variety avoiders. *Psychology & Marketing*, 13(3), 291-304. doi:10.1002/(sici)1520-6793(199605)13:3<291::aid-mar3>3.0.co;2-7.
- [8] Heath, D.B. (2000) *Drinking Occasions: Comparative Perspectives on Alcohol and Culture*. Philadelphia, PA: Brunner/Mazel
- [9] Insider Intelligence. (2022) *Generation Z News: Latest characteristics, research, and facts*. Retrieved January 5, 2022, from <https://www.insiderintelligence.com/insights/generation-z-facts/>
- [10] Institute of Agricultural Economics and Information. (2021) *Situační a výhledová zpráva réva vinná a víno*. Praha: Ministry of Agriculture, retrieved from: https://eagri.cz/public/web/file/694201/SVZ_2021_web.pdf
- [11] Kasasa. (2021). *Boomers, Gen X, Gen Y, Gen Z a Gen A*. Retrieved June 7, 2021, from <https://www.kasasa.com/exchange/articles/generations/gen-x-gen-y-gen-z>
- [12] Kennett-Hensel, P. A., Neeley, C. R., & Min, K. S. (2011). Uncorking the mystery of marketing wine to generation Y: Lessons from consumer psychology. *Marketing Management Journal*, 21(2), 54-69
- [13] Koksál, M. H. (2019). Differences among baby boomers, Generation X, millennials, and Generation Z wine consumers in Lebanon. *International Journal of Wine Business Research*, 31(3), 456–472. doi:10.1108/ijwbr-09-2018-0047
- [14] Krüger, S. (2021). *The soul of a new machine Die KI-Entscheidungen*. Berlin, Springer Science+Business Media.
- [15] Lieskovský, J., Kanka, R., Bezák, P., Štefunková, D., Petrovič, F., & Dobrovodská, M. (2013). Driving forces behind vineyard abandonment in Slovakia following the move to a market-oriented economy. *Land Use Policy*, 32, 356–365. doi:10.1016/j.landusepol.2012.11
- [16] Oksanen, A., Savolainen, I., Savela, N., & Oksa, R. (2021). Psychological stressors predicting increased drinking during the COVID-19 crisis: a longitudinal national survey study of workers in Finland. *Alcohol and alcoholism*, 56(3), 299-306.
- [17] Pew Research Center. (2019). *Defining generations: Where Millennials end and Generation Z begins*. Retrieved January 17, 2019, from <https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/>
- [18] Research Institute of Agricultural and Food Economics (2021) *Vinič hroznorodý, hroznové víno*. (Publication No. 22) Bratislava: Ministry of Agriculture and Rural Development of the Slovak Republic. retrieved from: http://www.vuepp.sk/dokumenty/komodity/2020/Vino_12_2020_v2.pdf
- [19] Schaefer, R., Olsen, J., & Thach, L. (2018). Exploratory wine consumer behavior in a transitional market: The case of Poland. *Wine Economics and Policy*, 7(1), 54–64. doi:10.1016/j.wep.2018.01.003
- [20] Schmits, E., & Glowacz, F. (2021). Changes in alcohol use during the COVID-19 pandemic: Impact of the lockdown conditions and mental health factors. *International journal of mental health and addiction*, 1-12.

-
- [21] Smith, D. E. and Mitry, D. J. (2007). Cultural convergence: consumer behavioral changes in the European wine market. *Journal of Wine Research*, 18(2):107–112.
- [22] Thach, L. (2012). Time for wine? Identifying differences in wine-drinking occasions for male and female wine consumers. *Journal of Wine Research*, 23(2), 134-154. doi: 10.1080/09571264.2012.676542
- [23] Velikova, N., Handuchova O., Olevskyi B., D'Camp H., (2021). *The effect of Covid-19 on U.S. wine consumption: six months after the original lockdown*. Research Report. Texax wine marketing research institute online (<https://www.depts.ttu.edu/hs/texaswine/docs/COVID-19-Wine-Report.pdf>)
- [24] Wine Market Council (2017), *Wine market council wine consumer segmentation slide handbook* Retrieved October 1, 2017, from http://winemarketcouncil.com/wpcontent/uploads/2017/10/2017_WMC_Wine_Consumer_Segmentation_Slide_Handbook2.pdf

Sustainable Approach within Environmental Protection and PR in Food Enterprises in Slovakia

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Abstract

Paper points to the sustainable approach within environmental protection in food enterprises placed in Slovakia that is included in corporate social responsibility. Direct attention is paid to the most frequently used activities within environmental protection and subsequently their communication as part of public relations in order to influence the consumer's behaviour when purchasing the products in the food market. In the questionnaire, research was included 125 food enterprises divided by production focus. As our research confirmed, almost 90% of food enterprises in Slovakia know the concept of CSR, although some of them do not know to define this concept precisely. Almost half of the food enterprises placed in Slovakia actively apply the concept of CSR in everyday life. Can be also concluded that the most frequently used activity in the field of environmental protection is recycling in all food enterprises divided by production. When communicating these CSR activities as a part of public relations, the most important target group are consumers for all food enterprises divided by production focus. Consumers are, in their purchasing decisions, strongly influenced by the CSR activities of certain food enterprises. The most frequently used tools for communicating CSR activities are the company's website and social networks, with the highest share in food enterprises processing vegetables. The second most frequently used PR activity in practice is press releases and communiqués ranging from 11.1% for companies producing alcohol and confectionery to 33.3% for companies that process vegetables. For statistical evaluation were used Two-sample Kolmogorov-Smirnov Z test, Exact tests, Pearson Chi-square test, Chi-square goodness of fit test, Contingency coefficient C and Monte Carlo method. To process the statistical data was used the software IBM SPSS.

Keywords: Corporate Social Responsibility, Environmental Protection, Food Enterprises, Production Focus, Public Relations, Consumers Shopping Behaviour.

JEL Classification: M14, M31, Q13

1. Introduction

The term Corporate Social Responsibility (hereinafter referred to as CSR) is a term used worldwide. CSR is a modern concept that captures the trend of business focused on long-term goals and penetrates all areas of the company's business. The nature of the company's behaviour towards the environment can have a significant impact on its position and financial results (Kunz, 2012).

CSR principles are addressed mainly to companies that are interested in living in their community sustainably and sustainably and at the same time strive to be good partners. Understanding and applying the principles of CSR helps to develop the company's reputation and to strengthen the company's competitiveness (Nagyová et al., 2018).

An important milestone in shaping the concept of CSR was the "Green Paper" (Promoting and European Framework Work for Corporate Social Responsibility) published in July 2001 by the

European Commission. The document launched discussions to clarify the concept of CSR and at the same time presents the first European definition including the Triple-Bottom-Line principle (Bohinc, 2014; Franc et al., 2006).

CSR can be divided into areas from social (People), environmental (Planet), the economic one (Profit). These areas affect the company's management system and its ability to respond to external society. Every company should develop its market activities effectively, and ethically, concerning its consumers, suppliers, competitors and all potential entities. (Kubicová and Kádeková, 2011; Nagyová and Kádeková, 2012).

In the practice of food companies, it is necessary to focus on the environmental pillar (that is referred to as Planet Pillar within the triple bottom). In the environmental pillar of CSR, companies are committed to reducing the negative impacts of their business on the environment. In business practice, this approach is implemented by using Environmental management. This area of CSR can mean a competitive advantage for the company as well as a reduction in costs (Prskavcová, 2008).

To achieve environmental responsibility, companies should change their traditional way of doing business to a greener one. An environmentally responsible view could include issues such as emphasis on increasing resource productivity, cleaner production and active dialogue with society's stakeholders (Uddin et al. 2008).

CSR is one of the most important development trends. This is because the world today faces problems and questions for which CSR is part of the answer (Horrigan, 2010).

At the beginning of the 21st century, successful companies do not underestimate the need for social responsibility and in their daily activities, they develop a variety of activities needed to solve a wide range of social problems and improve society (Kunz, 2012; Harjoto and Salas, 2017). However, in Slovakia, not many food companies use the full potential of CSR

More and more global corporations are publishing CSR reports and the public expects a visible initiative in the field of corporate social responsibility for companies of all sizes. Many companies use CSR to improve their image, create their brand, increase employee loyalty and for other activities (Milovanović et al. 2009).

The processes of globalization and internationalization have introduced changes in companies and their business environment (Golob and Podnar, 2019). At present, these processes are constantly ongoing and affect every area of social life and the business environment. In this environment, the importance of ethical behaviour and the associated corporate social responsibility increases (Németh, 2016).

Interest in CSR has been growing over the last twenty years, as evidenced by the efforts of international corporations to correct CSR efforts. Depending on how the company will face economic, environmental and social problems, there will be interest from both the government and the commercial sector. Legislative definitions of obligations in the economic and social areas are also possible, similarly to the protection of the environment (Džupina, 2013).

Companies can increase their positive image via CSR activities (Bronn and Vrioni, 2011; O'Brien et al., 2020,) and can be considered a basic and key success creating factor in business life (Polakevičová, 2015; Rybanská, 2015; Smutka et al., 2016; Pérez Barea et al., 2020) as the superior sustainability performance has a positive association with sustainability reputation (Alon and Vidovic, 2015). However, in Slovakia, not many food companies use the full potential of CSR in connection to PR which is strongly connected with the view and opinion of consumers on the food enterprises and their CSR activities. Fact that the food enterprises apply CSR and communicate these activities is one of the most important factors when consumers decide about their purchase in the food market.

2. Data and Methods

The submitted research paper is aimed at a sustainable approach to CSR activities within environmental protection in food enterprises divided by production and placed in Slovakia, as well as their communication with the target groups, especially consumers, who are, in this way, strongly influenced in their shopping behaviour.

The questionnaire research was held online and sent to 358 food enterprises registered in the Business Register of the Slovak Republic. Only the food enterprises with a production focus that was also available in the sample were used to verify the representativeness of the sample: namely - alcohol, meat, vegetables, pastries, non-alcoholic beverages, milk and dairy products, confectionery with a total number of 125.

Table 1 shows the numbers of the selected sample of food enterprises and the expected numbers of the base set by production focus.

Table 1: Numbers of the Selected Sample of Food Enterprises and the Expected Numbers of the Base set by Production Focus

Production Focus	Observed N	Expected N	Residual
Alcohol	13	13.6	-0.6
Meat	24	26.9	-2.9
Vegetables	11	19.3	-8.3
Pastries	36	23.8	12.3
Non-alcoholic Beverages	13	10.6	2.4
Milk and Dairy Products	15	18.8	-3.8
Confectionery	13	12.1	0.9
Total	125		

Source: author's research and calculations, processed in the SPSS program

Results of the Chi-square Goodness of Fit Test of food enterprises by production focus are shown in Table 2. Based on the comparison of the significant value with the set level of significance $\alpha = 0.05$, we do not reject the null hypothesis, which means that the sample of food enterprises is a representative sample at a significance level of $\alpha 0.05$. As the value of asymptotic significance is close to the level of significance, an exact test based on Monte Carlo simulations was applied. Based on this exact test, could be concluded that with a 99% confidence, the significance value will be in the range of 0.065 to 0.078.

For statistical evaluation were used Two-sample Kolmogorov-Smirnov Z test, Exact tests, Pearson Chi-square test, Chi-square *goodness of fit test*, Contingency coefficient C and Monte Carlo method. To process the statistical data was used the software IBM SPSS.

Table 2: Results of Chi-square Goodness of Fit Test- Food Enterprises by Production Focus

Test Statistics	Production Focus
Chi-Square	11.534 ^a
Df	6
Asymp. Sig.	0.073
Monte Carlo Sig.	0.072 ^b
99% CI Lower Bound	0.065
Upper Bound	0.078

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.6.

b. Based on 10000 sampled tables with starting seed 1745777953.

Source: author's research and calculations, processed in the SPSS program

3. Results and Discussion

Almost 90% of surveyed food enterprises in Slovakia know the concept of CSR, although some of them do not know to define this concept precisely. Almost half (66) of them actively apply the concept of CSR in everyday life. These are the subject of our evaluation.

Table 3 offers the most frequently used CSR activities for the field of environmental protection, listed based on the frequency of use and divided according to the production focus of food enterprises. The most important activity in the field of environmental protection is recycling, followed by activities such as - taking into account the impact on the environment in production activities and services, compliance with national and international standards and reducing the impact of the company's activities on the environment. The activities used in this area are also having an established program for control of energy and water consumption, providing the consumers, suppliers and the community with clear and accurate environmental information about products, services and activities, using materials that can be reused or recycled, having a waste management policy, communicating the environmental policy with the employees and consumers, as well as having an environmental management system and having a policy of reducing fuel consumption.

Table 3: The Most Frequently used CSR Activities within Environmental Protection Divided by the Production Focus of Food Enterprises (in%)

Activities in the Field of Planet Pillar	Production Focus							Total
	Alcohol	Meat	Vegetables	Pastries	Non-alcoholic Beverages	Milk and Dairy Products	Confectionery	
Recycling	14.3	12.0	9.7	13.5	14.9	11.8	11.9	12.7
Taking into account the impact on the environment in production activities and services	8.9	12.0	9.7	13.5	10.6	10.5	10.4	11.3

Compliance with national and international standards	8.9	10.8	9.7	11.7	12.8	10.5	11.9	11.0
Reducing the impact of the company's activities on the environment	10.7	10.8	12.9	12.6	12.8	6.6	9.0	10.6
Having an established program for control of energy and water consumption	8.9	9.6	12.9	9.9	8.5	9.2	9.0	9.6
Providing the consumers, suppliers and the community with clear and accurate environmental information about products, services and activities	10.7	12.0	12.9	7.2	6.4	11.8	7.5	9.6
Used materials can be reused or recycled	10.7	6.0	6.5	7.2	10.6	9.2	9.0	8.3
Having a waste management policy	7.1	7.2	3.2	7.2	2.1	10.5	7.5	7.0
Communicating the environmental policy with the employees and consumers	7.1	6.0	9.7	5.4	10.6	5.3	7.5	6.8
Having an environmental management system	7.1	4.8	6.5	6.3	6.4	7.9	7.5	6.6
Having a policy of reducing fuel consumption	1.8	3.6	3.2	1.8	2.1	6.6	4.5	3.4
Providing environmental training to employees	3.6	4.8	3.2	3.6	2.1	0.0	4.5	3.2

Source: author's research and calculations, processed in the SPSS program

When communicating these activities as a part of public relations, the most important target group are consumers, who, based on this, decide about their shopping decisions - for all food enterprises (60.8%) included in specific production focus, while the highest share was claimed in those producing non-alcoholic beverages confectionery. This target group was followed by business partners, suppliers, and intermediaries (24.3%).

Employees are the target group in public relations for only 16.7% of confectionery companies and 7.7% of meat processing companies. Children and young people are the target group in the field of public relations in 11.8% of bakery companies. The local community is the target group for companies that process milk and produce confectionery with an equal share of 8.3%.

The most frequently used tools for communicating CSR activities are the company's website and social networks, with a share ranging from 16.7% for companies producing alcohol to 66.7% for companies that process vegetables. The second most frequently used PR activity in practice is press releases and communiqués ranging from 11.1% for companies producing alcohol and confectionery to 33.3% for companies that process vegetables. Other activities used in practice were sponsorships and contributions to philanthropy and charity. Social networks are the most suitable way how to inform and influence the most important target group- consumers and later on, also their shopping behaviour.

According to the results in Table 4, we reject the null hypothesis of the independence of CSR activities concerning the environmental protection understood and communicated as part of the food enterprise's PR because of the asymptotic significance of the Chi-square test and the significance of the Monte Carlo approach are below the level of significance alpha 0.05. In other words, CSR activities understood and communicated as part of the food enterprises' PR, are implemented to varying degrees within environmental protection.

Table 4: Results of Pearson's Chi-square Test of CSR Activities concerning Environmental Protection Understood and Communicated as a Part of Food Enterprises' PR

	Chi-Square Tests					
	Value	df	Asymptotic Significance (2-Sided)	Monte Carlo Sig. (2-Sided)		
				Significance	99% Confidence Interval	
				Lower Bound	Upper Bound	
Pearson Chi-Square	32.239 ^a	6	0.000	0.000	0.000	0.000
Likelihood Ratio	35.548	6	0.000	0.000	0.000	0.000

^a 1 cells (8.3%) have an expected count less than 5. The minimum expected count is 3.00

Source: author's research and calculations, processed in the SPSS program

Table 5 shows the value of the contingency coefficient, which we consider to be a measure of the tightness of the dependence between the categorical variables. Its value is 0.298, which expresses a weak relationship between the frequency of CSR activities concerning the planet pillar understood and communicated as part of the food enterprises' PR.

Table 5: Association Rate Results

	Symmetric Measures				
	Value	Approximate Significance	Monte Carlo Sig. (2-Sided)		
			Significance	99% Confidence Interval	
			Lower Bound	Upper Bound	
Nominal by Nominal Contingency Coefficient	0.298	0.000	0.000 ^b	0.000	0.000

^b Based on 10,000 sampled tables with starting seed 1,455,697,065

Source: author's research and calculations, processed in the SPSS program

4. Conclusion

Almost 90% of food enterprises in Slovakia know the concept of CSR, although some of them do not know to define this concept precisely, almost half of the food enterprises placed in Slovakia actively apply the concept of CSR in everyday life. The submitted paper paid attention to the sustainable approach and CSR aimed at activities within the environmental protection and their communication with the target groups (especially the consumers) and used tools of marketing communication within PR in order to influence the shopping behaviour of consumers. When taking into account the applied activities in food enterprises by production focus in the field of environmental protection, we can conclude, that the most frequently used is recycling, followed by taking into account the impact on the environment in production activities and services, compliance with national and international standards and reducing the impact of the company's activities on the environment. These activities are communicated with the target group as can help to build the company's awareness and image. Food enterprises do realise this important fact and the most important target group for communicating sustainable approaches and activities to protect the environment are consumers as it was noticed in all food enterprises divided by production focus. The most frequently used tools for communicating CSR activities are the company's website and social networks, with the highest share in food enterprises processing vegetables, but generally can be concluded that websites and social networks are nowadays the most important communication tool in reaching and influencing consumers. The second most frequently used PR activity in practice is press releases and communiqués ranging from 11.1% for companies producing alcohol and confectionery to 33.3% for companies that process vegetables. Based on the statistical evaluation, a sustainable approach aimed at CSR activities understood and communicated as part of the food enterprises' PR, is implemented to varying degrees within environmental protection. We do realise the limits of our research that can be concluded as a limited area of research (Slovakia) and a specific area (food enterprises). This allows us to continue in research abroad and also in the other areas that could be compared with our current results. However, the results described in the submitted paper represent a suitable base for further research as well as education of the internal and external public in the given field and as a key factor of success when CSR activities could be used in order to influence the consumers' behaviour when purchasing the products in the food market.

Acknowledgements

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References

- [1] Alon, A. & Vidovic, M. (2018). Sustainability performance and assurance: Influence on reputation. *Corporate Reputation Review*, 18 (4), 337-352. doi: 10.1057/crr.2015.17
- [2] Bohinc, R. (2014). Corporate social responsibility: A European legal perspective. *Canterbury Law Review*, 20, 21-38.
- [3] Bronn, P.S. & Vrioni, A.B. (2011). Corporate social responsibility and cause-related marketing: an overview. *International Journal of Advertising*, 20, 207-222.
- [4] Džupina, M. (2013). Podniková vízia, poslania a podnikové hodnoty, ako kľúčové komponenty strategického plánovania. *Selye e-studies*, 4 (2), 36-49.

- [5] Golob, U. & Podnar, K. (2019). Researching CSR and brands in the here and now: An integrative perspective. *Journal of Brand Management*, 26(1), 1-8. doi: 10.1057/s41262-018-0112-6
- [6] Franc, P., Nezhyba, J. & Heydenreich, C. (2006). *Když se bere společenská odpovědnost vážně*. Brno: Ekologický právní servis.
- [7] Harjoto, M. A. & Salas, J. (2017). Strategic and institutional sustainability: corporate social responsibility, brand value, and Interbrand listing. *Journal of Product & Brand Management*, 26 (44), 33. doi: 10.1108/JPBM-07-2016-1277
- [8] Horrigan, B. (2010). *Corporate social responsibility in the 21st century: Debates, models and practices across government, law and business*. Cheltenham: Edward Elgar.
- [9] Kádeková, Z. & Nagyová, L. (2012). Social marketing concept: benefits of using public relations in the practice of food enterprises in Slovakia. *Roczniki Ekonomii Rolnictwa I Rozwoju Obszarów Wiejskich*, 99(3), 51 – 59.
- [10] Kubicová L. & Kádeková Z. (2011). Marketing strategy of the new product introduction on the market. In *Zeszyty Naukowe SGGW w Warszawie. Polityki Europejskie, Finanse i Marketing*, vol. 54, no. 5, pp. 78-90.
- [11] Kunz, V. (2012). *Společenská odpovědnost firem*. Praha: Grada.
- [12] Milovanović, G., Barac, N. & Andjelković, A. (2009). Corporate social responsibility in the globalization era. *Facta Universitatis*, 6(2), 89-104.
- [13] Nagyová, L. et al. (2018). *Marketing II*. Nitra: Slovenská poľnohospodárska univerzita.
- [14] Németh, H. (2016). Spoločenskou zodpovednosťou ku konkurencieschopnejšej firme. In *Kvalita a spoločenská zodpovednosť*, 2016 (4), 22-27.
- [15] Pérez Barea, J. J., Espantaleón-Pérez, R. & Šedík, P. (2020). Evaluating the perception of socially responsible consumers: The case of products derived from organic beef. *Sustainability*. 12(23), 10166, <https://doi.org/10.3390/su122310166>
- [16] O'Brien, I. M., Ouschan, R., Jarvis, W. & Soutar, G. N. (2020). Drivers and relationship benefits of customer willingness to engage in CSR initiatives. *Journal of Service Theory and Practice*, 30(1), 5-29.
- [17] Polakevičová, I. (2015). Application of transactional analysis in marketing research - models of the hierarchy of effects of marketing communication and structural analysis. *Prohuman*, 7(2), 1 – 10.
- [18] Prskavcová, M. et al. (2008). *Společenská odpovědnost firem, lidský kapitál, rovné příležitosti a environmentální management s využitím zahraničních zkušeností*. Liberec: Technická univerzita.
- [19] Rybanská, J. (2015). Selected personality characteristics as predictors of emotional consumer behaviour. *European journal of business science and technology*, 1(2), 128-136.
- [20] Smutka, L., Svatoš, M., Tomšík, K. & Sergienko, O. I. (2016). Foreign trade in agricultural products in the Czech Republic. *Agricultural Economics*, 62(1), 9-25. doi: 10.17221/18/2015-AGRICECON
- [21] Uddin, M. B., Hassan, M. R. & Tarique, K. M. (2008). Three Dimensional Aspects of Corporate Social Responsibility. *Journal of Business and Economics*, 3 (1), 199-212.

Food Waste and Effective Approach to Reducing it in Slovak Households

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Abstract

As a result of the more consumer way of life in today's society, various new global problems are emerging, one of which is the problem of food waste. We chose the topic because food is an integral part of our lives. We often receive them automatically and many times we treat them without further thought. This issue does not meet the conditions of sustainability today, due to food waste on all levels, ranging from large-scale production to households. It is households that account for a third of the world's food waste. The main aim of the submitted article is to evaluate the current situation, to analyse the issue and the reasons for the emergence of food waste in households, and to formulate proposals aimed at improving the situation. At the beginning of our research, it was necessary to get an overview of the current situation the issue. We have defined the basic concepts as well as the views of the authors who deal with the issue in their scientific and professional publications. A substantial part of the article consists of the results of the work, where it was necessary to evaluate the answers of respondents from the questionnaire survey. The results of the work are divided into loading households with food waste, the difference between the terms "minimum durability" and "Consume by", a waste of food during the holidays as well as a look at respondents' perceptions of food waste. In the end, we evaluated the achieved results and submitted suggestions for improved food waste issues.

Keywords: food waste, global problem, Slovak households, today's society

JEL classification: Q530, Q560, Q590

1. Introduction

In today's world, food waste is an increasingly addressed issue because there are two extremes in today's globalized world. The first is many people who suffer from hunger and have very limited resources. The second extreme is the globalized market, where consumers are under great pressure on producers. As a result, the food chain has expanded, resulting in a surplus of goods that are no longer used and usually end up in the trash. Food waste is also a growing problem in today's world. A significant part of the population suffers from poverty, hunger, and malnutrition, but as a result, more than one-third of the food produced is discarded or degraded. Food disposal is a big problem today, but it has only come to more attention in recent years. In today's climate change situation, it is necessary to draw more attention to this issue and try to lead people to value what they have more and not waste resources unnecessarily.

2. Literature Review

To understand the work, we define the basic concepts at the beginning, which will facilitate orientation in the text and in the topic itself. The first chapter is therefore devoted to clarifying the terms and definitions that are inseparable from the topic of food waste. Every year, one-third of food produced for human consumption is unused and lost during the food chain (Kapsdorferová et al., 2020).

Around the world, more than enough food is produced to feed the global population—but as many as 811 million people still go hungry. After steadily declining for a decade, world hunger is on the rise, affecting 9.9 percent of people globally. From 2019 to 2020, the number of undernourished people grew by as many as 161 million, a crisis driven largely by conflict, climate change, and the COVID-19 pandemic. (United Nation, 2021)

Food is wasted from the primary activity, such as agriculture, to the last link in the chain, which is the final consumer. This is also the main reason why we are increasingly confronted with the concept of food waste. There is still no uniform definition of this term. (FAO, 2011)

In 2012, the European Parliament recognized the cessation of food waste and defined the term as "the total amount of food products that are discarded from the food chain for economic or aesthetic reasons". (Schneider, 2012)

An important step in understanding the issue of food waste is to recognize the concepts of food loss and food waste, which are often confused.

By food losses, we mean all foods that are discarded, burned, or otherwise disposed of in the food chain as part of harvesting/slaughter/catch due to quantity reduction or unsatisfactory quality. We do not include secondary use as seed or feed here. These losses are referred to as the Fatty Liver Index (FLI). (Gustavsson, 2020)

By food waste we mean food that is discarded due to reduced quality at the discretion of retailers, food service providers, or consumers. This waste is generated in many ways:

- fresh products do not meet the standards of shape, size, color. These products are removed from the supply chain during sorting.
- Foods approaching the "minimum shelf life" date are being thrown away by both retailers and consumers due to declining quality.
- A large amount of remaining edible food is discarded from households or catering establishments as uneaten leftovers.

This type of waste is referred to as the Food Waste Index (FWI). (Gustavsson, 2020)

In 2015, all UN member states committed themselves to seventeen sustainable development goals, which will be met by 2030 at the latest, i.e., after fifteen years. All EU Member States are also members of the UN, so the EU is obliged to meet these goals. There are several goals that go to food waste. From the second goal dealing with zero hunger translation (Zero hunger), through the eleventh climate goal (Climate action), to the twelfth goal on a sustainable pattern of responsible consumption and production. (United Nations, 2015).

Food waste may be reduced by changing consumer reactions towards waste, increasing awareness of poverty and hunger, and highlighting the moral implications of waste, for example by using guilt (Ratinger et al., 2016; Szafrńska et al., 2020). Research on determining the factors affecting the level of food waste has been conducted for many years. The investigations most often focus on determining the influence of demographic and economic factors: income (Graham-Rowe et al., 2014; Aschemann-Witzel et al., 2017; McCarthy and Liu, 2017; Macková et al., 2019), consumer's age (Quested et al., 2011), education (Cox and Downing, 2007) and number of persons in the household. (Baker et al., 2009; Jørisen et al., 2015).

3. Methodology or Materials and Methods

The main goal of the paper is to evaluate the current situation and the reasons for the generation of food waste in households and to formulate proposals aimed at improving the situation.

In order to successfully fulfil the main goal, it is important to define the following partial goals: a study of scientific publications, decrees, and provisions of ministries as well as the study of domestic and foreign literature in order to better understand food waste, preparation of questionnaires aimed at obtaining information from consumers data collection took place online through an electronic questionnaire developed in Google Forms, processing and evaluation of the questionnaire survey, formulation of proposals and recommendations for reducing food waste and drawing conclusions.

The main method we used was the questionnaire survey method. The survey was conducted using a questionnaire compiled in Google Forms (Google Forms). The questionnaire survey focused on consumer households on shopping habits and the way food waste is managed in the household. The questionnaire survey was conducted over a period of three weeks, from 14 December 2020 to 04 January 2021. Data collection took place online via social networks (Instagram and Facebook) and also using the Twitch streaming platform. In addition, respondents were contacted by email as well as by phone.

The questionnaire consisted of four parts: the characteristics of the sample examined, the difference between the terms "minimum durability" and "use by", food waste management, and food waste during the holidays.

4. Results and Discussions

4.1 Characteristics of the examined file

The structure of the respondents was as follows: out of 85 respondents, 59 were men, which represents 69%, and 26 women, which makes up 31%.

In the second question of the questionnaire survey, we found out the age composition of the respondents. The majority of respondents belonged to the age category of 20-35 years with a share of 65%, which represents 55 respondents, another age category was the age category up to 20 years, which is 18% and that represents 15 respondents. Only 8 respondents belonged to the category of 36-49 years, which represents 9%. A smaller number of respondents came from the age category of 50-65 years, which consists of 5 respondents, which represents 6%, and we received the least answers from the age category of 60 or more years, where we had 2 respondents, which represents 2%.

More than half, up to 53 respondents have a complete secondary general / vocational education with a high school diploma, which represents 62%. The second-largest share had a university degree II. degree - master's, 10 respondents, which represents 12%. Only 6 respondents had a university degree III. degree - doctoral, which represents 7%, and 6, which represents 7%, the respondents had a university degree I. - bachelor. The same number of respondents had a secondary vocational education without a GCSE with an apprenticeship certificate (5 respondents, 6%) and there were also respondents with a different type of education (5 respondents, 6%).

When asked how many members live in the household, respondents answered differently. The most frequent respondents live in a 4-member household, there are 24 respondents, which represents 28%, followed by a three-member household, where 23 respondents agreed, which represents 27%. As many as 12 respondents live in a 5-member household, which represents 14%, followed by 11 respondents living in a two-member household, which makes up 13% of the answers. 9 respondents live in a household of more than 5 members, which represents 11%

and the smallest share of answers is represented by respondents living alone, this is how 6 respondents answered, which is only 7% of answers.

In the next question, we were interested in where the respondents came from. The largest respondents came from the city, this option was chosen by 51 respondents, which represents 60%, which means that the remaining 34 respondents, which represents 40% come from the countryside.

4.2 Difference between "minimum shelf life" and "use by"

As many as 71 respondents try to prevent food waste, which represents 83%. Figure 1 shows the respondents' answers to the question of how they try to prevent the generation of food waste.

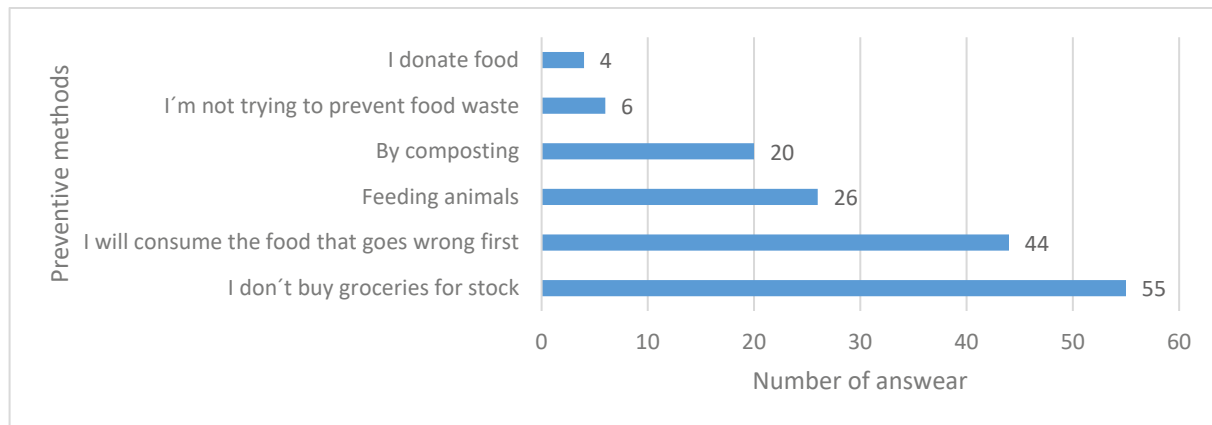


Figure 1: Respondents' answers

Source: own processing

Surprisingly, only 69% of respondents think they know the difference between "minimum durability" and "use by". Out of a total of 59 respondents who think they know the difference between 'minimum durability' and 'use by', only 42 respondents indicated the right options, representing 71%.

In the next question, we found out whether the respondents consume food after the minimum shelf life, most respondents decide whether the food is not spoiled, does not have an unusual color/odor, which means that they do not place much emphasis on the minimum shelf life, 41 respondents answered which represents up to 70%. 44% of respondents do not consume such food after the "use by" date and this is a big difference from the previous question, but most respondents again agreed on the answer, depending on whether the food is spoiled or does not have an unusual color/smell in the number of 28 respondents, which represents 47%

4.3 Food waste management

As many as 39 respondents said they threw bread/pastries most often. The other most frequently thrown out foods were the remnants of cooked food, this option was chosen by 26 respondents, followed by greens by 19 respondents, 15 respondents said that they threw fruit most often. 15 respondents said they did not throw away food at all. This is followed by dairy products, which are most often thrown away by 12 respondents, and the least thrown out food is meat, on which

only 7 respondents agreed. Only 3 of respondents said they threw away other food. In figure 2 we see the reasons why the respondents decided to throw away the food.

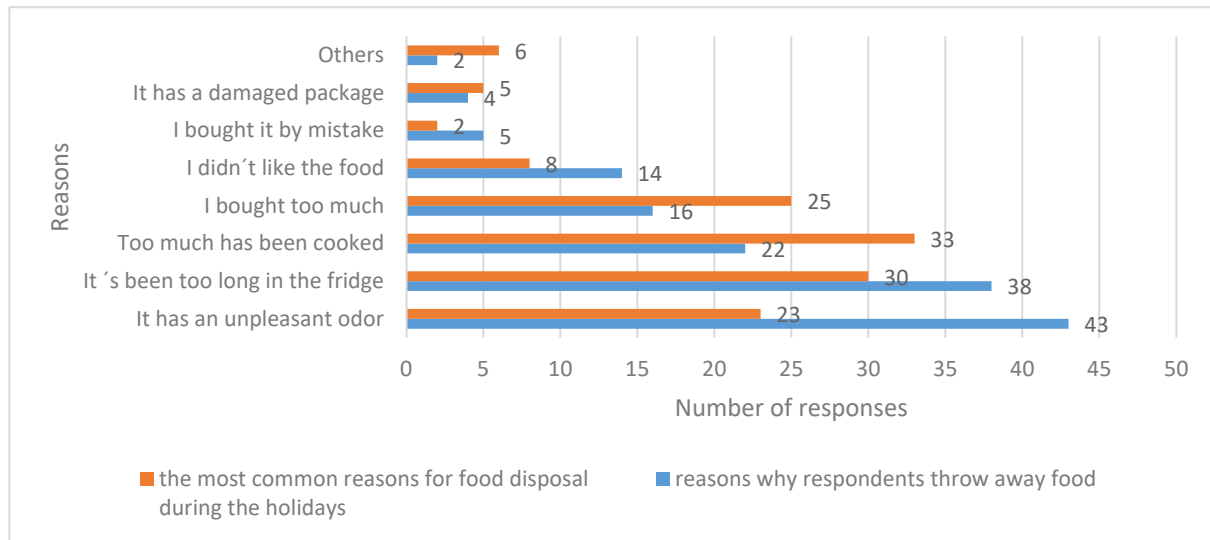


Figure 2: Reasons why the respondents decided to throw away the food

Source: own processing

4.4 Food waste during the holidays

According to the survey, 59% of respondents think that they do not waste more food during the holidays, while the same percentage of respondents perceive food waste as a big problem. The reasons why respondents do not throw away food during the holidays are shown in figure 3. Based on the survey, we also found that 76% of respondents spend more on food during the holidays.

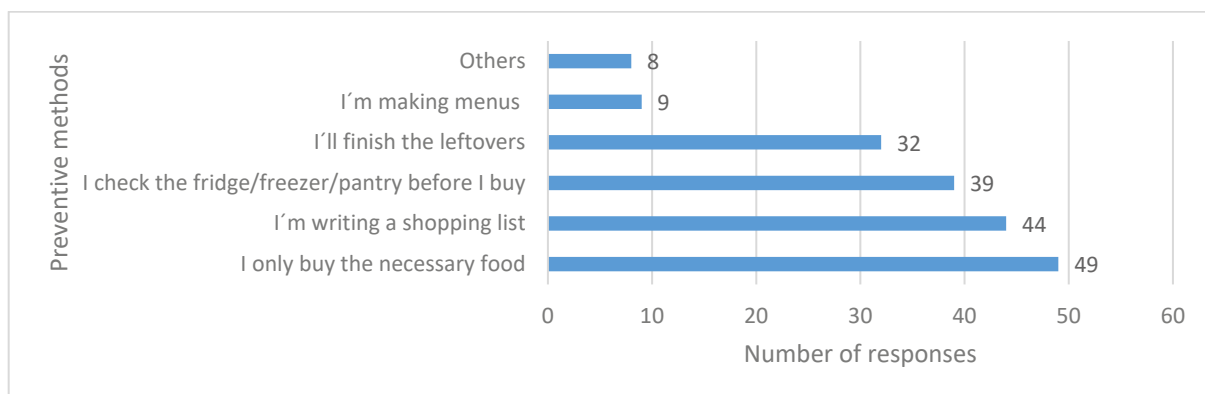


Figure 3: The reasons why respondents do not throw away food during the holidays

Source: own processing

5. Conclusions and Recommendations

In this paper, we addressed the topic of food waste in households. Using a questionnaire survey, we found out the attitudes of respondents to this issue. The main goal was to evaluate the current situation and the reasons for the generation of food waste in households and to formulate proposals aimed at improving the situation.

Thanks to a questionnaire survey of 85 respondents, we found that not all respondents behave responsibly in this area, this is also due to ignorance of the terms "minimum durability" and "consume until". In addition, we have found that there is more food waste during the holidays. During the holidays, respondents spend more money on food and at the same time waste more of it.

Based on the survey, we can assess that respondents would be most motivated in the area of food waste, saving money, which was agreed by 38% of respondents, 33% of responses from respondents had the opportunity that this is the right thing to do. Uncommon responses include environmental concerns, where 17% of respondents agreed and 10% of respondents are motivated to save time. Only 2% of respondents admitted that they would not be motivated by anything.

The issue of food waste is discussed at the global policy level. However, there is still a shortage of research and studies in the Slovak Republic and a comprehensive methodology for collecting data on food waste is lacking.

People throw-away food automatically and do not think about the consequences. They lack an awareness of what it all entails. Individuals should be more educated about this issue and aware of the impact of food waste on the world (economic, social and environmental). The solution could be better planning of food purchases - mobil apps can help (like: GoGreen, Too Good To Go, Empty my Fridge, Food Waste Tracker, Foodkeeper, Foodchain, Food Save and many others apps), greater awareness of the date of use and the date of minimum durability, or knowledge of how many people in the world suffer from hunger and malnutrition. The process of improving the overall situation of food waste will be long-term. But the most important thing is that each person starts right and especially from himself. It is necessary to keep in mind the model 5R (reduce, reuse, recycle, refuse, root).

References

- [1] Aschemann-Witzel, J., Jensen, J., Jensen M. and Kulikovskaja V. (2017) "Consumer behaviour towards price-reduced suboptimal foods in the supermarket and the relation of food waste in households", *Appetite*, Vol. 116, pp. 246-258. ISSN 0195-6663. DOI 10.1016/j.appet.2017.05.013
- [2] Baker, D., Fear, J. and Denniss, R. (2009) "What a waste - an analysis of household expenditure on food", *Policy Brief*, Vol. 6, pp. 1-24. ISSN 1836-9014.
- [3] Cox, J. and Downing, P. (2007) "Food Behaviour Consumer Research: Quantitative Phase", *Retail Programme - Food Waste: Final Report*, Wrap, Banbury, UK, [Online]. Available: <http://www.wrap.org.uk/sites/files/wrap/Food%20behaviour%20consumer%20research%20quantitative%20jun%202007.pdf> [Accessed: 9. Sep. 2019]
- [4] Food and Agriculture Organization of the United Nations. (2020). *Technical Platform on the Measurement and Reduction of Food Loss and Waste*. Retrieved May 26, 2021, from <http://www.fao.org/food-loss-and-food-waste/en/>
- [5] Graham-Rowe, E., Jessop, D. and Sparks P. (2014) "Identifying motivations and barriers to minimizing households food waste", *Resources, Conservation and Recycling*, Vol. 84, pp. 15-23. ISSN 0921-3449. DOI 10.1016/j.resconrec.2013.12.005
- [6] Gustavsson, J. & Cederberg Ch. & Sonesson U. 2011. *Global food losses and food waste: extent, causes and prevention: study conducted for the International Congress "Save Food!" at Interpack 2011*. Rome: Food and Agriculture Organization of the United Nations
- [7] Jörissen, J., Priefer, J. and Bräutigam, K. (2015) "Food waste generation at household level: results of a survey among employees of two European research centers in Italy and Germany", *Sustainability*, Vol. 7, No. 3, pp. 1-21. ISSN 2071-1050
- [8] Kapsdorferová, Z., Kadlečíková, M., & Švikruhá, P. (2020). *Spoločenská zodpovednosť a inováčné aktivity pri znižovaní potravinových strát so zreteľom na šetrné zaobchádzanie so životným prostredím*. Slovenská poľnohospodárska univerzita v Nitre. ISBN: 978-80-552-2265-3 <https://doi.org/10.15414/2020.9788055222653>
- [9] Macková, M., Hazuchová, N. and Stávková, J. (2019) "Czech consumers' attitudes to food waste", *Agricultural Economics – Czech*, Vol. 65, pp. 314–321. ISSN 1805-9295. DOI 10.17221/364/2018-AGRICECON
- [10] McCarthy, B. and Liu, H. (2017) "Food waste and the 'green' consumer", *Australasian Marketing Journal*, Vol. 25, pp. 126-132. ISSN 1441-3582. DOI 10.1016/j.ausmj.2017.04.007

- [11] Quested, T., Parry, A., Easteal, S. and Swannell, R. (2011) “Food and drink waste from household in the UK”, *Nutrition Bulletin*, Vol. 36, No. 4, pp. 460-467. ISSN 1467-3010. DOI 10.1111/j.1467-3010.2011.01924.x
- [12] Ratering, T., Tomka, A. and Boskova I. (2016) “Sustainable consumption of bakery products; a challenge for Czech consumers and producers”, *Agricultural Economics – Czech*, Vol. 62, pp. 447-458. ISSN 1805-9295. DOI 10.17221/244/2015-AGRICECON.
- [13] Schneider Návod jak správně nakládat s potravinami. (2012). Schneider. Retrieved from: http://futureofwaste.eu/public/download/Nvod_jak_pedchzet_vyhazovn_potravin_v_domcnostech.pdf
- [14] Szafrńska, M., Kapsdorferová, Z., & Krasnodebski, A. (2020). Level of Financial Literacy and Food Waste in Polish Households. *Agris On-Line Papers in Economics and Informatics*, XII (1), 99–109. <https://doi.org/10.7160/aol.2020.120109>
- [15] United Nations. (2015). *The Sustainable Development Goals*. Retrieved May 30, 2021, from <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- [16] United Nations. (2021). *Food*. Retrieved May 30, 2021, from <https://www.un.org/en/global-issues/food>

Consumption of Bakery Products in Correlation with Selected Demographic Characteristics

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Abstract

The presented paper analyzes the consumption of consumers of bakery products based on a questionnaire survey. For these data, the chi-square test of independence was used to examine the relationship strength between qualitative variables, specifically whether there's any dependence between sex and the existence of dietary restriction. Also, the relationship between the frequency of consuming bakery products and the age of respondents. For both case scenarios, a relationship between the specified attributes was discovered. Subsequently, we examined, relative abundancies of answers according to segmentation of consumers, while we found out the difference between classic consumer and consumer with alternative type of eating as vegan, paleo low carb, gluten free or diagnosed allergy, intolerance or other health problems related to consuming bakery products. The research is supported by the VEGA project: Challenges for food security in 21st century Europe - key factors, socio-economic and environmental contexts, no. VEGA 1/0755/21.

Keywords: bakery products, consumer behaviour, correspondence analysis, food market,

JEL Classification: C02, C12, C14

1. Introduction

According to Ashley, J.M. (2016) hunger, undernutrition, and food insecurity keep destitute people around the world from breaking the cycle of poverty in its broadest sense because they limit their ability to study, work, and care for themselves and their families. Progression of the poorest countries will continue to stay an unattainable goal if hunger and undernutrition persist, because they place a direct strain on these countries' economic and human potential, often from generation to generation. Development invariably entails improving the situation in terms of food security, which is critical in combating poverty.

Bread is only food known throughout the world, from the most developed towards the most primitive cultures, and it is on everyone's table in some form, said Elena P et al (2021).

Since bakery products are usually considered essential, research is focused on them and specifically on the consumption of bakery products by Slovak consumers.

According to Lopúchová, T. (2020), only half of the capacity of bakeries is used in Slovakia, and the use of this capacity depends mainly on the Slovak consumer. As the consumption of fresh bread in Slovakia is declining and its durability is rising, it is necessary to examine the reason for such consumer behavior.

Despite a lot of research dealing with consumer segmentation, such as research by Vigneau, E and Qannari E.M. (2002), or potato consumer research by Sharma, C. et al. (2020), it is necessary to address this issue in our territory, as with the correct segmentation of consumers of the products

and the subsequent targeting of marketing activities could contribute to the support of the Slovak market with the mentioned products.

Another fact is that the number of consumers with health restrictions in their diet is rising. It is for this reason that it is also necessary to analyze this reality and the product market itself for these consumers. These are special dietetic foods, respectively gluten - free or lactose - free / non - dairy bakery and cereal products. As Gómez M. (2021) said, gluten-free products are in high demand around the world because certain groups of people, that have now grown in recent decades, really must completely remove gluten from their diet. Gluten-free products are becoming increasingly popular among consumers who believe they are healthier. Even Hansen C et al (2022) stated that gluten-free diet may help prevent the development of type 1 diabetes, according to experimental and clinical evidence. According to Richardson et al (2022), the increased dietary restriction and request for testing are being driven by latest press attention to gluten and potential health advantages derived from removing it from the diet. According to Brites L, Schmiele M and Steel C (2018) Celiac disease is a genuine condition in today's society, with celiac patients taking account for about 1% of the population. The one and only treatment for those kind of people is to avoid gluten in their diet and lifestyle. As a result, bakery scientists have been busy creating and developing gluten-free options and a variety of bakery and pasta goods. Rajput M, Chauhan A, Makharia G (2022) said that because of the following factors, a shift in epidemiology and improved recognition of celiac disease has been possible. While diagnosing celiac disease used to be a time-consuming process, the availability of reliable serological tests has greatly simplified the criteria for a diagnosis. It was assumed that celiac disease only affected children, but it is now known that it affects people of all ages, including the elderly.

Padma Ishwarya S, Prabhasankar P (2014), in their research, addressed a probiotic approach to achieving a favorable environment in the human body by stimulating beneficial bacteria. Several food products act as substrates for the application of prebiotics and one of them is bakery products. The trend of increasing consumption of bakery products justifies the choice of their use as carriers for the supply of prebiotic compounds. In addition to health benefits, prebiotic compounds also have nutritional and technological effects in the food matrix. In addition to increasing fiber content, candidate prebiotics also affect the rheology and final quality of bakery products. Prebiotic compounds are selected to provide the final product with the desired properties. The health benefits of prebiotics, the technological benefits in bakery products such as bread and biscuits, and extruded products such as pasta are thoroughly discussed. Lluís Serra-Majem et al. (2007) in their study looked at the evaluation of eating habits in Spanish children and adolescents based on the Mediterranean Food Quality Index tool, which considers certain principles that support and call into question traditional healthy Mediterranean eating habits. Christoph Silow, Claudia Axel, Emanuele Zannini, Elke K. Arendt (2016) focused on salt reduction in bakery products. Bread and other cereal products contribute about 30% to the daily sodium intake of Westerners. Although it may sound simple, the reduction of salt in food is not so clear-cut, as salt affects the processability and quality properties of the final bakery products. Long-term strategies and revisions are needed to achieve the ultimate reduction targets. Several different techniques have been proposed for the reduction of sodium chloride. Other approaches include salt substitutions or enhancers. One promising strategy to reduce salt was to add sourdough to the pastry. The yeast can counteract some of the negative effects of salt reduction on bread, thus improving the overall quality. Fernando Rodríguez-Artalejo et al. (2007) tested the hypothesis that higher consumption of bakery products, sweetened soft drinks and yoghurts is associated with higher energy intake, saturated fats, sugars, and an overall poorer diet in Spanish children. This is a cross-sectional study involving 1112 children aged 6.0-7.0 years in four Spanish cities. Nutrition and food intake were obtained through a food frequency

questionnaire. The overall quality of the diet was calculated using the Healthy Eating Index (HEI).

2. Data and Methods

This paper presents calculations and results from pre-research. Given pre-research is part of dissertation research which is in progress. A questionnaire was used to collect data from quantitative research which was divided into 8 sections. First section was focused on respondent's lifestyle, if they have any healthy dietary restriction. If respondent did not have any diagnoses, they continued into second section. Second section was about alternative type of eating like low carb, gluten free, paleo or vegan and we asked if their lifestyle and alternative type of eating affects their selection of bakery products. Then if they eat alternatively, they continued to third section, where were question focused on their consumer behavior for example frequency and quantity of specific bakery product. Fourth and fifth section was for respondents which have dietary restriction. We asked similar questions as respondents without dietary restrictions except for two questions. Sixth and seventh section was for respondents without diagnoses and also without alternative type of eating and we asked similar questions as others. Last section was focused on identification questions while obtaining anonymity.

Characteristics of survey respondents

The questionnaire survey had 57 respondents, with 26 men and 31 women. 8.77 percent of respondents were under the age of 18, 22.81 percent were between the ages of 18 and 24, 35.09 percent were between the ages of 25 and 49, 24.56 percent were between the ages of 50 and 64, and 8.77 percent were over the age of 65. The Nitra region received the most responses, while the Banská Bystrica and Bratislava regions received the fewest. Women aged 25-49 from the Nitra region were the most numerous group of respondents.

Chi-square test of independence

When testing associations, we determine whether there is a dependence between the given attributes, i.e., whether a given occurrence of a certain attribute X is likely to assume the occurrence of another attribute Y. When examining the dependence between the attributes we verify the following hypotheses:

Null hypothesis: Attributes are independent.

Alternative hypothesis: Attributes are dependent.

The test criterion is expressed by formula:

$$\chi^2 = \sum_{i=1}^m \sum_{j=1}^r \frac{(E-T)^2}{T} \quad (1)$$

where: m – number of rows, r – number of columns, n – total number of respondents, E - empirical frequency, T – theoretical frequency χ^2 – symbolizes the calculated test criterion.

We measured the intensity of the dependence using:

Pearson’s coefficient

$$C = \sqrt{\frac{\chi^2}{n+\chi^2}} \quad (2)$$

Where:

- χ^2 – symbolizes the calculated test criterion,
- n – symbolizes total number of respondents.

The correlation coefficient can have a value between -1 and 1. If the correlation coefficient is equal to zero, it indicates there's no linear relationship between the variables under consideration. For our case (2x2 table) the maximum of coefficient is 0.7, what means that values near 0 are weak dependence, values near 0.353 are medium strong and from 0.4 to 0.7 can be consider as there is a strong dependence.

Cramer V coefficient

$$V = \sqrt{\frac{\chi^2}{n(\min((m,r)-1))}} \quad (3)$$

where: m – number of rows, r – number of columns, n – total number of respondents, χ^2 – symbolizes the calculated test criterion.

The values of coefficient is <0;1>. That means values from 0 to 0.5 are weak, values around 0.5 are medium strong and values near one are consider for strong dependence.

Correspondence analysis

Correspondence analysis, also known as reciprocal averaging, is an effective data science visualization tool to determine and presenting the connection between categories. In presented paper was correspondence analysis used for presentation of relationship between frequency of consumption of bakery products and age of respondents.

For calculations were used software SAS and Microsoft Excel.

3. Results and Discussion

In the first section of the paper, we focused on determining the dependence, or independence, between the presence of dietary restriction and the gender of the consumers. **Table 1** presents the data input from the survey that was conducted in 2022, specifically the chi square estimation.

Table 5 Calculation of chi square

	Male	Female	Calculation
have	2,915	2,445	
don't have	1,239	1,039	

7,638

Source: author’s calculations

The test characteristic was 7.638, with a critical value of 3.841 (for alpha = 0.05). Based on the findings, we can conclude that the presence of health dietary restrictions is statistically significantly related to the gender of the consumers (alpha = 0.01, critical value = 6.635). We can

affirm a weak dependence reaching the medium - strong dependence based on the coefficients evaluating the intensity of the dependence (Pearson's coefficient = 0.344, whereas the values for medium strong dependence = 0.353, Cramer's V coefficient = 0.369). **Table 2** shows the data from the questionnaire survey from January and February 2022. In this section, we examined the relationship between the frequency of consumption of bakery products and the age of consumers.

Table 6 Calculation of chi square

Age/Consumption	Sometimes	Regularly	Never	Calculation
0-17	0,385	0,422	0,263	
18-24	0,009	0,030	0,684	
25-49	0,254	0,506	1,053	
50-64	1,566	1,190	0,094	
65 and more	0,385	0,277	11,463	
				18,581

Source: author's calculations

The test characteristic was 18.581, with a critical value of 15.507. Based on the findings, we can conclude that the frequency with which bakery products are consumed is statistically dependent on age of the consumers. We can affirm a medium strong dependence relying on the coefficients measuring the intensity of the dependence (Pearson's coefficient = 0.496, Cramer's V coefficient = 0.581).

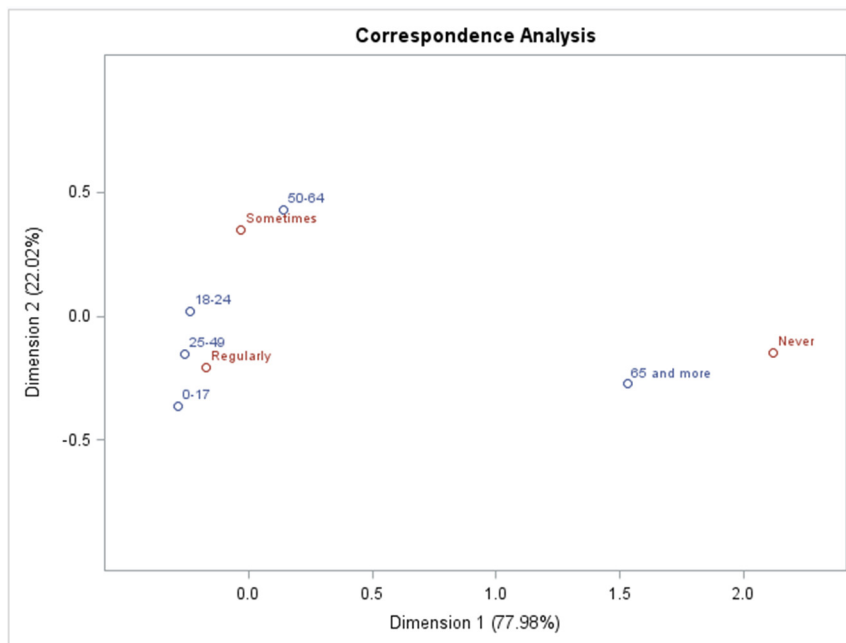


Figure 2 Relation of consumption of bakery products to the age of respondents

Source: author's calculations

As can be seen in **Figure 1**, Slovak respondents, in age from child to middle adulthood, consume bakery products regularly. Respondents in late adulthood according to answers from questionnaire survey consume less bakery product than younger consumers. Older respondents specifically respondents older than 65 years are more likely prone to minimal or none consumption of bakery products.

As the last part of presented paper we examined the degree of agreement with the statement according to the segmentation of consumers into three categories, namely the consumer with a voluntary alternative diet, the consumer with a dietary restriction and the traditional consumer.

Slovak respondents were asked, if they agree with statement: “My main reason for consuming bakery products is that I consider bakery products as essential.” In the following figures can be seen relative abundances of degree of agreement. Respondents have choice to partially agree or partially disagree even if it seems to be the same answers. Partially agree is for respondents which more agree than disagree and partially disagree are for respondents which more disagree than agree.

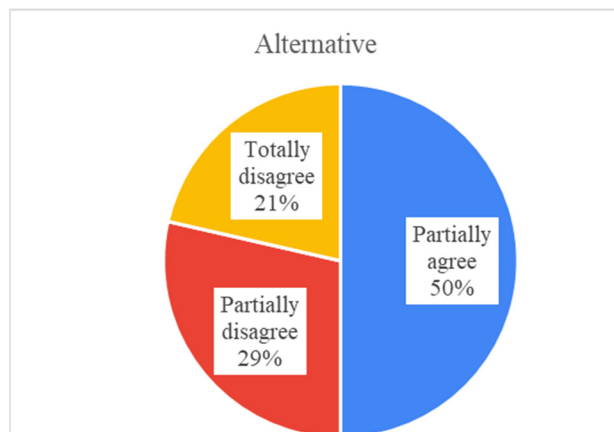


Figure 3 Answers from respondents on the alternative type of diet

Source: author's calculations

From **Figure 2** we can state, that 50% of respondents with alternative type of eating partly or totally disagree and 50% partially agree but none of respondents answered that they totally agree.

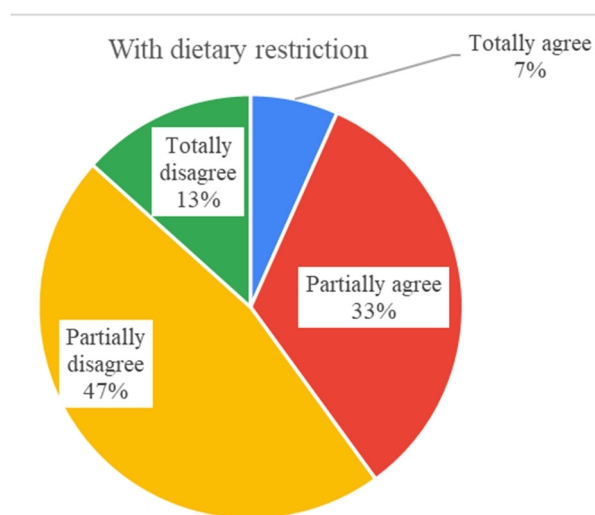


Figure 4 Answers from respondents with dietary restriction

Source: author's calculations

From **Figure 3** we can say that 40% totally or partially agree and 60% partially or totally disagree with statement.

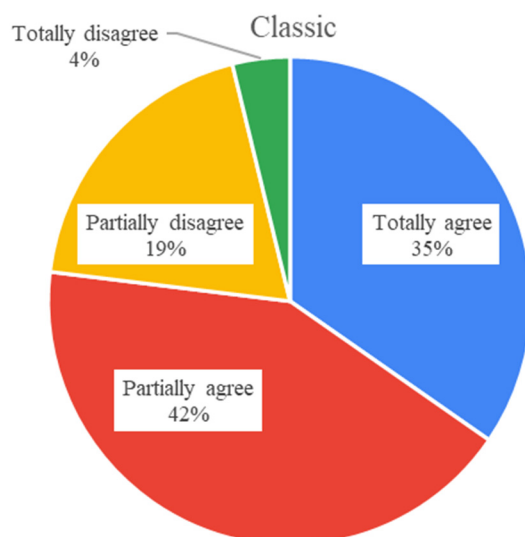


Figure 5 Answers from classic/traditional respondents

Source: author's calculations

The last segment of consumers of bakery products were classic or traditional consumers. Relative abundance of answers can be seen in **Figure 4**. 77% of respondents stated that they fully agree, resp. they partially agree that they consider bakery products as essential. Less than a quarter of respondents disagreed with presented statement.

4. Conclusion

Our intention, based on a questionnaire survey, was to analyze the relationship between the presence of health dietary restriction and the gender of consumers, in the next part we analyzed the relationship between the age of consumers and the frequency of consumption bakery products. In the subsequent section, using SAS software, according to the results from **Figure 1**. we found out that from child age to middle adulthood age there was a frequency of regular eating of bakery products. The reason may be the fact that, as is well known, Slovak consumers, from kindergartens to workers, usually have bakery products for breakfast or even for a snack. Respondents aged 50-65, which is consider as a late adult, eat less bakery products than younger ones. We believe that the reason is age awareness and the effort to start eating healthier. Another reason is that diagnosed food allergies, which cause restrictions on certain types of food (for our research, these are bakery products), are more common than a few years ago. In the last part of our research, we find out the respondents' opinions as to whether they consider a bakery product to be essential or not. Respondents were divided into three categories, namely voluntary alternative diet consumer, dietary consumer and traditional consumer. Based on the results, we can state that there are differences between the traditional consumer and the other two categories. The average consumer considers bakery products to be more necessary or essential than the other two categories. Other dependencies will be explored in the following research, which is part of the dissertation, but also part of the VEGA project: Challenges for food security in Europe in the 21st century - key factors, socio-economic and environmental contexts.

Acknowledgements

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References

- [1] Ashley, J., M., (2016). Causes of Food Insecurity. In Food Security in the Developing World. Academic Press, (pp. 39-55), ISBN 9780128015940, <https://doi.org/10.1016/B978-0-12-801594-0.00003-8>.
- [2] Brites L, Schmiele M, Steel C (2018). Gluten-Free Bakery and Pasta Products. In: Alternative and Replacement Foods. pp 385-410. DOI <https://doi.org/10.1016/B978-0-12-811446-9.00013-7>
- [3] Elena P et al. (2021). Consumer preferences and expectations. In: Trends in Wheat and Bread Making. Pp 431-458. 2021. <https://doi.org/10.1016/B978-0-12-821048-2.00015-5>
- [4] Gómez, M. (2021). Gluten-free bakery products: Ingredients and processes. In Advances in Food and Nutrition Research. 2021. ISSN : 1043-4526 DOI : 10.1016/BS.AFN.2021.11.005
- [5] Hansen C, et al. (2022). Gluten-free diet reduces autoimmune diabetes mellitus in mice across multiple generations in a microbiota-independent manner. In: Journal of Autoimmunity. 2022. <https://doi.org/10.1016/j.jaut.2022.102795>
- [6] Pacáková, V. et al..2009. Statistical methods for economists. Bratislava: Iura Edition. 411 p. (in Slovak).
- [7] Padma Ishwarya S, Prabhasankar P (2014). Prebiotics: application in bakery and pasta products. Critical Reviews in Food Science and Nutrition, 01 Jan 2014, 54(4): 511-522 DOI: 10.1080/10408398.2011.590244 PMID: 24237001
- [8] PKS. 12.3.2020.: Slovenské pekárne sa využívajú len na polovicu . Bratislava 2020. Available online < <http://www.potravinari.sk/page7511sk.html>>
- [9] Rajput M, Chauhan A, Makharia G (2022). Epidemiology and clinical features of celiac disease in adults. In: Coeliac Disease and Gluten-Related Disorders. Pp 1-23. <https://doi.org/10.1016/B978-0-12-821571-5.00012-X>
- [10] Richardson A. et al. (2022). Gluten-free diet adherence and implications for the diagnosis of coeliac disease. In: Pathology. 2022 <https://doi.org/10.1016/j.pathol.2021.12.297>
- [11] Rodríguez-Artalejo, F., López García, E., Gorgojo, L., Garcés, C., Royo, M., Martín Moreno, J., De Oya, M. (2003). Consumption of bakery products, sweetened soft drinks and yogurt among children aged 6–7 years: Association with nutrient intake and overall diet quality. British Journal of Nutrition, 89(3), 419-428. doi:10.1079/BJN2002787 Published online by Cambridge University Press: 09 March 2007. British Journal of Nutrition
- [12] Serra-Majem L, Ribas L, Ngo J, Ortega RM, García A, Pérez-Rodrigo C, Aranceta J. Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean Diet Quality Index in children and adolescents. Public Health Nutr. 2004 Oct;7(7):931-5. doi: 10.1079/phn2004556. PMID: 15482620. Published online Cambridge University Press: 2. January 2007.
- [13] Sharma, C., Jayanty, S.S., Chambers, E. IV., Talavera, M. Segmentation of Potato Consumers Based on Sensory and Attitudinal Aspects. Foods. 2020; 9(2):161. <https://doi.org/10.3390/foods9020161>
- [14] Silow, C., Axel, C., Zannini, E., & Arendt, E. K. (2016). Current status of salt reduction in bread and bakery products – A review. Journal of Cereal Science, 72(Complete), 135–145. <https://doi.org/10.1016/j.jcs.2016.10.0109>.
- [15] Vigneau E., Qannari E.M. 2002. Segmentation of consumers taking account of external data. A clustering of variables approach. Food Quality and Preference, 13 (7-8), pp. 515-521.

Pork Meat and Meat Products Market in the Slovak Republic

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Abstract

Currently, pork is the most consumed meat and has a key role in the diet, mainly due to its nutritional composition. However, in recent years, its consumption has been steadily increasing, which may lead to negative effects on consumer health, and growing production may have a negative impact on the environment. Based on the mentioned factors and the rising production costs, the aim of the paper is to point out the current market of pork meat and meat products in Slovakia in terms of production and consumption, as well as to identify consumer behavior. The results show that pork production has a slow growing trend and currently reaches almost 13 kg per capita and year. Consumption of pork in Slovakia is still growing and currently exceeds the recommended doses by 70%. These are also confirmed by the results of a survey conducted by 1,311 pork consumers. We found that the average annual consumption of pork is more than 35 kg per respondent and the amount of consumption is mainly affected by gender, age, education, residence, as well as the eating habits of consumers. Consumption is also influenced by factors determining purchase and consumption and consumers pay particular attention to the quality and freshness of the pork. Given the results achieved and current market trends, it is desirable that the consumption of pork should be eliminated, and consumers should focus on quality pork meat of Slovak production.

Keywords: Consumption, Factors, Pork meat and meat products, Slovak Republic

JEL Classification: M31, M39, Q13

1. Introduction

Pork is an important source of nutrients, is a nutritious food and is the most frequently eaten meat in the world (Kung, Wang & Liang, 2021). This may be justified by the fact that pork meat is classified as red meat and enriches the diet with a significant amount of energy, macronutrients, and micronutrients (Penkert, Li, Huang, Gurcan, Chung & Wallace, 2021). In addition, pork is generally cheaper and more affordable than beef, so pork meat and products sometimes represent an alternative to beef among red meat consumers (McNeil, 2014). Despite the above, pork also has many advantages. Pork is rich in protein and other essential nutrients such as iron, zinc, and B vitamins (An, Liu & Liu, 2020; Verbeke, Pérez-Cueto, Barcellos, Krystallis & Grunert, 2010). Moreover, meat proteins improve overall health and strengthen the immune system. Meat consumption also has beneficial effects on cognitive and psychomotor processes. In addition, consumption can strengthen the central nervous system and mental health (Dobersek, Wy, Adkins, Altmeyer, Krout, Lavie & Archer, 2021; Darooghegi Mofrad, Mozaffari, Sheikhi, Zamani & Azadbakht, 2021). On the other hand, excessive consumption of red meat can adversely affect the health of consumers and can cause health problems such as cardiovascular disease, colon cancer, obesity, diabetes, high blood pressure or stroke (McNeil & Van Elswyk, 2012).

It is important to emphasize that the demand for meat in developing countries continues to increase, together with growing incomes and a higher degree of urbanization. These aspects are key and lead to higher food consumption, and consumers prefer to consume food of animal origin and, especially pork, mainly due to the fact that its production is cheaper compared to other farm animals (Brondz, 2018). On the other hand, it is important to note that pork production is increasingly determined by rising input prices, such as compound feed, energy and labor prices. These factors will also be reflected in the consumer prices of pork meat (Szűcs and Vida, 2017).

In the context of the above, it is necessary to point out the quality of pork production and Slovak pork producers are one of the best pork producers in the European Union in terms of quality parameters. They are considered as strong producers with experienced management and sufficient investment equipment for modernization of production who are able to adapt to the ever-changing requirements of consumers resulting from the current globalized environment (Matošková & Gálik, 2016). Higher quality is also achieved by a minimum of antibiotics in pork, Slovak pigs show a value of only 43.2 mg of antibiotics per kilogram of live weight (Cebrová, 2019). Quality Slovak fresh pork is dry on the surface and contains a relatively low water content (4.53 ml per kg of meat), which spilled into the packaging and later during the heat treatment of the meat. Fresh quality Slovak meat can also be identified based on a light, pink color. The quality of pork produced in the Slovak Republic also depends on other factors, such as the method and system of breeding, the quality of compound feed, access to water, welfare of pigs, as well as transport to the slaughterhouse, housing before slaughter and elimination of animal stress (Devánová, 2018). <https://vedanadosah.cvtisr.sk/slovenske-maso-je-kvalitou-porovnatelne-so-zahranicnym>

2. Data and Methods

The aim of the paper is to examine current situation in pork meat market in Slovakia in terms of production and consumption and also identify consumer behavior of Slovak consumers. For achievement of the aim data obtained from Statistical Office of the Slovak Republic were analyzed using mathematical methods and calculation of the average growth coefficient k' . These data were also the basis for examining the development of the trend in production and consumption of pork meat which was described by using regression functions. The current situation in the pork market was also confronted by meat producers who have been the subject of research. Survey focused on meat producers was carried out in 2019 and 2020 by personal and e-mail communications and was attended by 26 companies from Slovakia.

Moreover, the consumer survey was conducted, and the aim was to determine the level of consumption of pork meat and meat products and to identify consumer behaviour on the Slovak pork market. The questionnaire survey was conducted on a sample of 1,409 respondents in Slovakia in the years 2019 - 2020 in an electronic version. Consumers who do not consume pork were excluded from that sample and thus the total number of consumers of pork meat and meat products was 1311. These respondents were divided into eight categories: gender, age, education, economic status, number of household members, monthly income of the respondent, monthly household income (Table 1).

Table 1: Distribution of pork meat and meat products consumers in terms of demographic characteristics

Gender			Monthly income of respondent		
Man	556	42.4%	Up to 500 €	514	39.2%
Woman	755	57.6%	501-1,000 €	493	37.6%
Age			1,001-1,500 €	210	16.0%
Up to 25 years	498	38.0%	More than 1,501€	94	7.2%
26-35 years	282	21.5%	Monthly income of household		
36-50 years	293	22.3%	Up to 1,000 €	235	17.9%
More than 51 years	238	18.2%	1,001-2,000 €	649	49.5%
Education			2,001-3,000 €	307	23.4%
Elementary	45	3.4%	More than 3,001€	120	13.5%
Secondary	635	48.4%	Number of members in household		
Higher education	631	48.1%	1	69	5.3%
Economic activity			2	257	19.6%
Employed	638	48.7	3	359	27.4%
Student	401	30.6%	4	404	30.8%
Self-employed	119	9.1%	More than 4	222	16.9%
Unemployed	11	0.8%	Residence		
Retired	105	8.0%	City	695	53.0%
Maternity leave	37	2.8%	Rural area	616	47.0%

Source: questionnaire survey, 2020

Consumer survey was aimed to the amount of pork meat consumption, and it was identified based on detailed recalculations of portions of individual types of pork meat and meat products. Consumers determined the average quantities consumed per week in portions, which were then converted to kilograms and year. Based on the consumption, the respondents were divided into three groups: consumers with low consumption, consumers with adequate consumption, and consumers with excessive consumption. Moreover, the dependence between pork meat and meat products consumption and selected demographic characteristics were examined using Chi-square test of independence. Survey was also orientated on the factors determining pork meat purchase and consumption. The factor analysis was based on a 25-item factors, which were evaluated by consumers at the scale from 1 to 10, where 1 represents the less important factor and 10 represents the most important factor. Factors were divided into latent components by using categorical principal component analysis (CATPCA). Data were elaborated by IBM SPSS software.

3. Results and Discussion

The trend in pork production was accompanied by an average annual decline of 3.86% ($k' = 0.9614$). In 2020, 70.49 thousand tons of pork were produced, which represents a decrease compared to the first year of the analyzed period by up to 42.34% (Figure 1). The Slovak Republic accounts for approximately 0.2% of pork production in the European Union. At present, the Slovak Republic has a very low production per capita, only 12.9 kg. The development of pork production is influenced by several factors. The decrease in production is mainly related to the decrease of livestock, the absence of subsidy incentives, increasing imports of pork, low price competitiveness, relatively low interest of Slovak consumers in meat of Slovak origin due to

higher prices, as well as a weak level of local patriotism (Matošková & Gálik, 2016). Furthermore, there are rising costs and higher input prices (Katina, 2019). Swine diseases, such as classical swine fever or the current African swine fever, have also had a negative impact on producers of pork meat (Ministry of Agriculture and Rural Development of the Slovak Republic, 2022). The trend of pork production in the Slovak Republic in the years 2006 - 2020 was expressed using a quadratic function with the following parameters:

$$q_t = 141.63 - 16.365 * t + 0.7931 * t^2 \quad R^2 = 0.9786$$

Based on the chosen quadratic function, it is possible to assume the future direction of pork production, should be approximately at the same level with a slight increasing tendency. The development of production may be influenced by several factors, which we have identified based on a survey conducted with producers of meat and meat products in the Slovak Republic. Important factors include a lack of skilled labor, a shortage of processors and slaughterhouses, problems in pig farms, high rates of cheaper meat imports, low competitiveness, high price of Slovak pork, low level of state support and rising production costs.

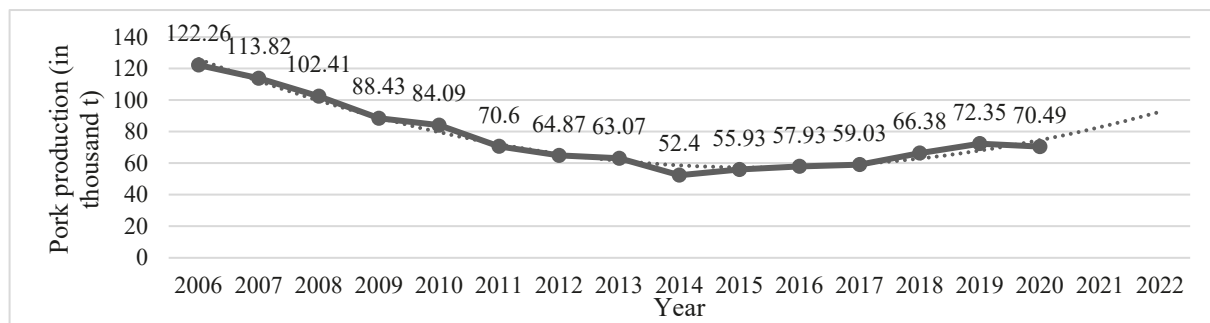


Figure 1: Pork meat and meat products production in the Slovak Republic in the years 2006-2020 (in thousand t)

Source: Statistical office of the Slovak Republic, 2022

The consumption of pork had a slightly increasing trend in the observed period 2006-2020 and ranged from 32.2 kg to 37.5 kg per capita in the Slovak Republic per year and the average growth of consumption was 1.09% ($k' = 1.0109$). During the analyzed period, a significant decrease in the pork meat and meat products consumption was recorded in 2014, which was mainly due to lower prices of poultry meat. Since that year, there has been a relatively sharp increase in pork consumption of almost 10 kg, which represented an increase of 33.9% (Figure 2). In Slovakia, lower consumption is achieved compared to the average consumption in other member states of the European Union (41.0 kg). We have chosen quadratic function with following parameters to describe the development trend of pork consumption in the Slovak Republic:

$$q_t = 34.059 - 1.212 * t + 0.0923 * t^2 \quad R^2 = 0.7152$$

Based on the chosen quadratic function, it is also possible to assume the pork and pork meat consumption in the next two years. It is assumed that consumption should increase and exceed 40 kg per capita in the Slovak Republic in 2022, so the level of consumption will approach the consumption recorded in European Union. This development trend may have a negative impact on the health of consumers due to exceeding the recommended dose by more than 100%. Consumption could be determined by increasing household incomes, declining pork prices, the availability of pork in grocery stores, support for the sale of pork, but also by prices of substitute types of meat.

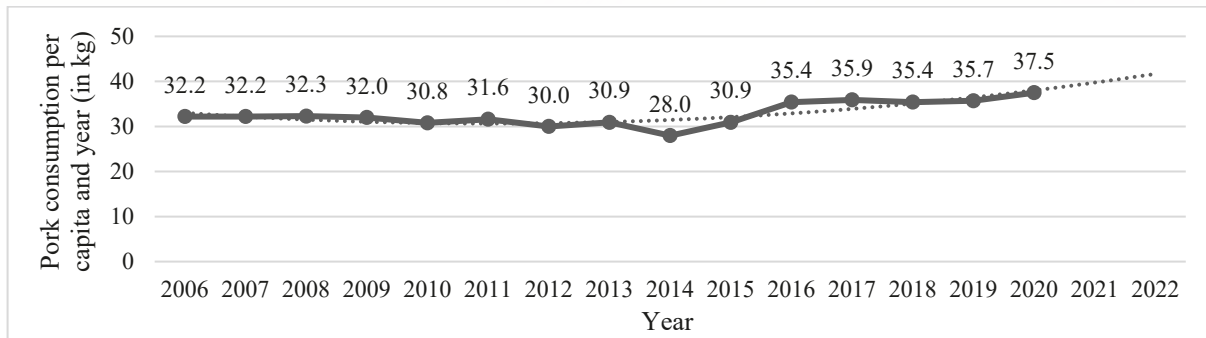


Figure 2: Pork meat and meat products consumption per capita in the Slovak Republic in the years 2006-2020 (in kg)

Source: Statistical office of the Slovak Republic, 2022

Based on data from the Statistical Office of the Slovak Republic (2022), it is possible to state increasing pork meat and meat products consumption and declining pork meat and meat products production, which is reflected in the negative trend of self-sufficiency in the pork market. The self-sufficiency of the Slovak Republic is about 40%, which means that the demand for pork is covered by imported meat mainly from the Czech Republic, Germany, Poland, Spain, Belgium, Hungary, and the Netherlands. Import meat represents approximately 70-80%, but their quality parameters are often not comparable with Slovak pork (Sedlák, 2018; Urbánik, 2021). A survey carried out by the Research Institute of Animal Production in Nitra showed that these qualitative parameters relate to the freshness, the free water content, the protein content, the presence of antibiotics and other additives. On the other hand, it is important to emphasize that quality pork meat produced in Slovakia is exported to Hungary, the Czech Republic, Poland, the Netherlands, and Romania. 70% of Slovak pork production is exported to foreign markets (Research Institute for Animal Production Nitra, 2022). The solution is that pig farming and pork production would be supported by subsidies at all levels of the vertical, as well as in other member states of the European Union. Slovak producers should also be supported by Slovak consumers who would be willing to buy and consume meat of Slovak origin, which is, however, about 25% more expensive than foreign ones.

In the context of the above, we examined the consumption of pork meat and meat products among Slovak consumers. We focused on the amount of consumption and key factors determining the pork consumption. Based on the results, it can be stated that the average consumption of pork meat and meat products per pork consumer involved in the questionnaire survey is 35.6 kg, so weekly consumption of pork meat and meat products is at the level of approximately 0.69 kg. The weekly consumption of the average Slovak pork consumer consists of 240 g of meat, 103 g of sausages, 83 g of ham, 70 g of canned meat and 186 g of other pork products (salami, sausage, bacon, stuffing, liver).

We diversified pork consumers into three groups based on consumption - consumers with low consumption, adequate consumption, and excessive consumption (Table 2). The first group is represented by consumers with excessive consumption of pork and based on the results, it can be stated that more than 60% of Slovak pork consumers consume more than the recommended dose interval (more than 22 kg per year). The average weekly consumption of these consumers is almost 950 g and consists of 313 g of meat, 150 g of sausages, 113 g of ham, 263 g of other pork products and 110 g of canned food. The second group is represented by consumers with adequate consumption and their annual consumption is in the range of recommended doses of 20-24 kg per year. This group includes 7.6% of consumers whose average annual consumption is at the level of 22.2 kg. The average weekly consumption of pork consumer in this category is 426 g and consists of 193 g of meat, 63 g of sausages, 58 g of ham, 92 g of smoked pork meat products and 20 g of canned pork. The last category of consumers are consumers with low consumption of

pork. Insufficient consumption of this type of meat was found in almost a third of respondents and on average their annual consumption reaches the level of 12.5 kg. The weekly consumption of these consumers is 240 g and includes 115 g of meat, 24 g of sausages, 32 g of ham, 69 g of other pork products.

Table 2: Average pork meat and meat products consumption per consumer included in the survey (divided into groups of consumers based on the amount of pork consumption)

Pork meat and meat consumption	Pork meat consumers			Average pork meat consumer
	Low consumption	Middle consumption	High consumption	
<i>Pork meat and meat products annual total consumption</i>	12.51 kg	22.2 kg	49.53 kg	35.55 kg
<i>Pork meat and meat products weekly total consumption</i>	239.93 g	425.76 g	949.81 g	681.73 g
<i>in that: meat</i>	114.81 g	193.18 g	313.39 g	240.39 g
<i>sausages</i>	24.17 g	62.88 g	149.62 g	102.69 g
<i>ham</i>	31.87 g	57.58 g	113.16 g	82.80 g
<i>salami</i>	33.77 g	46.97 g	108.04 g	79.52 g
<i>other smoked meat products</i>	29.44 g	45.46 g	155.67 g	106.72 g
<i>canned meat</i>	5.86 g	19.70 g	109.94 g	69.62 g

Source: own processing

In connection with the pork meat consumption, we also examined the differences between the amount of pork consumption (consumer categories) and selected demographic characteristics. Based on the applied Chi-square test of independence (Table 3), it is possible to state that differences exist in the following categories: gender, age, education, permanent residence, monthly income, as well as eating habits ($p\text{-value} = <0.05$). The results showed that men consume more pork than women and they tend to excessive pork consumption. This may be justified by the fact that women tend to choose poultry meat or fish meat, which is easier to digest. In addition, research has shown that men are larger consumers of meat (Frank, Jaacks, Batis, Vanderlee & Taillie, 2020). Furthermore, it can be stated that older consumers (over 50 years) consume more pork and products than younger ones. 70% of consumers over the age of 50 show excessive consumption of pork, while 45% of consumers under the age of 25 consume less pork and do not even reach the recommended consumption interval. This may be justified by the fact that younger consumers tend to be flexitarian, vegetarian, or vegan and the older population is more likely to be omnivorous. Consumer education also has an impact on the amount of pork consumption. An interesting finding is that consumers who consume low or moderate levels of pork have a university degree. This can be explained by the fact that erudite consumers are aware of the negative consequences of excessive meat consumption, as well as the negative impact of livestock production on the environment. Consumers with low and adequate consumption of pork are mainly consumers from the cities. This fact can be explained by the fact that urban consumers are more influenced by new trends and tend to reduce the consumption of pork. The amount of consumption of pork meat and meat products is also affected by the eating habits of consumers. The results showed that more than 10% of consumers with low pork consumption eliminate meat consumption and they also prefer meat substitutes. On the other hand, 95% of consumers with excessive pork consumption prefer meat consumption and meat substitutes do not consume almost at all. Papanagiotou, Tzimatra-Kalogianni and Melfou (2013) identified gender, level of education, or eating habits as determinants influencing pork consumption.

Table 3: Results of Chi-square test of independence to test dependences between pork meat and meat products consumption and demographic characteristics

<i>Demographic characteristics (Factor)</i>		<i>Total</i>	<i>Level of consumption</i>			<i>p-value</i>
			<i>Low</i>	<i>Middle</i>	<i>High</i>	
		1,311 (100%)	422 (32.19%)	99 (7.55%)	790 (60.26%)	
Gender	<i>Men</i>	556	104	35	417	<0.0001
	<i>Women</i>	755	318	64	373	
Age	<i><25 years</i>	498	215	41	242	<0.0001
	<i>26-35 years</i>	282	66	24	192	
	<i>36-50 years</i>	293	88	21	184	
	<i>>50 years</i>	238	53	13	172	
Education	<i>Elementary</i>	45	10	1	34	<0.0001
	<i>Secondary</i>	635	172	43	420	
	<i>University</i>	631	240	55	336	
Residence	<i>City</i>	695	242	58	395	<0.0001
	<i>Countryside</i>	616	180	41	395	
Number members	<i>1 member</i>	69	27	3	39	0.6479
	<i>2 members</i>	257	87	19	151	
	<i>3 members</i>	359	105	33	221	
	<i>4 members</i>	404	135	30	239	
	<i>> 4 members</i>	222	68	14	140	
Monthly income of household	<i>< 1,000 €</i>	235	82	23	130	0.1964
	<i>1,001 – 2,000 €</i>	649	217	41	391	
	<i>2,001 – 3000 €</i>	307	85	28	194	
	<i>> 3,0001 €</i>	120	38	7	75	
Dietary preference	<i>Meat consumption preferences</i>	1219	375	96	748	0.0013
	<i>Meat/Meat analogues preferences</i>	73	39	2	32	
	<i>Meat analogues preferences</i>	19	8	1	10	

Source: own processing

Pork meat and meat products consumption can also be influenced by other factors that are important for consumers during the purchase process. In the context of the mentioned, pork consumers rated 25 factors that influence their purchase and subsequent consumption on a scale of 1 to 10, with 1 being an insignificant factor and 10 a very important factor. The results showed that quality and freshness are the most important aspects. For a deeper analysis, we applied a categorical principal component analysis (CATPCA) based on which we identified hidden relationships between the factors examined. Three latent components have been identified – factor of product, factor of composition and factor of sales support (Table 4). Other studies have also focused on factors influencing the purchase and consumption of pork meat, and the results have shown that price, quality, and country of origin are crucial for consumers (Papanagiotou, Tzimitra-Kalogianni & Melfou, 2013; Kung, Wang & Liang, 2021; Grunert, 2005; Font-i-Furnols, Realini, Montossi, Sanudo, Campo, Oliver, Nute, & Guerrero, 2011). Consumers also

consider the freshness and safety of food (Hati, Zuliatni, Achyar & Safira, 2021; Wu, Gong, Qin, Chen, Zhu, Hu & Li, 2017). Špička, Náglová and Mezera (2017) add that freshness, quality, and price are the most important factors for consumers, but organic quality, place of purchase, animal welfare and brand are the least important factors. McCarthy, O'Reilly, Cotter and Boer (2004) state that price, income, taste, safety, and environmental aspects are key in meat consumption.

Table 4: Factors determining purchase and subsequently consumption of pork meat and meat products

Factors	Dimensions		
	1.	2.	3.
<i>Freshness of the product</i>	0.899	0.207	0.092
<i>Product fragrance</i>	0.822	0.246	0.152
<i>Proportion of meat</i>	0.789	0.346	0.023
<i>Product appearance</i>	0.781	0.199	0.163
<i>Country of origin</i>	0.761	0.322	0.165
<i>Durability</i>	0.729	0.215	0.306
<i>Previous experience</i>	0.723	0.124	0.289
<i>Product price</i>	0.701	0.096	0.248
<i>Producer</i>	0.687	0.336	0.246
<i>Health aspect</i>	0.627	0.403	0.335
<i>Product information on the packaging</i>	0.548	0.344	0.479
<i>Saturated fatty acid content</i>	0.175	0.841	0.256
<i>Salt content</i>	0.222	0.807	0.249
<i>Water content</i>	0.336	0.789	0.108
<i>Fat content</i>	0.275	0.773	0.277
<i>Emulsifiers</i>	0.382	0.762	0.089
<i>Energy value</i>	0.220	0.751	0.318
<i>Package appearance</i>	0.230	0.141	0.832
<i>Product promotion</i>	0.133	0.206	0.843
<i>Package size</i>	0.331	0.133	0.730
<i>Preparation speed</i>	0.154	0.246	0.703
<i>Ecological aspect (organic food)</i>	0.183	0.425	0.611

Source: own processing

4. Conclusion

Current trends in the consumption of meat and meat products lead to issues affecting the amount of consumption due to the changing lifestyle of consumers, eating habits, or the negative impacts of production on the environment. In the context of the above, the aim of the paper was to point out the situation on the market of pork meat and meat products, as the most consumed meat among consumers in the Slovak Republic. Based on the market analysis, we state that in the long-term perspective the pork production in Slovakia is developing negatively and with a view to the future will be affected mainly by rising input prices. However, pork consumption is popular in Slovakia and is one of the most consumed meats, mainly due to favorable consumer prices compared to other types of meat, especially beef. The conducted consumer survey showed that

the average annual consumption of pork meat and meat products is at the level of 35.6 kg. Respondents were divided into 3 groups in terms of the amount of consumption: consumers with low consumption, consumers with adequate consumption and consumers with excessive consumption of pork meat and meat products. We also identified differences between consumer groups in the following categories: gender, age, education, residence, monthly income, as well as eating habits. The main factors determining the purchase and consumption of pork meat and meat products can be considered a factor of product, factor of composition, as well as a factor of sales support. Based on the results, we propose to appeal to consumers to reduce the pork consumption due to the negative impact not only on the environment but also on the health of the consumer. Furthermore, it is necessary to inform Slovak consumers about the need of consumption of high-quality pork of Slovak origin, and thus it would be also possible to support Slovak producers. Despite the mentioned results, which could be applicable in practice, the paper also has limitations. The most significant is the fact that the consumption of pork meat and meat products was examined only in the Slovak Republic and results were related to consumer survey conducted among Slovak consumers. Therefore, in the future research it would be appropriate to focus on the current trends in pork meat consumption and examine consumer behavior in the other countries.

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References

- [1] An, R., Liu, J., & Liu, R. (2020). Pork Consumption in Relation to Body Weight and Composition: A Systematic Review and Meta-analysis. *American journal of health behavior*, 44(4), 513–525. doi: 10.5993/AJHB.44.4.12
- [2] Brondz, I. (2018). Why Judaism and Islam Prohibit Eating Pork and Consuming Blood as a Food?. *Voice of the Publisher*, 4, 22-31. doi: 10.4236/vp.2018.42003
- [3] Cebrová, L. (2019). *Na Slovensko si privádzame odpadové výrobky. Kvalitu z našich fariem posielame za hranice*. Retrieved January 20, 2021, from: <https://www.startitup.sk/na-slovensko-si-privazame-odpadove-vyrobky-kvalitu-z-nasich-fariem-posielame-za-hranice/>
- [4] Darooghegi Mofrad, M., Mozaffari, H., Sheikhi, A., Zamani, B., & Azadbakht, L. (2021). The association of red meat consumption and mental health in women: A cross-sectional study. *Complementary therapies in medicine*, 56, 102588. doi: 10.1016/j.ctim.2020.102588
- [5] Devánová, A. (2018). *Slovenské mäso je kvalitou porovnateľné so zahraničným*. Retrieved January 20, 2021, from <https://vedanadosah.cvtisr.sk/priroda/biologia/slovenske-maso-je-kvalitou-porovnatelne-so-zahranicnym/>
- [6] Dobersek, U., Wy, G., Adkins, J., Altmeyer, S., Krout, K., Lavie, C. J., & Archer, E. (2021). Meat and mental health: a systematic review of meat abstinence and depression, anxiety, and related phenomena. *Critical reviews in food science and nutrition*, 61(4), 622–635. doi: 10.1080/10408398.2020.1741505
- [7] Font-i-Furnols, M., Realini, C., Montossi, F., Sanudo, C., Campo, M., Oliver, M. A., Nute, G. R., & Guerrero, L. (2011). Consumer's purchasing intention for lamb meat affected by country of origin, feeding system and meat price: A conjoint study in Spain, France and United Kingdom. *Food Quality and Preference*, 22(5), 443–451. doi: 10.1016/j.foodqual.2011.02.007
- [8] Frank, S. M., Jaacks, L. M., Batis, C., Vanderlee, L., & Taillie, L. S. (2021). Patterns of Red and Processed Meat Consumption across North America: A Nationally Representative Cross-Sectional Comparison of Dietary Recalls from Canada, Mexico, and the United States. *International journal of environmental research and public health*, 18(1), 357. doi: 10.3390/ijerph18010357
- [9] Grunert, K. G. (2005). Food quality and safety: consumer perception and demand. *European Review of Agricultural Economics*, 32(3), 69–391. doi: 10.1093/euragg/jbi011

- [10] Hati, S., Zulianti, I., Achyar, A., & Safira, A. (2021). Perceptions of nutritional value, sensory appeal, and price influencing customer intention to purchase frozen beef: Evidence from Indonesia. *Meat science*, 172, 108306. <https://doi.org/10.1016/j.meatsci.2020.108306>
- [11] Katina, J. (2019). Nájďeme cestu zpět. *Řeznické noviny*, 9(1), 24-27.
- [12] Kung, M. L., Wang, J. H., & Liang, C. (2021). Impact of Purchase Preference, Perceived Value, and Marketing Mix on Purchase Intention and Willingness to Pay for Pork. *Foods (Basel, Switzerland)*, 10(10), 2396. doi: 10.3390/foods10102396
- [13] Matošková, D., & Gálik, J. (2016). Trh s hovädzím a bravčovým mäsom a jeho prognóza do roku 2020. *Ekonomika poľnohospodárstva*, 16(1), 88-105.
- [14] McCarthy, M., O'Reilly, S., Cotter, L., & de Boer, M. (2004). Factors influencing consumption of pork and poultry in the Irish market. *Appetite*, 43(1), 19–28. doi: 10.1016/j.appet.2004.01.006
- [15] McNeill S. H. (2014). Inclusion of red meat in healthful dietary patterns. *Meat science*, 98(3), 452–460. doi: 10.1016/j.meatsci.2014.06.028
- [16] McNeill, S., & Van Elswyk, M. E. (2012). Red meat in global nutrition. *Meat science*, 92(3), 166–173. doi: 10.1016/j.meatsci.2012.03.014
- [17] Ministry of Agriculture and Rural Development of the Slovak Republic. (2022). *Africký mor ošipáných*. Retrieved January 20, 2022, from <https://www.mpsr.sk/africky-mor-osipanych-aktualny-vyvoj-situacie/424---14648/>
- [18] Papanagiotou, P., Tzimitra-Kalogianni, I., & Melfou, K. (2013). Consumers' expected quality and intention to purchase high quality pork meat. *Meat science*, 93(3), 449–454. doi: 10.1016/j.meatsci.2012.11.024
- [19] Penkert, L. P., Li, R., Huang, J., Gurcan, A., Chung, M. C. & Wallace, T. C. (2021). Pork Consumption and Its Relationship to Human Nutrition and Health: A Scoping Review. *Meat and Muscle Biology*, 5(1), 1-22. doi: 10.22175/mmb.12953
- [20] Research Institute for Animal Production Nitra. (2022). *Slovenské bravčové mäso*. Retrieved January 25, 2022, from <http://www.vuzv.sk/index.php/en/component/content/article/872-2022-01-24-08-26-47>
- [21] Sedlák, J. (2018). *Slovensko sa mení na bravčové smetisko*. Retrieved January 24, 2022, from <https://ekonomika.pravda.sk/ludia/clanok/486211-slovensko-sa-meni-na-bravcove-smetisko/>
- [22] Špička, J., Náglová, Z., & Mezera, J. (2017, November 9). Consumers' Behaviour in the Czech Pork Meat Retail Market. *The International Scientific Conference INPROFORUM 2017* (pp. 103-107), České Budejovice, Czech Republic: University of South Bohemia in České Budějovice.
- [23] Statistical Office of the Slovak Republic (2022). Consumption of selected kinds of foodstuffs per capita [statistics]. Retrieved from DATAcube.
- [24] Szűcs, I., & Vida, V. (2017). Global tendencies in pork meat - production, trade and consumption. *Applied Studies in Agribusiness and Commerce*. 11, 105-112. doi: 10.19041/APSTRACT/2017/3-4/15
- [25] Urbánik, B. (2021, November 10). Ohrozený symbol domácností: Slovenský pôvod majú len 3 z 10 u nás skonzumovaných bravčových rezňov. *Rolnícké noviny*, 45, p. 1.
- [26] Verbeke, W., Pérez-Cueto, F. J., Barcellos, M. D., Krystallis, A., & Grunert, K. G. (2010). European citizen and consumer attitudes and preferences regarding beef and pork. *Meat science*, 84(2), 284–292. doi: 10.1016/j.meatsci.2009.05.001
- [27] Wu, L., Gong, X., Qin, S., Chen, X., Zhu, D., Hu, W. & Li, Q. (2017). Consumer preferences for pork attributes related to traceability, information certification, and origin labeling: Based on China's Jiangsu Province. *Agribusiness*, 33, 424–442.

Analysis of Meat Consumption in Slovakia in the third Millennium

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Abstract

The aim of the paper is to analyze the total meat consumption, consumption of individual types of meat in Slovakia in the third millennium with predictions to 2030. The consumption of fish in comparison with meat consumption is also presented. Data from the Statistical Office are presented in the paper. The data consist of beef, veal, pork, and poultry consumption. The analysis was carried out by means of mathematical statistics using a simple moving average. Moving averages are one of the core indicators in economic analysis, moving average is the easiest moving average to construct. It is simply the average consumer over the specified period. The paper also lists the factors affecting meat consumption (meat price, meat quality, environmental impact.) Knowing the values of meat consumption is important for pricing policy and consumer behavior for other types of food. The research results showed an increase in the consumption of chicken and pork and a decrease in the consumption of veal and beef.

Keywords: meat consumption, analysing the consequences, statistical results, environment, health

JEL Classification: Q13, L11, L66

1. Introduction

Interest in meat consumption and its impact on the environment and health has grown significantly over the last few decades. World food organisations present data at international and regional level, analyse the consequences of the deficiencies identified, and examine the environmental and health effects of meat consumption. Based on the results, they propose recommendations on meat consumption. They point to a lot of processed data, what kind of meat is processed, and present data on meat consumption. Of particular interest are also data on bone weight, food loss and waste, cooking weight loss and non-meat ingredients. Depending on the methods used to handle these ambiguous factors, statistical results for per capita meat consumption may vary by different factors.

Food statistics provide a clear but useful indicator of food consumption trends. Delgado (2003) cited an analysis by the Food and Agriculture Organization of the United States that meat consumption in the world increased by almost 60% between 1990 and 2009. Bogueva et al. (2017) explored reasons behind meat consumption. Their aims were find out, what motivates meat consumers and explore the opportunities of social marketing. Delgado (2003) found that the amount of meat consumed in developing countries increased three times as much as in developed countries between the early 1970s and mid-1990s, reflecting different income growth rates. Hawkesworth et al. (2010) report the factors that influence meat consumption in selected countries and link it to the trend of increasing fat consumption.

Meat consumption is also a current issue in Slovakia. Slovakia has recently gone through economic stages as well as the economic crisis in the process of globalization; these factors affect the standard of living and behaviour of households. The behaviour of the population in the market of goods and services is also affected by changes in economic conditions in the context of the

transformation process. In the long run, consumer behaviour is mainly influenced by demographic developments and social and political conditions (Pachingerová, M. 2000). Various food networks are being developed, offers in food markets throughout the country are being made and the market situation is being assessed. The already mentioned individual components of the food network enable us to react immediately to the offer. (Zentková, I. - Hošková, E. 2010). The standard of living of the population is usually compared according to food consumption, i.e., also meat consumption; we compare the share of consumer expenditure spent on food products measured as the percentage of total consumer expenditure per person. Kubicová (2008) writes about the share of consumer expenditure spent on food products as the percentage of the total consumer expenditure. Gradually increasing revenues turn into rising food spending, which leads to changes in consumer patterns. Income growth per capita is associated with slower growth in food spending, while housing, energy, health and transport spendings are rising.

Sans and Combris (2015) analysed dietary models for meat; they used data from 183 countries for the period 1961-2011, and pointed to the relationship between annual per capita gross economic product and meat consumption. They highlighted the sharp increase in meat consumption in China and Brazil. DE Baker at all. dealt with the idea of "Real men eat meat." Their results show that men who look more masculine consume less meat, have a greater tendency to reduce meat intake and have more positive attitudes towards vegetarians. Research has shown that not only biological differences between the sexes but also social and cultural differences between the sexes should be taken into account when analysing meat consumption.

Bonet et al. (2020) and Zur (2014) discussed the regulation of meat consumption in developed countries. Specifically, they discussed possible justifications for this regulation in terms of environmental, health and animal welfare considerations.

2. Data and Methods

For the analysis of meat consumption, we used data obtained from the website of the Statistical Office of the Slovak Republic. For data processing, we used basic mathematical statistics. We will analyse meat consumption in the first 20 years of the new millennium, compare meat consumption and fish consumption. Finally, we will compare the year 1993, when the Slovak Republic was established, with the year 2020. Table 1 shows the statistical data on meat and fish consumption between 2001 and 2010.

Table 1: The consumption of meat from 2001 to 2010 (values are in kilograms)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Meat	58.7	59.7	61.5	60.1	61.6	61.1	59.0	58.2	58.7	55.8
Beef	6.9	6.7	6.8	6.2	6.2	5.3	5.3	4.9	4.3	4.3
Veal	0.1	0.1	0.1	0.2	0	0	0.1	0.1	0.1	0
Pig	31.8	31.3	32.3	31.9	32.9	32.2	32.2	32.3	32.0	30.8
Lambs, goat and horse	0.3	0.3	0.3	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Fowls	18.5	20.1	20.7	20.4	21.1	22.3	19.9	19.3	20.7	19.0
Venison	0.3	0.4	0.5	0.4	0.4	0.4	0.5	0.6	0.6	0.7
Orther meat	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Fish	4.5	4.4	4.2	4.4	4.4	5.1	4.7	4.9	4.6	5.1

Source: <http://datacube.statistics.sk/>

Table 2 shows the statistical data on meat and fish consumption between 2011 and 2020, the values have been rising since 2014, from 2011 to 2014 we observe a decline in meat consumption.

Table 2: The consumption of meat from 2011 to 2020 (values are in kilograms)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Meat	56.6	52.5	53.3	47.9	50.6	58.4	62,8	64.3	69.3	69.9
Beef	3.7	3.6	4.4	4.2	4.3	4.7	5.2	5.2	5.2	5.3
Veal	0.1	0	0	0	0	0.1	0	0	0	0
Pig	31.6	30.0	30.9	28.0	30.9	35.4	35.9	35.4	35.7	37.5
Lambs, goat and horse	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Fowls	19.9	17.7	1,9	14.5	14.1	16.9	20.2	22.2	26.9	25.6
Venison	0.7	0.9	0.8	0.9	0.9	0.9	1.1	1.1	1.2	.,1
Orther meat	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2
Fish	4.7	4.8	5.1	5.4	5.3	5.1	5.5	5.5	5.6	5.9

Source: <http://datacube.statistics.sk/>

3. Results and Discussion

Meat consumption per capita was the lowest in 2014, then in 6 years, meat consumption increased by 22 kg per capita, which represents an increase of 31%. The largest contributor to the decline in total meat consumption was an increase in poultry consumption of 11.1 kg, which represents an increase of 79%. kg. From available EU data in 2014, the high consumption of meat per capita was in Denmark (108.3 kg), Austria (103.4 kg), and Portugal (101.5 kg). Recorded consumption of meat in Slovakia significantly lagged behind EU-countries which characterized a middle level of meat consumption for instance Germany (87.0 kg) and Nederland (88.2 kg). Figure 1 show the moving average on meat consumption between 2001 and 2020.

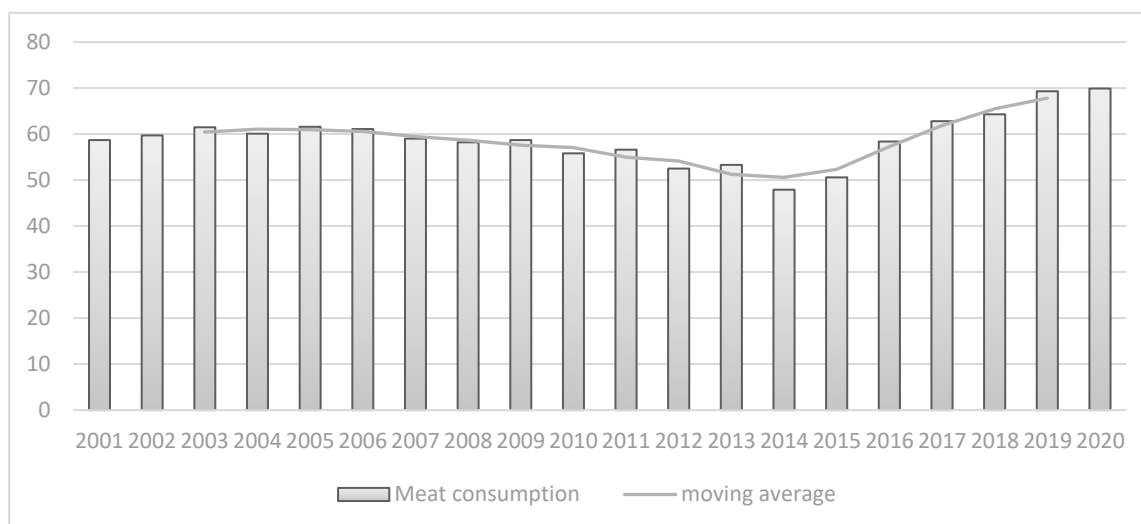


Figure 1: Meat consumption – moving average (values are in kilograms)

Source: author's calculations

Figure 2 shows the percentage of meat species between 2001 and 2019, that the change took place in 2015, when there was a decrease in pork consumption and an increase in chicken consumption began.

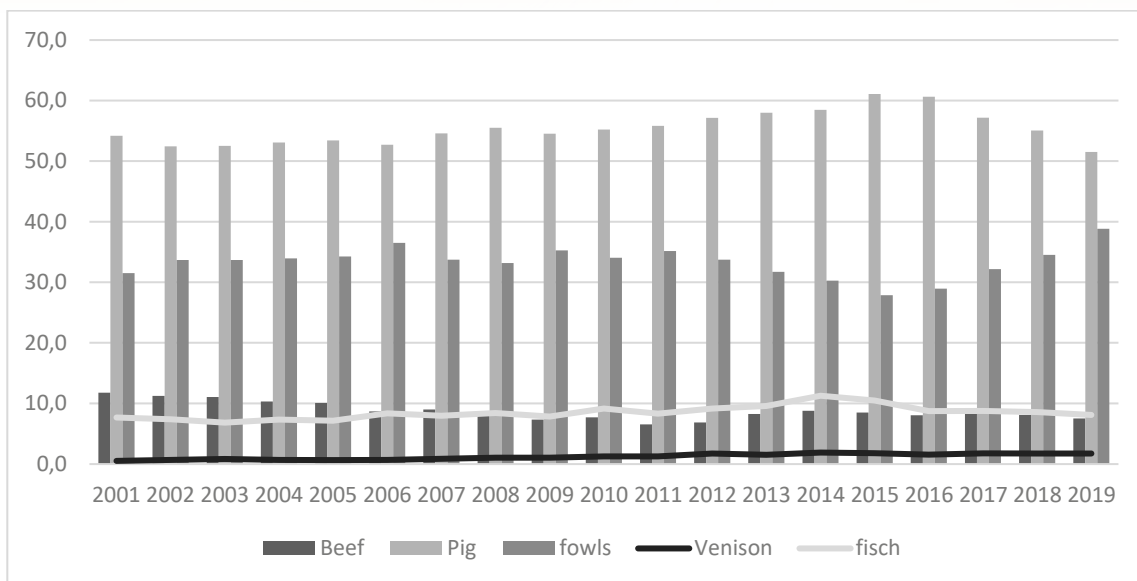


Figure 2: Percentage of meat species

Source: author's calculations

Figure 3 shows a comparison of pig, fowls and fish in percentages. The European Union estimates that total per capita meat consumption over the next 10 years will be similar to 2019 and 2020. Changes in consumer preferences, as well as changes in the dairy sector, will influence the meat market until 2030. Total meat consumption in the EU is projected to be at 67 kg in 2030, driven by lower meat availability.

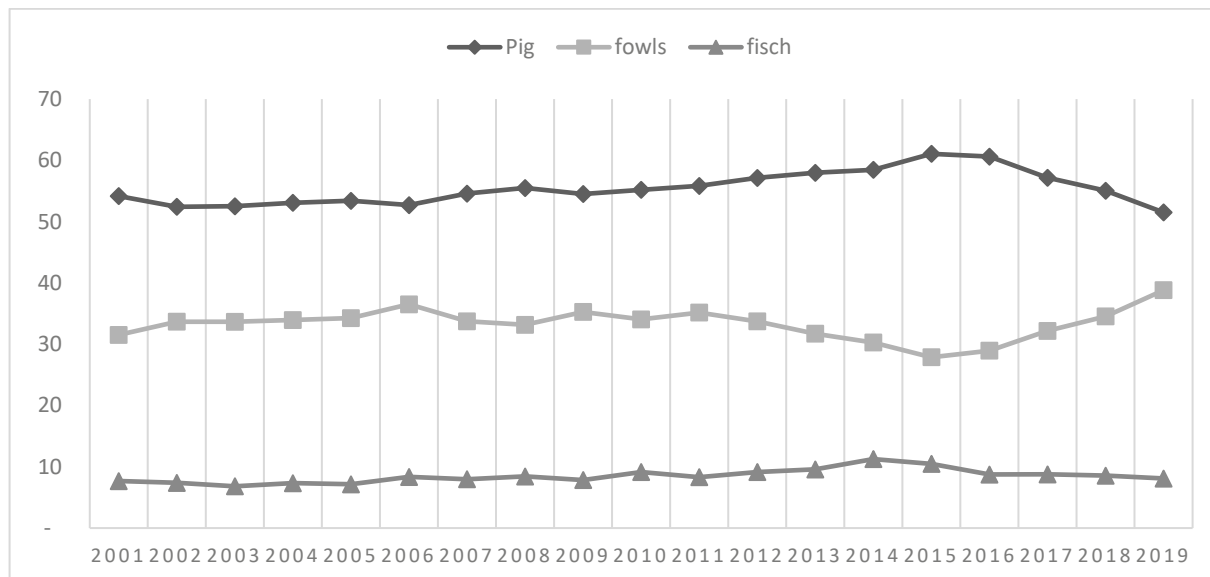


Figure 3: Percentage of meat species

Source: author's calculations

Consumption will also be affected by lower incomes among some population groups. By 2030, the European Commission expects pork and beef consumption to fall, while poultry consumption will increase. This is according to the European Union's agricultural outlook for 2018-2030, published by the European Commission. EU pork consumption will fall from 37.5 kg per capita in 2020 to 31.7 kg in 2030. Poultry will be the only meat to see a significant increase in EU production and consumption by 2030, according to the EC. Compared to other meats, it has

certain advantages such as affordability, absence of religious restrictions, lower production costs, and lower investment required.

Comparing 1993 and 2020, there has been a gradual reduction in veal and beef consumption; with veal consumption falling to almost zero and beef consumption falling by almost 70% (table 3). This is probably due to higher prices for beef and especially veal, but also to higher consumption of poultry and fish regarding healthier lifestyles. We can state that we have been eating less meat since 1993, the year the Slovak Republic was founded.

Table 3: Comparing 1993 and 2020 (1993 and 2020 values are in kilograms)

	1993	2020	difference
Meat	64.8	69.9	5.1
Beef	14.9	5.3	-15.4
Veal	0.7	0	-0.7
Pig	36.2	37.5	1.3
Venison	0.3	1.1	0.8
Fisch	3.8	5.9	2.1

Source: author's calculations

Total meat consumption has fallen by 10 percent. When we analyse poultry consumption, we find that consumption has increased by 114%. This is due to the fact that the cost of rearing and processing poultry has not increased, unlike the cost of rearing cattle.

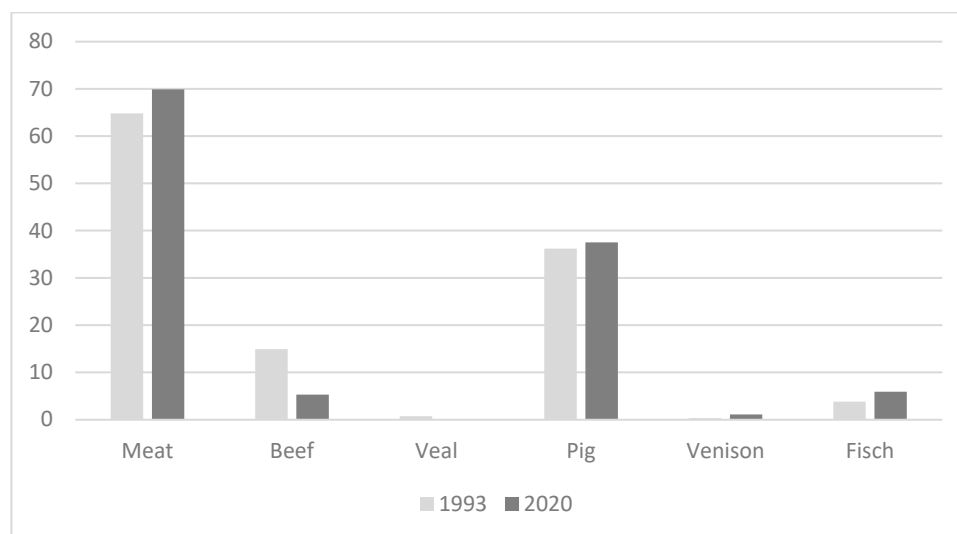


Figure 4: Comparing 1993 and 2020 (values are in kilograms)

Source: author's calculations

Fish consumption increased by a third. In percentage terms, our consumption of venison, in particular, has increased [by 200%] and, by comparison, our consumption of cheese, has increased from less than 5 kg to over 11 kg per person. We can conclude that meat is now being displaced by fish, pasta, and cheese.

4. Conclusion

The aim of the paper was to show the difference in consumer behaviour between different types of meat and fish in Slovakia. The Slovak Republic has similar consumer preferences as neighbouring countries. Consumption of meat is not only about satisfying the basic needs of life, but it is also important from the environmental point of view; efforts are made to find such farming options that meat is of high quality without polluting the environment. The results of the research showed a change in consumer behaviour (a significant increase in the consumption of chicken meat due to its low price). Rising prices of beef and veal lead to progressively lower per capita consumption. Consumption behaviour is also influenced by a quality and balanced diet, which is reflected in an increase in per capita consumption of fish, a doubling of cheese consumption. Fish, pasta and cheese dominate the menu.

On the basis of these results, we can say that overall meat consumption will continue to decrease. Meat is a valuable source of all amino acids and has high biological values. It is also a good source of usable iron, zinc and vitamin B12. The optimal consumption of meat is 150 to 200 grams per day.

Meat consumption, has been a hot topic of research recently, as some studies have shown a link between meat consumption and health complications including diabetes, heart disease, cancer and obesity. According to Norat et al. (2002) the hypothesis that consumption of red and processed meat increases colorectal cancer risk is reassessed in a meta-analysis of articles published during 1973–99. Larson et al. (2005) points out, that high consumption of red meat may increase the risk of colorectal cancer, and data by subsite within the colon are sparse. The objective of their study was to prospectively examine whether the association of red meat consumption with cancer risk varies by subsite within the large bowel.

Modernisation, innovative technologies and changes in farming practices will lead to more efficient and environmentally friendly meat production. Consumer concerns about the environment and climate change will lead to greater attention being paid to the production process and the origin of products. Godfray et al. (2018) says, that the global average per capita consumption of meat and the total amount of meat consumed are rising, driven by increasing average individual incomes and by population growth.

The consumption of different types of meat and meat products has substantial effects on people's health, and livestock production can have major negative effects on the environment. Troy and Kerry (2010) analyse the relationship between consumer perception of quality and the food industry's drive to satisfy consumer, science and innovation play a major role in equipping the industry to respond to consumer concerns and expectations. Halkier (2010), assumes, that consumers can enact societal agency and help change the world. In Europe meat consumption rising so much because meat is still identified with wealth.

Other factors for changing consumption habits are likely to be health and nutrition issues, as well as convenience linked to the shift in demand for more processed meat and semi-processed products.

References

- [1] Bogueva, D. Marinova, & T. Raphaely. (2017). Reducing meat consumption: The case for social marketing. *Asia Pacific Journal of Marketing and Logistics*, 29 (3) (2017), pp. 477-500, 10.1108/APJML-08-2016-0139
- [2] Bonnet, C. Bouamra-Mechemache, Z., Réquillart, V. & Treich, N. (2020). *British Food Journal*, 116 (4) (2014), pp. 629-642
- [3] Consumption of meat (2022). Retrieved 2022-01-11 from <http://datacube.statistics.sk/>.

- [4] Created a new food revolution. *The Journal of Nutrition*, 3907S–3910S.
- [5] Delgado, C. L. (2003). Rising consumption of meat and milk in developing countries. *Food Policy*, February (2020), Article 101847, 10.1016/j.foodpol.2020.101847
- [6] Halkier, B. (2010). *Consumption challenged - Food in medialisised everyday lives*. Farnham: Ashgate Publishing, 2010
- [7] Hawkesworth, S., Dangour, A.D., Johnston, D., Lock, K., Poole, N., Rushton, J., Uauy, R., &
- [8] HCJ Godfray, P Aveyard, T Garnett, JW Hall, & Key, C. (2018). *Meat consumption, health and the environment Science*, 361.
- [9] Ku, G. (2008). Learning to de-escalate: The effects of regret in escalation of commitment. *Organizational Behavior and Human Decision Processes*, 105(2), 221-232. doi:10.1016/j.obhdp.2007.08.002
- [10] Larsson, SC, Rafter, J, & Holmberg, L (2005). *Red meat consumption and risk of cancers of the proximal colon, distal colon and rectum: the Swedish Mammography Cohort*. Int J Cancer 113, 829–834. *Meat Science*, 86 (1) (2010), pp. 214-226, 10.1016/j.meatsci.2010.05.009
- [11] Norat, T, Lukanova, A, & Ferrari, P. (2002) Meat consumption and colorectal cancer risk: dose–response meta-analysis of epidemiological studies of agriculture on health. *Philosophical Transactions of the Royal Society B, Int J Cancer* 98, 241–256. 365, 3083–3097.
- [12] Pachingerová, M. (2000). *Ekonomika výživy*. Bratislava, Ekonomická univerzita, 2000, 112 p;
- [13] Ramankutty, N. & Foley, J. A. Estimating historical changes in global land cover: Croplands from 1700 to 1992. *Global Biogeochem. Cycles* 13, 997–1027 (1999). 10.1029/1999GB900046
- [14] Sans P. & Combris P. *Meat Sci.* 2015 Nov;109:106-11. *World meat consumption patterns: An overview of the last fifty years (1961-2011)*. doi: 10.1016/j.meatsci.2015.05.012. SUA in Nitra, 2010, 110p. ; ISBN 978-80-552-0439-0.
- [15] Troy, D.J. & Kerry, P. (2010). *Consumer perception and the role of science in the meat industry*
- [16] Viewpoint: Regulating meat consumption to improve health, the environment and animal welfare.
- [17] Waage, J. (2010). Feeding the world healthily: The challenge of measuring the effects
- [18] Zentková I. & Hošková, E. (2010). *Vplyv potravinovej a agrárnej politiky na trh s potravinami*. Nitra,
- [19] Zur, A. & Klöckner, C. (2014). Individual motivations for limiting meat consumption. ISBN 80-225-1316-4.

Decision Making for Ensuring Food Security in Ukraine

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Abstract

The problem of the food security in Ukraine remains unsolved. People of Ukraine consume food products below the rational rates. People consume lower volumes of animal products than rational rates. The main role in providing the food security of the country belongs to the agro holdings. Share of agricultural products manufacturing by households is falling gradually but despite this it remains rather high: 39.5% of the crop production and 54.2 % of the animal production is being produced by the households. Development of small business requires the government support. Current government program is not able to stimulate the development of the small business in the agriculture. Creating of the public-private partnerships will create conditions for merging the households and their transformation into agricultural cooperatives. This will make it possible to provide employment for the population and to improve the quality of the agricultural products.

Keywords: agriculture, decision making, food security, households, Ukraine

JEL Classification: Q18, E61, H31, L66, F52

1. Introduction

1.1 Analysis of recent research and publications

Food security is the object of studies of scientists, governments of countries and international organizations such as: United Nations (UN), Food and Agriculture Organization (FAO), World Bank Group, World Economic Forum (WEF), World Resources Institute (WRI).

In the Agenda for Sustainable Development 2030 of the United Nations zero hunger and end hunger are determined to achieve food security and improved nutrition and to promote the sustainable agriculture [5].

The World Bank Group [25] works with partners to improve food security and build food systems that can feed everyone, everywhere, every day. The FAO Policy Priorities for Food Security goal is to achieve food security for all and make sure that people have regular access to high-quality food to lead active, healthy lives [19].

The priority of the FAO Policy concerning providing the food security is direct and immediate access to food. The FAO's "twin-track approach" for fighting hunger combines the sustainable agricultural and rural development with targeted programs for enhancing direct access to food for the neediest [19, 26]. The mission of the World Economic Forum's System Initiative on Shaping the Future of Food [26] is to build inclusive, sustainable, efficient and nutritious food systems through leadership-driven, market-based action and collaboration, informed by insights and innovation, in alignment with the Sustainable Development Goals.

For many countries food security remains unsolved issue and an important challenge. The issue of food security measuring has long been central topic of the FAO. FAO is considering four pillars of food security: availability (of food supplies), accessibility (physical and economic access to food), utilization (of food), stability (of food supply and access) [3, 5]. Gross, Schoeneberger, Pfeifer & Preuss [8] also study the state of food security through the four major dimensions of food security, namely availability, access, utilization, and stability, characterizing the factors influencing each indicator. It is achieved not only as sufficiency of food for population (quantity, quality, safety, socio-cultural accept-ability) but also as a constant availability of food for the whole population to ensure a healthy and happy life. Availability implies the presence of sufficient food, i.e. the overall ability of the agricultural system to meet the demand for food products. According to Schmidhuber & Tubiello [17], availability includes a wide range of socio-economic and cultural factors that influence the state of plant and animal husbandry, which determine where and how households work, how supply is formed in response to market and social demands.

The scientific literature describes the role of farming in the economy, the formation of supply in the market of agricultural products and food, employment, etc. The specificity of supply in the Ukrainian agro food market is that the supply of agricultural products and accordingly processing enterprises is largely dependent on households unlike the situation in the economically developed countries.

Bellemare & Nova [2] identify as relevant to implement contractual relationships between processing enterprises and households, defining their important role in ensuring food security at both the household and country level.

The potential role of smallholders in food security and in poverty reduction was discussed at the conference "Food and nutrition security and the role of smallholder farms: challenges and opportunities" [4].

The development of private farms is important not only for providing food to the population, but it is an important part of rural social development, job creation, and increasing part of the population's job satisfaction. Herrero, Thornton, Power, Bogard, Remans, Fritz [9] consider the crucial importance of developing private farms to design activities that can appropriately address food security and ecosystem development in the face of population growth, urbanization and climate change. According to Schleifera P. & Sun Y. [16], in addition to the above factors food security is also affected by sustainability certification which is manifested in addressing the socio-economic problems of local private farms, namely influenza on land use, land rights and gender equality.

To cope with the issue many countries use different food supply organizations, which are agro food and food businesses of different sizes and types of work organization. In this context, Peramaiyan, Hermansen & Halberg [12] consider the existence in small private farms of the potential for organic farming that should improve food security in the country. Meemken E. and Qaim M. [10] consider that organic farming is not a key issue for agricultural development and food security but smart combinations of organic and traditional methods contributing to a sustainable increase in productivity in global agriculture.

The research by Ahmed, Ying, Bashir, Abid & Zulfiqar [1] identified the determinants of the development of food security of small private farms regarding the availability of food security at the household level. They explored various types of risks that households face in their activities, such as rising food prices, crop diseases, lack of irrigation water, and rising health care costs. The results show that the main factors affecting private farms' food security are family size, monthly income, food prices, health care costs and debt.

Analysis of the publications of scientists shows the need for the development of farming. However, the current legal, economic and social conditions in Ukraine do not contribute to the development of private farms that is why households still play an important role in ensuring the food security of the country. Private farms that do not possess the status of “private farms” provide food products not only to themselves but also to some of the products they sell to households, to processing enterprises, taking part in shaping the supply on the food market.

1.2 The role of Ukrainian households in agricultural production

Households as one of the subjects of microeconomics play an extremely important role in ensuring food security. In Ukraine a household is considered to be an entity of the economy consisting of one leading individual independent economy or more often a group of people living together and running a common economy. Usually, such a group of persons is united by family or family ties.

At the same time private farmers are the owners or tenants of the land and carry out their households by the efforts of their family or hiring additional labor force. Most of the farmers are owners of the land intended for personal peasant farming. These are people who use their own land on their own. Often they also use the land of family members and also rent land to neighbors (in this case, the lease relations in most cases are not formalized).

The majority of households producing agricultural products do not have official status of farmers. In Ukraine households produce products mainly for their own consumption and sale in “natural” markets.

Agricultural enterprises prevailed in 2017 in the structure of agricultural production, i.e. they were 56.4% of the total, including only 8.7% of agricultural production by farms, while households provided 43.6% of total production.

1.3 Objectives of the article

The main objective of this paper is to analyze the state of food security in Ukraine and to determine the role of households in ensuring its level. To reach the objective the following tasks have been set: to investigate the main problems of food security from the standpoint of food supply formulation, dependence on the structure of production participants; to determine the physical and economic availability of food for the population of Ukraine and the structure of consumption; to identify the advantages and disadvantages of household functioning that the state may face in the process of providing food security; to determine the level of consumption by households of food products of their own production; to justify the opportunities of households living in rural areas in the context of solving their food security problems.

2. Data and Methods

The paper has an explorative character. The data were used from the official open data source – the State Statistics Service of Ukraine for 2010-2020. The methods of statistical and comparative analysis, graphic method and method of summarizing and mean values were used in this paper. The analysis of statistical data allowed the authors to get conclusions about possible areas of food security in Ukraine by improving the efficiency of households and consolidating their efforts.

3. Results and Discussion

3.1 Analysis of the state of food security in Ukraine

Food security depends on both the macroeconomic situation, state of development of the economy as a whole and income of the population, and on the development of the national agro food sector of the economy.

The Global Food Security Index (GFSI) considers four core pillars of food security – Affordability, Availability, Quality and Safety and Natural Resources and Resilience.

Ukraine has one of the lowest GFSIs in the GFSI ranking among 113 countries. Ukraine ranks the 58th out of 113 and in the world (ranked 25th out of 26 European countries). Ukraine has high natural potential and good natural and climatic conditions. These can provide an appropriate level of GFSI.

Analyzing the state of food security in Ukraine on the GFSI, it should be noted that the separate components of the indicator tend to deteriorate during 2012-2021 (Table 1). Ukraine has the worst rating for Availability, i.e. the 74th position.

Table 1: The components of the Global Food Security Index of Ukraine

Year	Overall	Affordability	Availability	Quality and Safety	Natural Resources and Resilience
2012	58.4	55.6	58.0	66.1	x
2013	58.0	55.5	57.4	65.7	x
2014	56.4	58.7	50.6	66.7	x
2015	54.4	57.1	48.7	63.0	x
2016	55.2	57.2	49.6	65.1	x
2017	54.1	55.7	50.2	61.0	58.2
2018	55.7	54.1	53.8	65.2	57.5
2019	57.1	63.9	50.0	59.6	51,0
2020	63.0	74.4	51.6	75.3	50.3
2021	62.0	73.9	51.8	71.9	49.3
Deviation, 2012-2021	+3.6	+18,3	-6.1	+5.8	x
Deviation, 2020-2021	-1.0	-0,5	+0.2	-3.4	-1.0

Source: [6, 7]

The largest decline in the structure of the GFSI indicator for 2012-2021 was noted by the Availability category – (-6.1 points). The score of Affordability has increased when comparing 2021 to 2020 (+18,3 points).

The current economic and political situation in the country has a significant impact on food security in Ukraine. High level of political instability associated with military actions in the East of Ukraine and high level of corruption determine the low efficiency of the country's economy which affects the low level of GDP *per capita*. In its turn, the support of agricultural producers by the state can be ensured at the appropriate level only if there are positive changes in the economy of the country.

There are different approaches to assessing food security. It is advisable to use the approach used in calculating the Global Food Security Index (GFSI) to determine food security within the country. When calculating the GFSI, various factors affecting the country's food security are considered.

The threat to food security can arise as a result of many factors, among which the greatest impact belongs to: shortage of certain foodstuffs; high prices for the food group of goods; low purchasing power of the population; unequal opportunities of access to food for different groups of population.

For Ukraine all factors are relevant, apart from the shortage of certain foodstuffs. The last three factors in calculating the GFSI within the observed period show the greatest negative impact on food security. The result is that in Ukraine with a high level of self-sufficiency in the production of major food groups the consumption of food by the population remains insufficient. This can be explained by the high prices for food with low purchasing power of the population. Growth in food production by enterprises is determined mainly by export growth opportunities rather than by an increase in domestic demand.

3.2 The role of the agrarian sector of Ukraine in providing of food security

The production of all crops increased during the observed period. Households showed a steady tendency to increase plant production in all types of products from 2010 to 2020. The production of agricultural crops such as grain and leguminous crops, factory sugar beet and sunflower is dominated by agricultural enterprises, which account for 79.6, 94.3 and 87.7%, respectively (Fig. 1). Such tendencies are typical for most crops, apart from fruit, berries and potatoes.

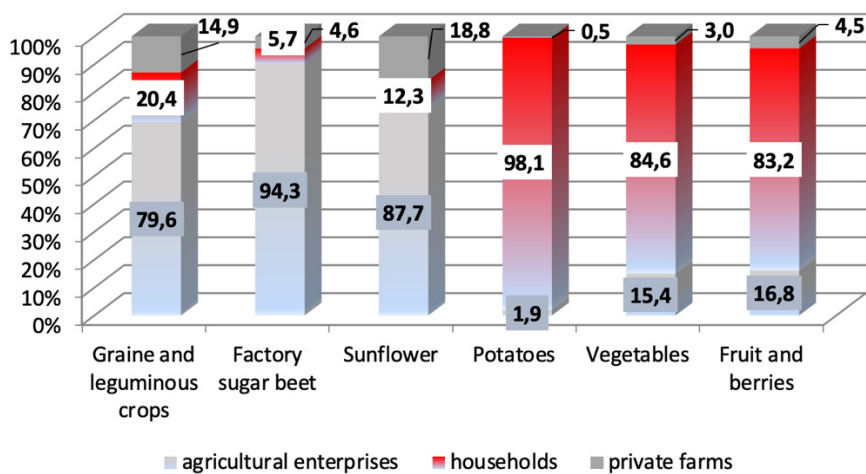


Figure 1: Structure of agricultural production, produced by agricultural enterprises and households, 2020 (%)

Source: [21, 22].

Crop production *per capita* over the period examined grew in all types of crops. This is due to two main factors: reduction in the population and increase in production.

Production of agricultural crops *per capita* in a year for sunflower, grain and leguminous plants, vegetables, potatoes exceed needs of the population (Table 2).

Table 2: Production of agricultural crops *per capita* (kilograms)

Agricultural crops	2010	2015	2016	2017	2018	2019	2020
Grain and leguminous crops	856	1403	1549	1457	1657	1788	1555
Factory sugar beet	300	241	328	350	330	243	219
Sunflower	148	261	319	288	335	363	314
Potatoes	408	486	510	523	532	482	499
Vegetables	177	215	221	219	223	231	231
Fruit and berries	38	50	47	48	61	50	48
Grape	9	9	9	10	11	9	7

*Bread-stuff products (bread and macaroni counted as flour; cereals, flour, leguminous) Source: [21, 22].

This gives the opportunity to export products to Ukrainian commodity producers. At the end of 2020 according to statistical data of Ukraine all categories of households were keeping cattle in the amount of 2978 th heads, including 1716.6 of cows. The number of pigs was 6169.1 th heads, sheep and goats – 1175.3 th heads and 205401.8 th heads of poultry.

Despite the fact that animal husbandry predominates in households, livestock production by households generates 31.2% of meat production (in slaughter weight). In the production of milk households dominate, i.e. 70.2% of total and 55.1% of egg production is provided by agricultural enterprises and 44.9% by households. The average annual milk yield per cow in households is lower than in agricultural enterprises by 29.7%. To increase milk production, it is necessary to solve the problems of improving the productivity of animals in households by introducing progressive technologies of milk yield and milk storage.

Food availability is considered in physical and economic aspects. The physical aspect is the ability of the state to produce and deliver to the population foodstuffs to the extent necessary to ensure adequate human nutrition of appropriate quality. The economic aspect is determined by the purchasing power of the population, i.e. the ability to buy or produce food in the households in quantities and assortments that ensure a normal standard of living and human health. It is access to food resources of all segments of the population at the expense of the existing solvent demand. Physical accessibility is the ratio of physical and desirable levels of food consumption. Every person wish in this area may be irrational or uncertain. But there are so-called targets, namely, medical standards. Such standards are developed by nutrition specialists for age and occupational groups, and also take into account geographical and social conditions for different population groups.

To determine the state of food security, the indicator of livestock production *per capita* is important (Table 3). This indicator determines the potential for consumption of animal products by the population of Ukraine.

Table 3: Production of animal products per capita

Animal products	Rational consumption rates	2010	2015	2016	2017	2018	2019	2020
Production of animal products <i>per capita</i>								
Meat (in slaughter weight), kg	83	44.9	52.5	54.5	54.6	55.7	59.3	59.3
Milk, kg	380	245.2	252.5	243.3	242.0	238.1	229.9	221.9
Eggs, pcs	290	372	431	354	365	382	397	387
Produced livestock products <i>per capita</i> regarding rational consumption standards, %								
Meat (in slaughter weight), kg	100	54.1	63.3	65.7	65.8	67.1	71.4	71.4
Milk, kg	100	64.5	66.4	64.0	63.7	62.7	60.5	58.4
Eggs, pcs	100	128.3	148.6	122.1	125.9	131.7	136.9	133.4

Source: [21, 22].

We can see that only in the case of eggs production, the actual production of livestock products *per capita* exceeds rational consumption. The level of meat production per capita on rational consumption rates in 2020 is approaching the maximum. However, this indicator is below the required level by 28.6%. Milk production *per capita* was below rational consumption standards over the entire period under investigation and in 2020 it accounted for 58.4% of the rational consumption.

Ukraine by foodstuffs in 2020 has a level of self-sufficiency more than 100%. Exceptions are fruit and milk; the level of self-sufficiency in their case are 75.3% and 99.1% respectively [23]. So it can be argued that the level of consumption of basic products depends to a greater extent on the purchasing power of the population than on the supply of commodity producers formed on the domestic market. Consumption by the population of Ukraine in 2020 of all foodstuffs is below

the rational norms [14, 20], except for potatoes – 103.9% and vegetables, watermelons, melons and gourds – 101.9%. Consumption of bread-stuff products and eggs is close to the rational and is 95.6 and 95.9%, respectively. Milk (by 49.9%), fish (by 38.0%), fruit (by 37.2%) and meat (by 35.2%) were consumed below the rational norms of consumption by the population of Ukraine.

3.3. The role of households in the formation of the consumption fund

Ensuring food security at the country level is shaped by its own production and the difference between the import and export of products. Construction of production and consumption balances allows identifying risks in food security and planning to minimize them. During the formation of the meat consumption fund 38-39% of the overall consumption fund was provided by households during the examined period (Table 4). The fruit consumption fund was formed by 66.3% - 71.6% at the expense of production by households. During the period under investigation the share of products produced by households tended to increase from 66.3% in 2010 to 79.9% in 2015. In the following years this indicator showed a decline to 71.4% in 2020. In the formation of the milk consumption fund the households provided 77.1% of the milk and dairy product consumption in 2020 to milk based on the basic fat content.

Table 4: Households in the formation of the consumption fund

Products	2010	2015	2016	2017	2018	2019	2020
The share of households in the formation of the consumption fund, %							
Meat	38.8	39.4	38.0	38.1	36.8	35.3	34.5
Milk and milk products,	95.4	88.3	85.8	88.5	87.5	82.3	77.1
Eggs (including egg products)	69.5	58.4	61.6	61.5	67.8	61.9	62.5
Fruits, berries and grape	66.3	79.9	77.2	76.5	75.6	71.6	71.4
Manufactured by households for consumption fund, %							
Potatoes	308.1	345.9	356.7	357.6	374.8	348.7	365.5
Vegetables and gourds (incl. canned and dried products counted as fresh)	108.8	115.1	115.9	117.1	116.7	119.4	119.2

Source: [21, 22].

Agro holdings focus on the production of eggs and egg products for both domestic and foreign markets. Within the last two years the formation of the domestic consumption market has been by about 62,5 % provided by households.

Different situation is in the formation of the consumption fund of potatoes and vegetables. Potato production by households exceeded consumption by more than 3.6 times in the period 2013-2020. This can be explained by the fact that the production of potatoes in 2020 was 20439.9 thousand tons but the consumption fund was only 5593 thousand tons.

During 2010-2020 production of vegetables by households exceeded the consumption fund from 8.8% in 2010 to 19.2% in 2020. During the formation of consumption fund losses and wastes amounted to 10148 th tons from produced 6846 th tons of vegetables in 2020.

So, households are the main manufacturers of foodstuffs. These are mainly the households which form a significant proportion of the consumption fund providing physical availability of food and creating the conditions for food security. This is proved by the share in the structure of consumption of products produced by households. Thus, for fish and fishery products, oil and sugar this share does not exceed 1.2%.

Although the consumption of products produced by households is not critical for the population of Ukraine the households living in rural areas consume a significant proportion of food produced in personal farms. Due to their own production in 2020, there was consumed 37.8% of meat and meat products, 36.3% fruits, 43.7% of milk and cheese, 93.7% of eggs and 64.0% of vegetables. Own production completely covers the need for consumption of potatoes. Such high proportion

of consumption of products produced by households makes it possible to meet the need for food at the household level and creates the preconditions for ensuring food security in Ukraine.

However, the role of households is not limited to meeting their own needs. They sell products in natural markets and to processing plants. At the expense of households in 2020, a small-town retail market was formed: 2.6% of meat and meat products (in terms of meat); 4.5% milk and cheese (in terms of milk); 13.9% of eggs; 36.3% of potatoes; 19.8 vegetables; 10.3% fruit.

3.4. Ways to improve the household's efficiency

Households play a significant role in providing raw materials to the processing industry. Households form a significant proportion of livestock production revenues not from processing enterprises. The reduction in the supply of meat to households by processing plants took place at the expense of animals grown in the processing enterprises (Table 5).

Table 5: Supply of animal production to enterprises engaged in their processing (thousand tons)

	2010	2015	2016	2017	2018	2019	2020	2020/2010,%
<i>Agricultural animals (in live weight)</i>								
Total supply	1345.2	1689.9	1621.0	1717.6	1752.3	1891.5	1778.2	132.2
<i>incl. from households, %</i>	7.9	1.1	1.4	1.5	1.4	1.1	0.6	x
Purchased – total	512.7	395.2	353.7	341.8	327.5	321.3	282.7	55.1
<i>Incl. from households, th tons</i>	106.1	18.7	22.3	25.2	24.8	21.3	10.0	9.4
<i>share in total supply, %</i>	20.7	4.7	6.3	7.4	7.6	6.6	3.5	x
Animals grown in processing enterprises that were supplied for processing	796.6	1258.0	1227.4	1335.5	1380.8	1532.1	1459.1	183.2
<i>Milk</i>								
Total supply	4716.6	4251.2	4182.7	4348.3	4179.2	3800	3511.8	74.5
<i>including from households, %</i>	52.7	31.7	28.6	28.5	26.0	22.4	20.9	x
Purchased – total	4660.9	4089.8	3709.7	3927.8	3808.5	3461.5	3289.1	70.6
<i>incl. from households, th tons</i>	2487.8	1346.1	1197.8	1239.3	1088.6	851.1	733.1	29.5
<i>share in total supply, %</i>	53.4	32.9	32.3	31.6	28.6	24.6	22.3	x
Milk produced in processing enterprises that was supplied for processing	13.6	23.6	32.1	24.6	25.0	20.4	20.1	147.8

Source: [21, 22]

A similar tendency is also observed for milk supply from households to processing enterprises. During the investigated period the purchase of milk from households decreased but its share in sales to processing enterprises remained high – 20.9% in 2020. At the same time the price of raw milk received by processing enterprises from households in 2020 was only 76.7% of the price paid to agricultural enterprises. The problem of such deliveries is low quality of raw materials that are being recycled and the lack of direct supplies of raw materials to processing enterprises.

Considering the high proportion of households engaged in agricultural production and the formation of a consumption fund in Ukraine, they concentrate on the high potential of agricultural production and the level of food security. The main areas of development of this potential are the following.

1. Development of the small business requires the governmental support. Current government program is not able to help the development of small business in the agriculture. Nowadays almost 60% of public aid is provided by large agro holdings with rather high level of income. State support needs to be directed more towards the support and development of households.
2. The main problem of the products manufactured by households is in its reduced quality level. It limits the possibilities of selling the agricultural products by the processing enterprises. To improve

the quality of livestock products it is necessary to arrange mini workshops for primary processing of raw materials, to provide the necessary conditions for storage and transportation of manufactured products to processing enterprises. For the meat production, shops for the slaughter of cattle and special vehicles should be used. For milk producers, milking machines, milk storage containers and special vehicles should be used.

Households will not solve these problems because they do not have sufficient resources. Problems can be solved by creating livestock cooperatives that unite households [11]. In case if the households unite the low level of their income will not allow them to form the necessary assets. The solution of the problem may be in the narrow of creating public-private partnerships with the participation of municipal communities (Fig. 2.).

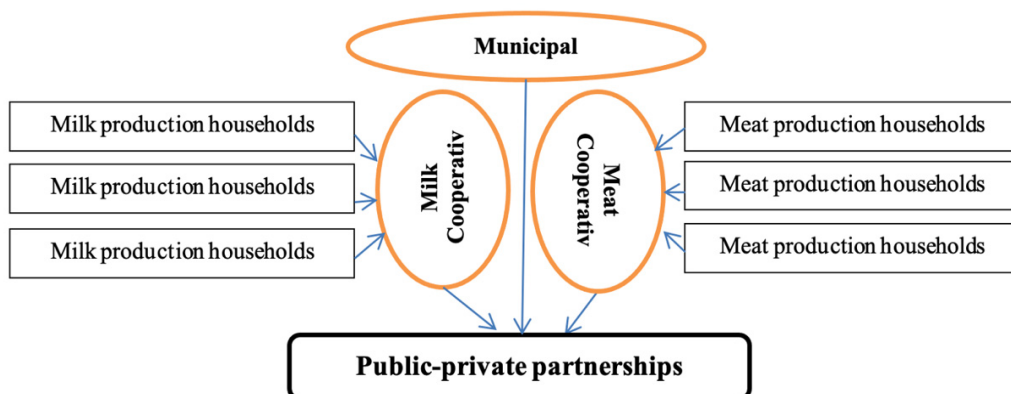


Figure 2: The mechanism of public-private partnerships

Source: own study

Public-private partnerships can be seen as institutes that promote the implementation of the principles of market-responsible behavior of participants and ensure their mutual benefit.

Pongsiri [13] mentions, that “a public-private partnership can be seen as an appropriate institutional means of dealing with particular sources of market failure by creating a perception of equity and mutual accountability in transactions between public and private organizations through co-operative behavior. The relative merit of the idea of public-private partnership is oriented mainly around a mutual benefit”.

Vining and Boardman [24] defined the rules of conduct of government agencies in the creation of public-private partnerships. Public-private partnerships have different organizational forms that have evolved gradually. They are based on contractual relations, use common resources, have both common and different goals. This approach in building public-private partnerships ensures their sustainability as they balance the interests of individual participants. Public-private partnerships are based on the use of various opportunities in different sectors of economic relations [15].

Creating of the public-private partnerships will create conditions for merging the households and their transformation into agricultural cooperatives. This will make it possible to provide employment of the population and to improve the quality of life of the rural population and quality of the agricultural products.

4. Conclusion

Ukraine ranked 58 in the world by indicator of global food security in 2020. At the same time, the agricultural production of households still plays an important role in solving food security problems. Households form a significant specific weight in the consumption fund in Ukraine.

FAO notes that Ukraine is a leading global food producer with a large share of smallholder farms [18, p.20].

At the same time, households produce more than 70% of total production of individual agricultural products. Households provide 22.3% of milk deliveries to dairy processing enterprises and 3.5% of meat deliveries to meat processing plants. Nowadays the main problem of raw materials produced by households is low quality and accordingly low prices, which makes disadvantageous maintenance of household animals and reduction of the livestock.

To solve the problems of improving the quality of products and create conditions for increasing the production of livestock products by households it is necessary to establish the public-private partnerships. Such partnerships should include milk cooperatives, cooperatives for the cultivation of animals with households, and territorial communities in their structure.

Creating public-private partnerships will create additional job opportunities for the rural population, suspend urbanization processes, and increase household incomes.

The problem of food security in Ukraine is becoming especially acute during the Russia's war in Ukraine. It should be noted that military action on the Ukrainian territory is threatening food security for millions of people around the world, given the position of Ukraine in the production and export of agricultural products on world commodity markets.

References

- [1] Ahmed, U.I., Ying, L., Bashir, M.K., Abid, M., & Zulfiqar, F. (2017). Status and determinants of small farming households' food security and role of market access in enhancing food security in rural Pakistan. *PLOS ONE*. 12(10), 1-15. doi.org/10.1371/journal.pone.0185466
- [2] Bellemare, M.F., & Nova, I. (2017). Contract farming and food security. *American Journal of Agricultural Economics*, 99(2), 357-378. Retrieved from: <https://academic.oup.com/ajae/article/99/2/357/2632247>
- [3] Food and Agriculture Organization of the United Nations (2008). An Introduction to the Basic Concepts of Food Security. Retrieved from: <https://www.fao.org/documents/card/ru/c/2357d07c-b359-55d8-930a-13060cedd3e3/>
- [4] Food and nutrition security and role of smallholder farms: challenges and opportunities. (2016). Editors: Riesgo, L., Louhichi, K., & Gomez, S. JRC Conference and workshop reports. European Union, Spain.
- [5] General Assembly (2015). Resolution adopted by the General Assembly on 25 September 2015.
- [6] Global Food Security Index (2018). Retrieved from: <https://foodsecurityindex.eiu.com/Country/Details#Ukraine>.
- [7] Global Food Security Index (2021) <https://impact.economist.com/sustainability/project/food-security-index/Country/Details#Ukraine>
- [8] Gross, R., Schoeneberger, H., Pfeifer, H., & Preuss, H.J.A., (2000). The Four Dimensions of Food and Nutrition Security: Definitions and Concept. Nutrition and Food Security. Retrieved from: http://fpmu.gov.bd/agridrupal/sites/default/files/Four_Dimension_of_FS_0.pdf. Hansen, H., Trifković, N., 2014. Food standards are good – for middle-class farmers.
- [9] Herraro, M., Thornton, P. K., Power, B., Bogard, J. R., Remans, R., Fritz, S. et al. (2017). Farming and the geography of nutrient production for human use: a transdisciplinary analysis. *Lancet Planet Health*. 1, e33–e42.
- [10] Meemken, E.-M., & Qaim, M. (2018). Organic agriculture, food security, and the environment *Annu. Rev. Resour. Econ.*, 10 (1), pp. 39-63. Retrieved from: <https://10.1146/annurev-resource-100517-023252>.
- [11] Mostenska, T.L., & Tur, O.V. (2018). The role of the state-private partnership in the creation of agrarian formations. *Bulletin of the Zaporizhzhya National University. Economic Sciences*. 38(2), 37-43.
- [12] Peramaiyan, P., Hermansen, N., & Halberg, J.E. (2010). Food security of small holding farmers: comparing organic and conventional systems in India. *Journal of Sustainable Agriculture*. 35(1), 48-68, Retrieved from: https://www.researchgate.net/publication/233242497_Food_Security_of_Small_Holding_Farmers_Comparing_Organic_and_Conventional_Systems_in_India
- [13] Pongsiri, N. (2002). Regulation and public-private partnerships. *International Journal of Public Sector Management*. Retrieved from: <https://www.emerald.com/insight/content/doi/10.1108/09513550210439634/full/html>.

- [14] Resolution of the Cabinet of Ministers of Ukraine №1379 “Some Issues of Food Security”. 5.12.2007. Retrieved from: <http://zakon4.rada.gov.ua/laws/show/1379-2007-rr>
- [15] Shah, H.R. (2015). Public Private Partnerships (PPPs): The Concept, Rationale, and Evolution; Stakeholders’ Perspective Second International Conference on Public-Private Partnerships. doi: [org/10.1061/9780784480267.003](https://doi.org/10.1061/9780784480267.003)
- [16] Schleifera, P., & Sun, Y. (2019). Reviewing the impact of sustainability certification on food security in developing countries *Global Food Security* 24(3). **Chyba! Neplatné hypertextové prepojenie.**
- [17] Schmidhuber, J., & Tubiello, F.N. (2007). Global food security under climate change *Natl. Acad. Sci. U.S.A.*, 104. doi: [org /10.1073/pnas.0701976104](https://doi.org/10.1073/pnas.0701976104)
- [18] SOFA (2022). *FAO in Europe and Central Asia 2021*. Budapest. Retrieved from: <https://www.fao.org/3/cb9266en/cb9266en.pdf>
- [19] *Strengthening Sector Policies for Better Food Security and Nutrition Results* (2017). FAO Policy Guidance Series. Retrieved from: <http://www.fao.org/3/a-i7214e.pdf>.
- [20] The Law of Ukraine “On the subsistence minimum”. Retrieved from: <http://www.rada.gov.ua>
- [21] The Statistical Yearbook “Agriculture of Ukraine” for 2020 (2021). Kyiv: State Statistics Service of Ukraine. Retrieved from: http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/09/zb_sg_20.pdf
- [22] The statistical yearbook “Agriculture of Ukraine” for 2013 (2014). Kyiv: State Statistics Service of Ukraine. Retrieved from: http://www.ukrstat.gov.ua/druk/publicat/kat_u/2014/zb/07/zb_spog_2013.zip
- [23] The statistical yearbook “Balances and consumption of the main food products by the population of Ukraine” for 2020 (2021). Kyiv: State Statistics Service of Ukraine. Retrieved from: http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/07/Zb_Bsph_2020.pdf
- [24] Vining, A.R., & Boardman, A.E. (2008). Public–Private Partnerships: Eight Rules for Governments. *Public Works Management & Policy*. 13(2), 149-161. Retrieved from: <https://journals.sagepub.com/doi/abs/10.1177/1087724x08323843>
- [25] World Bank Group (2018). *Food Security. Policy Brief*. Retrieved from: <https://www.worldbank.org/en/topic/food-security>.
- [26] World Economic Forum (2018). *Shaping the Future of Food*. Retrieved from: <https://www.weforum.org/system-initiatives/shaping-the-future-of-food-security-and-agriculture/>.

The Use of Biometrics in Testing the Perception of a Selected Indicator of the Nutritional Composition of Food

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Abstract

Poor eating has a direct impact on increasing the percentage of overweight and obese people in the global population. It is scientifically proven that obesity directly increases the risk of human health problems (cardiovascular, oncological diseases), which ultimately leads to higher health care costs. In this context, it is a society-wide problem. This is the reason why a change in eating habits must be a priority and a subject of interest in the global understanding. Knowing the process of consumer behavior when buying food creates room for influencing towards healthier products or a balanced diet. The point of sale is the last place that can influence the consumer. The aim of food indicators is primarily to point out the balance of diet, or healthier alternatives, but in no case the complete elimination of consumption of products that achieve worse nutritional scores. There are several models of nutritional indicators on the market that have their advantages and disadvantages. The fact is that successful is the one that is generally accepted by producers, retailers, and by consumers. The paper examines the perception of the Nutri-score food indicator on a selected well-known product using consumer neuroscience tools and an online platform. Finally, the paper points to the perception of the food indicator as well as its effectiveness in terms of changing consumer preferences.

Keywords: biometrics, consumer behaviour, foodstuffs, healthy eating, nutritional composition

JEL Classification: M30, M31, M39

1. Introduction

Nowadays, people during the food selection take into consideration their lifestyle, which could be considered as an increasing trend on the food market. When making a buying decision, they focus on health or nutritive aspects of each product category (Predanócyová et al., 2018). As the foods and drinks associated with improved health generally have low negative environmental influence, a dietary transition toward greater eating of healthier foods would generally improve environmental sustainability. The importance of eating a healthy diet and its impact on healthy human lifestyles and natural sustainability has been recognized. There is a growing interest in developing f.e. functional foods that contribute to the maintenance and improvement of human health (Huang et al., 2022). Health consciousness refers to the psychological inclination that motivates consumers to take better actions (Michaelidou-Hassan, 2008). With the increase in life expectancy and income levels, health concerns are increasing along with the health boom (Schlarb, 2017). Customer awareness of healthy eating habits and lifestyles continues to increase, and consumers are beginning to view the healthiness of food/ drinks as one of the most important attributes and are choosing more products that are positively associated with their health (Holotová, Horská & Nagyová, 2020). Health-conscious people care about their health, and they strive to enhance and maintain status by engaging in behaviors, such as consuming nutritional foods (Kim, Yim & Kim, 2021). One modifiable aspect of reducing non-communicable diseases is to prevent obesity. The prevalence of it is a serious health problem worldwide (Rahamat et al., 2022). In the last decades, there has been

growing interest in the development and adding of health promotion interventions in the workplace, on the other hand, the eating of added sugars, processed meats, and trans fats is higher than the recommended daily intake (Sogari et al., 2018). Front-of-package (FOP) labels promote healthy diets as an ancillary tool to the more comprehensive food-based dietary guidelines by increasing consumer understanding of the nutrient content of their food, informing healthier food purchases and consumption, and encouraging product reformulation (Wartella, Lichtenstein & Boon, 2020). Differences in their design, nutrition criteria, nutrients displayed, products targets, and their mandatory or voluntary implementation can stimulate various responses by consumers and industry (Khandpur, Swinburn & Monteiro, 2018). Understandings of health, these food and meals, and the contextualization of the concept have been investigated in consumer studies and the sociology of food for more than a decade. There are three concepts to reflect better consuming purchase behavior and decision: *health as nutritional value*; *health as pleasure*; and *health as purity* (Ditlevsen, Sandoe & Lassen, 2019).

In order to facilitate the choice of foods for a healthy and balanced diet, products in some countries display nutrition values, with the three most common versions of the labeling being: NS (Nutri-Score), Guideline Daily Amounts (GDA), MTL (Multiple Traffic Light) (Berčík, 2020). EuroHealth Magazine (2019) and Folkvord, Bergmans & Pabian (2021) present the explanation of Nutri-Score as a nutritional label based on a five-color coded scale going from dark green to dark orange, associated with letters from A to E. Dark green and the letter A is attached to products with the best nutritional quality, while dark orange and the letter E is attached to products with the lowest nutritional quality. Nutri-Score equips consumers with information about the general nutritional quality of products on the front of packaging. The underlying nutritional scoring method was developed by the British Food Standard Agency and is known as the 'FSA score'. This score, which goes from -15 to 40, allows us to evaluate the overall nutritional quality of food. Based on 100g of product, it incorporates unfavorable factors such as calories (kj), saturated fatty acids (g), sugars (g), and sodium (mg); and favorable factors such as protein (g) fiber (g), and fruits, vegetables, legumes, nuts, and olive, nut, and colza oils (%). There are two objectives when using Nutri-Score: supporting consumers, and encouraging the improvement of products. By giving access to information and helping people to compare products at a glance, consumers are pointed towards products with the best nutritional quality (Egnell et al., 2020; Chantal & Herberg, 2017; Chantal & Charpak et al., 2018). Front-of-Pack Nutrition Labels (FoPLs) have received growing attention from public health authorities. They have been demonstrated to be efficient tools to help consumers make healthier food choices at the point-of-purchase as they deliver at-a-glance nutritional information (Egnell et al., 2020). Numerous studies in the French context, and one study in other countries including some European countries, have been carried out to validate the graphical format of the Nutri-Score, regarding several dimensions of its effectiveness (Dréano-Trécant et al., 2020). Tests of perception and understanding of the Nutri-Score indicator are currently underway, as it takes into account food labeling criteria at the EU level, to which our legislation is directly subject. In case of Slovakia, food traffic light has been approved. There has even been an informal platform to support this indicator (Berčík, 2021).

Face reader is about facial-expression coding as it reads muscles in the face. It measures emotional responses through the face and represents an automatized facial expression analysis software that provides an objective assessment of emotions (Púchovský & Kohoutová, 2015; Neomániová, Berčík & Pavelka, 2019; HBR, 2020). Noldus Co. (2022) describes that Face Reader is the most robust automated system for the recognition of a number of specific properties in facial images, including the six basic or universal expressions: happy, sad, angry, surprised, scared, and disgusted. It immediately analyzes data (live, video, or still images), saving valuable time. The option to record audio as well as video makes it possible to hear what people have been saying. Eye tracker can measure attention (via the eyes' fixation points) and arousal (via pupil

dilation). It allows us to examine consumer behavior by the point of gaze, how long it lasts, and also the motion of the eye. It measures the intensity and frequency of gaze (Púchovský & Kohoutová, 2015; HBR, 2020; Berčík et al., 2020). Tabletop eye trackers and glasses-type eye trackers exist. Eye tracking facilitates the measurement of unconscious movements in gaze and provides objective data that cannot be obtained via interviews (Yasui et al., 2019). Eye-tracking has been used to evaluate the effectiveness of nutrition labels and nutrition information. It is obvious that paying attention to the nutrition information does not mean that doing so will result in healthier food choices. However, it is also clear that consumers need to view the information on the food package before they can use it. The results of eye-tracking studies have suggested that consumers pay less attention to nutrition information as they indicate when are explicitly asked how much attention they pay to this information (Siegrist, Leins Hess & Keller, 2015; Oliveira et al., 2016).

2. Data and Methods

The subject of interest was testing the understanding and perception of the nutritional indicator Nutri-Score on the subpage of a food retailer. The testing was performed by viewing the "Nutri-Score" website by 30 respondents aged 18 to 75 years (50% men, 50% women). The testing process consisted of three parts. The first part was an in-depth interview, the second part a test of the perception of a website with information about Nutri-Score and the third part a test of understanding and influencing consumer preferences.

The introductory interview consisted of questions about shopping, lifestyle, diet and perceptions of food labelling as well as food quality.

In the second part, the visual attention of the respondents was monitored by a Tobii X30 static eye camera (eye tracking) and emotional response was captured by face reading (FA) by Noldus company. The assignment for the respondents was as follows:

"Imagine you want to eat healthily. The retail chain is now coming up with a new Nutri-Score product label. Please take a look at this company's website."

After studying the website and getting acquainted with the Nutri-Score, the task of the respondents was to make a product selection based on the nutrition label through a graphical display. The third part of the testing process was realized using a special platform samolab.online for sensing emotional response and reaction time.

The survey was conducted on 23rd, 24th and 27th of November 2021 in the Laboratory of Consumer Studies at FEM SUA in Nitra.

3. Results and Discussion

In the introductory interview, the majority (77%) of respondents (6 certainly yes, 17 rather yes) stated that they care about a healthy lifestyle most often through exercise / physical activity (23). 19 out of the total number stated that they also eat healthily (4 certainly yes, 15 rather yes) and half (50%) of respondents are interested in the nutritional composition of food (6 certainly yes, 9 rather yes).

In terms of reason for shopping, 80% of respondents (24) most often buy groceries for the family, 6 respondents said, "for themselves", while in terms of frequency of purchase, most respondents said they make purchases several times a week (19) and once a week (6).

The introductory interview also included a question about Coca-Cola consumption. We were mainly interested in whether consumers prefer standard Coca-Cola or with reduced sugar content. From Fig. 1 it can be seen that 17 respondents stated that they did not consume this drink, 7 stated that they prefer classic Coca-Cola, and 6 respondents stated that they prefer Coca-Cola with a reduced sugar content. The reason for including this question is the test of the influence of the nutritional indicator on consumer decision-making after looking at the website of the retail company.

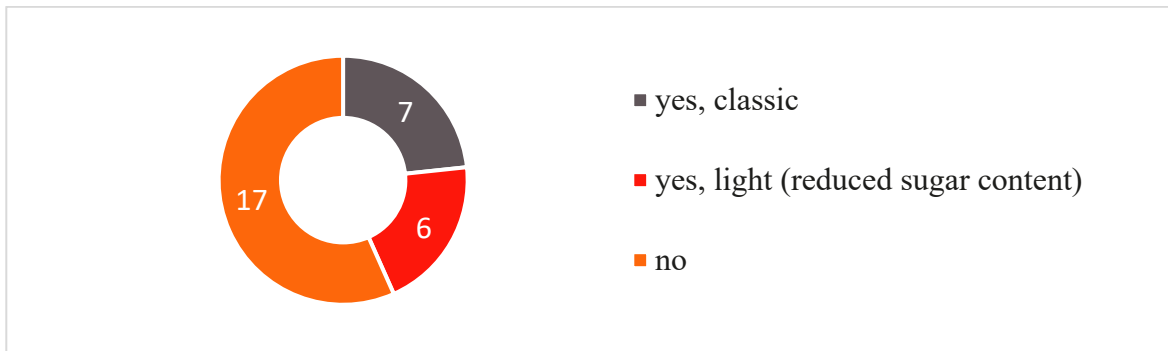


Figure 1: Coca-Cola consumption

Source: Authors' own elaboration based on research 2021

After the introductory interview, the respondents continued to familiarize themselves with the food indicator via the Nutri-Score website. Visual and emotional attention was monitored during site browsing.

Based on measurements via a mobile eye camera, the highest level of visual attention was identified through outputs in the form of thermal maps and points of interest (AOI). It can be seen in Figure 2 that most attention (red) was focused on the text describing the nutritional indicator "What is a Nutri-Score?". At the same time, the respondents were the first to notice the logo within the main banner after an average of 6.63 milliseconds, the latest in this section they noticed the Nutri-Score image, including its A-E variants (42.36 milliseconds). They spent the longest time looking at the text "What is a Nutri-Score?" (On average 6.06 seconds).

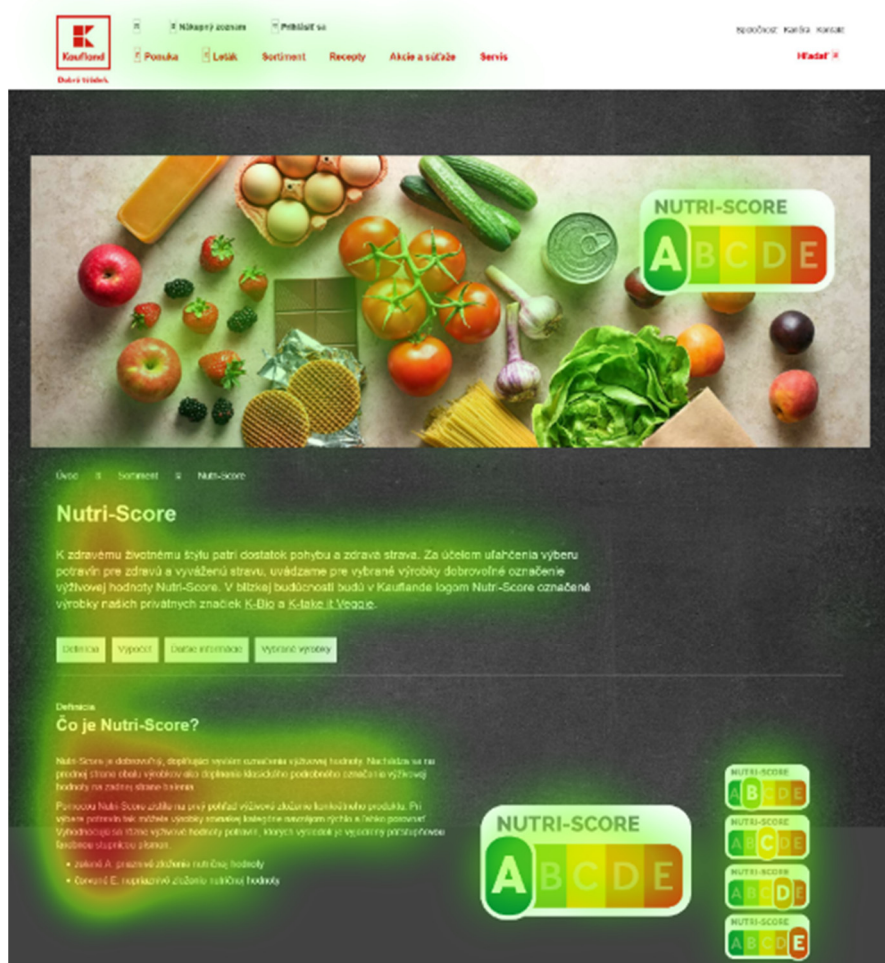


Figure 2: Sample visual attention map when viewing Nutri-Score information - part 1 of the subpage

Source: Authors' own elaboration based on research 2021

At the same time, the respondents' emotions were also monitored through facereading. Based on the data on valence (polarity of emotions), a thermal map of negative feelings was created, it is places where respondents had the highest level of frustration based on average values (red means the highest level of frustration).

In the first part of the website, the introductory text paragraph "Nutri-Score" caused increased frustration, which most respondents tried to read and quickly understand. This was also the case with the definition of "What is a Nutri-Score?", probably due to the length of the text and the relatively small letters as can be seen in Figure 3.

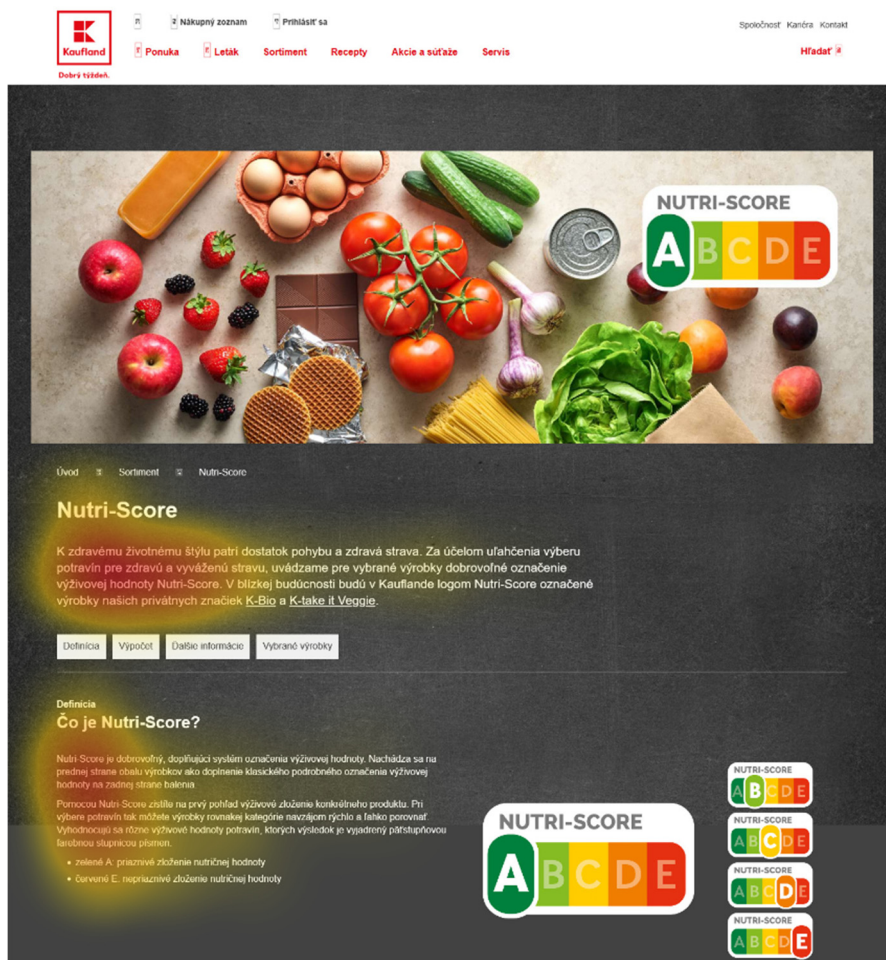


Figure 3: Example of an emotional attention map when viewing Nutri-Score information - part 1 of the subpage

Source: Authors' own elaboration based on research 2021

Following the view, respondents were asked to indicate which Coca-Cola they would choose. In this case, they made their decisions based on the visuals of the product, which was marked with the Nutri-Score food indicator. The classic version of Coca-Cola is according to this indicator in the E category and the sugar-free version (Coca-Cola Light / Zero) in the B category. This test was carried out through a special platform which, in addition to the respondents' response, also recorded the respondent's reaction time and rate and emotional response. From the results (Fig. 4) it can be seen that the studied nutritional labeling indicator had an impact on product choice (20 respondents identified Coca-Cola Light, which is labeled B). At the same time, the relevance of these responses based on facial biometrics is 72%, which indicates a relatively sufficient validity of the results.

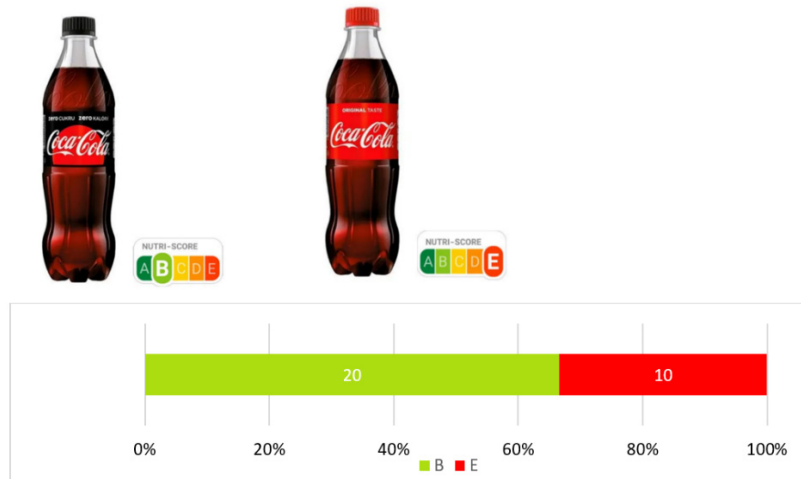


Figure 4: Consumer preferences when choosing Coca-Cola after reading the Nutri-Score information

Source: Authors' own elaboration based on research 2021

The results also show that 16 respondents correctly understood the importance of food labeling with the Nutri-Score indicator and 14 respondents misunderstood this indicator (12 incorrect, 2 partially correct), which confirms the impact on consumer product choice.

Understanding the indicator also suggests measuring the reaction time to this question. The average length of reading a question and choosing answers was 22 seconds. Based on the results of the reaction time measurement, it can be seen that the average response time (including reading the question) was 25 seconds, which indicates a relatively fast selection.

Table 1: Response time when selecting a Coca-Cola version with a nutritional indicator

	Minimum	Maximum	Average
Reaction Time	7 seconds	64 seconds	25 seconds

Source: Authors' own elaboration based on research 2021

4. Conclusion

After studying the Nutri-Score website and based on the interview, we can conclude that the majority of respondents understood the informative meaning of the website (17 correct statements, 5 partially correct). The use of neuromarketing methods suggests that some improvements are needed, as many respondents identified a higher level of frustration with reading "What is a Nutri-Score", which could be a problem in terms of text comprehension (valence -0.075). On the other hand, the control test confirmed the understanding of the indicator at the conscious and subconscious level when choosing a product. The studied nutrition labeling indicator had an impact on product selection, as 20 respondents identified Coca-Cola Light marked as B in the control selection, but most declared before seeing the subpage that if they drink Coca-Cola, then the classic, which is marked as E. Measurement of reaction time and calculation of relevance based on Facereading and pupil dilation showed a relatively fast response and degree of concentration when selecting a product through graphical visuals. The involvement of neuromarketing methods in testing the perception of the selected subpage and consumer choice revealed a lot of detailed information on consumer perception, which is further usable in the process of marketing management and communication.

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References

- [1] Berčík, J., Mravcová, A., Gálová, J., Mikláš, M. (2020). The use of consumer neuroscience in aroma marketing of a service company. *Slovak Journal of Food Sciences*, Vol. 14, pp. 1200-1210. doi: 10.5219/1465
- [2] Berčík, J. (2020, September 24). Oplyvňuje kvalita, zloženie či pôvod potravín nákupné správanie? Message posted to www.tovarapredaj.sk
- [3] Berčík, J. (2021, February 18). Potravinový semafor – Ideme hlavou proti múru? Message posted to www.tovarapredaj.sk
- [4] Ditlevsen, K., Sandoe, P., & Lassen, J. (2019). Healthy food is nutritious, but organic food is healthy because it is pure: The negotiation of healthy food choices by Danish consumers of organic food. *Food Quality and Preference*, Vol. 71, pp. 46-53. doi: 10.1016/j.foodqual.2018.06.001
- [5] Dréano-Trécant, L. et al. (2020). Performance of the Front-of-Pack Nutrition Label Nutri-Score to Discriminate the Nutritional Quality of Foods Products: A Comparative Study across 8 European Countries. *Nutrients*, 12(5), 1303. doi: 10.3390/nu12051303
- [6] Egnell, M. et al. (2020). Compared to other front-of-pack nutrition labels, the Nutri-Score emerged as the most efficient to inform Swiss consumers on the nutritional quality of food products. *Plos One Journal*, 15(2), e0228179. doi: 10.1371/journal.pone.0228179
- [7] EuroHealth Magazine. (2019). *Nutri-Score: The story so far*. Retrieved from <https://eurohealthnet-magazine.eu/nutri-score-the-story-so-far/>
- [8] Folkvord, F., Bergmans, N., & Pabian, S. (2021). The effect of the nutri-score label on consumer’s attitudes, taste perception and purchase intention: An experimental pilot study. *Food Quality and Preference*, Vol. 94. doi: 10.1016/j.foodqual.2021.104303
- [9] HBR. (2020) *Neuromarketing: What you need to know*. Available at: <https://hbr.org/2019/01/neuromarketing-what-you-need-to-know>
- [10] Holotová, M., Horská, E., & Nagyová, E. (2020). Changing patterns of sustainable food consumption regarding environmental and social impact-insights from Slovakia. *Frontiers in Sustainable Food Systems*, Vol. 5, no. 703827. doi: 10.3389/fsufs.2021.703827
- [11] Huang, Z. et al. (2022). Marketing Healthy Diets: The Impact of Health Consciousness on Chinese Consumers’ Food Choices. *Sustainability*, Vol. 14 (4). doi: 10.3390/su14042059
- [12] Chantal, J., & Hercberg, S. (2020). *Nutri-Score: Evidence of the effectiveness of the French front-of-pack nutrition*. Retrieved from <https://www.ernaehrungs-umschau.de/english-articles/16-01-2018-nutri-score-evidence-of-the-effectiveness-of-the-french-front-of-pack-nutrition-label/>
- [13] Chantal, J., Charpak, Y. et al. (2018). Promoting public health in nutrition: Nutri-Score and the tug of war between public health and the food industry. *European Journal of Public Health*, Vol. 28 (3), pp. 396-397. doi: 10.1093/eurpub/cky037
- [14] Khandpur, N., Swinburn, B., & Monteiro, C.A. (2018). Nutrient-Based Warning Labels May Help in the Pursuit of Healthy Diets. *Obesity*, 26 (11), pp. 1670-1671. doi: 10.1002/oby.22318
- [15] Kim, K.Y., Yim, M.Y.C., & Kim, E.A. (2021). Reeves, W. Exploring the optimized social advertising strategy that can generate consumer engagement with green messages on social media. *Journal of Research in Interactive Marketing*, Vol. 15 (1), pp. 30–48. doi: 10.1108/JRIM-10-2019-0171
- [16] Michaelidou, N., & Hassan, L. M. (2008). The role of health consciousness, food safety concern and ethical identity on attitudes and intentions towards organic food. *International Journal of Consumer Studies*, Vol. 32 (2), pp. 163–170. doi: 10.1111/j.1470-6431.2007.00619.x

- [17] Neomániová, K., Berčík, J., & Pavelka, A. (2019). The Use of Eye-tracker and Face Reader as useful Consumer Neuroscience Tools within Logo Creation. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, Vol 67 (4), pp. 1061-1070. doi: 10.11118/actaun201967041061
- [18] Noldus Co. (2022). *Emotion analysis. FaceReader*. Retrieved from <https://www.noldus.com/facereader>
- [19] Oliveira, D. et al. (2016). Consumers' attention to functional food labels: Insights from eye-tracking and change detection in a case study with probiotic milk. *LWT – Food Science and Technology*, Vol. 68, pp. 160-167. doi: 10.1016/j.lwt.2015.11.066
- [20] Predanócyová, K. et al. (2018). Consumption and offer of organic food on the Slovak market. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, Vol 66 (5), pp. 1315-1323. doi: 10.11118/actaun201866051315
- [21] Púchovský, F., & Kohoutová, L. (2015). *Nástroje neuromarketingu a ich využitie v praxi*. Bratislava: UK, pp. 160-192.
- [22] Rahamat, S., Jeong, E. H., Arendt, S. W., & Xu, Y. (2022). Menu labeling influence on purchase behaviors: Applying the theory of planned behavior and health consciousness. *Appetite*, PMID: 35157999. doi: 10.1016/j.appet.2022.105967
- [23] Schlarb, A.A. et al. (2017). Sleep disturbances and mental strain in university students: Results from an online survey in Luxembourg and Germany. *International Journal Mental Health System*, Vol. 11 (24). doi: 10.1186/s13033-017-0131-9
- [24] Siegrist, M., Leins Hess, R., & Keller, C. (2015). Which front-of-pack nutrition label is the most efficient one? The results of an eye-tracker study. *Food Quality and Preference*, Vol. 39, pp. 183-190. doi: 10.1016/j.foodqual.2014.07.010
- [25] Sogari, G. et al. (2018). College Students and Eating Habits: A Study Using An Ecological Model for Healthy Behavior. *Nutrients*, Vol. 10 (12): 1823. doi: 10.3390/nu10121823
- [26] Wartella, E.A., Lichtenstein, A.H., & Boon, C.S. (2010). *Nutrition Rating Systems and Symbols: Phase I Report*. Washington DC: National Academies Press. 140 pp. ISBN 978-0-309-15827-5. Retrieved from <https://doi.org/10.17226/12957>
- [27] Yasui, Y. et al. (2019). Relationship between preference and gaze in modified food using eye tracker. *Journal of Prosthodontic Research*, Vol. 63 (2), pp. 210-215. doi: 10.1016/j.jpjor.2018.11.011

Reduction of Food Wasting - Attitude and Activities of Senior Households

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Abstract

It is a truism to say that wasting food is an extremely important problem these days. The aim of the article is to define the attitudes and behaviours of seniors towards this problem. The framework was developed with the use of qualitative methodology. Individual in-depth interviews were used as the research method. The study was conducted in Poland, Croatia and the Czech Republic with 16 seniors.

The study shows that seniors are aware of the phenomenon of food waste. Seniors declare that they are trying not to waste food and suggest several ways to prevent food waste.

The study contributes and expands the knowledge about food waste of old people in the conditions of the COVID-19 pandemic.

Keywords: food waste, seniors consumption, qualitative research

JEL Classification: D12, Q01, Q56

1. Food waste as a global problem

The goals of sustainable development as the overarching goal are to improve the quality of people's life - through appropriate shaping of environmental, social and economic conditions. Each of the 17 goals indicates what is expected of countries, organizations, enterprises and households in this regard. They indicate the need for a systemic and integrated approach and involvement of all market participants for their implementation (Chen et al. 2020).

One of the goals - 12.3 is dedicated to preventing food waste: “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses”. The consequences of wasting food include the following negative effects for:

- the environment – there is a need to find land for waste, the emission of greenhouse gases and poisonous methane as a result of decomposition processes, the infiltration of the environment of harmful waste (water contamination, consumption by birds, etc.);
- economy (waste of raw materials needed to produce food, including water, soil, human hours, energy);
- society - hunger, wars for access to water and food.

As a result, food waste is a waste of land, water, energy and inputs, as well as an unnecessary contributing factor to climate change (Kummu et al., 2012).

According to the data, food waste alone represents around 3–5% of global warming impacts, more than 20% of biodiversity pressure, and 30% of all of the world's agricultural land (EU 2014). In other research an estimated 8-10% of global greenhouse gas emissions are associated with food that is not consumed (Mbow et al., 2019). The Food Waste Index Report 2021 estimates that around 931 million tons of food waste was generated in 2019, 61% of which came from households, 26% from food service and 13% from retail (UN, 2021). Meanwhile, 842 million people still suffer from under nourishment (FAO, 2013), while obesity has become a significant public health issue with 500 million obese adults (Allen and Prosperi, 2016).

To sum up, it is worth emphasizing that the statistics on food waste presented above are frightening. The analyzed problem is very serious, especially in Poland, because in all three countries the most food is wasted in households, while fruit and vegetables, bread, meat are among the most discarded products. As indicated, the waste of these products causes enormous damage to the natural environment. Of course, it is worth adding that statistics are not precise, sometimes different studies present different values, different methodologies, but regardless of this, the problem of food waste is becoming more and more important.

2. Senior households

In the context of food and its waste, both producers and intermediaries are responsible for its production and distribution, while households, i.e. consumers, are particularly responsible for reducing food waste (Benton 2015). This study focuses precisely on consumers and their involvement in the development of sustainable consumption and responsible food waste management.

Households contribute to a different degree and to a different extent to both food waste and the prevention of this phenomenon. There are also different attitudes of households (Coskun 2021). Due to significant intergenerational differences in consumer attitudes, the article focuses on senior households. Several arguments support this approach:

- experiences related to the lack of availability of basic products,
- limited access to food products,
- a different value system compared to the generations of younger consumers,
- experience of the entire life cycle of the family - this factor causes the senior to experience a period when it was necessary to purchase more food and reduce during the "empty nest" period or transition to the one-person farm phase,
- experiencing universal access to food now,
- being affected by promotions of stores that encourage the purchase of larger packages or larger quantities (multi-packs),
- seeking savings by looking for the best bargains in stores,
- perceived anxiety about ensuring a "peaceful old age" in a situation where retirement benefits are significantly lower than remuneration in the period of professional activity.

We assume that not all households contribute to the problem of food waste equally. To conclude senior households may be less involved in the creating problem with food waste because they may create less wastes, be better organized and know more solutions to creatively use leftovers.

3. 3R and 5R concept

The above factors undoubtedly shape the attitude of households towards food (Borusiak 2021). There are a number of different ways of preventing food waste, which can be described as a 3R (reduce, reuse, recycle) or 5R (additionally repair and rot) model. Much of the food waste is inevitable, the

majority of food waste is preventable. Some of them can be directly adopted by senior households. We also assume that the creativity of seniors toward preventing food waste is high.

In the case of reduce - we mean reducing the number of products purchased and thus reducing consumption. Both methods bring benefits such as savings and avoid falling into the obesity trap associated with reduced physical activity. Regarding reuse - the food can be reused - in its same form or after having been modified. Recycling, on the other hand, relates primarily to packaging and the possibility of recovering them for reprocessing, but also for re-use. Rot is about getting rid of leftovers in the form of composting them.

The above-mentioned ways of managing food scraps are conditioned by various additional, unforeseen factors - e.g. the COVID-19 pandemic. For example, during the lockdown in Great Britain, the amount of food thrown away decreased by about 1/5, which was related to the fact that more people prepared their meals at home. In turn, studies from Australia indicate that during a pandemic COVID-19 the quantity and composition of household food waste was found to be strongly influenced by the number of people and children in a household, and somewhat influenced by socioeconomic factors and neighborhood food environment characteristics, including the availability, density, and proximity of retail food outlets (Everitt 20140). The factor determining the attitude towards food may also shape the material status and education. The UNEP Food Waste Index Report (2021) shows that levels of household food waste (the total of edible and inedible parts) are similar for high-income, upper middle-income and lower middle-income countries.

In order to identify the attitudes of senior households towards the phenomenon of food waste and prevention, a qualitative study was carried out among senior households.

4. Data and Methods

Primary research was conducted to identify the attitudes of senior households from Poland, the Czech Republic and Croatia about the 5R concept in the context of sustainable food consumption. There is pilot study research. Qualitative studies were performed in which the method of individual-in-depth-interviews was applied (also because of the coronavirus pandemic). They were followed by semi-structured interviews and field note-taking. The scenario consisted of four parts:

- attitudes towards food waste according to the 5R concept,
- food waste and education (including sharing knowledge and experiences between generations),
- new technologies as a support for not wasting food,
- Covid-19 and changes in food waste.

This study was conducted in February 2022, among older people from Poland, Croatia and the Czech Republic. Participants were selected through purposive sampling, which is useful in qualitative research, particularly among populations which are difficult to access, and when the research issues may be perceived by the respondents as difficult and sensitive.

The survey was conducted among 16 respondents. There were 8 pensioners from Poland, 4 from Croatia and 4 from the Czech Republic. In total, 12 women and 4 men participated in the research, aged 63-84. As far as size of the sample is concerned, one of the rules of qualitative research is that the selection of respondents is based on the experience of other researchers carrying out research on a similar subject. Also the typical size in that type of research is 12-16 interviews (Stefańska and Olejnik 2021). For comparison, in the UK research 15 household food purchasers were interviewed (Graham-Rowe, Jessop and Sparks 2014). In another study among seniors with the same subject matter, 16 respondents over 65 years of age were surveyed, but in retirement

living communities (McAdams, von Massow and Gallant 2019). Most of the respondents participating in our survey were the main persons responsible for purchasing in households.

The duration of each study was approximately 45 minutes. The interviews, with the consent of the participants, were recorded and then transcribed. The results were processed with the use of the Atlas.ti computer program. The analysis of the content of the collected material was performed according to the principles developed by Miles and Huberman (1984), and with the use of the descriptive, attribute and process coding of statements in accordance with Saldana's recommendations (Saldana, 2021).

5. Results

5.1. Spontaneous associations with “food wasting”

At the beginning, all respondents agreed that generally food plays a very important role in their lives (4-5 points) and that money doesn't bring happiness, but can make living and decision making much easier.

Food waste in the context of the global problem is perceived by retirees through the prism of tons of food that are thrown away primarily by restaurants and large stores, but not necessarily households. The problem in this case arises from production that is not adapted to the needs of society and from improper distribution. The result, according to pensioners, is world hunger. It is worth quoting here two examples of respondents' statements: *“We throw out and others starve, it is unfair that we do what we do and others would give a lot for a piece of bread; It is a global problem, too many tons of food are thrown away”* (3PL) and *“poor kids in Africa”* (3CZ).

On the other hand, in the case of the second group of associations - closely related to the respondents, retirees in the first associations emphasize that the problem of wasting food does not directly concern them, because they personally do not waste food: *„I use everything to the end, and the rest is for animals”* (2PL), *„With me, there is no waste, I hate it, I process the bread differently, I dry, I make casseroles, grated bread, nothing is wasted in the countryside* (4PL). In general, wasting food is also associated with throwing food into the trash bin, too large purchases resulting from e.g. *“buying with your eyes”* (7PL) and *“Useless wasting and use, consumption, not effective redistribution, expiry”* (1CZ). One of the respondents, in turn, associates not wasting food with *„logic of thinking, being active in life, being someone”* (8PL).

5.2. Food reuse

The research shows that retirees try to manage their food in such a way as not to waste it, but also not to waste much of it for re-use. All respondents agree that they **save leftovers and use it another day**. In order not to spoil, they hide the rest in the refrigerator (or *„if it's cold I can put it on the balcony”*, 1CZ). Both they and their family members have no problem eating the same dish again. Sometimes, however, if there is too much of this food, the household *“without enthusiasm, but they eat; they are not happy, but whoever does not want to, don't eat”* (5PL). Some of the respondents are emotional when household members do not eat leftovers, for example sadness (1CRO, 2CRO, 4CRO), angry or worried due to attitude that it is a financial loss as well (4PL, 1CRO, 3CRO, 4CRO).

As they emphasize, they try to buy and prepare as much food as they or their loved ones are able to eat. As one pensioner points out: *“I buy and prepare as much as I have to eat, and even less, I don't make unnecessary supplies. If I need 1 cucumber, I don't buy any more because it will break. When I do more, I heat it up in the microwave the next day and continue eating it. It doesn't matter that I don't feel like eating it. I must”* (1PL).

Another strategy for dealing with the food left over from a meal is to **make it into a different dish** (2PL, 3PL, 5PL, 6PL, 1CRO, 4CRO). It is worth quoting here: *“Something is going to be done the next day, for example if there are potatoes left, you can cook carrots and other vegetables and make a vegetable salad”* (2PL). Retirees provide examples of such solutions. It is very common to make tomato soup from chicken soup (3PL), fry potatoes, make potato dumplings (5PL), or use excess meat to bake (6PL).

In addition, the still working pensioner emphasized that if there is any food left, she takes it **to work the next day**, *“I take the cake to work to share with my friends”* (3PL). Retirees, so that the food they have prepared is not wasted, they also share their **excess with their relatives, giving them home** (3PL, 4PL, 3CZ): *“When I see that there is too much left, I separate the guests so that they don't get wasted. Children and grandchildren get taken away”* (3PL). Another solution is to **freeze excess food** prepared (4PL, 5PL, 2CZ, 3CZ).

Rarely, but it happens that such residues are thrown away *“I often throw out when it is stale, or I get bored, or there is nobody to give to”* (7PL). In the case of retirees, especially those living in the countryside, food leftovers are often used as **food for animals**, not only farm animals, but also dogs or cats, not only their own, but also those who walk freely in the countryside (2PL; 4PL, 8PL).

Another aspect raised in the research was the attitudes of retirees towards wasting food by **leaving uneaten portions on the plate**. They strongly emphasize that this is a very good rule, although not always possible to be strictly adhered to (5PL, 1CZ, 2 CZ). For example, as one respondent notes: *„Sometimes it may happen that the kid is not feeling well, maybe he or she would like to eat something else. It is a useless stress”* (3CZ).

The way to avoid wastage in this case is to put a portion size on the plates that you can eat. *“As everyone puts himself on, he throws away less. Everyone knows how much he wants to eat”* (2PL), *“It's better to have smaller portions and make toppings. Then I would have leftovers for sure”* (5PL). Also all Croats respondents agree that each individual is responsible for their own plate and they claim that there is a tradition and culture in their families to eat everything that is taken to one's plate.

In the case of placing dishes on plates, the way to reduce food waste may be to eat the leftovers of the loved ones, *“In the family I can I can even finish after someone (after my wife) or I was able to finish a meal after my kids. But if there is any leftover on the plate it was not consumed by a visitor/guest, those I would throw away. From this perspective serving on a platter is better as guests can take as much as they like”* (1CZ).

On the other hand, some people see the advantages of putting food on the plates right away, but on the condition that each reveler indicates how much he or she wants to eat *„Putting food on the platter means for me more work and at the end even more dishes”* (3CZ).

Sometimes, however, especially at some ceremonies, the hostess herself imposes or encourages us to eat more. As the respondents emphasize, they do not like such situations: *“There is no such obligation to eat everything. If someone puts too much on me, first I scream not to put more on me, and when he does, it's his housewife's problem, because I will leave it. But in a restaurant, I would rather eat everything, even by force. I will not leave it there, because it would be wasted. Or a dishonest restaurateur will give it to someone else, and if they throw it away, it's a waste of food. I would challenge someone if someone throws away food”* (1PL). At the same time, they notice that people often put too much food on their plates during holidays or trips. In their opinion, such behavior may result from greed, ill-considered behavior, fear that there will be no more for them, they consider it a little-sense approach.

In turn, being the hostess, they also try not to force anyone to eat the entire portion, even if someone put it on their plate and did not eat it all. *“Maybe someone did not like it and did not eat it. You cannot force anyone”* (2PL). There are times, however, that leaving food on the plate may be misunderstood by retirees and may be irritating. As one of the respondents points out, *“When the son-in-law arrives, he must always leave some crumbs, uneaten pork chop, and half-finished tea. He has such a habit from home. But we leave our plates clean”* (4PL).

6. Discussion and Conclusion

The results presented above show great engagement of senior households in managing food wasting. This conclusion is confirmed by the results of studies carried out in other countries, including in Spain by Conde-Caballero et al. (2021) who insist that “the inductive-deductive analysis revealed enduring memories that shaped present-day attitudes towards food - i.e. maximization of ingredients and “zero-waste” practices”. Also a study in Italy by Lanfranchi et al. (2016) indicates that seniors are characterized by high skill levels due to their involvement in food management, including the problem of food wasting. However, as explained by Schanes et al. (2018), “There is no consensus about how far food waste generation is subject to age”. Generally in many research we can observe a negative correlation between the amount of food wasted and age (Secondi et al., 2015; Ishangulyyev et al. 2019; Bozdog and Cakiroglu, 2021), but in other studies their authors indicate that seniors waste more food than younger (Cecere et al., 2013).

The attitudes of seniors towards wasting food depend on where they live. Like Secondi et al. (2015) who indicated that “at individual level it was observed that people living in towns and large cities tend to produce more waste thus emphasizing the need of diversifying policy interventions at local level according to the extent of urbanization”, our research also confirms this relationship. This is because seniors living in the countryside have a greater ability to feed their animals with food scraps or compost, which is not seen as a waste of food by them.

The results presented above lead to some general conclusion. As far as the level and the structure (categories) of food waste is concerned, we observed large differences among countries. Second - food plays an important role in their life. Next - senior households represent a similar attitude toward food waste no matter the country of origin. They perceive that as both a global problem but also economic, social and environmental consequences. Seniors are very creative in the ways to reduce food waste (and money waste). We don't observe differences in respondents' answers and that leads to the conclusion that their attitude is a result of problems experienced by them when they were children.

To conclude, this study has deepened the understanding of the food waste problem in seniors households and ways of preventing the problem. It seems clear that seniors respect food and are very creative in decreasing losses. At the same time they are aware that nobody can be forced into any solutions. It also seems clear that much of the attitude of people comes from home. This is the first place of education.

7. Limitations and future directions of research

The studies are pilot studies, they were carried out on a small sample and in only three countries. And in a rather specific time - the covid-19 pandemic. Since it's not obvious whether age is in fact the determinant of household attitude toward food waste, in that article we concentrated our research on the older generation to explore their attitude, motives and behaviour. We didn't analyze younger households due to the unsolved and pending conclusions from other research that generation X and Y, and maybe Z can represent different attitudes toward the food waste

problem. Future research may be oriented on recognition of the attitude of their households toward the problem of food waste and methods of education and adaptation of new technologies to prevent the phenomenon, as a kind of exchange of knowledge and experience between generations.

We didn't either ask respondents in detail how they understood the expiration date. It's worth mentioning here about the interpretation of labels. According to research by Zielińska et al. (2020) people have difficulty distinguishing and understanding the terms on the label and that a significant proportion of the respondents consume food products after the "best before" date. The authors tested in laboratory milk, pasta, mayonnaise and jam and they confirmed the microbiological safety of the products even six months after the "best before" date. Other features (texture, colour and sensory quality) slightly changed after one month for milk and mayonnaise (the colour had become more yellow) and after three months for pasta (its hardness had decreased) and jam (it had become browner). Similar problem with understanding labels was among Greek households - in the research of Abeliotis, Lasaridi and Chroni (2014) about 40% of respondents misunderstand the meaning of food date labels. We may expect that a similar problem is faced by seniors, who in interviews inform that they throw out food after expiration date, and it can also be another topic of future research.

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References

- [1] Abeliotis, K., Lasaridi K., & Chroni C. (2014). Attitudes and behaviour of Greek households regarding food waste prevention, *Waste Management&Research: The Journal for a Sustainable Circular Economy*. 32(3), 237-340. doi: 10.1177/0734242X14521681
- [2] Allen, T., & Proserpi, P. (2016). Modeling Sustainable Food Systems. *Environmental Management*, 57, 956–975. doi:10.1007/s00267-016-0664-8
- [3] Beldowicz, A. (2021). *Raport ONZ: miliard ton żywności rocznie ładuje na śmietniku (5.3.2021)*, <https://klimat.rp.pl/ekotrendy/art17074151-raport-onz-miliard-ton-zywnosci-rocznie-laduje-na-smietniku>
- [4] Benton Jr, R. (2015). Reduce, Reuse, Recycle...and Refuse, *Journal of Macromarketing*, 35(1), 111-122. DOI: 10.1177/02761467145346
- [5] Borowski, M. (2019). *Nie marnuj jedzenia 2019, Raport Federacji Polskich Banków Żywności*, 1-12, https://niemarnuje.bankizywnosci.pl/wp-content/uploads/2019/11/banki-zcc87ywnosci_-raport-nie-marnuj-jedzenia-2019.pdf
- [6] Borusiak, B. (2021). Sustainable Consumption. in: Sustainability and sustainable development M. Stefańska (ed.), 35–41, <http://doi.org/10.18559/978-83-8211-074-6/13>
- [7] Bozdog, A., & Cakiroglu, F. (2021). Determination of the factors affecting the amount of food waste generated from households in Turkey, *Future of Food: Journal on Food, Agriculture and Society*, 9(2).
- [8] Cecere, G., Mancinelli, S., Mazzanti, M. (2013). Waste prevention and social preferences: the role of intrinsic and extrinsic motivations, *Consumer Social Responsibility eJournal*, DOI:10.2139/ssrn.2273477
- [9] Chen, T-L., Kim, H., Pan, S-Y., Tseng, P-C., Lin, Y-P., & Chiang, P-C. (2020). Implementation of green chemistry principles in circular economy system towards sustainable development goals: Challenges and perspectives, *Science of The Total Environment*, 716, 1-16, <https://doi.org/10.1016/j.scitotenv.2020.136998>.
- [10] Conde-Caballero, D., Rivero-Jimenez, B., & Mariano-Juarez, L. (2021). Memories of hunger, continuities, and food choices: An ethnography of the elderly in extremadura (Spain), *Appetite*, 164, 105267.

- [11] Coskun, A. (2021). Identification of different user types for designing household food waste interventions, *International Journal of Sustainable Engineering*, 14(4), 609-617, DOI: 10.1080/19397038.2021.1886372
- [12] Everitt, H., van der Werf, P., Seabrook, J. A., Wray, A., & Gilliland, J. A. (2021). The quantity and composition of household food waste during the COVID-19 pandemic: A direct measurement study in Canada, *Socio-Economic Planning Sciences*, <https://doi.org/10.1016/j.seps.2021.101110>
- [13] *Gdzie marnuje się najwięcej żywności? Wcale nie w sklepach. Jest nowe badanie (12.11.2021)* <https://businessinsider.com.pl/wiadomosci/gdzie-marnuje-sie-najwiecej-zywnosci-wcale-nie-w-sklepach-jest-nowe-badanie/7yqsjhf>
- [14] Graham-Rowe, E., Jessop, D.C., & Sparks, P. (2014). Identifying motivations and barriers to minimising household food waste, *Resources, Conservation and Recycling*, 84, 15-23,
- [15] Halloran, A., Clement, J. Kornum, N., Bucatariu, C., & Magid, J. (2014). Addressing food waste reduction in Denmark, *Food Policy*, 49, 294–301
- [16] Ishangulyyev, R., Kim, S., & Lee, S. (2019). Understanding Food Loss and Waste—Why Are We Losing and Wasting Food? *Foods*, 8(8), 297.
- [17] *Każdy Polak marnuje rocznie 247 kg żywności. Jesteśmy na 5. miejscu w UE (8.08.2019)* <https://businessinsider.com.pl/wiadomosci/marnowanie-zywnosci-w-polsce/1fkhng5>
- [18] Kummu, M., Moel, H., Porkka, M., Siebert, S., Varis, O., & Ward, P.J. (2012). Lost food, wasted resources: global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use. *Science of The Total Environment*, 438C, 477–489.
- [19] Lanfranchi, M., Calabrò, G., De Pascale, A., Fazio, A. & Giannetto, C. (2016). Household food waste and eating behavior: empirical survey, *British Food Journal*, 118(12), 3059-3072.
- [20] Mbow, C., Rosenzweig, C., Barioni, L. G., Benton, T. G., Herrero, M., Krishnapillai, M., Liwenga, E., Pradhan, P., Rivera-Ferre, M. G., Sapkota, T., Tubiello, F. N., & Xu, Y. (2019). Food security. In *Climate Change and Land: An IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. Intergovernmental Panel on Climate Change*. https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/08_Chapter-5_3.pdf
- [21] McAdams, B., von Massow, M. & Gallant, M. (2019). Food Waste and Quality of Life in Elderly Populations Living in Retirement Living Communities, *Journal of Housing For the Elderly*, 33(1), 72-84, DOI: 10.1080/02763893.2018.1451801
- [22] Miles, M. & Huberman, A.M. (1984). *Qualitative Data Analysis*. London: Sage.
- [23] Saldana, J. (2021). *The Coding Manual for Qualitative Researchers*, London: Sage Publications Ltd.
- [24] Schanes, K., Dobernick, K., & Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications, *Journal of Cleaner Production*, 182, 978-991.
- [25] Secondi, L., Principato, L., & Laureti T. (2015). Household food waste behaviour in EU-27 countries: A multilevel analysis, *Food Policy*, 56, 25-40,
- [26] Stefańska, M., & Olejnik, I. (2021). Dobór próby i analiza wyników w badaniach jakościowych. In: M. Rószkiewicz, K. Mazurek-Łopacińska & A. Sagan (Eds), *Dobór próby we współczesnych badaniach marketingowych. Podejścia ilościowe, jakościowe i mieszane* (pp. 59-74). Szczecin, Uniwersytet Szczeciński, Rozprawy i Studia (1311) 1237.
- [27] UNEP Food Waste Index Report (2021). *2021 United Nations Environment Programme*, ISBN No: 978-92-807-3868-1, 1-100.
- [28] Zielińska, D., Bilaska, B., Marciniak-Łukasiak, K., Łepecka, A., Trzaskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A., & Koločyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. *International Journal of Environmental Research and Public Health*. 17(5):1632. <https://doi.org/10.3390/ijerph17051632>

Slovak Young Adults and Their Beer Consumption Habits

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Abstract

Intense alcohol consumption among young adults is considered as an issue in general. Thus, in depth understanding of the consumption habits of this age group is needed. The drinking habits are different not only based on the age group but on the type of alcohol beverage and country. Therefore, the article deals with the beer consumption habits of Slovak young adults which were examined in the form of questionnaire survey conducted on the sample of 726 individuals. Statistical analysis enclosed significant differences between young adults of various income, relationship status and place of living in the set of ten beer factors out of which amount respondents can drink at single occasion, beer likeness and frequency of drinking beer were identified as most important. The results of the article are beneficial for beer producer companies in terms of marketing strategy, and on the other hand, for appropriate policy creation, as the effects of alcohol on young consumers are not the same as they are on adults.

Keywords: young adults, preferences, beer, drinking habits

JEL Classification: L26, M14, K22, L53

1. Introduction

The habits of alcohol consumption differ based on various aspects, such as the age group, as beer consumption is considered primarily as a drink for the younger generations, while older age groups traditionally prefer wine or spirits (Penina, 2017). Three main categories are known when it comes to age groups of the youth: adolescents (puberty or 12–17 years), young adults (18–25 years), and later adults (26–39 years). The categorisation based on Arnett J. J. (2000) is a bit different, since young adulthood typically covers ages 18–29. The article focuses on young adults aged 18–26, as this age group is considered as an especially vulnerable target for beer consumption, as they are a key target for marketing and advertising, as the majority of alcohol products are promoted as proper drinks for social events such as festivals, parties and other occasions. Based on Connolly et al. (1994) young men who consume beer were mostly aware of beer advertisements and were most likely to be targeted by beer promotions. In addition, the drinking habits of young adults are influenced not only by the media but also by peer pressure, that is suggested in several studies (Ding L. et al., 2018, Borsari 2001, Korte et al. 2012). Also, in various researches alcohol consumption is analyzed in depth that emphasizes psychological aspects (Brewer et al., 2017, Kirouac & Witkiewitz, 2017) and even sensory evaluation (Medoro et al., Viejo et al., 2019). According to Borsari et. al. alcohol consumption within a group is not a personal choice, but rather an obligation to protect the loyalty and harmony of the group. When it comes to drinking habits, they are formed based on various factors such as monthly income, place of drinking, relationship status or place of living. Affordability or monthly income is a significant factor which affects alcohol consumption. When income rises, alcohol consumption can rise, since as alcohol beverages become more affordable for people (Nelson, 2013). Therefore, there are several researches that analyse alcohol consumption in economic or market terms (Madsen & Wu, 2016, Colen & Swinnen, 2016, Morgan et al., 2020). Various studies,

examine that certain rural-to-urban migrants consume less alcohol products due to a protective effect of rural backgrounds or economic limitations (Quisumbing, 2020). According to Macinko (2015) drinkers are slightly more likely to reside in urban areas than in rural ones. Understanding the consumer habits and which beverages are the most consumed among young adults has implications for policy and intervention works, which can be improved by concentrating on the beverages that are the most frequently consumed ones (Stern, 2017).

2. Data and Methods

At the preparation stage of our research, the study of relevant scientific sources in the field of beer consumption among young adults was included. Acquired knowledge was used in the phase of creating a questionnaire as the main research method. This was conducted in the online form using Google Forms platform distributed by social media among consumers of various characteristics. In total, 735 answers were received. After exclusion of incomplete answers and subsequent data adjustment (Munk, et al., 2013) the sample was narrowed to 726 answers.

The questionnaire consisted of three sorting questions (SQ1, SQ2 SQ3) related to consumer's income, relationship status and place of living and 10 questions of "beer factors" (BF1-BF10) related to their preferences connected with consumption of beer:

- SQ1 Monthly Income (1 - Under 300 EUR, 2- Up to 300 EUR)
- SQ2 Relationship Status (1- Single, 2 - In Relationship)
- SQ3 Place of Living (1 - City, 2- Village)
- BF1 Beer Likeness (1- Very weak, 2- Weak, 3- Averagely, 4- Strong, 5- Very strong)
- BF2 Beer Frequency (1- Couple times a year, 2- Once a month, 3- Couple times a month, 4 - Couple times a week, 5- Every day)
- BF3 Place of Drinking (1- Pub, 2- Home, 3- Outdoor activities, 3- Restaurant (with meal), 5- At friend's place)
- BF4 Beer Preferences (1- Tapped, 2- Can, 3- Glass Bottle, 4- Plastic Bottle)
- BF5 Dispose of Cans (1- Mixed waste, 2- Separated waste)
- BF6 Dispose of Glass Bottles (1- Mixed waste, 2- Separated waste, 3- Refund)
- BF7 Dispose of Plastic Bottles (1- Mixed waste, 2- Separated waste)
- BF8 Amount Single Occasion (1- Less than 0,3 l, 2- 0,3-0,5l, 3- 0,5-1,5 l, 4- 1,5-3,5l, 5- 3,5l and more)
- BF9 End Up at the Occasion (1- Single glass, 2- Tipsy, 3- Move to harder alcohol, 4- K.O.)
- BF10 Increased Beer Expenses during COVID 19 pandemic (1- Yes, 2- No)

Included "beer factors" were selected in regard of describing consumer's preferences in drinking beer and their habits towards responsible waste management (dispose of beer packages) and last but not least, in regard of changes in their expenses on beer during pandemic.

After processing the data, the Shapiro-Wilk test of normality was used to determine if a data set is well-modelled by a normal distribution, based on the the null hypothesis is that "sample distribution is normal." Our analysis confirmed non-normal distribution. Therefore, Kruskal–Wallis non-parametric method for testing whether samples originate from the same distribution was applied with the assumption of following null hypothesis H_0 and set of alternative hypothesis derivate from H_a :

- H_0 : There is no difference between young adults in their beer drinking habits.
- H_1 : There is a difference between young adults in their beer drinking habits.
 - H_{1a} : There is a difference between young adults according to their monthly income.

- H1b: There is a difference between young adults according to their relationship status.
- H1c: There is a difference between young adults according to their place of living.

For evaluation, the significance level α was determined at 0.05, i.e. a 5% test error is accepted. If the p-value is $\leq \alpha$, then H_0 is rejected at the significance level α and we accept H_a . If p-value $> \alpha$, then H_0 is not rejected at the significance level α . Usually, the post hoc test is used for further evaluation of the differences found by Kruskal Wallis test. Since our sorting characteristics (SQ1-3) are dichotomist (have just two possible answers) the usage of post hoc test calculated to counteract the problem of multiple comparisons between the examined questions (Miller, 1996), was not needed. Instead, find differences were further described by cross tabulation of found pairs of sorting questions and beer factors identified as sign of difference.

3. Results and Discussion

Drinking habits of young adults in Slovakia can be characterized by their general likeness and preferences of beer, frequency of its consumption, place of drinking, drink amount and also by their habits in the disposing of beer packages (cans, glass bottles, plastic bottles). Recently, also the question of increased expenses on beer during pandemic is increasing.

As the first factor of beer drinking among young adults in Slovakia, the (BF1) Beer Likeness was included in the analysis. The majority of 47.1 % of examined young adults likes beer very strongly and additional 35.1 % strongly. This shows positive attitudes of examined young adults towards beer drinking. Next, beer frequency (BF2) was considered among young adults. There are 34.2% of respondents who consume beer a couple times a month, 32.5% couple times a week, 21.3% couple times a year, 9.5% once a month and 2.5% every day. Therefore, young adults can be considered as frequent consumers of beer. The next factor is the place of drinking (BF3), which represents that the majority of the respondents, 48.5% prefer to consume beer in a pub, 23.8% at home, 12.1% at a friend's place, 9.6% at a restaurant with a meal and 5.8% besides outdoor activities. In fact, young people like to consume beer products while socializing with friends. When it comes to beer preferences in terms of packaging and serving (BF4), there is positive attitude towards tapped beer, which was selected by 83.9% of the respondents. This behaviour can be connected the previous factor (BF3), since young adults prefer beer consumption mainly in pubs. The other beer preferences in terms of packaging and serving are represented by lower percentage, since 8.7% of the respondents prefer can, 6.6% glass bottle and 0.8% plastic bottle. The following tables are connected to sustainability in terms of disposing and recycling. Disposing of cans (BF5) and illustrates that 74.2% of the respondent throw out cans to separated waste and 25.8% to mixed waste. Therefore, young adults are more likely to recycle and care about the environment. On the other hand, while considering the factors connected to waste management (BF5, BF6, BF7) can is the packaging form that is more likely ending in the mixed waste. The next answers about the dispose of glass bottles (BF6) enclosed that, there are only 3.7% of respondents who throw glass bottles into mixed waste. The majority of the respondents are conscious about recycling, since 55.5% chose refund option of glass bottles and 40.8% separated waste option. The last factor that is connected to waste management is the dispose of plastic bottles (BF7). Next factor shows that 87.5% of the respondents throw plastic bottles to separated waste and 12.5% to mixed waste.

The next feature is connected to the amount of beer consumed by one occasion (BF8). Almost half of the respondents, 48.2% consume 0.5l - 1.5l of beer per one occasion, 21.6% of young adults consume 0.3 - 0.5 l, 21.1% 1.5 - 3.5 l, 6.3% less than 0.3 l and 2.8% 3.5 l and more. According to responses for the factor of how respondents end up by one single occasion of beer consumption shows factor BF9. More than half of the results, 65.4% of the respondents become

tipsy, 22.6% drink just a single glass of drink, 9.8% of young adults start with beer but then move to other alcoholic drink that contains more percentage of alcohol, such as spirits, and 2.2% of the respondents end up drunk. The last factor is connected to the beer expenses during the COVID-19 pandemic. Since most of the food and beverage products have become more expensive during this period, also beer should be considered. The perspective of young adults on the beer expenses (BF10) illustrates that 95.9% of the respondents did not experience higher expenses for beer products and 4.1% answered yes. After examining the frequencies of beer factors (BF1-BF10) includes in this study of beer consumption habits, the statistically analysis of differences between set groups of young adults (groups of differ monthly income, relationship status and place of living) was included.

Initially, the differences between young adults who earn more and less than 300 EUR monthly were examined. Table 1 shows outcomes of Kruskal-Wallis test which find two significant differences between these two groups of young adults: BF2 Beer Frequency (Asimp sig. = 0.038) and BF8 Amount Single Occasion (Asimp sig. = 0.011). In case of other beer factors, the Assimp sig. value was up to 0.05 which indicates no statistically significant difference. Therefore, **we can accept the alternative hypotheses H1a for BF2 and BF8** and reject the null hypothesis H0. In case of other factors, we are accepting the null hypothesis (H0) of no statistically significant difference between young adults.

Table 1: Statistically Significant Differences According to Monthly Income

	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	BF9	BF10
Kruskal-Wallis H	0.549	4.316	0.220	0.772	0.598	1.387	0.490	6.466	0.444	1.356
Asymp. Sig.	0.459	0.038	0.639	0.380	0.439	0.239	0.484	0.011	0.505	0.244

Source: Own calculations

Found statistically significant difference between young adults who earn more than 300 EUR monthly and who earn less we can describe in connection with frequency of beer drinking thorough table 2. This shows difference in case of consumers who drink beer every day since just 6 of them are from group of lower income and two times more of them from the higher income group.

Table 2: SQ1 Monthly Income * BF2 Beer Frequency Crosstabulation

		BF2 Beer Frequency					Total
		1	2	3	4	5	
Monthly Income	1	81	35	112	102	6	336
	2	74	34	136	134	12	390
Total		155	69	248	236	18	726

Source: Own calculations

Also, statistically significant difference was found between young adults of various income in the amount of beer they drink at single occasion. The differences are visible (Table 3) mostly in case of those who can drink 1.5-3.5 litres of beer at once and even more in case of those who can drink 3.5 litres and more at once.

Table 3: SQ1 Monthly Income * BF8 Amount Single Occasion Crosstabulation

		BF8 Amount Single Occasion					Total
		1	2	3	4	5	
Monthly Income	1	26	76	169	60	5	336
	2	20	81	181	93	15	390
Total		46	157	350	153	20	726

Source: Own calculations

The first part of research of statistically significant differences between young adults shows that their consumption is affected by their income since higher income group declare stronger likeness of beer and bigger amount they can drink at single occasion.

Table 4 represents the outcomes of Kruskal-Wallis test with four significant differences between these groups of young adults: BF1 Beer Likeness (Asimp sig. = 0.013), BF2 Beer Frequency (Asimp sig. = 0.040), BF8 Amount Single Occasion (Asimp sig. = 0.0060) and BF9 End Up Single Occasion (Asimp sig. = 0.001). The Assimp sig. value was up to 0.05 for the other beer factors, which indicates no statistically significant difference. **We can accept the alternative hypotheses H1b for BF1, BF2, BF8 and BF9** and reject the null hypothesis H0. In case of other factors, we accept the null hypothesis (H0) of no statistically significant difference between young adults.

Table 4: Statistically Significant Differences According to Relationship Status

	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	BF9	BF10
Kruskal-Wallis H	6.238	4.210	2.429	0.740	2.146	1.879	0.425	7.459	10.623	0.085
Asymp. Sig.	0.013	0.040	0.119	0.390	0.143	0.170	0.514	0.006	0.001	0.771

Source: Own calculations

There is a weak statistically significant difference between young adults who are single and who are in relationship in connection with beer likeness that is presented in table 15. 165 of the single respondents and 177 of the respondents in relationship like beer very strongly but the difference can be observed in the case of weak (2) and average (3) level of beer likeness (Table 5).

Table 5: Crossable – SQ2 Relationship Status * BF1 Beer Likeness Crosstabulation

		BF1 Beer Likenes					Total
		1	2	3	4	5	
Relationship Status	1	13	17	14	111	165	320
	2	14	38	33	144	177	406
Total		27	55	47	255	342	726

Source: Own calculations

Next, relationship status in connection with beer frequency is illustrated in table 6. There is statistically significant difference between singles who drink beer a couple of times a year (66 respondents) and respondents in relationship (89 respondents), there are two times more respondents in relationship who drink beer once a month than singles. On the other hand, 11 single respondents and 7 in relationship drink beer daily.

Table 6: SQ2 Relationship Status * BF2 Beer Frequency Crosstabulation

		BF2 Beer Frequency					Total
		1	2	3	4	5	
Relationship Status	1	66	22	107	114	11	320
	2	89	47	141	122	7	406
Total		155	69	248	236	18	726

Source: Own calculations

Relationship status in connection with the consumed amount by single occasion is represented in table 7. 63% of the respondents who consume 0.3 – 0.5l by one occasion is single and 36% in relationship, 40% of the respondents who consume 1.5 – 3.5l by one occasion are single and 60% are in relationship. Therefore, there is a stronger statistically significant difference.

Table 7: SQ2 Relationship Status * BF8 Amount Single Occasion Crosstabulation

		BF8 Amount Single Occasion					Total
		1	2	3	4	5	
Relationship Status	1	17	57	158	80	8	320
	2	29	100	192	73	12	406
Total		46	157	350	153	20	726

Source: Own calculations

Table 8. illustrates the connection of relationship status and how respondents end up by one single occasion of alcohol drinking. There is statistically significant difference between young adults who are single and who are in relationship in connection with who they end up by a single occasion of alcohol drinking. 68.75% of the respondents are single and 31.25% in relationship who end up drunk, 34.75% are in relationship and 65.25% in relationship who drink just one glass of drink by one single occasion.

Table 8: SQ2 Relationship Status * BF9 End Up Single Occasion Crosstabulation

		BF9 End Up Single Occasion				Total
		1	2	3	4	
Relationship Status	1	57	215	37	11	320
	2	107	260	34	5	406
Total		164	475	71	16	726

Source: Own calculations

The next part of research of statistically significant differences between young adults shows that their consumption is affected by their relationship status since respondents in relationship are more likely to consume beer, single young adults drink more frequently, respondents in relationship drink more alcohol by one occasion and two times more respondents end up drunk by one occasion of drinking.

The Kruskal-Wallis test in table 9 denotes three significant differences between the groups of young adults: BF1 Beer Likeness (Asimp sig. = 0.006), BF4 Beer Preferences (Asimp sig. = 0.036) and BF5 Dispose of cans (Asimp sig. = 0.000). The Assimp sig. value was up to 0.05 for the other beer factors, which indicates no statistically significant difference. **We can accept the**

alternative hypotheses H1c for BF1, BF4 and BF5 and reject the null hypothesis H0. In case of other factors, we accept the null hypothesis (H0) of no statistically significant difference between young adults.

Table 9: Statistically Significant Differences According to Place of Living

	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	BF9	BF10
Kruskal-Wallis H	7.465	0.294	2.999	4.385	16.690	2.736	0.381	2.867	0.184	1.619
Asymp. Sig.	0.006	0.588	0.083	0.036	0.000	0.098	0.537	0.090	0.668	0.203

Source: Own calculations

The next aspect is the connection between the place of living and beer likeness that is illustrated in table 10. There is no statistically significant difference between the two aspects in most of the cases, for example 53.5% of the respondents who drink beer everyday lives in a city and 46.5% in a village. The only exception is in the case of young adults who drink beer a couple times a month, 22.9% lives in a city and 77.1% in a village. In this case there is a statistically significant difference.

Table 10: SQ3 Place of Living * BF1 Beer Likeness Crosstabulation

		BF1 Beer Likeness					Total
		1	2	3	4	5	
Origin	1	14	24	11	121	183	353
	2	13	31	36	134	159	373
Total		27	55	47	255	342	726

Source: Own calculations

The connection between the place of living and beer preferences is showed in table 11, where there is statistically significant difference between the preference of canned beer of young adults living in city (34.92%) and in village (65.08%). In the case of beer packed in glass bottle, plastic bottle are tapped there is no statistically difference based on the place of living.

Table 11: SQ3 Place of Living * BF4 Beer Preferences Crosstabulation

		BF4 Beer Preferences				Total
		1	2	3	4	
Origin	1	307	22	21	3	353
	2	302	41	27	3	373
Total		609	63	48	6	726

Source: Own calculations

Based on the results in table 12, there is statistically significant difference between the place of living and dispose of cans. In the case of separation of cans 67.42% of young adults who separate are living in a city and 80.69% in a village.

Table 12: SQ3 Place of Living * BF5 Dispose of Cans Crosstabulation

		BF5 Dispose of cans		Total
		1	2	
Origin	1	115	238	353
	2	72	301	373
Total		187	539	726

Source: Own calculations

The last part of the research of statistically significant differences between young adults shows that their consumption is affected by their place of living since the majority of respondents who drink beer a couple of times a month, prefers beer in can and separate canned beer lives in a village.

However, there are several targeting opportunities, in the case of beer producers, targeting based on the age group is essential in the 21st century, mainly to strengthen the responsibility of the brewing industry. Therefore, this topic has a very close relation to the CSR activities of the brewing companies. Even though, there are various studies that are dealing with CSR activities in the food and beverage industry (Nirino et al. 2019, Sokil et al. 2020), topics oriented on the importance of CSR in the brewing industry have their limitations. Therefore, further and deeper research is needed.

4. Conclusion

In conclusion, the article was dealing with the beer consumption preferences of Slovak young adults (aged between 18-26). Since beer is considered as a drink of socialisation, it is essential to understand the consumer behaviour of this age group that spends a considerable time with friends and peers. Therefore, it can provide suggestions to strategic decision-making in terms of marketing, business and policy creation. As it resulted from the research, most of the respondents consume beer a couple of times a month (34.2%) or a couple of times a week (32.5%), that proves that beer is a common drink among this age group. There are three aspects that needed to be considered: monthly income, relationship status and origin. Based on the research the consumption of young adults is affected by their income since higher income group declare stronger likeness of beer and bigger amount they can drink at single occasion. Next, respondents in relationship are more likely to consume beer, single young adults drink more frequently, respondents in relationship drink more alcohol by one occasion and two times more single respondents end up drunk by one occasion of drinking. The last part of the research showed that consumption habits are affected also by the place of living since the majority of respondents who drink beer a couple of times a month, prefers beer in can and separate canned beer lives in a village. In addition, beer consumption has a broader aspect – social, cultural, economic and therefore environmental, as well. Based on the article young adults are conscious about recycling, since 87.5% of the respondents throw plastic bottles to separated waste, 55.5% chose refund option of glass bottles and 74.2% of the young adult respondents throw out cans to separated waste. Based on the results of this paper, it is recommended for breweries in Slovakia to strengthen their CSR activities that are considered important to this generation, and therefore to apply such marketing communication strategy that supports the awareness of young adults of them. Therefore, the outcomes can help to create a sufficient strategy to target this age group based on their monthly income, relationship status and place of living, and increase their sales responsibly.

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References

- [1] Arnett, J. J. (2000). Emerging adulthood. A theory of development from the late teens through the twenties. *The American Psychologist*, 55, 469–480. <https://doi.apa.org/doiLanding?doi=10.1037%2F0003-066X.55.5.469>
- [2] Borsari, B., Carey, K. B. (2001). Peer Influences on College Drinking: A Review of the Research. *Journal of Substance Abuse*, 13, 391–424. [https://doi.org/10.1016/S0899-3289\(01\)00098-0](https://doi.org/10.1016/S0899-3289(01)00098-0)
- [3] Brewer, C., Streeb, E., & Skinner, M. (2017). Supervised disulfiram's superior effectiveness in alcoholism treatment: ethical, methodological, and psychological aspects. *Alcohol and Alcoholism*, 52(2), 213–219. <https://doi.org/10.1093/alcalc/agw093>
- [4] Colen, L., Swinnen, J. (2016). Economic growth, globalisation and beer consumption. *Journal of Agricultural Economics*, 67(1), 186–207. <https://doi.org/10.1111/1477-9552.12128>
- [5] Connolly, G. M., Casswell, S., ZHANG, J. F., & Silva, P. A. (1994). Alcohol in the mass media and drinking by adolescents: a longitudinal study. *Addiction*, 89(10), 1255–1263. <https://doi.org/10.1111/j.1360-0443.1994.tb03304.x>
- [6] Ding, L., Newman, I. M., Buhs, E. S., & Shell, D. F. (2018). Influence of peer pressure and self-efficacy for alcohol self-regulation on Chinese university physical education students' drinking behaviors. <https://doi.org/10.4236/ape.2018.81006>
- [7] Kirouac, M., Witkiewitz, K. (2017). Identifying “Hitting Bottom” among individuals with alcohol problems: development and evaluation of the noteworthy aspects of drinking important to recovery (NADIR). *Substance Use & Misuse*, 52(12), 1602–1615. <https://doi.org/10.1080/10826084.2017.1293104>
- [8] Korte, J., Pieterse, M. E., Postel, M. G., & Van Hoof, J. J. (2012). Private Peer Group Settings as an Environmental Determinant of Alcohol Use in Dutch Adolescents: Results from a Representative Survey in the Region of Twente. *Health & Place*, 18, 892–897. <https://doi.org/10.1016/j.healthplace.2012.02.010>
- [9] Macinko, J., Mullachery, P., Silver, D., Jimenez, G., & Libanio Morais Neto, O. (2015). Patterns of alcohol consumption and related behaviors in Brazil: evidence from the 2013 National Health Survey (PNS 2013). *PLoS one*, 10(7), e0134153. <https://doi.org/10.1371/journal.pone.0134153>
- [10] Madsen, E. S., Wu, Y. (2016). Marketing and globalization of the brewing industry. In I. Cabras, D. Higgins & D. Preece (Eds). *Brewing, beer and pubs*. London: Palgrave Macmillan, 34–53. https://doi.org/10.1057/9781137466181_3
- [11] Medoro, C., Cianciabella, M., Camilli, F., Magli, M., Gatti, E., Predieri, S. (2016). Sensory profile of Italian craft beers, beer taster expert versus sensory methods: a comparative study. *Food and Nutrition Sciences*, 7(06), 454. <https://doi.org/10.4236/fns.2016.76047>
- [12] Miller, R. G. 1966. *Simultaneous Statistical Inference*. McGraw-Hill Book Comp., New York 1966, 272 p. <https://doi.org/10.1002/bimj.19700120508>
- [13] Morgan, D. R., Thomas Lane, E., & Styles, D. (2020). Crafty marketing: an evaluation of distinctive criteria for “craft” beer. *Food Reviews International*. Advance online publication. <https://doi.org/10.1080/87559129.2020.1753207>
- [14] Munk, M., Drlik, M., Kapusta J., Munková, D. (2013). Methodology Design for Data Preparation in the Process of Discovering Patterns of Web Users Behaviour. *Applied Mathematics & Information Science*, vol. 7, no. 1, p. 27–36. <http://dx.doi.org/10.12785/amis/071L05>
- [15] Nelson J. (2013) Meta-analysis of alcohol price and income elasticities—with corrections for publication bias. *Health Econ Rev* 3:1–10. <https://doi.org/10.1186/2191-1991-3-17>
- [16] Nirino, N., Miglietta, N., Salvi, A. (2019). The impact of corporate social responsibility on firms' financial performance, evidence from the food and beverage industry. *British Food Journal*. <https://doi.org/10.1108/BFJ-07-2019-0503>
- [17] Penina, O. (2017). Alcohol-related causes of death and drinking patterns in Moldova as compared to Russia and Ukraine. *European Journal of Population*, 33(5), 679–700. <https://doi.org/10.1007/s10680-017-9450-4>

-
- [18] Quisumbing, A., & McNiven, S. (2020). Moving forward, looking back: The impact of migration and remittances on assets, consumption, and credit constraints in the rural Philippines (pp. 91-113). Routledge.
- [19] Sokil, O., Ubrežiová, I., Eugenio, T., & Marques, T. (2020). Does foodservice industry care about CSR? A study in Portugal and Ukraine. *Potravinarstvo*, 14(1). <https://doi.org/10.5219/1281>
- [20] Stern, S. A., Terry-McElrath, Y. M., & Patrick, M. E. (2017). Beverage-specific patterns of 5+ alcoholic drink consumption by young adults in the US. *Addictive behaviors*, 65, 19-24. <https://doi.org/10.1016/j.addbeh.2016.09.010>
- [21] Viejo, C. G., Fuentes, S., Howell, K., Torrico, D. D., Dunshea, F. R. (2019). Integration of non-invasive biometrics with sensory analysis techniques to assess acceptability of beer by consumers. *Physiology & Behavior*, 200, 139–147. <https://doi.org/10.1016/j.physbeh.2018.02.051>

Exploring Honey Consumer's Behaviour of Urban Millennials in Slovakia: Pilot Study

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Abstract

The aim of this paper was to study consumer behaviour of urban millennials in Slovakia. Research is based on primary data obtained from an online questionnaire survey in 2021. Research sample comprises 179 urban honey consumers between 25 – 30 years. Results showed that honey is mainly consumed due to medicine purposes during winter and illness period. The most respondents indicated occasional consumption with annual consumption up to 1 kg. The most preferred types of honey were both acacia and linden honey. This segment mostly purchases honey at retail stores or directly from beekeepers. Quality and taste were evaluated as the most important factors.

Keywords: honey consumers, purchasing behaviour, honey preferences, young segment,

JEL Classification: M30, M31, Q13

1. Introduction

During the decades the consumer's approach towards food had changed significantly. Health and nutrition are creating important trends in modern society. As reported by Goetzke & Spiller (2014) nowadays, the desire for health and well-being is a strong motivator in the food market. Likewise, Bleiel (2010) adds that aspects such as nutrition and health are forming the consumer's perspective in regard to food. As claimed by Sheau-Fen & Hong (2009) the constant changes in consumers' attitudes and behaviour towards a healthy lifestyle certainly heightened the interest in healthier alternatives of products and services. Similarly, several studies made by Oravec & Kovács (2019); Testa, Asciuto, Schifani, Schimmenti & Migliore (2019); Oliveira, Paiva & Novais (2020) claimed that the concern in consuming healthy food is constantly increasing. In the context of health trends, honey can be considered a food with many benefits to human health.

1.1 Consumer behaviour on honey market

Honey and other bee products have been used for their healing and medicinal properties since ancient times (Senel & Demir, 2018). Due to several attributes such as amino acids, carbohydrates, proteins and enzymes, Kafantaris, Amoutzias & Mossialos (2021) claimed that honey belongs to the category of superfood. Moreover, Ahluwalia, Dhandapani & Vaibhav (2020) believe that honey is an indispensable component in nutrition, which can be used as a dietary food, sweetener as well in medicine. The study made by Oravec & Kovács (2019) has established that the honey market has an increasing tendency in total consumption thanks to the growing concern about consuming foods with healthy properties. In research by Pocol & Ványi (2012), the results showed a positive relation between honey consumption and a healthy lifestyle. On average a resident of Slovakia consumed approximately 1.1 kg of honey in 2019 and the overall consumption of honey reached nearly 5 800 tons (Statistical Office of the Slovak Republic, 2022). Moreover, Pocol & Marghitas (2008) and Tiganis, Avgeris, Tigani, Tsakiridou & Grigoroudis (2020) pointed out that honey consumption is largely influenced by family habits

learned from parents and relatives. In addition, Žak (2017) was discovering consumption patterns in the young generation in Poland. Based on the results, it can be concluded that the main consuming motive between young consumers was tradition. This fact is also confirmed by a study done by Hudecová, Šedík & Nagyová (2021) where the majority of respondents claimed the honey consumption in the whole family. Similar results were obtained in Romania by Pocol, Šedík & Horská (2018) where honey was consumed mostly by the whole family. On the contrary, results by Batt & Liu (2012) showed that respondents ranked themselves as the major consumer of honey, while children were the other group most likely to consume honey. Some previous researchers have dealt with the time of year when consumers consume honey. It can be concluded that consumption differs from country to country. According to consumer research in Serbia respondents consume honey mostly throughout the whole year (Ćirić, Ignjatijević & Cvijanovic, 2015) as well as in Romania and Italy (Ignjatijević, Prodanović, Bošković, Puvača, Simin, Peulić & Đuragić, 2019). On the other hand, consumers in Portugal are most likely to consume honey both in autumn and winter (Ribeiro, et al. 2019). According to the Statistical office of the Slovak Republic (Fig. 1), the annual consumption of honey per capita is increasing. From 2007 till 2020, the honey consumption doubled. Nevertheless, if we compare honey consumption with consumption of sugar, it can be stated that there is a significant difference, since the average Slovak inhabitant consumes more than 30 kg of sugar annually.

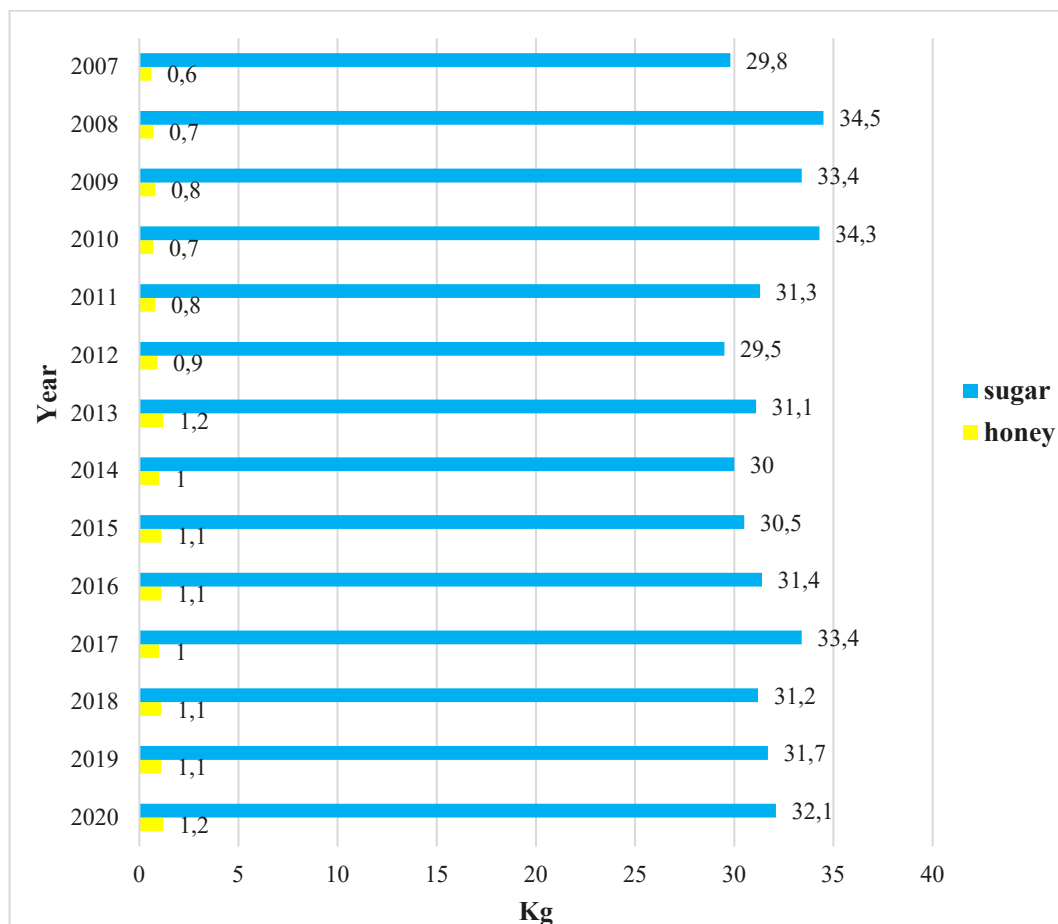


Figure 1: Annual consumption of honey and sugar per capita in Slovakia

Source: Slovstat, 2021

2. Data and Methods

The main objective of this paper was to identify consumption patterns, purchasing behaviour and preference of urban millennials in the Slovak honey market. The research was based on primary data obtained by implementing questionnaire survey in 2021 as pilot testing. In total, 179 respondents were selected into the research. The selection criteria were as follows: honey consumer, age between 25 – 30 years living in urban areas. The socio-demographic characteristics are shown in Table 1. A Snowball sampling technique was used via social media including emails. Meng & Choi (2019) stated that this method is appropriate to apply among young segment due to the high use rate of smartphones and social networks.

Table 1: Socio-demographic characteristics of research sample

Variable	Categories	Frequency (%)
Gender	male	32,40%
	female	67,60%
Level of education	secondary	77,65%
	university	22,35%
Economic activity	maternity leave	2,23%
	entrepreneur	1,68%
	student	71,51%
	employed	24,58%
Monthly income in netto	up to 400 €	50,84%
	401 - 600 €	17,32%
	601 - 800 €	20,11%
	801 - 1 000 €	6,15%
	more than 1000 €	5,59%
Household structure	I live with parents	66,48%
	I live with my spouse without children	21,79%
	I live alone	7,82%
	I live with my spouse with children	3,35%
	I live only with children	0,56%

Source: author's calculations

In order to accomplished paper's objectives a several hypotheses were posited:

H1: It is assumed that there exists dependency between honey consumption in childhood and actual consumption frequency.

H2: It is assumed that there exists dependency between honey preference and gender

H3: It is assumed that young respondents evaluate the importance of selected factors considered at purchase of honey in different ways.

Besides descriptive statistics, non-parametric tests were applied as follows:

- Friedman test
- Nemenyi's procedure
- Chi-square test of independence
- Fisher's Exact Test

3. Results and Discussion

Results showed that the most urban millennials consume honey either occasionally (40.22 %) or regularly on a weekly basis (31.28 %). Nearly 47 % indicated that they consume only up to 0.5 kg per year and 47 % between 0.5 – 1 kg. The majority of respondents stated they consumed honey for its healing effects during winter session as an immunity booster and for its nutritional value as well. Moreover, we revealed statistically significant dependency between consumption frequency in childhood and actual consumption by applying Chi-square test of independence (p-value = <0.000). Respondents who consume honey only occasionally used to consume it also sporadically or not at all. The most preferred honey types among young urban consumers were acacia honey (43.02 %) and linden honey (36.31 %). Our second hypothesis assumed statistically significant differences in type preferences between gender. This assumption was confirmed by Fisher's Exact Test (p-value = 0.039). Women prefer more acacia honey while men indicated a bigger preference for rapeseed honey and linden honey. Regarding the purchasing behaviour, urban millennials tend to purchase honey at retail stores or directly from beekeepers. Furthermore, they perceived the importance of selected factors during purchase of honey in a different way, which was confirmed by applying Friedman's test (Table 2). Obtained results confirmed our last hypothesis (H3).

Table 2: Friedman's test

Q (Observed value)	275.682
Q (Critical value)	15.507
DF	8
p-value (one-tailed)	<0.0001
alpha	0.050

Source: author's calculations

Furthermore, Nemenyi's procedure based on multiple pairwise comparisons revealed where exactly exist significant differences (Table 1). As the most important factors were selected quality and taste followed by country of origin, consistency, aroma, type, colour and price. As the least important factor was indicated the labelling. Based on the results it can be concluded that price is not perceived as the most important factor, nevertheless it is important to monitor optimal price for this segment of consumers. Survey showed that the optimal price which this segment is willing to pay ranges from 5 to 6 euros per 1 kg.

Table 1: Multiple pairwise comparisons using Nemenyi's procedure

Sample	Mean of ranks	Groups			
quality	3.500	A			
taste	3.626	A	B		
origin	4.411		B	C	
consistency	4.947			C	D
aroma	5.092			C	D
type	5.235			C	D
colour	5.341				D
price	5.754				D
label	7.095				E

Source: author's calculations

According to Popescu and Guresoaie (2019), the whole purchasing process of honey is mainly influenced by numerous aspects which differ from country to country. Besides 4P of the marketing mix, namely place, product, promotion and price, there are other important attributes when it comes to purchasing agro-food products. Consumers feel stimulated mostly by the appearance of the product and attributes such as colour, shape, or size are also very relevant (Ribeiro, Fernandes, Cabo & Diniz 2019). In the context mentioned above, Hudcová, Šedík & Nagyová (2021) identified five major motives that drove Slovakian consumers to purchase honey. There were quality, previous experience, price, country of origin and size/weight of honey. The promotion and design of packaging were indicated as irrelevant motives. Meanwhile, results by Roman, Popliela-Pleban, Kozak & Roman (2013) revealed that the most important factors influencing the purchasing process of honey in Poland were mostly the packaging, the cleanliness and hygiene of the packaging. According to Lymperi & Fragkaki (2018), purchasing honey directly from a local producer is an important factor in establishing customer confidence in its quality. This fact is supported by Thoma, Kokthi & Kelemen-Erdős (2019) where the main factors indicated in Albania were mostly origin followed by taste.

4. Conclusion

Slovak millennials in urban areas tend to consume less honey than it is the average annual consumption. Consumption pattern is related to their honey consumption in their childhood. Honey is consumed for medicine purposes mainly during winter season and illness period. Quality and taste were evaluated as the most important factors when buying honey, while the least important was the label.

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References

- [1] Ahluwalia, M., Ahluwalia, P., Dhandapani, K. M., & Vaibhav, K. 2020. Honey: A Sweet Way to Health. In Rehman, M. U., Majid, S. *Therapeutic Applications of Honey and its Phytochemicals*. Singapore: Springer, 53-80. doi:10.1007/978-981-15-6799-5
- [2] Batt, P.J., & Liu, A. 2012. Consumer behavior towards honey products in Western Australia. *British Food Journal*, 114(2), 285-297. doi: 10.1108/00070701211202449
- [3] Bleiel, J. 2010. Functional foods from the perspective of the consumer: How to make it a success? *In International Dairy Journal*, 20(4), 303-306. doi:10.1016/j.idairyj.2009.11.009
- [4] Ćirić, M., Ignjatijević, S., & Cvijanović, D. 2015. Research of honey consumers' behavior in province of Vojvodina. *Economics of Agriculture*, 62(3), 627–644. doi: 10.5937/ekoPolj1503627C
- [5] Goetzke, B. & Spiller, A. (2014). Health-improving lifestyles of organic and functional food consumers. *British Food Journal*, 116(3), 510-526. doi:10.1108/BFJ-03-2012-0073
- [6] Hudecová, M., Šedík, P., & Nagyová, E. 2021. Analysis of Consumer Behaviour on the Bee Products Market in Relation to the Health Trends. Challenges of Nowadays in the Light of Sustainability - 8th VUA YOUTH Scientific Session. ISBN 978-963-269-968-4
- [7] Ignjatijević, S. D., Prodanović, R. V., Bošković, J. Z., Puvača, N. M., Tomaš Simin, M. J., Peulić, T. A., & Đuragić, O. M. (2019). Comparative analysis of honey consumption in Romania, Italy and Serbia. *Food and Feed Research*, 46(1), 125-136. doi: 10.5937/FFR1901125I
- [8] Kafantaris, I., Amoutzias, G. D., & Mossialos, D. (2020). Foodomics in bee product research: a systematic literature review. *European Food Research and Technology*, 247(2), 309–331. doi:10.1007/s00217-020-03634-5
- [9] Lymperi, A., & Fragkaki, A. G., 2020. Investigation of consumers' trends concerning honey supply: A case study in Central Greece. *Advances in Nutrition and Food Science*, 2, ISSN: 2641-6816.
- [10] Oliveira, N., Paiva, W. M., & Novais, J. S. (2020). "Honey is Good for Health": Patterns of honey purchasing and consumption in Lower Amazon. *Consumer Behavior Review*, 4(3), 324-336. doi: 10.51359/2526-7884.2020.247470
- [11] Oravec, T., & Kovács, I. (2019). Qualitative study of preferences and attitudes towards honey consumption in Hungary. *Analecta Technica Szegedinensia*, 13(1), 52-58. doi:10.14232/analecta.2019.2.52-58.
- [12] Pocol, C. B. & Marghitas L. A. 2008. A comparison between the segmentation of honey market in Romania and Ireland. *Bulletin UASVM*, 65(2). 279-282.
- [13] Pocol, C.B., Šedík, P., & Horská, E. 2018. Honey Consumption Patterns Of Young People In Romania. *International Scientific Days 2018*.
- [14] Pocol, C. B., & Ványi, G.A. 2012. A comparison between Hungarian and Romanian consumption. *Bulletin UASVM*, 69(2), 244-252.
- [15] Popescu A., & Guresoiaie I. 2019. Consumer's behaviour towards honey purchase – a case study in Romania. *Scientific Papers. Series Management, Economic Engineering in Agriculture and rural development*, 19(1), 451-470. ISSN 2284-7995.
- [16] Ribeiro, M. I., Fernandes A. J., Cabo, P. S. & Diniz, F. J. (2019). Trends in Honey Purchase and Consumption in Trás-os-Montes Region, Portugal. *Ekonomika Regiona (Economy of Region)*, 15(3), 822-833. doi:10.17059/2019-3-15
- [17] Roman, A., Popliela-Pleban, E., Kozak, M. & Roman, K. (2013). Factors influencing consumer behavior relating to the purchase of honey part 2. product quality and packaging. *Journal of Apicultural Science*, 57(2), 175-185. doi: 10.2478/jas-2013-0027.
- [18] Şenel, E., & Demir, E. 2018. Bibliometric analysis of apitherapy in complementary medicine literature between 1980 and 2016. *Complementary Therapies in Clinical Practice*. 31(1), 47-52. doi: 10.1016/j.ctcp.2018.02.003
- [19] Sheau-Fen, Y., & Hong, L. (2009). Exercise as a Healthy Lifestyle Choice: A Review and Avenues for Future Research. *International Business Research*. 2(1), 146-158. doi:10.5539/ibr.v2n1p146.
- [20] Statistical Office of the Slovak Republic. (2022). *Food consumption 2009 to 2020* [statistics]. Available from Slovak Statistics database

-
- [21] Testa, R., Asciuto, A., Schifani, G., Schimmenti, E., & Migliore, G. (2019). Quality Determinants and Effect of Therapeutic Properties in Honey Consumption. An Exploratory Study on Italian Consumers. *Agriculture*, 9(8), 174. doi:10.3390/agriculture9080174
- [22] Thoma, L., Kokthi, E., & Kelemen-Erdős, A. (2019). Analyzing consumer preferences for honey: Empirical evidence from Albania. *Management, Enterprise and Benchmarking in the 21st Century*, 162-176
- [23] Tiganis, A., Avgeris, A., Tigani, X., Tsakiridou, E., & Grigoroudis, E. (2020). Criteria for honey consumption in Greece: a MUSA application. Conference: XIV Balkan Conference on Operational Research.
- [24] Żak, N. 2017. Preferences of Polish and American consumers regarding the consumption of bee honey. *Marketing i Zarządzanie*, 2(48) 117-130. doi:10.18276/miz.2017.48-11
- [25] Meng, B., Choi, K. 2019. Tourists' intention to use location-based services (LBS). *International Journal of Contemporary Hospitality Management*, 31(8), 3097-3115. doi:10.1108/IJCHM-09-2018-0734

Pandemic Food Purchasing: an Example on Silver Generation in the Slovak Republic

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Abstract

The COVID-19 pandemic in 2020 affected the shopping behavior of each of us. As more and more people stayed at home to limit the spread of COVID-19, it is no surprise that this new reality may have changed the way and place where people shop. Even if only time will tell whether these changes will be temporary or permanent, we can begin to observe the change in how the pandemic affects demographic shopping behavior. Many studies confirm that the silver generation is not a homogeneous group and is most affected by the pandemic. The aim of the paper is to examine the consumer habits and patterns of seniors when buying food during the pandemic in 2020. The segmentation factor is their age. The survey results confirmed that the seniors aged 50-64 are a heterogeneous group with a higher variability of responses. Due to the greater isolation and greater restriction of movement, people aged 65 and over were less variable in their responses to food purchases. The purpose of this study is to broaden the knowledge base about the attitudes and buying behavior of the silver generation during the pandemic.

Keywords: silver generation, senior community, shopping behavior, retail network, Slovakian consumers

JEL Classification: R21, R230

1. Introduction

Not only in Europe, but also in Slovakia, the importance of the senior community is growing significantly, and it is therefore necessary to understand its shopping behavior. People's shopping habits also evolve with the age and time, resulting in changing needs for products and services as well as shopping behavior. This is why the age is one of the key factors that should be taken into account by retailers when considering marketing strategies (Broeckhoven et al. 2021, Rahman and Yu, 2019, Spence and Youssef, 2021). It is becoming crucial for retailers to deal with and understand the specific needs and expectations of older consumers. These are considered to become a completely different marketing segment (Kendall et al., 2016, Conklin, Maquire and Monsivais, 2013, Rousseau, 2018, Bazoche et al., 2020). Many studies confirm that seniors are not a homogeneous group and require the study of other more sophisticated segmentation factors. The importance of older consumers also lies in their changing food habits and patterns, which in turn influence their buying decisions. Consumer habits are of great importance to retailers, as the sales have a major impact on their business (Alhammedi, Santos-Roldán, and Cabeza-Ramírez, 2021, Teller, C. and Gittenberger, 2011, Yin, Pei, Ranchhod, 2013). These authors point out that if eating habits change with the age of older consumers, it is important to alert traders to these changes in order to offer products accordingly.

Relatively little attention was paid in the academic sphere to age-related work – to silver seniors. According to Evanschitzky and Woisetschläger (2008), there are at least two reasons: firstly, most sectors of the economy have been traditionally focused on younger segments of consumers who are more perceived as throwaway shoppers. As a result, research funding is spent mainly in

this direction. Secondly, the academic research on consumer behavior has an almost natural tendency to use student samples because they require less effort to obtain representative household samples. These are also the reasons why so little is known about the relationship between seniors and consumption, e.g. on purchasing behavior in relation to chronological age, on the collection and processing of information, etc. With its restrictions, the pandemic has exacerbated the problems in the elderly's shopping. The aim of the paper is to enrich this area, to better understand the behavior of older consumers when buying food during the Covid-19 pandemic. Based on a review of the literature and the purpose of this research, it is assumed that: i) silver generation shows more heterogeneous shopping patterns regardless of age, ii) age segmentation shopping patterns emerge, with the younger seniors (50-64 year olds) responding with more variable options than the older seniors (65 and more).

2. Data and Methods

Information about a customer can be obtained from several sources (loyalty cards, monitoring of shoppers' movements through shopping malls and other activities), but the most complete is from questionnaire surveys. Empirical research was conducted in the months of May to June 2020 in the Nitra region through an online questionnaire distributed by Department of Geography, Geoinformatics and Regional Development students, obtaining 269 answers of the representatives of silver generation (50+). Age acts as the main study variable. The term third age is commonly used to refer to persons over 65 years of age. There are also studies (Pálenik et al. 2012, Pavlič et al., 2018, Rahman and Yu, 2019, Križan et al., 2020, Trembošová et al., 2021) that indicate a person 50+ to belong to the third age, which is also our case. Many researchers (Gordon et al., 2002, Tréguer, 2002) use 50+ as a cut-off point for their studies of mature people. According to another classification, this is the “pre-boomers” generation that was born before 1946 (Schiffmann et al., 2012), the “baby boomers” consumer generation born in 1946-1964 (Solomon et al., 2016), but also the X or “baby busters” generation of 1965-1970 (Dunne et al., 2011), who reached the age of 50 in 2020. Seven questions were analyzed for the purposes of this paper:

1 *How often do you buy groceries? (circle)*

a) regularly every day, b) 2-3 times a week, c) once a week, d) I do not shop (the others do that for me)

2 *Did anything change in your shopping habits during the first wave of the COVID19 pandemic?*

a) changes: a1) out of former smaller purchases one big purchase became, we buy more – only once a week, a2) out of more purchases one purchase realised, we buy less and limit the grocery consumption – only once a week, a3) of more purchases one big was realised, we buy more – several times a week, a4) of more purchases one purchase was realised, we buy less and limit the grocery consumption – several times a week,

b) no changes: we purchased the same way as before the pandemic and we did not limit the consumption, c) I cannot judge.

3 *I prefer shopping in the grocery store (max 1 option)*

a) a small shop up to 100 m², b) a medium size shop up to 100 – 400 m², c) a large one over 2 500 m².

4 *Indicate the most common type of grocery store during the COVID 19 pandemic:*

a) hypermarket, such as Kaufland, b) supermarket, such as Billa, Lidl, Terno, c) smaller self-service shops, e.g. Jednota, Náš kraj, Samoška, Nitrazdroj, d) small counter stores, e) marketplace, e.g. farmer's market, f) mobile shops, g) internet shops - online sales, h) I don't buy, it's done by a family member, i) I don't buy, I eat in a senior housing.

5 Which of the factors influenced your choice most while shopping during the pandemic?

a) a wide range of goods, b) the product quality, c) a favourite food brand, d) location - proximity to the household, e) a long-term habit f) advertising, g) pleasant environment, h) lower prices, i) opening hours, j) friendly and helpful staff, k) Slovak products, l) healthy food, m) parking near the store, n) I have no choice, o) I don't know.

6 Do you use your car when you go shopping? YES/NO

7 Do you use the internet shop in order to buy groceries? YES/NO

The first part of the questionnaire focused on demographic information, such as gender, age, the level of education, occupation, the level of personal monthly income and geographical information - place of residence.

Subsequently we tested whether shopping behaviour is depended on demographic characteristics (gender, age groups, education, economic activity, household size, and average household income). If there was an addiction, we monitored its intensity. We performed the testing using the test of square contingency of qualitative features, where we tested χ^2 at the significance level p with a value of 0.05. If the value of the calculated χ^2 is lower than the critical value, the two characters are independent, the dependence does not exist. If the value of the calculated χ^2 is higher than the critical value, the two characters are dependent, the dependence does exist. Otherwise, there is a dependency. The intensity of the relationships between the characteristics of the respondents and the types of shopping behaviour was determined on the basis of the coefficient of consistency C and verified using the Cramer's test

V. The testing was processed in the SPSS program.

Pearson's contingency coefficient expresses the degree of dependence between two qualitative features in a contingency table and is determined by the relation:

$$C = \sqrt{\frac{\chi^2}{\chi^2 + n}}$$

where χ^2 is the Pearson test statistic (square contingency test) Enter the equation.

$$n = \sum_{i=1}^r \sum_{j=1}^s n_{ij}$$

The more C acquires values approaching 1, the higher the dependence of both qualitative features. Conversely, C values approaching 0 indicate very low to no dependence. The Cramer's V coefficient represents the most appropriate degree of association between two qualitatively variable ones and is a modified version of the correlation coefficient. It is used for tables of variables larger than 2×2 , which is true in our case. Cramer's V coefficient is expressed:

$$V = \sqrt{\frac{\chi^2}{n \cdot \min(m - 1, k - 1)}}$$

where χ^2 is Pearson's test statistic, n is the number of variables in the table, m is the number of columns and k is the number of rows in the table. We calculate Pearson's test statistic χ^2 based

on the relation: where f are the frequencies of the variables arranged in q classes, f_e are the empirical frequencies and f_o the expected frequencies.

$$\chi^2 = \sum_{p=1}^q \frac{(f_{ep} - f_{op})^2}{f_{op}}$$

3. Results and Discussion

Overall, we can say that the current COVID-19 pandemic has not only caused global concerns about individuals' health problems, but it has also triggered a change in consumer behavior, especially in the retail network. During the pandemic, going out and shopping normally is considered a threat to people's lives due to the danger of virus infection. Examples of changed behavior include e.g. disinfection, temporal restricted movement, food imports, storage, etc., when going outside for social reasons was prohibited. In contrast to previous times, new products have been added to the shopping list, such as durable foodstuffs and items such as disinfectants, masks, gloves and other antiviral stuffs to protect health.

This situation is a particular challenge for older people. In Slovakia, the term "essential shops" was introduced, i.e. grocery stores, drugstores and pharmacies, but with limited opening hours. At the same time, the recommended shopping time for retirees was introduced from 9:00 a.m. to 11:00 a.m., which they did not have to comply with as a matter of priority, but at that time other age groups were not allowed to enter. However, the pandemic has not only triggered a change in shopping, but in the longer term it has triggered much more serious societal problems

- a significant disruption of normal service activities, job losses and redundancies in companies due to business losses. The pandemic has triggered not only the physical health vulnerability of the elderly, but also other mental health problems such as depression and anxiety caused by confinement in the home, or states of panic and threat (Morrow-Howell, Galucia and Swinford, 2020). In addition, earnings and savings problems have led older people in particular to spend their savings on grocery shopping. Thus, there is an overall change in traditional ways and habits of shopping. Online shopping increased drastically during COVID-19, and technology began to take over more and more. Customers have the option of shopping online instead of physically visiting stores (Reddy, 2021). Contributions related to the silver generation shopping behavior during the pandemic address consumer assessments of specific foodstuffs (Broeckhoven et al., 2021) as well as food safety in households of the elderly over 60 (Thaivalappil et al., 2021), the impact of the senses on eating behavior (Spence and Youssef, 2021), food insecurity, loneliness and social support among older people (Burris et al., 2021). In the countries hard hit by COVID-19, the older generation of consumers is stockpiling food and other basic things, with greater isolation.

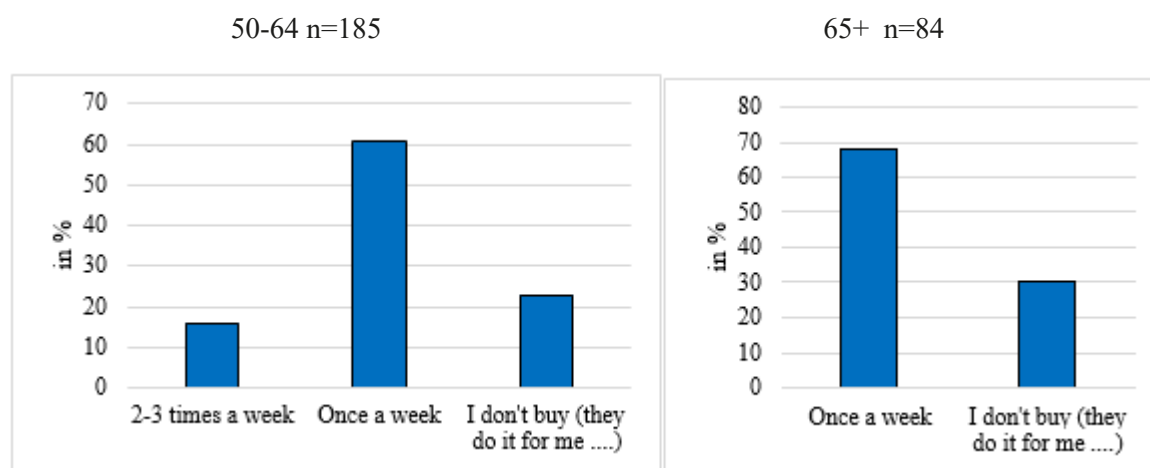
Women predominated in the research sample of seniors (approximately 71%). With regard to age groups (Table 1), 69% of respondents belong to the age group from 50 to 64 years. The structure of education showed that the majority of respondents (75%) graduated from secondary school, while one third reached higher education. In addition, only less than 60% of respondents were employed. Almost 80% of respondents had a monthly household income below € 800.

Table 1: Respondents' profiles

Demographic characteristics		Frequency	Percentage (%)
AGE			
	50-64	185	68,8
	65 and over	84	31,2
GENDER			
	Female	191	71,1
	Male	78	28,9
EDUCATION			
	Primary school or less	2	0,7
	High school	202	75
	Graduate degree	65	24,3
OCCUPATION			
	Public sector	83	30,9
	Private sector	66	24,5
	Private businessperson	14	5,2
	Housekeeper	5	1,8
	Retired	101	37,6
MONTHLY INCOME € (Ø in 2019 - 477,14 €)			
	≤4 00	15	5,6
	401-600	28	10,4
	601-800	167	62,1
	801-1000	41	15,2
	1001 ≤	18	6,7

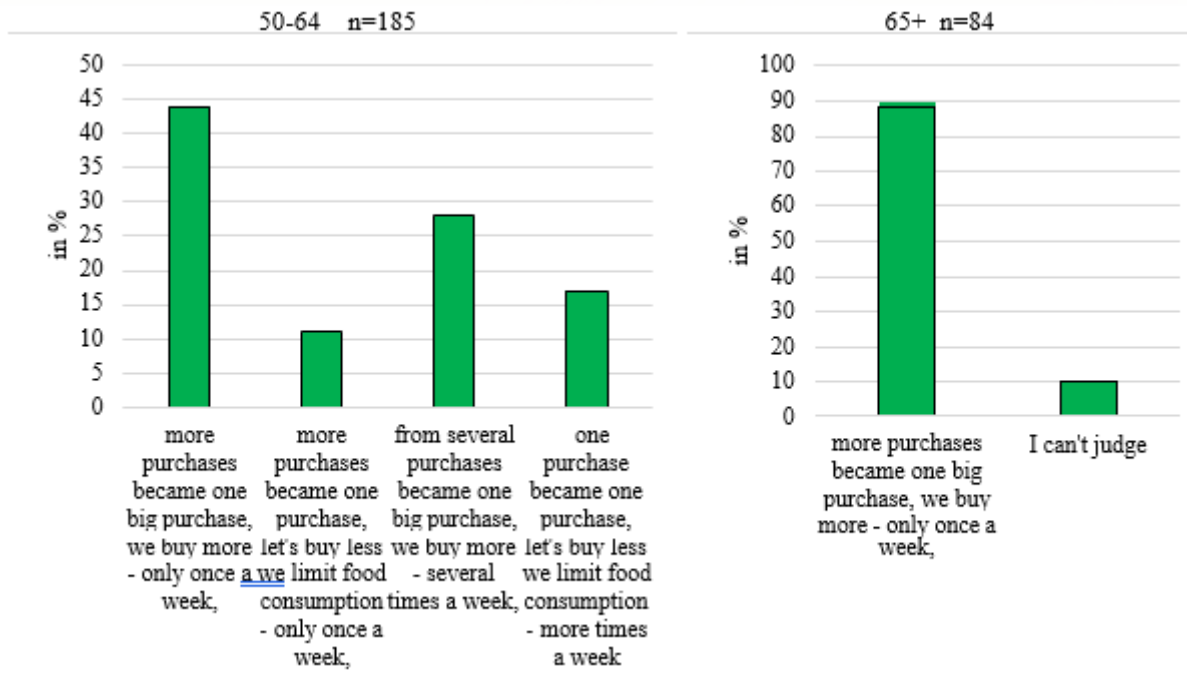
Source: own research

The frequency of purchases (Graph 1) once a week was the most common for both groups assessed. This frequency was reaffirmed in the second question, (Graph 2) “Did anything change in your shopping habits during the first wave of the COVID19 pandemic?” Most seniors said that more purchases were replaced by one big purchase; they buy more - only once a week. All 269 respondents reported a change in shopping during the pandemic.



Graph 1: How often do you buy groceries?

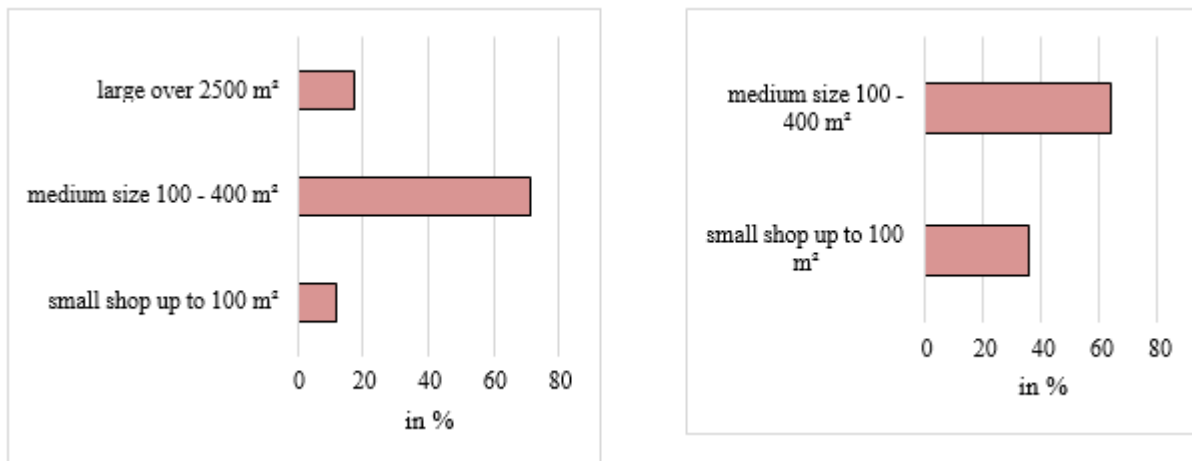
Source: own research



Graph 2: Did anything change in your shopping habits during the first wave of the COVID19 pandemic?

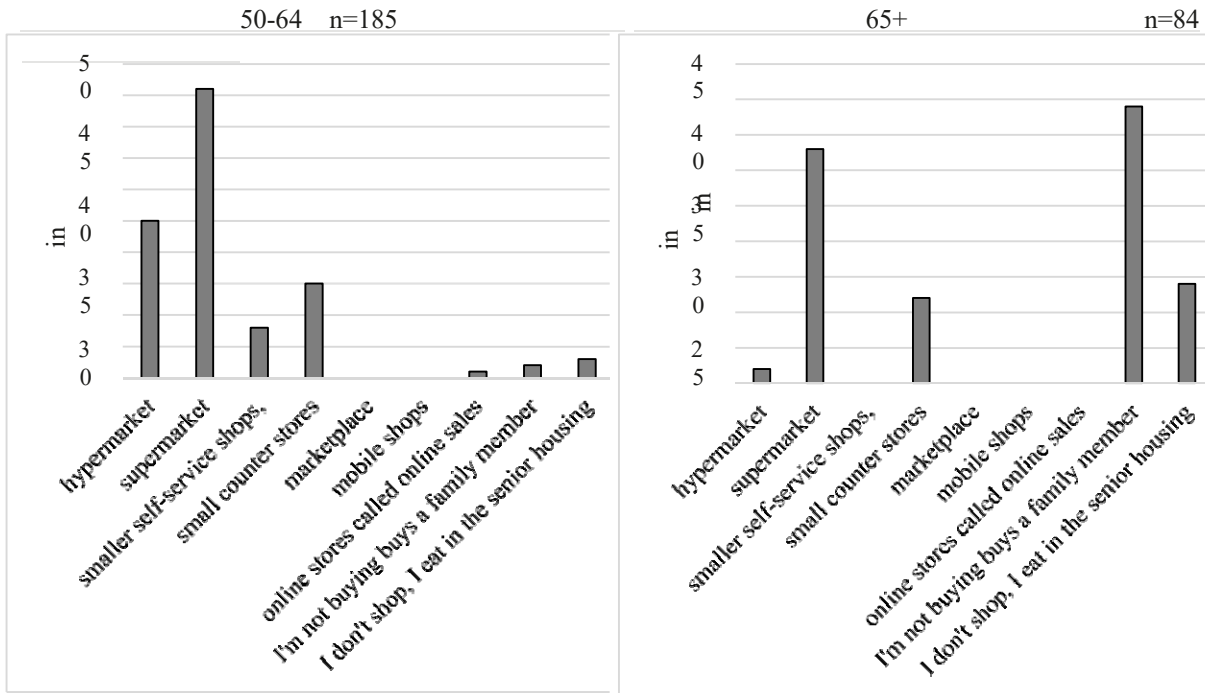
Source: own research

As many as 71% of the younger seniors and 68% of the older ones mentioned that the preferred shopping format of the supermarket and the size of the store was from 100 to 400 m² (Graph 3). Younger seniors ranked hypermarkets in second place, while the older ones listed small shops up to 100 m². 39% of the older seniors reported that their purchases were made by relatives (Graph 4).



Graph 3: Prefer shopping at the grocery store

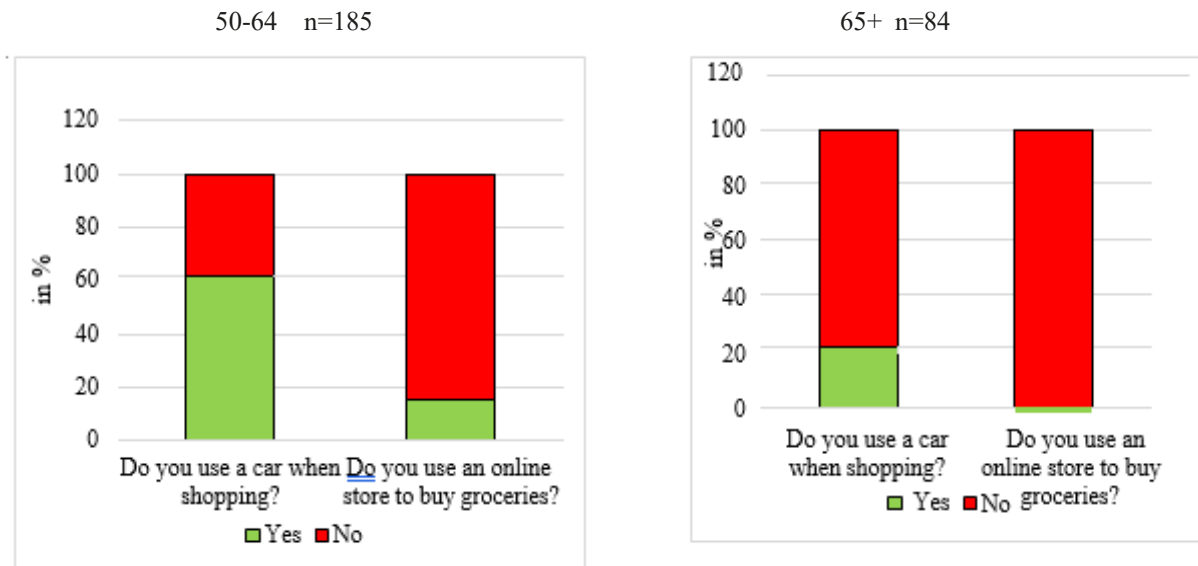
Source: own research



Graph 4: Indicate the most common type of grocery store during the COVID 19 pandemic

Source: own research

In relation to the internet shopping of the seniors, we can indicate its deficit during the pandemic (Graph 5), as pointed out by Teerakapibal and Melanthiou (2019), who confirm seniors' distrust in their skills and ability to understand and use technologies. 63% of the younger seniors and about 20% of the older ones used their cars to buy groceries (Graph 5).

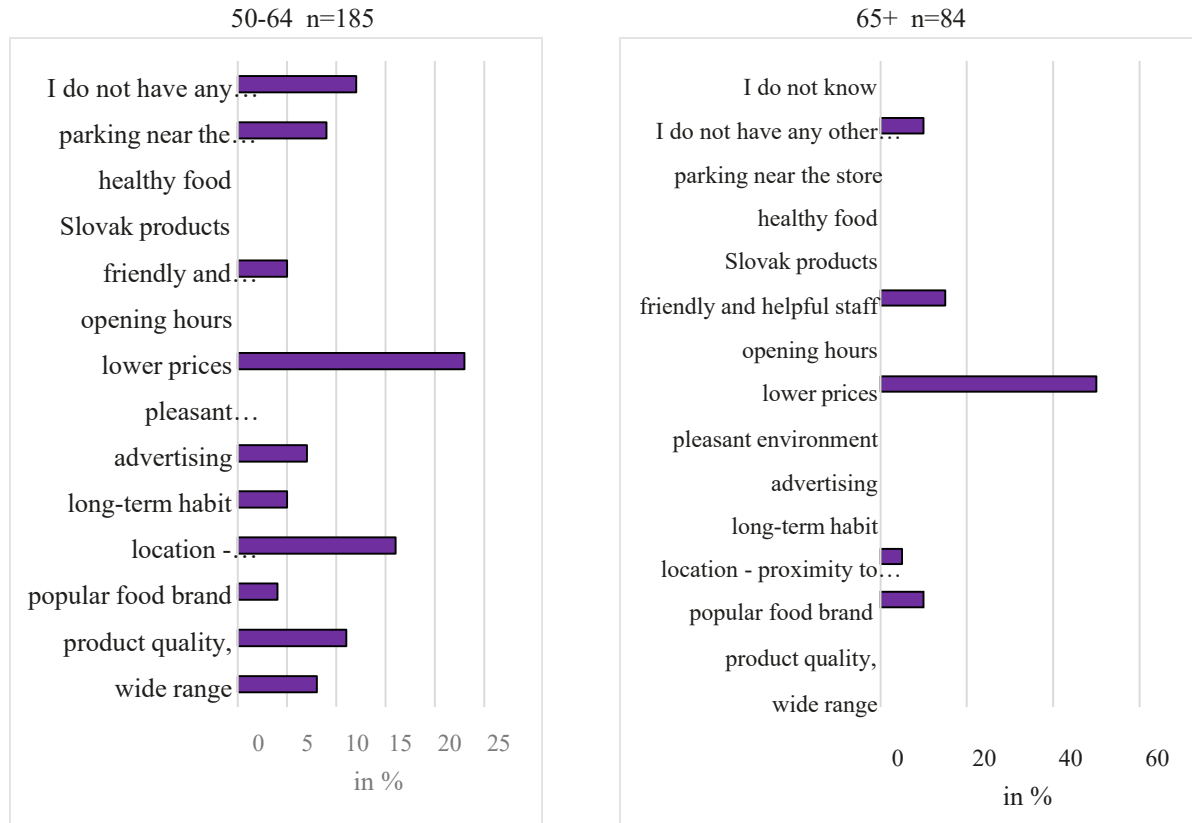


Graph 5: Online store and the use of cars

Source: own research

Among the factors influencing shopping during the pandemic, seniors preferred the low price (23% younger seniors and 50% older ones), then the location and a wide range. As many as 12% of older seniors said they had no choice but to buy at a certain outlet. The possibilities

of parking were also mentioned by seniors among the decisive factors. Surprisingly, advertising was of neglected importance, respectively, it was not a decisive factor (Graph 6). Pleasant environment, Slovak products and healthy food were not preferred as decisive factors. On the contrary, up to 15% of the younger seniors and 5% of the older seniors mentioned pleasant and friendly staff.



Graph 6: Which factors influenced you most when buying food during the pandemic?

Source: own research

In all 7 questions about the pandemic food shopping, the younger seniors aged 50 to 64 reported a wider range of answers than the older seniors (see Charts 1-6). This follows naturally from their freer movement and less isolation during the pandemic (commuting to work, for necessary services, etc.).

Chi-square testing confirmed that younger seniors 50-64 years are a heterogeneous group with higher response variability and lower chi-square testing than seniors 65+ (Table 2). Due to greater isolation and greater restriction of movement, people aged 65 and over were less variable in their responses to food purchases. In the group of younger Nitra seniors, one relationship was not confirmed, namely the question of determining the factors influencing the purchase of food during the pandemic.

Table 2: Phi square test of good agreement answers about shopping behavior by age

Questions	χ^2 50-64	χ^2 65+
How often do you buy groceries?	0,76	0,78
Did anything change in your shopping habits during the first wave of the COVID19 pandemic?	0,66	0,73
Prefer shopping at the grocery store Indicate the most common type of grocery store during the COVID 19 pandemic	0,77	0,82
Which of the factors influenced your choice most while shopping during the pandemic?	0,43	0,53
Do you use your car when you go shopping	0,79	0,82
Do you use the internet shop in order to buy groceries?	0,72	0,81

Source: own research

4. Conclusions

The aging of society is a major challenge not only for academic research but also for business management. This paper examines a specific segment of the consumer market during the pandemic when direct contact with respondents has been limited. Nevertheless, an initial sample was obtained. The results of the research confirmed the assumption of segmentation of seniors by age. Younger seniors (50-64 years old) showed a greater variability in responses than the group of older seniors (65 and older). The assumption of homogeneity of the entire 50+ senior group during the Covid-19 pandemic has not been confirmed.

The average pension in 2020 in Slovakia was € 477.14 (EÚ SILC, 2019). It is evident that seniors spend a significant part of this income on food purchases. As blockades began to be introduced around the world, nervous consumers and seniors alike were struggling to cope with the new restrictions caused by the COVID-19 pandemic. In the early stages of the pandemic in 2020, when the first blockades began to be imposed, seniors in particular began to reassess their expenditures. Consumers have focused on buying the things they need to survive and protect themselves from this new, invisible threat, which is not surprising.

It is evident that spending patterns have suddenly changed for all age groups. All senior respondents (100%) reported a change in shopping during the pandemic, while in the contribution of Križan et al. (2020), only 55.5% reported a change in the 18+ sample.

According to the results, food purchases were most often made once a week, in medium-sized supermarkets from 100 to 400 m², several purchases were replaced by one large purchase, the seniors were buying a larger quantity but only once a week, it often happened that older seniors (65+) were brought the grocery by relatives. The lower price, location and quality of products stand out from the factors influencing the purchase of food. The lower price suppressed healthy food or Slovak food. Here it turned out that many seniors had to reconsider their purchasing expenses and reached for their savings. The family predominates especially as the modality with the greatest impact on the senior consumer thanks to the help with the implementation of purchases in 39% of the older seniors. A group of older consumers face difficulties in using online shopping technologies because they lack confidence in their skills and abilities. The survey also shows that 5% of younger seniors and 2% of older seniors used an online store to buy food during the pandemic. In this regard, it is necessary to support and inform seniors about the benefits of online shopping. Based on the results, we can predict that seniors will continue to play an important role in retail spending in this tense economic situation during the pandemic.

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References

- [1] Alhammedi, K., Santos-Roldán, L., & Cabeza-Ramírez, L.J. (2021). A Theoretical Framework on the Determinants of Food Purchasing Behavior of the Elderly: A Bibliometric Review with Scientific Mapping in Web of Science. *Foods*, 10, 688. <https://doi.org/10.3390/foods10030688>
- [2] Bazoche, P., Desmots, M.H., Herbreteau, V., & Soler, L.G. (2020). Willingness to pay and sensory preferences for products targeting the nutritional needs of seniors: An experimental approach. *Cahiers de Nutrition et de Diététique*, 55 (6), 325–339. <https://doi.org/10.1016/j.cnd.2020.10.002>
- [3] Broeckhoven, I., Verbeke, W., Tur-Cardona, J., Speelman, S., & Hung, Y. (2021). Consumer valuation of carbon labeled protein-enriched burgers in European older adults. *Food Quality and Preference*, 89 (8), 104114, <http://dx.doi.org/10.1016/j.foodqual.2020.104114>
- [4] Burris, M., Kihlstrom, L., Arce, K.S., Prendergast, K., Dobbins, J., McGrath, E., Renda, A., Shannon, E., Cordier, T., & Song, Y.J. (2021). Food Insecurity, Loneliness, and Social Support among Older Adults. *Journal of Hunger & Environmental Nutrition*, 16 (1), 29–44. <https://doi.org/10.1080/19320248.2019.1595253>
- [5] Conklin, A.I., Maquire, E., & Monsivais, P. (2013). Economic Determinants of Diet in Older Adults. *Journal of Epidemiology and Community Health*, 67 (9), 721–727. <https://dx.doi.org/10.1136%2Fjech-2013-202513>
- [6] Dunne, P., Lusch, R., & Carver, J. (2014). *Retailing*. Mason (South-Western Cengage Learning). 8th edition, [7] ISBN 978-133-95380-7
- [8] EÚ SILC 2019 - Zisťovanie o príjmoch a životných podmienkach domácností v SR. Dostupné na: <https://slovak.statistics.sk/wps/portal/>, str. 20 (18_1_2022).
- [9] Evanschitzky, H. & Woisetschläger, D.M. (2008). Too Old to Choose? The Effects of Age and Age Related Constructs on Consumer Decision Making. *Advances in Consumer Research*, 35 630-636.
- [10] Gordon, T., Moser, H.R., & Warren, W.E. (2002). “Serving the needs of mature citizens: strategies and techniques for targeting the 50 + population”. *Services Marketing Quarterly*, 24 (1), 1 -16. https://doi.org/10.1300/J396v24n01_01
- [11] Kendall, H., Brennan, M., Seal, C., Ladha, C., & Kuznesof, S. (2013). Behind the kitchen door: A novel mixed method approach for exploring the food provisioning practices of the older consumer. *Food Quality and Preference*, 53, 105-116. <https://doi.org/10.1016/j.foodqual.2016.06.005>
- [12] Križan, F., Bilková, K., Hencelová, P., Danielová, K., Čuláková, K. & Zeman, M. (2020). *Nákupné správanie spotrebiteľov na Slovensku*. Univerzita Komenského v Bratislave, 134 p. ISBN 978-80-223-5070-9
- [13] Morrow-Howell, N.; Galucia, N.; Swinford, E. Recovering from the COVID-19 Pandemic: A Focus on Older Adults. *Journal of Aging & Social Policy* 2020, 32 (4-5), 526–535. <https://doi.org/10.1080/08959420.2020.1759758>
- [14] Páleník, V., Domonkoš, T., Dovál'ová, G., Hvozíková, V., Lichner, I., Páleník, M., Pauhofová, I., Petříková,
- [15] K. & Radvanský M. (2012). *Strieborná ekonomika v slovenskom, európskom a svetovom kontexte*. Ekonomický ústav, Bratislava, 300 pp. <https://www.iz.sk/download-files/sk/strieborna/>
- [16] Pavlič, I.; Vojvodic, K.; Puh, B. (2018). Segmenting the baby boomer generation: An example of croatian consumers. *Ekonomski Vjesnik/Econviews* 31 (1), 47–63. UDK: 658.89(497.5)
- [17] Rahman, O., & Yu, H. (2019). Key antecedents to the shopping behaviours and preferences of aging consumers a qualitative study. *Journal of Fashion Marketing and Management*, 23 (2), 193–208. <https://doi.org/10.1108/JFMM-12-2018-0165>
- [18] Reddy, A. (2021). Covid-19 Impact: Consumers Move more Towards Digital. 2020. *Bussines Line*. 04-4-

2020. Available online: <https://www.thehindubusinessline.com> (accessed on 16 February 2022).
- [19] Rousseau, G. (2018). The impact of longevity on older consumer needs: Implications for business. *Journal of Consumer Sciences*, 46, 19–33. <https://doi/pdf/10.10520/EJC-13b88a52e8>
- [20] Schiffmann, L.G, Kanuk, L.L., & Hansen, H. (2012). *Consumer Behaviour: A European Outlook*. 2th Ed. London, (Pearson). 460 pp.
- [21] Solomon, M.R., Bamossy, G.J., Askegaard, S., & Hogg, M.K (2016). *Consumer Behaviour: A European Perspective*. Harlow 6th Ed. (Pearson). 706 pp. ISBN 9781292116723
- [22] Spence, C. & Youssef, J. (2021). Aging and the (Chemical) Senses: Implications for Food Behaviour amongst Elderly Consumers. *Foods*, 10 (1), 168. <https://doi.org/10.3390/foods10010168>
- [23] Teerakapibal, S., & Melanthiou, Y. (2019). The new helping the old Social media as a facilitator for variety seeking in food choices of the grey population. *Bussines Foods*, 122, 272–290. <https://doi.org/10.1108/bfj-08-2018-0559>
- [24] Teller, C., & Gittenberger, E. (2011). Patronage behaviour of elderly supermarket shoppers—antecedents and unobserved heterogeneity. *The International Review of Retail, Distribution and Consumer Research*, 21, 483–499. <https://doi.org/10.1080/09593969.2011.619701>
- [25] Thaivalappil, A.; Young, I.; Paco, C.; Jeyapalan, A., & Papadopoulos, A. (2020). Food safety and the older consumer: A systematic review and meta-regression of their knowledge and practices at home. *Food Control*, 107, 106782. <https://doi.org/10.1016/j.foodcont.2019.106782>
- [26] Tréguer, J.P. (2002). *50 + Marketing: Marketing, communicating and selling to the over 50s generations*. Paris: Houndmills, Basingstoke, Hampshire ; New York : Palgrave. ISBN 0333984129
- [27] Trembošová, M., Dubcová, A., Nagyová, L. & Cagaňová, D. (2021). The Specifics of the Retail Network and Consumer Shopping Behaviour in Selected Regional Towns of West Slovakia. In: *Advances in Industrial Internet of Things, Engineering and Management* / ed. Dagmar Cagaňová, Natália Horňáková, Andy Pusca, Pedro Filipe Cunha. - Cham : Springer, 2021. ISBN 978-3-030-69705-1, 39–74
- [28] Yin, Y.Y., Pei, E., & Ranchhod, A. (2013). The shopping experience of older supermarket consumers. *Journal of Enterprise Information Management*, 26 (4), pp. 444-471. <http://dx.doi.org/10.1108/JEIM-05-2013-0025>

Convergence Trends in European Food Consumption

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Abstract

The paper aims to verify the existence of convergence in food consumption in European countries. Convergence trends are verified based on basic food groups in 38 European countries in the period 2000-2019. The data are taken from the FAO database and are in calorific value in kcal per capita per day. Convergence of countries in terms of food consumption is examined through beta and sigma convergence. The performed analyzes confirmed the existence of beta convergence during the period 2000-2019 in all examined commodities except for milk, while these processes were more intensive in the first examined subperiod (2000-2009). The examination of convergence trends through sigma convergence also confirmed the results of beta convergence, while in the second subperiod examined these trends in terms of milk, animal fats, eggs and vegetables consumption were slightly distorted as differences between countries increased slightly during this period.

Keywords: *beta convergence, European countries, food consumption, sigma convergence*

JEL Classification: *C2, D12, I15*

1. Introduction

The well-known definition of food security was adopted in World Food Summit (FAO, 1996). It states that "food security exists when all people at all times have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life." Ensuring food security is part of the Agenda 2030's Sustainable Development Goals (UN, 2015). Food consumption is one of the indicators which monitor food security.

Agriculture, forestry, and other land uses contribute up to 23% of total greenhouse gas emissions (GHG), making them major contributors to global warming (IPCC, 2019). Furthermore, agricultural overexploitation is causing biodiversity and habitat loss. (Geiger et al., 2010). Among agricultural practices, the livestock industry is a significant contributor to global climate change, accounting for between 12% and 18% of total GHG emissions (Gomez-Zavaglia et al., 2020, Allen and Hof, 2019).

The Common Agricultural Policy (CAP) has had a significant impact on how food supply and demand have been developing in Europe. Households living on the brink of poverty have been affected by the global rise in agricultural commodity prices and the slowdown in economic growth, since their food expenditures have been raising.

According to the authors Cupák, Pokrivčák and Rizov (2015), the share of European household food spendings has been continuously dropping over time because of CAP reforms and rising incomes. Food expenditures represented from 10% to 35% of total household budgets in 2005, a year after the new Member States from Central and Eastern Europe joined the EU. The highest shares of food expenditures had the new member states of EU. On the contrary, EU-15 countries had the smallest shares of food expenditures among the European Union. In case of Slovakia, the authors also noticed a significant national trend with food expenditures and incomes ratios falling to levels comparable to the EU-15's countries. The findings revealed that Slovak households reacted to changes in prices and earnings. Some foods, such as fruits, vegetables, and dairy products, have had a positive elasticity, implying that they have been a luxury item for some households.

Meat and meat products provide an important source of nutrients to the human diet, including proteins, iron, and vitamins. However, this protein source has a significant environmental impact (Salter, 2018). It is well understood that livestock production has a negative impact not only on GHG emissions, but also on the water footprint, water pollution, and water scarcity (Farchi, De Sario, Lapucci, Davoli, & Michelozzi, 2017). As a result, there is an urgent need to change current lifestyle and consumption habits, not only for the sake of the planet's health, but also for the sake of one's own human health.

As a result of globalization and income growth, empirical studies showed that less developed countries were increasingly catching up with higher-income countries in terms of eating habits. To compare countries, it is essential to determine if disparities between them are widening or, in contrary, whether they are decreasing, which means that the process of convergence is happening. Authors Borkowski, Dudek and Szczesny (2009) pointed out in their research paper a variety of reasons of importance to analyse convergence in food patterns. Firstly, convergence in food consumption would reflect a similarity in standard of living. Furthermore, it could indicate that globalization was homogenizing European cultural identity.

Popkin (2007) posited that convergence in food systems would mean that both the benefits and difficulties connected with changes in local diets will become global issues very quickly. Increased use of processed foods, which have high fat and sugar content, has been blamed for contributing to the global obesity pandemic.

The convergence trends in food consumption and expenditures have been examined by several authors in their research. Gil et al. (1995) published the first study on absolute beta convergence in food consumption. The authors used cross-section methods to compare data from 15 European Union countries plus Norway in the years 1970, 1980, and 1990. They simply looked at calorie intake and they found that total per capita calorie intake and the proportion of calories from grains, pulses, animal fats, milk, and sugar were beta convergent. Similar study of using absolute beta-convergence in food consumption was written by Dudek, Borkowski and Szczesny (2009). Unlike in Gil et al. (1995) research, these authors used panel data for period 1961-2003 and they examined both calorie intakes and per capita consumption of several food products. Dudek, Borkowski, and Szczesny (2009) looked at Czechoslovakia, Hungary, and Poland as a group. Cereal, sugar and sweeteners, vegetables, dairy items excluding butter, and eggs all showed beta-convergence. It was demonstrated that if there was convergence in these countries, it had a higher rate than all other countries.

Convergence trends in food demand and supply across 47 high- and middle-income countries in years 1990-2004 were studied by Regmi, Takeshima and Unnevehr (2008). Authors used sigma convergence for analysis and found that in terms of food purchasing patterns at both retail and foodservice facilities, middle-income countries were starting to approach high-

income countries. Food expenditures in 47 nations showed significant convergence in total food, cereals, meats, fish, dairy, sugar and confectionery, caffeinated beverages, and soft drinks consumption trends. This convergence reflected both global economic growth and consumption increase in middle-income countries due to fast development of their food delivery systems.

Food convergence between Central and Eastern Europe and EU-15 were examined by Mauracher and Valentini (2006). These authors found that the European countries were facing homogenisation of its food consumption patterns. This conclusion was confirmed by professors Mauracher and Gerolimetto (2012) in their research, in which they analysed food consumption in Europe using cluster analysis.

Among the last studies Baquedano (2020) examined the global food consumption trends in 18 food groups between 1994 and 1995 and 2015-2017 to see if there was any evidence of global convergence. The findings revealed that as income increased, so did food consumption. Most of the world had likewise transitioned from a period of lack of food and high famine danger to a period of increased food variety. Caloric diversity rose for most food groups, but grains were becoming more concentrated. Meat was the second-largest source of calories after cereals, while calories from fats, carbohydrates, and vegetable oils had also risen.

2. Data and Methods

The information source for evaluating food consumption convergence trends among European countries consists of data on annual food consumption, acquired from the FAOSTAT database. The study examines food consumption in 38 countries, apart from Serbia and Montenegro for the period 2000-2019. Analyses were also performed in two sub- periods: 2000-2009 and 2010-2019. The consumption of individual food commodities (animal fats, cereals, eggs, fruits, meat, milk, oils, vegetables) is represented in kcal/per capita/day in the dataset.

From a methodological point of view, to verify the existence of convergence of food consumption of the population, we used the methodology according to Barro and Sala (1992). These authors recommend measuring convergence through β -convergence. The calculations were performed using SAS Enterprise Guide and MS Excel statistical software.

Beta-convergence occurs when consumption in lower-consumption countries grows faster than consumption in higher-consumption countries. It is estimated using the regression function:

$$\frac{1}{T} \log \left(\frac{y_{i,t_0+T}}{y_{i,t_0}} \right) = a - \left(\frac{1 - e^{-\beta T}}{T} \right) \log(y_{i,t_0}) + u_{i,t_0,t_0+T} \quad (1)$$

where y_{i,t_0} is food consumption of i-country in t_0 -year in kilocalories per capita, y_{i,t_0+T} is food consumption of country i in year t_0+T in kilocalories per capita, T is the length of the period, β is the speed of the convergence and u_{i,t_0,t_0+T} is random component with time lag between years t_0 and t_0+T .

Because the function is nonlinear, we use mathematical substitution to transform the model to a linear model in parameters:

$$b = - \frac{1 - e^{-\beta T}}{T} \quad (2)$$

We transform the nonlinear convergence equation by substitution into the following form and estimate the least squares model:

$$\frac{1}{T} \log \left(\frac{y_{i,t_0+T}}{y_{i,t_0}} \right) = a - b \cdot \log(y_{i,t_0}) + u_{i,t_0,t_0+T} \quad (3)$$

The convergence rate, which depends on the size of the β -coefficient, is calculated by plugging the estimated parameter b into the following formula:

$$\beta = -\frac{\log(1 + T \cdot b)}{T} \quad (4)$$

Beta convergence is confirmed, if the β -coefficient is positive and statistically significant. On the contrary, we speak about divergence, if the β -coefficient is negative and statistically significant. Although a positive β -coefficient satisfies the beta convergence condition, it is insufficient. As a result, analysis of sigma-convergence is also required.

Sigma-convergence refers to reducing disparities over a period between countries. It occurs when the variability of per capita food consumption between countries is lowering over a period. The existence of beta-convergence is a requirement for the existence of sigma-convergence. However, the opposite relationship is not required. Sigma-convergence is calculated as the sample standard deviation of the natural logarithms of the food consumption data expressed in calories per capita per day in the group of European countries according to the following expression:

$$\sigma_{y,t} = \sqrt{\frac{\sum_{i=1}^n (\log y_{i,t} - \overline{\log y_t})^2}{n-1}} \quad (5)$$

where $y_{i,t}$ is food consumption of i -country in t -year in kilocalories per capita.

3. Results and Discussion

The study's goal was to verify the hypothesis of food consumption convergence in European countries to a mutually similar level of consumption based on beta and sigma convergence. The existence of beta convergence was verified first. The essence of this task, according to the above methodology, was to estimate the parameters of the β -regression function examining convergence. If the estimated β -factor is positive, the convergence hypothesis is valid. At the same time, the regression model needs to be statistically significant at the $\alpha=0.05$ significance level. According to the form of the regression equation and its factual interpretation, beta-convergence occurs when consumption in countries with lower calorie consumption grows faster than consumption in countries with higher calorie consumption.

Regression functions were estimated using cross-sectional data from 38 countries from 2000 to 2019, divided into two subperiods: 2000-2009 and 2010-2019. The results of beta convergence are shown in Table 1 for the entire research period and in Table 2 for the individual subperiods.

Table 1: Results of β -convergence for period 2000-2019

Period: 2000-2019	β	p value	R ²	Sig. F
Animal fats	0,0193	1,51E-04	33%	1,63E-04
Cereals - Excluding Beer	0,0309	1,57E-07	53%	1,98E-07
Eggs	0,0324	4,38E-03	20%	4,50E-03
Fruits - Excluding Wine	0,0520	1,20E-09	64%	1,76E-09
Meat	0,0348	7,49E-11	69%	1,21E-10
Milk - Excluding Butter	0,0126	6,82E-02	9%	6,87E-02
Vegetable Oils	0,0286	9,97E-07	49%	1,20E-06
Vegetables	0,0318	2,89E-04	31%	3,08E-04

Source: own processing

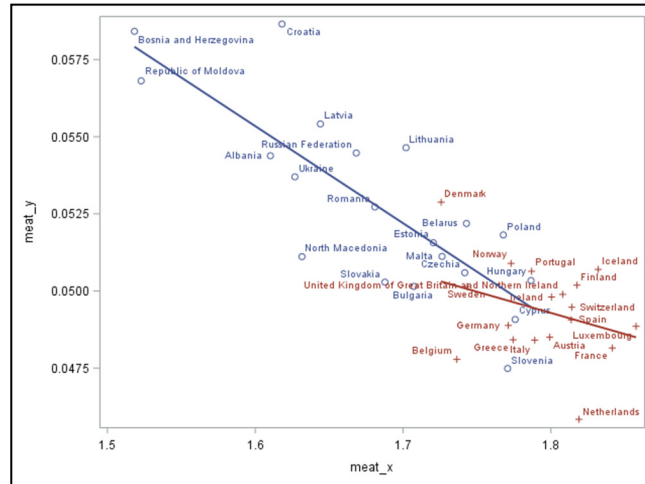
Tables 1 and 2 show the significance level of beta coefficients (p value), the coefficient of determination (R²) in percent, and the estimated regression model's significance level (Sig. F), which provide the explanatory power of individual regression models.

Table 2: Results of β -convergence for individual subperiods

Subperiod: 2000-2009	β	p value	R ²	Sig. F	Subperiod: 2010-2019	β	p value	R ²	Sig. F
Animal fats	0,0447	6,22E-06	43%	7,16E-06	Animal fats	0,0108	2,01E-01	5%	2,01E-01
Cereals - Excluding Beer	0,0418	4,56E-07	51%	4,56E-07	Cereals - Excluding Beer	0,0350	9,63E-03	17%	9,82E-03
Eggs	0,0376	6,67E-03	19%	6,83E-03	Eggs	0,0479	2,07E-02	14%	2,10E-02
Fruits - Excluding Wine	0,0793	2,79E-05	39%	3,11E-05	Fruits - Excluding Wine	0,0757	2,47E-06	46%	2,90E-06
Meat	0,0504	3,81E-09	62%	5,39E-09	Meat	0,0240	4,60E-03	20%	4,73E-03
Milk - Excluding Butter	0,0096	3,26E-01	3%	3,27E-01	Milk - Excluding Butter	0,0053	5,97E-01	1%	5,97E-01
Vegetable Oils	0,0610	1,85E-05	40%	2,07E-05	Vegetable Oils	0,0247	4,50E-03	20%	4,62E-03
Vegetables	0,0438	1,13E-03	26%	1,19E-03	Vegetables	0,0331	1,87E-02	14%	1,90E-02

Source: own processing

Except for the aggregated milk group, all beta coefficients are positive when assessing convergence for the entire period 2000-2019, confirming the hypothesis of a certain tendency towards a similar level of consumption in European countries. Positive beta values indicate that consumption of all commodities (except milk) is growing faster in lower-income countries in 2000 than in higher-income countries. When we evaluate the explanatory power of regression models for individual commodities over the entire period, we find that the meat commodity has the highest R² value. In the first subperiod, we achieved the same result (2000-2009). The rate of convergence tendencies slowed in the second subperiod (2010-2019). The first position of meat commodities was replaced by egg commodities during this subperiod. In addition to milk, the regression model of animal fats was statistically insignificant during this time. The beta coefficients are positive in both cases, but due to their statistical insignificance and the insignificance of regression models, we cannot confirm the existence of beta convergence within this subperiod. The previous conclusions are also documented in Figure 1, which shows the change in meat consumption in 2019 compared to 2000.



Source: own processing

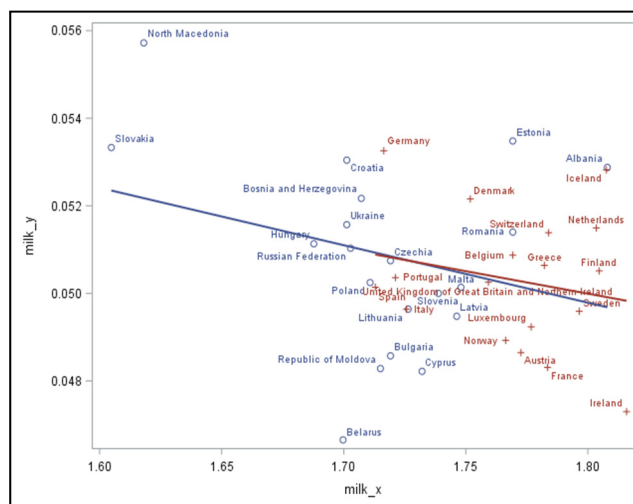
Figure 1: Change in meat consumption in 2019 compared to 2000

Legend: meat_x is consumption in 2000 in logarithmic expression and meat_y is change in meat consumption in 2019 compared to 2000.

Figure 1 shows the color-coded countries of Europe. The EU15 and economically developed non-EU countries are highlighted in red. Blue presents the countries that became members of the EU after 2004, as well as other European countries except Montenegro and Serbia.

Bosnia and Herzegovina and the Republic of Moldova are depicted in the top left image. In the year 2000, these countries had the lowest levels of meat consumption. The countries displayed below or above the regression line are determined by whether the change in meat consumption is greater or less than the overall average. Countries above the regression line (Croatia, Latvia, Lithuania, and so on) consume more of the commodity under consideration than the average. On the contrary, countries in the regression function (Slovakia, Czechia, Bulgaria, and so on) consume less meat than the estimated average. The countries at the bottom right (mostly in red) represent countries with a higher initial level of meat consumption (EU countries), with a lower change during the review period. According to the graph's lines, the steeper decline has a blue curve, indicating greater changes in consumption and faster catching up with the countries on the right. The red line has a gentler slope, indicating that convergence trends in this group of countries are already slower.

In Figure 3, we also show a regression model of milk and dairy consumption for the entire period 2000-2019. The slopes of the red and blue lines are identical, and their course is milder, indicating slight changes in milk consumption, with changes in the blue group of countries being like changes in the red group of countries. It is not possible to speak of the convergence of countries with lower starting levels of milk consumption to countries with higher levels of milk consumption. The beta convergence estimates for this food group also led to this conclusion.



Source: own processing

Figure 2: Change in milk and dairy products consumption in 2019 compared to 2000

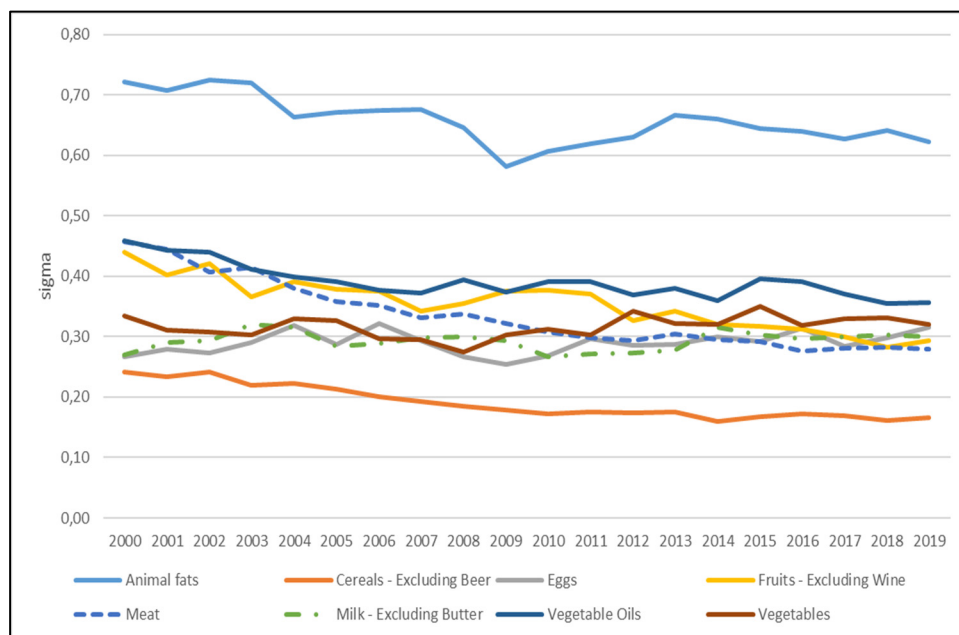
Legend: milk_x is consumption in 2000 in logarithmic expression and milk_y is change in milk consumption in 2019 compared to 2000.

The slopes of the red and blue lines are almost identical, and their course is milder, which indicates slight changes in milk consumption, with changes in the blue group of countries being similar to changes in the red group of countries, i. it is not possible to talk about the convergence of countries with a lower starting level to countries with a higher level of milk consumption. This conclusion was also derived from the beta convergence estimate for this food group.

Another goal of the analyses was to confirm the sigma-convergence-based convergence trends in food consumption in European countries. The essence of this task, according to the above methodology, is the calculation of standard deviations in each year and the subsequent analysis of their development over the observed time horizon, primarily through a graphical representation of the development. If the standard deviation calculated from the logarithms of consumption data has a decreasing tendency over time, the hypothesis of population convergence to similar nutrition can be considered valid.

Figure 3 depicts a declining trend in sigma convergence for most commodities. The most significant changes occurred in meat, fruit, and cereal consumption. We see the greatest fluctuations in animal fat consumption. In the case of this food group, there is a decrease in variability until 2009 (a decrease of 20 percent compared to 2000). Until 2013, there was an increase in variability, owing primarily to a decrease in consumption of this commodity in North Macedonia, Estonia, and Croatia. We can once again discuss convergence trends in the last years studied. The average growth coefficient calculated from the sigma values for this commodity assumes a value of 0.99, implying that there has been a slight decrease in variability in the consumption of this commodity over the entire period under review. The dashed line depicts the evolution of sigma for meat commodity, which beta convergence confirmed the greatest acceleration in the convergence trend analysis. This fact can also be recorded in the sigma graphic presentation.

Convergence trends in the food group milk and milk products have not been confirmed by beta convergence. When studying the evolution of sigma, it is impossible to speak definitively of either convergent or divergent tendencies. With minor fluctuations, the development of sigma convergence is roughly at the same level.



Source: own processing

Figure 3: Sigma convergence in the period 2000-2019

4. Conclusion

The above findings indicate a trend toward convergence in European consumers' eating habits, suggesting that countries with lower food consumption are catching up with those with higher consumption. We confirmed previous studies' assumptions about the convergence of food consumption across European countries. Although convergence has slowed, it remains significant in the most important food categories, particularly those that are good for health, such as fruits, vegetables, meat, and eggs. The analysis also revealed another fact that need to be considered in future research. This trend is expected to continue in the future due to the globalization and internationalization of the food market. Regardless of these trends, certain market segments with homogeneous socioeconomic characteristics will continue to exist within national countries. Traders and politicians alike should consider the existence of these segments and strive for their identification and subsequent satisfaction. This creates opportunities for further analyses that would deal with these trends in greater depth.

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References

- [1] Barro, R. J., & Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy*, 100(2), 223-351. doi: 10.1086/261816
- [2] Baquedano, F. (2020). *Convergence of food diets: characterizing consumption patterns, food diversity, and the relationship to trade*. Background paper for the State of Agricultural Commodity Markets 2020. Rome, FAO. Retrieved February 27, 2022, from <https://www.fao.org/3/cb0775en/CB0775EN.pdf>

- [3] Cupák, A., & Pokrivčák, J., & Rizov, M. (2015). Food demand and consumption patterns in the new EU Member States: The case of Slovakia. *Ekonomický časopis*, 63(4), 339-358. doi: 10.22004/ag.econ.182825
- [4] Dudek, H., & Borkowski, B., & Szczesny, W. (2009). Food consumption convergence within Europe: a panel data analysis. *Polish Journal of Environmental Studies*, 18(5B), 41-47. Retrieved February 27, 2022, from https://www.researchgate.net/publication/270507177_Food_consumption_convergence_within_Europe_a_panel_data_analysis
- [5] FAO (1996). *Rome Declaration on World Food Security and World Food Summit Plan of Action: World Food Summit, 13-17 November 1996*. Rome, Italy. FAO. Retrieved February 27, 2022, from <https://www.fao.org/3/w3613e/w3613e00.html>
- [6] Farchi, S., De Sario, M., Lapucci, E., Davoli, M., & Michelozzi, P. (2017). Meat consumption reduction in Italian regions: health co-benefits and decreases in GHG emissions. *PLoS one*, 12(8), e0182960. Doi: 10.1371/journal.pone.0182960.
- [7] Gil, J. M. et al. (1995). Food Consumption and Economic Development in the European Union. *European Review of Agricultural Economics*, 22(3), 385-399. doi: 10.1093/erae/22.3.385
- [8] Gomez-Zavaglia, A., Mejuto, J. C., & Simal-Gandara, J. (2020). Mitigation of emerging implications of climate change on food production systems. *Food Research International*, 134, 109256.
- [9] Masson-Delmotte, V., Zhai, P., Pörtner, H. O., Roberts, D., Skea, J., Shukla, P. R., ... & Waterfield, T. (2018). Global warming of 1.5 C. *An IPCC Special Report on the impacts of global warming of, 1(5)*. Retrieved February 27, 2022, from <https://apps.ipcc.ch/outreach/documents/451/1551801374.pdf>
- [10] Mauracher, Ch., & Valentini, M. (2006). Tipicità e convergenza alimentare dei PECO. *Economia Agro-Alimentare*, 10(3), 115-136. Retrieved February 27, 2022, from https://www.francoangeli.it/Riviste/Scheda_rivista.aspx?idArticolo=33428
- [11] Mauracher, Ch., & Gerolimetto, M. (2012). *Analysis of food consumption in Europe via time series clustering* [Master's Thesis, Università Ca' Foscari Venezia]. Retrieved February 27, 2022, from <http://dspace.unive.it/bitstream/handle/10579/2981/831151-1153740.pdf?sequence=2>
- [12] Popkin, B. M. (2007). The world is fat. *Scientific American*, 297(3), 88-95. doi: 10.1038/scientificamerican0907-88
- [13] Regmi, A., & Takeshima, H., & Unnevehr L. (2008). *Convergence in global food demand and delivery* (Economic Research Report Number 56). Washington, DC: United States Department of Agriculture, Economic Research Service. Retrieved February 27, 2022, from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1354244
- [14] Salter, A. M. (2018). The effects of meat consumption on global health. *Revue Scientifique et Technique (International Office of Epizootics)*, 37(1), 47-55. doi:10.20506/rst.37.1.2739
- [15] UN General Assembly. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development, 21 October 2015 (A/RES/70/1)*. UN General Assembly. Retrieved February 27, 2022, from <https://www.refworld.org/docid/57b6e3e44.html>



SESSION 4

FOOD CHAIN AND UNFAIR TRADE PRACTICES
(Supported by project: Food Chain and Unfair Trade Practices
APVV-18-0512)

Legislation Aspects of Sustainable Trade Practices in Food Supply Chains

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Abstract

Sustainability is one of the four principles defined by the Trade for Sustainable Development programme for global supply chains. It includes the social, environmental and economic dimension of trade as well as quality, management and ethics issues. However, recent changes in the concentration of EU markets affected the organisation of supply chains, including the food supply chain. These significant changes severely impacted especially small and medium-sized enterprises which are likely to be exposed to unfair trading practices contradicting the principles of sustainable trade. Imbalances in bargaining power between large and small enterprises lead to competition inequalities and unfair trade practices that need a specific legislation governance. This paper provides an overview of the Slovak and EU legislation regulating unfair trade practices in the agro-food sector. The main aim of both the European and Slovak legal acts regulating unfair trading practices is to ensure protection and fair income for businesses and quality and wider choice for consumers.

Keywords: *unfair trade practices, food supply chain, legislation, bargaining power*

JEL Classification: *Q13, L14, K42*

1. Introduction

The Trade for Sustainable Development Programme launched by the International Trade Centre (ITC), an organization established by the WTO and the UN, helps to evolve four basic principles in business and trade activities: sustainability, transparency, harmonization and alignment to the UN Sustainable Development Goals. The framework of a sustainable trade brings environmental aspects to the fore, nevertheless, it also includes the social and economic dimension of trade extended to quality, management and ethics as an important component (ITC, 2017). Changes and development of supply chains cause that businesses, regardless of their position in the value chain, sometimes deviate from sustainable trade principles. Increased concentration in retailers and processors in many developed countries such as in the EU led to their dominance on the market often followed by the abuse of bargaining power. Although understanding the abuse of bargaining power is still limited (Popović, Mihailović, & Simonović, 2018), the EU expressed concerns about the importance of regulation of unfair trade practices (UTPs) to protect weaker parties in food supply chains. Imbalances in bargaining power in business relationships between trading partners play a crucial role and is often quoted as the primary driver of the occurrence of these unfair practices (Russo, 2020). The (CIAA, 2010) also acknowledges the imbalance of bargaining power as a crucial factor of UTPs, especially when considering small and medium-sized enterprises. As explained in the study, for example the three largest retailers with more than 50% market share are present in almost every EU Member State and in some countries like Finland and the Netherlands their market share may be up to 80%. Because of this imbalance, the small and medium-sized enterprises are most often exposed to UTPs.

There are also other factors that are often considered to be a cause of UTPs (Renda, A. et al., 2014) such as: asymmetric information, switching costs, costs of contract enforcement, transaction costs, and perishability of goods and seasonality of production. When considering UTPs in food supply chains, European Commission also presented (European Commission, 2014) that particularly this supply chains are very sensitive to unfair trade practices. Moreover, UTPs within food supply chains may have important consequences affecting all EU consumers, because their main role is to secure supply of food and drinks.

However, sometimes it is difficult to judge whether some practice is fair or unfair and the same practise can be perceived differently in different situations. According to (Swinnen & Vandeveld, 2019) the assessment of justice should consider the economic aspect but also sociological factors.

All these concerns led policy makers to prepare a legislative framework that would clearly define the practices considered as unfair, prohibit their use and assist weaker business partners with legal protection. The purpose of this paper is to put unfair trade practices in food supply chain into a legal context. This paper explains the relevant Slovak and EU legislation and duties related to UTPs.

1.1 The problem and definition of unfair trade practices (UTPs) in food supply chain

Increasing concentration and vertical integration in the EU markets significantly affected also the functioning of food supply chains. Consequently, imbalance in bargaining power at different stages of supply chain increased. According to (European Commission, 2016) the difference in bargaining power is common in trade relationships, however it can sometimes lead to the abuse of market power and bargaining power and further lead to unfair trading practices.

Unfair trade practices were defined by (European Commission, 2013) as practices that “grossly deviate from good commercial conduct, are contrary to good faith and fair dealing. “ To eliminate UTPs in business relationships it is important to have clear and enforceable contracts. However as found out by (Di Marcantonio, F. et al., 2018) trading partners often meet with unfair trade practices already in the process of contract negotiations. Further on, UTPs can occur also in the phase of contract execution and its termination. Because of weaker position, producers often have no other choice than accept unfair practices in order to maintain business relations with the buyers (European Commission, 2019). This is due to the so called “fear factor”. As stated by (Lee, 2017), the above-mentioned factors are the two main factors that affect the occurrence of UTPs. He identified them as imbalance in bargaining power or capacity to obtain better conditions in business relationship as the most important factor and the second factor which is the fear factor (fear to take legal action against other business party).

2. Data and Methods

To provide an overview of the EU and Slovak legislative regulations on unfair trade practises. We have collected and analysed number of scientific papers and official documents as well as relevant Slovak national and EU legislation.

To retrieve the main publications for this study, we hand-searched EU commission and council website for legislative documents on UTPs as well as collection of acts of the Slovak Republic. Moreover, we performed a literature search of Researchgate as well as EU database retrieving articles published from 2005 to January 2022 that focused on legislation of unfair trade practices. Articles that reported information regarding any national laws or legislations in the

area of UTP among the European countries as well as on the EU level were considered eligible. Articles were critically evaluated for inclusion. The data taken from the legislative documents were made in the form of a narrative overview and arranged in tables. The paper used analytical-synthetic method during the conclusion's formulation and recommendations. In the study we are providing chronological sequence of legislative documents, categorization of EU countries based on legislation on UTPs, categorisations of UTPs based on EU Directive 2019/633, and a comparison of the Slovak Republic legislation regarding UTPs, Act no. 362/2012 Coll and the currently in force Act no. 91/2019 Coll.

3. Results and Discussion

The problem of unfair trade practices has been recognized by the European Commission in 2005, and since that time the legislation is gradually changing at both the European and national levels of individual EU member states.

3.1 Legislation on Unfair Trading Practices in the EU

The first regulations concerning UTPs were introduced in 2005 under the title “Unfair Commercial Practices Directive” (UCPD, 2005/29/EC). UTPs in this directive were recognized as an important problem particularly within individual stages of food supply chain between individual parties of business relationship (European Commission, 2010). However, this regulation focused only on one part of supply chain and that was trade practices between businesses and their consumers (B2C) and did not tackle the problem of trading practices between businesses (B2B).

In 2009, the European Commission started the communication titled “A better functioning of the food supply chain in Europe” (COM (2009) 591) and established a High-Level Forum on the topic. This communication presents the ways and concrete policy initiatives of overcoming challenges within EU food supply chain. Two main policy initiatives were presented. First one on promoting sustainable and market-based relationships and the second one on increasing transparency to encourage competition and price volatility within food supply chain.

(European Commission, 2013) stated, that in 2013 the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs made another step forward, towards more fair conditions for B2B relations. They published the Green Paper on Unfair Trading Practices in the B2B Food and Non-Food Supply Chain in Europe (COM (2013) 37).

Table 7 EU Member States' by UTP Legislation

Legislation on UTPs	EU Member States
No legislation on UTPs	Estonia, Luxembourg, Malta, The Netherlands
Limited scope legislation (Mainly consumer-type UTP approach)	Belgium, Denmark, Finland, Sweden
Specific legislation on UTP	
Cross-sector applicable: - along the supply chain	Austria, Cyprus, France, Germany, Greece, Latvia, Portugal

- towards retailers only	Lithuania
In the agri-food sector applicable: - along the supply chain - towards retailers only	Bulgaria, Croatia, Italy, Poland, Romania, Slovakia, Slovenia, Spain Czech Republic, Hungary, Ireland, United Kingdom

Source: (Cafaggi & Iamiceli, 2018)

Next steps against UTPs were proposed by Directorate-General for Agriculture and Rural Development in 2018. They designed a Directive on UTPs. This directive covered restriction of four UTPs which were published by (European Commission, 2018). The main aim of this Directive was to protect small and medium-sized enterprises from unfair practices imposed by their larger and stronger trading partners. Practices like late payments, short notice order cancellations for perishable food products, unilateral or retroactive changes to contracts and the forcing of suppliers to pay for wasted products became prohibited.

Current EU Directive 2019/633 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain from 2019 published by (European Commission, 2019) modified and extended the previous proposal. It did not concern just the protection of small and medium sized enterprises but also large companies. Other than that, it restricted ten so called “black practices” in the EU agri-food supply chains. Additionally, there were introduced six “grey practices” which are allowed only when trading partners explicitly agree in advance in writing on their use (Table 2). This directive had to be incorporated into national legislation of the EU member states.

It took more than decade for directive about UTPs to come into the effect. Many EU member states adopted this legislation at national level since the EU allows them to adopt stricter rules on UTPs.

Table 2 UTPs in the EU Directive 2019/633

Black UTPs	Grey UTPs
payments later than 30 days for perishable agricultural and food products	return of unsold products
payments later than 60 days for other agri-food products	payment of the supplier for stocking, display and listing
short-notice cancellations of perishable agri-food products	payment of the supplier for promotion
unilateral contract changes by the buyer	payment of the supplier for marketing
payments not related to a specific transaction	payment of the supplier for advertising
risk of loss and deterioration transferred to the supplier	payment of the supplier for staff of the buyer, fitting out premises

refusal of a written confirmation of a supply agreement by the buyer, despite request of the supplier	
misuse of trade secrets by the buyer	
commercial retaliation by the buyer	
transferring the costs of examining customer complaints to the supplier	

Source: (European Commission , 2019)

EU directive 2019/633 is not the only way of protection against UTPs. Other than that, different member states created and implemented their own specific legislation against UTPs or other specific measures. Beside specific legal acts, (Swinnen & Vandeveld, 2019) stress also the importance of the voluntary initiatives against UTPs. Before the directive against UTPs came into the effect, many of such initiatives were introduced within individual member states. Example of such an initiative is “Agri Food Chain Consultation” from Belgium. It was introduced in 2009 and its members include representatives from all stages of food supply chain. Main drive of this initiative is relationship fairness between suppliers and purchasers, because distinct economic interest of these parties can rise unhealthy competitiveness. Content of the initiative concerns according to (Supply chain initiative, 2022) “*the principles of good practices, procedures for dispute settlement, management and monitoring of the code, the tasks and responsibilities of the 'Committee'*”.

To combine existing legislation with voluntary initiatives at EU level, (European Commission, 2014) established the so called “Green Paper”. The Green paper contains different voluntary programs with reliable and effective enforcement. Based on this Green Paper the Supply Chain Initiative (SCI) was also established. The initiative was active in between 2013 and 2019 and its main purpose was to promote fair business practices in the food supply chain using tools and mechanisms that support business respecting contractual freedom and ensuring competitiveness (The Supply Chain Initiative, 2022).

3.2 Legislation on Unfair Trading Practices in the Slovak Republic

UTPs represent a topic that has been addressed in Slovakia for a long time mainly in food supply chain (Vargová, 2019). Main legislation regulating UTPs was adopted in 2012, under the Act no. 362/2012 Coll. on unfair terms in trade relations involving foodstuff. However, it was repealed in 2019 and substituted by Act no. 91/2019 Coll. on unfair terms in the food trade. This new legal act defines unreasonable conditions in business relations, subject of which is food. Various forms of monetary obligations, which are beyond the agreed purchase price, can be considered unreasonable conditions in the food trade. These are, for example, hidden discounts, payments for leaflets, extended invoice deadlines, etc. (MP SR, 2019).

(Act no. 91/2019 Coll.) on unfair terms in the food trade is the main legal act which regulates the requirements associated with unfair trade practices in Slovak Republic. It provides basic description of who this act is applicable to and what is the subject of this act. Within paragraph 3 it explains unreasonable conditions which are prohibited in business relations:

- Prohibition to require, agree, or enforce an unfair practice;
- Unfair practice is a monetary performance or a non-monetary performance of a party of business relationship for services;

- There is no unfair practice of monetary performance or a non-monetary performance of a party of business relationship for services in accordance with paragraph 3;
- Additional unfair practices;
- Unfair practice for the delivery of the invoice for the purpose of running the deadlines according to paragraph 5.

(Act no. 91/2019 Coll.) which replaced (Act no. 362/2012 Coll.) describes specific terms in more details. While for example, the customer was seen just as business operator, in the new act this term also includes a legal entity that is not an entrepreneur or businessman. The same applies to the case of supplier, who is not just entrepreneur but the operator of a food business and supplies food to the customer but also a legal entity that is an association. These and other modifications of this act are illustrated in the Table 3.

Table 3 Changes in SR Legislation on Unfair Trading Practices

Matter	Act no. 362/2012 Coll	Act no. 91/2019 Coll.
Payment definition	Payment provided to the party of the business relationship	payment requested, agreed or provided to the party of the business relationship
The contract under which the food is placed on the market	Described essentials of the contract under which the food is placed on the market	Not listed
Unfair practices	It is prohibited to place agreement on unfair practices.	It is prohibited to require, agree, or enforce an unfair practice. Unfair practices are extended and described more into the details.
Code of ethics	Suppliers and buyers can agree on the adoption of a code of ethics, which is in accordance with this Act and other generally binding legal regulations.	No code of ethics.
Control	Initiation to carry out an inspection must include identification data of the complainant, person against whom the complaint is filled and description of complain. Complainant is known.	Initiation to carry out an inspection must include just identification data of person against whom the complaint is filled and description of complain. Complainant can be anonym. Better structured, extended obligations of control body.

Controller	The duties of the controller as well as his rights are not clearly stated.	the duties of the controller as well as his rights are structured and described.
Controlled subject	the duties of the controlled subject as well as his rights are not clearly stated.	the duties of the controlled subject as well as his rights are structured and described.
A report or record shall be drawn up of the inspection carried out	Not specified.	If, based on the performed inspection, it is found that the inspected entity has or applied an unfair practice specified in § 3, a draft protocol shall be prepared and delivered to the inspected entity.
Disciplinary fine and administrative offenses	Disciplinary fine is up to 500 euros. Fine for administrative offences is up to 300 000 euros.	Disciplinary fine is up to 100 000 euros. Fine for administrative offences is up to 500 000 euros. Detailed description.

Source: own processing based on Acts no. 362/2012 Coll and no. 91/2019 Coll on unfair food trade practices in Slovak Republic 2022

Not only business practices between firms often suffer with unfair trading practices. Sometimes it is the relationship between suppliers and final consumers that need to be protected. The Act no. 250/2007 Coll. on consumer protection regulates business practices to final consumers. It includes also the rules tackling UTPs such as deceptive conduct and deceptive omissions, aggressive commercial practices.

4. Conclusion

The food supply chain is particularly sensitive to unfair commercial practices mostly imposed to small or medium size businesses. The first legal acts were established late, in 2005, and did not concern B2B relations. Currently, European and Slovak legal acts related to UTPs are trying to ensure fair income for business and to give consumers more choice. European commission main act concerning unfair trade practices are Directive of the European Parliament and of the Council of 17 April 2019 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain, Green paper and Supply Chain Initiative. Slovakia adopted Act. No 91/2019 Coll. on unfair terms in the food trade as the main legal act which regulates the requirements associated with unfair trade practices in Slovak Republic.

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References

- [1] Act no. 362/2012 Coll. (n.d.). Zákon o neprimeraných podmienkach v obchodných vzťahoch, ktorých predmetom sú potraviny.
- [2] Act no. 91/2019 Coll. (n.d.). o neprimeraných podmienkach v obchode s potravinami.
- [3] Cafaggi, F., & Iamiceli, P. (2018). JRC Technical Reports: Unfair Trading Practices in the Business-to-Business Retail Supply Chain. Luxembourg: Publications Office of the European Union.
- [4] CIAA. (2010). Supporting the competitiveness of the European food and drink industry. Retrieved from https://www.fooddrinkeurope.eu/uploads/publications_documents/ciaa-comprepweb.pdf
- [5] Di Marcantonio, F. et al. (2018). Unfair trading practices in the dairy farm sector: Evidence from selected EU regions. Publications Office of the European Union.
- [6] European Commission . (2019). of the European Parliament and of the Council of 17 April 2019 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain. Official Journal of the European Union.
- [7] European Commission. (2010). Retail market monitoring report “Towards more efficient and fairer retail services in the internal market for 2020”. Brussels: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.
- [8] European Commission. (2013). Green Paper on Unfair Trading Practices in the Business-to-Business Food and Non-Food Supply Chain in Europe.
- [9] European Commission. (2014). Tackling unfair trading practices in the business-to-business food supply chain. Communication From The Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Commission. Strasbourg.
- [10] European Commission. (2016). Trackling unfair trading practices in the business-to-business food supply chain. Strasbourg: Communication from the commission to the European parliament, the council, the European economic and social committee andthe committee of the regions.
- [11] European Commission. (2018). Proposal for a Directive of the European Parliament and the of the Council on Unfair Trading Practices in Business-to-Business Relationships in the Food Supply Chain.
- [12] European Commission. (2019). European Parliament Legislative Resolution of 12 March 2019 on the Proposal for a Directive of the European Parliament and of the Council on Unfair Trading Practices in Business-to-Business Relationships in the Food Supply Chain (COM(2018)0173 – C8- 0139/).
- [13] Falkowski, J., & et al. (2017). Unfair Trading Practices in the Food Supply Chain: A Literature Review on Methodologies, Impacts and Regulatory Aspects. European Commission. doi:10.2760/800
- [14] ITC. (2017). Building Sustainable Supply Chains. Retrieved from Available online through <https://www.intracen.org/T4SD/Publications/> or direct link https://www.intracen.org/uploadedFiles/intracen.org/Content/Exporters/Market_Data_and_Information/Market_Analysis_Tools/Trade_for_Sustainable_Development/3480.pdf.
- [15] Lee, S. (2017). The Possibility of the Introduction of Business-to-Business Unfair Trading Practices Regulation in EU Law. Budapest: Eötvös Loránd University. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2985377
- [16] MP SR. (2019). The new law puts an end to unfair food trade practices. Retrieved from Ministry of Agriculture and Rural Development of the Slovak Republic: <https://www.mpsr.sk/aktualne/novy-zakon-skoncuje-snekalymi-praktikami-v-obchodovani-s-potravinami/13862>
- [17] Popović, V., Mihailović, B., & Simonović, Z. (2018). Modern food retail and unfair trading practices. *Ekonomika poljoprivrede*, 65(4), 1499-1511. doi:10.5937/ekoPolj1804499P
- [18] Renda, A. et al. (2014). Study on the Legal Framework Covering Business-to-business Unfair Trading Practices in the Retail Supply Chain. European commission. doi:10.2780/91447
- [19] Russo, C. (2020). Pass-Through of Unfair Trading Practices in EU Food Supply Chains: Methodology and Empirical Application, Publications Office of the European Union, Luxembourg,. doi:10.2760/837579
- [20] Sexton, R. J. (2017). The Unfair Trading Practices in the Food Supply Chain: Types of UTPs. European Commission, In Paper Presented at the Workshop on "Unfair Trading Practices in the Food Supply Chain", Brussels.

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- [21] Supply chain initiative. (2022). About the initiative. Retrieved from supplychaininitiative: <https://supplychaininitiative.be/en/about-the-initiative/>
- [22] Swinnen, J. O., & Vandavelde, S. A. (2019). From Unfair Prices to Unfair Trading Practices. Retrieved from [online]: http://respect.eui.eu/wp-content/uploads/sites/6/2019/12/SWINNEN_paper1_D2.5.pdf
- [23] The Supply Chain Initiative. (2022). The Supply Chain Initiative. Retrieved from The Supply Chain Initiative: <https://www.supplychaininitiative.eu/>
- [24] Vargová, L. (2019). Úloha súťaže v potravinovom reťazci na trhoch s poľnohospodárskymi komoditami. dizertačná práca, 144.

Aromatisation and Its Effectiveness in a Food Retail Store

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Abstract

Customers generally prefer not only freshness, quality, convenience, and a wide assortment when shopping, but also the possibility of fast and efficient shopping. At the same time, influencing the customer's senses through the shopping atmosphere is an equally important area for experience shopping. The point of sale is considered to be one of the few communication channels that is not yet saturated and has a relatively large potential in the future. In a challenging competitive environment, building a Unique Selling Proposition (USP) through various forms of in-store communication comes to the fore. Scents as means of influencing the purchase of goods or services has a long history, but aromachology as an area of in-store communication is a matter of the present. This new trend, the importance and use of which has been growing in recent years, has been the subject of much research lately. To increase the effectiveness of these elements, it is essential to become familiar with the factors that affect the customer, whether consciously or subconsciously. The paper deals with the study of the influence of selected aromatic compounds on consumer decision-making when buying food, as well as assessing the effectiveness of their implementation in a food retail store. We conclude with recommendations for efficient and effective space aromatisation, with which the retailer can achieve not only a successful form of in-store communication and a pleasant sales department environment, but ultimately increase the retail turnover of its store.

Keywords: aromachology, business, consumer behaviour, efficiency

JEL Classification: M30, M31, M39

1. Introduction

Designing the right in-store atmosphere in order to create a valuable customer experience is essential to achieve success for retailers (Grewal, Roggeveen, & Nordfält, 2017). A favourable in-store environment, which is leading to successful and immersive customer experiences (Melia & Caridà, 2020) requires the effective management of many elements, which we can find both inside (e.g., atmosphere, assortment) and outside of the retailer's control (e.g., purpose of shopping, influence of others) (Verhoef et al., 2009). Due to the complexity of the buying process, the in-store communication is now critical to maintain a successful store environment atmosphere, since it presents a strategy that enhances the store atmosphere, displays, service and layout (Fam et al., 2011). The involvement of large-scale retailers (especially in consumer goods markets) led to various changes in the promotion and advertising activities of companies within this sector. As a result, in addition to being a place of purchase, the point of sale increasingly provides an opportunity for customer relationships to be built and developed over time (Riboldazzi & Capriello, 2021). Significant changes in the last ten years therefore resulted in focusing on the multiple dimensions of the in-store atmosphere (Melia & Caridà, 2020).

Retail units are increasingly using scent to differentiate, attract customers, stimulate sales, influence mood and create an overall enjoyable and memorable shopping experience (Madzharov, Block, & Morrin, 2015; Biswas & Szocs, 2019). As the smell as one of the senses cannot be turned off and evokes immediate emotional responses, retailers are beginning to realize its usefulness in communicating with consumers at the point of sale. As a result, consumers have been increasingly affected by ambient scents, which are defined as general fragrances that do not come from the product, but are present as part of the retail environment (Bradford & Desrochers, 2009). In the marketing literature, the scent has so far received much less attention compared to other environmental factors of the store environment – such as colour, temperature, lighting, music etc. (Leenders, Smidts, & Haji, 2019). At the same time, even a relatively small change in the environment, resulting from the addition of proper fragrances, can in some cases have a noticeable positive effect on customers. These elements indicate the great potential for the application of aromachology in various sectors of entrepreneurship, including retail units (Horská *et al.*, 2018).

Over the years, a slowly growing number of academic studies have documented a range of fragrance effects in the retail environment (Table 1). The research context, such as whether the studies are performed in highly controlled laboratory environments or natural conditions, the scent type and the intensity of its use, conscious awareness of fragrances, or other disruptive influences, can significantly affect the final findings (Morrin & Tepper, 2021). The studies show the positive effects of the fragrance on customers' emotional states and behaviour in retail (time spent in store, product selection) and attitudes (intention to purchase, determination to revisit the store). However, the results are inconsistent and an explanation of the impact on customer behaviour is often insufficient (Giacalone, Pierański, & Borusiak, 2021).

Table 1: Studies about scent effects in the retail environment

	<i>Research questions</i>	<i>Research main findings</i>
<i>Mattila and Wirtz (2001)</i>	Impact of ambient factors (scent, music) on consumers' evaluations and behaviour in retail store	Pleasant ambient factors can improve the shopping experience but should not be considered in isolation.
<i>Chebat and Michon (2003)</i>	Impact of ambient odours on shoppers' emotions, cognition and spending in a shopping mall environment	Ambient scent affects the positive perception of the shopping mall and indirectly product quality.
<i>Michon, Chebat, Turley (2005)</i>	Effect of ambient odours on shoppers' emotions and perceptions in a shopping mall	Ambient scent has a positive effect on shoppers' perception of the mall environment under certain condition. The effect on shoppers' mood is not significant.
<i>Ward, Davies, Kooijman (2007)</i>	Impact of aroma on retailer image and dwell time	The scented space is perceived differently. Aroma is able to influence dwell time, positively or negatively.
<i>Morrison et al. (2011)</i>	Impact of in-store music and aroma on shoppers' behaviour and satisfaction in a real retail setting	In-store music and odours positively influence shopper behaviour, time and money spent, and satisfaction with the shopping experience.
<i>Doucé and Janssens (2013)</i>	Influence of an ambient scent on customers' affective, evaluative and approach reactions	A pleasant fragrance positively influences consumers' affective reactions, evaluations and intentions to revisit the store.
<i>Jacob, Stefan, Guéguen (2014)</i>	Influence of an ambient scent on consumer behaviour and sales in a florist's retail shop	Scented shop increased the number of customers and sales of plants and flowers.

<i>Helmefalk and Hultén (2017)</i>	Effects of multisensory cues on shoppers' emotions and behaviour in retail settings	Multisensory congruent cues positively affect shoppers' emotions, purchase behaviour and time spent.
<i>Leenders, Smidts and Haji (2019)</i>	Effect of different scent intensity on shoppers' mood, behaviour and evaluations in a real supermarket setting	The scent has a positive effect on shoppers' store evaluations, time spent and sales under high scent intensity condition.
<i>Biswas and Szocs (2019)</i>	Effects of ambient scent on food purchases	Pleasant ambient scent leads to lower purchases of unhealthy foods.
<i>Tri, Kim, Nga (2021)</i>	Influence of an ambient scent on shoppers' behaviour in fashion stores	Ambient scent positively affects intention to revisit the store, consumer spending and time spent in the store.

Source: Authors' elaboration, 2021

The studies cited in Table 1 examined the effects of ambient fragrances on consumer evaluation, whether environmental perception, product evaluation, shopping behaviour or perception of time spent in the retail store. However, the latest test of scent effectiveness in the commercial environment is its impact on sales (Schifferstein & Blok, 2002). Retailers should therefore pay particular attention to the choice of fragrance. In other words, for it to be considered appropriate, it has to be aligned with the store's design, the product categories, and the target consumers (Leenders, Smidts, & Haji, 2019). At the same time, one must pay attention to ensuring that the fragrance does not evoke negative emotions in consumers, i.e., they do not perceive it as a marketing tactic used to influence their behaviour (Lunardo, 2012). Despite the potential risks, retailers should consider incorporating scents into their shopping environment, as this is one of the cheapest techniques to improve ambient perception (Chebat & Michon, 2003).

2. Data and Methods

The subject of interest were data on the number of pieces sold and sales within the confectionery subcategories at a food retail store in Nitra. The obtained data were compared from two points of view. The first was a year-on-year comparison of the two periods (2020/2021) during which aromatisation was used in the confectionery department with the same period in the previous year (2019/2020) without aromatisation (see Table 2).

Table 2: Year-on-year comparison of data

Period	Dates
With aromatisation	10. 11. 2020 – 31. 01. 2021
Without aromatisation	10. 11. 2019 – 31. 01. 2020

Source: Authors' elaboration, 2021

The obtained data were also compared with a reference store of the same food retailer in Trnava, as according to the company's internal data it is a comparable one in terms of purchasing power, product mix, store layout and sales area, economic indicators, and location. At the same time, periods in which the same seasonal effect on confectionery sales is observed were also compared. In this case, the pre-Christmas period with aromatisation and the pre-Easter period without aromatisation were compared (see Table 3).

Table 3: Comparison of data with the seasonal effect

Period	Dates
With aromatisation	10. 11. 2020 – 30. 11. 2020
Without aromatisation	22. 02. 2021 – 14. 03. 2021

Source: Authors' elaboration, 2021

A nougat scent from a German aroma and scent marketing provider was used in the store. At the same time, the consumption of aromatisation filling was recorded in detail in order to calculate the costs of aromatising the space and the related efficiency. Data provided by the food retailer company have been adjusted by coefficients to prevent misuse of sensitive company data. We grouped the obtained secondary data into clearly arranged tables and graphs, which allowed us to compare selected time periods. We also calculated the index of change for some indicators. We applied the index method, the method of grouping into time series, the method of comparison, selection and graphical representation as basic methods of data processing.

3. Results and Discussion

In order to verify the effect of aromatisation on selected economic indicators, we examined the impact of the deployed aromatisation not only on the evaluation of the sales department atmosphere, but also on sales and the number of categories of goods sold in the confectionery department.

Due to the situation with the spreading COVID-19 pandemic and after consultation with the Business Intelligence Department of the food retailer, we decided to compare the data recorded in the Nitra store for the same period with the reference store, in which no aromatisation was used in the confectionery department. The main reason for not comparing the data with the same period of the previous year was mainly the potential of significant bias in the results and findings. In this context, data analysts from the company also confirmed changes in consumer behaviour and a significant decrease in turnover in particular product categories, which could fundamentally distort the results of the effect of aromatisation. After careful consideration by the food retailer company, the Trnava store was chosen as the reference one. This has a similar location, sales area, number of visitors, product layout, redesign and, based on internal data from the company, there is also the same purchasing power in the city of Trnava as in Nitra.

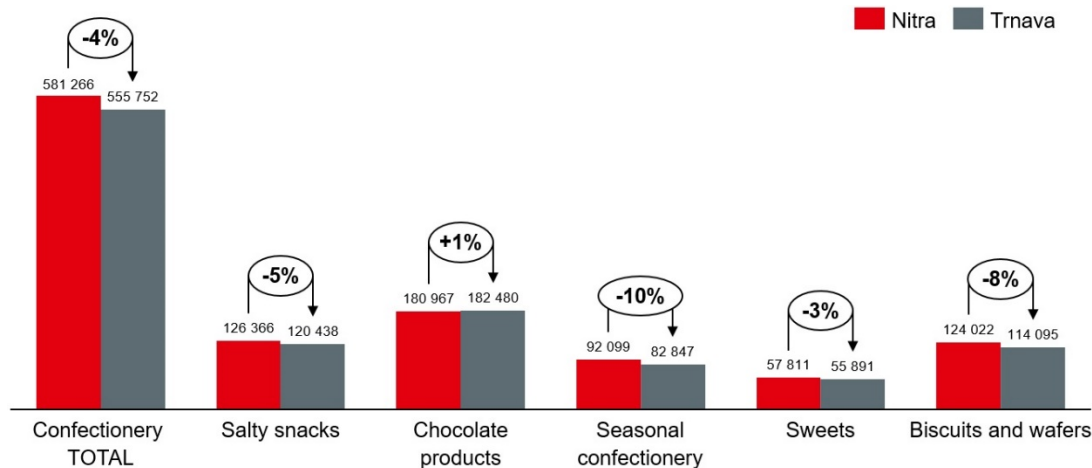


Figure 1: Turnover at the Nitra and Trnava stores for the entire confectionery category and its subcategories for the period between 10.11.2020 – 31.01.2021

Source: Authors' elaboration based on company documents, 2021

Figure 1 shows a comparison of subcategories in the confectionery department within the period from 10.11.2020 to 31.01.2021, when the nougat scent was used in the confectionery department at the Nitra store. In almost all subcategories of this department, with the exception of chocolate products (1% higher sales in Trnava), we see a higher turnover in the Nitra store. The highest difference (10%) is presented by the subcategory of seasonal confectionery, of which the Nitra store sold 9,252 EUR more. A significant difference (8%) can also be observed in the case of biscuits and wafers, where the difference for the period under review amounts to 9,927 EUR. The total difference in the sales of confectionery in the monitored stores represents the amount of 25,514 EUR (4%) in favour of the Nitra store.

Despite the presented differences in confectionery subcategories in favour of the aromatized department in Nitra, it is not possible to unambiguously attribute this fact to the effect of the nougat scent. Higher sales of confectionery in the Nitra store may also be largely related to the fact that only one store of this food retailer is allocated in Nitra, while there are two in Trnava. Nitra also has almost 12,000 more inhabitants than Trnava. Thus, we decided to compare the previous period without aromatisation in both stores.

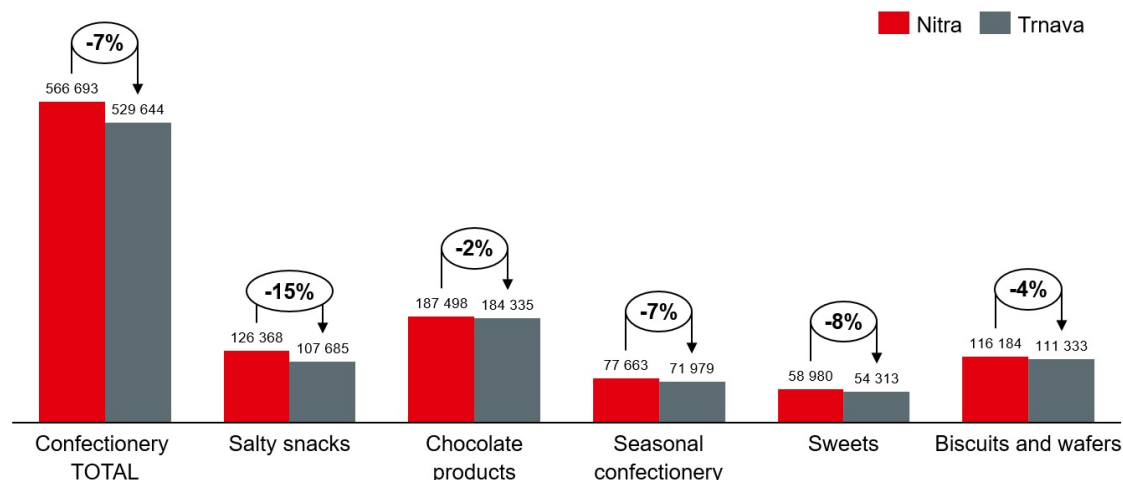


Figure 2: Turnover at the Nitra and Trnava stores for the entire confectionery category and its subcategories for the period between 10.11.2019 – 31.01.2020

Source: Authors' elaboration based on company documents, 2021

The subject of interest was the period from 10.11.2019 to 31.01.2020. A comparison of the subcategories in Figure 2 shows that the Nitra store generally has a higher turnover (7 %) in the confectionery segment, which represents 37,049 EUR. The largest differences can be seen in the subcategories of salty snacks (15%), sweets (8%) and seasonal confectionery (7%). In the year-on-year comparison (2019/2020), we can see a higher increase (4.9%) in the volume of confectionery sales in Trnava, while in Nitra this increase was at the level of 26,108 EUR, which represents 4.4%.

The above results show that the scent used did not have a positive effect on the sales of goods in the confectionery department. However, it should be emphasized that the results could have been significantly affected by the pandemic situation. In this context, it is possible to consider two major influences. The first is the economic situation of households. Many people lost their jobs as a result of the pandemic, which significantly changed the contents of the consumer basket. Given the high nature of the impulsiveness of this department, it can be assumed that it was in this department that the household saving regime manifested itself the most. The second factor is the face mask wearing and the disinfection of sales areas. Face masks can significantly reduce the sense of smelling aromatic substances and the disinfection can neutralize their effect. Last but not least, the total sales turnover is also affected by various promotions, discounts, hardsell communication, assortment composition (seasonality) as well as the pandemic situation. Due to this, the sale of goods in confectionery subcategories was also of interest.

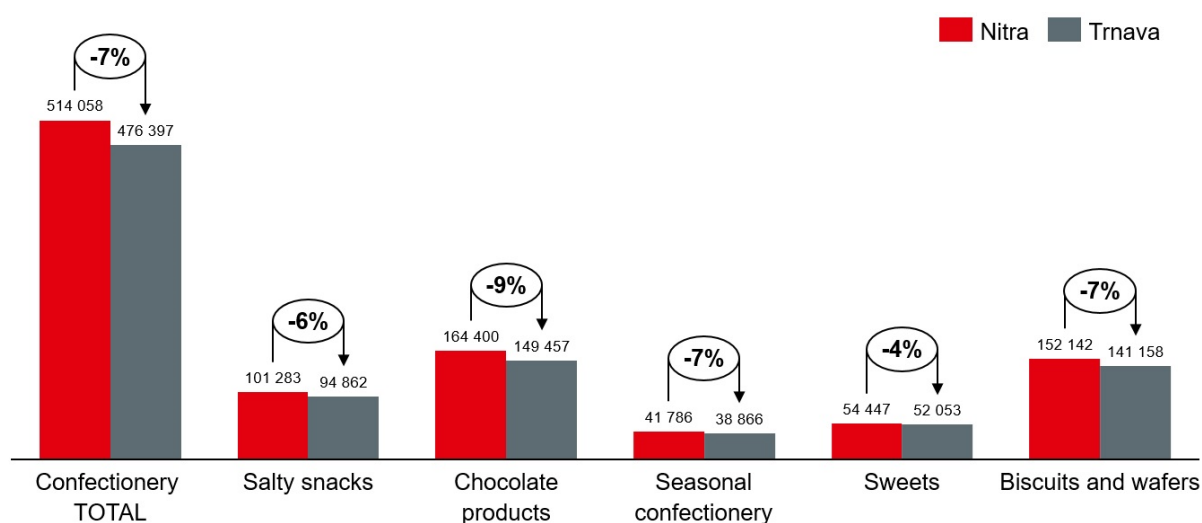


Figure 3: Number of pieces sold at the Nitra and Trnava stores for the entire confectionery category and its subcategories for the period between 10.11.2020 – 31.01.2021

Source: Authors' elaboration based on company documents, 2021

Figure 3 shows a comparison of the number of pieces sold in the confectionery department in the Nitra and Trnava stores for the period from 10.11.2020 to 31.01.2021. As mentioned above, the confectionery department in Nitra was aromatised in this period with the nougat scent. The biggest differences in terms of the number of pieces sold is visible in the subcategories of chocolate products (9%), but also biscuits and wafers (7%). The total difference between the number of pieces sold in the Nitra store and the reference store is 37,661 pieces (7%).

Table 4: Calculation of aromatisation costs

	Purchase price of the aroma unit	Rental price of the aroma unit per day	Grade of aromatisation [1-20]	Price of consumed filling per day (when using 150 ml)	Price of consumed filling per day (when using 500 ml)	Aromatisation costs per day when renting the aroma unit	Total costs of using the aroma unit per month (excluding VAT)
Aroma Streamer 650 Touch, Bluetooth Wi-Fi	319.20 EUR	0.53 EUR	5	1.16 EUR		1.69 EUR	50.64 EUR
			10	2.31 EUR		2.84 EUR	85.35 EUR
			15	3.47 EUR		4.00 EUR	120.06 EUR
			20	4.63 EUR		5.16 EUR	154.76 EUR
			5		0.60 EUR	1.13 EUR	33.91 EUR
			10		1.20 EUR	1.73 EUR	51.89 EUR
			15		1.80 EUR	2.33 EUR	69.87 EUR
			20		2.40 EUR	2.93 EUR	87.85 EUR
Aroma Streamer 750 Touch, Bluetooth Wi-Fi	479.20 EUR	0.66 EUR	5		0.50 EUR	1.16 EUR	34.90 EUR
			10		1.00 EUR	1.66 EUR	49.89 EUR
			15		1.50 EUR	2.16 EUR	64.87 EUR
			20		2.00 EUR	2.66 EUR	79.85 EUR

Source: Authors' elaboration based on documents from an aroma and scent marketing provider and research at the food retailer, 2021

Regardless of the impact of aromatisation on consumers' shopping behaviour, from an economic point of view, the most important issue is the costs and their return. The three basic factors that affect the cost of aromatisation are the size of the aromatised space (in m²), the time of aromatisation and the air flow in the room. The aroma unit itself can be purchased or rented. Most companies dealing with aromatisation of premises provide comprehensive packages of services, which also include regular service and refilling, which in terms of managing a higher number of stores and related costs is beneficial, especially for larger

businesses. As shown in Table 4, with a 10-hour deployment of a rented aroma unit AS650 (for rooms up to 150 m²) with a minimum output (grade 5), the daily costs are 1.69 EUR excluding VAT, which represents a monthly expense of 50.64 EUR, excluding VAT.

Table 5: Price list of aroma units and fillings

	Purchase price of the aroma unit	Rental price of the aroma unit	Price of the filling	
			150 ml	500 ml
Aroma Streamer 650 Touch, Bluetooth, Wi-Fi	319.2 EUR	15.92 EUR / month	41.65 EUR	71.92 EUR
Aroma Streamer 750 Touch, Bluetooth, Wi-Fi	479.2 EUR	19.92 EUR / month		

Source: Authors' elaboration based on documents from an aroma and scent marketing provider and research at the food retailer, 2021

4. Conclusion

In accordance with the above, it should be noted that the direct effect of aromatisation did not have a significant effect on sales and number of pieces sold, but on the other hand, in the store where aromatisation was used in the period under review there was a year-on-year decrease of 4%, therefore a smaller decrease in compared to the reference store (6%). The overall comparison in the period between the 46th week of 2019 and the 4th week of 2020 presents the turnover within the confectionery product category in the Nitra store higher by 5% and in the period between the 46th week of 2020 and the 4th week of 2021 by 7%, which represents in comparison with the Trnava store a difference of 37,133 EUR.

At the same time, we decided to compare sales and the number of pieces sold in the Nitra store within the seasons, which are characterized by increased purchases of confectionery. The results of the comparison show that in the pre-Christmas period, when aromatisation was used in the store, the turnover in the confectionery was 26% higher, which represents a difference of 35,140 of these items. This fact may be largely related to aromatisation, as in the same period of the previous year the difference in the seasonal comparison of the volume of goods sold in this section was 11%, which represents an increase of 15%.

It follows that our assumption about the effect of the sales department aromatisation on consumer decisions has been partially confirmed in the form of a 15% year-on-year increase in confectionery turnover in seasonal comparison, but also an overall smaller year-on-year decrease in sales (4%) in confectionery due to the pandemic compared with the reference store (6% decrease).

In terms of cost-effectiveness, it is certainly worth considering using the larger AS750 aroma unit, as it has a larger aromatisation filling, which is cheaper (see Table 5) and also needs to be supplemented less often. At the same time, the unit's more powerful compressor can disperse more fragrance particles in a shorter period of time, which translates into lower consumption. The result is a daily cost of 1.16 EUR excluding VAT, which represents a monthly expenditure of 34.90 EUR excluding VAT, with a 10-hour deployment of a rented AS750 aroma unit (for rooms up to 300 m²) with a minimum output (grade 5).

Furthermore, in addition to air quality and fragrance compounds, which are released into the environment naturally (e.g. in the case of fresh products), but also in a targeted way through aromatisation, also play a significant role in assimilating the store's environment, which is a major factor for consumers. The issue occurs when there is mixing of odours and incorrect matching of aromatisation with air quality conditions. It is primarily a matter of setting the right dosage intensity, while respecting the working conditions of employees, but also the selection of specific aromas depending on the type of goods sold and other quality factors, including compliance with air conditioning.

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References

- [1] Biswas, D., & Szocs, C. (2019). The Smell of Healthy Choices: Cross-Modal Sensory Compensation Effects of Ambient Scent on Food Purchases. *Journal of Marketing Research*, 56(1). doi:10.1177/0022243718820585
- [2] Bradford, K.D., & Desrochers, D.M. (2009). The use of scents to influence consumers: The sense of using scents to make cents. *Journal of Business Ethics*, 90, 141-153. doi:10.1007/s10551-010-0377-5
- [3] Chebat, J.C., & Michon, R. (2003). Impact of ambient odors on mall shoppers' emotions, cognition, and spending: A test of competitive causal theories. *Journal of Business Research*, 56(7), 529-539. doi:10.1016/S0148-2963(01)00247-8.
- [4] Doucé, L., & Janssens, W. (2013). The Presence of a Pleasant Ambient Scent in a Fashion Store: The Moderating Role of Shopping Motivation and Affect Intensity. *Environment and Behavior*, 45(2). doi:10.1177/0013916511410421
- [5] Fam, K.S., Merrilees, B., Richard, J.E., Jozsa, L., Li, Y., & Krisjanous, J. (2011). In-store marketing: A strategic perspective. *Asia Pacific Journal of Marketing and Logistics*, 23(2), 165-176. doi:10.1108/13555851111120470.
- [6] Giacalone, D., Pierański, B., & Borusiak, B. (2021). Aromachology and customer behavior in retail stores: A systematic review. *Applied Sciences*, 11(13), 6195. doi:10.3390/app11136195
- [7] Grewal, D., Roggeveen, A.L., & Nordfält, J. (2017). The Future of Retailing. *Journal of Retailing*, 93(1), 1-6. doi:10.1016/j.jretai.2016.12.008
- [8] Helmfalk, M., & Hultén, B. (2017). Multi-sensory congruent cues in designing retail store atmosphere: Effects on shoppers' emotions and purchase behavior. *Journal of Retailing and Consumer Services*, 38, 1-11. doi:10.1016/j.jretconser.2017.04.007
- [9] Horská, E., Šedík, P., Berčík, J., Krasnodębski, A., Witczak, M., Filipiak-Florkiewicz, A. (2018). Aromachology in food sector-aspects of consumer food products choice. *Zywność Nauka Technologia Jakość*, 25(4), 33-41. doi:10.15193/zntj/2018/117/257
- [10] Jacob, C., Stefan, J., & Guéguen, N. (2014). Ambient scent and consumer behavior: a field study in a florist's retail shop. *The International Review of Retail, Distribution and Consumer Research*, 24, 116-120. doi:10.1080/09593969.2013.821418
- [11] Leenders, M.A.A.M., Smidts, A., & Haji, A. (2019). El Ambient scent as a mood inducer in supermarkets: The role of scent intensity and time-pressure of shoppers. *Journal of Retailing and Consumer Services*, 48, 270-280. doi:10.1016/j.jretconser.2016.05.007

- [12] Lunardo, R. (2012). Negative effects of ambient scents on consumers' skepticism about retailer's motives. *Journal of Retailing and Consumer Services*, 19(2), 179-185. doi:10.1016/j.jretconser.2011.11.007.
- [13] Madzharov, A. V., Block, L.G., & Morrin, M. (2015). The cool scent of power: Effects of ambient scent on consumer preferences and choice behavior. *Journal of Marketing*, 79(1). doi:10.1509/jm.13.0263
- [14] Mattila, A.S., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. *Journal of Retailing*, 77(2), 273-289. doi:10.1016/S0022-4359(01)00042-2
- [15] Melia, M., & Caridà, A. (2020). Designing In-Store Atmosphere for a Holistic Customer Experience. In F. Musso, & E. Druica (Ed.), *Handbook of Research on Retailing Techniques for Optimal Consumer Engagement and Experiences* (pp. 142-161). IGI Global, Hershey, PA. doi:10.4018/978-1-7998-1412-2.ch007
- [16] Michon, R., Chebat, J.C., & Turley, L.W. (2005). Mall atmospherics: The interaction effects of the mall environment on shopping behavior. *Journal of Business Research*, 58(5), 576-583. doi:10.1016/j.jbusres.2003.07.004
- [17] Morrin, M., & Tepper, B.J. (2021). Multisensory marketing: effects of environmental aroma cues on perception, appetite, and consumption of foods and drinks. *Current Opinion in Food Science*, 40, 204-210.
- [18] Morrison, M., Gan, S., Dubelaar, C., & Oppewal, H. (2011). In-store music and aroma influences on shopper behavior and satisfaction. *Journal of Business Research*, 64(6), 558-564. doi:10.1016/j.jbusres.2010.06.006
- [19] Riboldazzi, S., & Capriello, A. (2021). Large-scale Retailers, Digital Media and In-store Communications. In Camilleri, M.A. (Ed.). (2021). *Strategic Corporate Communication in the Digital Age*. Emerald Publishing Limited, Bingley, pp. 145-160. doi:10.1108/978-1-80071-264-520211009
- [20] Schifferstein, H.N.J., & Blok, S.T. (2002). The signal function of thematically (in) congruent ambient scents in a retail environment. *Chemical Senses*, 27(6), 539-549. doi:10.1093/chemse/27.6.539
- [21] Tri, C.M., & Kim, T.; Nga, D.Q. (2020). Do ambient scents affect customers' behavioral responses at fashion stores in Vietnam? *Ho Chi Minh City Open University Journal of Science*, 10. doi:10.46223/hcmcoujs.econ.en.10.1.228.2020
- [22] Verhoef, P.C., Lemon, K.N., Parasuraman, A., Roggeveen, A., Tsiros, M., Schlesinger, L.A. (2009). Customer Experience Creation: Determinants, Dynamics and Management Strategies. *Journal of Retailing*, 85(1), 31-41. doi:10.1016/j.jretai.2008.11.001
- [23] Ward, P., Davies, B.J., & Kooijman, D. (2007). Olfaction and the retail environment: Examining the influence of ambient scent. *Service Business*, 1(4), 295-316. doi:10.1007/s11628-006-0018-3

Price Transmission Along the Ukrainian Pork Supply Chain

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Abstract

Pork production plays an essential role in the Ukrainian agricultural sector. At the beginning of the 90s, Ukraine was one of the biggest pork producers in Eastern Europe. However, due to the collapse of the Soviet Union's planning economy and the beginning of privatisation processes, the Ukrainian meat industry has experienced profound changes. One of those changes was the increase in concentration among pork producers and retailers during the last decades. Therefore, investigating how the transformation of the pork sector influenced the competitive environment within the supply chain is crucial. One of the ways to examine this phenomenon is to analyse the transmission of price adjustments along the supply chain. In this study, we used monthly price series of pork producers and consumers from January 2013 till December 2021. To analyse the data, we employed the Threshold Autoregressive, Momentum-Threshold Autoregressive and Error Correction models. The results of our analysis strongly indicate the presence of the long-run equilibrium between the investigated price series. At the same time, only one out of four estimated models weakly suggests the presence of asymmetric price adjustments along the pork supply chain. Finally, the Granger causality tests demonstrated that the pork producers' price Granger cause the consumers' price. However, there is not enough evidence to say that consumers' price have a similar effect on producers' price. Therefore, we can conclude that producers might be the driving force of pork price change on the Ukrainian market.

Keywords: asymmetric price transmission, cointegration, market power, unfair trading practices

JEL Classification: D43, L13, L16, L66

1. Introduction

There is a bunch of literature focused on the investigation of price transmission in agricultural food markets (e.g. recent meta-analysis of Kouyaté & Cramon-Taubadel (2016) found 492 papers using “price transmission” search query). Studying price transmission in food supply chains is crucial in numerous ways.

First of all, the speed and magnitude of price adjustment of price pass-through are crucial indicators of the overall functioning of the food value chain. Moreover, price transmission asymmetries might indicate the presence of unfair trading practices (UTPs) or/and market power (MP) along the particular supply chain.

Furthermore, price transmission is considered one of the fundamental mechanisms governing the inflationary process, which is particularly important in the context of agricultural supply chains since food inflation is one of the most volatile elements of general inflation (Leibtag, 2009).

Finally, a significant number of empirical papers on the prices transmission along the meat supply chain mainly focus on the U.S. and European markets (e.g. Dong et al., 2018; Miller & Hayenga, 2001; Rudinskaya, 2019). However, limited research is based on the data from developing East European countries, which might lead to selection bias in the literature and

distort the understanding of market power and price transmission mechanisms. As it is mentioned by Deconinck (2021) in his recent review of price transmission literature: “... not all sectors and regions have been equally well-represented in the empirical literature to date. Even if there is little evidence of systematic and widespread competition problems, important competition issues may still exist in specific markets”. Therefore, with this study, we aim to fill this gap and contribute to the literature by analysing price transmission between the pork producers’ and consumers’ prices in Ukraine.

Pork production has historically been an essential part of the Ukrainian agricultural sector since it is one of the main types of meat consumed by Ukrainians (Table 1), and pork-based Ukrainian cuisine is considered to have a longstanding cultural heritage. Even though the structure of meat production has changed significantly since the early 90s (Figure 1), Ukraine still produce sufficient volumes of meat to satisfy its internal demand (Svynous & Stepura, 2018). However, paying attention to the price transmission mechanism in the Ukrainian pork sector has become increasingly important since several factors might indicate the possible presence of competition issues along this supply chain.

Table 1: Balance of main types of meat in 2020 in Ukraine (Thousand Tonnes)

	<i>Beef</i>	<i>Pork</i>	<i>Poultry</i>	<i>Other</i>	<i>Total</i>
Production	345	697	1405	31	2478
Change of stocks	-2	-4	-9	0	-15
Import	18	96	113	3	230
Total resources	365	797	1527	34	2723
Export	27	10	435	1	473
Domestic total consumption;	337	786	1089	32	2244
Per capita (in kg)	8.1	18.8	26.1	0.8	53.8

Source: State Statistics Service of Ukraine

First of all, the production structure of meat had been shifting during the first decades of independence (Lutsiy, 2017). Some scholars demonstrated that the share of small pork producers decreased substantially in recent decades in favour of big intensive vertically integrated pork manufacturers (Bolshakova, 2019; Cherevko, 2017). Such dramatic changes in the pork production structure might be explained by the low economic efficiency and productivity of small pork producers. It was demonstrated that big industrial pork manufacturers with more than 1000 pigs were the only type of producers that received economic profit in 2016, while all the smaller producers reported economic losses (Zbarsky et al., 2017; Zbarsky & Shpak, 2016). Moreover, there is evidence of an ongoing trend for an increase in meat industries concentration (Perekhozhuk et al., 2011), while the high level of industry concentration is traditionally associated with possible competition issues in a food supply chain (Bain, 1951; Sexton, 2000; Sexton & Xia, 2018). Finally, there is some evidence that the developing Eastern European countries are more predisposed to MP and UTPs than the developed countries (Deconinck, 2021, p. 18).

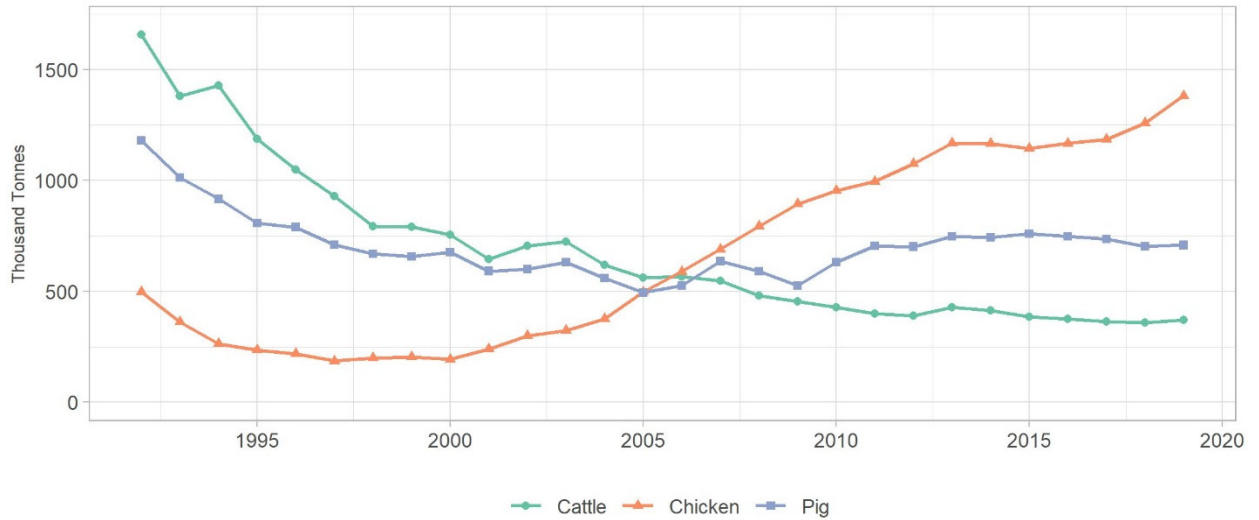


Figure 6: The Dynamics of Meat Production in Ukraine

Source: State Statistical Service of Ukraine

Therefore, all the issues mentioned above provoke concerns regarding the possible presence of market power and unfair trading practices among pork producers or retailers, which motivated us to analyse the price transmission between producer and consumer prices to test this hypothesis. The paper is organised as follows: the following section briefly outlines the data and the methodology used to analyse price transmission. Then, we describe the results of our analysis. Finally, the conclusions are briefly presented in the last section.

2. Data and Methods

The first step of our analysis lies in testing for the stationarity of the individual time-series data. Non-stationary price series can be used for the Engle-Granger cointegration test and estimation of the Threshold Autoregressive (TAR) and Momentum Threshold Autoregressive (MTAR) models to assess the presence of a long-term equilibrium relationship between the price series. In TAR and MTAR, the null hypothesis of no cointegration ($H_0: \rho_1 = \rho_2 = 0$) is examined using the F-test. If the series are cointegrated, we can proceed to the next step, which involves testing the null hypothesis of symmetry of price adjustments ($H_0: \rho_1 = \rho_2$). Finally, in the last step, we estimate the asymmetric error-correction model (ECM) if the hypothesis of symmetry of price adjustments is rejected or symmetric ECM otherwise.

This empirical strategy to examine the price transmission mechanism was proposed by Enders & Siklos (2001). Equation 1 describes the general form of the TAR model:

$$\Delta\mu_t = I_t\rho_1\mu_{t-1} + (1 - I_t)\rho_2\mu_{t-1} + \sum_{i=1}^p \gamma_i\Delta\mu_{t-i} + v_t \quad (1)$$

where the term I_t is the Heaviside indicator, which is defined as:

$$I_t = \begin{cases} 1 & \text{if } \mu_{t-1} \geq \tau \\ 0 & \text{if } \mu_{t-1} < \tau \end{cases} \quad (2)$$

where τ is a threshold value. The adjustment is modelled by $\rho_1\mu_{t-1}$, if μ_{t-1} is above the threshold and by the term $\rho_2\mu_{t-1}$, if μ_{t-1} if it is below the threshold. The MTAR model has a comparable structure, but in MTAR, the term μ_{t-1} in the equation (2) is replaced by its first

ferences $\Delta\mu_{t-1}$. While the TAR model captures a deep cycle process, the MTAR is more suitable to examine sharp sequential movements (Enders & Siklos, 2001).

In this study, we estimated four different models: TAR and MTAR with zero threshold and non-zero threshold, which is estimated with the procedure proposed by Chan (1993). We selected the model with the best performance according to AIC and BIC information criteria.

According to the Granger representation theorem, the error correction model can be estimated. We can confirm the presence of the cointegration relation between the variables (Engle and Granger, 1987). In case if the null hypothesis of symmetric adjustment in the long-term equilibrium can be rejected, it is possible to estimate an asymmetric error correction model with or without threshold cointegration. However, in our analysis, we did not reject the hypothesis of price adjustments symmetries (Table 2), so the symmetric ECM is used in our study, which can be defined as:

$$\Delta Y_t = \theta_Y + \delta_Y E_{t-1} + \sum_{j=1}^J \alpha_{Yj} \Delta X_{t-j} + \sum_{j=1}^J \beta_{Yj} \Delta Y_{t-j} + \vartheta_{Yt}$$

where ΔY_t is the dependent variable price; t indexes time; θ is an intercept; α and β are coefficients for each lag term for consumer and producer prices respectively; δ is the error correction term; J is the number of lags; and ϑ is a noise term. The maximum lag J is chosen with the AIC statistic and Ljung–Box Q test, so the residuals have no serial correlation.



are integrated of order one. We also rejected the null hypothesis of no cointegration using the Engle-Granger cointegration test. The nonlinear cointegration analysis was performed using four models (TAR, MTAR and their consistent alternatives). The results of those models can be seen in Table 2. Diagnostic of the residuals through AIC, BIC and Ljung–Box Q statistics showed that a lag of order zero is the most appropriate for performing the threshold cointegration tests. As shown in Table 2, all four models also overwhelmingly reject the null hypothesis of no cointegration between time series.

Table 2: Results of threshold cointegration tests

	TAR	CTAR	MTAR	CMTAR
<i>Parameters</i>				
Lags	0	0	0	0
τ	0	-0.025	0	0.017
ρ_1	-0.683*** (-5.408)	-0.738*** (-6.268)	-0.784*** (-6.269)	-0.894*** (-5.719)
ρ_2	-0.64*** (-4.767)	-0.547*** (-3.762)	-0.544*** (-4.052)	-0.559*** (-4.999)
<i>Diagnostics</i>				
AIC	-470.945	-471.945	-468.452	-469.763
BIC	-462.926	-463.927	-460.462	-461.773
LB (4)	0.418	0.356	0.328	0.34
LB (8)	0.498	0.419	0.35	0.301
LB (12)	0.301	0.266	0.276	0.244
<i>Hyphotheses</i>				
$H_0: \rho_1 = \rho_2 = 0$	25.986*** (0)	26.723*** (0)	27.858*** (0)	28.852*** (0)
$H_0: \rho_1 = \rho_2$	0.055 (0.816)	1.042 (0.31)	1.713 (0.194)	3.028* (0.085)

Note: *, **, *** denote significance at the 10%, 5% and 1% significance levels.

LB(p) denotes the significance level for the Ljung-Box Q statistic, where (p) number of lags;

Source: Estimated by authors.

However, none of the models can formally reject the null hypothesis of symmetric price transmission at the standard 5% significance level. The results of the CMTAR model can reject this hypothesis only with a 10% significance (p-value = 0.085). Therefore, we could suggest that there is only weak evidence of an asymmetric price adjustment process. Since the CTAR model has the lowest values of AIC and BIC, we discuss it in more detail. The point estimate for the price adjustment shows that the positive deviations from the long-term equilibrium resulting from increases in the pork producer price or decreases in the consumer price (higher than threshold value -0.025) are eliminated at 73.8% per month. Negative deviations from the

long-term equilibrium resulting from a decline in the producer pork prices or increases in the consumer price (lower than threshold value -0.025) are eliminated only at a rate of 54.7% per month. Therefore, there is some evidence of slightly faster convergence for positive deviations (above threshold) from long-term equilibrium than negative deviations (below threshold). However, as seen from the tests, the difference between the values ρ_1 and ρ_2 is not statistically significant.

The detailed results of the error correction model are reported in Table 3. The error correction term δ is significant and negative, as expected, but significant only in the producer pork price equation. These results imply that producer prices adjust to their long-run equilibrium after the shock. The diagnostics Ljung-Box Q suggest no autocorrelation in the models' residuals, and the R^2 and the information criteria suggest a much better fit for a consumer price model.

Table 3: Result of Error Correction Model

	Consumer	t-value	Producer	t-value
<i>Parameters:</i>				
θ	0.005**	(2.298)	0.006	(1.472)
α_1	0.139	(1.173)	0.062	(0.282)
β_1	0.3***	(3.45)	0.188	(1.166)
δ	-0.142	(-1.217)	-0.673***	(-3.108)
<i>Diagnostics:</i>				
R-squared	0.262		0.095	
AIC	-495.949		-364.812	
BIC	-482.632		-351.495	
LB(4)	0.508		0.605	
LB(8)	0.568		0.7	
LB(12)	0.43		0.314	
<i>Hypotheses:</i>				
		p-value		p-value
$H_{01}: \alpha = \sum_{j=1}^J \alpha_j = 0$	1.694	(0.19)	1.849	(0.16)
$H_{02}: \beta = \sum_{j=1}^J \beta_j = 0$	6.119***	(0)	1.446	(0.24)

Note: *, **, *** denote significance at the 10%, 5% and 1% significance levels;

H_{01} : Granger causality test (consumer price does not Granger cause ...)

H_{02} : Granger causality test (producer price does not Granger cause ...).

LB(p) denotes the significance level for the Ljung-Box Q statistic;

Source: Estimated by authors.

Finally, the Granger causality tests demonstrated that the pork producers' price Granger cause the consumers' price. However, there is not enough evidence to say that consumer prices Granger cause the producer prices in turn. Therefore, we can conclude that producers might be the driving force of pork price change in the Ukrainian pork supply chain.

4. Conclusion

This paper analysed price transmission between pork producers' and consumers' prices in Ukraine to study the possible presence of competition issues along the supply chain. After conducting our analysis, we can provide several insights. First of all, there is strong evidence that producers' and consumers' pork prices have a long-term cointegration relationship. A cointegration relationship means that there is a long-term equilibrium between the price series. However, in our research, we observed only weak evidence of the presence of price transmission asymmetries along the Ukrainian pork supply chain. Only one out of four estimated models could reject the hypothesis of symmetrical price adjustments with the 10% significance threshold. Therefore, there is only weak evidence that the price adjustment process is asymmetric when the producers' and consumers' pork prices adjust to the long-term equilibrium. Finally, the results of the Granger causality test suggest that changes in producers' price can determine the consumers' price, but not the other way around. The fluctuation in consumers' price seems to have a low or no influence on the producers' price. However, we have to stress that the results of price transmission analysis should be perceived with great caution as the first step in understanding how the price formation mechanism works in a particular food supply chain. Therefore, we suggest that the pork and other food supply chains of Ukraine need a more thorough investigation to understand the degree of the competitive environment.

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References

- [1] Bain, J. S. (1951). Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936–1940. *The Quarterly Journal of Economics*, 65(3), 293–324. <https://doi.org/10.2307/1882217>
- [2] Bolshakova, Y. (2019). MEAT PROCESSING INDUSTRY IN UKRAINE: MONITORING THE STATE AND TRENDS IN THE DEVELOPMENT. *MANAGEMENT OF THE 21ST CENTURY: GLOBALISATION CHALLENGES. ISSUE 2*, 171.
- [3] Chan, K. S. (1993). Consistency and Limiting Distribution of the Least Squares Estimator of a Threshold Autoregressive Model. *The Annals of Statistics*, 21(1), 520–533.
- [4] Cherevko, G. (2017). MARKET OF PORK IN UKRAINE: STATE AND PROSPECTS. *Edited by Assoc. Prof. WULS-SGGW Elżbieta Jadwiga Szymańska, D. Sc.*, 7.
- [5] Deconinck, K. (2021). Concentration and market power in the food chain. *OECD Food, Agriculture and Fisheries Papers*. <https://doi.org/10.1787/3151e4ca-en>
- [6] Dong, X., Brown, C., Waldron, S., & Zhang, J. (2018). Asymmetric price transmission in the Chinese pork and pig market. *British Food Journal*, 120(1), 120–132. <https://doi.org/10.1108/BFJ-02-2017-0056>
- [7] Enders, W., & Siklos, P. L. (2001). Cointegration and Threshold Adjustment. *Journal of Business & Economic Statistics*, 19(2), 166–176. <https://doi.org/10.1198/073500101316970395>
- [8] Engle, R. F., & Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55(2), 251–276. <https://doi.org/10.2307/1913236>
- [9] Kouyaté, C., & Cramon-Taubadel, S. von. (2016). Distance and Border Effects on Price Transmission: A Meta-analysis. *Journal of Agricultural Economics*, 67(2), 255–271. <https://doi.org/10.1111/1477-9552.12145>
- [10] Leibtag, E. (2009). How Much and How Quick? Pass through of Commodity and Input Cost Changes to Retail Food Prices. *American Journal of Agricultural Economics*, 91(5), 1462–1467.

- [11] Lutsiy, K. (2017). Obecny stan rozwoju branży mięsnej na Ukrainie. *Zeszyty Naukowe SGGW - Ekonomika i Organizacja Gospodarki Żywnościowej*, 117, 19–31. <https://doi.org/10.22630/eiogz.2017.117.2>
- [12] Miller, D. J., & Hayenga, M. L. (2001). Price cycles and asymmetric price transmission in the U.S. pork market. *American Journal of Agricultural Economics*, 83(3), 551–562. Scopus. <https://doi.org/10.1111/0002-9092.00177>
- [13] Perekhozhuk, O., Matyukha, A., & Glauben, T. (2011). *Estimating the Degree of Buyers' Market Power: Evidence from the Ukrainian Meat Processing Industry*. <https://doi.org/10.22004/ag.econ.114782>
- [14] R Core Team. (2020). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- [15] Rudinskaya, T. (2019). Investigation of the Determinants of Market Power on Czech Pork Meat Market. *Agris On-Line Papers in Economics and Informatics*, 11(2), 71–80. <https://doi.org/10.7160/aol.2019.110207>
- [16] Sexton, R. J. (2000). Industrialisation and consolidation in the U.S. Food Sector: Implications for competition and welfare. *American Journal of Agricultural Economics*, 82(5), 1087–1104. Scopus. <https://doi.org/10.1111/0002-9092.00106>
- [17] Sexton, R. J., & Xia, T. (2018). Increasing Concentration in the Agricultural Supply Chain: Implications for Market Power and Sector Performance. *Annual Review of Resource Economics*, 10(1), 229–251. <https://doi.org/10.1146/annurev-resource-100517-023312>
- [18] Sun, C. (2011). Price dynamics in the import wooden bed market of the United States. *Forest Policy and Economics*, 13(6), 479–487. <https://doi.org/10.1016/j.forpol.2011.05.009>
- [19] Svytnous, I., & Stepura, L. (2018). *Self-Sufficiency As An Indicator Of Ukraine's Food Security*. Slovak University of Agriculture in Nitra. <http://rep.btsau.edu.ua/handle/BNAU/1542>
- [20] Zbarsky, V., & Shpak, O. (2016). Pig breeding as a key sector in agriculture of Ukraine. *Agrosvit*, 21, 8–14.
- [21] Zbarsky, V., Zbarska, A., & Shpak, O. (2017). Development of Pig Production in Agricultural Enterprises of Ukraine. *Scientific Bulletin of Uzhgorod University. Series: Economics*, 1 (2), 197–202.

The Hierarchy of Responsibility for Food Safety – the Case of Polish Consumers

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Abstract

Food safety is very important because it has a direct impact on human health. Food safety has to be assured at every stage of the food chain, from farm to fork. The food chain has many stages and actors: farmers, importers, food processing, storage, retailers, consumers. Lack of food safety can occur at any of these stages. Each food chain actor and institutions are responsible for food safety in the food chain.

The paper presents the results of a survey made in 2020 in Poland among 2,000 consumers. Consumers were asked to assess the hierarchy of responsibility for food safety. According to the results it was shown that consumers perceive food producers to have the biggest responsibility for food safety (73.6% of indications), then food safety authorities/institutions (51.6% of indications), distributors and retailers (69.7% of indications), and themselves (73.8%).

Keywords: consumers, food safety, food safety assurance

JEL Classification: P46, Q18, Q19

1. Introduction

Food chain is very complex with many actors such as: farmers, distributors, producers, retailers and finally consumers. Food safety authorities/institutions issue legal requirements and make inspections of the entities in the food chain. Each of them has the responsibility for food safety. Food safety hazards (biological, chemical, physical) may appear at each stage of the food chain. Entities in the food chain have the requirements that have to be fulfilled. For example, the obligatory food safety assurance systems should be implemented such as GHP, GMP and HACCP (excluding the primary production). The European Commission has implemented the farm to fork strategy to ensure safety and healthy food in the whole food chain². Farm to fork strategy now represents a wide approach to food. It consists of 4 main points: sustainable food production, sustainable food processing and distribution, sustainable food consumption, food loss and waste prevention (Trucker et al., 2006; Raspor, 2008).

Appearance of food hazard results in negative impact on human health and big loss for the economy, i.e. food withdrawing, image loss, healthcare expenses. It is very important for all of us because we all are food consumers. The food we consume influence our health. The World Health Organisation gives the most important facts about the food safety³: (1) access to sufficient amounts of safe and nutritious food is key to sustaining life and promoting good health, (2) unsafe food containing harmful bacteria, viruses, parasites or chemical substances, causes more than 200 diseases – ranging from diarrhoea to cancers, (3) an estimated 600

² https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_pl#documents

³ <https://www.who.int/news-room/fact-sheets/detail/food-safety>

million – almost 1 in 10 people in the world – fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (DALYs), (4) US\$110 billion is lost each year in productivity and medical expenses resulting from unsafe food in low- and middle-income countries.

“Safer food saves lives” is a sentence that opens the document of WHO on the global burden of foodborne diseases⁴.

Each country has the institutions responsible for food safety. It is usually centered or not. 22 EU countries have model with a single food safety authority or model with more institutions, where one of them has a dominant position, 5 EU countries (18.5%), including Poland – dispersed model with several authorities responsible for food safety. In Poland the model is multiinstitutional. Some activities were made to make it more centered, i.e. starting from 1 July 2020. The Agriculture and Food Quality Inspectorate took over that quality supervision from the Trade Inspectorate in retail trade. On the basis of the report made by the Supreme Audit Office in Poland in 2021 on food safety institutions it was concluded that: (1) consolidating institutional food control structures, (2) educating the society on healthy eating, (3) increasing efficiency and effectiveness of control activities, (4) taking measures to impact EU solutions. As Hadjigeorgiou et al. (2013) says many think that it is the government’s responsibility to satisfy the need for safe food for all. However, it is the responsibility for each of us. For example, if a consumer buys a safe food and storage it or prepare in an inappropriate way (not to obey hygienic rules) it may cause food risk.

Food producers are obliged to implement GHP, GMP and HACCP. These systems help to prevent food hazards. For example in the process of food production the Critical Control Points (CCPs) have to be identify and monitor, GHP and GMP describe the principle of hygienic behavior in the workplace. Moreover, food producers are obliged to implement the traceability to be able to recover the history of the food starting from the ingredients. Food law inter alia requires the name of the producer on the food label to identify it and also the best before date/expiration date that informs till when the food can be consumed. Food distributors and retailer are also obliged to implement HACCP and GHP,GMP in their activities. Consumers although the do not have the legal obligations, they also should actively participate in the food safety assurance. An important source of food safety hazards are factors related to human behavior and the use of inappropriate practices during meals preparation at home (Powell et al., 2011; Redmond & Griffith, 2003; Milke et al., 2015). The main questions and issues to be considered about food safety along the food chain are presented in Table 1.

Table 1. Questions about food safety and responsibility

Participant of the food chain	Main issues to be considered
Producers	1) Food producers should fulfill the requirements of food safety standards and collaborate with other entities in the food chain to increase the ability to assure food safety 2) Food producers should have procedures in case of food hazard/threat and the need to withdraw products from the market 3) Food producers should remember that lack of food safety causes big financial loss

⁴ World Health Organization. Draft WHO Global Strategy for Food Safety 2022–2030. In Towards Stronger Food Safety Systems and Global Cooperation; World Health Organization: Geneva, Switzerland, 2021

	<ol style="list-style-type: none"> 4) Food producers should inform consumers about the proper way of the storage and preparation of their products, for example with the information on the food labels that should be clearly stated 5) Standards and regulations regarding food safety and the responsibility should take small farmers into account and be a support for them
Food providers and retailers	<ol style="list-style-type: none"> 1) Food providers and retailers should implemented the food safety standards 2) They should be aware of their role in food safety assurance as well as their responsibility for the food safety (for example storage and transport of food products) 3) They should be ready to collaborate with food authorities in the situation of food scares and the need for food withdrawal from the market
Food authorities/institutions	<ol style="list-style-type: none"> 1) The scope of the responsibilities if each institution should be clear 2) Employees of these institutions should have a high level of competence 3) Food authorities/institutions should participate in the education of consumers
Consumers	<ol style="list-style-type: none"> 1) Consumers have the impact on food safety and also are responsible for food safety by their purchase choices, by their way of food preparation and food storage, and hygienic practices 2) There is a need for consumer education on food safety behavior, i.e. how to storage food, how to prepare food 3) The source of information should be reliable 4) Consumers should be aware of their active role in food safety, not just to transfer the responsibility on other participants of the food chain

Source: own elaboration

2. Data and Methods

The research process consisted of the following stages:

- developing research methodology;
- consultation of the research tool;
- sample selection, implementation of the measuring phase of the survey;
- developing a statistical report;
- developing a final report.

The study was carried out using the CAWI (Computer Assisted Web Interviewing) technique based on conducting a computer-supervised internet survey in Poland in 2020. The questionnaire was built of 23 closed-typed questions. The sample consisted of 2000 people selected taking into account the place of residence (voivodship), gender and age. Respondents were also characterized in terms of education and material status. The exact distribution of the sample taking into account gender, age and place of residence is presented below. It reflects the structure of the population of adult Poles residing in the country.

Numeric variables were characterized using basic descriptive statistics: cardinality (N), arithmetic mean (mean), standard deviation (SD), median, lower and upper quartile (IQR), minimum and maximum values (range). Group comparisons were made using Chi-square test. The value of significance (p) was set at 0.05. Calculations were made in the R program (ver. 3.5).

The sample was representative for the whole country. 1049 women and 951 men were interviewed. Among the respondents, 42.4% were the sole decision-makers in the purchase of food products. About 49.7% of respondents said they make the majority of purchasing decisions for the household. The smallest group (7.9%) were people for whom someone else makes the majority of purchasing decisions. In the survey, respondents also specified their education, size of place of residence and net income per family member. Most respondents had secondary education (32.2%) and basic vocational education (30.7%). Persons with higher education constituted 26.9%, and the remaining 10.3% of respondents had primary / lower secondary education. Persons with a net income not exceeding PLN 1200 (about 300 €) per person constituted about 19.1% of the total number of respondents. One-fifth of survey participants (20.0%) indicated an income of PLN 1201 to 1600 (301 to 400 €), and respondents declaring income per person within PLN 1601-2000 (401 to 500€) net constituted 20.7% of all respondents. Income in the amount of 2001-2400 (501 to 600 €) was indicated by 19.5% of respondents and 20.9% of respondents had income per one person exceeding PLN 2400 (+600 €) net.

People living in the village accounted for 19.9% of the total, while about 23.0% of the respondents were city dwellers up to 50,000 inhabitants.

Approximately 29.0% of respondents were residents of cities with 50 to 250 thousand inhabitants, and 14.7% lived in cities with 250 to 500 thousand inhabitants. The least 13.5% of respondents lived in cities with over 500,000 inhabitants (Table 2).

Table 2. Characteristics of the respondents

Voivodship	Woman (age)						Man (age)					Total	
	18- 29	30-39	40-49	50-59	60-69	+70	18- 29	30-39	40-49	50-59	60- 69		+70
Dolnośląskie	12	16	13	11	15	13	12	16	13	11	13	8	153
Kujawsko-pomorskie	10	10	9	9	10	9	10	11	9	8	8	5	108
Lubelskie	10	10	9	9	10	10	10	11	9	8	8	6	110
Lubuskie	4	5	5	4	5	4	5	5	5	4	4	2	52
Łódzkie	11	12	11	10	13	13	11	12	11	9	10	7	130
Małopolskie	16	18	15	13	14	15	16	18	15	13	12	9	174
Mazowieckie	23	29	25	20	25	25	23	28	25	19	20	14	276
Opolskie	4	5	5	4	5	5	4	5	5	4	4	3	53
Podkarpackie	10	11	9	9	9	9	11	11	10	9	8	5	111
Podlaskie	6	6	5	5	5	6	6	6	5	5	4	3	62
Pomorskie	11	12	10	9	10	9	11	12	11	9	9	6	119
Śląskie	19	23	21	20	22	21	20	23	21	19	19	13	241
Świętokrzyskie	6	6	5	5	6	6	6	6	6	5	5	4	66
Warmińsko-mazurskie	7	7	6	6	7	6	7	8	6	6	6	3	75
Wielkopolskie	16	18	16	14	16	14	16	19	16	13	13	8	179
Zachodniopomorskie	7	9	8	7	9	7	8	9	8	7	8	4	91
Total	172	197	172	155	181	172	176	200	175	149	151	100	2000

Source: own elaboration

3. Results and Discussion

During the survey, respondents were asked who, in their opinion, is responsible for food safety. Most often, the respondents indicated the producer in the first place (73.5% of indications), followed by official control (17.1% of indications). Consumers and distributors / market were indicated as entities less responsible for food safety. Detailed information is presented in the table below.

Table 3. Food safety responsibility – opinion of the respondents

Entity responsible for food safety	Percentage of people indicating 1 st place	Percentage of people indicating 2 nd place	Percentage of people indicating 3 rd place	Percentage of people indicating 4 th place	Average position
Producer	73.5%	17.9%	6.2%	2.7%	1.3
Official control institutions	17.1%	51.6%	22.7%	8.5%	2.2
Consumer	6.0%	7.8%	11.4%	73.8%	3.5
Retailer/ market	3.5%	22.8%	59.7%	15.1%	2.8

Source: own elaboration

On the basis of the research it was shown that consumers perceived themselves as they have little responsibility for food safety. It is not true. As Redmond (2002) says consumers should be educated about their role in food safety because in many cases they are unaware of it. Consumers should be educated how to improve their behavior to prevent foodborne diseases. Evans and Redmond (2019) showed in their research that older consumers perceived themselves as less responsible for food safety than other consumers.

Raspor (2008) and Janjic et al. (2018) emphasize the role of consumers in food safety and characterize food handling in the households as “the last line of defence” in food production and consumption. That’s why food hygiene during food preparation by consumers has a crucial role. The World Food Safety Day 2019’s theme was that food safety is everyone’s business what shows the fact that everyone is responsible for food safety. FAO Director-General José Graziano da Silva said “Whether you are a farmer, farm supplier, food processor, transporter, marketer or consumer, food safety is your business”⁵. It also can be said that food safety is a shared responsibility. It is a shared responsibility because each food chain actor is responsible for food safety and if food safety is not maintained in previous stage of the food chain, then it will be no food safety in the next stage. People have the tendency to perceive themselves as less responsible than others.

Karabasil et al. (2017) characterize the role in food safety in hierarchical order as: food authorities, producers and consumers. Food law place food producers on the first place in food safety responsibility.

Of course, looking from the legal side food producers have the biggest responsibility for food safety but we should remember that we all are responsible for food safety. Because of this it is very important that each actor of the food chain should understand their role in food safety. Without this awareness and collaboration in the food chain it will be difficult to assure food safety. As Jen (2017) emphasizes that food safety is not the responsibility of one person, one

⁵ <https://www.who.int/news/item/06-06-2019-food-safety-is-everyones-business>

group of people, nor of an industry or a government agency. It is the shared responsibility of many people and organizations, in fact everyone. The food industry and government agencies have a major responsibility for food safety. Academia and media have their special responsibilities. Every consumer and everyone who eats food has to share responsibility for food safety. The shared responsibility for food safety and the need to be aware of the shared responsibility for food safety is mentioned by many authors (Ramsingh and Wallace, 2014; Powell et al., 2011; Rawluk, A. et al, 2021).

The overall responsibility for food safety can be seen in case of food hazard/threat and the need of collaboration between various food chain actors (Islam & Cullen, 2021). As Rodriguez-Salvador and Dopico (2020) say consumers play a key role in the efficiency of traceability. According to the research made by Erdem et al. (2012) it can be stated that the perception of the responsibility for food safety among food chain actors is varied, i.e. consumers tend to think farmers are more responsible for ensuring meat safety than farmers do. Similarly, farmers tend to think consumers have a greater degree of responsibility than consumers believe they have themselves.

Thanks to the traceability requirement it is possible to identify and withdraw hazardous food product from the market. Traceability gives many advantages (Montet & Ray, 2018): 1) for consumers it satisfies their needs for food safety in terms of health and well-being and their expectations in terms of information, 2) for professionals within food chain it gives a better risk management, a tool of crisis management, a way to better define their limits of liability, and a tool to allow the establishment of relationship of trust with consumers, 3) for authorities the traceability constitutes a means of risk prevention and a means of localization and expertise in case of food crises.

4. Conclusion

In many studies it was shown that producers are perceived to have the biggest responsibility for the food safety. Food producers do have the responsibility for food safety, they have to implement obligatory food safety standards and are controlled by food safety authorities. However, during the food processing process food producers/owners of the business have to delegate the responsibility to the employees. The employees should have the knowledge about the hygienic requirements, process parameters, food hazards preventions etc. Food safety authorities also should play an active role in food safety assurance and responsibility by their ability to issue requirements and decisions from the inspections. Food retailers and distributors also have to implement food safety standards and have the responsibility for the food safety. It is worth to emphasize the fact that all of the abovementioned entities are the participants of the food chain so have the responsibility for food safety and the obligation to respect food safety requirements. Although consumers perceive themselves as the least responsible for food safety, they also have the responsibility for the food safety by their behaviour during meals preparation, food storage, hygienic behavior. Consumers should be aware of their role in food safety and their responsibility. Another good example of the complex responsibility for food safety is a situation of food hazard or food threat and the need to withdraw the food products from the market. Then the system of traceability should work. Traceability system is built of three components: a step back (supplier), process (internal traceability) and one step forward (consumer). Traceability allows to identify the history of the products (suppliers of the ingredients) and to inform then about the hazardous products. It also allows to identify the markets, distributors to whom this product was sold so they can withdraw the product from the

market. The traceability principles show the need of collaboration between food chain actors as well as the responsibility of each of them for food safety.

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References

- [1] Erdem, S., Rigby, D., Wossink, A. (2012). Using best–worst scaling to explore perceptions of relative responsibility for ensuring food safety, *Food Policy*, vol. 37, 6, 661-670.
- [2] Evans, E., Redmond E. C. (2019). Older Adult Consumers' Attitudes and Perceptions of Risk, Control, and Responsibility for Food Safety in the Domestic Kitchen, *J Food Prot.*, 82 (3), 371-378.
- [3] <https://doi.org/10.4315/0362-028X.JFP-18-357>
- [4] Hadjigeorgiou, B., Soteriadesc, E. S., Philalithisa A., Psaroulakie, A., Tselentise, Y., Gikasf, A. (2013). National food safety systems in the European Union: A comparative survey. *International Journal of Food Studies IJFS*, Volume 2,105-117.
- [5] https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_pl#documents, Retrieved on 06 March 2021
- [6] <https://www.who.int/news/item/06-06-2019-food-safety-is-everyones-business>, Retrieved on 06 March 2021
- [7] <https://www.who.int/news-room/fact-sheets/detail/food-safety>, Retrieved on 06 March 2021
- [8] Islam, S. and Cullen, J. (2021). Food traceability: A generic theoretical framework, *Food Control*, Vol. 23, 107848, <https://doi.org/10.1016/j.foodcont.2020.107848>
- [9] Janjic, J., Ciric, J., Boskovic, M., Sarcevic, D., Popovic, M., Baltic, M.Z. (2018). Consumer Responsibility for Food Safety. *Research in Agriculture*, Vol. 3, No. 1, 2018, doi:10.22158/ra.v3n1p1
- [10] Jen, J. (2017). Shared responsibility for food safety, in: *Food Safety in China: Science, Technology, Management and Regulation*, (eds.) Jen. J. and Chen, J., John Wiley & Sons.
- [11] Karabasil, N., Boskovic, T., Dimitrijevic, M., Vasilev, D., Dordevic, V., Lakicevic, B., Teodorovic, V. (2017). Food safety – the roles and responsibilities of different sectors. IOP Conf. Series: Earth and Environmental Science 85, 012023 doi :10.1088/1755-1315/85/1/012023
- [12] Milke, D., Sauer, K., Roberts, K. R., & Johnson, D. (2015). Consumer food handling practices lead to cross-contamination. *Food Protection Trends*, Vo. 35, No. 1, 36-46.
- [13] Montet, D. and Ray, R. (2018). *Food traceability and authenticity* (eds.), CRC Press.
- [14] Powell, D.A., Jacob, C.J. & Chapman, B.J. (2011). Enhancing food safety culture to reduce rates of foodborne illness. *Food Control*. 22(6), 817-822, <https://doi.org/10.1016/j.foodcont.2010.12.009>
- [15] Ramsingh, B. and Wallaca, C. A. Going beyond sights, smell and taste: Shared responsibility for food safety at farmers markets in the UK, in: McWilliams M.: *Food & Markets: Proceedings of the Oxford Symposium on Food and Cookery*, 2014.
- [16] Rawluk, A., Belin, R., Lavau, S. (2021). Enacting shared responsibility in biosecurity governance: insights from adaptive governance, *Ecology and Society*, 26, 2: 18, <https://doi.org/10.5751/ES-12368-260218>
- [17] Raspor, P. (2008). Total food chain safety: how good practices can contribute?. *Trends in Food Science & Technology*, vol 19, 405-412.
- [18] Redmond, E. C. (2002). Food handling risks in the home: Development, application and evaluation of social marketing food safety education initiative (Ph.D. thesis). University of Wales, Cardiff, UK.
- [19] Redmond, E. C., & Griffith, C. J. (2003). Consumer food handling in the home: A review of food safety studies. *Journal of Food Protection*. <https://doi.org/10.4315/0362-028X-66.1.130>
- [20] Rodriguez-Salvador, B., Dopico, D. C. (2020). Understanding the value of traceability of fishery products from a consumer perspective, *Food Control*, vol. 112, 107142, <https://doi.org/10.1016/j.foodcont.2020.107142>



- [21] Tucker, M., Whaley, S. R., Sharp, J. S. (2006). Consumer perception of food related risks. *International Journal of Food Science and Technology*, 41, 135-146.
- [22] World Health Organization. Draft WHO Global Strategy for Food Safety 2022–2030. In *Towards Stronger Food Safety Systems and Global Cooperation*; World Health Organization: Geneva, Switzerland, 2021

Coronavirus Pandemic and Its Impact on Tourism Industry as a Part of Experience Economy

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Abstract

Even though the experience economy has been prevailing over the last decades, certain external factors can dramatically change the situation. The coronavirus pandemic became one of these factors. The pandemic has changed numerous life patterns, including those of experience economy since it was based on real-life experiences and impressions. Tourism is one of the brightest and clearest manifestations of the experience economy since it makes impressions and experience a commercial offer. Being a powerful global industry, it plays a significant role in the formation of GDP and the creation of additional jobs, having a huge impact on such economy sectors as transportation, communications, construction, agriculture and playing a role of catalyst for socio-economic development of the society globally. It is one of the industries that suffered the most from the pandemic outbreak and its consequences.

The main objective is to evaluate to what extent the COVID-19 pandemic influenced tourism as a part of experience economy.

Keywords: *experience economy, impression, tourism, COVID-19.*

JEL Classification: *O11, Z3, P4*

1. Introduction

The experience economy has been gaining increasing importance for the society over the last decades. Its development indicates that everything that a person previously received outside of economic activity becomes an object of sale and purchase. Society is increasingly surrounded by an intangible economy, in which the largest sources of wealth and prosperity do not belong to the world of physical objects. Tourism is one of the most bright and clearest manifestations of the experience economy, since it is tourism business that makes impressions and experience a commercial offer.

Tourism has become a powerful global industry, playing a significant role in the GDP formation, creation of additional jobs and employment, having a huge impact on such economy sectors as transportation, communications, construction, agriculture and playing a role of catalyst for socio-economic development of the society globally.

The pandemic has changed numerous life patterns, and experience economy was not an exception since it was based on real-life experiences and impressions. Tourism was one of the industries that suffered the most from the pandemic outbreak and its consequences. With the 10,4% contribution to global GDP in 2019, the indicator shrank to 5,5% in 2020, which is change of almost 50%.

1.1 Theoretical background of the experience economy and tourism as its part

Economists, among whom is Allan Fisher (1939) define three large sectors of economy: 1) primary, which is extractive industries, agriculture and forestry; 2) secondary, which is characterized by processing industries; 3) tertiary, which is service sector or services.

The transformation of the services into the dominant sector of economies has become a global trend recently. The growth rate of the service sector in all countries of the world is twice the rate of growth of the manufacturing sector. The transformation of the service sector into the dominant sector of the national economy contributing to GDP and the number of employees was called the “service revolution”. Today developed countries obtain 70-80% of GDP and the total number of employees, more than 2/3 of capital investments and fixed capital concentrated in services (Cherevichko, 2016).

The service sector has become firmly established in the life of modern society, being a space for the implementation of service activities. A distinctive feature of the service sector is the creation of non-material goods that satisfy various social needs. The results of this sector’s operations do not take objective form but appear in the form of a useful effect inseparable from the activity itself. The 21st century is characterized by a service sector, which is linked with innovations and flexibility.

The emergence of the modern global economy forces different assessment of the service sector as a special branch of the economy. It should be considered as a component of the global infrastructure, understood as a modern transport and communication complex (McKinsey&Company, 2016).

Pine and Gilmore (1998) offered to identify experience as separate fourth economic offering apart from 3 economic sectors because consumers wanted experiences, and businesses responded to this need by precisely designing and promoting them. First there were goods to be commoditized, after the services followed, and the next would be for the experiences to emerge as the next step in the progression of economic value. Therefore, both b2b and b2c companies would realize that the next field to compete in would be staging experiences.

Currently, a product is mostly material standardized thing, which is transferred to the consumer according to the inventory. A service is an intangible, non-material personalized satisfaction of a need obtained at the request of an individual entity or a group of entities. An experience is a memorable, personal sensation or impression that manifests itself over time and remains in the memory of the subject, forming own inner world and beliefs. Unlike a service, an experience has no direct economic benefit since it cannot be “consumed” immediately (Pine and Gilmore, 2005).

Tourism is one of the clearest manifestations of the experience economy since it makes impressions and experience a commercial offer. The impressions purchased by a customer at all stages of the journey have utility, consumer value and cost. A cost is created via interaction with intermediaries and suppliers, who contribute to the creation of an overall travel experience and thereby add value to the integrated travel product. These products then create value chains uniting the most diverse businesses in the tourism system. All these businesses are values that are embodied into experiences.

1.1.1 Tourism as a part of global economy

The tourism industry is extremely sensitive towards crises. Within last 15 years the global tourism industry has survived 2 crises – global financial crisis of 2007-2008, and crisis caused

by the COVID pandemic in 2020. The spread of the coronavirus put the tourism industry into the worst crisis in the history of the world economy. According to the World Travel and Tourism Council, the contribution of tourism to the world economy was 10.4% of world GDP (USD 9 170 billion) in 2019 and 5.5% (USD 4 671 billion) in 2020. This way, total tourism and GDP change in 2020 was of -49.1%, which equals to a decrease by USD 4 489 billion.

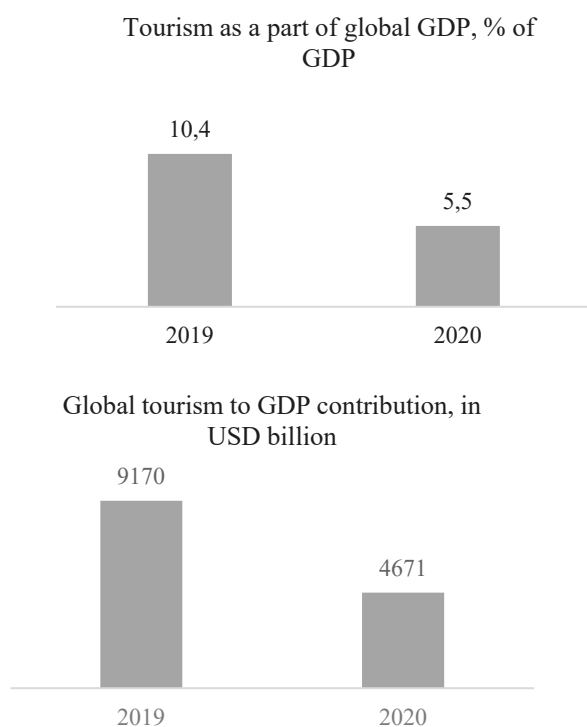


Figure 1: Total tourism to GDP contribution, in % and USD billion

Source: own elaboration based on World Travel and Tourism Council

Before the COVID the industry has even been called world's economy global driver, developing dynamically. In recent 15 years it accounted for about 6-7% of global world's exports.

Table 1: Tourism's share in global world's exports

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Tourism in total exports	6%	6%	6%	6%	6%	6%	6%	6%	6%	7%	7%	7%	7%	7%	3%

Source: own elaboration based on UNWTO Global Tourism Dashboard

To ensure the tourism processes continuity, large number of specialists from related industries are involved, which constitute the essence of the tourism industry and infrastructure. Total number of travel and tourism employees in 2019 was 334 million employees (1 in 10 jobs in the world) and 272 million employees in 2020 (1 in 11 jobs.) In 2020, 62 million jobs were lost, which is a drop of 18.5%.



Figure 2: Total tourism and travel jobs in 2019 and 2020, in millions

Source: own elaboration based on World Travel and Tourism Council

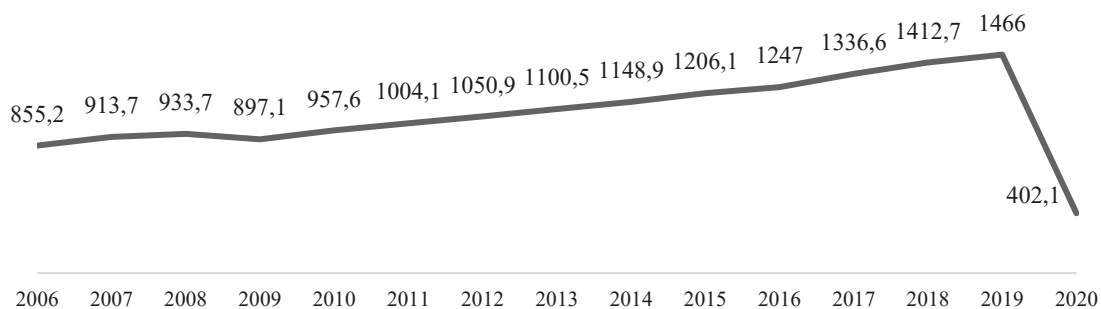


Figure 3: Global international tourist arrivals in million

Source: own elaboration based on UNWTO Global Tourism Dashboard

As for the global international tourist arrivals, over the last 15 years the industry has been growing and the number of international tourist arrivals has increased – starting with 855,2 million tourists in 2006, it seized 1466 million tourists in 2019, with one drop in 2009 due to the global financial crisis. The next sharp decline happened in 2020. From 1466 million arrivals in 2019, the dramatical fall to the indicator 393,8 million in 2020 occurred due to the COVID-19 pandemic that resulted in economic crisis, and global travel and border restrictions.

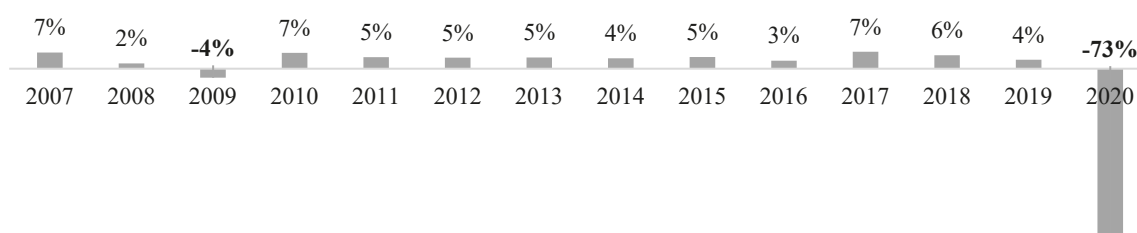


Figure 4: Change in global international tourist arrivals over 2007-2020

Source: own elaboration based on UNWTO Global Tourism Dashboard

If we consider percentage change of arrivals, the arrivals were stable in 2006-2018, with post-crisis decrease of 4% in 2009, but in 2020 it sharply decreased by 73%.

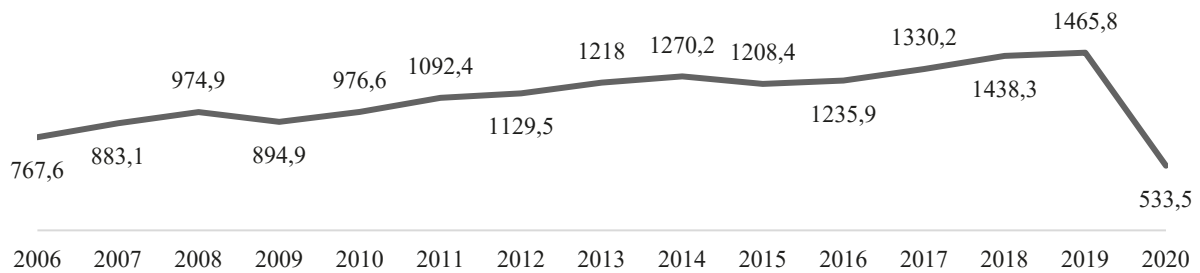


Figure 5. Global international tourism receipts in USD billion

Source: own elaboration based on UNWTO Global Tourism Dashboard

Concerning the international tourism receipts, in 2006-2019 there was year-to-year growth with only two exceptions in 2009 with the after-crisis receipts fall to USD 894,6 billion compared to USD 974,5 billion in 2008, and another decrease in 2015. Although, in 2020 we observe quite significant drop to USD 533,5 billion, which is 64% decrease. At the same time, individual receipts per arrival were more stable and fluctuated yearly in 2006-2019 and rose in 2020 up to 1330 USD per arrival.

According to the UNWTO, international tourism export revenues are composed of “passenger transport” receipts and “travel receipts” (receipts in destination). There was a constant growth with only two decreases in 2009 and in 2015, with decrease of 10% and 5% respectively, until 2019, and sharp decline of 63% in 2020.

2. Data and Methods

The survey called “Response to the post-COVID travel norms” was used in terms of this article.

The survey was held anonymously within April 30 and May 10, 2021. It was distributed among 804 random representatives in 39 countries.

The survey consisted of 26 multiple choice questions, and it was divided in the following parts:

- introduction – mentions the goal of the survey conducted;
- basic questions – aimed to distinguish the audience of the survey;
- general questions – aimed to find out people’s general travel attitude;
- specified questions – aimed to find the impact of COVID-19 pandemic on travel attitude;
- attitude questions – aimed to reveal people’s attitude to travel-related businesses and decision-making in tourism.

The survey was conducted online via Google Forms. The link was distributed using social media means, namely posts in social networks and mailing over emails and messengers.

After the answers were collected, the data was transferred to the Microsoft Excel tool and analyzed. The results were provided both in numerical (quantity and percentage) and in graphical form.

Among 804 total respondents 267 (33,2%) were males, 537 (66,8%) were females.

The sample was divided into four age categories:

- under 25 – 325 (40,4%) respondents;

- age 25 to 40 – 309 (38,4%) respondents;
- age 40 to 55 – 146 (18,2%) respondents;
- older than 55 – 24 (3%) respondents.

As for the occupancy of the respondents, the distribution is as follows:

- 414 (51,5%) respondents are employed,
- 141 (17,5%) respondents are students;
- 131 (16,3%) respondents are students who are also working (either full-time or part-time, or freelancing);
- 75 (9,3%) respondents are entrepreneurs;
- 34 (4,2%) respondents are unemployed;
- 9 (1,1%) respondents are retired.

Table 2: Number of respondents by country

Name of the country	Number of respondents	% of total respondents	Name of the country	Number of respondents	% of total respondents
Ukraine	580	72,14%	Macedonia	2	0,25%
Slovak Republic	87	10,82%	Switzerland	2	0,25%
Russian Federation	35	4,35%	Greece	2	0,25%
Turkey	9	1,12%	France	2	0,25%
Italy	9	1,12%	Moldova	1	0,12%
Poland	8	1,00%	Israel	1	0,12%
USA	7	0,87%	Albania	1	0,12%
UK	6	0,75%	India	1	0,12%
Kazakhstan	5	0,62%	Syria	1	0,12%
Croatia	5	0,62%	Palestine	1	0,12%
Spain	5	0,62%	Kyrgyzstan	1	0,12%
Czech Republic	4	0,50%	Iraq	1	0,12%
Romania	4	0,50%	Latvia	1	0,12%
Serbia	3	0,37%	Uzbekistan	1	0,12%
Germany	3	0,37%	Estonia	1	0,12%
Peru	3	0,37%	Finland	1	0,12%
Norway	2	0,25%	Armenia	1	0,12%
Tajikistan	2	0,25%	Argentina	1	0,12%
Lithuania	2	0,25%	Denmark	1	0,12%
Republic of Belarus	2	0,25%	TOTAL	804	100,00%

3. Results and Discussion

In 2021 we conducted a survey to evaluate the society's response to the changes in travel norms due to COVID and to understand what peculiarities should be considered upon conducting tourism activities.

We identified how much the attitude towards local trips changed. During COVID 27,6% respondents travelled 2-5 times a year, which is 33,5% decrease comparing to pre-COVID, 27,1% travelled once a year. 6,5% travelled only 5-10 times a year and 4,4% stated they travelled once in 2-3 years and even less often, which is almost half decrease for both indicators – 47,5% and 48,5% respectively. 2,4% managed to travel more often than once a month and 2,6% – 10-12 times a year with a decrease of 62,7% and 53,3% respectively. 29,48% have not travelled locally in their countries at all during the pandemic, which is 887,5% increase comparing to the pre-COVID indicator.

As for the trips abroad during the pandemic, the situation is different. Only little people travelled frequently: 0,2% managed to travel more often than once a month, 0,5% travelled 10-12 times a year, and 1,5% travelled 5-10 times a year, which is a dramatical decline comparing to pre-COVID responses – 85,7%, 83,3% and 78,2% decrease respectively. 10,6% travelled 2-5 times a year, which is also a big decline of 72,7%, and there were 3,9% of those who travelled once in 2-3 years and less often. Almost a quarter of respondents, 22% managed to travel at least once a year during COVID, while number of people who have not travelled during the pandemic at all seized 61,3%, which shows an extreme growth of the number of non-travellers of 460,2% compared to the pre-COVID indicators.

Table 3: Changes in local trips before and during the COVID pandemic

	Local trips BEFORE the pandemic		Local trips DURING the pandemic		% change
	Number of respondents	% of total respondents	Number of respondents	% of total respondents	
More often than once a month	51	6,3%	19	2,4%	-62,7%
10-12 times a year	45	5,6%	21	2,6%	-53,3%
5-10 times a year	99	12,3%	52	6,5%	-47,5%
2-5 times a year	334	41,5%	222	27,6%	-33,5%
Once a year	183	22,8%	218	27,1%	19,1%
Once in 2-3 years and less often	68	8,5%	35	4,4%	-48,5%
I didn't travel	24	3,0%	237	29,5%	887,5%
	804	100,00%	804	100,00%	

Source: own processing and calculations based on survey conducted

Table 4: Change in international trips before and during the COVID pandemic

	International trips BEFORE the pandemic		International trips DURING the pandemic		% change
	Number of respondents	% of total respondents	Number of respondents	% of total respondents	
More often than once a month	14	1,7%	2	0,2%	-85,7%
10-12 times a year	24	3,0%	4	0,5%	-83,3%
5-10 times a year	55	6,8%	12	1,5%	-78,2%
2-5 times a year	311	38,7%	85	10,6%	-72,7%
Once a year	209	26,0%	177	22,0%	-15,3%
Once in 2-3 years and less often	103	12,8%	31	3,9%	-69,9%
I didn't travel	88	10,9%	493	61,3%	460,2%
	804	100,00%	804	100,00%	

Source: own processing and calculations based on survey conducted

Also, we identified how much the frequency of trips changed due to COVID based on the available data on respondents' income. We performed the cross analysis of the 2 sets of data – income and data concerning trips of our respondents in their countries before and during the coronavirus pandemic, as well as trips abroad before and during the coronavirus pandemic. Concerning the local trips, we can see that in every income group most people used to travel 2-5 times a year in their countries before the COVID, the second most popular answer in most income groups was travelling once a year, and also travelling locally 5-10 times a year was a quite popular choice.

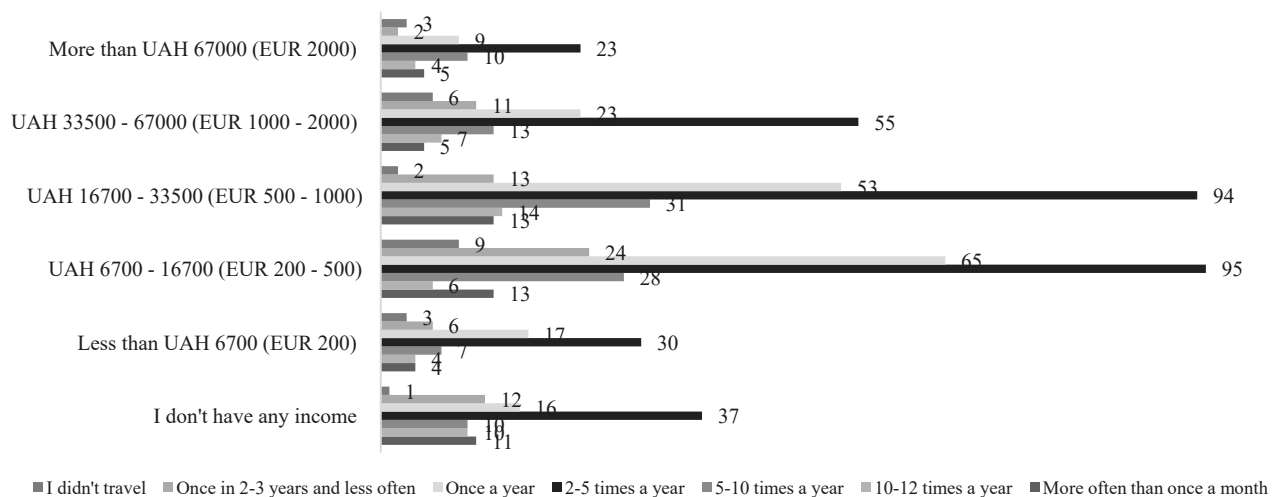


Figure 6: Local trips before COVID-19 based on the income of respondents

Source: own calculations based on survey conducted

UAH to EUR exchange rate 32,2 defined by the National Bank of Ukraine as at February 19, 2022.

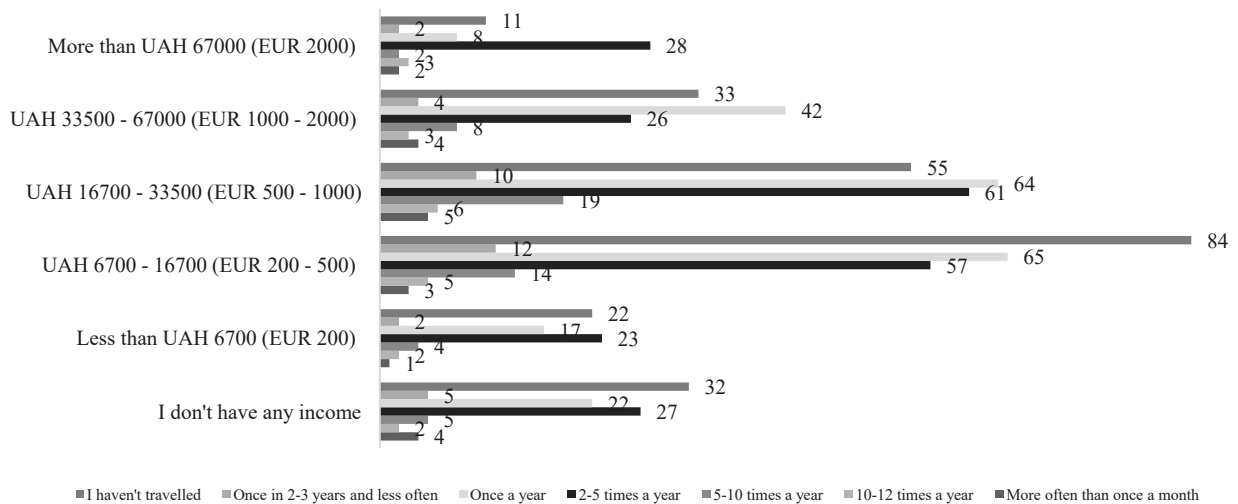


Figure 7: Local trips during COVID-19 based on the income of respondents
Source: own calculations based on survey conducted

UAH to EUR exchange rate 32,2 defined by the National Bank of Ukraine as at February 19, 2022.

However, during COVID the situation with travelling inside countries changed. People who earned EUR 500 and less have not travelled at all during the pandemic. At the same time, majority of people with monthly earnings of EUR 500 – 2000 managed to travel at least once a year, while those of incomes more than EUR 2000 even managed to travel 2-5 times a year during the pandemic.

As for the international trips before COVID, in every income group majority of people used to travel abroad 2-5 times a year. The second most popular option in all categories who had any income was travelling abroad once a year, while those people who did not have any income at all claimed to travel in other countries once in 2-3 years and less often.

Situation changed dramatically during the COVID-pandemic. Despite the size of earnings, in every income group majority of respondents have not travelled at all during the pandemic. However, the second most popular option for all the incomes was travelling abroad at least once a year.

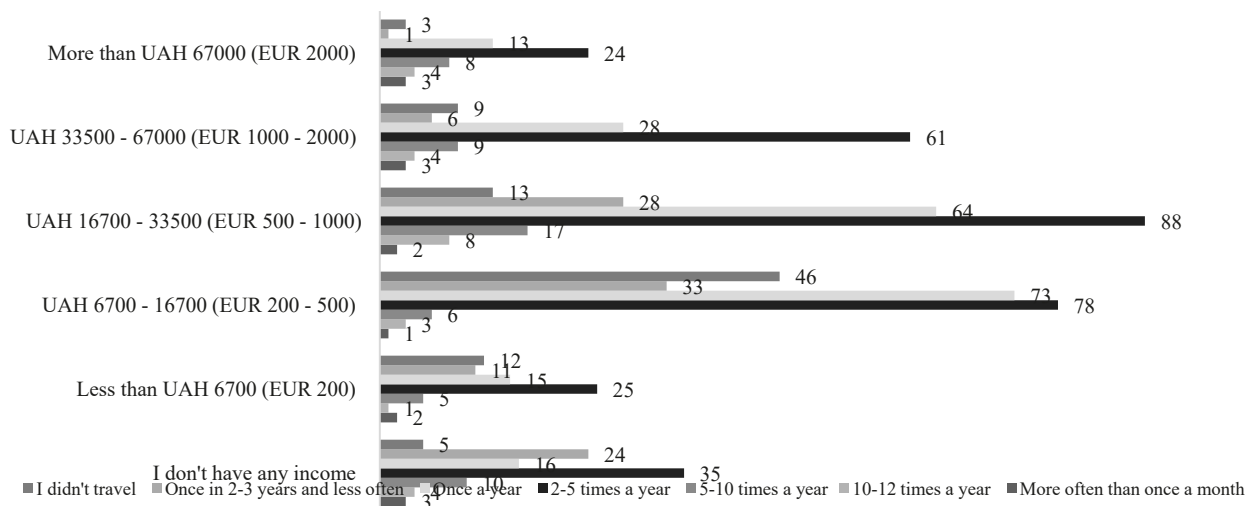


Figure 8: International trips before COVID-19 based on the income of respondents

Source: own calculations based on survey conducted

UAH to EUR exchange rate 32,2 defined by the National Bank of Ukraine as at February 19, 2022.

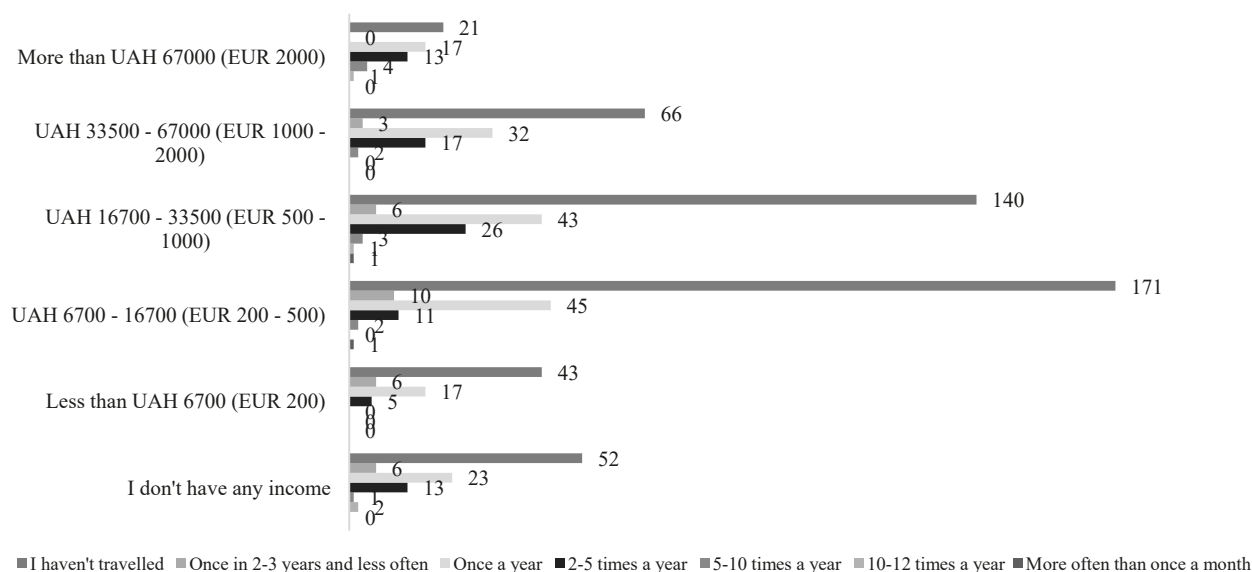


Figure 9: International trips during COVID-19 based on the income of respondents

Source: own calculations based on survey conducted

UAH to EUR exchange rate 32,2 defined by the National Bank of Ukraine as at February 19, 2022.

4. Conclusion

This research aimed to identify how much and due to which reasons changes in tourism occurred to the coronavirus pandemic.

According to our findings, such a big number of people who have not travelled can be explained by border closures, transportation restrictions over the world, obligatory quarantines, special requirements such as obligatory PCR COVID tests or vaccination certificate, inability to get visas to enter foreign countries due to the closure of government bodies, lockdowns.

Even though the local tourism should not be influenced by the borders closure, there still were certain internal travel restrictions in numerous countries. COVID-19 enforced majority of countries to impose bans on internal transportations and lockdowns, which made trips either very complicated or even impossible at all. Also, due to the lockdowns numerous businesses closed and people lost their jobs, which influenced their willingness to pay for trips.

Apart from the mentioned restrictions, another limitation would be the financial one. Incomes also influenced people's willingness to travel. People who earned EUR 500 and less have not travelled locally at all during the pandemic. At the same time, majority of people with monthly earnings of EUR 500 – 2000 managed to travel at least once a year, while those of incomes more than EUR 2000 even managed to travel 2-5 times a year during the pandemic.

Talking about financial limitations in international trips during COVID, we can notice how dramatically the situation with international travelling changed during the COVID-pandemic. Despite the size of their earnings, in every income group overwhelming majority of respondents have not travelled at all during the pandemic. However, the second most popular option for all the incomes was travelling abroad at least once a year.

The pandemic has fully reshaped lives, stimulating additional desire for real, offline, experiences, which is a necessity for human beings. Being a part of experience economy, tourism can satisfy society's needs and desires. However, the out-crisis path for the tourism industry will be quite challenging.

The crisis related to the COVID-19 pandemic has forced the tourism business to step out of its comfort zone and look for innovative ways to develop and operate. Therefore, various innovations and dynamic actions, as well as flexibility and ability to adapt, are needed to accelerate tourism's recovery. Together with state support for tourism and travel-related business initiatives, improved service, personalized offerings of impressions and active information campaigns the tourism can back to the pre-COVID norms.

Acknowledgements

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References

- [1] Boosting Demand in the "Experience Economy". Market Research. Harvard Business Review, January–February 2015. ©2021 Harvard Business School Publishing. [online]. Available at: <https://hbr.org/2015/01/boosting-demand-in-the-experience-economy>
- [2] CHEREVICHKO, T. 2016. Experience economy: tutorial. Saratov National Research State University named after N.G. Chernyshevsky. 43 p. Available at: http://elibrary.sgu.ru/uch_lit/1640.pdf

- [3] FISHER, Alan. 1939. Production, primary, secondary and tertiary. *Economic Record*. 15 (1): 24–38. Available at: <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1475-4932.1939.tb01015.x>
- [4] MCKINSEY & COMPANY. 2016. Bridging global infrastructure gaps. McKinsey Global Institute. Available at: <https://www.un.org/pga/71/wp-content/uploads/sites/40/2017/06/Bridging-Global-Infrastructure-Gaps-Full-report-June-2016.pdf>
- [5] NILSEN, Berit Therese. 2015. The Production and Consumption of Experiences: A Study of the Spa Industry in Norway: thesis for the degree of Philosophiae Doctor. Trondheim. Norwegian University of Science and Technology. p.28. [online]. ISSN: 978-82-326-1011-2. Available at: <<https://core.ac.uk/download/pdf/52124604.pdf>>
- [6] NOY, Ilan – DOAN, Nguyen – FERRARINI, Benno – PARK, Donghyun. 2020. Measuring the economic risk of Covid-19. In *Covid Economics, Vetted and Real-Time Papers* [online], iss. 3, pp. 103-118. © CEPR Press, 2020. Available at: <<https://cepr.org/file/9011/download?token=OYF-efkM>>
- [7] OECD. 2021. OECD Tourism Statistics – Key tourism indicators. [online] © 2021 OECD. Available at: https://www.oecd-ilibrary.org/economics/data/oecd-tourism-statistics/key-tourism-indicators_e5d0c450-en
- [8] OECD. 2021. Tourism GDP (indicator). [online] © Organisation for Economic Co-operation and Development. Available at: <https://data.oecd.org/industry/tourism-gdp.htm>
- [9] PINE B., Joseph II – GILMORE, James. 1998. Welcome to the Experience Economy. In *Harvard Business Review Magazine*, July-August 1998. Available at: <https://hbr.org/1998/07/welcome-to-the-experience-economy#>
- [10] PINE B., Joseph II – GILMORE, James. 2005. The experience economy: work is theater and every business a stage. Williams Publishing House. 304 p. ISBN 5-8459-0828-0.
- [11] PINE B., Joseph II – GILMORE, James. 2013. The experience economy: past, present and future. In *Handbook on the Experience Economy*, pp. 21-44. ISBN: 9781781004210. [online]. Available at: https://www.researchgate.net/publication/260917972_The_experience_economy_past_present_and_future
- [12] United Nations World Tourism Organization. 2011. *Tourism Towards 2030 / Global Overview of 10 October 2011*. © 2011, World Tourism Organization (UNWTO). ISBN-13: 978-92-844-1399-7. [online]. Available at: <https://www.e-unwto.org/doi/epdf/10.18111/9789284414024>
- [13] United Nations World Tourism Organization. 2021. UNWTO Global Tourism Dashboard. [online]. © UNWTO. Available at: <https://www.unwto.org/country-profile-inbound-tourism>
- [14] UNWTO e-Library. All Countries: Inbound Tourism: Arrivals 1995 - 2019 (02.2021). *Tourism Statistics*. © The World Tourism Organization 2021. [online]. Available at: <https://www.e-unwto.org/doi/abs/10.5555/unwtotfb0000270019952019202102>
- [15] World Travel and Tourism Council. *Economic Impact Reports*. 2021. [online]. © World Travel & Tourism Council. Available at: <https://wtcc.org/Research/Economic-Impact>

The Impact of the Covid-19 Pandemic Determinants on Selected Agricultural Commodity Prices

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Abstract

The global Covid-19 pandemic is the most notable event that has been affecting our lives since the end of 2019. The ongoing pandemic influenced many sectors, including agriculture and commodity markets. The evolution of selected agricultural commodity prices during the global pandemic of Covid-19 is investigated in this paper. The major goal is to determine if the Covid-19 indicators affect the price movements of cocoa, corn, sugar, and wheat. Using the ARDL model, we examined the daily prices of chosen commodities from January 23, 2020, to November 30, 2021. Our results show that the price of corn and wheat was not statistically significantly affected by the Covid-19 pandemic determinants. On the other hand, in the case of cocoa, we observed a negative indirect effect of financial volatility in the long run. Furthermore, in the short-run cocoa prices were negatively influenced by the financial volatility index as well as new daily Covid-19 cases. Besides, sugar prices were affected by the increase in the new confirmed Covid-19 cases and death in the long run. We also found an indirect negative impact of the financial volatility on the sugar prices in the short and long run. Moreover, sugar prices were in the short-run heavily affected by its previous developments as well as by the Covid-19 media coverage index.

Keywords: Cocoa, Corn, Covid-19, Sugar, Wheat

JEL Classification: C32, G19, Q 02

1. Introduction

While in the past commodities were traded for their importance as inputs to production, today commodities are also of interest to investors as a financial asset. Thus, investors in general, as well as portfolio managers, brokers, and traders, became participants in the commodity market. According to Balcilar and Sertoglu (2020) in uncertain times, these market actors try to prevent each other from acting, making the market turbulent and loud. At the same time, commodity markets are well-developed, with characteristics such as risk transfer and volatility mitigation. As a result, during the past decade, the financial markets have become more intertwined with commodity markets.

Endogenous variables, macroeconomic factors, and exogenous uncertainties all influence agricultural commodity price changes (Liu, Liu, Ye, Tang & Wang, 2022). The emergence of the novel coronavirus Covid-19 was perhaps the most momentous event in our lives in 2020 - 2021. The coronavirus pandemic negatively affected the world economy, international markets and global society. The pandemic's negative impacts have created economic and financial instability throughout the world, culminating in a global recession. Border closures, lockdowns, travel restrictions, as well as social distancing, were used by countries all around the world to manage the outbreak. Numerous industries, including services, industry, and agriculture, have been badly impacted (Chang, McAleer, & Wong, 2020). Besides, a

significant worldwide decline in commodity markets was also reported at the same time, in addition to the severe impact of these measures on economic activity, supply routes, and international trade (Aslam, Aziz, Nguyen, Mughal, & Khan, 2020). Agricultural commodity market swings have well-established ramifications for the whole economy, and Covid-19 has impacted both sides of the market, demand and supply of agricultural products. Thus, all types of commodities have suffered a considerable drop in demand and supply as a result of the latest coronavirus pandemic (Ji, Zhang, & Zhao, 2020; Borgards, Czudaj & Van Hoang, 2020). For instance, Elleby, Domínguez, Adenauer, and Genovese (2020) in their study examine the effects of the demand shock induced by the Covid-19 pandemic on global agricultural markets, as well as the initial wave of lockdown measures implemented by countries in the first half of 2020 to control it. Besides, the global pandemic reduced also investments into commodities (Shaikh, 2021). Thus, all these events had an impact on commodity pricing.

Salisu, Akanni, and Raheem (2020) proved that the relationship between stock markets and agricultural commodity markets is critical during times of crisis. Significant volatility, commodity price flips, and financial market uncertainty are only a few of the impacts of the crisis (Antonakakis, Chatziantoniou, & Filis, 2017). It is widely acknowledged that the global pandemic-19 has also raised global uncertainty, volatility, and risk. Bakas and Triantafyllou (2020) estimated the influence of the Covid-19 pandemic's uncertainty on commodity market volatility. Their results show a strong impact on the volatility caused by the pandemic. On the other hand, using the TPV-VAR model, Adekoya and Oliyide (2021) investigated the influence of the Covid-19 epidemic on linkages across commodity and financial markets. Likewise, Kotyza, Czech, Wielechowski, Smutka, and Procházka, (2021) examined possible structural changes in the link between sugar prices and financial market instability in times of coronavirus crisis. Gharib, Mefteh-Wali, and Jabeur (2021) showed that the linkages between oil and other commodity prices have shifted dramatically throughout the outbreak and that they are meant for investment strategies such as cross-hedging and speculating. On the other hand, using multifractal detrended cross-correlation analysis, Wang, Shao and Kim (2020) investigated the cross-correlation between agricultural future markets and crude oil. The findings show that there is a high cross-correlation between London Sugar futures and Brent Crude Oil and that this cross-correlation rises as the Covid-19 contagion spreads. The study by Le, Do, Nguyen, and Sensoy (2021) offered evidence on the frequency-based dependence networks of various financial assets in the tails of return distributions given significant price swings during the Covid-19 outbreak. The results demonstrate that cross-asset tail-dependency of equities, currency, and commodities grows significantly, particularly in the left-tail, indicating a greater degree of tail contagion effects.

In contrast, Musa, Rabi, Nafisa and Mukhari (2020) indicated that the number of new coronavirus infections has a negative influence on oil prices, but a long-term favourable impact on the food price index. Oil prices, as well as the food price index, were severely impacted in the short term. Moreover, according to Adekoya, Oliyide and Oduyemi (2021), the pandemic was significant in spreading risk across commodity and financial markets. Similarly, the study of Ge and Tang (2020), showed that the uncertainty shock has a significant impact on commodity prices. On the other hand, Salisu et al. (2020) discovered a positive correlation between commodity yields and the Global Pandemic Fear Index, with commodity yields increasing as the fear of a new coronavirus grew. The study of Balcilar and Sertoglu (2020) used daily data to investigate the impact of the Covid-19 sentiment on key agricultural commodity prices more specifically on cattle, cocoa, coffee, corn, cotton, hog, rice, soya oil, soybeans, soybean meal, sugar, and wheat. In a cross-section of revenue from commodity futures, Bannigidmath and Narayan (2021) investigated whether investors appreciate the risk

component of pessimism from economic news. In contrast, the effect of the Covid-19 pandemic panic on commodity price volatility was investigated by Umar, Gubareva, Naeem, and Akhter (2021). According to Sadefo Kamdem, Bandolo Essomba, and Njong Berinyuy (2020), the number of verified coronavirus infections and deaths influences commodity price volatility. Sifat, Ghafoor, and Ah Mand, (2021) studied the Covid-19 pandemic as well as commodity speculation, such as oil, precious metals, and agricultural futures. In contrast, Ji et al. (2020) assessed the secure function of assets during the pandemic. Gold and soybean futures, according to the findings, have played a significant "safe haven" function during the downturn. Likewise, Maghyreh and Abdoh (2020) discovered that commodity prices are influenced by investors' attitudes. Moreover, according to Ezeaku, Asongu and Nnanna (2020) commodity investments may become less liquid and volatile as Covid-19 continues to destabilize the global economy.

In this paper, we aim to contribute to the study of the Covid-19 effects and their impact on the agricultural commodity markets and fill the gap in the literature with analysis focusing on agricultural commodities. Our study is structured as follows. Section 2 describes the data and provides an overview of the methodology used. Section 3 discusses the findings and conclusions are summarized in chapter 4.

2. Data and Methods

To analyse the impact of the Covid-19 pandemic on the price development of agricultural commodities we employ an ARDL model. The ARDL model is an ordinary least square-based model that may be used to represent both non-stationary and mixed order of integration time series. In a general-to-specific modelling framework, this model uses a suitable number of lags to reflect the data generation process. A simple linear transformation may be used to generate a dynamic error correction model (ECM) using ARDL. According to Pesaran and Shin (1999), a suitable ARDL model definition is enough to solve both the serial correlation and endogeneity problems. Another advantage of the ARDL technique is that each regressor can have a different number of delays. The ARDL approach, unlike other methods, may be employed both in the case of stationary times series $I(0)$ or stationary in first differences $I(1)$. To test for the presence of a long-term relationship between prices of corn, cocoa, sugar and wheat and chosen Covid-19 indicators, we use the ARDL bounds test devised by Pesaran, Shin, and Smith (2001).

We tested the stationarity of time series using the Augmented Dickey-Fuller (ADF) test to ensure that none of the variables is integrated of order $I(2)$ or higher. Akaike information criterion (AIC) was used to decide on the number of lags. After stationarity testing, the ARDL bounds testing approach was used to determine whether or not there is a long-term link. The general form of the ARDL model (p, q, \dots, q) is as follows:

$$y_t = c_0 + c_1 t + \sum_{i=1}^p \phi_i y_{t-i} + \sum_{i=0}^q \beta_i x_{t-i} + u_t \quad (1)$$

where y is the dependent variable, x is the independent variable, p is the number of optimal lags of the dependent variable and q represents the number of optimal lags of each explanatory variable. The constant is c_0 and the trend $c_1 t$. After reparameterization in the form of an error correction model we get:

$$\Delta y_t = c_0 + c_1 t - \alpha(y_{t-1} - \theta x_t) + \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \sum_{i=0}^{q-1} \psi_{xi} \Delta x_{t-i} + u_t \quad (2)$$

where α expresses the rate of adjustment of the dependent variable to the short-term shock, θ represents the long-term and ψ short-term coefficients. For a particular degree of significance, there are two types of critical values. The first type assumes that all of the variables in the model are I(1), whereas the second type assumes that all of the variables are I(0). If the estimated F-statistic exceeds the upper limit, the null hypothesis of no cointegration is rejected. The null hypothesis of no long-term link cannot be rejected if the computed F statistic is less than the lower limit, and the ARDL model should be estimated in the first differences without the error correction term. The conclusion is inconclusive if the F statistic is between these two thresholds (Pesaran et al., 2001).

We used the natural logarithms of all variables. The inclusion of natural logarithms in the model, according to Musa et al. (2020), enhances the linearity assumption, decreases the challenges of multicollinearity and heteroscedasticity, and makes the coefficients in terms of elasticity simpler to grasp. Finally, we used the Breusch-Godfrey LM test to check for residual serial correlation, the Engle ARCH-LM test to check for ARCH effects, and the Jarque-Bera test to check for normality at the end of our estimation.

The descriptive characteristics of the time series employed are shown in Table 1. Daily prices of corn, cocoa, sugar, and wheat were derived from investing.com⁶. Furthermore, we employed Covid-19 indicators to test for the influence of the Covid-19 pandemic on commodity prices: daily cases of newly infected patients, daily fatalities, panic index, media hype index, false news index, infodemic index, and media coverage index. The worldwide daily cases and new daily fatalities were gathered from ourworldindata.org⁷. The panic index, media hype index, false news index, infodemic index, and media coverage index data were gathered from ravenpack.com⁸. In addition, we included the economic policy uncertainty index (epu), and the financial volatility index (vix) in our models to control for the influence of financial and equity volatility and economic and policy uncertainty. Fred.stlouisfed.org⁹ provided information regarding daily epu. Finance.yahoo.com¹⁰ provided us with vix information. Moreover, we created a set of models for each of the four commodities to assess the impact of the Covid-19 pandemic. The variables considered for each model are listed in Table 2.

Table 8: Descriptive statistics of commodity prices and Covid-19 determinants

Variable	Obs	Mean	Std. dev.	Min	Max
Sugar	462	15.24103	2.953629	9.21	20.7
Corn	462	467.9832	122.1897	302.75	772.75
Wheat	462	618.1456	85.476	473.62	856
Cocoa	462	2502.268	177.5869	2160	3054
new cases	462	377687.9	230352.3	98	905842
new deaths	462	7616.764	3903.593	1	18062
panic index	462	2.41367	1.139167	0.61	7.1
media hype index	462	30.00381	11.40348	6.21	60.11
fake news index	462	0.6167532	0.3268111	0.08	1.9

⁶ <https://www.investing.com/commodities/>

⁷ <https://ourworldindata.org/coronavirus>

⁸ <https://coronavirus.ravenpack.com/>

⁹ <https://fred.stlouisfed.org/series/USEPUINDXD>

¹⁰ <https://finance.yahoo.com/quote/%5EVIX/>

infodemic index	462	47.79418	10.74	12.47	67.67
media coverage index	462	68.99652	9.207924	28.89	83.93
Epu	462	213.2644	139.2377	20.63	807.66
Vix	462	25.07764	10.43364	13.68	82.69

Source: Authors elaboration

Table 2: Selection of variables in estimated models

Model	1.1	1.2	1.3	1.4	1.5	1.6	1.7
selected commodity	x	x	x	X	X	x	x
daily new cases	x						
daily new deaths		x					
panic index			x				
media hype index				X			
media coverage index					X		
infodemic index						x	
fake news index							x
Vix	x	x	x	x	x	x	x
Epu	x	x	x	x	x	x	x

Source: Authors elaboration

3. Results and Discussion

Because the ARDL model required all variables to be stationary at their levels or the first differences, we used a unit root test¹¹ to check the stationarity of time series in the first phase of our estimation. The results show that all the variables are stationary at their first differences at the 1% significance level. According to the cointegration testing using the ARDL bounds test¹², the findings for certain commodities significantly varied in different versions of the estimated models. T-stat and F-stat were employed to check if there was a cointegration between the variables. None of the commodity models for corn and wheat verified the cointegration link between Covid-19 determinants. In the case of cocoa, we found four models which verify the existence of the long-term relationship (Table 3). On the other hand, cointegration was verified in all models of sugar (Table 4).

3.1 Covid-19 determinants and cocoa prices

As seen from Table 3 the error correction terms are negative and highly statistically significant as desired. None of the Covid-19 factors had a long-term influence on the cocoa price in these models. Although, the coefficients of financial volatility are highly statistically significant and influence negatively cocoa prices in long run. Besides, financial volatility harms cocoa prices also in the short run. As a result, a rise in financial volatility leads to a drop in cocoa prices in the short and long term. Furthermore, the increase in newly infected patients causes a price drop in the short term.

¹¹ The results of the unit root ADF test are available upon request from authors

¹² The results of the ARDL bounds test are available upon request from authors

Table 3: ARDL estimates for cocoa

Var.	1.1	1.2	1.5	1.6
ECT	-0.0450***	-0.0454***	-0.0438***	-0.0425***
LR				
new cases	-0.0231			
new deaths		-0.0258		
infodemic index			-0.1733	
media coverage index				-0.2396
Epu	0.0383	0.0530	0.0925	0.0724
Vix	-0.1919***	-0.2139***	-0.1815***	-0.1737***
SR				
LD.cocoa	0.0267	0.0214	0.0156	0.0151
L2D.cocoa	0.09889***	0.1077***	0.1049***	0.1014***
L3D.cocoa	0.0656584	0.0735	0.0750	0.0749
D1.new cases	-0.0082***			
LD.new cases	-0.0017			
L2D.new cases	-0.0014			
L3D.new cases	-0.0037			
D1.new deaths		-0.0033		
LD.new deaths		0.6000		
L2D.new deaths		0.0012		
L3D.new deaths		0.0001		
D1.infodemic index			-0.0163	
LD.infodemic index			0.0095	
LD.media coverage index				-0.0169
D1. media coverage index				0.0044
D1.vix	-0.0245***	-0.0224***	-0.0222***	-0.0226***
LD.vix	-0.0133	-0.0124	-0.0151	-0.0151
D1.epu	-0.0023	-0.0028	-0.0041	-0.0033
LD.epu	-0.0003	-0.0011	-0.0018	-0.0013
L2D.epu	-0.0019	-0.0018	-0.0029	-0.0023
L3D.epu	-0.0035	-0.0037	-0.0035	-0.0033
Constant	0.4688***	0.4684***	0.4620***	0.4730***

Source: Authors calculations in Stata

3.2 Covid-19 determinants and sugar prices

Cointegration was verified in all models with sugar (see Table 4). The error correction terms in all of these models are negative and highly statistically significant. The coefficients of new

daily cases and new daily fatalities are similarly statistically significant, implying that they have a long-term impact on sugar prices. Sugar prices rise in lockstep with the number of newly infected Covid-19 patients. A similar impact on sugar prices has also increased in deaths caused by the coronavirus. Furthermore, a rise in financial volatility leads to a long-term fall in sugar prices. Similarly, a surge in financial volatility leads sugar prices to decline in the short term. Similar results were obtained also by Kotyza et al. (2021). Additionally, sugar prices are largely impacted by previous developments in the short term. The Covid-19 media coverage index, on the other hand, has a short-term impact on sugar prices. When the amount of publicity in the media grows, so does the price.

Table 4: ARDL estimates for sugar

Var.	1.1	1.2	1.3	1.4	1.5	1.6	1.7
ECT	-0.0480 ***	-0.0308 ***	-0.0498 ***	-0.0435 ***	-0.0446 ***	-0.0492 ***	-0.0427 ***
LR							
new cases	0.0446***						
new deaths		0.0494 ***					
panic index			0.1802				
media hype index				0.1661			
infodemic index					0.3496		
media coverage index						0.4819	
fake news index							0.2244
Epu	-0.0954	-0.0829	-0.0191	-0.0830	-0.0769	-0.0571	-0.0936
Vix	-0.4515 ***	-0.5297 ***	-0.9360 ***	-0.7586 ***	-0.8000 ***	-0.7608 ***	-0.7492 ***
SR							
LD.sugar	-0.4911 ***	-0.5013 ***	-0.5155 ***	-0.5105 ***	-0.5120 ***	-0.5013 ***	-0.5080 ***
L2D.sugar	-0.2950 ***	-0.2996 ***	-0.3086 ***	-0.3038 ***	-0.2987 ***	-0.2954 ***	-0.3048* **
L3D.sugar	-0.1334 ***	-0.1380 ***	-0.1425 ***	-0.1401 ***	-0.1417 ***	-0.1394 ***	-0.1422 ***
D1.new cases	0.0076						
LD.new cases	-0.0051						
L2D.new cases	0.0014						
L3D.new cases	-0.0005						
D1.new deaths		0.0023					

LD.new deaths								0.0008
L2D.new deaths								0.0014
L3D.new deaths								0.0028
D1.panic index								-0.0107
LD.panic index								-0.0095
L2D.panic index								0.0033
L3D.panic index								0.0014
D1.media hype index								-0.0314
LD.media hype index								-0.0024
L2D.media hype index								0.0156
L3D.media hype index								-0.0294
D1.infodemic index								0.0817
LD.infodemic index								0.0136
LD.media coverage index								0.2328 ***
D1.media coverage index								-0.0889
D1.fake news index								-0.0107
LD.fake news index								-0.0117
L2D.fake news index								-0.0043
L3D.fake news index								-0.0059
D1.vix	-0.0634 ***	-0.0650 ***	-0.0693 ***	-0.0667 ***	-0.0613 ***	-0.0563 ***	0.0718 ***	
LD.vix	-0.0520 ***	-0.0497 ***	-0.0470 ***	-0.0509 ***	-0.0512 ***	-0.0503 ***	0.0718 ***	
D1.epu	0.0079	0.0066	0.0022	0.0051	0.0052	0.0054	0.0062	
LD.epu	0.0104	0.0094	0.0055	0.0086	0.0075	0.0071	0.0090	

L2D.epu	0.0094	0.0085	0.0057	0.0082	0.0075	0.0069	0.0082
L3D.epu	0.0020	0.0015	-0.0009	0.0001	-0.0003	-0.0012	0.0004
Constant	0.3189	0.3113	0.2812	0.2677	0.2354	0.2004	0.3584
	***	***	***	***	***	***	***

Source: Authors calculations in Stata

4. Conclusion

The purpose of this study is to add to the discussion on the influence of Covid-19 on the development of commodity prices. We focused on agricultural commodity prices as there is a gap in the literature that focuses on agricultural commodity markets. Daily observations of corn, cocoa, sugar, and wheat prices, as well as several Covid-19 indicators, including new daily cases of covid positive patients, daily fatalities, panic index, media hype index, false news index, infodemic index, and media coverage index, were used. Economic policy and financial market uncertainty were also taken into account.

In the case of corn and wheat, we found out that there is no cointegration link between the price and pandemic determinants. In the case of cocoa, only financial volatility has an impact on cocoa prices in the long and short run. When the financial volatility increases the sugar prices fall in both periods. Besides, the increase in newly infected patients causes a price drop of cocoa in the short term as well. In contrast, the cointegration relationship was verified in all models of sugar. Sugar prices climb in lockstep with the number of Covid-19 patients that are newly infected as well as deaths due to coronavirus. Furthermore, an increase in financial volatility causes sugar prices to fall over time. Sugar prices are heavily influenced by recent developments in the short term. The Covid-19 media coverage index has also a short-term influence on sugar prices. As the degree of media attention rises, so does the sugar price.

Given that the Covid-19 pandemic is still ongoing, there is room for additional study based on more up-to-date data as time progresses. Besides, commodity prices react to shifting economic conditions produced by the pandemic scenario. Thus, this makes commodity price data analysis during Covid-19 more difficult and necessitates more attention from academics and policymakers for further research.

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References

- [1] Adekoya, O. B., & Oliyide, J. A. (2021). How COVID-19 drives connectedness among commodity and financial markets: Evidence from TVP-VAR and causality-in-quantiles techniques. *Resources Policy*, 70. doi:<https://doi.org/10.1016/j.resourpol.2020.101898>
- [2] Adekoya, O. B., Oliyide, J. A., & Oduyemi, G. O. (2021). How COVID-19 upturns the hedging potentials of gold against oil and stock markets risks: Nonlinear evidences through threshold regression and markov-regime switching models. *Resources Policy*, 70. doi:<https://doi.org/10.1016/j.resourpol.2020.101926>

- [3] Antonakakis, N., Chatziantoniou, I., & Filis, G. (2017). Oil shocks and stock markets: Dynamic connectedness under the prism of recent geopolitical and economic unrest. *International Review of Financial Analysis*, 50, 1–26. <https://doi.org/10.1016/j.irfa.2017.01.004>
- [4] Aslam, F., Aziz, S., Nguyen, D. K., Mughal, K. S., and Khan, M. (2020). On the Efficiency of Foreign Exchange Markets in times of the COVID-19 Pandemic. *Technological forecasting and social change*, 161, 120261.
- [5] Bakas, D., & Triantafyllou, A. (2020). Commodity Price Volatility and the Economic Uncertainty of Pandemics. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3581193>
- [6] Balçilar, M., & Sertoglu, K. (2021). The COVID-19 Effects on Agricultural Commodity Markets. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3882442>
- [7] Bannigidamath, D., & Narayan, P. K. (2021). Economic news and the cross-section of commodity futures returns. *Journal of Behavioral and Experimental Finance*, 31. doi:<https://doi.org/10.1016/j.jbef.2021.100540>
- [8] Borgards, O., Czudaj, R.L., & Van Hoang, T.H. (2020). Price overreactions in the commodity futures market: An intraday analysis of the Covid-19 pandemic impact. *Resources Policy*, 71. doi:<https://doi.org/10.1016/j.resourpol.2020.101966>
- [9] Chang, C. L., McAleer, M., & Wong, W. K. (2020). Risk and Financial Management of COVID-19 in Business, Economics and Finance. *Journal of Risk and Financial Management*, 13(5), 102. doi:<https://doi.org/10.3390/jrfm13050102>
- [10] Elleby, C., Domínguez, I. P., Adenauer, M., & Genovese, G. (2020). Impacts of the COVID-19 Pandemic on the Global Agricultural Markets. *Environmental and Resource Economics*, 76(4), 1067–1079. <https://doi.org/10.1007/s10640-020-00473-6>
- [11] Ezeaku, H., Asongu, S., & Nnanna, J. (2020). Volatility of International Commodity Prices in Times of COVID-19: Effects of Oil Supply and Global Demand Shocks. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3754734>
- [12] Ge, Y., & Tang, K. (2020). Commodity prices and GDP growth. *International Review of Financial Analysis*, 71. doi:<https://doi.org/10.1016/j.irfa.2020.101512>
- [13] Gharib, C., Mefteh-Wali, S., & Jabeur, S. B. (2021). The bubble contagion effect of COVID-19 outbreak: Evidence from crude oil and gold markets. *Finance Research Letters*, 38, 101703. <https://doi.org/10.1016/j.frl.2020.101703>
- [14] Ji, Q., Zhang, D., & Zhao, Y. (2020). Searching for safe-haven assets during the COVID-19 pandemic. *International Review of Financial Analysis*, 71(101526).
- [15] Kotyza, P., Czech, K., Wielechowski, M., Smutka, L., & Procházka, P. (2021). Sugar Prices vs. Financial Market Uncertainty in the Time of Crisis: Does COVID-19 Induce Structural Changes in the Relationship? *Agriculture*, 11(2), 93. <https://doi.org/10.3390/agriculture11020093>
- [16] Le, T. H., Do, H. X., Nguyen, D. K., & Sensoy, A. (2021). Covid-19 pandemic and tail-dependency networks of financial assets. *Finance Research Letters*, 38, 101800. <https://doi.org/10.1016/j.frl.2020.101800>
- [17] Liu, Y., Liu, S., Ye, D., Tang, H., & Wang, F. (2022). Dynamic impact of negative public sentiment on agricultural product prices during COVID-19. *Journal of Retailing and Consumer Services*, 64, 102790. <https://doi.org/10.1016/j.jretconser.2021.102790>
- [18] Maghyereh, A., & Abdoh, H. (2020). The tail dependence structure between investor sentiment and commodity markets. *Resources Policy*, 68, 101789. <https://doi.org/10.1016/j.resourpol.2020.101789>
- [19] Musa, K.S., Rabiou, M., Nafisa, M., & Mukhari, M. (2020). COVID-19 pandemic, oil price slump and food crisis nexus: an application of ARDL approach. *Open Access Library Journal*, 7.
- [20] Pesaran, M. H., & Shin, Y. (1999). *An autoregressive distributed lag modelling approach to cointegration analysis*. Strom, S. (Ed.), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*. Cambridge: Cambridge University Press.
- [21] Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to analysis of level relationships. *Applied Economics*, 16(3), 289-326. doi:<https://doi.org/10.1002/jae.616>

- [22] Sadefo Kamdem, J., Bandolo Essomba, R., & Njong Berinyuy, J. (2020). Deep learning models for forecasting and analyzing the implications of COVID-19 spread on some commodities markets volatilities. *Chaos, Solitons & Fractals*, 140. doi:<https://doi.org/10.1016/j.chaos.2020.110215>
- [23] Salisu, A. A., Akanni, L., & Raheem, I. (2020). The COVID-19 global fear index and the predictability of commodity price returns. *Journal of Behavioral and Experimental Finance*, 27. doi:<https://doi.org/10.1016/j.jbef.2020.100383>
- [24] Shaikh, I. (2021). On the relation between Pandemic Disease Outbreak News and Crude oil, Gold, Gold mining, Silver and Energy Markets. *Resources Policy*, 72. doi:<https://doi.org/10.1016/j.resourpol.2021.102025>
- [25] Sifat, I., Ghafoor, A., & Ah Mand, A. (2021). The COVID-19 pandemic and speculation in energy, precious metals, and agricultural futures. *Journal of Behavioral and Experimental Finance*, 30, 100498. <https://doi.org/10.1016/j.jbef.2021.100498>
- [26] Umar, Z., Gubareva, M., Naeem, M., & Akhter, A. (2021). Return and volatility transmission between oil price shocks and agricultural commodities. *PLOS ONE*, 16(2). doi:<https://doi.org/10.1371/journal.pone.0246886>
- [27] Wang, J., Shao, W., & Kim, J. (2020). Analysis of the impact of COVID-19 on the correlations between crude oil and agricultural futures. *Chaos, Solitons & Fractals*, 136. doi:<https://doi.org/10.1016/j.chaos.2020.109896>

The Impact of Government Debt on Economic Growth in North Macedonia

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Abstract

This paper investigates the impact of the North Macedonian government debt on its economic growth through an econometric analysis. The data consists of relation between domestic and foreign general government debt to economic growth in North Macedonia. For this purpose, the appraisal utilizes the model of autoregressive distributed lag exploiting yearly data for the time-frame 1999 - 2020. Moreover, the assessment comprised additional variables to control the main variables and they are the following: Debt service payments, Foreign reserve position, Gross fixed capital formation as a percentage of GDP and Foreign Direct Investment inflow as a percentage of GDP. The data are converted to natural logarithm and it is found a solid negative relationship of domestic and external government debt to real growth rate of gross domestic product.

Keywords: domestic debt, external debt, real economic growth rate, Policy

JEL Classification codes: C22, E62, H63, O40

1. Introduction

Government debt have always placed main economic topic for discussion among the government globally. Its role becomes more actual during crisis, considering the last financial global crisis in 2007 and lately the pandemic Covid-19 and the actual crisis Russia-Ukraine. It addresses the owning of the country to lenders. The lenders incorporate: people, organizations and foreign governments. Government debt as an expression is regularly utilized reciprocally with the government sovereign obligation term. Ordinarily it articulates just for public obligation. Whereas a few nations additionally incorporate as obligation that needs to be payed to countries, areas and also districts. Consequently, there is a need for being cautious once we contrast government obligations among nations with ensure the definitions are the equivalent. Despite this expression, government obligation is the collection of the yearly budget deficit. These comes as a consequence of expenditures made by the government if they are becoming higher compared to what its gets over taxes that considered as income (Amadeo, 2020). As indicated by Irons and Bivens (2010) exists a lot of discussions in government approach regarding the upcoming dangers in the country's economy in case they pass a particular specific limit for the proportion of government obligation and real growth rate of gross domestic product.

The theories for real growth rate of gross domestic product and the relation with other variables such as of inflation and unemployment (Phelps, 1967; Friedman, 1968, Fellner, 1960) empower us for additionally exploring if the relationship exists among real growth rate of gross domestic product and government obligation in North Macedonia. Moreover, analysing also the type of this relationship if it is positive or negative.

Furthermore, legitimization for borrowing of governments is deeply explained by neoclassical growth models, that recommends the capital requirement of scant for expanding it and amassing furthermore consistent of output per capita in country level (Madow et al., 2021). With the expansion of financial crisis worldwide brought additional interest (particularly for the developing countries) to increase their borrowings since the expenditures have increased more than their inflow of capital (Ogbonna et al., 2019). Additionally, other theories recommend for public obligation that impacts positively on economic development especially in the short-run by increasing the aggregate demand also output. In any case, the findings of literature highlight a negative relationship between economic growth and public debt which additionally brings to crowding out private investment, increase in long term of interest rates, increase in inflation, and also increase in future duty (Mhlaba et al., 2019). By increasing broadly, the internal debt might also bring to serious consequences to the economy. Internal debt service impacts in consumption of main government incomes, particularly considering that internal rates of interest remain greater compared to external interest rates. If the stock of debts increases, the cost of interest of internal borrowing might increase particularly in thin financial markets. Over the long period the increase in interest rates, impacts in crowding out private investments. This will follow to a lower consistent state capital stock by which also the output will decrease as well. In this manner, the impact of higher debt of one country in long term might decrease the output, consumption and also the welfare of economy. Borrowings in long term brings problems to new generations which leaves them with modest capital stock (Ákos and István, 2019).

The North Macedonia stands classified in Southeast European countries not very heavily indebted country with a total public debt of 59.3% of GDP according to the latest data of the Ministry of Finance or North Macedonia (Open Finance, 2022a). This debt ceiling is compatible with Maastricht criteria that specifies that the ratio of total debt to GDP should not exceed 60% at the end of the fiscal year. The forecasting of Fitch rating agency (Rating report, 17 November 2021) is that the gross general government debt to increase to 53.7% of GDP in 2021 and would reach the peak and stabilize at around 55.5% of GDP starting 2026. The main risk regarding the debt sustainability will be a failure to reduce the primary budget deficit and weaker growth. The 2021 deficit will be partly financed by the IMF Special Drawing Rights allocation equivalent to EUR160 million (1.4% of GDP). Increasing worldwide the rates of interest in addition to the expanding obligation weight for North Macedonia highlights additional crunch for debt emergency in the very near future. It is obvious that the public debt is not sustainable and that impacts in deterring investments and bringing down economic development in North Macedonia, along these lines diminishing the country's worldwide competitiveness also expanding monetary market defencelessness to global shocks. Moreover, the European Commission Staff Working Document for North Macedonia 2021 Report, indicated that Partial headway existed for the public enclosure and security. The findings say that 21.6% of citizens live in poverty in addition to 448,000 individuals are living below the relative poverty limit. The portion of individuals that live in danger of destitution was exceptionally great by 39.9%, even though it has a diminishing pattern, however staying on double rate compared to mean of EU27. Besides, social work centres capacities are weak. The public authority altered its 2021 financial plan, modifying up its deficit forecast from 4.9% of GDP to 6.5%. This reflects higher revenue assumptions (4.7%) and consumption increments (8.7%) coordinated towards the agricultural and wellbeing areas also by expansion of public

investments to MKD30 billion. The government aid connected with the pandemic is expected to be EUR150 million (1.3% of GDP) in 2021, that is much lower compared to 2020 where it was EUR1 billion (9% of GDP). The budget deficit of the government in the period of January-September 2021 was 3.5% of GDP, because of proceeded twofold digit revenue development (16% yoy) and 70% implementation of recalculated expenditures for the entire year. The main factor in increase of revenue is economic growth. Additionally, revenues are expected to increase further because of improvement of tax collection effectiveness and diminished avoidance by the Tax System Reform Strategy (Fitch ratings, 2021).

Since the ending of political crisis in 2016, North Macedonia had managed debt service to revenue ratio with the exception of spread of COVID-19 pandemics in 2020 when the ratio has increased. North Macedonia's government spent about 24.9 billion Macedonian denars to pay its debt in 2019 whereas it had 203.8 billion Macedonian denars revenues, or 12.2% debt service to revenue ratio. The cost of debt profile has almost doubled in North Macedonia in 2020, registering increase in debt service payments to 50.2 billion Macedonian denars and decrease in total budget revenues to 189.6 billion Macedonian denars, or 26.4 % debt service to revenue ratio. (Ministry of Finance of NRM, 2022b). This recommends that 26.4% of the revenue created in 2020 remained utilized for meeting debt payment commitments that troubling signs. At the point when a state a large percentage from its revenue to pay own debts, it remains little to spend on capital expenditures that influences decrease in economic growth.

The interest for choosing North Macedonia in this research is on limited empirical studies on the abovementioned increase in domestic and external public debt, rapid increase in debt service to revenue ratio, fluctuation on total reserves including gold, decrease on Foreign Direct Investment as a percentage of GDP and decrease on Gross Fixed Capital Formation as a percentage of GDP.

The strife between a quick expansion in public debt and debt service payments brings to low degree of GDP development and growth for poverty in North Macedonia becomes special interest to study for researchers. This vulnerability incited the interest to analyse assuming a raising country debt has any impact on growth in North Macedonia.

2. Literature review

Scholastics, market analysts, specialists and others raised huge discussion for the variables that impact real growth rate of gross domestic product. Growth rate has kept on being the fundamental objective of development approach, after that can analysed other variables (Ramos and Hynes, 2019). The effect for increasing government obligation in relation to economic growth in European Union is additionally a touchy subject being broadly focussed from Mencinger et al. (2014) that look at immediate impact from greater obligation towards economic development within European Union member countries. As an outcome demonstrates a genuinely critical not-direct effect of public obligation proportions on yearly p.c. development rates.

Public obligation was additionally a worry for North Macedonia since its independence. In spite of the fact that contrasted with different nations, North Macedonia remained viewed as recuperating great from the worldwide monetary emergency; government obligation stayed a concern lately. Country obligations raised by double for the last 10 years, that is from 23% debt to GDP ratio in year 2008 up to 50.1% in year 2016 according to Ministry of Finance of the Republic of North Macedonia (2017). Albeit it might be considered low if you compare it neighbouring countries or western European states, still for a small economy that has North

Macedonia is measured maximum level that the country can reach to have a stable obligation. Numerous studies have illustrated for in case the government debt is above the threshold it reduces likely economic development, that in fact might demonstrate a non-linear and concave, that is opposite connection among public obligation to GDP development (Cecchetti, et al. 2010; Checherita and Rother, 2010; Clements, et al. 2003; Kumar and Woo, 2010; Reinhart and Rogoff, 2010; etc). It implies small degrees of government obligations influences while additionally raise GDP development. At the point when obligation arrives at a specific stage, an extra increment of its effect on GDP development could imply that it transforms into negative.

Other group of examinations that studied also the level of effect of various degrees of public obligation on GDP development exists with common conclusion that the negative correlation is present exclusively beyond a specific obligation to economic growth. The findings of Pattillo, et al. (2002) show a nonlinear, correlation of external levels of debt and GDP development utilizing a huge board informational index of 93 non-industrial nations during the period from 1969 until the year of 1998. They conclude that having high debt level brings to decrease in efficiency of investments and that results to decrease in economic growth. This outcome is similar to other research papers where the total factor productivity clarifies the greater part of the varieties in production. Between ongoing investigations, Clements, et al. 2003 discover uphold intended for a non-direct connection among external obligation as well as GDP development where they used a panel data from 55 less developed nations throughout 1970-1999. Their findings show dangerous net value for external obligation is from 20% to 30% of GDP (while for critical nominal value for external debt is higher than 50% of GDP). The results of Kjosev et al. (2021) show that general government debt in RNM affect positively economic growth up to the level of 30% debt-to-GDP ratio, while additional indebtedness probably might bring to adverse correlation. Additionally, Trpeski et al. (2020) conducted Granger causality test and indicated that the increase in public debt in North Macedonia, doesn't essentially affect GDP per capita growth, whereas by conducting Vector Error Correction Model show negative correlation of public debt in both short run and long run economic growth.

3. Methodology, data and hypotheses

3.1 Methodology

With the purpose of verifying if the data are valid, and testing hypothesis, we have analysed published data being taken from main financial institution in North Macedonia and abroad. This includes the Ministry of Finance of the North Macedonia, the National Bank of North Macedonia, World Bank, State Statistical Office of North Macedonia, etc. the applied method is quantitative and also the research design is descriptive with the point of to give solutions to the research implications. The accumulated macroeconomic variables data are: External public debt (ExDebt), the Domestic public debt (DoDebt), Debt service payments (DSP), Foreign reserve position (FRP) all figures are represented in millions of USD, whereas the Growth rate of Gross Domestic Product per capita (GRGDP), Gross fixed capital formation (GFCF) and Foreign Direct Investment (FDI) are represented as a percentage of GDP. Taking into consideration availability of data that is limited, the variables are covering the period of time only from 1999 until 2020 that in total it makes 22 observations. Because of the shortage of access on the data in quarter basis, each variable is taken on a yearly premise. All the data are collected from secondary sources, since priory they had been checked by specialists and other

government institutions preceding their publication. Nonetheless, the data are presumed as reliable, however the chance of random error was not disregarded. The applied method is correlation and other techniques for studying the relation of real growth rate per capita and other independent variables. For this purpose, the data analysed in SPSS application software. The reason for choosing the specified above mentioned variables is based on economic theories and accessible literature related to the effect of government debt on economic growth in developing countries. As a dependent variable in this research with the purpose to proxy the economic growth was the growth rate of GDP per capita, whereas for the independent variables are considered government debt that are disaggregated into external and domestic debts. Except the independent variables additional control variables are used toward being between the relation dependent and independent variable. These control variables are: Debt service payments, Foreign reserve position, Gross fixed capital formation and Foreign Direct Investment. Barro and Sala (2004) show that the above mentioned control variables are reliably. Since the selected variables at some points show geometric growth it is compulsory to take their natural logarithms in order to linearize their changes through the time period. Subsequently, in the study, the ExDebt, DoDebt, DSP and FRP are converted to their natural logarithms. The converted logarithm permits to interpret the coefficients as elasticities. The variables GFCF and FDI are presented as a percentage of GDP.

The following linear regression model was analysed in equation 1, as follows:

$$\text{LogYit} = a + \Sigma B\text{LogXit} + \varepsilon it, \quad (1)$$

$$i = 1, \dots, n$$

$$t = 1, \dots, t$$

In this equation yit represents the real growth rate of GDP per capita, t represents time, Xit represents the independent variables and εit the error correction term. These data are analysed in the fourth chapter of this study.

3.2 Definition of variables

The real growth rate of GDP per capita (RGRGDP). RGRGDP is the real growth rate which is an inflation adjusted gross domestic product per capita.

The external public debt (ExDebt). ExDebt stands for general government external debt that needs to be payed to external moneylenders.

The domestic public debt (DoDebt). DoDebt stands for general government external debt that needs to be payed to internal moneylenders.

Debt service payments (DSP). DSP refers to payments to be made for: interest on foreign government debt, interest on domestic government debt, principal on external government debt and principal on domestic government debt.

Foreign reserve position (FRP). FRP include property of gold, SDR, reserves of IMF members held by the IMF, and foreign exchange under the control of monetary authorities in this case National Bank of Republic of North Macedonia. The gold part of these stores is esteemed by December 31 of each year.

Gross fixed capital arrangement as a level of GDP (GFCF). GFCF incorporates land upgrades; plant, machinery, and equipment purchases; and the improvement of streets, rail routes, and

such, including schools, workplaces, hospitals, private residences, and business and industrial structures. This variable is presented as a percentage of GDP.

Foreign Direct Investment inflow as a percentage of GDP (FDI). FDI are the influxes of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. This variable is presented as a percentage of GDP.

3.3 Hypotheses

The main hypothesis that we intend to examine in this study is as such: the internal and external public debt don't have correlation with real growth rate of GDP per capita in North Macedonia. The other hypotheses that we examined are: DSP, FRP, GFCF and FDI don't have correlation with real growth rate of GDP per capita in North Macedonia.

4. Empirical findings

In this chapter are provided the results from the equation one that is given in chapter three. The first table represents the mean score for both dependent and independent variables. Starting with the real growth rate of the GDP, the mean for the time period 1999-2020 is 2.43%, the mean for Log of Domestic Debt is 6.68 million Euro that is lower than the mean for Log of External Debt that is 7.5 million Euro. The descriptive statistics for other variables is as follows: the mean for GFCF is about 22 % of GDP, the mean for FDI is about 4.1 % of GDP, the mean for Log of FRP is 7.5 million Euro and the mean for Log of DSP is 5.6 million Euro. Additionally, the table shows that the minimum real growth rate of the GDP for North Macedonia was in COVID-19 pandemic in 2020, with the rate of negative 5.02%, whereas the maximum reached in year 2007, the year prior to the global financial crisis, reaching the record of 6.3%. The other variables registered this figures: minimum records for domestic public debt was in 1999, 4.73 million euro, maximum in 2020, 7.68 million euro; minimum for external public debt was in 2007, 6.92 million euro and maximum in 2020, 8.37 million euro; minimum for GFCF is in 1999, 15.79% of GDP and maximum is 2008, 25.84% of GDP; minimum for FDI is in 2012, 1.47% of GDP and maximum is in 2001, 12.66%; minimum for FRP is in 1999, 6.13 million USD and maximum is in 2020, 8.33 million USD and minimum for DSP is in 1999, 4.4 million euro and maximum is in 2020, 6.7 million euro.

Table 1: Descriptive Statistics

	RGRGDP	LogDoDebt	LogExDebt	GFCF	FDI	LogFRP	LogDSP
N Valid	22	22	22	22	22	22	22
Missing	0	0	0	0	0	0	0
Mean	2.4330	6.6750	7.4977	21.9965	4.0685	7.5000	5.5791
Std. Deviation	2.74983	.64940	.47327	2.25550	2.69825	.65386	.56276
Minimum	-5.02	4.73	6.92	15.79	1.47	6.13	4.40
Maximum	6.30	7.68	8.37	25.84	12.66	8.33	6.70

Source: own research

As an additional analysis in this research, the correlations of the independent variables and the dependent variable were analysed, which were studied through the Pearson correlation presented in Table 2 below. Analysing the studied correlations, we can conclude that some independent variables have positive correlations with the dependent variable, while some independent variables have negative correlations with the dependent variable. Ex. With the increase of the foreign direct investments in North Macedonia, the real growth rate has increased, whereas by increasing the domestic debt, the economic growth rate has decreased. None of the variables play significant role in determining the real growth rate of GDP per capita.

Table 2: Correlation matrix

	RGRGDP	LogDoDebt	LogExDebt	GFCF	FDI	LogFRP	LogDSP
Pearson Correlation	RGRGDP	1.000					
	LogDoDebt	-.309					
	LogExDebt	-.344					
	GFCF	-.059					
	FDI	.038					
	LogFRP	-.151					
	LogDSP	-.119					
Sig. (1-tailed)	RGRGDP	.					
	LogDoDebt	.081	.				
	LogExDebt	.059	.000	.			
	GFCF	.397	.064	.327	.		
	FDI	.433	.309	.064	.450	.	
	LogFRP	.251	.000	.000	.005	.115	.
	LogDSP	.298	.000	.000	.126	.313	.000
N	RGRGDP	22	22	22	22	22	22
	LogDoDebt	22	22	22	22	22	22
	LogExDebt	22	22	22	22	22	22
	GFCF	22	22	22	22	22	22
	FDI	22	22	22	22	22	22
	LogFRP	22	22	22	22	22	22
	LogDSP	22	22	22	22	22	22

Source: own research

From the analysis we found that the independent variables describe a low fraction of changes in real growth rate of the GDP per capita, that is only 19.5%. Additionally, the internal and external public debt do not characterise significant factors for real growth rate of the GDP per capita. The fundamental inquiry of our examination regarding if the real growth rate of the GDP per capita is influenced through various degrees of public debt by significance level of 5%.

The outcomes likewise show that other independent control variables including GFCF as a percentage of GDP, FDI as a percentage of GDP, LogFRP and LogDSP have low significant effect on the determination of the dependent variable, the real growth rate of the GDP per capita. Although the Durbin-Watson measurement consistently demonstrates a result of 1.977, that shows that in the model exists a positive relation between the given provided variables.

According to table 1, the coefficient of logarithm of domestic debt from the estimated model results with negative 1.493, that implies with the increment of domestic public debt by 1 M€, as we mentioned above that the data are given in million euro, then the real growth rate of GDP per capita in RNM declines by 1.493%. The external public debt is negative 2.348 that implies with the increment of foreign public debt by 1 M€, then the real growth rate of GDP per capita in RNM reduces by 2.348%. Gross fixed capital formation as a percentage of GDP is only 0.018, that suggests with the increase of GCFC by one unit, then the real growth rate of GDP per capita in RNM increases by 0.018%. Foreign Direct Investment inflow as a percentage of GDP is negative 0.103 that advocates with the increase of FDI by one unit, then the real growth rate of GDP per capita in RNM reduces by 0.103%. Foreign reserve position is negative 0.299 that indicates with the increase of FRD by 1 M USD, as we mentioned above that the data are given in million USD, then the real growth rate of GDP per capita in RNM reduces by 0.299%. Debt service payment is 2.412 that indicates with the increase of DSP by 1 M€, as we mentioned above that the data are given in million €, then the real growth rate of GDP per capita in RNM increases by 2.412%. The prob. value is 0.722 (higher than 0.05), in this case the null hypothesis is rejected, and suggest that internal and external public debt and other independent control variables have relation with real growth rate of GDP per capita in RNM.

Table 3: Estimation of the model

Model	Coefficients
Constant	18.808
LogDoDebt	-1.493
LogExDebt	-2.348
GFCF	0.018
FDI	-0.103
LogFRP	-0.299
LogDSP	2.412
R Square	0.195
P-value	0.722
Durbin-Watson statistic	1.977

Source: author's calculations

Conclusions

The goal of the research study is to examine the effect of government debt on economic growth represented by real growth rate of GDP per capita in RNM, through utilizing panel data consisting 22 observations that is actually from 1999 until 2020. The assessed variable as dependent is real growth rate of GDP per capita in RNM and independent variables are: internal and external public debt expressed in million euro and used in natural logarithm, foreign reserve position expressed in million USD, debt service payments expressed in million-euro debt service payments and both are also used in natural logarithm, whereas gross fixed capital formation and foreign direct investment inflow are expressed as a percentage of GDP of North Macedonia.

The outcomes from the study demonstrate that the model is not highly significant considering the fact by which selected variables as independent are representing only low fraction of changes in real growth rate of GDP per capita in RNM as dependent variable, with the figure of only 19.5%. Moreover, both domestic and external public debt signifies negative correlation with real growth rate of GDP per capita in RNM. These results are not reliable with the outcome of preceding studies that analyse the relations between government debt and economic growth, recommending that when debt increases the economy increases as well. Related studies and conclusions are found also by: (Mencinger et al. 2014; Cecchetti, et al. 2010; Checherita and Rother, 2010; Clements, et al. 2003; Kumar and Woo, 2010; Reinhart and Rogoff, 2010; Pattillo, et al. 2002; Kjosev et al. 2021 and Trpeski et al. 2020. It is recommended that future studies to be focused in different time frames as well as to include eventually other independent variables in order to compare the obtained results with the current study.

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References

- [1] Ákos, D., & István, D. (2019). Public debt and economic growth: What do neoclassical growth models teach us? *Applied Economics*, 51(29), 104–121.
- [2] Amadeo, K. (2020). Public debt with its pros and cons. Retrieved from: <https://www.thebalance.com/what-is-the-public-debt-3306294>
- [3] Barro, R. J., & Sala-i-Martin, X. (2004). Public finance in models of economic growth. *Review of Economic Studies*, 59 (4), 645–661.
- [4] Cecchetti, S.G., Mohanty, M.S. and Zampolli, F., (2010). The Future of Public Debt: Prospects and Implications. *BIS Working Papers No. 300*, Basel: Bank for International Settlements.
- [5] Checherita, C. and Rother P., (2010). The Impact of High and Growing Government Debt on Economic Growth: An Empirical Investigation for the Euro Area. *ECB Working Paper Series No. 1237*, Frankfurt: ECB.
- [6] Clements, B., Bhattacharya, R. and Nguyen, T.Q., (2003). External Debt, Public Investment and Growth in Low-income Countries. *IMF Working paper 03/249*, Washington, DC: IMF.
- [7] European Commission. (2021). Commission staff working document North Macedonia 2021 Report. Luxembourg: Office for Official Publications of the European Communities.
- [8] Fitch ratings. (17 November 2021). Republic of North Macedonia. *Rating report*.
- [9] Fellner, W. (1960). Professor Baumol's new approach to the theory of the firm. *Kyklos*, 13(1): 110-112.

- [10] Friedman, M. (1968). The role of monetary policy. JSTOR. *The American economic association*. 58(1): 1-17.
- [11] Irons, J. & Bivens, J. (2010). Government debt and economic growth. Briefing Paper 271.
- [12] Kjosev, S., Noveski, M., & Mojsova Kjoseva, N. (2021). Public Debt Threshold in the Republic of North Macedonia. *Management journal of sustainable business and management solutions in emerging economies*. (Manuscript submitted for publication).
- [13] Kumar, M.S. and Woo, J., (2010). Public Debt and Growth. *IMF Working Paper 10/174*, Washington, DC: IMF.
- [14] Madow, N., Nimonka, B., Brigitte, K. K., & Camarero, M. (2021). On the robust drivers of public debt in Africa: Fresh evidence from Bayesian model averaging approach. *Cogent Economics & Finance*, 9(1), 1860282.
- [15] Mencinger, J., Aristovnik, A. & Verbic, M. (2014). The impact of growing public debt on economic growth in the European Union. Econ Papers, MPRA Paper, University Library of Munich, Germany.
- [16] Ministry of Finance of the Republic of North Macedonia. (2017). *Stock of general government and public debt*. <http://www.finance.gov.mk/en/node/2678>
- [17] Ministry of Finance of the Republic of North Macedonia (2022a). Open Finance. Total Public debt. Retrieved from: <https://javendolg.open.finance.gov.mk/en>
- [18] Ministry of Finance of the Republic of North Macedonia (2022b). Statistical Review. Budget revenues (annual data). Retrieved from: <https://finance.gov.mk/statistical-review-3/?lang=en>
- [19] Mhlaba, N., Phiri, A., & Nsiah, C. (2019). Is public debt harmful towards economic growth? New evidence from South Africa. *Cogent Economics & Finance*, 7(1), Article 1603653.
- [20] Ogbonna, K. S., Ibenta, S. N., Chris-Ejiogu, U. G., & Atsanan, A. N. (2019). Public debt services and Nigerian economic growth: 1970-2017. *European Academic Research*, 6(10), 22–34.
- [21] Pattillo, C., Poirson, H. and Ricci, L., (2002). External Debt and Growth. *IMF Working Paper 02/96*, Washington, DC: IMF.
- [22] Pattillo, C., Poirson, H. and Ricci, L., (2004). What are the Channels through Which External Debt Affects Growth? *IMF Working Paper 04/15*, Washington, DC: IMF
- [23] Phelps, E. (1967). Phillips Curves, Expectations of Inflation and Optimal Unemployment over Time. *Economica*, New series, 34(135), 254-281.
- [24] Ramos, G. & Hynes, W. (2019). Beyond growth: towards a new economic approach. OECD report of the Secretary General's Advisory Group on a New Growth Narrative
- [25] Reinhart, C.M. and Rogoff, K.S., (2010). Growth in a Time of Debt. *American Economic Review*, 100(2), 573–578.
- [26] Trpeski, P., Kozheski, K., Marijana, C. & Gunter, M. (2020). *Zbornik Radova Ekonomskog Fakulteta u Istocnom Sarajevu*, 21, 11-20.

The Empirical Research on Managing Consumer Behaviour and Making Decisions in Tourism while the COVID-19 Pandemic Affection

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Abstract

The importance of the research stems from the impact of the coronavirus pandemic on the experience economy in general, and the tourism industry in particular, as well as changes in tourism's contribution to the global economy. The objective of the research is to evaluate how the coronavirus pandemic has influenced the experience economy through the prism of changes it might cause in the operations of tourism enterprises. The object of the research is how the tourism market functions in terms of a pandemic. The subject of the research is the potential influence of the coronavirus pandemic on tourism operations. The following research methods are applied: tabular, graphical, statistical, abstract-logical, method of comparative analysis, method of synthesis, survey, documentary analysis, cross-analysis. The prerequisites for the experience economy's formation are described; tourism as a part of the experience economy is portrayed. The coronavirus pandemic potential influence of the experience economy is assessed; tourism was evaluated as a part of the global economy by showing its contribution to global GDP and share in the global world's exports. The evaluation of the carried out survey is given in order to assess society's response to the changes in travel norms due to COVID-19 and to understand what peculiarities tourism firms should consider. The critical issues that tourism enterprises must address are: a significant decrease in local and international travel (due to governmental restrictions) despite their revenue level; growing demand for promotions and sales despite tourist enterprise losses during the COVID-19 pandemic; and the emergence of a number of formalities as a result of the pandemic. Even though given matters are growing, the pandemic has stimulated a desire for real experience among the population. Weighing up all the arguments, we suggest consideration of cancellation policies, refund procedures, and different insurance possibilities as the directions for further research in the given field.

Keywords: consumer behaviour, experience economy, impression, pandemic, tourism, survey

JEL Classification: Z3, P4, O11, C81

1. Introduction

According to the World Bank and the UNWTO, tourism has become a powerful global industry, having a huge impact on such economic sectors as transportation, communications, construction, and agriculture, and playing a role as a catalyst for the socio-economic development of societies globally. The contribution of tourism to the world economy was 10.4% of world GDP in 2019 [13]. The world's development and globalization have caused changes in society's perception of the economy [4]. Apart from the three traditional economic sectors, Pine and Gilmore have offered to identify experience as a separate fourth economic

offering [10]. Pekar has stated that first there were goods to be commoditized, then services followed, and the next step would be for experiences to emerge as the next step in the progression of economic value [9]. Therefore, the United Nations Conference on International Travel and Tourism stated that businesses should realize that the next field to compete in would be staging experiences and impressions. The tourism industry is one of the brightest and clearest manifestations of the experience economy, since it is the tourism business that makes impressions and experiences of a commercial offer [12]. According to the World Travel and Tourism Council, the coronavirus pandemic has become one of the factors that have influenced the experience economy. Tourism was one of the industries that suffered the most from the pandemic and its consequences [15].

The main objective of the given paper is to evaluate how the COVID-19 pandemic influenced the experience economy through the prism of changes it might cause in the operations of tourism enterprises. To achieve this main goal, we set up certain partial goals, such as clearing the concept of the experience economy and including tourism as its part, evaluating tourism as a part of the global economy, assessing COVID-19 both in selected countries and as a factor that influenced tourism and the experience economy as a whole, and evaluating how the coronavirus pandemic influenced consumer patterns in tourism. The object of our research is the tourism market's functioning in terms of coronavirus. The subject of the research is the potential influence of the coronavirus pandemic on tourism operations and patterns.

2. Data and Methods

While conducting the given research, we used both quantitative and qualitative data, both primary and secondary data. Secondary data was processed with the method of analysing of information and comparison of the outcomes, while primary data was collected via a survey we carried out and its results were processed through the following: analysis of primary results, comparison of the outcomes, cross-data analysis for sets of questions, and a graphical method to illustrate the results. When reviewing the literature, we used the methods of synthesis of the information concerning the experience economy and the coronavirus pandemic, the method of comparison of different approaches towards the experience economy and tourism concepts, and documentary analysis to study the measures governments used to wrestle with COVID-19 consequences.

The next step was the processing of the data acquired from the questionnaire and looking at the results received. The goal of the survey was to evaluate society's response to the changes in travel norms due to COVID-19 and to understand what peculiarities tourism firms should consider when conducting their activities. The sample was international – people from 39 countries answered the questionnaire, with a majority from Ukraine and the Slovak Republic. The tool we used was Google Form. It consists of 26 closed questions of multiple choice and of a choice of one option. The results obtained are given in the form of charts and tables. The results are given both in quantity and in percentage. The survey was carried out in April and May 2021. There were 1000 questionnaires passed around, and 804 were returned, filled out and taken into account. The first group of questions was supposed to find out the social categories taking part in the survey. The second part of the questionnaire contained questions concerning people's general travel attitudes. The last group of questions dealt with COVID-19 concerns and their influence on consumer behaviour in tourism. Also, cross analysis of the paired sets of data was conducted.

3. Results and Discussion

3.1 Tourism as a part of global economy

The transformation of the service sector into the dominant sector of the national economy has recently become a global trend [3]. The development of the service sector, among other sectors of the economy [12], is currently characterized by two major trends. The first trend would be the specialization and diversification of the production of services, which is reflected in the increasing diversity of service activities. The second trend would be unity in diversity, which is manifested in the growing role of cooperation and complementarity of services. These tendencies are manifested in the complication of the multifunctional dependence of some services on others [3].

The emergence of the modern global economy forces a completely different assessment of the service sector as a special branch of the economy [5]. Thus, it should now be considered as a component of the global infrastructure, which is understood as a modern transport and communication complex [25]. Pine and Gilmore offered to identify experience as a fourth economic offering apart from the three economic sectors because consumers wanted experiences, and businesses responded to this need by precisely designing and promoting them [18]. The experience economy is becoming one of the main spheres of life in society [13]. This is a new economy in which beauty, entertainment, attention, learning, pleasure, and even spiritual nourishment are as real and economically valuable as steel or semiconductors [9]. Nilsen argues that there are three levels that can be distinguished in an individual's experience interpretation: neuropsychological, evaluative, and habitual [8]. Pekar offered several suggestions that provide a competitive advantage at the expense of positive impressions [17].

Tourism is one of the clearest manifestations of the experience economy, and its businesses are values that are embodied in experiences [23]. The motivational model of the tourist's behavior forms and reveals his preferences, which form the basis of the tourist's consumer behavior [14]. The result of a tourist's consumer behavior is a consumer choice of travel that satisfies their needs and allows them to combine desires (preferences) and possibilities (income) [7].

3.1 Tourism as a part of global economy

Tourism has become a powerful global industry, playing a significant role in the formation of GDP, the creation of additional jobs, and employment. According to the World Travel and Tourism Council, the contribution of tourism to the world economy was 10.4% of world GDP (USD 9 170 billion) in 2019 and 5.5% (USD 4 671 billion) in 2020, which is shown in Figure 2 and Figure 3. This way, total tourism and GDP change in 2020 was of -49.1% which equals USD 4 489 billion. The total number of travel and tourism employees in 2019 was 334 million, which is 1 in 10 jobs, and 272 million employees in 2020, which is 1 in 11 jobs. In 2020, 62 million jobs were lost, representing a drop of 18.5% [26]. In terms of the number of international tourist arrivals per 100 people, there is still a large distance between advanced and emerging economies as the majority of humanity. In total, 6 billion people, or approximately 85% of the world's population, live in emerging economies, and are predicted to live in emerging economies (87% in 2030) [15]. While the number of arrivals in advanced economies was set to rise from 49 to 70 per 100 of population between 2010 and 2030, in emerging economies the number would rise from 8 to 14 per 100 of population.

If we refer to global international tourist arrivals, we can see that for the last 15 years, the industry has been growing and the number of international tourist arrivals has increased. Figure 1 depicts that, starting with 855,2 million tourists in 2006, it seized, 1466 million tourists in 2019. However, there was one drop in increase in 2009, which was due to the global financial crisis [22].

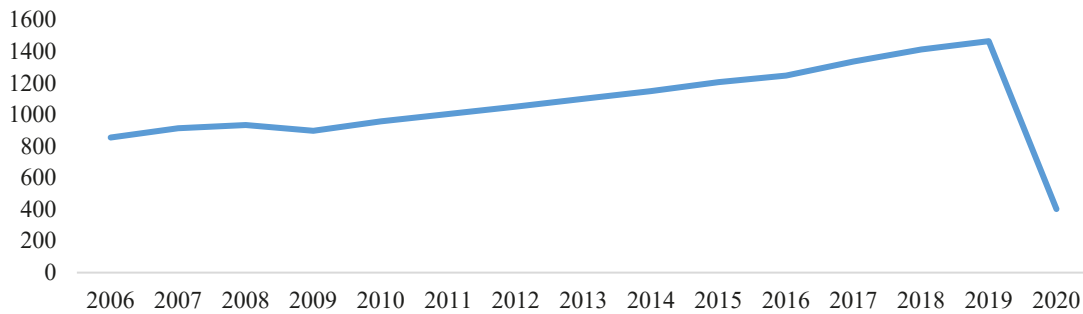


Figure 1: Global international tourist arrivals in million

Source: own elaboration based on [22].

The next sharp decline occurs in 2020. From 1466 million arrivals in 2019, the dramatic fall to the indicator of 393,8 million in 2020 occurred due to the COVID-19 pandemic that resulted in an economic crisis and global travel and border restrictions [22].

Looking at the international tourism receipts, we can note that in 2006-2019 there was year-to-year growth with only two exceptions in 2009, when after the global crisis, total receipts fell to 894,6 USD billion compared to 974,5 USD billion in 2008, and another decrease in 2015 [22].

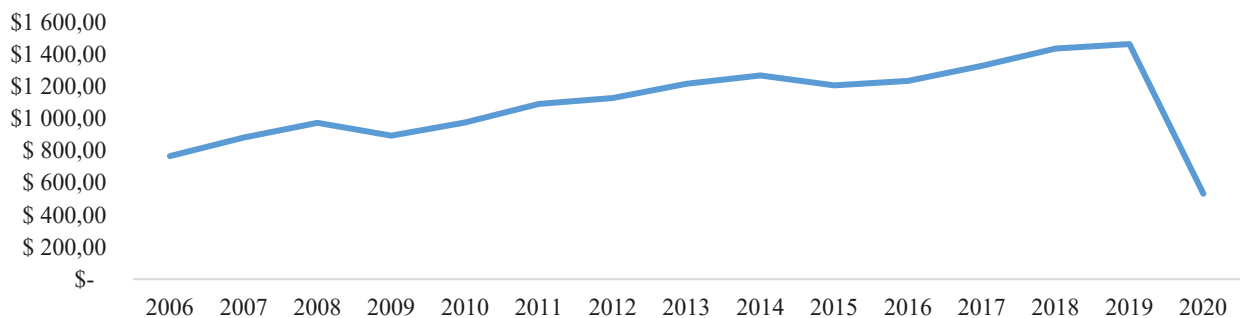


Figure 2: Global international tourism receipts in USD billion

Source: own elaboration based on [22].

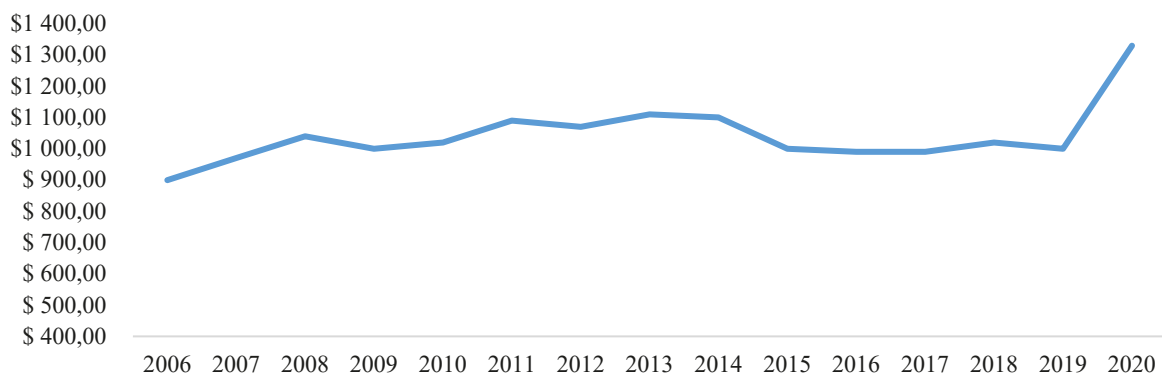


Figure 3: Global international tourism receipts per arrival in USD

Source: own elaboration based on [22].

Also, in 2020 we observe a quite significant decrease, down to 533,5 USD billion, which is a 64% decrease (Figure 2). At the same time, individual receipts per arrival were more stable and fluctuated yearly in 2006-2019 and rose in 2020 up to, 1330 USD per arrival (Figure 3) [22].

3.3 Tourism and COVID-19-19

The coronavirus pandemic is one of the biggest challenges in the world's history. Tourism is one of the sectors of the world economy that has suffered the most from restrictions imposed [1, 2].

Key industry players have been surviving the coronavirus crisis in different ways [10]. Referring to the hospitality industry, Zhelikhovskaya, citing Valery Ishunkin, assumes that the pandemic has caused the greatest damage to large hotel chains and large hotels [27]. However, small boutique hotels that are not owned by large corporations, apart-hotels, and private villas could adapt to new conditions since they are able to meet both the obligatory requirements of safe tourism and the desire of travelers to avoid large crowds. On the other hand, for a customer, it is profitable to book a hotel during a pandemic – The Leading Hotels of the World's guests decided to extend their bookings due to low prices, free room upgrades, and additional privileges, such as free shuttle service or a spa treatment [27]. Many hotels around the world had to close for a while, but they could still use that period with maximum utility [19]. Numerous hoteliers used the lockdowns with maximum utility by performing necessary repairs, which allowed them to play with new colors in front of tourists [1]. Many international hotel chains have introduced a number of external and internal measures to minimize the effects of the COVID-19 pandemic [16]. Ishunkin also notes that the demand for accommodation types has changed during COVID-19: detached houses and villas have been booked by 60-70% more compared to the pre-COVID-19 times. Another pattern is that local travel around the country has become more active, and also, travelers now prefer going to remote places to spend the holidays in solitude [20]. Referring to airlines, we can say that this is the industry that got the biggest blow by the coronavirus pandemic [21]. The International Civil Aviation Organization (ICAO) estimated that passenger airline losses from the pandemic could range from USD 160 billion to USD 253 billion, depending on the post-quarantine scenarios [4]. The drop in airline activity has also affected other industries, for example, the energy sector [5].

All in all, it is very unlikely that tourism in the near future will turn into an elite form of entertainment [12]. Active development of Internet services, platforms for booking hotels, travel and other travel services will contribute to the further development and availability of the industry, which results in tourism liberalization.

3.4 The empirical research on society's response and changes in tourism

The first group of questions was supposed to find out the social categories taking part in the survey. The ratio of males and females who took part in the survey – 33,2% (267) were males, 66,8% (537) were females. The sample was divided into four age categories, and the results were that 40,4% (325) were under 25, 38,4% (309) were aged 25 to 40, 18,2% (146) were aged 40 to 55 and finally 3% (24) were older than 55, being the smallest representation. The occupancy of the respondents is as follows: 51,5% (414) people are employed, 17,5% (141) are students, and 16,3% (131) are working students (full-time/part-time/freelancing), 9,3% (75) of people who took part in the questionnaire are entrepreneurs, 4,2% (34) respondents are unemployed, and also 1,1% (9) of respondents are already retired. The geographic distribution of respondents has been as follows – 39 countries took part in the survey. The vast majority of

respondents were from Ukraine – 580 respondents. The second-largest sample was from the Slovak Republic, and the third – from the Russian Federation. The educational levels of the respondents were divided in the following way: 42,4% (341) of respondents got master's degrees, 36,9% (297) stopped with bachelor's degrees, 10,6% (85) claimed the highest level of education to be secondary school, 5,6% (45) answered with having a PhD or MBA and 4,5% (36) said that their level of education is different from the offered variants. The level of income of the respondents was as follows: the highest share of 29,9% (240) were people with average income of UAH 6 700 – 16 700, which is EUR 200 – 500, next group consists of people with average salaries of UAH 16 700 – 33 500 (EUR 500 – 1 000) making 27,4% (220); 14,9% (120) earn UAH 33 500 – 67 000 (EUR 1 000 – 2 000). 12,1% (97) claimed not to have any income at all, 8,8% (71) earn less than UAH 6 700 (EUR 200), and only 7% (56) earn more than UAH 67 000 (EUR 2 000) monthly.

The second part of the questionnaire contained questions concerning people's general travel attitudes before the pandemic. The results of the survey show that the overwhelming majority of 98,1% (789) people have ever traveled, and only 1,9% (15) have never travelled at all. Also, 41% (330) of respondents spend on average 5-9 days on trips, 21,1% (170) spend 3-5 days on a trip, 20,4% (164) travel for 9-14 days on average, 9,6% (77) spend on their trips 2-3 days, 4,6% (37) on average travel for 14-30 days, and 3,2% (26) respondents travel more than 30 days on average. In addition, the majority of respondents of 52,7% (424) stated they spend EUR 20-50 per person a day, 26,1% (210) spend EUR 50-100 a day, 14,2% (114) spend less than EUR 20 per person a day, and only 7% (56) spend more than EUR 100 per person a day on a trip. It is equally important that 45,5% (366) stated they would prefer to travel to a new place, 7% (56) would rather travel to a familiar destination, and 47,5% (382) would choose based on the circumstances, depending on the budget available, seasonality, destination's agenda, and other factors. Then, we asked a question in order to reveal the factors influencing the choice of a travel destination. We offered several options, and our respondents could choose as many options as they considered applicable. Finally, the following results were acquired: 53,7% (432) choose their travel destination based on the recommendations or previous experience from friends, colleagues or relatives; 36,4% (293) make their choice based on the budget available, and therefore, they constantly monitor discounts provided by air companies, accommodation facilities, leisure activities, etc.; 36,1% (290) stated they refer to their own previous experience, for example, photos from previous journeys, which basically means that these people are "return travelers"; 31,5% (253) choose their destination randomly or by their own desire and inspiration; 21,6% (174) make their choice under the influence of TV and YouTube shows, which are basically travel shows, blogs, reviews of the destinations; 20,9% (168) monitor the calendar and travel to take part in different events, for example music festivals (Tomorrowland festival in Belgium, Sziget Festival in Hungary etc.), sport events (European Football Championship, Formula 1 racings, UEFA Champions League finale which is played every year in different city etc.), cultural events (Carnival in Venice, Rio Carnival etc.), international fairs (EXPO etc.), religious events (Hajj – annual Islamic pilgrimage etc.) and other leading world's leisure and cultural events; 14,2% (114) choose their travel destinations based on the influencers' posts on social media, which was a surprisingly small share for us, given the fact that social media came into our lives having a huge impact, and advertising campaigns held on the Internet by top influencers are called to seriously influence our decision-making; 12,7% (102) take destination ideas from special travel-related resources, for example, Conde Nast Traveler journal or after visiting tourism-related fairs; 12,4% (100) pick up destinations based on the recommendations upon visits to travel agencies, which is a small percentage, but basically one of the best options when planning a trip, since an

experienced travel manager can help to create unique itinerary and will give the best advice and recommendations.

The next group of questions revealed the impact of the COVID-19 pandemic on attitudes. First, we found out if our respondents thought COVID-19 had significantly influenced their potential trips. 84,5% (679) answered "yes" and 15,5% (125) refused the fact that COVID-19 influenced their travel plans. Second, we determined the frequency of local travel before and during the COVID-19 outbreak. As for the pre-COVID-19 trips, the 41,5% (334) travelled locally 2–5 times a year, while 22,8% (183) travelled once a year. 12,3% (99) travelled 5-10 times a year, 8,5% (68) – once in 2-3 years and less often. 5,6% (45) travelled 10-12 times a year, 6,3% (51) – more often than once a month. 3% (24) said they had not travelled locally before COVID-19 at all. As for the local trips during COVID-19, the situation is totally different. 27,6% (222) traveled 2-5 times a year, which is a 33.5% decrease compared to pre-COVID-19, when 27,1% (218) travelled once a year. 6,5% (52) travelled only 5-10 times a year and 4,4% (35) stated they travelled once every 2-3 years or even less often, which is almost half the decrease for both indicators – 47,5% and 48,5% respectively. 2,4% (19) managed to travel more often than once a month and 2,6% (21) – 10-12 times a year with a decrease of 62,7% and 53,3% respectively. 29,48% (237) have not travelled locally in their countries at all during the pandemic, which is an 887,5% increase compared to the pre-COVID-19 indicator.

The cross analysis of the 2 sets of data – income and data concerning trips of our respondents in their countries before the coronavirus pandemic was conducted. It is shown that in every income group, the majority of people used to travel 2-5 times a year in their countries. The second most popular answer in most income groups is travelling once a year, and also travelling locally 5-10 times a year was a quite popular choice. Next, our findings describe the situation with travelling inside countries changed during COVID-19. People who earned EUR 500 and less have not travelled at all during the pandemic. At the same time, the majority of people with monthly earnings of EUR 500 – 2000 managed to travel at least once a year, while those of incomes more than EUR 2000 even managed to travel 2-5 times a year during the pandemic.

Third, the data on how often respondents traveled abroad before and during the COVID-19 pandemic was collected. As for the pre-COVID-19 trips, the majority of 38,7% (311) travelled abroad 2-5 times a year, while 26% (209) travelled once a year. 12,8% (103) travelled once every 2-3 years or even less often, and 10,9% (88) claimed they had not travelled internationally before COVID-19 at all. As for the more frequent travelers, 1,7% (14) travelled abroad more often than once a month, 3% (24) travelled 10-12 times a year and 6,8% (55) travelled 5-10 times a year. As for the trips abroad during the pandemic, the situation is different. Only a few people traveled frequently: 0,2% (2) managed to travel more often than once a month, 0,5% (4) travelled 10-12 times a year, and 1,5% (12) travelled 5-10 times a year, which is a dramatic decline compared to pre-COVID-19 responses – 85,7%, 83,3% and 78,2% decreases, respectively. 10,6% (85) travelled 2-5 times a year, which is also a big decline of 72,7%, and there were 3,9% (31) of those who travelled once every 2-3 years and less often. Almost a quarter of respondents, 22% (177) managed to travel at least once a year during COVID-19, while the number of people who had not travelled at all during the pandemic seized 61,3% (493), which shows an extreme growth of the number of non-travelers of 460,2% compared to the pre-COVID-19 indicators. In every income group, the majority of people used to travel abroad 2-5 times a year. The second most popular option in all categories for those who had any income was traveling abroad once a year, while those who did not have any income at all claimed to travel to other countries once every 2-3 years or less often.

By the same token, our result represents how dramatically the situation of international travel changed during the COVID-19-pandemic. Despite the size of their earnings, in every income group, the overwhelming majority of respondents have not traveled at all during the pandemic. However, the second most popular option for all income levels was travelling abroad at least once a year.

Next, the survey aimed to discover if the respondents had to cancel any pre-paid trips, either fully or partially, due to the COVID-19. Apparently, the majority of respondents – 59,3% (477) – did not plan any trips, but still there were those who suffered from the COVID-19 cancellations. For example, 9,7% (78) had to cancel their trips, and they received only a part of the money they spent, and 5,8% (47) booked their trips at a non-refundable rate, so they did not get any money at all. Still, there were also those who managed to receive 100% of their pre-payment back – 9,6% (77) respondents, and also 15,5% (125) managed to rebook their trip for later without losing money. It is equally important to note that, in comparison with previous data, 15,5% (125) respondents stated that they did not think that COVID-19 significantly influenced their travel plans. This implies that the majority of respondents did not have any planned trips.

The last group of questions dealt with COVID-19 concerns and their influence on consumer behavior in tourism. Correspondingly, the survey focused on what kind of discomfort caused by the pandemic was experienced by those tourists who traveled during COVID-19. The respondents chose any applicable option: 42,2% (339) denoted the necessity to wear a mask as the main source of discomfort, causing difficulties with breathing, especially inside airplanes, trains and buses; 36,7 (295) named lockdown restrictions such as closures of cafes and restaurants, shops, cinemas and theaters, museums, and other leisure activities as a factor influencing the comfort of their trips; 34,1% (274) stated that the necessity to take COVID-19 tests (PCR and others) before departure or (and) after arrival was uncomfortable for them, which can be both due to the fact that this requires additional attention and time, and also because COVID-19 tests significantly increase the cost of a trip; 20,8% (167) of respondents experienced discomfort due to obligatory quarantine (self-isolation) upon arrival in a foreign country, which resulted in an extension of their stay abroad and, therefore, additional costs connected with it; 18,2% (146) selected the discomfort of transport inconveniences such as flight delays, flight cancellations, train/bus cancellations, etc., which occurred due to the decreased number of tourists and restrictions in destinations; 17,3% (139) were feeling uncomfortable with restrictions on sightseeing, for example, changed visiting hours, decreased capability of guests, which resulted in big queues, etc.; 13,8% (111) stated they experienced transportation restrictions such as extensive border control when travelling abroad or additional checkpoints when travelling between regions within a country; 7,8% (63) named the discomfort of limited accommodation capacity and inability to book accommodation due to the COVID-19; 5,5% (44) have experienced delays with the documents issued, such as delayed issuance of visa or residence permits, foreign passports, etc. Moreover, the respondents answered if COVID-19 had stimulated an extreme desire to travel – 43,4% (349) "yes" and 56,6% (455) "no". The majority of people are not influenced by the borders' closure and restrictions. Furthermore, almost half of the respondents, 47,4% (381) are not going on any celebration "trip", 11,1% (89) respondents do not need a trip to celebrate since they were travelling almost as usual, 15,9% (128) stated that even though they have been travelling during the pandemic, they still want to organize a "celebration" trip as a manifestation that the restrictions are over, and 25,6% (206) have not travelled during the pandemic, and are waiting for it to finish organizing the celebration trip. In the same way, the respondents were asked about travel-related businesses. The survey aimed to check if the respondents thought travel

booking platforms needed to increase their transparency about cancellation policies, refund processes, and trip insurance options. 92,9% (747) of respondents agreed with this statement, and only 7,1% (57) answered "no". Also, the respondents were asked if they had expected tourism businesses (hotels, air companies, etc.) to support future travel plans via promotions and sales, and 75,5% (607) agreed with this fact, while 24,5% (197) were not expecting any promotions to encourage travel. After that, the survey was to ask if the respondents thought travel-related businesses would offer more flexible cancellation and reimbursement policies for tickets, accommodation, etc., given the possible instability. 73,6% (592) agreed with this statement, 3,6% (29) disagreed and 22,8% (183) stated they were not sure concerning this question. Furthermore, the respondents were asked if they preferred a certain trip they could afford in the short-term or to save for a dream trip in the future with more uncertainty. 69,2% (556) chose to go on a certain trip at the closest time that they could afford without saving for it, while 30,8% (248) stated they would rather save for a dream trip later in the future, even though it is more uncertain. Next, the survey was to assess if people were only comfortable traveling after a COVID-19 vaccine had been globally in place, and 28,6% (230) agreed with it. Still, 27% (217) refused the necessity of global vaccination for comfortable travel, and 44,4% (357) were not sure whether it would influence their comfort in travelling. The world has been adapting to the COVID-19-caused changes. A large share of respondents was not sure if traveling would be comfortable for them after COVID-19 vaccination, which might be due to the fact that vaccination would be followed by the introduction of COVID-19 passes, and those who were not going to take a vaccine at all might be at risk of additional controls upon entering the countries or not being able to travel at all. Finally, the respondents asked if any COVID-19 restrictions, such as compulsory PCR tests, COVID-19 vaccination certificates, isolations, etc. could possibly impact their choice of destination, and also if it could influence their desire and possibility to travel at all. 69,4% (558) stated that all the COVID-19 restrictions influence their travel-related decisions and desires, while 30,6% (246) refused the fact that restrictions can have an impact on their decisions.

4. Conclusion

Our survey showed that consumer patterns in tourism had changed significantly, which influenced both core tourism enterprises and the tourism market as a whole. Even though the border closure should have no effect on local tourism, there are still certain internal travel restrictions in many countries. Incomes influenced people's willingness to travel inside their countries. As for the international trips during the pandemic, the situation is totally different. Only a few little people travelled frequently, like once a month or more often. Additionally, we can come up with the following recommendations: providing detailed and cross-checked information concerning the cultural and entertainment locations to tourists to avoid unwanted consequences; collaborating with laboratories and offering tourists PCR tests; shifting to offering tourists tailor-made individual tours with personal guides; preparing some "recovery packages"; increasing their transparency about cancellation policies, refund processes, and trip insurance options; offering more flexible products to their customers in terms of changes, cancellations, and reimbursements; and preparing certain "hot" deals at a good price to offer to customers immediately with close departure.

The crisis related to the COVID-19 pandemic has forced the tourism business to step out of its comfort zone and look for innovative ways to develop and operate. Therefore, various innovations and dynamic actions, as well as flexibility and the ability to adapt, are needed to accelerate tourism's recovery. Together with state support for tourism and travel-related

business initiatives, improved service, personalized offerings of impressions and active information campaigns, tourism can go back to the pre-COVID norms.

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References

- [1] Abbas, J., Mubeen, R., Terhemba Iorember, P., Raza, S., & Mamirkulova, G. (2021). Exploring the impact of COVID-19 on tourism: transformational potential and implications for a sustainable recovery of the travel and leisure industry. *Current Research in Behavioral Sciences*. 2. 100033. <https://doi.org/10.1016/j.crbeha.2021.100033>
- [2] Aronica, M., Pizzuto, P., & Sciortino, C. (2021). COVID-19 and tourism: What can we learn from the past? *The World Economy*. 45(2). 430-444. <https://doi.org/10.1111/twec.13157>
- [3] Cherevichko, T. (2016). *Experience economy: tutorial*. Saratov: Saratov National Research State University named after N.G. Chernyshevsky. Retrieved from http://elibrary.sgu.ru/uch_lit/1640.pdf
- [4] Coles, T., Garcia, G., O'Malley, E., & Turner, C. (2022). Experiencing Event Management During the Coronavirus Pandemic: A Public Sector Perspective. *Frontiers in Sports and Active Living*. 3. <https://doi.org/10.3389/fspor.2021.814146>
- [5] Engidaw, A. E. (2022). Small businesses and their challenges during COVID-19 pandemic in developing countries: in the case of Ethiopia. *Journal of Innovation and Entrepreneurship*. 11(1). <https://doi.org/10.1186/s13731-021-00191-3>
- [6] Fisher, A. (1939). Production, primary, secondary and tertiary. *Economic Record*, 15(1), 24-38. [doi/full/10.1111/j.1475-4932.1939.tb01015.x](https://doi.org/10.1111/j.1475-4932.1939.tb01015.x)
- [7] Gössling, S. & Schweiggardt, N. (2022). Two years of COVID-19 and tourism: what we learned, and what we should have learned. *Journal of Sustainable Tourism*. 30(4). 915-931. <https://doi.org/10.1080/09669582.2022.2029872>
- [8] Hotel and Destination Consulting. (2020). *COVID-19 Pandemic and its Effects on Ukrainian Tourism Sector – Update of “The Roadmap for a Competitive Development of Ukrainian Travel & Tourism Industry”*. Kyiv, Ukraine: HDC. Retrieved from <http://www.ntoukraine.org/assets/files/EBRD-COVID19-Report-UKR.pdf>
- [9] International Civil Aviation Organization. (2020). *Effects of Novel Coronavirus (COVID-9) on Civil Aviation: Economic Impact Analysis*. Montreal, Canada: ICAO. Retrieved from https://www.icao.int/sustainability/Documents/COVID-19/ICAO%20Coronavirus%202020%2004%2022%20Econ%20Impact.pdf?fbclid=IwAR06fsptgiHZaG0b9yey0b_N7mbMJID6I5Mo5PDziyvAtXRYMQjbv0XwxYY
- [10] Johann, M. (2022). CSR Strategy in Tourism during the COVID-19 Pandemic. *Sustainability*. 14. 3773. <https://doi.org/10.3390/su14073773>
- [11] Kolomiets, V., & Kalashnik, P. (2020, April 20). Oil prices turned negative for the first time in history: sellers pay extra to buyers. Message posted to <https://hromadske.ua/ru/posts/cena-nefti-wti-opustilas-dorekordnogo-dollar1-za-barrel>
- [12] Kovtun, O., Lutsiak, V., Ostapchuk, A., Lavinska, D., Sieriebriak, K., Kononenko, A., & Bebeko, S. (2021). Contemporary Management of University`s Strategic Development: the Case Study on Ukrainian Universities. *International Journal of Computer Science and Network Security*. 21(12). 269-279. doi.org/10.22937/IJCSNS.2021.21.12.39
- [13] Kristiana, Y., Pramono, R., & Brian, R. (2021). Adaptation Strategy of Tourism Industry Stakeholders During the COVID-19 Pandemic: A Case Study in Indonesia. *The Journal of Asian Finance*. 8(4). 213-223. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO4.0213>

- [14] Lutsiak, V.V. (2015). Methodology of marketing of small manufacturing enterprises on the example of the food industry: aspect of product quality. *Economic Annals-XXI*. 2015. 7-8 (2). 27-31.
- [15] Muller, D. (2018). *Emerging Markets – Powerhouse of global growth*. Ashmore Investment Management Limited. Retrieved January 22, 2022, from http://www.ashmoregroup.com/sites/default/files/article-docs/MC_10%20May18_2.pdf
- [16] Nilsen, B. T. (2015). *The Production and Consumption of Experiences: A Study of the Spa Industry in Norway* (Doctoral dissertation). Trondheim: Norwegian University of Science and Technology. Retrieved from <https://core.ac.uk/download/pdf/52124604.pdf>
- [17] Pekar, V. (2008). Introduction to the experience economy. *Marketing and Advertising*. 2008. Retrieved January 24, 2022, from <http://pekar.in.ua/ExperienceEconomics.htm>
- [18] Pine, B. J. II, & Gilmore, J. (1998). Welcome to the Experience Economy. *Harvard Business Review Magazine*. Retrieved January 24, 2022, from <https://hbr.org/1998/07/welcome-to-the-experience-economy#>
- [19] Pocinho, M., Garcês, S., & de Jesus, S. N. (2022). Wellbeing and Resilience in Tourism: A Systematic Literature Review During COVID-19. *Frontiers in Psychology*. 12. <https://doi.org/10.3389/fpsyg.2021.748947>
- [20] Rahman, M. K., Gazi, M. A. I., Bhuiyan, M. A., & Rahaman, M. A. (2021). Effect of Covid-19 pandemic on tourist travel risk and management perceptions. *PLoS ONE*. 16(9): e0256486. <https://doi.org/10.1371/journal.pone.0256486>
- [21] Sharma, G. D., Thomas, A., & Paul, J. (2021). Reviving tourism industry post-COVID-19: A resilience-based framework. *Tourism management perspectives*. 37. 100786. <https://doi.org/10.1016/j.tmp.2020.100786>
- [22] United Nations World Tourism Organization. (2022). *UNWTO Global Tourism Dashboard*. UNWTO. Retrieved January 22, 2022, from <https://www.unwto.org/country-profile-inbound-tourism>
- [23] United Nations. (1963). Proceedings from E/CONF. 47/18: United Nations Conference on International Travel and Tourism. Rome: Italy. Retrieved from <https://digitallibrary.un.org/record/723571#record-files-collapse-header>
- [24] UNWTO. (2021). *All Countries: Inbound Tourism: Arrivals 1995 - 2019 (02.2021)*. Tourism Statistics. Washington, DC: The World Tourism Organization. Retrieved from <https://www.e-unwto.org/doi/abs/10.5555/unwtotfb0000270019952019202102>
- [25] Wozel, J., Garemo, N., Mischke, J., Hjerpe, M., & Palter, R. (2016). *Bridging global infrastructure gaps*. McKinsey&Company. Retrieved January 24, 2022, from <https://www.un.org/pga/71/wp-content/uploads/sites/40/2017/06/Bridging-Global-Infrastructure-Gaps-Full-report-June-2016.pdf>
- [26] World Travel & Tourism Council. (2021). *Economic Impact Reports*. London: Oxford Economics. Retrieved from <https://wtcc.org/Research/Economic-Impact>
- [27] Zhelikhovskaya, M. (2020, August 10). Domestic tourism boom is caused by the despair – Director of Leading Hotels of the World. Message posted to <https://style.rbc.ru/people/5f7190a99a79472ea43199ae>

Legislative Aspects of Unfair Trade Practices in B2C Relationships

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Abstract

Unfair trade practices have been applied by traders against consumers who, therefore, enjoy a strong legal protection. Legislation on the EU and also on the national level in Slovakia describes the nature of unfair trading practices that should be avoided in commercial transactions. This paper aims at developing the understanding of unfair trade practices in business-to-consumer relations by reviewing the relevant legislative framework and by providing an overview of types of unfair practices that are prohibited and practices that were subject to consumers' claims.

Keywords: consumers, unfair trade (commercial) practices, legal framework

JEL Classification: L14, K42

1. Introduction

Unfair trade practices can occur at all stages of a supply chain. Unfair practices occurring between businesses are often referred to as unfair trade practices or unfair business practices. Unfair practices occurring between a business and a consumer are referred to as unfair trade practices or unfair commercial practices. A market practice is unfair if it is in contrast with the principle of professional diligence and may influence consumers' buying decisions (Grassie, 2006). Unfair practices arise because there is imbalance of market power and the weaker party in negotiations has no real alternatives to trade, or because one of the parties might be highly dependent on other parties (e.g. know-how or technological advantage of one party), or because there is asymmetry of information available to the parties (Sexton, 2017). Unfair practices harm at least one participant of the business relation (Falkowski, 2017) and they became the subject for scientific discussion and policy regulations, high attention is paid to practices in the food supply chain (Wolski, 2019).

Unfair trade practices in business-to-consumer relationships (B2C) are prohibited since a directive in 2005 has been adopted on the EU level (EC, 2005) and a full harmonization of the protection against unfair trade practices has been required across Member States by June 2007 (MacGregor Pelikanova, 2019). Concerns about unfair trade practices in business-to-business relationships (B2B) triggered attention to practices used in earlier stages of the supply chain (Menard, 2017). A directive governing unfair trading practices in the agricultural and food supply chain has been adopted in 2019 and it should be transposed into national law of Member States by May 2021 (EC, 2019). Although any partner of a transaction may be subject to unfair practices, consumers are considered a very vulnerable group because they have only a limited ability to protect themselves from unfair commercial practices and to take response (Paterson & Brody, 2015). This study aims to provide an overview of the legislative framework for consumers' protection on the EU as well as national level in the case of Slovakia. It also summarises unfair commercial practices that are prohibited.

2. Data and Methods

The paper builds up on a systematic literature review conducted to identify unfair trade practices in business-to-consumer relations. It aims at summarising and providing an overview of relevant European and Slovak legislation governing unfair commercial practices and of types of these practices that should be prohibited.

3. Results and Discussion

3.1 EU and Slovak legislation on unfair trade practices in B2C relationships

The core EU regulation on unfair trade practices against consumers is the Directive 2005/29/EC, the “Unfair Commercial Practices Directive”. An unfair commercial practice is “contrary to the requirements of professional diligence and it materially distorts or is likely to materially distort the economic behaviour with regard to the product of the average consumer whom it reaches or to whom it is addressed, or of the average member of the group when a commercial practice is directed to a particular group of consumers” (EU Directive 2005/29/EC). Except for this regulation the topic of unfair commercial practices and consumers’ protection is also included in other legal acts, the most important directives are (EC, 2022):

- Directive 93/13/EEC on unfair terms in consumer contracts
- Directive 98/6/EC on consumer protection in the indication of the prices of products offered to consumers
- Directive 2011/83/EU on consumer rights
- Directive 2011/83/EU on consumer rights
- Directive (EU) 2019/770 on certain aspects concerning contracts for the supply of digital content and digital services
- Directive (EU) 2019/771 on certain aspects concerning contracts for the sale of goods
- Directive (EU) 2019/2161 on better enforcement and modernization of EU consumer protection
- Directive (EU) 2020/1828 on representative actions for the protection of the collective interests of consumers

EU Directives become law in Member States through their adoption in national legislation. The Consumer Protection Act no. 250/2007 is the main act addressing unfair commercial practices and consumers’ protection in Slovakia. Other acts include (ME SR, 2022):

- Act no. 372/1990 on offenses
- Act no. 147/2001 on advertising
- Act no. 128/2002 on state control of the internal market in consumer protection issues
- Act no. 161/2011 on consumer protection in the provision of certain tourism services
- Act no. 102/2014 on consumer protection in the sale of goods or provision of services on the basis of a distance contract
- Act no. 391/2015 on alternative dispute solution
- Act no. 170/2018 on tours, related tourism services, certain conditions of business in tourism

In January 2022 the Slovak Ministry of Economy announced a new Consumer Protection Act that has been prepared for the legislative process. Reflecting increasing online transactions the new act should introduce obligations to inform consumers about how the trader ensures

authenticity of consumer product evaluations and about the main parameters that determine the ranking of products in online search results. Double quality marketing should be considered a deceptive business practice. A new price reduction regulation should also be introduced in order to avoid price manipulations. (SITA, 2022).

The auspice and control of consumer protection is carried out by the Slovak Commercial Inspection, which is an independent authority of internal market surveillance (Act no. 128/2002). The offense of unfair commercial practices or of harming the consumer can be punished according to the Slovak criminal law (Act no. 300/2005).

3.2 Prohibited unfair trade practices in B2C relationships

Unfair trade practices against consumers are prohibited before, during and after the commercial transaction. The EU Unfair Commercial Practices Directive 2005/29/EC as well as the Slovak Consumer Protection Act no. 250/2007 distinguish two main types of unfair practices in business-to-consumer relationships:

1. Misleading commercial practices including both misleading actions and misleading omissions,
2. Aggressive commercial practices.

Misleading commercial practices mean that businesses do not give consumers enough accurate information for an informed buying decision usually through claiming false information or leaving out important information. The EU Directive 2005/29/EC and the Slovak Consumer Protection Act no. 250/2007 explicitly list misleading commercial practices that are always considered unfair and hence, prohibited. We have sorted these practices into three groups:

- Providing information that is not in line with the current state of the art:
 - Claiming to be a signatory to a code of conduct when the trader is not,
 - Claiming that a code of conduct has an endorsement from a public or other body which it does not have,
 - Displaying a trust mark, quality mark or equivalent without having obtained the necessary authorisation,
 - Claiming that a trader or a product has been approved, endorsed or authorised by a public or private body when he/it has not,
- Practices of false sales and advertisement:
 - Bait advertising: making an invitation to purchase products at a specified price if the trader does not have enough stocks or possibilities to supply the products at the offered price,
 - Bait and switch: making an invitation to purchase products at a specified price and then refusing to take orders or to deliver the item to consumers, offering another product instead,
 - Falsely stating that a product will only be available for a very limited time, in order to elicit an immediate decision,
 - Promoting a product similar to a product made by a particular manufacturer such that consumers can get into confusion,
 - Using editorial content in the media to promote a product where a trader has paid for the promotion without making that clear in the content or by images or sounds clearly identifiable by the consumer (advertorial),

- Including in marketing material an invoice or similar document seeking payment which gives the consumer the impression that he has already ordered the marketed product when he has not,
- Claiming in a commercial practice to offer a competition or prize promotion without awarding the prizes described or a reasonable equivalent,
- Claiming that products are able to facilitate winning in games of chance,
- Describing a product as ‘gratis’, ‘free’, ‘without charge’ if the consumer has to pay anything other than the unavoidable cost of responding to the commercial practice and collecting or paying for delivery of the item.
- Other misleading practices:
 - Presenting rights given to consumers in law as a trader’s offer,
 - Stating or otherwise creating the impression that a product can legally be sold when it cannot,
 - Passing on materially inaccurate information on market conditions or on the possibility of finding the product with the intention of inducing the consumer to acquire the product at conditions less favourable than normal market conditions,
 - Making a materially inaccurate claim concerning the nature and extent of the risk to the personal security of the consumer if he does not purchase the product,
 - Establishing, operating or promoting a pyramid promotional scheme where a consumer gives consideration for the opportunity to receive compensation that is derived primarily from the introduction of other consumers into the scheme rather than from the sale or consumption of products,
 - Falsely claiming that a product is able to cure illnesses, dysfunction or malformations,
 - Falsely claiming or creating the impression that the trader is not acting for purposes relating to his trade, business, craft or profession, or falsely representing oneself as a consumer,
 - Claiming that the trader is about to cease trading or move premises when he is not,
 - Undertaking to provide after-sales service while languages used prior to a transaction and after a sale differ without clearly disclosing this to the consumer before the transaction,
 - Creating the false impression that after-sales service in relation to a product is available in a Member State other than the one in which the product is sold.

Aggressive commercial practices aim to bully a consumer into buying. Harassment, coercion and undue influence belong to this category. Also for this category of practices the EU Directive 2005/29/EC and its conversion to the Slovak Consumer Protection Act no. 250/2007 provide a list of practices that are always considered unfair:

- Creating the impression that the consumer cannot leave the premises until a contract is formed,
- Conducting personal visits to the consumer’s home ignoring the consumer’s request to leave or not to return (except in justified circumstances),
- Making persistent and unwanted solicitations by telephone, fax, e-mail or other remote media,
- Requiring a consumer who wishes to claim on an insurance policy to produce documents which could not reasonably be considered relevant or failing systematically to respond to pertinent correspondence,
- Including in an advertisement a direct exhortation to children to buy advertised products or persuade their parents to buy advertised products for them,

- Demanding immediate or deferred payment for or the return or safekeeping of products supplied by the trader, but not solicited by the consumer (inertia selling),
- Explicitly informing a consumer that if he does not buy the product or service, the trader's job or livelihood will be in jeopardy,
- Creating the false impression that the consumer has already won, or will win a prize or other equivalent benefit, when in fact either there is no prize or taking any action in relation to claiming the prize is subject to the consumer paying money or incurring a cost.

Except for always unfair commercial practices directly specified by the legislation and mentioned above, any **other practices** that do not meet the requirements of professional diligence or distort the purchasing behaviour of an average consumer are also unfair. The average consumer is an average member of a group and it is a reasonably well-informed and reasonably observant and circumspect person (Schebesta & Purnhagen, 2020). Although Incardona & Poncibo (2007) note that when evaluating unfair commercial practices, the concept of an average consumer requiring rationality and information should be interpreted more flexibly taking into account individual consumer behaviour, it is used as a benchmark for the classification of unfair practices. Figure 1 shows all the criteria a commercial practice must fulfil to be allowed.

Does the commercial practice:

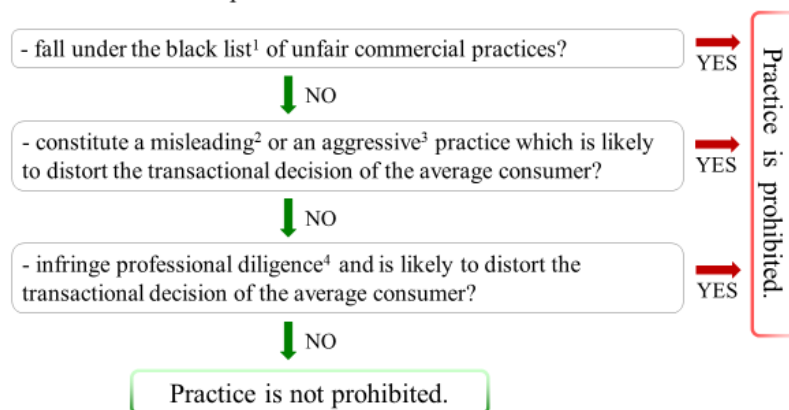


Figure 1: Allowed and prohibited commercial practices

Source: EC: Commission Notice 2021/C 526/01

Note 1: for the black list of commercial practices see Annex I of EU Directive 2005/29/EC or Annex I of Slovak Act no. 250/2007 (also listed in chapter 3.2)

Note 2: for misleading practices see Article 6-7 of EU Directive 2005/29/EC or §8 of Slovak Act 250/2007

Note 3: for aggressive practices see Article 8-9 of EU Directive 2005/29/EC or §9 of Slovak Act 250/2007

Note 4: for professional diligence see Article 2 (h) of EU Directive 2005/29/EC or §2 (u) of Slovak Act 250/2007

Empirical studies conclude, that unfair trading practices can be observed in the markets for goods, but consumers also face these practices in other areas and service sectors, like the financial or energy sector (OECD, 2008). In Slovakia the prohibition of certain trading practices is mainly aimed at the elimination of the abuse of economic power in the supply chain (Blazo et al., 2019). This should be true not only for B2B relations but also for B2C relations as for example the retail market in food products is dominated by supermarket chains that sell more than 80% of the food sector output to final consumers with 3 biggest, foreign-owned

supermarkets, holding approximately 65% of the supermarket retail market (Blazo et al., 2019). Misleading advertisement is in general one of the most common unfair commercial practice across the economy (CUTS, 2013; CPEC, 2008). CUTS (2013) revealed the following forms of misleading advertisements: inappropriate or untrue content of advertisements, content not respecting safety issues, advertisements deviating consumers' choices by not referring to relevant facts or product characteristics, advertisements offering sales, price discounts or free gifts with no intention to comply with such an offer. Civic Consulting collected mass claims of consumers suffering unfair practices for many sectors of the EU economy (CPEC, 2008). Law infringements reported in the food sector and in other consumer goods sectors are shown in Table 1.

Table 1: Consumer mass claims on unfair commercial practices

<i>Infringement</i>	<i>Food sector</i>	<i>Other consumer goods sectors</i>
Marketing of dangerous food and drinks	x	
Misleading information about food quality	x	
Failure to deliver ordered and prepaid goods/products	x	x
Significant delay in delivery of goods		x
Unfair commercial practices in offering products/services - aggressive solicitations by telephone	x	x
Personal injuries caused by dangerous food services/products	x	
Misleading information about discounts of goods in supermarkets	x	
Misleading advertising		x
Selling defective or goods that do not meet standards		x
Non-conformity of goods		x
Refusal of price refund for defective goods		x
Lack of response to consumers' demands/lack of contact with seller		x
Refusal of reparation during the warranty term		x
Providing warranty shorter than two years		x
Unfair contract terms imposing additional costs/fees/charges on consumers		x
Sending invoices for unsolicited goods		x
Other unfair commercial practices - false impression that a prize was won		x
Infringements of data protection law by installing unsolicited software (digital rights management)		x

Source: CPEC (2008)

4. Conclusion

The existence of unfair commercial practices has a negative impact on prices and quality of goods and services, on competition in the market, and on consumers' rights and buying decisions (CUTS, 2013). The understanding of unfair practices is still very limited. The reasons are that many factors potentially influencing unfair trading or unfair commercial practices have

not been studied yet, in contrary, existing evidence and findings are very heterogeneous and little data are available (Falkowski, 2017). It is important that consumers are aware of practices that are considered unfair such that they can stay resistant when facing those practices in their purchasing decisions and that they can contact responsible authorities if they have a suspicion of an unfair practice. On the other hand, it is also important for researchers and policy makers to observe practices in the markets, to provide evidence and to reflect the findings in establishing new policies and amending the legislative framework ensuring protection to consumers.

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References

- [1] Blazo, O. & Kovacikova, H. & Patakyova, M.T. (2019). Slovakia. National Report on Unfair Trading Practices. In: Piszcz, A. & Jasser, A. (Ed.) (2019). Legislation Covering Business-to-Business Unfair Trading Practices in the Food Supply Chain in Central and Eastern European Countries. Warsaw: University of Warsaw, 2019. pp. 243-269. ISBN: 978-83-66282-06-3 (e-book). doi.org/10.7172/978-83-66282-06-3.2019.wwwz.1.
- [2] CPEC - Civic Consulting of the Consumer Policy Evaluation Consortium. (2008). Study Regarding the Problems Faced by Consumers in Obtaining Redress for Infringements of Consumer Protection Legislation, and the Economic Consequences of such Problems. http://www.civic-consulting.de/reports/redress%20problem_study.pdf. [01.02.2022].
- [3] CUTS - Consumer Unity and Trust Society. (2013). Unfair Trade Practices and Challenges in India. http://www.cuts-ccier.org/pdf/Unfair_Trade_Practices_and_Institutional_Challenges_in_India-An_Analysis.pdf. [01.02.2022].
- [4] Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market ('Unfair Commercial Practices Directive').
- [5] Directive (EU) 2019/633 of the European Parliament and of the Council of 17 April 2019 on unfair trading practices in business-to-business relationships in the agricultural and food supply chain.
- [6] EC – European Commission. (2021). Commission Notice – Guidance on the interpretation and application of Directive 2005/29/EC of the European Parliament and of the Council concerning unfair business-to-consumer commercial practices in the internal market (2021/C 526/01).
- [7] EC – European Commission. (2022). Consumer Protection Law. https://ec.europa.eu/info/law/law-topic/consumer-protection-law_en. [01.02.2022].
- [8] Falkowski, J. (2017). The Economic Aspects of Unfair Trading Practices: Measurement and Indicators. In: JRC. (2017). Unfair Trading Practices in the Food Supply Chain: A Literature Review on Methodologies. Luxembourg: Publications Office of the European Union, 2017. pp. 20-38. ISBN 978-92-79-73831-9. <https://data.europa.eu/doi/10.2760/800>.
- [9] Grassie, G. (2006). EU Directive on Unfair Commercial Practices - a UK Perspective. *Journal of Intellectual Property Law and Practice*, 1(2) (2006), 107-112. <https://doi.org/10.1093/jiplp/jpi025>.
- [10] Incardona, R. & Poncibo, C. (2007). The Average Consumer, the Unfair Commercial Practices Directive, and the Cognitive Revolution. *Journal of Consumer Policy*, 30 (2007), 21–38. <https://doi.org/10.1007/s10603-006-9027-9>.
- [11] MacGregor Pelikanova, R. (2019). Harmonization of the Protection against Misleading Commercial Practices: Ongoing Divergences in Central European Countries. *Oeconomia Copernicana*, 10, 2 (2019), 239-252. <https://doi.org/10.24136/oc.2019.012>.
- [12] Menard, C. (2017). Summary and Conclusions: The Many Challenges of Unfair Trading Practices in Food Supply Chain Systems. In: JRC. (2017). Unfair Trading Practices in the Food Supply Chain: A Literature

- Review on Methodologies. Luxembourg: Publications Office of the European Union, 2017. pp. 67-87. ISBN 978-92-79-73831-9. <https://data.europa.eu/doi/10.2760/800>.
- [13] ME SR - Ministry of Economy of the Slovak Republic. (2022). Legislatíva v oblasti ochrany spotrebiteľa. <https://www.mhsr.sk/obchod/ochrana-spotrebiteľa/legislatíva-v-oblasti-ochrany-spotrebiteľa>. [01.02.2022].
- [14] OECD - Organisation for Economic Cooperation and Development. (2008). The Interface between Competition and Consumer Policies. Document no. DAF/COMP/GF(2008)10. <https://www.oecd.org/daf/competition/40898016.pdf>. [01.02.2022].
- [15] Paterson, J.M. & Brody, G. (2015). “Safety Net” Consumer Protection: Using Prohibitions on Unfair and Unconscionable Conduct to Respond to Predatory Business Models. *Journal of Consumer Policy* 38 (2015), 331–355. <https://doi.org/10.1007/s10603-014-9276-y>.
- [16] Sexton, R. (2017). Unfair Trade Practices in the Food Supply Chain: Defining the Problem and the Policy Issues. In: JRC. (2017). *Unfair Trading Practices in the Food Supply Chain: A Literature Review on Methodologies*. Luxembourg: Publications Office of the European Union, 2017. pp. 6-19. ISBN 978-92-79-73831-9. <https://data.europa.eu/doi/10.2760/800>.
- [17] SITA - Slovak News Agency. (2022). Rezort hospodárstva predstavil nový zákon o ochrane spotrebiteľa, pomôže odbúrať nekalé praktiky obchodníkov. <https://www.webnoviny.sk/rezort-hospodarstva-predstavil-novy-zakon-o-ochrane-spotrebiteľa-pomoze-odburat-nekale-praktiky-obchodnikov/>. [01.02.2022].
- [18] Schebesta, H. & Purnhagen, K.P. (2020). Island or Ocean: Empirical Evidence on the Average Consumer Concept in the UCPD. *European Review of Private Law*, 2 (2020), 293–310. ISSN 0928-9801.
- [19] Slovak Act no. 250/2007 on Consumer Protection (Zákon Národnej rady Slovenskej republiky č. 250/2007 Z.z. z 9. mája 2007 o ochrane spotrebiteľa).
- [20] Slovak Act no. 128/2002 on the Slovak Commercial Inspection (Zákon Národnej rady Slovenskej republiky č. 128/2002 Z.z. z 15. februára 2002 o štátnej kontrole vnútorného trhu vo veciach ochrany spotrebiteľa).
- [21] Slovak Act no. 300/2005 The Criminal Law (Zákon Národnej rady Slovenskej republiky č. 300/2005 Z.z. z 20. mája 2005 Trestný zákon).
- [22] Wolski, D. (2019). Regulating Unfair Trading Practices in Selected West European EU Member States – in Search of Equilibrium. In: Piszcz, A. & Jasser, A. (Ed.) (2019). *Legislation Covering Business-to-Business Unfair Trading Practices in the Food Supply Chain in Central and Eastern European Countries*. Warsaw: University of Warsaw, 2019. pp. 25-40. ISBN: 978-83-66282-06-3 (e-book). doi.org/10.7172/978-83-66282-06-3. 2019.wwz.1.

Self - sufficiency of the Slovak Republic in the Beef Sector in the Context of the Common Market of the European Union

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Abstract

The structured paper deals with the issue of production and food self-sufficiency. The aim was to assess the degree of production and food self-sufficiency of the Slovak Republic in the beef sector in the context of the common market of the European Union. The analysis was performed for the time period year 2015-2020. Emphasis was placed on quantifying and comparing the levels of self-sufficiency of the Slovak Republic and the EU in the beef sector. Two methodological procedures were used to determine self-sufficiency rates, based on balance sheet indicators and manufacturing output. The paper also brings a new perspective on the level of food self-sufficiency by quantifying potential self-sufficiency. Based on the performed analysis, we can state that the results of the examined indicators confirm the low level of self-sufficiency of the Slovak Republic in beef, while the European Union as a whole is in surplus in this sector. At the same time, the results directly reveal the existence of problems and dysfunction of supplier-customer relations between primary production and beef processors in the Slovak Republic.

Keywords: agri-food trade, beef, food self-sufficiency, Slovak Republic, the EU

JEL Classification: Q02, Q11, Q17

1. Introduction

The growing global demand for agricultural and food products as a result of accelerating demographic growth raises concerns about the extent to which humanity will be able to continue to feed on limited resources (Godfray et al 2010, Foley et al 2011, Kummu et al 2017). Many studies have looked at ways in which humanity could meet its growing food needs by either reducing demand or increasing food production (Foley et al 2011). Options for reducing food demand can be found in reducing food waste (Kummu et al 2012), minimizing resource inefficiencies (Springmann et al 2018), using more efficient fertilization and irrigation techniques (Jägermeyr et al 2016), as well as radical dietary changes transition from animal to plant-based diet (Cassidy et al. 2013, Jalava et al. 2014, Davis, D'Odorico & Rulli 2014). Other studies have focused on finding ways to increase food production by sustainably increasing crop yields on existing arable land (Phalan et al 2011, Garnett et al 2013, Pretty 2018).

The need to address the growing demand for food has moved to a higher level on the political agenda in many countries around the world, including the Slovak Republic. The decisive impetus for this turnaround in politics was the extreme volatility of food prices in 2007-2008 and its subsequent shocks. The world has renewed interest in food self-sufficiency. The need to increase the level of food self-sufficiency was gradually adopted by the governments of the Slovak Republic. In the current Program Statement of the Government of the Slovak Republic for the period 2020-2024, one of the strategic goals in agriculture is to increase the level of its own food self-sufficiency (MPRV SR 2020). One of the main arguments for increasing the

level of food self-sufficiency in the Slovak Republic is the constantly deepening deficit of the agri-food trade and its unfavourable commodity structure. In the Slovak Republic, agri-food products with lower added value (especially agricultural raw materials) have long prevailed, in contrast to imports, where products with higher added value (especially final foodstuffs) dominate (MPRV SR 2021).

Food self-sufficiency is a commonly used term. Nevertheless, there is no uniform and universal definition of the term. There are several understandings of food self-sufficiency that can be applied at different levels of analysis (O'Hagen 1975). In its most basic form, the FAO has defined food self-sufficiency as follows: "The concept of food self-sufficiency is generally taken to mean the extent to which a country can satisfy its food needs from its own domestic production" (FAO 1999). This most basic definition can apply at the individual, region, or country level. By applying the basic principle of food self-sufficiency, defined by the FAO, the country would avoid any international food trade and would rely exclusively on domestic food production to meet the food needs of its people (Clapp 2017). Therefore, with this definition it is possible to characterize a country that closes its borders and accepts complete autarchy for its agri-food sector. The extreme political attitude of fully closed borders is very rare in practice. All countries in the world rely on food imports. Even large food exporters, who produce much more food than they consume, usually import at least some food to satisfy part of their domestic consumption (Clapp 2017).

Given the predominance of trade in today's global economy, a more pragmatic understanding of food self-sufficiency is domestic food production, which equals or exceeds 100% of food consumption in a given country. In this context, trade is not excluded, as food self-sufficiency is defined by the ratio of food produced and food consumed at domestic level. The mentioned principle is also applied by the MPRV SR. However, due to the openness of the Slovak economy and the need for imports, the so-called irreplaceable agricultural and food products, MPRV SR defines the full food self-sufficiency of the country so that domestic production equals or exceeds 80% of consumption in the SR (MPRV SR 2021a). Food self-sufficiency understood in this way is not necessarily focused on where specific foods are grown, but rather on the domestic food production capacity in the country. This means that self-sufficient countries can still carry out a certain degree of agricultural specialization in order to trade these foods with other countries. Then a key indicator for measuring food self-sufficiency is the self-sufficiency rate (SSR), which expresses the percentage of consumed food that is produced on the domestic market (FAO 2012). SSR is measured using the following equation with respect to food production and trade:

$$\text{SSR} = \text{Production} \times 100 / (\text{Production} + \text{Imports} - \text{Exports}).$$

The SSR can be further refined to include fluctuations in the level of domestic food stocks (Puma et al 2015). SSR can be measured either in calories (Porkka et al 2013, Davis, D'Odorico & Rulli 2014, Puma et al 2015) or in the volume of food produced by the country. SSR is usually calculated for a particular commodity or class of commodities.

2. Data and Methods

The aim of our research is to evaluate the degree of self-sufficiency of the Slovak Republic in the beef sector in the context of the common market of the European Union. MPRV SR in its conceptual materials, prepared in accordance with the Program Statement of the Government of the Slovak Republic for the period 2020-2024 for the field of agriculture, distinguishes two indicators of self-sufficiency: production and food self-sufficiency (MPRV SR 2021a). In our

paper, we will therefore focus on both indicators. Production self-sufficiency is actually simple food self-sufficiency, expressed by a relationship (Matošková, Gálik & Jamborová 2015):

$$\text{Production self-sufficiency} = \text{gross domestic production} \times 100 / \text{domestic consumption} \quad (1)$$

In calculating production self-sufficiency, we based on beef and veal balances, which were compiled and published annually by the Research Institute of Agricultural and Food Economics as part of the situation and outlook report (Gálik 2021). The European Commission also follows the same balance sheet principles and procedures when compiling the medium-term outlook for the market for basic agri-food commodities (EU 2021). We used balance indicators to express the European Union's productive self-sufficiency.

With a simple adjustment, it is also possible to determine the level of food self-sufficiency from beef balances in the Slovak Republic and the EU. We will replace gross domestic production by net production, which is the result of the difference between gross domestic production and net exports of live cattle.

$$\text{Food self-sufficiency} = \text{net production} \times 100 / \text{domestic consumption} \quad (2)$$

Using data on the production of the food industry (Radela 2021, departmental report of the Ministry of Agriculture of the Slovak Republic Food) it is possible to determine and evaluate the food self-sufficiency of individual branches of the food industry (Matošková et al. 2020) according to the relation:

$$\text{Food self-sufficiency} = \text{production} \times 100 / (\text{production} - \text{export} + \text{import}) \quad (3)$$

The research used this relationship to calculate food self-sufficiency in the beef sector measured through the production of the processing industry (departmental report Food). From the detailed data, we focused only on the production of beef from the primary processing of animals for slaughter in slaughterhouses. The same data for the EU is also monitored by Eurostat (2022). We used data for foreign trade of the Slovak Republic and the EU from the databases of the Statistical Office of the Slovak Republic and from Eurostat (database Comext 2022) for precisely defined items: HS 0201, HS 0202 and HS 021020.

Detailed data of the Ministry of Regional Development of the Slovak Republic Food allow us to determine the degree of potential food self-sufficiency, which expresses the share of theoretical production of food products corresponding to fully utilized production capacities in their current consumption (Matošková et al. 2020):

$$\text{Potential self-sufficiency} = \text{production capacity} \times 100 / (\text{production} - \text{export} + \text{import}) \quad (4)$$

The period covered by the analyses carried out lasted from 2015 to 2020. All the data used for the European Union were the sum of the 27 Member States without the United Kingdom since the agreement leave the EU was signed.

3. Results and Discussion

The food vertical of beef in Slovakia is one of the problematic. This fact is also documented by the basic balance sheet indicators captured in Table 1. Gross domestic production, after reaching its maximum in 2016, is constantly declining in the following period. In 2020, gross domestic production was only at the level of 80,5% from 2016, which represents a production shortfall of up to 5,5 thousand tonnes c.w.e. At the same time, the average number of cows without market production increased by up to 6,3% during the same period. The increase in the basic herd of mainly meat breeds was not reflected in the growth of production. The reasons

must therefore be found in the deteriorating reproductive indicators of beef cattle. On the other hand, during the period under review, we record a significant increase in total domestic beef consumption, as reported by the Statistical Office of the Slovak Republic. Until 2017, consumption in our country grew sharply, while in the following period its growth slowed down and slowed down. It is astonishing that the volume of our production is declining in a period of growing domestic demand. Nevertheless, the Slovak Republic is a net exporter of live cattle. In the last period almost 12 thousand tonnes c.w.e. is exported from Slovakia in the live state. At the same time, it is a substantial part of domestic production which, instead of processing and placing it on the domestic market, was exported as a low value-added raw material. Consequently, domestic consumption must be largely rehabilitated by imports of beef and beef products. If in 2015 the net export of meat and meat products with high added value reached the level of -11,9 thousand tonnes c.w.e., in 2020 it was already at the level of -15,5 thousand tonnes c.w.e. It follows that the growth in domestic consumption had to be covered by an increase in the volume of meat imports.

Table 1: Development of basic balance indicators on the beef market (in tonnes c.w.e.)

	2015	2016	2017	2018	2019	2020
Slovak Republic						
Gross domestic production	24 316	28 246	25 872	24 336	22 716	22 734
Net exports of live animals	14 056	17 712	15 450	13 654	11 998	11 822
Net beef exports	-11 900	-13 148	-15 907	-16 856	-15 314	-15 494
Domestic consumption	23 285	25 884	28 011	28 179	28 334	28 990
European Union						
Gross domestic production	6 983 048	7 195 436	7 220 513	7 329 808	7 208 875	7 150 650
Net exports of live animals	188 938	226 633	244 495	243 262	233 270	231 801
Net beef exports	176 345	234 101	265 004	223 592	190 140	285 224
Domestic consumption	6 617 765	6 734 702	6 711 013	6 862 954	6 785 466	6 633 625

Source: Cattle for slaughter and calves for slaughter. Situation and outlook report. NPPC-VŮEPP, MPRV SR: 2021; SO, SR; EU Agricultural Outlook 2021-2031. European Union: 2021; own calculations.

If we look at the development of balance indicators for the entire European Union, in contrast to the Slovak Republic, they show a stable and balanced trend. Gross domestic production oscillates around the level of 7,2 mil. Tonnes c.w.e., while domestic consumption is on average at the level of 6,7 mil tonnes c.w.e. Unlike the Slovak Republic, the European Union is only minimally involved in trade with countries outside the EU common market (so-called third countries). At the same time, it has long maintained its position as a net exporter of not only live cattle, but also beef.

For the correct calculation and interpretation of the degree of self-sufficiency, we must look at the structure of gross domestic production in Slovakia (Figure 1). Gross domestic production consists of 3 parts: slaughterhouses in slaughterhouses, self-supply and net exports of live cattle. Self-sufficiency represents an estimate and calculations of the production of the Statistical Office of the Slovak Republic not only for small farmers, but also for small processors who are not part of national or departmental statistical surveys. The share of self-sufficiency has strengthened by up to 6 pp over the past 6 years (2015-2020). It is the production of beef, which has a regional character and is subsequently consumed in the region.

For the domestic market, the production processed by the domestic processing industry is crucial, i.e. slaughter of animals for slaughter in slaughterhouses. At the same time, the killings make up on average only 1/3 of the total beef production in the Slovak Republic. Net exports of live cattle have a decisive share in domestic production, although their share is declining every year. More than half of our production is slaughtered animals that have been bred in our country, but will be processed by foreign processing capacities. Over the past 6 years, up to 55% of the live animals exported were calves and young cattle weighing up to 300 kg. What is striking is that live animals exported from us are then imported in the form of meat products. This means that all added value will remain abroad.

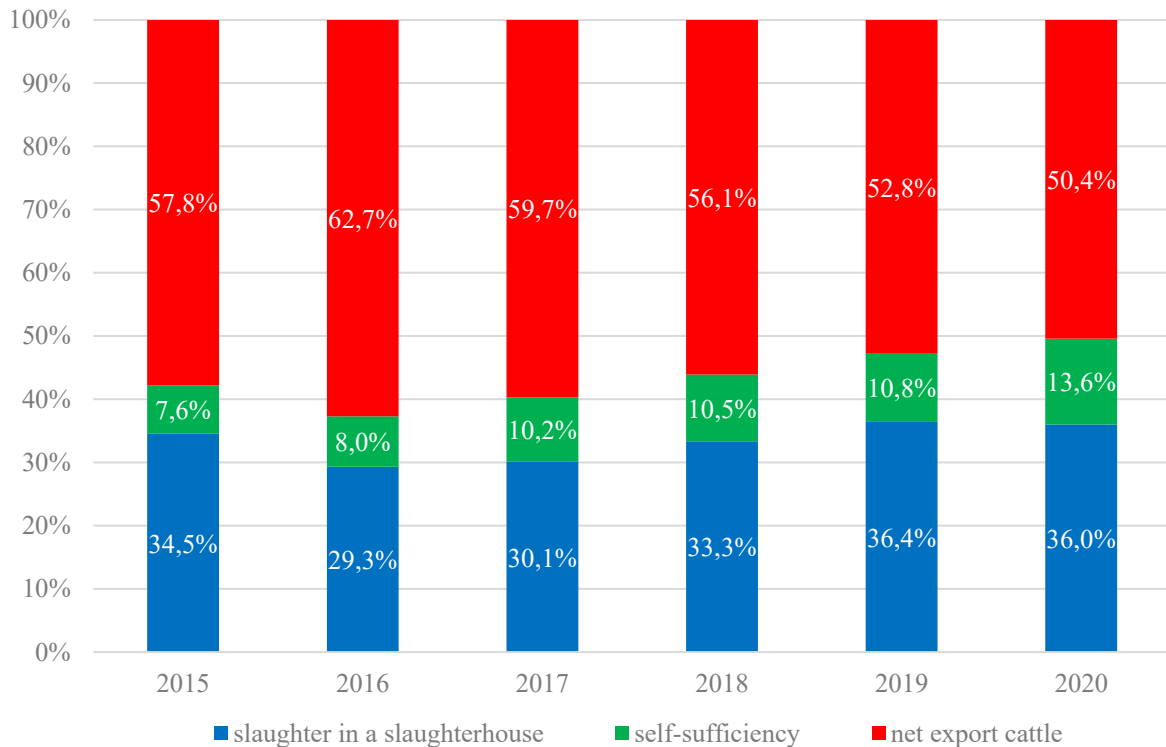


Figure 1: Structure of gross domestic beef production in the Slovak Republic (in %)

Source: Cattle for slaughter and calves for slaughter. Situation and outlook report. NPPC-VÚEPP, MPRV SR: 2021; own calculations

Based on the above balance indicators, we can determine the level of production and food self-sufficiency (MPRV SR 2021a) in the Slovak Republic and the EU in the beef sector (Table 2). The level of production self-sufficiency (1) of the Slovak Republic decreased sharply due to the opposite development of production and consumption. If in 2015 we produced 4,4% and in 2016 even as much as 9,1% more meat than we could consume, in the last 2 years the rate of production self-sufficiency is around 80% at the level of full self-sufficiency defined by MPRV SR (MPRV SR 2021a). The European Union has long been able to fully cover domestic consumption with its own production and place its overproduction on third-country markets, whether in the form of live animals for slaughter or processed meat.

Table 2: Self-sufficiency rate in the beef sector (in %)

	2015	2016	2017	2018	2019	2020
Production self-sufficiency						
Slovak Republic	104,4	109,1	92,4	86,4	80,2	78,4
European Union	105,5	106,8	107,6	106,8	106,2	107,8
Food self-sufficiency						
Slovak Republic	44,1	40,7	37,2	37,9	37,8	37,6
European Union	102,7	103,5	103,9	103,3	102,8	104,3

Source: Own calculations

Due to the high share of net exports of live animals in total production, the rate of food self-sufficiency (2) in the Slovak Republic is significantly below the level of production self-sufficiency. The rate of food self-sufficiency decreased each year from 44,1% in the base year to 37,6% in 2020. It follows that slaughter animals processed in Slovakia cover only about 38% of domestic beef consumption and the remaining about 62% must be imported from abroad. Exports of live animals from the EU to third countries do not jeopardize the degree of food self-sufficiency of the EU common market. The level of net production of EU member states is able to fully cover the total consumption of the EU population and at the same time generate exportable surpluses of processed beef placed on third country markets.

From the available data, it is possible to determine and assess the level of food self-sufficiency also in terms of manufacturing production (3). The rate of food self-sufficiency of the Slovak Republic, measured by the primary production of the processing industry, is on average up to 10,8 pp. higher than the food self-sufficiency rate based on balance indicators. Nevertheless, the processing industry of the Slovak Republic was able to cover on average only 50% of the estimated domestic consumption of beef (Table 3). If we look at the whole of the European Union, we can conclude that, even from the point of view of the processing industry, the EU has an overall surplus in beef production.

Table 3: Food self-sufficiency rate in the beef sector measured through the production of the processing industry (in %)

	2015	2016	2017	2018	2019	2020
Slovak Republic	51,5	52,4	50,6	54,7	44,9	46,1
European Union	102,5	103,1	103,5	102,9	102,5	103,6

Source: Departmental Report Food (MPRV SR); SO, SR; Eurostat; own calculations

A new view of the level of food self-sufficiency offers us a calculation of potential self-sufficiency (4). It is clear from the construction of the indicator that it allows us to reveal the reserves that exist in the degree of processing of agricultural raw materials. In the case of beef in particular, the level of actual production from the primary processing of bovine animals for slaughter is replaced by the existing processing capacities of domestic slaughterhouses. At the same time, the processing capacities are declared by the reporting units themselves within the Ministry of Agriculture of the Slovak Ministry of Agriculture SR (Radela 2021). It is clear from the recalculated data that the rate of potential food self-sufficiency has fallen sharply over the past 6 years (Table 4). The reason is the rapid decline in declared processing capacity. If in 2015 the processing industry in the Slovak Republic declared that it has the capacity for

slaughter processing 58,8 thousand t of beef and veal, in 2020 it was only at the level of 15,2 thousand t. Despite this sharp decline, in 2020, with full use of existing processing capacities, we would be able to cover almost 77% of estimated domestic consumption from domestic production. It follows that in 2020 the potential self-sufficiency was up to 30,8 pp. higher than food self-sufficiency measured through actual production by the processing industry. With full use of existing processing capacities, on the one hand, domestic production of beef and beef products would become more efficient and, on the other hand, the processing rate of beef cattle for slaughter would increase. This development would subsequently be reflected in a decrease in net exports of live animals, but also in a decrease in negative net exports of meat.

Table 4: Potential food self-sufficiency rate of the Slovak Republic in the beef sector (in %)

	2015	2016	2017	2018	2019	2020
potential self-sufficiency	329,3	294,2	242,9	183,8	91,6	76,9

Source: Departmental Report Food (MPRV SR); SO, SR; own conversions

4. Conclusion

Increasing self-sufficiency, as a strategic goal in agriculture, has resonated in our society for decades. It has also been adopted by the current Slovak government and is subject to its regulatory and supportive policies. As the contribution showed in the evaluation of the vertical of beef, in the context of the measures taken and the setting of regulatory and support policy, it is necessary to identify sectors in which it is effective to increase the level of self-sufficiency of the Slovak Republic. At the same time, it is necessary to state clearly whether it is important to prefer the growth of production or food self-sufficiency. In the event of increasing production self-sufficiency, the measures should be directed to primary agricultural production through support for the breeding of beef breeds. However, as the data analysed suggest, such support would only lead to an increase in the volume of live bovine exports abroad. However, if measures are to increase food self-sufficiency, regulatory and support policies would need to focus on increasing beef processing rates. However, it is necessary to draw attention to the existing and unused processing capacities, which directly indicate the problems and dysfunction of the supplier-customer relations between primary production and processors. Ultimately, increasing and modernizing processing capacity would not guarantee an increase in the rate of processing of domestic bovine animals for slaughter. Therefore, in the vertical of beef, it is directly necessary to link primary production and the processing industry, e.g. through interbranch producer organizations. As the Slovak Republic has been a part of the EU common market since 2004, it is necessary to assess the self-sufficiency of the Slovak Republic in the context of the EU single market. The results of our analysis confirm the low level of self-sufficiency of the Slovak Republic in beef, while the European Union as a whole is in surplus in this sector. For this reason, we believe that the adoption of measures, based on the growth of the self-sufficiency of the Slovak Republic, is insufficient with regards to the European Commission.

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References

- [1] Cassidy E. S., West P. C., Gerber J. S. & Foley J. A. (2013). Redefining agricultural yields: from tonnes to people nourished per hectare. *Environmental Research Letters*, 8, 034015
- [2] Clapp, J. (2017). Food self-sufficiency: Making sense of it, and when it makes sense. *Food Policy*, 66, 88-96. doi: 10.1016/j.foodpol.2016.12.001
- [3] Comext (2022). *Full access to detailed statistics on international trade in goods (Comext)*. Retrieved Jan. 18, 2022, from epp.eurostat.ec.europa.eu/newxtweb/
- [4] Davis K. F., D'Odorico P. & Rulli M. C. (2014). Moderating diets to feed the future. *Earth's Future*, 2, 559–65. doi: 10.1002/2014EF000254
- [5] Davis K. F., Rulli M. C., Seveso A. & D'Odorico P. (2017). Increased food production and reduced water use through optimized crop distribution. *Nature Geoscience*, 10, 919-24
- [6] EU (2021). *EU Agricultural Outlook for Markets, Income and Environment 2021-2031*. Luxembourg: European Union, 2021. doi: 10.2762/753688
- [7] Eurostat (2022). *Slaughtering in slaughterhouses - annual data*. Retrieved Jan. 18, 2022, from <https://ec.europa.eu/eurostat/web/agriculture/data/database>
- [8] FAO (1999). *Implications of economic policy for food security: a training manual*. Retrieved Jan. 18, 2022, from <http://www.fao.org/docrep/004/x3936e/x3936e03.htm>
- [9] FAO (2012). *FAO Statistical Yearbook 2012 – World Food and Agriculture*. Retrieved Jan. 18, 2022, from <http://www.fao.org/docrep/015/i2490e/i2490e00.htm>
- [10] Foley J. A. et al (2011). Solutions for a cultivated planet. *Nature*, 478, 337–42
- [11] Gálik, J. (2021). *Jatočný hovädzí dobytok a jatočné teľatá. Situačná a výhľadová správa k 30.6.2021*. Bratislava: NPPC-VÚEPP, MPRV SR, 2021, XXIX (2), 24 p.
- [12] Garnett T. et al (2013). Sustainable intensification in agriculture: premises and policies. *Science*, 341, 33–34. doi: 10.1126/science.1234485
- [13] Godfray H. C. J., Beddington J. R., Crute I. R., Haddad L., Lawrence D., Muir J. F., Pretty J., Robinson S., Thomas S. M. & Toulmin C. (2010). Food security: The challenge of feeding 9 billion people. *Science*, 327, 812–8. doi: 10.1126/science.1185383
- [14] Jalava M., Kummu M., Porkka M., Siebert S. & Varis O. (2014). Diet change—a solution to reduce water use? *Environmental Research Letters*, 9, 074016
- [15] Jägermeyr J., Gerten D., Schaphoff S., Heinke J., Lucht W. & Rockström J. (2016). Integrated crop water management might sustainably halve the global food gap. *Environmental Research Letters*, 11, 025002
- [16] Kummu M., de Moel H., Porkka M., Siebert S., Varis O. & Ward P. J. (2012). Lost food, wasted resources: global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use. *Science of The Total Environment*, 438, 477–89
- [17] Kummu M., Fader M., Gerten D., Guillaume J. H., Jalava M., Jägermeyr J., Pfister S., Porkka M., Siebert S. & Varis O. (2017). Bringing it all together: linking measures to secure nations' food supply *Current Opinion in Environmental Sustainability*, 29, 98–117
- [18] Matošková, D., Gálik, J. & Jamborová, M. (2015). *Prognóza slovenského agropotravinárskeho trhu do roku 2020*. 1. vyd. Bratislava: NPPC-VÚEPP, 2015. 145 p.,
- [19] Matošková, D., Gálik, J., Chrastinová, Z. & Krížová, S. (2020). *Ekonomická situácia v potravinárskom priemysle a maloobchode*. 1. vyd. Bratislava: NPPC-VÚEPP, 2020. 146 p.
- [20] MPRV SR (2020). *Programové vyhlásenie vlády Slovenskej republiky na obdobie rokov 2020-2024*. Bratislava: MPRV SR. Retrieved Jan. 24, 2022, from <https://www.mpsr.sk/programove-vyhlasenie-vlady-slovenskej-republiky-na-obdobie-rokov-2020-2024/800-17-800-15434/>
- [21] MPRV SR (2021). *Správa o poľnohospodárstve a potravinárstve v SR za rok 2020*. Bratislava: MPRV SR. Retrieved Jan. 24, 2022, from <https://www.mpsr.sk/polnohospodarstvo-a-potravinarstvo/122>
- [22] MPRV SR (2021a). *Vízia spoločných postupov pri budovaní moderného pôdohospodárstva v horizonte roku 2035*. Bratislava: MPRV SR. Retrieved Jan. 24, 2022, from <https://rokovania.gov.sk/RVL/Material/26781/1>

- [23] O'Hagan, J. P. (1975). National self-sufficiency in food. *Food Policy*, 1(5): 355–66. doi: 10.1016/0306-9192(76)90071-3
- [24] Phalan B., Balmford A., Green R. E. & Scharlemann J. P. W. (2011). Minimising the harm to biodiversity of producing more food globally. *Food Policy*, 36, S62–S71. doi: 10.1016/j.foodpol.2010.11.008
- [25] Porkka, M., Kummu, M., Siebert, S. & Varis, O. (2013). From Food Insufficiency towards Trade Dependency: A Historical Analysis of Global Food Availability. *PLoS ONE*, 8, e82714. doi:10.1371/journal.pone.0082714
- [26] Pretty J. (2018). Intensification for redesigned and sustainable agricultural systems. *Science*, 362, eaav0294. doi: 10.1126/science.aav0294
- [27] Puma, M. J., Bose, S., Chon, S.Y. & Cook, B. I. (2015). Assessing the evolving fragility of the global food system. *Environmental Research Letters*, 10, 024007
- [28] Radela (2021). *Výsledky výkazu Potrav.* Retrieved Jan. 18, 2022, from www.radela.sk/Statistiky.html
- [29] Springmann M. et al (2018). Options for keeping the food system within environmental limits, *Nature*, 562, 519-25

Financial Instruments in Slovak Agriculture: Estimating Potential Multiplier Effect of Guarantees

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Abstract

The main objective of this paper is to estimate the multiplier effect of financial instruments in Slovak agriculture. Slovakia intends to implement guarantee schemes as one type of financial instruments (FIs) in the CAP programming period 2023-2027. FIs are modern, transparent and efficient form of support to cover investment needs of farmers. They combine the experience of commercial banks with the CAP subsidies, which are limited. FIs should cover the financing gap, which arose in Slovakia due to sub-optimal financing conditions for some types of farms. FIs can offer advantages for small and medium enterprises (SMEs), and farms, because they have similar difficulties with access to finance. In the first part of the paper, we evaluate the development of bank loans in Slovak agriculture over the period 2014-2020. Bank loans to farmers increased from 477,1 mil. EUR in 2014 to 900 mil. EUR in 2020. In the second part we describe the leverage effect of guarantees. Leverage effect is determined by multiplier, which depends on the guaranteed rate and guarantee cap rate. Based on these rates it is possible to determinate bank and guarantor's shares on default risk. With a proposed allocation of 150 mil. EUR of FIs in form guarantees in Slovakia in 2023-2027 (from CAP) and a multiplier of 5 it is possible to provide 750 mil. EUR in loans to farmers. Another 1 250 mil. EUR of bank loans could be provided to support agri-food sector. These loans will be supported by guarantees from Slovak state budget in volume 250 mil EUR. Use of guarantees is way, how to contribute to sustainability of farms and agri-food industry.

Keywords: financial instrument, bank loans, CAP, subsidies

JEL Classification: Q14, Q18, G21, G31, O13

1. Introduction

Bank loans play an important role in financing investments in agriculture. The largest provider of loans to agriculture worldwide is the World Bank (World Bank, 2005). There are several challenges and factors affecting the success of institutions providing financial services for agricultural activities (Andrews, 2006). Empirical analysis of rural credit market failure has been of key scientific and political interest (Petrick, 2005). Ciaian & Swinnen (2009) analysed the impact of subsidies on bank credit constraints, namely, that subsidies reduce the credit constraint, and thereby reduce inefficiencies in the economy. Pokrivčák (2002) analysed problems of Slovak farms with financing investments and bank loans during transition period. Most of the private farms in Slovakia cannot rely on bank credit. These farmers cannot get credit because they are high-risk customers of banks. Swinnen & Gow (1999) focused on potential roles of governments in solving some credit market failures through credit subsidies, loan guarantees and specialised agricultural lending institutions in Central and Eastern European countries. Financial market innovations have solved some of the credit market

problems. Currently, the preferred way to support access to finance are financial instruments (FIs).

In agriculture, public subsidies increase private investment, which otherwise are perceived too risky. Generally, there are several types of FIs. They have been implemented in CAP since 2000, but there are yet many barriers for their implantation in rural development policy (Wieliczko, 2019).

“FIs are increasingly important due to their leverage effect on the ESIF Funds, their capacity to combine different forms of public and private resources to support public policy objectives, and because revolving forms of finance make such support more sustainable over the longer term” (Regulation No 1303/2013 of the European Parliament and of the Council).

In the new CAP programming period 2023-2027, Slovakia plans to implement FIs in agriculture as a part of investment support to increase the efficiency of public funds. FIs can be targeted only in areas where a financial gap was identified. Financial gap is the mismatch between the higher demand for investment loans and the supply of commercial banks. In Slovakia FIs will be implemented through guarantees and investment grants connected with guarantees. Therefore, in the first part of our paper we focus on development of bank loans in Slovak agriculture and in the second part we describe the leverage effect of guarantees. Leverage effect is multiplying the amount of public funds and is an important advantage of FIs. We calculate the multiplier of guarantees and volume of loans, which is possible to provide based on 150 mil. EUR allocation planned in the new Common Agriculture Policy (CAP) in the period 2023-2027 in Slovakia.

#

2. Data and Methods

The main goal of the paper is to estimate the multiplier effect of guarantees that will be achieved by:

1. Analysis of available literature focusing on investments in agriculture, financing gap, FIs and their advantages for SMEs and for farms with focus on guarantees supported by public funds.
2. Analysis of bank loans in Slovak agriculture in period 2014-2020. We analysed the structure of loans divided into short term up to 1 year, long-term (1-5 years) and long term (over 5 years) by using data of National bank of Slovakia (NBS). Firstly, we calculated the share of agriculture loans (including forestry and fishing) to all loans of all sectors in 2014-2020 and then we compared this share with share of agriculture in total GDP in Slovakia (all sectors). GDP was calculated by production approach at current prices in period 2014-2020 by using data of Statistical Office of the Slovak Republic (SOSR).
3. Analysis of CAP Strategic plan 2023-2027 - SLOVAKIA
4. Quantification of multiplier of the capped portfolio guarantee instrument. *“The capped portfolio guarantee provides credit risk coverage to bank on a loan-by-loan basis, up to a guarantee rate, for the creation of a portfolio of new loans to SMEs up to a guarantee cap rate”* (Robino, 2016). In case of capped portfolio guarantee instrument it is possible by Robino (2016) to calculate the multiplier using formula:

$$\text{Multiplier} = \frac{1}{\text{guarantee rate}} * \frac{1}{\text{guarantee cap rate}} \quad (1)$$

3. Results and Discussion

3.1 Development of bank loans in Slovak agriculture

The EU's agricultural policy is a dynamic policy that responds to the new challenges faced by European agriculture. In recent years, the bioeconomy has also become the focus of EU level agricultural policies, which include agriculture and forestry. Farmers and foresters play an important role in developing the bioeconomy in Europe's rural communities. The bioeconomy is also linked to objectives in various areas, and one of them is to strengthen market orientation and increase competitiveness (Bioeconomy Cluster, 2020). Loans can be used by farmers to renew and modernize processing capacity, which will increase the competitiveness.

Slovakia has no experience with the use of financial instruments in agriculture. In the previous CAP programming period 2014-2020, financial needs associated with investments in agriculture were financed by farms (profit, depreciation, and another forms of equity) by subsidies or debt including bank loans or leasing.

Bank loans in agriculture increased significantly and doubled over the period 2014-2020 from 477.1 mil. EUR up to 900.6 mil. EUR. This increase was due to increased farm demand for bank loans, as well the willingness of banks to provide these loans. The trend in agriculture is in line with the overall increase in loans in Slovakia. The importance and share of agriculture in total bank loans increased from 1.14% to 1.35% (Table 1).

In general, the increase in bank loans may be related with expansion monetary policy of European central bank (ECB), which used in addition to traditional indirect instruments, non-traditional instruments, like quantitative easing. These instruments together have caused historically low interest rates that increase demand for loans. Unconventional monetary policy can support investment by reducing the incidence of credit restrictions, especially for large and old companies (Gómez, 2019).

Table 1: Bank loans in mil. EUR as of the end of the relevant year

	2014	2015	2016	2017	2018	2019	2020
Agriculture	477.1	543.2	650.3	712.4	746.1	913.3	900.6
All sectors	41 765.7	45 462.0	49 997.6	54 781.9	59 894.9	63 712.3	66 917.5
Share of Agriculture	1.14%	1.19%	1.30%	1.30%	1.25%	1.43%	1.35%

Source: own processing based on data of National Bank of Slovakia (NBS)

Note: Agriculture includes forestry and fishing

The share of agriculture in total GDP decreased over the period 2014-2020 (Table 2). This may seem positive, as the literature states that developed countries have a lower share of agriculture in total GDP than developing countries (Arendonk, 2015). However, the decrease in absolute figures from 2095.1 mil. EUR in 2014 to 1618.5 mil. EUR in 2020 is showing an overall negative trend in the performance of Slovak agriculture. The sector is stagnating due to the structure of farms and CAP support focusing on direct payments.

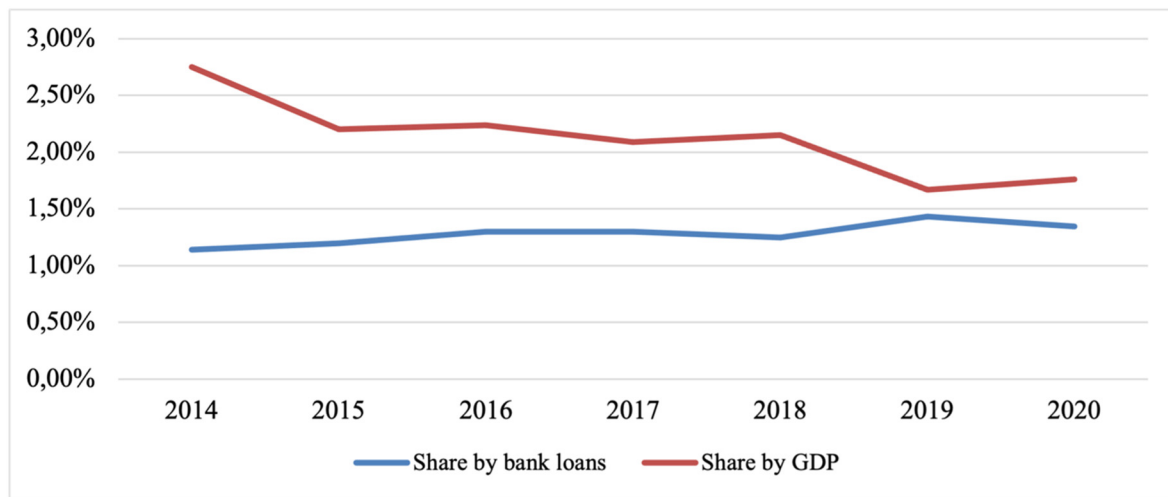
Table 2: GDP value Slovakia in mil. EUR as the end of the relevant year

	2014	2015	2016	2017	2018	2019	2020
Agriculture	2 095.1	1 755.9	1 818.4	1 765.4	1 922.6	1 568.2	1 618.5
GDP	76 092.7	79 888.2	81 014.3	84 442.9	89 430.0	94 048.0	92 079.3
Share of Agriculture	2.75%	2.20%	2.24%	2.09%	2.15%	1.67%	1.76%

Source: own processing according data of Statistical Office of the Slovak Republic (SOSR) calculated by production approach at current prices

Note: Agriculture includes forestry and fishing

A comparison of the share of agriculture in GDP and share of agriculture loans (including forestry and fishing) to all loans shows that, although agriculture contributes to GDP less, the share of loans for agriculture in total loans has slightly increased (Figure 1).


Figure 7: Share of agriculture in GDP and total bank loans

Source: Table 1, Table 2, own processing

Table 3 shows the structure of bank loans in Slovak agriculture. The structure was dominated by short-term loans with a maturity up to 1 year. Farms use these loans to bridge the timing mismatch between their short - term operating needs and collection of subsidies (in form of direct payments). Generally, subsidies are paid by Agricultural Paying Agency (APA) at the end of year. Banks usually use subsidies as a guarantee for loans. Long-term loans are important in terms of investment development. We can observe that their share in total farm loans is increasing, especially with maturity over 5 years. Their share was almost 50% in year 2020 while in 2014 the share was only 30.4%. The increase in the volume of loans significantly correlated with the implementation of the CAP II. pillar and measures related to investments. Banks also assessed the risks of investments and did co-finance investment projects of farmers. Investment activities of farmers were significantly fluctuating over time due to irregularity of calls related to investment measures of CAP in Slovakia (Ministry of Agriculture and Rural Development of the Slovak Republic, 2022). The literature asserts a positive relationship between investment grants and productivity of credit constraint firms (Ciaian, Falkowski & Kancs, 2012). Investment grants may provide an additional source of finance in non-repayable forms or indirectly through the improved access to bank loans.

Table 3: Structure of bank loans in Slovak agriculture in mil. EUR as of the end of the relevant year

	2014	2015	2016	2017	2018	2019	2020
short term (to 1 year)	239.9	272.9	274.9	286.4	306.1	343.5	304.2
long term (1-5 years)	92.2	102.0	146.2	170.8	170.6	207.4	158.2
long term (over 5 years)	144.9	168.3	229.2	255.3	269.4	362.4	438.1
short term (to 1 year)	50.3%	50.2%	42.3%	40.2%	41.0%	37.6%	33.8%
long term (1-5 years)	19.3%	18.8%	22.5%	24.0%	22.9%	22.7%	17.6%
long term (over 5 years)	30.4%	31.0%	35.2%	35.8%	36.1%	39.7%	48.6%

Source: own processing according data of National Bank of Slovakia (NBS)

3.2 Guarantees as form of FIs in Slovak agriculture

The guarantee is “A written commitment to assume responsibility for all or part of a third party's debt or obligation or for the successful performance by that third party of its obligations if an event occurs which triggers such guarantee, such as a loan default.” (European Commission, 2014).

Kulawik, Wieliczko & Soliwoda (2018) state some quantitative and qualitative advantages of FIs compared to subsidies. To quantitative advantages belong the multiplier effect (only credit guarantees), the leverage effect and the revolving effect. Qualitative include increasing the potential for some firms with low credit rating.

The leverage effect – “the leverage effect of Union funds shall be equal to the amount of finance to eligible final recipients divided by the amount of the Union contribution” (Commission Delegated Regulation (EU) No 1268/2012). In many publications is multiplier effect used as a synonym to leverage effect. Multiplier effect was formalized by John Maynard Keynes in the 1930s. The concept is now universally accepted among economists and applies to changes in exogenous demand for any industry's output (Rusu & György, 2011).

In case of guarantees it is important how the risk is shared between bank and guarantor. Risk sharing can be at the individual loan level (guarantee rate), or at the level of the portfolio, when losses on individual loans are paid to the bank within a total limit, then we speak about a capped portfolio guarantee instrument (fi-compass, 2019).

Bank's and guarantor's shares on default risk size is determined by guaranteed rate, guarantee cap rate and total loans' amount (Figure 2). The guarantee cap rate is determined in ex ante risk assessment (it is not equal the ex-ante analysis for implementation of FIs in a given country). By the default of loan, the bank asks for payment of the guarantee at the rate agreed, but the bank will recover debts from the debtor. Recovered amounts will be shared between bank and guarantor as per the risk sharing agreements.

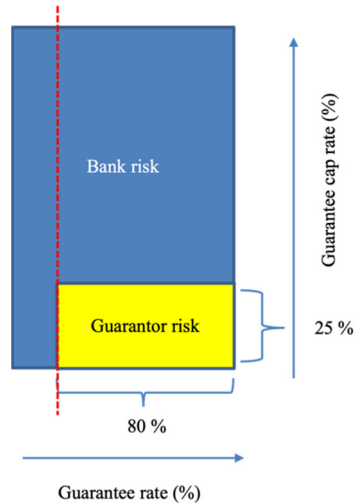


Figure 8: Portfolio of new Loans

Source: own processing according to Robino, 2016

The minimum multiplier of guarantees as form of FIs is 5, which we can calculate:

$$\text{Multiplier} = \frac{1}{\text{guarantee rate}} * \frac{1}{\text{guarantee cap rate}} = \frac{1}{0,8} * \frac{1}{0,25} = 5$$

According to the lending police of Commission Implementing Regulation (CIR) 964/2014 portfolio has include new loans (no refinancing) up to EUR 1.5 mil. EUR with maturity 1 to 10 years.

In the proposed CAP Strategic plan for period 2023-2027 – SLOVAKIA wants to implement FIs for farmers. One of the components will focus on guarantees. The proposal states that investments will be supported also by using of modern FIs. FIs can increase time flexibility, transparency of support and reduce administrative burdens, too. The use of FIs should contribute to the competitiveness growth of Slovak farmers. The investments should be supported by 340 mil. EUR, and of that 278.7 mil. EUR in form of FIs. The following FIs are proposed:

1. FIs in form of the guarantees in volume 150 mil. EUR, which represents 30 mil. EUR per year.
2. FIs in forms investment grants connected with guarantees in volume 128.7 mil. EUR, which means 25.74 mil. EUR per year. In this case, the investment grants are meant in the form of interest subsidies or forgiveness of part of the principal in bank loans.

According to the CAP Strategic plan for period 2023-2027 Slovakia are eligible final recipients:

1. All business entities operating in agriculture (farming agricultural land or keeping live animals or processing their own crop or livestock production), including entities established for cooperation in the field of storage, production of goods, sale of goods.
2. All entities starting a business in agriculture.
3. Producer organizations (recognized according to EU and Slovak legislation).

Common condition for all final recipients: entities keep simple or double entry bookkeeping.

In Slovakia is planned to implement capped portfolio guarantee instrument (with guarantee rate 80% for losses on individual loans), with multiplier 5. With an allocation of 150 mil. EUR in FIs in form guarantees, it will be possible to provide 750 mil. EUR new loans for farms in 5 years. These new loans could cover an estimated a financial gap in Slovak agriculture. It is estimated between 140 and 316 mil. EUR annually. Small farms (up to 20 ha) have up to 60% share in the financial gap. The financial gap of young farmers is between 25.3 and 110.4 mil. EUR (fi-compass, 2020). The total support of investment is planned 878.7 mil. EUR (150*5 +128,7 mil. EUR).

A similar FI is also prepared to support agri-food sector in Slovakia. It will be covered from state budget in total amount of 250 mil. EUR (25 mil. EUR annually). Providing of loans will take place over a period of 10 years (2022-2031). The guarantee will cover 20% of the amount of provided loans with 80% guarantee rate for each loan and is expected to also have a multiplier effect 5 and generate new bank loans in volume 1 250 mil. EUR. The loans will be used for the renewal and modernization of food processing. Government aims on increase the competitiveness of the sector and bring more Slovak food oh shelves of retailers (Ministry of Agriculture and Rural Development of the Slovak Republic, 2022).

In addition to the leverage effect caused by the multiplier, guarantees also have a revolving effect. To calculate this revolving effect, it is important to estimate first the multiplier and other determinants like level of default loans and recovery rate of these default loans. We will focus on revolving effect in our other research.

4. Conclusion

FIs are modern, transparent and efficient form of support of investment needs of enterprises, which can be used for farms to increase their access to finance and cover investments need. There are several forms of FIs, like grants, equity, debt, guarantees. Guarantees combine the experience of commercial banks with the limited EU funds and can bring many advantages for farmers. The demand for finance is increasing in Slovak agriculture. Volume of loans did double over 7 years and agriculture is an interesting sector for banks. This is confirmed also by the increasing share of bank loans for agriculture in total bank loans. On the other hand, the share of agriculture in total GDP is decreasing. The banks usually have used volume of direct payments as the guarantee.

Guarantees as one form of FIs are intended for farmers, who have no access to bank loans. They are intended for small, young and new farmers. These farmers have the highest financing gap in Slovakia. The using of guarantees is way, how to contribute to sustainability of farms and agri-food industry. Guarantees are agreement between guarantor and banks. Important part of this agreement is their risk sharing. Risk sharing can by at the individual loan level (guarantee rate), or at the level of the portfolio, when losses on individual loans are paid to the bank within a total limit. Such an FI is called a capped portfolio guarantee instrument. In the new CAP programming period Slovakia plans to implement such a FI with total allocation of 150 mil. EUR in form of guarantees EUR. With multiplier 5.00 it is possible to provide 750 mil. EUR in new loans in period 2023-2027. Similarly, Slovak government will support agri-food sector with additional loan volume 1 250 mil. EUR until 2031. These loans could cover a major part of the financing gap in Slovak agri-food sector.

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References

- [1] Agricultural Paying Agency in Slovakia (2021). *Program Implementation*. Retrieved from <<https://www.apa.sk/sumarne-prehlady-1>>
- [2] Andrews, M. (2006). *Microcredit and agriculture: How to make it work. MEDA (Mennonite Economic Development Associates)*. Retrieved from <https://www.findevgateway.org/sites/default/files/publications/files/mfg-en-paper-microcredit-and-agriculture-how-to-make-it-work-2006_0.pdf>
- [3] Arendonk, A.V. (2015). *The development of the share of agriculture in GDP and employment : a case study of China, Indonesia, the Netherlands and the United States*. Retrieved from <[https://edepot.wur.nl/342795#:~:text=5\)%20Developed%20countries%3A%20Agriculture%20employs,GDP%20and%20employment%20is%20presented](https://edepot.wur.nl/342795#:~:text=5)%20Developed%20countries%3A%20Agriculture%20employs,GDP%20and%20employment%20is%20presented)>
- [4] Bioeconomy Cluster (2020). *Príspevok slovenského biohospodárstva k strategickému plánu SPP 2021-2027*. Retrieved from <<https://bioeconomy.sk/wp-content/uploads/2020/01/Pr%C3%ADspevok-slovensk%C3%A9ho-biohospod%C3%A1rstva-k-SP-SPP-2021-2027-1.pdf>>
- [5] Ciaian, P. & Swinnen, J. F. M. (2009). Credit market imperfections and the distribution of policy rents. *American Journal of Agricultural Economics*, 91(4), 1124-1139. doi: 10.1111/j.1467-8276.2009.01311.x
- [6] Ciaian, P., Falkowski, J., Kancs, D. (2012). Productivity and Credit Constraints: A Firm Level Propensity Score Evidence from Agricultural Farms in Central and East European Countries. *Acta Oeconomica*, 62(4), 459–487. doi: 10.1556/AOecon.62.2012.4.3
- [7] Commission Delegated Regulation (EU) No 1268/2012 of 29 October 2012 on the rules of application of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union. (2012). Official Journal, L 362, 1-111. CELEX: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R1268\[legislation\]](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R1268[legislation])
- [8] Commission Implementing Regulation (EU) No 964/2014 of 11 September 2014 laying down rules for the application of Regulation (EU) No 1303/2013 of the European Parliament and of the Council as regards standard terms and conditions for financial instruments. (2014). Official Journal, L 271, 16-44. CELEX: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0964\[legislation\]](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014R0964[legislation])
- [9] European Commission (2014). *Guidance for Member States on Financial Instruments – Glossary*. Luxembourg: Publications Office of the European Union, 2014. ISBN: 978-92-79-35487-8
- [10] European Investment Bank (2014). *Ex-ante Assessment Methodology for Financial Instruments in the 2014-2020 Programming Period. Enhancing the Competitiveness of SME, Including Agriculture, Microcredit and Fisheries* (Thematic Objective 3), Volume III. doi: 10.2776/81801
- [11] fi-compass (2020). *Financial needs in the agriculture and agri-food sectors in Slovakia*. Study report. 72 pages. Retrieved from <https://fi-compass.eu/sites/default/files/publications/financial_needs_agriculture_agrifood_sectors_Slovakia.pdf>
- [12] fi-compass (2019). *Debt finance and use of credit guarantee instruments for agricultural enterprises in the EU*. Retrieved from <https://www.fi-compass.eu/sites/default/files/publications/Debt%20finance%20and%20use%20of%20credit-updated_final_web.pdf>
- [13] Gómez, M.G.P (2019). Credit constraints, firm investment and employment: Evidence from survey data. *Journal of Banking & Finance*, 99, 121-141. doi: 10.1016/j.jbankfin.2018.11.016
- [14] Kulawik, J., Wieliczko, B., & Soliwoda, M. (2018). Is There Room for Instruments in the Common Agricultural Policy? Casus of Poland. *The Common Agricultural Policy of the European Union – the present*

- and the future EU Member States point of view. no 73.1, IAFE-NRI (pp. 34-42), Warsaw, Poland 2018. doi: 10.30858/pw/9788376587431.3
- [15] Ministry of Agriculture and Rural Development of the Slovak Republic (2022). *CAP Strategic plan for the period 2023-2027 - Slovakia*. Retrieved from <<https://www.mpsr.sk/download.php?fID=21357>>
- [16] Ministry of Agriculture and Rural Development of the Slovak Republic (2021). *Ministerstvo pôdohospodárstva pripravilo ďalší nástroj na podporu výrobcov slovenských potravín*. Retrieved from <https://www.mpsr.sk/aktualne/ministerstvo-podohospodarstva-pripravilo-dalsi-nastroj-na-podporu-vyrobcovslovenskychpotravin/17284>
- [17] National Bank of Slovakia (2022). *Loans statistics*. Retrieved from <<https://www.nbs.sk/en/statistics/financialinstitutions/banks/statistical-data-of-monetary-financial-institutions/loans>>
- [18] Petrick, M. (2005). Empirical measurement of credit rationing in agriculture: A methodological survey. *Agricultural Economics*, 33(2), 191-203. doi: 10.1111/j.1574-0862.2005.00384.x
- [19] Pokrivčák, J. (2002). Agricultural credits and contracts. *Agricultural Economics*, 48(5), 215-218. doi: 10.17221/5305-AGRICECON
- [20] Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund and laying down general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund and the European Maritime and Fisheries Fund and repealing Council Regulation (EC) No 1083/2006. (2013). . Official Journal, L 347, 320-469. CELEX: [https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013R1303\[legislation\]](https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32013R1303[legislation])
- [21] Robino, B. (2016). *How does a guarantee scheme work?* [PowerPoint slides]. European Investment Bank. Retrieved from <https://www.fi-compass.eu/sites/default/files/publications/Bruno_Robino_How_does_a_Guarantee_scheme_work_0.pdf>
- [22] Rusu, S. & György, O. (2011). Tourism multiplier effect. *Journal of Economics and Business Research*. XVII, No.1, 70-76. XVII. ISSN: 2068-3537
- [23] Statistical Office of the Slovak Republic (2022). GDP by production approach at current prices [statistics]. Retrieved from DATAcube.
- [24] Swinnen, J. F. M. & Gow, H. (1999). Agricultural Credit Problems and Policies during the Transition to a Market Economy in Central and Eastern Europe. *Food Policy*, 24(1), 21–47. doi: 10.22004/ag.econ.31887
- [25] Wieliczko, B. (2019). Financial instruments—a way to support sustainable development of the EU rural areas? Case of Poland. *Studia Ekonomiczne*, 382, 214-229. ISSN 2083-8611
- [26] World Bank (2005). *Agriculture Investment Sourcebook: Agriculture and Rural Development*. Washington, D.C. : World Bank Group. Retrieved from <<http://documents.worldbank.org/curated/en/633761468328173582/Agriculture-investment-sourcebook>>

Slovak Agri-trade Competitiveness

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Abstract

This article aims to determine the competitiveness of Slovak agri-food products. The article applied a comparative advantage (RCA) index and Lafay Index (LFI). The monitoring period was from 2011 to 2020. The Slovak Republic has long been competitive in trade in live animals, cereals, and oilseeds. Of food products, we are only competitive in sugar and confectionery, milk products and malt, as well as in milk and dairy products and cocoa products. Exports are dominated by lower value-added products, with higher value-added products predominating on the import side. This is ultimately reflected in the ever-deepening passive trade balance of the Slovak Republic in trade in agricultural and food products. Slovakia has a trade structure oriented on trade flows of old EU members. These interpretations provide policymakers with information on Agri-trade competitiveness.

Keywords: agri-trade, competitiveness, export, import, balance

JEL Classification: Q17, F19, F41

1. Introduction

Historically, the term competitiveness has been used primarily to link with the cost position of firms or countries. Reasons for losing competitiveness focus on wages as the main cost component, but they also extend to high energy prices and taxes. Later, competitiveness came to be seen as more than an accounting result comparing costs and revenues at one point in time. A wide interpretation of the term evaluates the sources of competitiveness of firms and countries as well as their outlook. Competitiveness was initially measured using trade or current account balances, with deficit countries judged to be uncompetitive wrote Aiginger, Bärenthaler - Sieber and Vogel (2013).

The agricultural sector's competitiveness, which in general is protected in developed countries, is monitored given the potential consequences if protection is reduced. Competitiveness can be defined as the ability to face competition and to be successful when facing competition. Competitiveness would then be the ability to sell products that meet demand requirements (price, quality, quantity) and, at the same time, ensure profits over time that enable the firm/sector to thrive. Trade theory suggests that a nation's competitiveness is based on the concept of comparative advantage. Conceptualized by Ricardo and the Heckscher-Ohlin model, comparative advantage postulates that trade flows result from differences in production costs among countries and that a country will specialize in the production of goods in which it has a cost advantage (Latruffe, 2010).

2. Data and Methods

There are several methods and indices available to assess competitiveness. To complete the analysis of the development of agri-food foreign trade of the Slovak Republic, the indicator of

comparative advantages- RCA, due to the availability of data and unambiguous interpretation of results with good explanatory power, the indicator of comparative advantages (Revealed Comparative Advantage) index was used. It is the most used easily interpretable indicator with a good telling ability. It is particularly suitable for assessing the competitiveness of agri-food trade (commodities, group of commodities) of one country vis-à-vis another.

$$RCA = \ln ((x / m) / (X / M)) \quad (1)$$

where: x - export of the relevant commodity,

m - import of the relevant commodity,

X - total agri-food exports,

M - total agri-food imports.

If the RCA value is greater than zero, the relevant commodity (sector) is at a comparative advantage; if the RCA value is less than zero, the relevant commodity is at a comparative disadvantage. If the RCA value is zero, this is neither a comparative advantage nor a disadvantage. If the Slovak Republic is a net importer of a certain commodity, in the table summaries it is marked with the symbol "D", net exports with the symbol "V" and if the given commodity was not traded, the symbol "..." is used for the designation (Serenčėš & Gálík, 2012).

Identification of competitive commodities in foreign markets based on the Lafay index (LFI):

$$LFI_j^i = \left(\frac{X_j^i - M_j^i}{X_j^i + M_j^i} - \frac{\sum_{j=1}^N (X_j^i - M_j^i)}{\sum_{j=1}^N (X_j^i + M_j^i)} \right) * \frac{X_j^i + M_j^i}{\sum_{j=1}^N (X_j^i + M_j^i)} * 100 \quad (1)$$

where:

X_{ij} - export of country "i" in commodity group "j"

M_{ij} - import of country "i" in commodity group "j"

N - number of analysed commodity groups,

whereas the sum of the LFI index for all analysed commodity groups is equal to zero,

$$\sum_{j=1}^N LFI_j^i = 0. \quad (1)$$

The Lafay index can be divided into three basic components (Burianova & Belova, 2012):

$$LFI_1 = \frac{X_j^i - M_j^i}{X_j^i + M_j^i} \quad (1)$$

$$LFI_2 = \frac{\sum_{j=1}^N (X_j^i - M_j^i)}{\sum_{j=1}^N (X_j^i + M_j^i)} \quad (2)$$

$$LFI_3 = \frac{X_j^i + M_j^i}{\sum_{j=1}^N (X_j^i + M_j^i)} \quad (3)$$

then:

$$LFI = (LFI_1 - LFI_2) * LFI_3 * 100 \quad (4)$$

- LFI1 - measures net exports for given commodities by the turnover of these commodities. This relationship is known as the Ballass RCA index.
 - LFI2 - compares total net exports (sum of all analysed commodities) to their total turnover. The difference of the first two components acquires a positive value if $LFI1 > LFI2$, which means that the RCA index of a given commodity is greater than the RCA index of the sum of all monitored commodities.
 - LFI3 - adjusts the value in parentheses. It expresses the share of a given commodity in the total turnover.
- A positive LFI index indicates the existence of comparative advantage of a commodity or commodity aggregation.
- A negative value of the LFI index signals that specialization and therefore also a comparative advantage does not exist (Zaghini, 2005).

We obtained data for the sections and chapters of Agri-trade of the Common Customs Tariff from the Statistical Office of the Slovak Republic. The reference period is 2011 to 2020.

3. Results and Discussion

The basic motivation of all companies is the development of business activities. The research results show that the main reasons for the operation of Slovak agri-food companies on the foreign market are:

- the company's management is interested in territorial expansion,
- insufficient demand on the domestic market,
- foreign market demand,
- growth of competition on the domestic market,
- efforts to build a promising market position abroad,
- the existence of a branch or production plant abroad and the adoption of "internationalization" as a current trend in a globalizing world,
- the company's involvement in the business network of internationally cooperating companies and ambition to establish itself in foreign markets (Horská et al., 2008).

Bojnec & Ferto (2009) found that higher and more stable comparative trade advantages are found for bulk primary raw agricultural commodities and less for consumer-ready foods, implying competitiveness shortcomings in food processing.

Bojnec & Ferto (2012) found that Central European countries experienced a more significant number of products with relative trade disadvantages and greater significance of one-way imports.

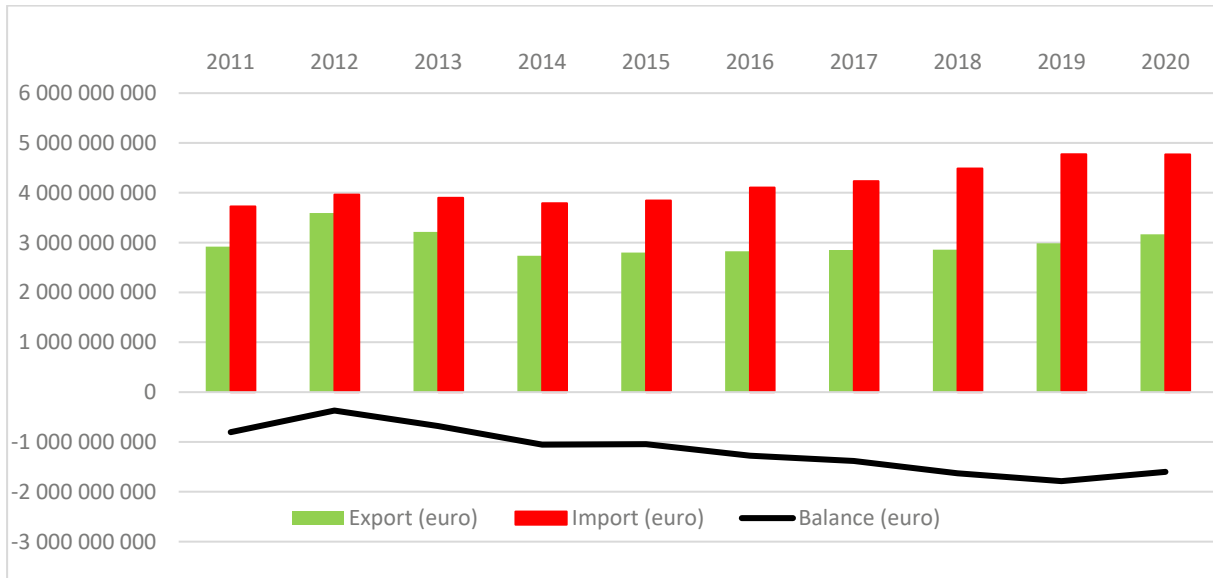


Figure 1: Basic characteristics of Slovak Agri-trade in Euro

Source: Statistical Office of the Slovak Republic

In the monitored period, Slovak Agri-trade is in deficit with a growing tendency. It can be seen from the graph that in 2012 higher exports are compared to other years. Based on Intrastat suspicions, export companies were investigated for fictitious exports of oils, oilseeds, sugar, and fats. After the investigation, the data in Chapters 12, 15 and 17 were even increased.

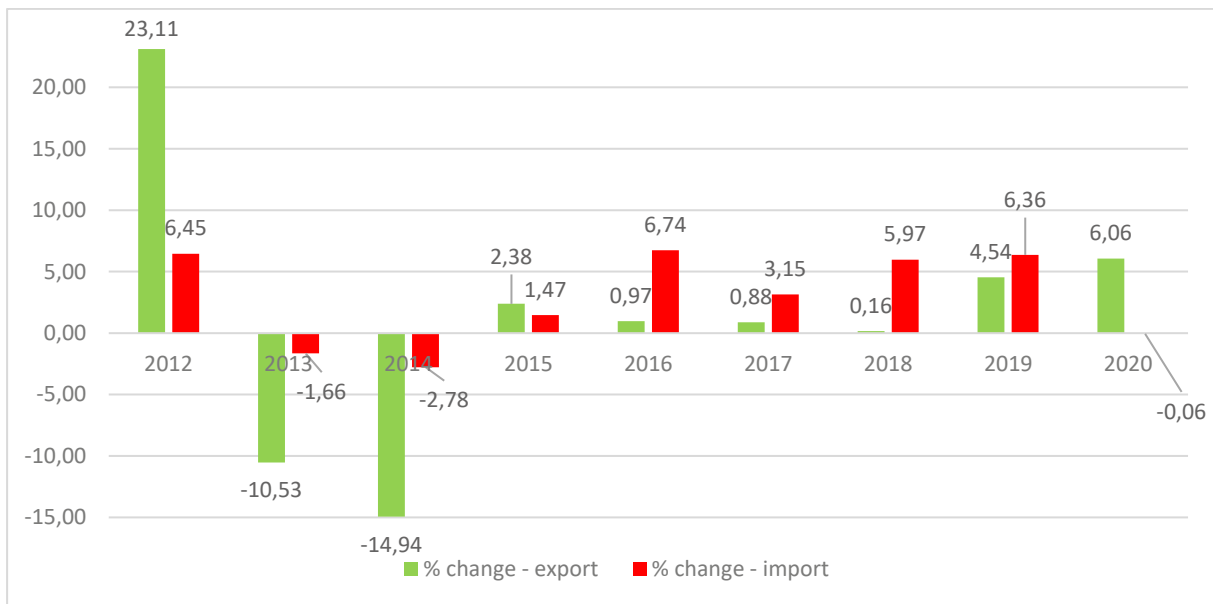


Figure 2: Year-on-year change in Agri-exports and Agri-imports in %

Source: Statistical Office of the Slovak Republic + own calculation

In the years 2015 to 2019, the import of Slovak agribusiness grew faster year-on-year than exports. In 2020, imports reached 4.77 billion Euros and exports 3.17 billion Euros. The value of imports represents the amount that Slovaks paid for agri-food produced abroad. This amount is far from being a commodity designed to diversify consumption. These are mainly foods that we can produce at home. The EU's carbon footprint is strong and contributes to environmental degradation. It might be appropriate to review the agricultural policy-making frameworks and

give stronger support to the local economy and local producers. This would help Slovakia to develop this sector evenly, use the potential of production factors and gradually reduce the value of imports. It would also have a strategic dimension.

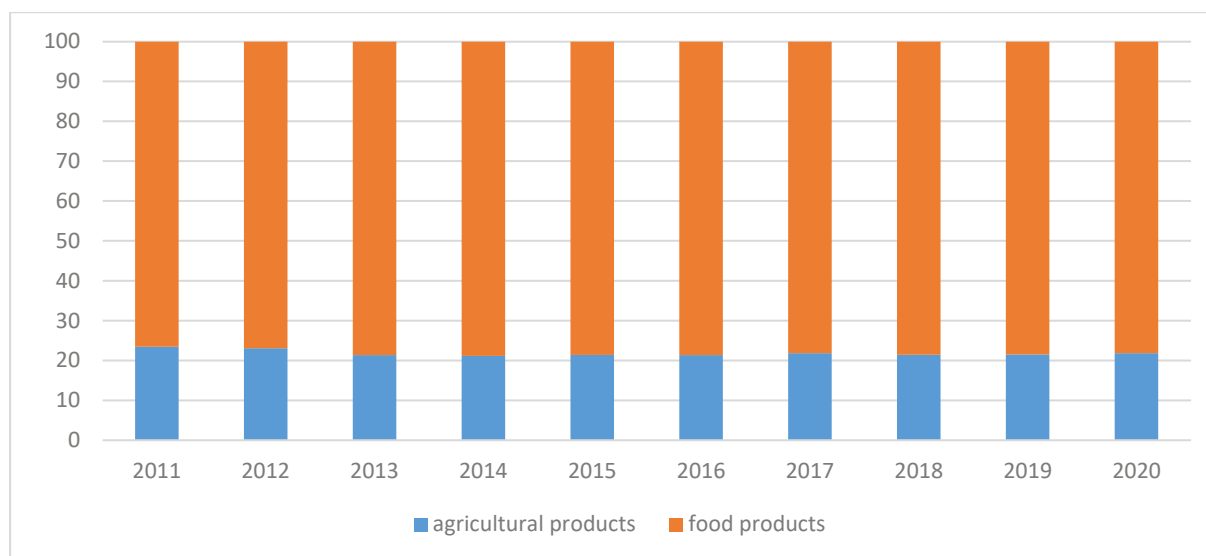


Figure 3: Share of Agricultural and Food products in Agri-imports in %

Source: Statistical Office of the Slovak Republic + own calculation

Agri-import to the Slovak Republic is mainly represented by food (almost 80%), commodities with higher added value processed abroad.

In 2011, sugar and confectionery (12.95%) accounted for Agri-exports; oil seeds and oleaginous fruits, straw, fodder (11.72%); cereals (10.27%) and milk, eggs, honey, and products (9.28%). In 2011, meat and edible meat offal accounted for the largest share in Agri-imports (10.55%); milk, eggs, honey, and products (7.75%); beverages, spirits, and vinegar (7.72%) and animal and vegetable fats (6.98%). In 2020, grain chapters accounted for Agri-exports (12.8%); miscellaneous food preparations (10.49%); milk, eggs, honey, and products (8.41%) and cocoa and cocoa preparations (7.96%). The following chapters of the tariff on meat and edible meat offal contributed the most to Agri-imports in 2020 (11.41%); milk, eggs, honey, and products (8.69%); beverages, spirits, and vinegar (8.37%) and miscellaneous food preparations (7.98%).

Table 1: RCA

Code	Item name	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	live animals	1,03	0,64	0,91	1,36	1,37	1,39	1,24	1,16	1,22	1,06
02	meat and edible meat offal	-0,86	-0,76	-0,81	-0,72	-0,83	-0,97	-1,38	-0,97	-0,94	-1,36
03	fish and shellfish	-0,92	-2,12	-1,17	-0,91	-1,98	-1,96	-1,85	-1,69	-1,65	-1,73
04	milk, eggs, honey, and products	0,18	0,07	0,13	0,24	0,21	0,14	0,11	0,18	0,12	-0,03
05	products of animal origin	-0,46	-0,80	-0,74	0,17	0,25	-0,27	-0,11	0,14	0,08	-0,03
06	live plants and floricultural products	-1,39	-1,57	-1,28	-0,98	-1,05	-1,15	-1,11	-1,05	-1,09	-1,09
07	edible vegetables, roots, and tubers	-1,57	-1,32	-1,68	-1,49	-1,44	-1,49	-1,46	-1,38	-1,21	-1,32
08	edible fruits and nuts	-1,05	-1,16	-0,91	-1,00	-1,04	-1,05	-0,97	-0,88	-0,88	-1,01
09	coffee, tea, and spices	-0,05	0,08	-0,13	-0,13	0,07	0,23	0,36	0,29	0,48	0,43
10	grain	0,91	0,93	1,19	1,51	1,57	1,89	1,78	1,51	1,43	1,88

11	mill products, malt, starches	1,39	1,33	1,48	1,55	1,51	1,51	1,31	1,33	1,30	1,34
12	oil. seeds and fruits, straw, fodder	1,19	1,25	2,01	1,06	1,16	1,09	1,18	1,38	1,42	1,20
13	shellac, rubber, resin	-2,06	-2,16	-1,90	-2,42	-1,91	-2,68	-2,04	-1,18	-1,73	-1,74
14	vegetable knitting materials	-0,54	-0,33	-0,81	-2,00	-4,37	-4,58	-4,66	-1,25	-0,69	-0,92
15	animal and vegetable fats	-0,24	-0,02	-0,03	-0,12	-0,12	-0,08	-0,43	-0,24	-0,60	0,30
16	meat and fish preparations	-0,83	-0,86	-0,81	-0,45	-0,37	-0,40	-0,35	-0,30	-0,32	-0,45
17	sugar and confectionery	0,74	0,77	0,92	1,00	1,23	1,11	1,26	1,15	1,22	1,15
18	cocoa and cocoa preparations	0,37	-0,04	-0,01	0,15	0,18	0,18	0,21	0,24	0,23	0,29
19	preparations of cereals, milk	-0,66	-0,72	-0,55	-0,45	-0,52	-0,45	-0,30	-0,34	-0,26	-0,32
20	preparat. of vegetables, fruits, plants	-0,68	-0,89	-0,89	-0,91	-0,68	-0,58	-0,43	-0,50	-0,67	-0,89
21	various food preparations	-0,30	-0,51	-0,38	-0,28	-0,20	-0,10	-0,03	0,05	0,28	0,27
22	drinks, spirits, and vinegar	-0,22	-0,18	-0,45	-0,41	-0,35	-0,41	-0,43	-0,43	-0,28	-0,30
23	residues and waste, feed	-0,35	-0,42	-0,25	-0,21	-0,33	-0,26	-0,36	-0,21	-0,24	-0,33
24	tobacco, substitutes	-2,08	-3,09	-2,55	-3,23	-3,77	-2,82	-2,81	-2,54	-3,03	-2,35

Source: Statistical Office of the Slovak Republic + own calculation

Its unfavourable commodity structure has been deepening in the agri-food foreign trade of the Slovak Republic for a long time. It is reflected in the high share of agricultural raw materials on the export side and processed food products dominate on the import side. During the period under review, agricultural raw materials accounted for an average of up to 32.8% of the total value of agri-food exports. On the other hand, food products accounted for an average of up to 78.2% of the value of total agricultural imports. The unfavourable commodity structure was also reflected in the assessment of the competitiveness of Slovak agri-food commodities (Table 1). The Slovak Republic has long been competitive in trade in live animals, cereals, and oilseeds. Of food products, we are only competitive in sugar and confectionery, milk products and malt, as well as in milk and dairy products and cocoa products. As a result of the growth in the consumption of cheese and butter, which was rehabilitated by their increased imports, the Slovak Republic lost a competitive advantage within the entire chapter of milk, eggs, honey, and their products. On the contrary, we record a positive development in the chapter coffee, tea, and spices. Although these are mostly commodities of an irreplaceable nature, the increase in production and thus in the export of coffee is constantly increasing the comparative advantage of the entire commodity group.

The unfavourable commodity structure of the agri-food foreign trade of the Slovak Republic can be assessed more clearly based on the RCA indicator in individual product verticals. Within the meat vertical, we are only competitive with live livestock. It is a basic raw material for the meat industry with low added value. At the same time, we have long achieved a comparative disadvantage with meat products (Ch 16) and especially meat (Ch 02). In terms of the trade balance, the deteriorating situation in the meat trade is striking.

Table 2: LFI

Code	Item name	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01	live animals	1,79	1,35	2,12	2,69	2,42	2,47	2,54	2,00	1,88	1,58
02	meat and edible meat offal	-3,00	-2,68	-2,84	-2,46	-2,60	-3,11	-4,12	-3,56	-3,58	-4,07
03	fish and shellfish	-0,30	-0,42	-0,42	-0,44	-0,57	-0,53	-0,51	-0,51	-0,50	-0,48
04	milk, eggs, honey, and products	0,75	0,25	0,62	1,17	0,94	0,59	0,50	0,81	0,50	-0,13
05	products of animal origin	-0,10	-0,18	-0,16	0,05	0,09	-0,06	-0,03	0,05	0,02	-0,01
06	live plants and floricultural products	-0,54	-0,60	-0,52	-0,43	-0,44	-0,52	-0,51	-0,54	-0,57	-0,59
07	edible vegetables, roots, and tubers	-2,03	-1,59	-1,99	-1,90	-2,02	-2,11	-1,99	-1,90	-2,06	-2,11
08	edible fruits and nuts	-1,85	-1,98	-1,93	-2,11	-2,29	-2,44	-2,19	-2,01	-2,01	-2,30
09	coffee, tea, and spices	-0,12	0,20	-0,29	-0,29	0,22	0,66	0,80	0,63	0,93	0,71
10	grain	3,02	2,56	2,78	4,00	4,70	5,08	4,78	3,62	3,46	5,20
11	mill products, malt, starches	1,66	1,49	1,74	1,63	1,58	1,62	1,48	1,53	1,54	1,49
12	oil, seeds and fruits, straw, fodder	4,01	5,14	5,34	2,26	2,13	2,07	2,46	2,94	2,54	2,32
13	shellac, rubber, resin	-0,09	-0,10	-0,11	-0,14	-0,16	-0,18	-0,16	-0,10	-0,17	-0,14
14	vegetable knitting materials	-0,01	0,00	0,00	-0,01	-0,01	-0,01	-0,01	-0,01	0,00	-0,01
15	animal and vegetable fats	-0,73	-0,09	-0,10	-0,35	-0,29	-0,17	-0,63	-0,37	-0,70	0,59
16	meat and fish preparations	-1,19	-1,13	-1,22	-0,83	-0,74	-0,80	-0,73	-0,62	-0,68	-0,96
17	sugar and confectionery	3,33	4,06	3,48	2,88	2,69	2,29	2,79	2,17	2,38	2,09
18	cocoa and cocoa preparations	0,94	-0,09	-0,04	0,47	0,60	0,70	0,75	0,82	0,74	0,96
19	preparations of cereals, milk	-1,40	-1,43	-1,26	-1,06	-1,34	-1,17	-0,79	-0,88	-0,72	-0,93
20	preparat. of vegetables, fruits, plants	-0,87	-1,04	-1,08	-1,10	-0,93	-0,80	-0,64	-0,70	-0,86	-1,12
21	various food preparations	-0,79	-1,13	-1,01	-0,80	-0,62	-0,31	-0,10	0,19	1,17	1,21
22	drinks, spirits, and vinegar	-0,74	-0,54	-1,34	-1,35	-1,17	-1,35	-1,40	-1,52	-0,98	-1,03
23	residues and waste, feed	-0,56	-0,73	-0,46	-0,45	-0,63	-0,48	-0,63	-0,38	-0,44	-0,60
24	tobacco, substitutes	-1,20	-1,34	-1,31	-1,43	-1,56	-1,45	-1,66	-1,68	-1,91	-1,68

Source: Statistical Office of the Slovak Republic + own calculation

We record the highest values of the RCA index for grain. Even in mill products, thanks to significant malt exports, we are competitive in foreign markets. However, for final products with higher added value, such as cereal products (Ch 19) as well as feed (Ch 23), the situation is the opposite with a significant negative impact on our trade balance. We also achieve a comparative advantage in another commodity group of agricultural raw materials, which is oilseeds. Even in this product vertical, we are not able to transform it into final food products (Ch 15).

The worst situation is within the vertical of fruits and vegetables. The Slovak Republic is not competitive not only in processed fruit and vegetable products (Ch 20) but also in fresh vegetables and fruit (Ch 07 and 08). However, with fresh vegetables and fruits, the unfavourable situation is also due to the number of their species, which cannot be produced in our natural conditions. At the same time, in the off-season, it is economically more advantageous to import them from countries with more suitable climatic conditions. In terms of trade balance developments, the deepening comparative disadvantage in processed fruit and vegetable food products is striking.

We also verified the achieved results by means of the Lafay index (Table 2). The Lafay index is a more comprehensive indicator of competitiveness assessment and has fully confirmed and highlighted the unfavourable developments identified by the RCA. In terms of comparative advantages in individual product verticals, he further highlighted the differences in the competitiveness of agricultural raw materials and food products. The results of the Lafay index reveal unfavourable and worrying trends in the development of comparative advantages in the agri-food foreign trade of the Slovak Republic. We have identified only 7 commodity groups within which the Slovak Republic has a comparative advantage. It is evident from the results that in up to 4 commodity groups (live animals, milk and dairy products, oilseeds, sugar, and confectionery) the Slovak Republic is gradually losing comparative advantages on world markets. On the other hand, only in cereals and, more recently, in coffee and spices, the Slovak Republic is strengthening its position in foreign markets. This development, combined with deepening comparative disadvantages within up to ten chapters of the HS, does not provide a precondition for reducing the value of the deficit balance of agri-food foreign trade.

4. Conclusion

The analysis of the agri-food foreign trade of the Slovak Republic through the indicators of comparative advantages confirms the long-term unfavourable commodity structure of our trade. Exports are dominated by lower value-added products, with higher value-added products predominating on the import side. This is ultimately reflected in the ever-deepening passive trade balance of the Slovak Republic in trade in agricultural and food products. It is evident that if the efficiency and effectiveness of the food industry do not increase, the improvement of this situation cannot be solved by a massive increase in agricultural exports, as it will lead to further escalation of high value-added food imports based on raw materials exported from Slovakia.

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References

- [1] Aiginger, K., Bärenthaler-Sieber, S. & Vogel, J (2013) *Competitiveness under New Perspectives*. (WIFO Working Paper no 44). Retrieved February 16, 2022, from [Competitiveness-under-New-Perspectives.pdf](#) (oecd.org)
- [2] Bojnec, S. & Ferto, I. (2009) Agro-food trade competitiveness of Central European and Balkan countries. *Food Policy* 34: 417-425.
- [3] Bojnec S. & Ferto, I. (2012) Complementarities of trade advantage and trade competitiveness measures. *Appl Econ* 44: 399–408.
- [4] Bojnec, S. & Ferto, I. (2015) Agri-Food Export Competitiveness in European Union Countries. *JCMS: Journal of Common Market Studies* 53(3), pp.476-492.
- [5] Burianová, J. & Belová, A. (2012) The Competitiveness of Agricultural Foreign Trade Commodities of the CR Assessed by Way of the Lafay Index. In: *Agris on-line Papers in Economics and Informatics*. FEM CULS Prague. 2012, IV, No. 4 - Special. pp. 27-36. ISSN 1804-1930
- [6] Gauger, I. & Katarzyna, S. (2018) Is a Model of Comprehensive Regionalism Trade-Increasing for V4 Countries? Sectoral Approach. *Prague Economic Papers* (1), pp.21-39.

- [7] Horská, E. a kol. (2008) *Internacionalizácia agropotravinárskych podnikov SR*. Nitra: SPU. 234 s. ISBN 978-80-552-0136-8
- [8] Jambor, A. (2013) Comparative Advantages and Specialisation of the Visegrad Countries Agri-food Trade. *Acta Oeconomica et Informatica* 16(1): 22-34.
- [9] Lafay, G. (1992) The Measurement of Revealed Comparative Advantages. In: *M. G. Dagenais and P. A. Muet eds. International Trade Modelling*. London, United Kingdom: Chapman and Hall, 1992, pp. 209-234. ISBN: 10:0412450003/0-412-45000-3
- [10] Laursen, K. (2015) Revealed Comparative Advantage and the Alternatives as Measures of International Specialization. *Eurasian Business Review* 5(1): 99-115. <http://dx.doi.org/10.1007/s40821-015-0017-1>
- [11] Latruffe, L. (2010) *Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sector.*, (OECD Food, Agriculture and Fisheries Papers, No. 30, OECD Publishing). Retrieved February 16, 2022, from <http://dx.doi.org/10.1787/5km91nkdt6d6-en>
- [12] Qineti, A., Rajcaniova, M. & Matejkova, E. (2009) The competitiveness and comparative advantage of the Slovak and the EU agri-food trade with Russia and Ukraine. *Agricultural Economics - Czech*, Vol. 55, No. 8, pp. 375-383
- [13] Serenčes, R. & Gálik, J. (2012) *Tendencie vývoja komoditnej a teritoriálnej štruktúry agroobchodu Slovenskej republiky*. 1. vyd. Nitra: SPU, 91 s. ISBN 978-80-552-0955-5
- [14] Torok, A. & Jambor, A. (2013) Agri-food trade of the new member states since the EU accession. *Agricultural Economics – Czech*. Vol. 59 No. 3, pp. 101-112.
- [15] Zaghini, A. (2005) Evolution of trade patterns in the new EU member states. In: *Economics of Transition*. 13, No. 4, pp. 629-658. ISSN: 1468-0351



SESSION 5.1

NEW DIMENSIONS OF EDUCATION

Critical Thinking of Internet Users and Trust in the Information Sources: Comparison of the Survey Results between Slovakia and Ukraine

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Abstract

The paper focuses on a summary of the views of Slovak and Ukrainian respondents on Internet sources. We investigate whether they trust the video. We verify differences in attitudes to the statement: "If I see a video with a person, I believe what he/she is saying." We also test their relationship to the Internet as a source of information; and whether he/she thinks the Internet can make people a better-informed person. The paper suggests the need to draw attention to new possibilities of video editing and counterfeiting. It indicates the need to include in ICT training services that verify photo editing and verify that videos have been edited.

Keywords: *Critical Thinking, Fake News, Fake Video,*

JEL Classification: *O30, I21, I26*

1. Introduction

At present, there is probably no doubt that the Internet and social networks influence attitudes and opinions of society in a significant way. We are in a situation where many computer users can obtain information but cannot judge its veracity.

The current situation is described in e.g. research by By Soroush Vosoughi, Deb Roy, and Sinan Aral, who dealt with The spread of true and false news online. Their question from the beginning accurately describes the current situation: "Adding to the confusion is speculation about what's behind such developments—is the motivation deliberate and political, or is it a case of uninformed misinformation? And who is spreading the word online—rogue AI bots or agitated humans?" (Vosoughi, 2017)

Usually, research focuses on monitoring the spread of individual false claims, which topics are most common. They use quantitative methods to examine the number of shares and statistically analyze it. For example, Italian Facebook was researched by Alessandro Bessi in Trend of Narratives in the Age of Misinformation. (Bessi, 2015)

There are fewer psychologically oriented surveys using the Likert scale and measuring attitudes. However, they are important and can help us understand the differences between different groups of Internet users. e.g. how they perceive information and what are the determinants of their attitudes. We can use this with precisely targeted access to individual groups of Internet users. Research of differences according to gender, education we see e.g. at Susanne Dida in "Gender, education, and digital generations as determinants of attitudes toward health information for health workers in West Java, Indonesia." (Dida, 2021) This study

focused on comparisons by gender, education. The purpose of this study was to outline the attitudes of health professionals towards health information, which is determined by gender, educational attainment and age differences. In this paper, we tried to obtain indicative information about how people trust selected information sources in two surveys.

In this paper, in two surveys, we tried to obtain indicative information on how people trust selected information sources.

2. Starting points and implementation of the survey

The surveys were scheduled at the beginning of the COVID-19 pandemic. In the Slovak version of survey, we focused on the questions that detect from where the respondents draw information about COVID-19, how important information is obtained from friends, etc. In parallel, a survey focused on Ukrainian-speaking respondents was created. It had a different orientation and respected the differences of the local society. It focused on the Internet and trust in the information obtained from various sources, including social networks. It tried to find out how much money Ukrainian respondents are willing to spend on newspapers and other information. The questionnaire for Ukrainians was created in Russian language. The co-authors of the survey had the opportunity to change the exact wording of the questions and to adapt the answers offered. We focused on their knowledge of the environment in which they deploy questionnaires. Several questions proved problematic. Respondents in Ukraine asked who these answers are for.

3. Aims of the survey

The survey focuses on the level of trust in fake video messages among Slovak and Ukrainian Internet users. It means, the survey is focusing on the differences between users of both nations.

The following aims have been set out in this paper:

To compare if both groups (Slovak and Ukrainian) think the Internet has made them more informed people. We also researched "How much they trust video in the news."

We tested the hypotheses:

H1₀: There are no statistically significant differences between Slovak and Ukrainian respondents in the answers to question no.16. (Thanks to the Internet, I am better informed...)

H2₀: There are no statistically significant differences between Slovak and Ukrainian respondents in the answers to question no.17. (If I see a video of a person, I believe that he/she said it. ...)

4. Methods and Survey Sample

To obtain the opinions and attitudes of the Slovak and Ukrainian respondents, we chose the questionnaire method. In total, the Slovak questionnaire had 19 questions. The questionnaire was anonymous and was created in electronic form in Google Docs. We distributed the questionnaire via e-mail and social networks. Only the first part - demographic questions (gender, age, education and the size of the city, where respondents spend most of the year) were set as mandatory questions.

For the Ukrainians, the questionnaire was written in Russian language. At the time of its creation and distribution, it did not seem to be a problem of war and many Ukrainian respondents stated that they spoke Russian at home. The questionnaire for Ukrainians had 17 questions and they were aimed at finding out what information sources they use. Second question was “How much do you pay for newspapers and subscriptions to paid channels?”. Both questionnaires, finally, had questions focused on trust in video and photography.

For example, we asked (Q17):

- In Slovak questionnaire: How much do you agree with the statement? "If I see a video with a speech of politician, I believe he/she said it (I always see and hear it happened!)"
- In Russian questionnaire: Do you agree with the statement: "If I see a video of a person, I believe that he/she said it."?

Respondents could answer the questions on the Likert scale. The answer 1 was "I didn't think about it, I don't understand it". In the Russian version, the offered answer was "I Didn't think about it / I don't care". Other answers represent the classic Likert 5-point scale. E.g., 2 - Strongly agree, 3 - Agree, 4 - I do not have a reserved opinion (Russian version free translation - difficult to answer neither agree nor disagree), 5 - Disagree, 6 - Strongly disagree. The respondent had to express his/her views as very much in agreement with the offered statement. After the initial phase of testing and initial dissemination, we also proceeded to the dissemination of the printed version in Ukraine to obtain the views of respondents who are not in the habit of filling in electronic questionnaires. We used a store near an unnamed nuclear power plant in the central part of Ukraine. The initial collection of attitudes was from April to August 2021. Questionnaires in electronic form were used to collect the attitudes of respondents from June 2021 to January 2021. The survey of the attitudes of students of Faculty of Management and Business of University of Prešov continued from September to January 2022. Questionnaires in electronic form were used here.

Some of the respondents who completed the questionnaire in this period are Ukrainian students studying in Slovakia. Similarly, 163 full-time and part-time students from the Faculty of Management and Business of the University of Prešov completed the Slovak questionnaire in this period. These respondents are only a supplement to the sample. The first more than 160 Slovak questionnaires and 120 Russian questionnaires were filled in by respondents from several universities and workplaces. The selection criterion was the willingness to complete the questionnaire. When testing hypotheses and analyzing respondents' attitudes, we use basic demographic data about respondents as the primary one. We compare their answers in terms of gender, education.

The Slovak version of the questionnaire was completed by 387 respondents. There were 39% of men (151) and 71% of women (236). The Russian version of the questionnaire was completed by 183 respondents. There were 43,72% of men (80) and 56,28% of women (103).

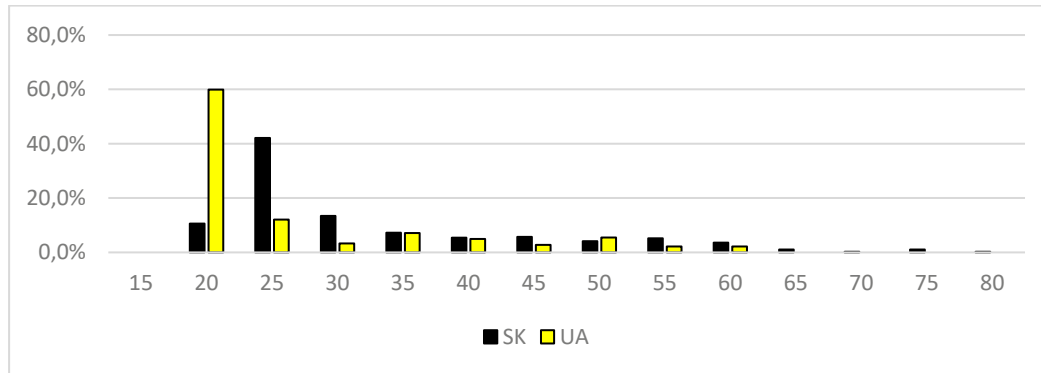


Figure 1: Age structure of respondents SK-UA

Source: author's calculations

5. Selected results of the survey

Due to the limited scope of the paper, we will focus on selected issues. Among the most interesting answers were those that indicated how respondents evaluate the benefits of Internet information and how much they trust what they see in the video.

Question no. 16: How much do you agree with the statement: "I think that ICT and social media have made me a more informed person". The answers offered were without the possibility "I did not think about it". Respondents could choose from 1 - definitely not ... 5 -definitely yes. The results are very similar in both groups. No statistically significant differences between Slovak and Ukrainian respondents were confirmed.

Table 1: Q 16 SK - UA

	SK	N	UA	N
1-definitely not	1,6%	6	1,7%	3
2	5,0%	19	5,0%	9
3	22,3%	85	18,4%	33
4	35,4%	135	33,0%	59
5-definitely yes	35,7%	136	41,9%	75
Summary	100,0%	381	100,0%	179

Source: author's calculations

We tested the hypothesis:

H₁₀: There are no statistically significant differences between Slovak and Ukrainian respondents in the answers to question no.16.

Table 2: Mann-Whitney U Test Q 16 SK-UA

variable	Rank Sum (Group 1)	Rank Sum (Group 2)	U	Z	p-value
Q 16. Thanks to the Internet, I am better informed	104578,5	52501,50	31807,50	-1,28334	0,199376

Z (adjusted)	p-value	Valid N (Group 1)	Valid N (Group 2)
-1,35561	0,175223	381	179

Source: author's calculations

We used a nonparametric Mann Whitney U-test for comparing two independent samples. $P > 0,05$ show that we do not reject the null hypothesis H_{10} .

No significant differences were found in question 17 "If I see a video with a speech politician I believe he said it (I always see and hear it happened!)" between Slovak and Ukrainian respondents.

Similarly, no statistically significant differences were found between men and women when examining the entire sample. We also focused on the differences in this issue in the group of Slovak respondents and especially in the group of Ukrainian respondents. No significant differences were confirmed in the Slovak group.

Table 3: Mann-Whitney U Test Q 17 SK-UA

	SK	N	UA	N
1-"I didn't think about it, I don't understand it"	5,5%	21	5,6%	10
2-definitely not	3,6%	14	3,9%	7
3	21,8%	84	15,6%	28
4	33,5%	129	32,8%	59
5	28,6%	110	37,2%	67
6-definitely yes	7,0%	27	5,0%	9
Summary	100,0%	385	100,0%	180

Source: author's calculations

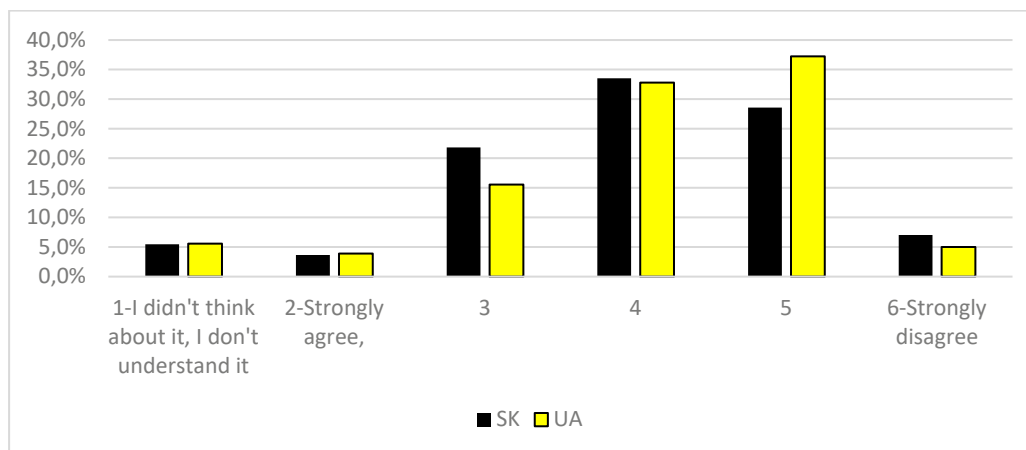


Figure 2: Q 17 SK-UA
Source: author's calculations

We tested the hypothesis:

H2₀: There are no statistically significant differences between Slovak and Ukrainian respondents in the answers to question no.17.

Table 4: Mann-Whitney U Test Q 17 SK-UA

variable	Rank Sum (Group 1)	Rank Sum (Group 2)	U	Z	p-value
Q 17. If I see a video with a speech politician I believe he / she said it	95057,0 0	47788,0 0	28627,0 0	- 1,39226	0,16384 5

Z (adjusted)	p-value	Valid N (Group 1)	Valid N (Group 2)
-1,45920	0,144511	364	170

Source: author's calculations

We used a nonparametric Mann Whitney U-test comparing two independent samples. $P > 0,05$ show that we do not reject the null hypothesis H2₀.

5. Conclusion

The findings of the survey indicate the current situation. It is important to examine the attitudes of respondents on a larger sample and to verify the current effects of Internet sources of information. About a quarter of Slovak respondents and a fifth of Ukrainian respondents expressed doubts about the truth of the video if they see it. It is quite alarming that a third of respondents (33,5% SK and 32,8% UKR) chose the option "difficult to answer neither agree nor disagree". Most respondents, therefore, believed the information, the announcement if they saw the person's statements on video (35,6% SK and 42,5% UKR - answers 5 and 6). With photos in newspapers, internet users already know that they may not be true. We also examined this issue and the results indicated better awareness of this issue. For a video, we can expect

Internet users to be interested in new tools to verify that the video has been edited. Verification of photographs and detection of their first use is already common today.

The devices for analysing photos and verifying their potential pre-modification have appeared relatively recently (e.g., TinEye - Reverse Image Search). Many companies, such as Microsoft, Facebook, and Google, work diligently to find altered video detection tools. In addition, plugins and tools appear, e.g., InVID Verification Plugin Microsoft Video Authenticator, and their number will further increase.

According to our findings, education is the key. When educating all age groups, it will be important to teach internet users not only to obtain information but also to verify it.

When we educate students of all ages it will be important to teach internet users as well as verify information. It is important to examine their truthfulness, to verify whether they have been modified. New video editing options, even at home, will continue to provide better falsification results.

The future is going to be difficult and we cannot imagine its risks today. The preparation should be flexible and it would be ideal to prepare students for new threats that yet to come. (Alcnauer, 2018)

For the future, it will be very important to ensure that the Internet serves to better understand the world around us and not to spread false information.

Customer attributes are influenced by the community that surrounds them. The intensity how customers are influenced or how they influence the others may be an important indicator of their future behavior. Modern approaches can leverage valuable information from social networks. (Háva & Alcnauer, 2012)

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References

- [1] Alcnauer, J. (2018). New starting points for the preparation of students in the field of information technology security, the current state of smartphone security from the point of view of students and managers. In E. Sałata & A. Buda (Eds.), *Edukacja-technika-informatyka w budowaniu lepszej przyszłości*. (pp.143-150) Radom: Wydawnictwo Uniwersytetu Technologiczno-Humanistycznego w Radomiu. ISBN 978-83-7351-860-5
- [2] Bessi,A. Zollo, F. Del Vicario,M. Scala, A. Caldarelli,G. & Quattrociochi,W. (2015). Trend of Narratives in the Age of Misinformation. Retrieved from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0134641>
- [3] Dida, S. Hafiar,H. Kadiyono, A.L. & Lukman,S.(2021). Gender, education, and digital generations as determinants of attitudes toward health information for health workers in West Java, Indonesia, Heliyon, Volume 7, Issue ISSN 2405-8440, <https://doi.org/10.1016/j.heliyon.2021.e05916>. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S2405844021000219>
- [4] Háva, O., & Alcnauer, J. (2012). New emerging data mining approaches in marketing and education, In R. Štefko & M. Frankovský, (Eds.), *Management 2012 : research management and business in the light of practical needs*, (pp. 365-369). Prešov: Bookman. ISBN 978-80-89568-38-3.
- [5] Vosoughi, S., Roy, D. & Aral,S. (2017). The spread of true and false news online.
- [6] Retrieved from: <https://ide.mit.edu/wpcontent/uploads/2018/12/2017-IDE-Research-Brief-False-News.pdf>

Opportunities for Self-Evaluation in the Field of Vocational Subject Teachers' Digital Competencies with an Accent Placed on Reference Framework Standardization

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Abstract

In the proposed paper, the issues of self-evaluation in the context of vocational subject teachers' digital competencies are elaborated with an accent placed on the currently applied reference frameworks in the European environment. Special attention is paid to the DigCompEdu reference framework, within which digital competencies are considered among teachers' key competencies in the current information society. From among the number of reference frameworks, we mention ECDL – European Computer Driving Licence, as well as ISTE and MENTEP standards. Particularly, the questions of educational transformation in the context of distance teaching and opportunities for improving the quality of the teaching profession in the information society are dealt with. Self-evaluation is presented as a dynamic process of a changing set of interconnected activities, which are in mutual interaction. The topic is discussed in the context of the European environment having an impact on education in Slovakia.

Keywords: Teachers' digital competencies, self-evaluation, vocational education and training, distance teaching.

JEL Classification: I2

1. Introduction

In the modern information society, people are surrounded by digital technologies, which form its basis. Technologies mediate huge amounts of information, which is reflected in the name of the current society. They have an impact on all phases of our lives and so, this phenomenon cannot be omitted in the sphere of education, what is more, it is probably education which is most influenced by digital technologies. Understanding digital technologies in relation to humans is not easy and is not clearly defined by experts at all. Nevertheless, certain initiatives by the information science can be observed and it is information scientists who consider digital literacy among the most important topics in their field of interest. But it is not only the information science that focuses on digital literacy and digital competencies, but also pedagogy, sociology, and informatics deal with them. These phenomena can be considered transdisciplinary. The target group is formed by teachers in the context of information society, expectations placed on them, and the undergoing changes in the teaching profession. Their role has been changing as a consequence of massive technological development during the last decades and therefore, technological transformation is necessary, and teachers' digital competencies must be developed for evaluating educational activities, the educational environment or the outputs of education.

2. Standardization of vocational subject teachers' digital competencies

A dynamic development of the society can be observed in all its dimensions, not only on social, cultural, economic levels, but also on the technological one. It is reflected in clear changes in the educational content but also approaches applied in the educational process both by teachers and students. In other words, in the context of new challenges, not only the content of education but also the approaches to sharing and acquiring knowledge are changing. It must be noted that in the field of secondary education – if compared with vocational subjects - there is no sufficiently extensive field didactic theory, which would help understand newly observed phenomena. Such a situation requires systematic research activities. In available research, the aspect of teachers' digital competencies and their link with online teaching in secondary schools have been in the centre attention with an accent placed on distance teaching, particularly on teachers' professional competencies including communication at the workplace, professional collaboration, reflective practice and continuous professional development.

Lorenzová, Jirkovská, and Mynaříková (2020) presented the results of their extensive research (N = 2015) focused on secondary school teachers' digital competencies. They aimed to find out about the knowledge and user specific digital competencies of human and social sciences teachers compared with the whole data set, but above all with ICT and technical subject teachers. As the research tool, an author-constructed questionnaire was used. Data analysis was carried out by means of Chi-square test of independence, Chi-Square goodness of fit test, ANOVA, independent samples T-tests and paired T-tests, and IBM SPSS Statistics, version 24 was used. The results showed that teachers tend to apply simple digital devices for the purposes of teaching, the didactic application of which is not difficult. More complex means (e.g. e-learning or virtual laboratories) are applied less frequently. The results also highlighted that even though teachers see the educational potential of didactic technologies, they do not know much about the forms and means of digital education. The authors of the research study pointed out the discrepancy between the expectations regarding the pedagogical effect of using digital technologies and only moderately developed knowledge and user aspects of digital competencies. From the point of view of knowledge and user specifics, human and social sciences teachers statistically significantly lag behind ICT and technical subject teachers in the field of evaluating their knowledge and user skills. If compared with the whole dataset consisting of teachers of maths, science, medical, agricultural and environmental sciences, no statistically significant differences were observed, but VET teachers achieved poorer results. It is important to pay sufficient attention to the development of digital competencies in teachers as it is them who prepare students for their lives in the digital society. Teachers' digital competencies can be analysed based on a whole a range of frameworks or models [1, p. 39].

2.1. DigCompEdu reference framework

DigCompEdu is a recommendation by the European Commission for EU Member States in the field of teachers' digital competencies. It builds on the previously designed European digital competence framework for citizens, consumers, and also digitally functioning organizations. The declared goal of the DigCompEdu framework is to reflect on the existing programmes or tools and to synthesize them into a coherent model enabling teachers at all levels of education to evaluate their educational digital competencies and to develop them. The framework focuses on teachers' competencies in the field of using digital technologies. It divides teachers' digital competencies into 22 key competencies categorized into 6 areas – Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence – as described below.

Professional Engagement includes digital competencies in the field of using digital technologies for job-related tasks. This field can be characterized by four competencies. The first one is professional communication where teachers interact with students, parents or anyone else through digital technologies and work on the improvement of their communication skills. The second competence is professional collaboration including teachers' activities and collaboration with colleagues, sharing knowledge and experience through digital technologies. The third competence is represented by mediation, which means that teachers use digital technologies within their professional practice. The last competence is continuous professional development including using digital technologies for systematic lifelong learning. Currently, a large scale of digital resources to be worked with in the classroom are available. To use them meaningfully, teachers should work with them effectively. This is included in the three competencies belonging to the field focused on digital resources. The first one can be characterized by selecting from among the available digital resources, when teachers search and evaluate the appropriateness of digital content. In this process, educational goals, educational content, pedagogical approaches, and other factors are taken into account. The second competence is represented by digital content, which means that teachers develop and modify existing digital resources considering the context of teaching, educational goals, the target group, and pedagogical approaches. The third competence is organizing, protecting, and sharing digital resources, as well as making accessible and sharing digital content by teachers. An emphasis is placed on digital content protection, copyright and privacy protection. This field also includes the requirement to understand the concepts of open licences and open educational resources. Technologies can increase the quality and efficiency of teaching, but it requires a certain level of teachers' digital competencies. The third field is teaching. This field is represented by four teacher competencies. The first one is teaching, which means that teachers modify their activities, implement digital technologies and digital resources in order to increase the efficiency of their teaching procedures. Pedagogical intervention is managed by means of digital technologies. Moreover, new forms and didactic methods are introduced, teachers experiment with them, and examine their suitability. The second competence is leading students, implementation of digital technologies as means of communication, and using them for students' individual and group interactions. Digital technologies can also be used for tutoring [8, p. 15]. The third competence is represented by students' cooperation. Teachers try to use the potential given by digital technologies for promoting students' mutual collaboration. The final competence is independent learning. Teachers promote students' independent learning through digital technologies, encourage them to plan, organize, monitor, and evaluate their own learning activities. The fourth field is digital evaluation. Competencies in this field focus on using digital technologies for a range of forms of evaluation and assessment, as well as providing students with feedback. In the process of assessment, there is a huge amount of digital data at teachers' disposal and therefore, it is important to know how to work with them effectively and how to analyse them. The next field consists of three competencies. The first one is the strategy of assessment, which means that teachers apply a whole scale of ways and approaches to student performance assessment by means of digital technologies. The second competence is analysing educational outputs including active involvement in gathering data regarding students' activities and their subsequent analysis and interpretation. The third and last competence is feedback and planning, which means that teachers provide students with feedback by means of digital technologies. Digital technologies enable promoting students' performance in entirely new ways as students can actively participate in educational activities and also the application of an individualized approach to students is enabled. The fifth field is supporting students and includes three competencies. The

first one is access and inclusion, where teachers ensure equal opportunities for all students including those with special educational needs. The second one is differentiation and individualization, which means that teachers use digital technologies for meeting students' educational needs. By means of digital technologies, teachers allows students to learn at their own pace, various levels and in various ways. The third competence is activating students, when teachers use digital technologies to promote students' active learning. It means application of cross-cutting skills, higher order cognitive skills, and creative thinking. Teachers try to use real-life situations in the classroom with the aim to promote students active participation [5, p.142]. They are those whose task is to prepare students for their lives in the digital society and should promote the development of their digital competencies. So, the final field is promoting the bellow described five students' digital competencies. The first one is information and media literacy. Teachers make efforts to implement such activities in their teaching, which develop students' information and media literacy and make efforts to include also activities related to formulating information need, browsing and searching information in the digital environment, organizing, processing, analysing and interpreting information, a critical comparison and evaluation of the credibility and reliability of information and information resources. The second competence is digital communication and collaboration within which teachers lead their students towards an appropriate and responsible usage of digital technologies. Teachers also introduce activities where students use various types of digital technologies for communication, collaboration and engaging in citizenship [7, p. 84]. The third one is digital content creation where teachers teach students how to express themselves through digital technologies and create digital content. Alongside with that, students learn about copyright, citations, and using licences. The fourth competence is responsible usage of digital technologies when teachers focus on physical and mental safety, as well as socially responsible usage of digital technologies. Teachers also teach students how to manage risks related to using digital technologies. The final, fifth competence is problem solving by means of digital technologies which means that teachers develop their students' ability to recognize and solve technical issues and apply their existing knowledge in new situations. Where can teachers use their digital competencies?

2.2 Levels of teachers' progress in self-evaluation

The DigCOPmEdu framework works with six proficiency levels – from A1 (Newcomer) to C2 (Pioneer) – along which educators' digital competence typically develops. Teachers on the level Newcomer (A1) have very limited experience with digital technologies. They need guidance and encouragement in the field of using digital technologies in the classroom. Teachers on the level Explorer (A2) are interested in using digital technologies in the classroom and are aware of their potential. They have already started using digital technologies but without following a comprehensive or consistent approach. These teachers need encouragement, support, and inspiration. The Integrator (B1) level is achieved by teachers when they start experimenting with digital technologies, using them in a creative way, and integrating them into professional activities; when they are willing to try out new tools and improve in using them. These teachers need time, further experiments, reflection, and collaboration with colleagues to move to the next level. On the level Expert (B2), there are teachers who are confident, creative, and critical in using a range of digital technologies in their work. They select tools meaningfully considering the particular situation. They experiment in the classroom, broaden and consolidate the repertoire of their strategies, and are open to new ideas. They provide support when new strategies, technologies or tools are to be introduced. Teachers on the level Leader (C1) have a consistent and comprehensive approach

to using digital technologies to enhance pedagogical and professional practices. They rely on a broad repertoire of digital strategies and know how to choose the most appropriate one for any given situation. They continuously work on their improvement, they are in touch with their peers; they exchange ideas and experiences. They serve as a source of inspiration for others. The highest level – Pioneer (C2) – is achieved by teachers when they start questioning the adequacy of contemporary digital and pedagogical practices, of which they are Leaders. They try to introduce innovations, experiment with highly innovative and complex digital technologies and pedagogical approaches, and introduce new ones [6, p. 110]. These teachers are role models for their colleagues. The DigCompEdu framework considers digital competencies among teachers' key competencies in the current information society. It works with digital competencies as interconnected fields influencing each other and creating a complex unit. The link between teachers' professional engagement and promoting students' digital competencies is interesting. These two fields are not exclusively connected to education. They are influenced by the context in which teachers work, but also their broader environment. Various authors try to unify terminology and to develop a common concept of teachers' digital competences. DigCompEdu was inspired by already existing frameworks and tools and based on them, it presents a new approach to digital competencies. For teachers, it can be useful for its simplicity on one hand and complexity on the other hand. Digital competencies are classified into six fields covering twenty-two competencies. The frameworks' universality (for teachers of various subjects and at all levels of education) and the fact that it provides examples of practical activities for each competence can be considered its contribution. The field of digital educational resources discussed in this paper is represented by a whole category. According to DigCompEdu, working with them includes their selection (including evaluation), organization, and modification. An emphasis is placed on teachers' ability to create new digital content and to share it. Also privacy protection and copyright are important in the course of such activities, as well as understanding the principles of working with digital educational resources.

3. Forms of institutionalized education

Lešková and Švač (2001) in the work (Zlámalová, 2006), [9, p.86] classified the forms of institutionalized education into conventional traditional forms of education, distance education, virtual education, and online education.

3.1 Conventional traditional education

Conventional traditional education is represented by typical forms of education applied in schools characterized by dialogical methods of teaching, lessons, lectures, seminars, exercises, and excursions [3, p. 47], vocational practice in a target environment, by studying in libraries (including the virtual ones), by means of devices such as data projectors, blackboards, but also using other educational environments – organizations, exhibitions, museums, etc.

3.2 Distance education

Distance education has been influenced by the development of digital technologies as distance learning is typically realized when teachers and students are separated in space and they interact through a range of technologies, which means that personal contact is replaced by mediated communication.

3.3 Virtual education

Virtual education is face-to-face education realized remotely, which would not be possible without digital technologies. In virtual classrooms, teachers and learners are separated in space, they are not in the same physical classroom. Currently, for educational purposes, digital technologies offer a wide range of information in their multimedial form [2, p. 43]. The digital environment provides huge amounts of information, as well as digital and multimedial content, and therefore, working with information requires high levels of digital literacy from learners. Nowadays, a range of online educational technologies are available. Considering the above processes, the need for optimizing vocational subject teachers' digital competencies arises, which can be defined as a set of various mutually connected activities in interaction. Teachers need to assess their level of competencies, formulate goals, consider strategies, and the overall realization of the planned distance teaching activities.

3.4 Online education

Online education is a relatively new and not much examined phenomenon. Closing schools and other educational institutions has had great impact on people's lives during the pandemic crisis. For teachers, the new situation represented a challenge in three fields. In the initial phase, the most important task was to maintain contact with their students, to ensure technologies, develop a routine, to create conditions promoting emotional well-being even in the online environment, and finally, to deliver education by using online platforms. Because of the inequity in opportunities given by differences in the availability of devices in students' households and internet access, parents' help was a necessity [4, p. 123]. In this situation, intensive collaboration between teachers and parents was more important than ever before. Recording lessons, as well as making educational content accessible to students at any time and from anywhere helped a lot as students could revise everything and watch videos again.

3.5 Comparison of the needs in the field of developing competencies in relation to teachers' job position

During the pandemic in 2021, we carried out a research on the sample of 252 secondary school teachers (females represented 79.37% and males 20.63% of the sample) on the priorities in developing teachers' digital competencies within a research project realized in collaboration with the Self-Governing Region of Trenčín. The respondents were categorized based on their job position. The first group consisted of school leaders, teachers with first or second attestations, and the second group was formed by novice teachers and teachers without an attestation. Within the research study, we were verifying the hypothesis H: "We assume that there are statistically significant differences in the evaluation of the results in the field of preferences as for the priorities in developing secondary school teachers' digital competencies between two groups: school leaders and teachers with first or second attestations, and other teachers." In the context of the investigation and examining preferences in the field of developing secondary school teachers' digital competencies in the Self-Governing Region of Trenčín, we dealt with the priorities for school management at all levels, including the urgent need for solving the situation in the field of online education in secondary schools. Secondary school teachers were diversified in two groups, and we present the findings regarding the development needs in the two listed groups. The need for increasing the quality of competencies was observed in the following fields – creating new tests and tasks with an accent placed on new trends 74.78% and 66.39%; increasing the quality in integrating the available tools of educational platform Microsoft Office 365 – 42.25% and 33.95%; increasing efforts in searching for new innovative on-site programmes within competence development –

69.53% and 61.23%; increasing the quality of preparing competence development related to the visual side and animations in on-site learning – 53.52% and 45.22%; intensifying controlling information and internet safety as a part of competencies – 45.43% and 37.11%; improving the quality of creating e-learning courses by developing competencies – 66.44% and 10.13%; ensuring better usage of the opportunities provided by educational platforms when teaching online by developing competencies – 56.59% and 50.29%; improving material and technical equipment, as well as the competencies in the field of working with dynamic educational softwares – 66.45% and 58.14%; and increasing efforts in developing competencies in new CAD, CAM, CAE systems – 73.26% and 64.96%. The values are listed for the two participating groups of respondents – school leaders and teachers with attestation(s), and other teachers. We were interested in teachers' responses regarding their educational priorities within the development of secondary school teachers' competencies.

The results obtained by analysing data from both groups of respondents (1. school leaders and teachers with first and second attestations; 2. other teachers) are displayed in Figure 1. It displays the comparison of the needs in the field of developing competencies in both groups of secondary school teachers.

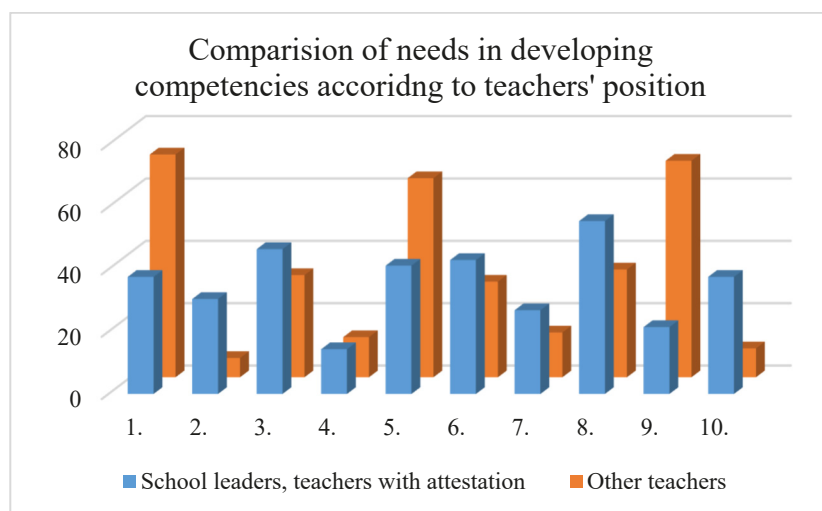


Figure 1 Preferences of needs in the field of developing teachers' competencies during the pandemic in year 2021 in the Self-Governing Region of Trenčín

Source: own research

For examining statistically significant differences, the results of both datasets – school leaders and teachers with attestation(s); and other respondents – were compared, the Chi-square test was used. The obtained data are displayed in Table 1.

The unmarked values in Table 1 lower than the level of statistical significance $\alpha=0.05$ are among the statistically significant differences of positive responses by the examined groups regarding their educational priorities in developing secondary school teachers' competencies. In the context of comparing teachers' needs in developing their competencies, no statistically significant differences were found between the two groups of respondents – school leaders and teachers with attestation(s); and other respondents – in priorities no. 3, 4, and 6 – opportunities to increase efforts in searching for new innovative on-site programmes within competence development; improving the quality of competencies in the field of interactive teaching; and increasing control in the field of information and internet safety within competencies.

Table 1 Comparison of positive responses in groups in the field of educational priorities within secondary school teacher competence development (Chi-square test)

Priorities in developing digital competencies	Pearson Chi-Square	Df	Asym.Sig.(2-sided)
1.	21.857	1	0.000
2.	25.245	1	0.000
3.	3.725	1	0.061
4.	0.215	1	0.768
5.	9.386	1	0.005
6.	3.064	1	0.089
7.	4.934	1	0.031
8.	8.341	1	0.007
9.	41.458	1	0.000
10.	26.823	1	0.000

Source: own research

Taking into account the above presented results, we consider the hypothesis H: “We assume that there are statistically significant differences in the evaluation of the results in the field of preferences as for the priorities in developing secondary school teachers’ digital competencies between two groups: school leaders and teachers with first or second attestations, and other teachers.” to be confirmed.

In relation to solving problems being a part of the subject of the research project, a whole range of interesting phenomena were revealed and new questions with the potential to contribute to the educational theory and practice arose. It is recommended to pay similar attention to secondary schools as their work is influenced by online education and innovations. Also an investigation focusing on the methods teachers use would be interesting as they can assign certain topics a particular degree of importance. But also on the level of the realized online teaching, the teaching content – due to the impact of a range of factors – is not necessarily presented to students effectively.

In order to make distance teaching efficient, secondary schools’ material and technical equipment should be optimized by building digital infrastructure, but as research results show, neither high-quality equipment nor a more frequent use of digital technologies automatically guarantee innovative teaching. Infrastructure represents a challenge for schools in another sense – it must be continuously renewed and schools are not able to establish regular and adequate cycles of infrastructure renewal (especially computers) taking into account the length of its technological and moral life. Therefore, purchasing new equipment prevails, but the share of older technologies is alarming.

Based on the above, it is a necessity to consider the needs in developing secondary school teachers’ competencies in the field of online teaching not only on the level of self-governing regions, but to find conceptual solutions for entire Slovakia. Primarily, teachers’ teaching competencies in the field of Using digital resources – creating and modifying, but also organizing, protecting, and sharing digital resources; within the field of Digital evaluation – strategies of evaluation, analysis of educational results, feedback, and planning [10, p. 138]; within the field Teaching – teaching, leading students, cooperation between students, and students’ independent learning; and in the field of Supporting students – accessibility and inclusion, differentiation and individualization, and activating students – should be developed.

Also the development of teachers' professional competencies as a component of their professional engagement, especially those of cooperation, professional collaboration at various levels should be dealt with, examples of good practice from both Slovakia and abroad should be used, and continuous professional development should be focused on as well.

4. Conclusion

Vocational subject teachers' self-reflection was evaluated from the aspect of the quality and efficiency of their work in the process of distance teaching. National and international organizations have taken measures to help teachers to provide such education that will enable graduates to find application on the labour market of the 21st century. In this field, a lot of work has been done by the European Union, which – by its approaches and recommendations – provides its members with examples of good practice that should help them create ideal teachers for the current world. The DigCompEdu framework can be considered some kind of a recommendation, which provides an intersection of many of teachers' roles and duties they have to deal with at a certain level. It uses strategies, tries to set such goals and plan interventions that have the potential to help particular school systems to compete with the rest of the world. But their application and edification do not always penetrate the direct teaching practice. Therefore, developing the educational system is a gradual process. The current pandemic situation has had an impact on the process of transformation and has forced teachers to improve their strategies and competencies faster. In the context of the challenges in the field of using digital technologies, we focused our attention on reference frameworks having an impact on teachers' professional preparedness. They are also a part of their personal development plans. The DigCompEdu framework considers digital competencies among teachers' key competencies in the current information society. There exist several evaluation reference frameworks for teachers' digital competencies, including ECDL – the European Computer Driving Licence, as well as worldwide and European ISTE and MENTEP standards. Similarly to the DigCompEdu framework, there is a self-evaluation tool, which offers teachers an opportunity to find out about their digital competencies, to receive a certificate of their proficiency level in using digital technologies in an app. Within the reference framework, digital competencies are considered mutually interconnected fields influencing each other and forming a complex unit. Teachers' professional engagement and promoting students' digital competencies [12, p. 231] is an interesting field as well. These two fields are directly linked not only by education, they represent a context, in which teachers work and also other circumstances are taken into account. Many authors try to unify terminology and provide a basis for common understanding of teachers' digital competencies.

Digital competencies are perceived as one or more teachers' abilities that can form a part of their digital literacy, but not necessarily [11, p. 42]. To be competent means that a person is equipped with a complex set of effectively interconnected knowledge, skills, and attitudes, which enable individuals to successfully deal with tasks and situation occurring during their studies, at work, or in their private lives. To be competent means that individuals can find orientation in a certain situation, they carry out appropriate activities, and apply a positive approach. It can be concluded that the implementation of the Strategy 2030 aims to create and develop an open educational system, which could react to the changing external environment and provide relevant educational contents from a lifelong perspective. In compliance with the European model – as a reaction to the educational needs in the information society – a change leading towards individuals' participation in educational processes and developing competencies necessary for living in the 21st century is required. Those competencies include

the ability to react to the changing environment, self-improvement, as well as the development of the whole society. For carrying out such a change, all stakeholders should be prepared.

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References

- [1] Barnová, S., Krásna, S., & Čepelová, S. (2020) Digital technologies as a means of teachers' professional development. R&E-SOURCE. Online Journal for Research and Education Special Issue 18, 11-17.
- [2] Dohnanská, M. -Lajčín, D.-Bočková, K (2019) Project Management Teaching at Czech Public Universities in the Context of Project Manager Competencies Covered within the National Competence Baseline of Project Management : version 4; Current Trends in Public Sector Research 2019, 23 [24.01.2019-25.01.2019, Brno, Česko]. – WOS CC In: Current Trends in Public Sector Research [textový dokument (print)] [elektronický dokument] : Proceedings of the 23rd International Conference / Dvořáková, Petra [Zostavovateľ, editor] ; Beblavá, Emília [Recenzent]. – 1. vyd. – Brno (Česko) : Masarykova univerzita, 2019. s. 42-49.
- [3] Gašparová, M. - Kysel'ová, J. (2020) Excursion in distance learning = Exkurzia v dištančnej výučbe. In: Inovace a technologie ve vzdělávání (1/2020). časopis o nových metodách a inovacích v technickém a přírodovědném vzdělávání. 1. vyd. Plzeň : Západočeská univerzita v Plzni, 2020. s. 45-49
- [4] Kursch, M. (2021) Impact of a One-Off Demonstration on the Use of ICT in the Teaching of Andragogy Students on Their Change of Attitude Towards the Use of ICT in Education. _International Journal of Cognitive Research in Science Engineering and Education-IJCRSEE_, vol 9, Issue 1, 2021, p. 121-134.
- [5] Oberuč, J., Porubčanová, D., Porubčan, M. (2020) Teória výchovy v procese výchovy a vzdelávania. Vysokoškolská učebnica. Dubnica nad Váhom, VŠ DTI. s. 180
- [6] Porubčan, M.- Doríčková, M. (2020) Innovative in schools In: R&E-Source [elektronický dokument] . – Baden (Rakúsko) : Pädagogische Hochschule NÖ. – suppl. Enter new engineering pedagogy curriculum , č. 18 (2020), s. 109-112.KURÁK, J. 2001. Vláda schválila politiku informatizácie spoločnosti v SR. [online]. [cit. 2003- 03 -10] In Bulletin SAK, roč. 13, 2001, č. 4. Dostupné na internete: < <http://www.sakba.sk/bulletin/bulletin4/cl2.html> >.
- [7] Svobodová, Z., Kursch, M. & Veteška, J. (2021) Problems and obstacles of distance learning in the point of view of primary school teachers in the "Covid period". In Sánchez, I. A., Kommers, P., Issa, T. & Isaías, P. (eds.). _Proceedings of the International Conferences Mobile Learning 2021 (ML 2021) and Educational Technologies 2021_(ICEduTech 2021), virtual 3-5 March 2021. Lisboa: IADIS, 2021, s.83-90.
- [8] Veteška, J., Kursch, M. (2018) The research on the efficiency of the methods of talent management within organizations. _New Educational Review, vol 52, Issue 2, 2018, p. 28-42.
- [9] Zlámalová, H. (2015) Distanční vzdělávání a e-Learning. Vysoká škola J. A. Komenského, 2006. 108 s.
- [10] Zapletal, L., Hanuliaková, J. (2015) Soziologisch-pädagogische Grundlage und pädagogische Aufgaben der Manager 1.vyd.- Karlsruhe, Deutschland : Ste-Con, 2015.- 138 s.
- [11] Zapletal, L., Porubčanová, D. Oberuč, Education as returnable investment for both individuals and society In: Vadyba Journal of Management.- Lithuania : Klaipeda University Press, 2016.- Vol. 28, no. 1(2016) s. 43-51
- [12] Zapletal, L., Porubčanová, D. Rozvadský Gugová, G. (2020) Uvedení do sociologie pro pedagogy Veřejnosprávní vzdělávací institut, o.p.s. Strážni, s.239.

Demand for Short-term Distance Courses in Armenia to Boost Employability

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Abstract

This article discusses the needs assessment survey having been carried out with the identification of short-term distance courses needed to boost employability for organizing distance learning as lifelong learning (LLL) at International Scientific-Educational Center of NAS RA. The aims and objectives of the need assessment study were to find out the areas and specific topics of short-term courses needed to boost their employability after graduating an HEI and identify preferable ways of organizing distance courses such as duration of the course, required time, hour, structure, assessment methods, etc.

Keywords: distance learning/education, distance courses, needs assessment survey, target groups, employability

JEL Classification: I25, I21

1. Introduction

The European Higher Education Area (EHEA) prioritizes making education systems more inclusive, as the population becomes more and more diverse in line with regional and demographic changes (Yerevan Communiqué 2015, pp. 2-3). One of the priorities of higher education is to increase participation in higher education, support institutions that provide relevant educational activities for different students, including life-long education, develop transparency and coherence among different educational sectors, promote social orientation in higher education and improve gender balance also expanding access to education and degree opportunities.

Strategic Program of Prospective Development of the Republic of Armenia for 2014-2025 (p. 146), considering the particular importance of human resources for the long-term socio-economic development of the country, lays down the following priorities in the field of education:

- 1) Increasing access to the secondary and higher professional education for all the segments of the population.
- 2) Improving the quality of professional education, its compliance with the requirements of the labor market, promoting the employment of graduates.

Despite the fact that the enrollment in higher education in Armenia has increased significantly over the past decade, reaching about 30%, it is still lower than the European average indicator (Professional Education System of the Republic of Armenia – Program on Expanding Integration to European Higher Education Area, p. 1). In Western Europe, the overall enrollment rate for tertiary education is 45-50%, while in Sweden and Norway it accounts to 65%.

Enrollment rates in professional education in Armenia remain low compared to those of Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS). In 2019, the gross enrollment rate in professional educational institutions constituted 77.5%, including 50.4% in the first cycle of higher education (bachelor) and 14.6% in the second cycle of higher education (master).

The issue of access to professional education is reaching the wider community today. According to the publication of RA Statistical Committee "Social Image of Armenia and Poverty" issued in 2019, the largest group of the poor in the compared population was 60.5% with secondary and lower education, and 22.8 and 16.7% with secondary vocational and higher education, respectively.

Higher education remains inaccessible to the poor and the extremely poor. Thus, if the gross enrollment of the population aged 18-22 in universities amounted to 47% in 2017, only 17% of the extremely poor population and 29% of the poor population were enrolled in universities.

In particular, the income of children from low-income rural households is much lower than that of children from well-off urban families. The studies showed that in 2009 only 6.9% of Armenian HEI students were from the families indicated in the lowest income, while 32% of the students were from the families with the highest income group. This picture is relatively the same for 2019. Article 16 of draft law "On Approving State Program on Education Development in the Republic of Armenia till 2030" prescribes that the accessibility and affordability of professional education, especially those of higher education, is a serious problem Armenia is currently experiencing in terms of vulnerable groups of society (including people with special needs). According to the comprehensive household survey, 82.8% of students in higher education institutions in 2018 were not poor, 17.2% were poor (excluding the extremely poor), and 0% were from extremely poor households.

Thereby, increasing overall enrollment in higher education and ensuring its accessibility is a major challenge, which is also one of the main (social) directions of the EHEA action plan.

Distance education is a universally recognized educational model and a priority for the development of education, and its goal is for students to receive a high-quality education in their places of residence, especially in the regions of the Republic of Armenia and in the Diaspora at no additional costs. Another advantage of distance education is not so much the physical-spatial access, but primarily the financial accessibility compared to the traditional education models, which is a great advantage in the current socio-economic conditions.

1.1 Research Background

Within the framework of the Bologna reforms of education system, one of the commitments adopted by the Republic of Armenia is the organization and implementation of lifelong education in the country through the organization of distance education. In this context, International Scientific-Educational Center of NAS RA (ISEC NAS RA) implemented "Organization of Further Distance Education at ISEC NAS RA" project. Within the frameworks of "Education Quality and Relevance" project (Center for Education Projects PIU), the purpose of which was to direct development of the Armenian Education System towards the demands of knowledge-based economy through ensuring increase in the quality of General and Tertiary Education that meets the social-economic needs of the society. With the financial support of "Competitive Innovation Fund", International Scientific Educational Center of NAS RA implemented "Organization of Further Distance Education at ISEC NAS RA" project.

Within the framework of the Bologna Process, Armenia has undertaken commitments in education area reforms where distance learning is viewed as priority. In step with the scientific and technological development, the popularity of distance learning as lifelong education is increasing worldwide, which provides good opportunities to people in need to get further distance education or get further qualifications online at any place and time convenient to them. The project is was open to all social groups, regardless of their age, sex and religion. The only requirement to apply for distance learning courses at ISEC NAS RA was having a Bachelor's degree diploma, since distance learning education at ISEC NAS RA was considered to be as further education. The most important notion of this project, besides its main aims and objectives, was the educational content created in the Armenian language, which primarily increased the volume of online educational content in the Armenian language and promoted the involvement of young people both in Armenia and abroad to continue learning in their native language. With this project, ISEC, as a matter of fact, became the first higher educational institution in Armenia to offer massive open online courses (MOOCs) in the Armenian language in the context of lifelong learning and promoting employability in the regions.

2. Data and Methods

Prior to the implementation of the project, a needs assessment was conducted to identify attitudes of potential beneficiaries towards distance learning. The objectives of the needs assessment study were as follows:

1. To find out the level of awareness of different groups of the society about distance learning.
2. To find out the areas and specific topics of the courses which are needed (what additional knowledge is needed for different groups to find or improve their place in the labor market).
3. To identify the preferred ways of organizing distance courses (duration of the course, required time, hour, structure, assessment methods, etc.).
4. To find out what preconditions are needed for representatives of different groups to participate in further distance learning courses (price, credibility, teacher qualifications, etc.).

In this research paper we will cover only two findings of the needs assessment survey: identification of the distance courses to boost employability and preferences in the organization of distance courses.

At the initial stage of the program, the following target groups were identified:

- Those who graduated from the university long ago but currently do not have a job due to educational reasons;
- Graduates and undergraduates;
- Employed people, HEI graduates, who needed updated knowledge to advance in the labour market;
- People with special needs.

Considering the specifics of distance education, the main age group was the population aged from 20 to 50.

The research was carried out with the following methods:

- a) direct needs assessment
- b) indirect needs assessment

In the framework of the direct evaluation, two methods of information collections were used: focus group discussions with representatives of different social groups, in-depth interviews with representatives of employers, employment agencies, and employment and career centers. In-depth interviews were conducted with people with special needs.

Indirect evaluation was made to collect additional/supporting information through the analysis of various documents containing information on labor market, labor supply and demand.

Indirect evaluation was performed by analyzing various documents containing information on the labor market, job supply and demand for additional/supporting information.

Methods of collecting information used to achieve the purpose of the research and the tools are presented below:

Table 1. Information Collection Methods and Tools

Information Collection Methods	Information Collection Tools
Focus group discussions	Questionnaire for focus groups
Interviews with employers, employment agencies, career center representatives	Questions of interviews with key stakeholders
In-depth interviews with people with special needs	In-depth interview questions

3. Research sampling

The number of focus groups constitutes 12, whereas the number of participants in each focus groups makes up 8-12 people on average.

When selecting focus group participants, the main criteria according to which the target groups of the program were identified were considered. The formation of the main part of the groups was carried out on the basis of two key criteria:

- Employment status (employed or unemployed)
- Type of location (capital and regions)

Based on the types formed in the range of crossing of the above-mentioned two criteria, the number of focus groups was distributed as follows:

Table 2. Distribution of Focus Groups in Regions of Armenia

	Yerevan	Regions
Employed	1	2
Unemployed	1	4

The gender, occupation and age of the respondents were also considered when selecting the focus group participants.

The main criterion underlying the selection of the regions was the distance from Yerevan. The economic situation, employment opportunities and socio-cultural characteristics were also discussed.

The choice of these criteria is based on their expected impact on the labor market and employment opportunities.

According to the data published by RA Statistical Committee, in recent years the proportion of people with higher education among the unemployed has been constantly increasing by an average of 11% per year. The unemployed with higher education are inferior in absolute value only to those without education. (RA Statistical Committee, 2013, pp 85-87)

The selection of the regions was conducted in the following manner:

1. The regions of the Republic of Armenia were grouped under the average distance each of them is located from Yerevan – the capital city of Armenia. The following subgroups were formed: regions located with an average distance of over 50, 50-150, and 150 km from Yerevan.
2. In the subgroups formed above, the specific regions were selected according to the following criteria: size (number of population), geographical location (north-south, east-west) and financial efficiency.

The average distance of the region from Yerevan (km)	Regions of Armenia ¹³	Selected Regions
20-50	Ararat, Armavir, Aragatsotn, Kotayq	Ararat
50-150	Shirak, Gegharkunik, Vayots Dzor	Shirak, Gegharkunik,
150 and over	Tavush, Lori, Syunig	Tavush

In addition to the aforementioned 8 groups, 2 discussions were held with the officers of the educational institutions subordinated to RA Defense Ministry and 2 discussions were organized with high school students and new graduates. The separation of these groups was due to the separation of the latter as an individual target group in the project. These four discussions were organized in Yerevan. The profession and the place of residence were considered when selecting the participants.

The selection of people with special needs was carried out based on criterion sampling. The main criteria were the nature of the disability, occupation, place of residence, employment status. The number of interviews constituted 10. In addition, interviews were conducted with the heads of two non-governmental organizations dealing with disability issues to identify common issues and assess the needs.

35 in-depth interviews were conducted with key stakeholders, particularly with 20 employers, representatives of 10 employment agencies, 3 representatives of career centers in 4 regions and

¹³ The limited number of focus groups in each region (1 or 2) would not allow for representative representation of residents from different towns and villages from the given region. In order to neutralize the influence of the factor of distance from the regional center on the results of the focus groups, selecting the residents from the regional centers and the surrounding villages was chosen as a principle.

Yerevan. The criteria for selecting employers were the size of the enterprise and the sector of their activities.

Table 3. Distribution of Sampling

	Yerevan	Ararat	Tavush	Gegharkunik	Shirak
Employer	8	3	3	3	3
Employment Center/Agency Representative	6	1	1	1	1
Career Center Representative	3				

Labor market studies conducted in recent years were used for the secondary assessment, which included the description of the attitudes towards the institute of education, expectations, gaps of different groups of the population, the description of the knowledge and skills provided by educational institutions and compliance with labor market requirements.

3. Results and Discussion

Yorke defines employability as “the set of achievements – skills, understandings and personal attributes – that make graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy” (2006a, p. 8). In the same way, Lourtie (2009) argues that employability should be a goal of any training in any cycle, be it first, second, third, or even short cycle. The aim is to increase the graduate’s chances of obtaining employment and being successful in his/her occupation.

In our case, the need for additional knowledge for employability or career promotion was more or less important for the focus group participants. However, there was a noticeable difference in the attitudes between those employed and unemployed. The understanding of the need for knowledge was more pronounced in the groups of the employed participants. Those unemployed, especially during the discussions in the regions, were frustrated and disappointed as they did not see connection between knowledge and employment opportunities. As to them, the main condition for getting a job was the strong network of friends and colleagues.

On the other hand, employers valued professional skills, work experience, and communication skills when hiring new employees. Based on their experience, it is difficult to find employees with the following skills and characteristics:

- work experience
- knowledge of languages
- computer skills
- management skills
- communication skills
- networking
- fundraising and grant writing skills

Considering that the above skills/knowledge can be obtained in short-term courses, they can also be organized in the form of distance learning. According to “Aspirations and Expectations

of the Youth of Armenia” report, 5.1% of people aged 18-30 study in short-term courses (RA Ministry of Sports and Youth, 2012, p. 41).

Based on the above-mentioned survey, 10.5% of young people in Armenia want to set up their own business (RA Ministry of Sports and Youth, 2012, p. 56), which suggests that training on business management skills may also be desirable for them. Such an opinion was also expressed by some participants in the course of the regional focus group discussions.

A major attraction of distance education is the ability to learn "anytime and anyplace". While seemingly abolishing the access barriers experienced by traditional students, distance education has its own set of restrictions for students. Distance education may be widely available, but it is not necessarily widely accessible, which has sparked much discussion and research into "information haves and have-nots" (Kerka 1989 , p. 2).

These student access barriers can be defined as follows (Galusha, 1998):

- Costs and motivators
- Feedback and teacher contact
- Alienation and isolation
- Student support and services
- Lack of experience/training

The needs assessment also aimed to identify the preferred ways of organizing distance courses (duration of the course, required time, hour, structure, assessment methods, etc.).

Duration

Most of the participants in the focus group discussions found it difficult to specify the specific duration of the course, as, according to them, it depends on the complexity, amount of materials and structure of the specific course. However, the maximum length of time acceptable to participants having taken part in the discussion was 6 months. The average duration was 2-3 months. It was desirable for both employed and non-employed participants.

However, the length of the course was not, in fact, a decisive factor in the decision to participate in the course. The participants of the discussion were ready to spend 4-6 hours per day on average.

Hours

The opinions of the participants having taken part in the discussions related to the course hours during the day can be grouped as follows: the employed preferred to have in the evening, the unemployed women until 16:00 or late in the evening, whereas the hour did not matter for the unemployed men. The approach was the same for people with special needs interviewed. The employers mentioned that the courses should be organized in the evening.

Price

The main tendency regarding the price of the courses during focus group discussions was that the participants found it difficult to answer how much they were willing to pay for short-term distance courses being inexperienced of participating in such courses and not having a clear idea about them. The prices discussed constituted from 20,000 AMD up to 50,000 AMD, which, however, they were willing to paid only if they had guarantees that the participation will directly contribute to being employed or promotion at work. However, the vast majority of participants said they would only take online courses if they were free. This attitude prevailed in all discussions.

Employers also found it difficult to say how much they were willing to pay for their employees' online training. Some of them, yet, mentioned fees, predominantly fees ranging from 25,000-30,000 AMD.

Based on the focus group discussions and the opinions expressed during the interviews with people with special needs, employers, employment centers, the identified list of short-term distance courses that are of interest to almost everyone, regardless of profession, field of employment (classified by importance and frequency of being mentioned) is as follows:

- Communication skills
- Basics of accounting
- English (different levels)
- Marketing
- Computer skills
- Business management
- Management psychology
- Project and time management
- PR
- Culture of speech, rhetorical art
- Basics of tourism development
- System graphics, design
- HR, staff management

Interestingly, the employers identified the following list of short-term courses based on their priorities and needs:

- Communication skills
- Marketing
- Customer service
- Negotiation skills
- Accounting
- Time management
- Advertising
- Computer design
- Foreign languages
- Market research
- Management skills
- Tourism management

4. Conclusions

As we can see, most courses and skills identified both among the respondents and the employers mainly match giving grounds to infer that higher education in Armenia basically fails to provide these skills within the frameworks of their academic curricula, though most of them can formally be found in the syllabi and curricula of the majority of the Armenian higher educational institution. The lack of the skills and knowledge identified as hindrance to future employability can be supplemented through short-term distance courses in the context of lifelong learning. Unlike different approaches to the format and organization of short-term distant courses, all the respondents were willing to pay for further education only in case of a

solid guarantee of being employed or promotion at work. However, the vast majority of the surveyed would only take short-term distance courses if they were free, which was a dominant attitude in all discussions.

References:

- [1] Center for Education Projects PIU, retrieved from <https://www.cfep.am/en/history/> 05.02.22
- [2] Galusha, J. (1998) . Barriers to learning in distance education. Hattiesburg, MS: The University of Southern Mississippi.
- [3] Kerka, S. (1989) . Communication technologies in adult, career and vocational education. Columbus, OH: The Ohio State University.
- [4] Lourtie, P. (2009). Quadro Europeu de qualificações e acesso às profissões. In O Processo de Bolonha e os seus Desenvolvimentos, CNE.
- [5] Professional Education System of the Republic of Armenia –Program on Expanding Integration to European Higher Education Area, retrieved from https://www.e-gov.am/u_files/file/decrees/arc_voroshum/2012/03/MAR10-14_1.pdf 05.02.22
- [6] RA Ministry of Sports and Youth, Report on Aspirations and Expectations of Youth of Armenia, retrieved from <https://escs.am/files/files/2019-08-30/71db875b0a59ed2e7bddd0207823e851.pdf> 05.02.22
- [7] Statistical Committee of the Republic of Armenia, Social Image and Poverty in Yerevan, retrieved from <https://armstat.am/am/?nid=81&id=2217> 05.02.22
- [8] Statistical Committee of the Republic of Armenia, Socio-economic State of the Republic of Armenia for January-December 2013, retrieved from http://www.armstat.am/file/article/sv_12_13a_141.pdf 05.02.22
- [9] Strategic Program of Prospective Development 2014-2025 of the Republic of Armenia, retrieved from <https://www.gov.am/files/docs/1322.pdf> 05.02.22
- [10] Yerevan Communiqué, retrieved from http://www.ehea.info/media.ehea.info/file/2015_Yerevan/70/7/YerevanCommuniqueFinal_613707.pdf 01.02.2022
- [11] Yorke, M. (2006b). Pedagogy for employability. United Kingdom: The Higher Education Academy.

Theory and Practice of Online Assessment at Comenius University

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Abstract

Assessment is an integral part of teaching. This goes for online teaching too. This article focuses on theory of online assessment and its specifics. We discuss an overview of research as well as knowledge gained from our experiences.

Part of the article is also dedicated to a short survey among Comenius University teachers and their views of this issue. We focus on the issue of cheating in an online environment and the ways to prevent it.

Keywords: *online assessment, cheating in online environment, teacher experience*

JEL Classification: *A290, I210, I230, I290*

1. Introduction

Due to the pandemic, in March 2020 Comenius University switched to fully online distance education. It was an unexpected change and in certain aspects we were not prepared technically or methodologically. Covid took control over all aspects of social life and our university was not an exception. However, it was clear that the situation was not going to change anytime soon, we needed to act and the teaching needed to go on.

The Training Center within the Center for Information Technologies of Comenius University took on providing distance learning support in the form of training, consultations and helped by preparing guidebooks and instructional materials. We focused on two university supported environments – Moodle and MS Teams. With a few exceptions, the willingness of teachers to transfer their classes online was very high – evidently shown through the high participation in our meetings and workshops. Many teachers were clearly stepping out of their comfort zone in order to keep the teaching process going without major problems.

However, change comes with the need for adjustment and issues concerning online assessment became more pronounced with the end of the term in sight. One thing was clear – if we simply transfer assessments used in the classroom into an online environment without any changes, we can't expect it to work exactly the same way. So we created a Methodology of Online Assessment Guide for our teachers that summarizes the specifics of online assessment. The Guide is based not only on literature, but also on our experiences.

This article contains information on online assessment and its specifics. We have not focused only on the theoretical aspects of these issues; we include lessons learned from experience with online assessment at Comenius University. We are trying to bring attention to the importance of following certain rules when assessing students online in order to limit cheating in an online environment. This article also includes views and opinions on online assessment from our teachers, their experience with different tools, and the problems they faced.

Our results might be useful for further development of online learning in the future.

2. Theory – Methodology of Online Assessment

In a learning environment, assessment takes two forms.

Summative assessment (Perera-Diltz, 2009) measures the end product – it is a more formal final evaluation at the end of the term. It represents an appraisal of whether learning outcomes were achieved.

Formative assessment (Perera-Diltz, 2009) provides ongoing evaluation. This is an assessment conducted multiple times during the term. In an online environment, formative assessment grows in importance, because it can provide a means to ensure a student’s involvement during the term (Perera-Diltz & Moe, 2014).

For formative assessment, it is not always necessary for the teacher to do all the evaluation work. Techniques for peer-to-peer assessment and self-assessment are also available.

A number of authors (for instance Lederman, 2020 or Reed Osika, 2021) mention the fact that many faculty members believe that assessment, or online assessment means multiple choice tests. There are, of course, many more options that have better chances of engaging students and keeping them interested. Below is a short list of various engaging online assessment options with short descriptions and tips based on research and personal experience of the authors.

2.1 Assignments

Assignments in an online environment can have many forms (Berkeley CTI, 2022). Besides a classic research paper as homework, students can submit a memorandum or briefing, annotated anthology or a course reader, a fact-sheet, or a journal article, etc. Assignments can also be submitted in the form of pictures, audio or video files.

In the case of larger assignments, for instance a research article, studies recommend the use of scaffolding (as seen in Empire State College, 2020). It is a strategy of breaking down a larger task into smaller assignments that focus on particular skills the students will need to complete the large task.

2.2 Discussions

Conducting discussions as a teaching and learning tool has a very long history. Discussions are a tool that support critical thinking, while providing teachers with an opportunity to find out how well students understand the content. It is also a good tool to keep students involved during the semester. Discussions have been heavily used in online learning since the 1990s, often they are referred to as the “backbone of online learning” (Palloff & Pratt, 2011).

Online discussion can be conducted in a synchronous mode (in real time, or in the form of video, audio or chat) or asynchronous mode (participants contribute at different times, over a few days, usually in a text form). For online discussion to be successful and to support development of critical thinking, it needs to be very well planned and moderated (Bender, 2012)

2.3 Group Projects

Learning is a social activity, and for many learners the feelings of community, communication, and collaboration with classmates; and the feeling of not being alone through the journey are one of the most important parts of the process. The feeling of community develops naturally in the physical classroom, but online students are isolated behind their computers. Thus, online

teachers need to put some thought, planning and effort into creating the community feeling. Group projects and activities are one way to help resolve this issue.

Many teachers also use group projects as a tool in the physical classroom. Sometimes they are a success, sometimes not so much. An unsuccessful group project means good students doing work for the lazy ones, while a successful group project means productive collaboration and knowledge sharing (Lieberman, 2018).

The planning of group projects and activities in an online environment is not very different from planning group projects and activities in a classroom. However, there are factors that need to be taken into consideration such as issues of planning, creating groups, providing collaborative space, monitoring the collaboration, and giving feedback (Lieberman, 2018, Smith Budhai, 2016).

2.4 Presentations

Online presentation as a tool can (University of Leeds, 2021)

- Help students to improve their communication skills
- Offer students an opportunity for group collaboration and peer evaluation
- Provide teachers with an opportunity to see whether and how students understand the content and whether they know how to apply the knowledge they gain.

Presentations, whether individual, or in groups require more planning and guidance in an online environment (University of Waterloo, 2021).

2.5 Tests

Finally, even though there are many assessment options, tests are still the most often used assessment tool in the classroom as well as in an online environment. Learning Management Systems used online will enable most of the tests to be corrected and graded automatically, which makes these tools attractive for many teachers.

Preparing tests in online environments requires more preparation and consideration of some factors, such as (University of Waterloo, 2021):

- The impossibility of completely preventing cheating in the online environment
- Considering whether the test can be replaced with method of evaluation that individualizes the task and limits cheating opportunities
- Students needing more time for questions in online environment
- Students needing to know what to do in case of Internet trouble or other technical difficulties
- Being available for questions and troubleshooting before and after the test
- Being aware that whether you prohibit it or not, students will probably have a textbook or Internet browser open on the side while writing the test
- Understanding that a shorter time limit might discourage students from being able to search for answers in the textbook, but it can also make them stressed and panicking

3. Practice – Online Assessment at Comenius University

Comenius University in Bratislava, Slovakia has about 22,000 students, 13 faculties and over 900 different study programs. Before Covid, Comenius University was not providing any fully online courses to students. Both MS Teams and Moodle systems (that Comenius University offers to teachers and students, and provides training and support for) were used to support classroom teaching. MS Teams and Moodle have been Comenius University official supported e-learning platforms. At the beginning of 2020, MS Teams at Comenius University had 248 users and Moodle support was used for approximately 900 courses.

This all changed in Spring 2020. By 2021, there were 10,601 users on MS Teams and 1,547 courses on Moodle. As of today (March, 2022), there are 2,469 courses on Comenius University Moodle and 19,695 users on MS Teams.

In December 2020, we conducted a survey among students and teachers of Comenius University concerning online teaching and learning. 357 teachers participated. 3,016 students took part.

Concerning assessment, 302 of the teachers (84.6%) stated that they used MS Teams videoconference or chat for discussions, group work and more while 13 of them (3.6%) claimed they used Moodle applications (discussion forums, chat, Wiki, workshop) for discussions, group work and more.

Furthermore, only 135 of the teachers (37.9%) claimed to use MS Forms for online testing and 103(28.9%) claimed to use tests in Moodle.

At the same time, in December 2020, we conducted a survey among Comenius University students. They were given questions similar to the teachers. 3,280 students participated.

Concerning assessments, 2,703 of the students (82.4%) claimed their teachers used MS Teams videoconference or chat for discussions, group work, etc., and 303 of the students (9.2%) claimed their teachers used Moodle applications (discussion forums, chat, Wiki, workshop) for discussions, group work, etc.

This suggests some variability in assessment approaches.

In the school year 2021/2022, over 28,000 video conference meetings were held and 5,571 tests in forms were created on MS Teams so far.

In the school year 2021/2022, and across 2,649 courses, there have been 11,333 tests, 7,647 assignments and 1,284 discussion forums on Moodle.

So even though there is a variability in assessment approaches, online testing clearly has a large presence.

4. Theory – Cheating in Online Environment

Professors often think that students cheat more in an online environment (Lederman, 2020). It seems to be a general perception among teachers (Weimar, 2015).

In 2014, Viktoria Beck (Beck, 2014) conducted a study on this issue. She interviewed faculty and asked students whether they would cheat and in what circumstances. She also reviewed test results. She made an assumption that if a student with good prior results received a good result on a test, it could be expected and cheating was probably not involved. If a student with poor previous performance suddenly received an excellent test result, there are chances that cheating might have

been involved. This way she reviewed student results from both face-to-face and online courses and interestingly enough, she did not find higher chances of cheating in online courses. She concluded that the probability of cheating was the same in both forms of delivery.

There are reasons for this:

- A moral reason: those who want to cheat will find a way independently of the form of the course. A student who is not morally inclined to cheat will not cheat in online course just like they would not cheat in a face-to-face course
- A technical reason: students have access to electronic devices such as cell phones, tablets, applications, websites and social media even when they are taking a face-to-face course. Their access to information and resources to use for cheating doesn't increase when their course is taught online

While chances for cheating might be the same in both an online course and a face-to-face course, some of the methods to prevent them might be different for an online environment.

Vladimir Burjan (2020) listed 5 strategies to prevent cheating in an online environment:

1. Strict Monitoring. The author does not recommend this as a good strategy, because it is downright impossible for a teacher to compete with students when it comes to technology – especially when students are working from home. There is a number of software and applications like Safe Browser, ID check, computer locking, etc., but these are only really effective when in a computer lab with appropriate technical support
2. Differentiation of assignments. This is a good strategy to eliminate copying each other's work among students. The assignments don't need to be completely different for each student, it is enough to change one parameter. A good idea is individualization, i.e. the topic of the assignment is connected to the individual student (for instance a description of a family member).
3. Tasks where even Google won't help you. The main idea of this strategy is to create assignments, where answers can't be found online easily.
4. Assignments that require working with the internet. If it is not possible to prevent students from using the internet, you can create assignments that require it and might be aimed to teach students how to work with the internet more efficiently.
5. Assignments that spark interest. The theory behind this strategy is that if students are not interested in topic of their assignments, there are higher chances they might cheat. If the topic of their assignments is interesting to them, then they might enjoy working on it and look forward to learning something about the topic.

Further strategies against cheating online can be found at the SUNY website (2021) and University of Illinois (2021), where we added our own tips and experiences. These strategies can be split into:

A: Strategies for final written assignments:

- Ask students to continuously submit partial work for feedback, such as notes, structure, research review etc.
- Not allow students to select the topic of their final assignment completely by themselves.
- Ask students to collect some original data for their final assignment.

- Require proper citations and list of references for their assignment (or ask them to provide the text they reference to).
- Get to know the students and their writing styles during the term.
- Use the sites most often used by students to copy from as examples even before they start working on an assignment.
- Explain to the students what plagiarism is and what consequences they would face if they decide to do it.

B: Strategies for tests in online environment

- Use different questions for different students (random questions function).
- Set a time limit for your test.
- Making the test available to all students at the same time.
- If possible, tests should be taken in a proctored computer lab.
- Include open-ended and personalized questions that can't be copied easily.

Cheating in education has been around for a very long time. Hidden notes, whispering or other forms of cheating are common in the classrooms. Cheating exists in the online environment too and the problem is that in this environment teachers have a harder time trying to prevent it. That is why the above mentioned strategies are important, because as Karel Čapek said: *“If homework can be simply copied, it deserves to be”*.

5. Practice – Cheating at Comenius University

We attempted to get some insight into the issue of cheating and assessment methods used in the online environment at Comenius University. We are planning to run one more whole-university survey for teachers and students towards the end of the 2021/2022 school year that will include questions about assessment and cheating. In preparation for the survey, we collected some preliminary information. We contacted some of the teachers active in the online environment by email and asked them a few questions about their methods of assessment and their experience with cheating online. We received 28 answers. Here is what we learned.

5.1 Question: What assessment methods have you been using in your online teaching?

24 out of 28 teachers claimed to be using tests. However, in addition to the tests, 18 teachers used written assignments, 14 teachers assessed students by oral examination over video conference, 9 teachers used projects as a form of assessment, 3 teachers conducted assessment via email and 2 teachers claimed to assess students via discussion.

5.2 Question: Which platform have you been using to assess students online?

15 teachers have been using MS Teams, 15 have been using Moodle, and 3 claimed to be using email.

5.3 Question: What tools have you been using to assess students online?

23 teachers have been using MS Teams, 8 claimed to be using MS Forms, 17 teachers claimed they were using tests and assignments in Moodle, 4 claimed to be using email, 4 have been using Mentimeter, and 3 teachers have been using Kahoot.

5.4 Question: Were you satisfied with the options that these tools and methods provided? Are you planning to continue to use these tools and methods in the future?

23 of the teachers claimed they were satisfied with their use of online assessment, and 22 of them stated that they will continue to use some of the tools in the future. 10 of them emphasized that they will evaluate all their tools and select carefully which tools and methods they will continue to use to support their face-to-face courses. One of them explained that students like electronic forms of assessment better: it is how they communicate, they are used to it. She said, *“Now, when we can teach face-to-face again, to a group of over 70 students, I asked them to choose whether they want to do their test with paper and pen, or online in Moodle. Not one of them wanted the paper.”*

However, there was one teacher, who claimed that they are not planning to use online assessment in the future. They see it only as a poor replacement for real teaching and would use it only if another emergency like corona occurs again.

5.5 Question: What problems have you encountered concerning online assessment?

10 of the teachers claimed that they have not experienced any significant problems. 12 teachers stated that the main problem has been a weak internet connection on the side of the students. Only 7 of the teachers listed cheating as the main problem of online assessment.

5.6 Question: What are your experiences with cheating in an online environment?

14 teachers stated that they don't think cheating was a large problem, 4 stated that students have been cheating online more than in classrooms and 5 teachers believed that cheating issues were basically the same whether online or in the classroom. One of them suggested that it was the students who at the beginning had a feeling cheating might be very easy online.

5.7 Question: How have you been preventing cheating in an online environment?

11 teachers stated they demanded students to switch on their cameras during exams, 11 teachers were using shorter time limits on tests, 6 teachers were using randomly selected questions, or a tool to shuffle questions or the answers within the question. 6 teachers claimed they individualized questions and assignments, 5 teachers said they assess students' knowledge and understanding by having discussions with them and two teachers explained they appealed to students' honor and moral integrity. One said, *“The key is to work with the students during the whole term, give them creative assignments and dutifully read everything they write. Then you know if they are cheating”*.

5.8 Question: Based on your experience, what are the advantages and disadvantages of online assessment?

17 teachers saw automated grading of tests as the best advantage. They also listed flexibility (4 teachers), lack of commute to school (4 teachers) and the fact that all tests and assignments are automatically saved and archived (9 teachers) as other advantages. As disadvantages, 12 teachers mentioned cheating, 5 listed technical problems, 4 mentioned time-consuming work on test preparation. 7 teachers also stated that they simply prefer face-to-face contact with the students they teach.

6. Discussion

The short email interviews with 28 teachers are not able to provide a complex view into the thinking of all teachers at Comenius University, but they provide some valuable examples. Teachers' views on cheating in an online environment differ, and not everybody is convinced that an online environment makes it easier.

Based on the answers received we can say that the teachers managed to eliminate the cheating problems they were most worried about. It is interesting to note, that within our small inquiry of a few selected teachers' opinions, those teachers who stated that they have been using individualized assignments, projects, discussions or open ended questions are the same ones who think that cheating by their students was not a problem for them.

“Being aware of cheating risks, I simply formulate the questions in a way that doesn't test memorizing but understanding”.

“All of my assignments require creativity, or application of knowledge, etc. I never ask them to simply repeat information. Students have no opportunities to cheat this way”.

There is a clear connection between making assessment more individualized and creative and lowering the occurrence of cheating. Now that universities can move their teaching back to classrooms, teachers who don't like to teach online will no longer be forced to do so. Online teaching will be further done by teachers who are interested in it and hopefully those who will be willing to be more creative with assessment methods.

The same applies for students. During Corona time, all students were forced to learn online. The transition was very stressful for everybody, including students. Students are more likely to cheat when under stress, when the norms are unclear and they are presented with opportunities (Lederman, 2020). One of our interviewed teachers elaborated on their experience, *“During the Spring semester 2020 almost a third of my students were trying to cheat...During further terms, the amount of students cheating went down. They either realized that doing tests without cheating is better, or they learned to cheat in a way I am not able to track”.* As we move into the future, where only students interested in taking online courses will be taking them, the stress element could lower significantly.

7. Conclusion

After years of pandemic, some of the changes remain. Education is not exempt from these changes. We are still about to feel the consequences of some of them. The changes are not all negative. There is a good chance that some of the study programs that were taught fully online during the pandemic will remain online or in a hybrid form in the future. Past years have shown us that even though online learning has its limits, there are many advantages to its use. It is important though to know and respect its specifics, as online teaching differs from face-to-face teaching.

Online assessment is an integral part of online teaching and it needs to be planned and conducted smartly in order to avoid problems. Our Training Center published a guidebook for Comenius University teachers titled *Methodology of Online Assessment*. Besides theoretical recommendations, we included practical advice and experiences from teachers at Comenius University in Bratislava.

We don't want to compare incomparable things. This means that classroom teaching will always have the central spot on the stage, but with the experience we gained, we have a unique opportunity to move further and take advantage of what online learning can offer. If online learning is to continue, it is of key importance to provide the teachers with proper training opportunities for them to be able to handle not just online learning systems and tools, but also to be equipped to methodically plan their assessments.

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References

- [1] Beck, V. (2014) Testing a Model to Predict Online Cheating--Much Ado about Nothing, *Active Learning in Higher Education*, v15 n1 p65-75 Mar 2014
- [2] Bender, T. (2012), *Discussion-Based Online Teaching to Enhance Student Learning*. Stylus Publishing, Sterling, VA, USA
- [3] Berkeley CTI – Center for Teaching Innovation, Berkeley University of California (2022), *Alternatives to Traditional Testing*, Retrieved on April 1, 2022 from <https://teaching.berkeley.edu/resources/course-design-guide/design-effective-assessments/alternatives-traditional-testing>
- [4] Burjan, V. 2020. Úlohy, ktoré sa nedajú odpísať. In *Dobrá škola*. Retrieved on April 13, 2021 from <https://dobraskola.sk/ulohy-ktore-sa-nedaju-odpisat/>
- [5] Empire State College (2020), *Getting Started with Design*, State University of New York, Retrieved on April 1, 2022 from <https://teaching.berkeley.edu/resources/course-design-guide/design-effective-assessments/alternatives-traditional-testing>
- [6] Lederman, D. (2020) Best Way to Stop Cheating in Online Course? Teach Better. In: *Inside HigherEd* 2020/07/22 Retrieved April 2, 2022 <https://www.insidehighered.com/digital-learning/article/2020/07/22/technology-best-way-stop-online-cheating-no-experts-say-better>
- [7] Lieberman M. 2018. *Online Students Don't Have to Work Solo*. *Inside Higher ED*. Retrieved on June 11, 2021 from: <https://www.insidehighered.com/digital-learning/article/2018/04/25/group-projects-online-classes-create-connections-and-challenge>
- [8] Palloff, R.M. & Pratt, K. 2011. *The Excellent Online Instructor. Strategies for Professional Development*. Jossey-Bass, San Francisco, CA, USA.
- [9] Perera-Diltz, D. M. (2009). Assessment purposes. In E. Bradford (Ed.), *ACA encyclopedia of counseling* (pp.38–39). Alexandria, VA: American Counseling Association

- [10] Perera-Diltz, D., & Moe, J. (2014). Formative and summative assessment in online education. *Journal of Research in Innovative Teaching*, 7(1), 130-142. [cit. 2022/04/01] Available Online: https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1038&context=chs_pubs
- [11] Reed Osika, E. (2021) *Assessing Student Learning Online: It's More that Multiple Choice In: Assessing Online Learning: Strategies, Challenges and Opportunities*, July1, 2021, MagnaPubs, Michigan, WI Retrieve on April 1, 2022 from <https://www.facultyfocus.com/wp-content/uploads/images/AssessingOnlineLearning-OC.pdf>
- [12] Smith Budha, S. (2016). *Designing Effective Team Projects in Online Courses*. Retrieved on June 20, 2021 from <https://www.facultyfocus.com/articles/online-education/online-course-design-and-preparation/designing-effective-team-projects-in-online-courses/>
- [13] SUNY. (2021). State University of New York: *Academic Honesty website*. Retrieved on June 10, 2021 from <https://onlineteaching.open.suny.edu/page/cheating>
- [14] University of Illinois. (2021). *Strategies to minimize cheating online*. Retrieved on June 10, 2021 <https://www.uis.edu/ion/resources/tutorials/assessment/strategies-minimize-cheating-online/>
- [15] University of Leeds. (2021) *Presentations and Performances for online summative assesment and feedback*. Retrieved in August 5, 2018 from <https://digitalpractice.leeds.ac.uk/teaching-learning-online/presentations-and-performances-for-online-summative-assessment-and-feedback/>
- [16] University of Waterloo. (2021) *Making the Transition to Online Exams*. Retrieved on August 5, 2021 from <https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/teaching-tips-assessing-students/making-transition-online-exams>
- [17] Weimar, M. (2015) *Do Online Students Cheat More on Tests?* Facultyfocus Retrieved on April 5, 2022 from <https://www.facultyfocus.com/articles/online-education/online-assessment-grading-and-feedback/do-online-students-cheat-more-on-tests/>

The Changing Role of Hungarian Higher Education after the Change of Regime and its Relationship with the Development Potentials of the Regions of Hungary

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Abstract

The aim of this paper is to provide an overview on the changing role of higher education on the local economic development of the regions of Hungary after the change of regime, with special focus on the rural areas. The level of qualification of the population has always been an important factor in economic development, thus the development of the human resource must be a key issue in development policies. The higher is the share of population with tertiary education, the higher is the potential for economic growth. As being lecturers in higher education for more decades, our aim was to see how the role and function of the higher education has changed over the years in Hungary and how important its role is nowadays by being a center for innovations, basis for spin-off and start-up businesses, by the establishment of regional research centers acting as knowledge-transfer hubs. We all know that SMEs, startups, businesses with innovative approach play a crucial role in the local economic development, not only in Hungary but in the whole European Union, so any measures targeting their development are inevitable, however, we need to see whether the human resource of the country at the moment is suitable for the establishment/development of such innovative enterprises. In this paper we examined the 18 counties located in the rural areas. We collected and analyzed the data for NUTS 2 regions and NUTS 3 level counties located in Hungary. Our aim was to see the tendency of the role of higher education in the development of rural areas.

Key words: higher education institutions, innovation, local economic development, research and development, start-up businesses

JEL Classification: I24, I25 R58

1. Introduction

There is general consensus in the literature on innovation-oriented regional development that the utilization of a regional knowledge base, innovation potential and cooperation between businesses and research institutions continues to play an increasing role, not only with regard to business success but also in the competitive economic performance of a region (Lackenbauer, 2004; Cooke, 1995). In many regions, universities are viewed as the core of the knowledge base and at the heart of the knowledge economy, acting as key elements of innovation systems, supporting science and innovation-based regional growth (Huggins et al., 2008).

Universities and research institutes as knowledge centers, extending and disseminating comprehensive scientific information, are playing increasing role in regional development thus in the development of businesses operating in the region. Despite of the fact that universities always highlight their international acknowledgement and internationalization endeavors, most of the higher education institutions are embedded in their own region and significantly contribute to its economic and social development by maintaining local jobs, diversifying the local economy as well as by attracting investors to the region. Nowadays, in the globalized world, there is increasing competition to reach qualified labour force and the intellectual added values. Since nowadays the value of intellectual capital has higher priority than the physical resources, a shift towards the significance of universities can be observed, since they are the institutions where the knowledge-generation and dissemination are carried out, being the basis for the knowledge-based society. However, it has been getting more and more important how the higher education institutions' impact on the region's economy and society can be really measured (Molnár-Zuti, 2015). However, it was not always the situation with universities, their primary aim was not always to live in harmony with their regions and to boost active relationship with companies. That is why we intend to provide an overview on the transformation of the Hungarian higher education after the change of regime 1989/90. It can be clearly seen how universities were reshaped to meet the market needs and to contribute to the integrated development approach.

2. Theoretical background

2.1 The relationship between education and rural development

Since most of the territory of Hungary falls in the category of rural, we must see the most important roles of education and higher education in the development of rural areas. FAO and UNESCO (2003) emphasize that a community cannot foster development without an educated population. Businesses, large or small, are unlikely to choose to invest in rural areas if skilled or trainable human resources are unavailable. Similarly, a community cannot retain educated people without an attractive economic environment. It is obvious that knowledge, skills and competencies acquired through any formal, informal and non-formal education are considered one of the most significant economic and social factors contributing to the development of the countryside. Knowledge transfer/exchange helps to continue growing a sustainable rural area and also contributes to finding more of the long-term solutions that rural residents can offer to society (Greser et al., 2021).

According to Farheen (2019), it is important to understand the need for good quality education in rural areas, as it helps keeping the population in the rural areas. People, especially young people tend to move to urban areas for better opportunities in education and employment, thus improved rural education is one possible strategy for keeping them in the countryside. We agree with Ninh (2021) that well-educated farmers are likely to adopt new technologies early since they get distinct access to relevant information and are capable of distinguishing between promising and unpromising innovations. Education is also supposed to reduce the perceived level of uncertainty and the aversion of the farmer toward endogenous risks arising from his own choice of production technology. Since some rural areas are still dominated by agricultural production, the education of people working in agriculture is a key to sustainable development. In an OECD (2021) report, it is highlighted that in order to maintain quality services in rural regions and close gaps further exposed by the pandemic, governments must develop innovative responses tailored to the specificities of rural places and the long-term challenges they face. We believe that such innovative responses must also include the restructuring of higher education, meeting the requirements of the rural regions of Hungary.

2.2 The transformation of the Hungarian higher education after 1990

The first wave of the transformation of the Hungarian higher education system started with the act that was passed in 1993 exclusively on higher education – first in the history of the country. That Act made it possible to establish institutions maintained by the church or private companies in addition to the state-governed institutions. From that year, the number of state higher education institutions gradually decreased (by approx. 10% by 2000), the number of church-governed institutions tripled by the academic year 1993/94, while the number of institutions maintained by foundations or the number of private institutions has gradually increased. The largest increase in the number of the higher education institutions was during the 1992/93 academic year, when 15 new institutions were created and altogether 90 institutions existed (this situation did not change much until the millennium). However, the number of students increased only slightly, thus the institutional system has become very fragmented. At the beginning, institutions had low number of students and their professional scope was quite limited, which resulted in an inflexible training structure that could not adapt to the socio-economic changes and cost a lot. Thus the higher education system needed further developments. Moreover, after the change of regime, a normative financing scheme was introduced, meaning that colleges and universities were granted the state support based on headcount. It means that it was a targeted approach by the institutions to increase the number of students but taking into account that all the institutions from the same professional field received the same state support per head, the institutions in the countryside, having students from only the region could operate with lower costs, compared to the large, historical institutions.

The next phase of development was in 1995 when an integration process was initiated with state financial support. The main aims were as follows:

- to modernize the institutional system in a rational way;
- to use the capacities as well as the infrastructure more efficiently;
- to stop the unnecessary parallel courses;
- to operate the institutions more efficiently;
- to improve the quality of courses;
- to transform the course structure;
- to allow easier change between courses/institutions with the establishment of the credit system and
- to expand the supply of courses.

By the end of the 1990s, the number of students in higher education basically tripled, since the act on higher education in 1996 allowed to introduce self-financing courses in addition to the formerly existing state-supported courses. Since the rate of those who graduated on self-financing courses was much higher than on state-supported courses, more students preferred those courses and the institutions also intended to attract more students to those trainings. It resulted in a depreciation of diploma received at the end of self-financing courses. Additionally, higher vocational courses have been created that operated as engines of higher education expansion.

At the millennium, several institutions opened the academic year in the form of large institutions, as a result of the integration of formerly independent universities/colleges. The law effect since 1 January 2000 ordered the transformation of the institutional system based on regional aspects, the integration of institutions with similar or the same profile located in the capital, Budapest. The aim was to create more efficient institutions with broader scope, considering the economy of scale, and to create institutions more adaptable to the job market needs. Due to this integration process, the number of institutions decreased by almost 30% by

the year 2007. Despite of the fact that the integration process was the part of a financial modernization plan of the higher education system, and the concept was to establish institutions dealing with more than one disciplines and to have one higher education institution in one region, the integration – in some cases – was based on rather professional reasons and not on geographical proximity, therefore faculties of the new institutions might have been far from each other, making the efficient management, leadership and coordination more difficult. One of the aims of the integration was to force the newly integrated institutions to stop the parallel courses – formerly offered by the individual institutions – but most of the institutions did not manage to do that, since it would have meant firing lecturers who had been teaching certain topics for a long time. The management of the institutions did not want to make this decision and did not have professional reason whom to fire.

The next stage of the development of the Hungarian higher education system was around the accession to the European Union in 2004. The major aims in this phase were as follows:

- to increase the number of students in higher education
- to support lifelong learning
- to modernize the institutional system
- to develop the course contents and training forms meeting the job market needs as much as possible and
- to develop the infrastructure in line with the middle-term development plans of the institutions.

A few years later Hungary also made a lot of efforts to introduce the Bologna-system in the higher education to have a harmonized system on the international higher education market. It was the 2006/2007 academic year first starting in the framework of that system. The Hungarian higher education system faced various challenges in introducing the Bologna system, since the framework of courses were based on rather curricula and lexical knowledge rather than on competencies and skills. Therefore, at that time, Hungarian higher education was considered as a non-practice-oriented education that was not able to prepare the graduates even for the job market requirements in several aspects, like foreign language, IT skills (Rappai, 2005). Based on the abovementioned, it is clear that the Hungarian higher education system has been undergoing serious transformation since the change of regime 1989/90, however, there are debates whether all the measures could be considered modernization or not.

There were significant changes in the role of higher education over the past three decades. The primary role, namely education, has lost from its importance and additional functions (research, services to businesses) have become more important. The spatial dimension of innovation had been greatly determined by the transformation of universities during the transition years in Hungary. This involves not only the extension of their research profile, but also the transformation of the traditional university into the organizational structure of a research university (Gál, 2010). We could observe radical changes in the methods and nature of knowledge-transfer, serving more the knowledge-based economy. We can also see changes in the necessary knowledge required by the economy and society as well as how much the usability, functionality and employability of knowledge has been more in the focus. In addition, more and more links, relationships have been created between higher education institutions and businesses, companies, research centers, vocational training centers, SMEs etc. to use the resources more efficiently and to find solutions more-tailored to the business needs. Over the past decade, several regional research centers have been established at universities to serve as knowledge transfer hubs. Moreover, universities also strive to encourage and support their students to set up their own businesses. Nowadays, the presence of a higher education institution creates added value in many dimensions in the region where it is located and more

and more think that they play increasingly important role in local economic development. The territorial distribution of higher education institutions is not balanced in Hungary even if there are institutions or affiliates of institutions in each region. It has also to be mentioned that the efficiency and the innovation capacity of institutions are not balanced either. As Figure 1 shows, the higher education is still concentrated in the capital (the higher is the triangle on the map, the more institutions can be found in that town). The ownership structure also shows interesting tendency, namely that many institutions at the moment are in private ownership and their number will increase gradually in the coming future due to the higher education measures of the government. Formerly state universities will become private, under the supervision of foundations (even financed by the state!).



Figure 1. The location of the headquarters of higher education institutions in Hungary, 2021

Source: based on data from Education Authority, own editing, 2021

However, we need to mention that nowadays there are significant ongoing changes in the ownership of the higher education institutions, meaning that only 6 out of 64 will remain in state ownership soon, out of which only one is located in the countryside (Baja), the rest is in Budapest. It results that soon every third in ten students will study in institutions maintained either by foundations, private companies or church due to the government's recent measures related to higher education.

3. Material and method

In order to see clearly the role of higher education in the Hungarian countryside, we need to refer to the definition of 'rural' in Hungary. Hungary's rural definition followed the definitions stated in the 1305/2013/EU regulation. An area is a rural area if a city a town or village has less than 10,000 inhabitants (even if the population density is over 120 person/m²), or has more than 10,000 inhabitants but the part of the city is an outskirts and there are rural settlements. The capital of Hungary Budapest and its agglomeration are not included in the rural category and not covered in the rural development program (<https://www.palyazat.gov.hu/node/56582#>). It means that regarding urban-rural typology, Hungary has the capital and its agglomeration as urban area and the rest of the country as the countryside.

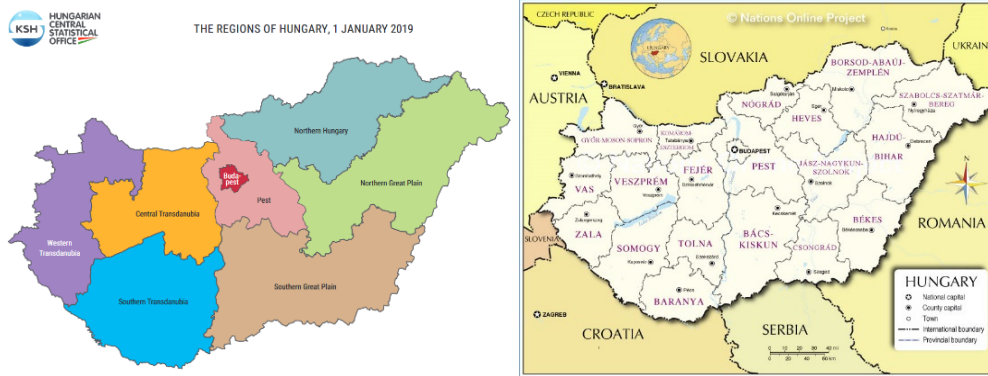


Figure 2, 3. NUTS 2 regions and NUTS 3 counties of Hungary

Source: https://www.ksh.hu/regionalatlas_regions and <https://www.nationsonline.org/oneworld/map/hungary-administrative-map.htm>

According to the general typology in the Rural Development Program of Hungary, rural is an area with population density under 120 person/m², also supports the abovementioned classification. According to the latest EU definition, rural area is an area where more than 50 % of its population lives in rural grid cells. Based on the abovementioned, we intended to highlight the discrepancies between the urban and rural areas of Hungary in terms of education. Figure 2 and 3 help to understand the regional and county-level statistics detailed below.

Regarding the national statistics, the number of students in higher education gradually increased over the past 30 years that is a benefit for all the regions of the country even if the is still a huge gap between the regions and counties. However, in general it is beneficial that the share of those who took part in higher education has been increasing, being a good and solid basis for economic development. The more educated the population is, the better is the potential for sustainable economic development. Despite of the fact that there were changes in the distribution, the share of full time students always remained dominant. There has been unequal territorial distribution of full time students in higher education over the past 2 decades. The distribution of the full-time students in higher education reflects huge concentration in the center of the country, resulting in large territorial inequalities - similarly to other macroeconomic indicators. In 2019, just a little above 100,000 people attended bachelor or master courses at higher education institutions from the countryside which might seem to be low compared to the number of population living in the 18 counties. If we look at the share of population with tertiary attainment education in the regions, we can see territorial discrepancies, since the capital reflects high concentration – similarly to other indicators. In Budapest, over 40% of the population have university degree, while in the countryside it is around 20%. This also highlights the need to strengthen the higher education institutions in the countryside so that they could attract more people primarily from the region where they are located. Regarding the number of people receiving diploma in the country showed increasing national tendency over the past decades that it is primarily due to the increasing data in the capital and its agglomeration and not due to the increase in the rural areas. Despite of the fact that compared to the beginning of the 90s, the number of people receiving diploma doubled by the millennium years (it has been around 50,000 in every year), there are significant regional discrepancies as explained above.

If we look at the potentials in the development of human resource in the regions of Hungary, we need to see the share of young population among the people aged 20-24 years with less than primary, primary or lower secondary attainment, since that age group of the society is the mostly expected to study further and show intention to go to secondary school and university

or contribute actively to the local economy be either setting up his/her own business or taking a job at a company. The situation is not favourable in the countryside. Not only because of the huge regional discrepancies, but because e.g. in Northern Hungary, nearly one in four people aged 20-24 does not have sufficient education attainment to be able to complete secondary education or to get admission to university. In the regions lagging behind regarding the potential applicants to higher education institutions, the problem is multidimensional, since the share of young people (18-24 years) neither in employment nor in education is also extremely high, meaning that there is no intention of young people to study if they are not successful in job search either. In the regions, located to the east of the Danube, one in five young people is not employed or studies and this data did not show any spectacular improvement over the past 5 years. It means that there is a massive group of young people, especially in the Eastern regions (which have low GDP per capita indicator as well), whom the nation cannot build on in short or middle terms if it comes to their economic contribution and development. It also means that in order to improve the local economic conditions, higher education institutions in the rural regions must focus on further trainings and other vocational short term trainings as well (in addition to the bachelor and master courses) to attract some of those young people who completed their secondary education. Higher education institutions have huge responsibility to improve the human resource of their regions in general, not limited to the university studies. Higher education institutions also have important task in developing the cooperation and the link with the businesses in the region, since they are the potential employers of the population of the region. This expectation is the highest in those regions which lag behind from economic point of view. As it has already been mentioned above, regions located to the east of the Danube lag behind in several aspects. It needs to be mentioned that spatial differences in economic development have serious impact on the network relationship of universities and business organizations. As the economic development level of the regions of Hungary also differs, the share of active population with tertiary education attainment also varies. The number one region is the one including the capital, it is not surprising. It is favourable that the share of population with tertiary education attainment doubled after the change of regime but based on the figures above we can see where it would still be very necessary and urgent to increase further the qualification of population. It is the regions in the countryside. The gap between the regions in this matter even increased over the past decades and the central region has shown increasingly large concentration (Aboelnaga et al. 2019).

4. Results and discussion

Universities can have an impact on the economic development of their own region in two ways: (Florax, 1992) on the one hand, through the multiplier effect of the purchasing power of students (a so-called expenditure effect) and on the other hand, through the knowledge transfer from the university into the business sector (knowledge effect) (Varga, 2004). According to Florax (1992), there are at least eight subsystems in the analysis of the regional and local impacts of universities: political, demographical, economic, infrastructural, cultural, attractiveness, educational and social. Higher education is an extremely attractive factor for capital development not only because it creates competitive advantage in the local labour market but also through its potential for creating innovation. It can be seen all over Europe that the development of large technology systems concentrated in metropolitan agglomeration was mostly determined by the research and development units of large companies. By contrast, the innovativeness of SMEs was, in the majority of cases, initiated by institutes of higher education, through the creation of local and regional clusters (Gál, 2010). The economic

attractiveness of the regions and spread of knowledge depend largely on a spatially-balanced network of university-based research facilities, and especially with regard to their relationship with companies (Gál, 2010). The role of higher education in the development of an area (country, region, county) can be interpreted from several aspects. Based on Gál (2016), the universities have different functions that fundamentally affect their commitment to the regional and local development, as follows:

1. The primary/basic function of universities is the *education*, namely giving knowledge to students that is competitive on the international and national/regional job market. However, the knowledge offered by the institutions is sometimes disharmony with the job market forecasts and the job market changes. Courses and the profile of the institutions are difficult to change in the traditional system and the role of the state cannot be replaced. This problem varies in the regions and it seems that in the peripheral regions the state has to take more role in higher education system.
2. Traditionally, the tasks of universities are primarily the education and secondly the *research*. The role of institutions in the fundamental and applied researches has gradually been determining. They have shown increasing intention to join international research networks.
3. Nowadays, universities are more likely to take the third mission, namely the *developing* role. Their role in innovation and economic development is getting more importance. Universities, especially in the peripheral regions, are determining economic actors by usually being the largest employers, attracting the purchase power of students, resulting in direct economic impacts. By supplying the regions with highly qualified human resource, they contribute to the development of various sectors.

Since there are no national statistics to measure the impact of higher education institutions within their third mission (developing and innovation), we must not forget about their impact on the number of businesses. Due to the knowledge-transfer and the innovation generating activities, universities are very much supportive and motivating environments for young students who are considering setting up their own businesses. Therefore, we can state that higher education institutions have indirect impact on business development. Several institutions have established their own startup centers within their institutions to assist the young entrepreneurs and support new innovative ideas. In the past 20 years the number of operating SMEs increased by 37% compared to the year 2000, exceeding 855,000 by 2019. Over 90% of the SMEs belong to the micro-enterprise category, which includes startups as well. Unfortunately, there is no statistics in Hungary about the startups separately, so we cannot see how the innovation influenced the establishment of new businesses in the past 2 decades but there is statistics for the newly established businesses. The capital and Pest county (the agglomeration of the capital) very much dominate the business sector regarding the newly established companies. Almost every third business was set up in the capital in 2000, while it was still over 25% in 2019. The newly established micro-enterprises in Hungary showed gradual increase after 2012, exceeding 118,000 in 2019. Except 2012, 60,000-70,000 micro enterprises were set up every year on average which reflects active entrepreneurship capacities. Micro-enterprises in this aspect cover the small businesses with maximum 9 employees. If we look at the detailed data, we can see that 99% of the newly established enterprises were those with maximum 4 employees. It means that we must consider the startups in this category, since they also usually have maximum 4 employees. The National Authority of Intellectual Property was ordered first in 2017 to register the startups, thus we could not have specific statistics about them before 2017. However, startups are not equal to new micro enterprises, but mean such businesses that have special aims. Startups are businesses that aim to enter on international market in short term based on their business model or innovative product and which has the

potential for such growth. In the followings subchapter, some information can be read about Hungarian initiatives related to universities and innovative businesses.

4.1 Initiatives to strengthen the innovation potentials in Hungary

4.1.1 Hungarian Startup University Program

The Hungarian Startup University Program (HSUP) is the first practice-oriented university-level startup course in Hungary aiming at bringing the next generations closer to the business sphere and teaching them how to think in a solution-oriented and innovative way. The idea of such a course was born in 2019. The course is for two semesters and intends to call the attention of young people that forming innovative ideas into businesses is a good career opportunity. This course may have long-term impact on the development of the Hungarian innovation ecosystem (<https://hsup.nkfi.gov.hu/>). In 2021, 21 higher education institutions joined the program and offer the course to the young talented students. It is not only the students but the partner institutions see great potentials in the program. In the second semester of the program, the students have team-work and work on over 100 project ideas. Based on the feedback of partners, the course helps to gather young innovative people with creative mentality who can get useful and applicable knowledge on innovation, making them competitive on the job market. The course focuses on the learning of innovation approach, increasing the interest on innovation. Several experts from the startup sector are also involved in the course, thus the Y and Z generations are involved in innovation environment by linking the generation, resulting in an „innovational generation”. The program also offers scholarships and business mentoring activity for the participants to support the best project ideas for the real market conditions.

University Innovation Ecosystem

According to the Hungarian National Strategy of Research and Development and Innovation, one of the overall objectives is to encourage the active knowledge- and technology transfer among the members of the innovation ecosystem as well as to exploit the knowledge transfer role of higher education institutions more efficiently. In harmony with the abovementioned objective, the National Research and Development and Innovation Authority launched the program called University Innovation Ecosystem (2019-1.2.1-EGYETEMI ÖKO). The aim of this program is to establish a separate department/unit within the universities that fosters the use of the scientific results born at the university on the market, supports the cooperation between the universities and business sphere on research, development, technology and innovation, as well as encourages the universities to take active part in EU research and innovation frameworks. One of the other aims of the program is to create an online platform where the R&D&I portfolio of universities can meet the concrete needs and inquiries from the business sphere. This match-making platform helps to contact the universities and assist in creating relationships between the academic and business sphere. In order to improve the innovation capacities and competitiveness, it is extremely important to strengthen the organizations, companies, universities, policies at regional and local level. The aim of the initiative called Territorial Innovation Platforms to create regional cooperation based on the knowledge basis of universities and to strengthen the relationship between the members of the innovation ecosystems. The constitutional agreement has been ratified by 7 universities from the countryside and 11 universities in Budapest. Moreover, 5 national professional organizations and several members of local innovation ecosystems joined the program.

5. Conclusions

Based on the overview on the transformation of the Hungarian higher education, we can see that universities and colleges have had increasingly important role in the economic development, especially in their own regions by fostering innovation, transferring knowledge, strengthening the relationship with the business sphere. Moreover, higher education institutions – due to market needs – had to realize that they must serve the businesses with their research and development activities. This process takes time, there are regional discrepancies still existing in the country, but due to the various programs and initiatives, spectacular progress can be observed. Therefore, it is not a question that higher education institutions play and must play important role in economic development at national, regional and local level. However, the more an institution is embedded in the local and regional economy and society, the stronger relationship it has with the business sphere, the more efficient is its multiplier activity in its region.

References

- [1] Cooke, P. (1995). Planet Europa: Network approaches to regional innovation and technology management, *Technology Management*, 2. 18-30
- [2] FAO, UNESCO (2003). *Education for rural development: towards new policy responses*, joint study, FAO ISBN: 95-5-104983-1, UNESCO ISBN 92-803-1220-0, retrieved from <http://www.fao.org/3/ad423e/ad423e.pdf>
- [3] Farheen, S. (2019). *The role of education in rural communities*, Rural Development Institute, retrieved from <https://www.brandonu.ca/rdi/>, 03/07/2021
- [4] Florax, R. (1992). *The university: A regional booster? Economic impacts of academic knowledge infrastructure*, Aldershot: Avebury
- [5] Gál, Z. (2010). The role of research universities in regional innovation: The case of South Transdanubia, Hungary, In: *Perspectives on learning cities and regions. Policy, practice and participation*, ed: Norman Longworth, Michael Osborne, ISBN 978 1 86201 448 0, pp. 84-105.
- [6] Gál, Z. (2016). Egyetem és a város. *Educatio 2016/2.*, ISSN 1419-8827, pp. 220-233.
- [7] Greser, J., Kamiński, R., Klatta, P., Knieć, W., Martinez-Perez, J., Sitek, A. & Wagstaff, A. (2021). Knowledge Transfer, Knowledge Acquisition and Qualifications in the Context of Rural Development in Poland. *European Countryside*, 13(1) 56-70. <https://doi.org/10.2478/euco-2021-0004>
- [8] Huggins, R., Johnston, A. and Steffenson, R. (2008). Universities, knowledge networks and regional policy, *Cambridge Journal of Regions, Economy and Society*, 321-340
- [9] Huggins, R. & Kitagawa, F. (2009). *Devolution and Knowledge Transfer from Universities: Perspectives from Scotland and Wales*. Discussion Paper: Impact of Higher Education Institutions on Regional Economies Initiative
- [10] Lackenbauer, J. (2004). Catching-up, regional disparities and EU cohesion policy; the case of Hungary, In: *Institutions and Policies for the New Europe International Conference, Portoroz-Koper, Slovenia, June 17-19 2004*
- [11] Molnár, G. (2015). Egyetemek gazdaságfejlesztési hatásainak számszerűsítése: a harmadik misszió mérési lehetőségei. Szakdolgozat, Szegedi Tudományegyetem, Szeged.
- [12] Molnár, G. & Zuti B. (2015). Egyetemek gazdaságfejlesztési hatásainak mérése, „Első szárnypórbálgatások”, Vol. II., No. TDK Műhelytanulmányok (2015): pp. 52-65.
- [13] Nagy, H., Káposzta, J., Varga-Nagy, A. (2018). Is ICT smartness possible development way for Hungarian rural areas? *Engineering for Rural Development*, 2018, 17, pp. 463-468
- [14] Ninh, Le K. (2021). Economic role of education in agriculture: evidence from rural Vietnam, *Journal of Economics and Development*, Vol. 23. No. 1. pp. 47-58, Emerald Publishing Limited, ISSN: 1859-0020, <https://doi.org/10.1108/JED-05-2020-0052>

- [15] OECD (2021). *Delivering Quality Education and Health Care to All: Preparing Regions for Demographic Change*, OECD Rural Studies, OECD Publishing, Paris, ISBN 978-92-64-44654-0, <https://doi.org/10.1787/83025c02-en>
- [16] Rappai, G. (2005). A Bologna-folyamat kihívásai a statisztika felsőfokú oktatása számára, *Statisztikai Szemle*, Vol. 83, No. 6, pp. 514-532
- [17] Varga, A. (2004). Az egyetemi kutatások regionális hatásai a nemzetközi szakirodalom tükrében, *Közgazdasági Szemle*, LI. évf. március, 259-275
- [18] <https://hsup.nkfi.gov.hu/> (retrieved on 11/04/2021)
- [19] www.ksh.hu (retrieved on 4/04/2021)
- [20] Oktatási Hivatal (oktatas.hu) (retrieved on 20/04/2021)
- [21] https://www.ksh.hu/regionalatlas_regions (retrieved on 04/07/2021)
- [22] <https://www.nationsonline.org/oneworld/map/hungary-administrative-map.htm> (retrieved on 04/07/2021)
- [23] <https://www.palyazat.gov.hu/node/56582#>

Information and Communication Technologies in Education (Current Issues and Challenges)

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Abstract

The paper deals with the changes in online education, which became common practice during the COVID-19 pandemic at all levels of the education system. Another trend in the period was the hybrid education model used in the temporary reopening of schools. The management of schools and universities immediately introduced measures to ensure the continuity of education and its transition to the online environment and defined the rules for the implementation of work activities in the home environment, i.e. home office. The decisive factor in the optimal "setting" of new conditions of education and work is their digitization and wide application of information and communication technologies and Internet services. After two years, it can be stated that the pandemic "contributed" and accelerated the processes of digital transformation of classical education systems and traditional forms of work. Benefits of the period are from the perspective of the individual/society increasing the level of information literacy and digital competencies, increasing the use of online learning platforms and digital learning resources (content), new opportunities for self-development and self-education of individuals and shaping their digital competencies for living and working in society. On the other side can be observed negative effects of education and work in the online environment associated with long-term social distance of people in several areas of personal/working life. The author is a member of the working team for the creation distance learning methodologies at FEM and participates in the formulation of procedures and practical implementation of emergency distance learning (ERL) tools. For a comprehensive view of the issue of emergency remote learning, he used his pedagogical and work experience (teacher of IT subjects; administrator of ICT and IT support), but also the results of a controlled interview with participants in emergency remote learning (teachers/students FEM, their experiences, problems and attitudes) in comparison with domestic and foreign research and studies.

Keywords: digital transformation, information technologies, online education platforms, human capital

JEL Classification: I25, J24, L86, O33

1. Introduction

The onset of the Covid 19 pandemic in March 2020 radically changed the functioning of human society worldwide, affected all areas of its economic and social life and changed many social activities to eliminate social contacts and protection of human life and health. In almost all areas of the functioning of human society was the significant phenomenon the unpreparedness and the need for an immediate response to ensure the operation of basic activities in the new conditions was a significant phenomenon. Arquilla & Guzdial (2020) state that the pandemic has demonstrated great vulnerability in social and economic systems and has led to huge economic costs and serious psychological damage inflicted by the virus. On the other hand, the adoption of anti-pandemic measures and social distances have accelerated the processes of digital transformation in sectors where it has stagnated, resp. lagged behind for various

reasons. The result is changes in the functioning of companies, schools, organizations and the implementation of basic activities in the virtual environment of the Internet, e-services and large-scale implementations of information and communication technologies (ICT). *The Internet and Web, videoconferencing, collaboration tools, email, and social media are now primary avenues for business, social interaction, and entertainment (Cerf, 2020).*

1.1 Education and its changes during a pandemic

Education was one of the areas where the virus pandemic led to a sharp shift forward and accelerated the digital transformation of existing traditional education systems and practices. However, according to Arquilla & Guzdial (2020), the response of the education sector was less developed, but the use of networking systems has shown there is a way to continue to educate via distance learning. They see its advantages especially for high school, college-level and postgraduate education, where in some ways it provides a deeper tutorial quality than like in traditional formal classroom learning. In the context of conventional remote learning methods, Tulaskar & Turunen (2021) define six different forms of remote learning based on their main characteristics: the place of teaching (physical/remote), participant interaction (synchronous/asynchronous) and educational intention. In a more detailed description, they can be supplemented by other characteristics: contact of the participants (direct/indirect), the way of their mutual communication (interpersonal/impersonal) and the forms/tools of the educational content used.

During the pandemic, three basic forms of learning were used: full-time, online and part-time, referred to as hybrid. While in the first year of the pandemic, full-time learning was almost eliminated and replaced by online learning, in the following period hybrid learning prevailed (combination of full-time and online form) depending on the government measures taken and the health situation of individual countries. Hybrid learning combines conventional classroom experiences and online courses; students have the opportunity to choose online or class lectures. Most used learning tools are video conferencing, LMS systems, online exercises, discussion forums, pre-recorded video instruction (Neelakandan, 2021).

1.2 Information and communication technologies and challenges for education

Vardi (2020) argues that computing is today the "operating system" of human civilization. The amazing world of the Internet and the web that we have created over the last 50 years now provides us with the tools that allow us to work and socialize. Vardi's "enthusiasm" confirms how ICTs affect the lives of individuals and society. In recent years development of ICT have been accelerating and bringing many innovations in the form of various technological solutions and services (cloud computing, IoT, augmented/virtual reality, artificial intelligence (AI). For individuals, the acquisition of sufficient digital skills and competencies is not only a prerequisite for their use, but also a prerequisite for successful participation in society. This requires the adaptation and digital transformation of education and education training systems. The aim of the education transformation is to improve it in the context of the demands that are placed on the current generation of students after completing formal education ITakadémia (2020). The challenging and complexity of the process of modern, digital education Evans (2020) explains, *"today, schools need to prepare students for rapid economic and social change than ever before, for jobs that have not yet been created, to use technologies that have not yet been invented, and to solve social problems we do not yet know will arise"*. The importance versatility of a worker as an ability *"to work in the mode of so-called multitasking and multiskilling"* is growing (ICTC in Oláhová, 2010). Fadel et al. (2015) uses the term versatile expert (abbreviated versatilist), who is able to apply the depth of skills

to a number of situations and experiences, acquire new competencies and take on new roles. He is able to constantly adapt and also to constantly learn and grow, to move in a rapidly changing world.

2. Data and Methods

The COVID-19 pandemic has created the largest disruption of education systems in history, affecting nearly 1.6 billion learners in more than 190 countries and all continents. Closures of schools and other learning spaces have impacted 94 % of the world's student population (United Nations, 2020). The main form of providing educational activities has become "emergency" online education implemented at a distance using information and telecommunications networks and with direct/indirect interaction between students and teachers. From the teacher's/student's point of view, their digital skills and competences, personal approach and objective preconditions for "learning and learning from home" have become decisive. Personal experience with the provision of teaching for two years, the author of the article also has a university teacher, but also as an IT specialist responsible for the operation of ICT and IT support for teachers, students and staff. The information obtained from controlled interviews with the participants of the educational process during the pandemic for the period March 2020 - December 2021 is also used, which brought a number of interesting observations of the user community. Furthermore, for the purposes of this article and the objective evaluation of the information obtained (their generalization), we used freely available outputs of domestic/foreign professional research and studies. The documents analyze and evaluate education and its problem areas from different perspectives. At the same time, they emphasize the need for the necessary modification and "redesign" of existing education systems for the future, with an emphasis on the participants in the educational process. The article used documents:

- Results obtained from interviews of ERL participants at FEM (teachers, students)
- Published research results of foreign authors
- Student Council of Higher Education Institutions of the Slovak Republic: *Survey - Impact of COVID-19 on students*
- International Association of Universities (IAU): survey *The impact of COVID-19 on higher education around the world*
- OECD: survey *The State of Higher Education One Year into the COVID-19 Pandemic*

The aim was to evaluate the emergency distance learning implemented at FEM for two years. Based on the analysis of the initial state of the ERL in the immediate "switchover" from the traditional form to the remote and monitoring of gradual changes in a two-year interval, it was possible to assess progress, but also point out problem areas. We focused on different areas of ERL education: organizational security, technological security (hardware and software), quality of the educational process (forms and content), digital readiness of participants (IT skills, IT support for end users) and psychological aspects of ERL (negative impacts on mental health). To obtain the data, we used a structured interview with questions according to these areas, for example, the participants also evaluated their two-year experience with ERL, i.e. a state "what I knew at the beginning" and a state after two years "how I progressed, what I learned". We chose the form of a personal interview because the interview participants were already "oversaturated" with work and presence in the online environment (reluctance to answer e-questionnaires). In addition, a number of responses were obtained through online training or IT support, remote troubleshooting (online consulting, emails, chat, meetings in MS

Teams, remote PC management tools). To compare and generalize our findings, we used methods of synthesis and comparison of our findings with other published research and studies.

3. Results and Discussion

The Covid-19 pandemic has generally accelerated the digital transformation processes of many industries by at least five years. Significant shifts were in the field of artificial intelligence, cloud services, communication platforms (Lacko, 2021). Digital transformation replaces traditional processes with digital technologies in order to improve or streamline ways of working (AirFocus, n.d.). The reorganization of work changes the way people work (Anderson-Connolly et al., 2002). Digital work is characterized by the use of new technologies and the possibility of working remotely, and it is essential that individuals adopt new technologies

as part of their daily work routine (Momani & Jamous, 2017). The current advancement of digitization of routine activities presupposes the ability of the end user to master new technologies. Being digitally literate is one of the prerequisites for successful employment. Digital literacy includes a large number of complex cognitive, motor, sociological and emotional skills that users need to function in a digital environment (Mnyanda & Mbelani in Oláhová, 2020). Digital technologies, e-services and the virtual world of the Internet are an integral part of the life and implementation of many activities. A key 21st century skill "to succeed in the AI world" is versatility. Fadel emphasizes the role of education by saying, "We must help prepare our students to be versatile enough to succeed no matter how our unpredictable world changes around us" (Fadel et al., 2015; Ferrari, 2018). Fadel's framework Four-Dimensional Education focuses at four key areas of modern education:

- Knowledge: the individual is a specialist in his field of study and also an expert with general knowledge from other fields i.e. has interdisciplinary knowledge.
- Skills: creativity, communication, collaboration and critical thinking. While the first three are commonly used, critical thinking often becomes a "hard nut to crack."
- Character: mindfulness, curiosity, courage, resilience, leadership, ethics are a prerequisite for shaping a better world.
- Meta-learning/meta-cognition as a motivation for lifelong learning and self-reflection of the individual in relation to his educational goals, professional growth and development.

The last two years of global change in the economic and social life of the countries have not escaped even the education system. The introduction of anti-pandemic measures, together with the order of the social distance, unexpectedly moved teaching to the online environment of the Internet and participants in the learning process to the home environment. From a practical point of view, distance learning has been a challenge and "test" for the community of students, educators and school staff to test the versatility of their skills in adopting new technologies and adapting to the virtual environment. However, the forced transfer of full-time teaching in March 2020 to the online environment pointed to unpreparedness on the part of schools and universities. In generally, the feasibility and quality of the transition to distance education was conditioned the synergy of three interconnected dimensions, namely: technical infrastructure and accessibility, distance learning competences and pedagogies and the field of study. (Marinoni et al., 2020). In assessing the readiness of higher education institutions to move online, according to a study by the Lumina Foundation (OECD, 2021), institutions were not fully prepared for a sudden shift to distance learning (Table 1). Monroy-Gómez-Franco et al. (2021) present a lack of available resources to scale up distance learning, and a lack of experience from the school system and teachers of operating entirely through distance

platforms. In a survey of online/distance learning in Europe 67 % of educators say this is their first experience with this form (School Education Gateway, 2020).

Table 1: Readiness of higher education institutions to move online

Factors of readiness	High-income countries	Middle-income countries	Low-income countries
Business continuity plan	□ □	□	□
Emergency management office	□ □	□	□
Power supply	□ □ □ □	□ □ □ □	□ □
Broadband Internet	□ □ □ □	□ □ □	□ □
Learning management system	□ □ □ □	□ □ □	□ □
Videoconferencing	□ □	□ □	□
Digital content resources	□ □	□	□
Teaching and learning unit	□ □	□ □	□
Trained instructors	□ □	□ □	□
Cybersecurity	□ □	□ □	□
□ □ □ □ fully available, □ □ □ generally available, □ □ not always available, □ rarely available			

Source: OECD (2021)

Our experience and knowledge from the provision of the educational process at the Faculty of Economics and Management (FEM) of SUA Nitra are comparable with the results of domestic/foreign surveys. Important information were also attitudes opinions and answers obtained from interviews with teachers and students of the faculty. Together, they can be a starting point for the development of plans or methodologies, the so-called crisis education for future use. Over the past period, we have identified the following problem areas of the educational process:

Organizational support

The absence of a unified approach (methodology) of education was a common feature of the education system at all levels. A survey by the Student Council of Higher Education Institutions and the Slovak Accreditation Agency for Higher Education found that the use of inconsistent solutions indicates a lack of quality management at universities and faculties in ensuring the transition to distance learning and coordinating teaching quality (Bílik, 2020).

Similarly,

the OECD TALIS survey of 2018 stated that Slovak education is not built or ready for long-term teaching through remote access (Schwabe, 2019). Even FEM has not developed a comprehensive distance learning methodology; the methodology is developed for e-learning (LMS Moodle, e-courses). After the transition to online teaching in March 2020, the basic documents to guide teachers to its organization and implementation were missing. According to educators, there were no uniform instructions for the implementation of basic or specific educational activities (for example, teaching subjects requiring individual work and immediate student response, teaching using licensed software available only in university PC labs, tools and forms of online/offline study materials). Therefore, the FEM management created a working group for the operational solution of remote learning, formulation of procedures and IT support.

Technical support

In 2018, almost 25% of Slovak schools stated that they did not have sufficient digital teaching technologies (Schwabe, 2018). FEM has sufficient equipment for workplaces, auditoriums and training facilities with ICT, as well as the equipment of teachers with equipment for working from home (laptops/tablets). In March 2020, the missing equipment was audiovisual technology (webcams, headphones, microphones, speakers) and a comprehensive video conferencing solution. At present, the given technology includes PC equipment at teachers' workplaces,

16 exercise rooms, 2 auditoriums (possibility of hybrid teaching), and a video conferencing solution for the meeting room is available. The question in our interview was the quality and methods of internet connection during the lessons. A minimum of teachers had problems with insufficient internet connectivity and accessibility, and more frequent failures and delays were reported on the part of students. This was mainly related to their geographical location, connection technology (Ethernet, wifi), outages were more frequent when participating in mass online meetings. The students stated that in the environment of MS Teams they therefore often used a combined approach (internet and mobile networks).

Software support

In the area of software, according to the CIT workplace, the most significant problems in March 2020 were due to the inconsistent approach and use of software solutions for online meetings, team collaboration and real-time communication and the lack of knowledge of their use by end users. Although the Office365 platform includes the MS Teams solution, some educators used Skype or the free Zoom application, which CIT did not recommend using due to lot of security vulnerabilities. The lack of skills to control MS Teams and its functionalities was on the side of teachers, as applications MS Teams (and Zoom too) did not use in the past. They also lacked skills in processing lectures/exercises in the form of video recordings, recording the desktop, creating tests, assigning tasks, etc. The use of MS Teams by students was smoother and seamless.

Quality of education (forms of education and digital content)

In analyzing and evaluating the quality of education, our findings are similar to the results of other surveys. In our interview, FEM students stated that at the beginning (March 2020) the offline form of education prevailed (sending materials / tasks by email, LMS Moodle courses, materials on the UIS server), gradually replaced by online meetings in MS Teams using integrated application functionalities (OneNote, assigned tasks, Forms, Stream, etc.). Students were particularly critical of the application of the passive form of teaching by some educators (Hall et al., 2019), until 28 % of them had to supplement their knowledge from extracurricular sources in order to successfully master most subjects (Bílik, 2020). Figure 1 represents SUA students' responses to the forms of education used in the first year of the pandemic. On the other hand, according to teachers, it was quite difficult to maintain the attention and especially the activity of students who attended "screens" not only lectures and exercises, but also other independent work (elaboration of assignments, seminar papers). The students' negative experiences were: the lack of feedback from teachers (41.7 % of students), which *"takes too long and therefore the learning process is very slow and boring"*; as well as contacts with teachers (38.7 % of students) *"most teachers are not available in case of unscheduled questions"* that students encounter in the process of self-study (Bílik, 2020; Malkawi & Khayrullina, 2020). In distance learning, the responsibility for the study is transferred to the student, so communication and quality feedback from the teacher are

important for its improvement and guidance on how to educate yourself. The teachers perceived negatively the "non-interaction" and the students' lack of interest in participating in the discussion during the online lectures (feedback only based on addressing the student by the teacher).

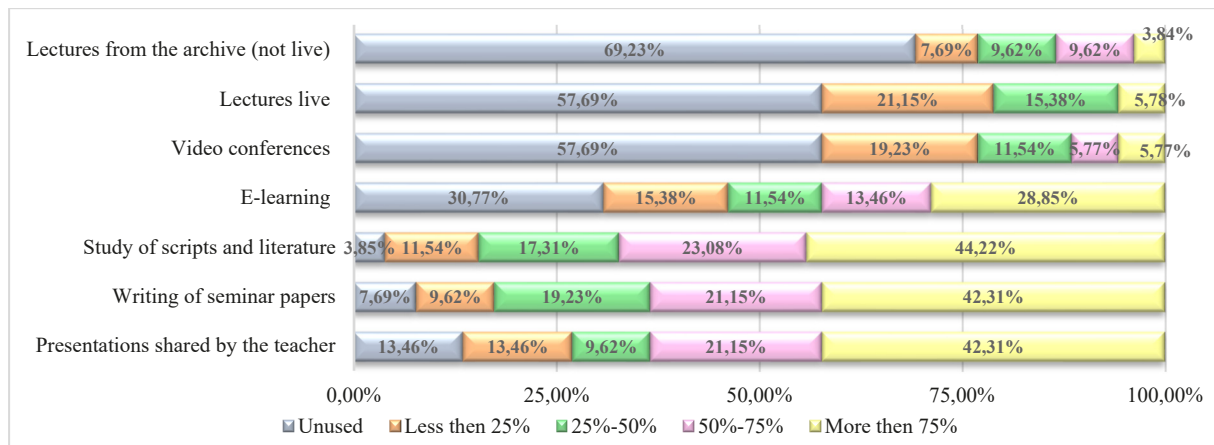


Figure 9 Teaching methods and forms used during emergency measures at SUA Nitra

Source: Hall et al. (2019)

Other problems were: availability of digital educational content and processed teaching materials, inconsistent procedure of their processing and publishing (faculty repositories: LMS Moodle and Exercises, school-wide repository: document server UIS SUA, internal repository MS Teams, OneDrive, web repository Google disc). Objective obstacles on the part of teachers were mostly the lack of knowledge of processing educational online documents in the form of audiovisual records of work procedures, lectures. The LMS Moodle SUA learning platform also did not see a significant increase in the number of courses. A total of 77 new courses were added (period February 2019 - February 2022). At present, 273 courses have been developed, with 50.2 % being courses of faculty FEM. The transformation of classical materials into an online environment is closely linked to the availability of distance learning resources and the growth of its quality (Jordan et al., 2021). From our point of view, it is necessary to unify and reduce online resources (repositories) of access to educational materials, for example, only in the LMS Moodle and Office365 environment. To provide an attractive environment for teaching, communication and collaboration, we also recommend the OneNote solution, which is an integrated part of MS Teams (Oláhová, 2018).

IT support and digital skills of end users

Digital skills of end users are an important factor in the success and mastery of distance learning, but their level varied on the part of students and teachers. According to the TALIS survey, only 44.7 % of Slovak teachers consider themselves very well prepared for the use of IT technologies in teaching (Schwabe, 2019). The critical view is on the part of students, in 2019 only 19.6 % of Slovak students stated that their digital skills were developed during their studies at university. Overall, they considered their development to be significantly undersized. According to Hall et al. (2019) up to 49 % of employers consider them to be key when choosing an employee, but only 8.2 % of graduates master advanced work with PC and 46.9 % simple work with PC (email, MS Office). In March 2020, the level of digital skills of FEM end-users varied. In the interview, they mentioned ignorance or little experience with the control of specific O365 applications used for remote learning (teachers, students). Teachers lacked skills in processing teaching materials in the form of multimedia files (screen recording, video tutorials), using MS Teams functionalities (assigning tasks, preparing tests / quizzes,

etc.). In the given period, these skills were developed in the form of online meetings/webinars in several IT areas (topics: online meetings and communication, teamwork, digital content, LMS Moodle). The activities of the CIT workplace, which provided extensive IT support to teachers and students, can be summarized in several points:

- implementation of online workshops / training in MS Teams,
- offline support via e-mail communication,
- creation of a freely available question and answer database (FAQ) in the team of employees,
- individual consultations and problem solving (HW/SW) of users "remotely" using remote management tools (TeamViewer, Quick Assist, or MS Teams),
- creation of the website Manual for the improvement of online teaching with topics for distance education (instructions, materials).

At the same time, the workplace emphasized the need to continue training employees in various areas of digital technology.

Mental health and psychological aspects of distance learning

They represent areas that are closely related to the personality and character traits of the individual. Although the facts given are the results of published researches, in our interview the participants (especially students) made the same statements. The multiplication of time spent on monitors during teaching time and at other times (preparation of further curriculum by teachers, or elaboration of student assignments) leads to "oversaturation" of the online environment. Digital fatigue is accompanied by feelings of mental and physical exhaustion in 52 % of respondents (Douglas, 2021). The causes of digital fatigue are excessive close contact, reduced mobility during a video call, constant camera involvement and the need for constant "monitoring" of the conversation, constant virtual meetings and digital work processes, etc. (Bailenson, 2020). In connection with learning, students cited self-regulation as a problem for a huge amount of self-study materials, which "increased so much that I don't know how to manage my time efficiently" (Malkawi & Khayrullina, 2020). This can lead to the procrastination of study tasks and responsibilities, loss of motivation and student frustration, and ultimately loss of learning ability (Maldonado & De Witte, 2020). FEM students in the second year of remote learning considered social isolation, lack of personal meetings with classmates and learning behind the screen to be the biggest negatives, which "will not replace their joint meeting in the classroom/lecture room or boarding school life". In virtual teams/classes, the teacher is a moderator and consultant as well, and feedback from students is important to him. As a frustrating experience FEM educators reported students' reluctance to use cameras in lectures/exercises and passivity in engaging in discussion.

4. Conclusion

The Covid-19 pandemic has hit hard education systems around the world, pointed to the existing "gaps" and problems of online education. In order to ensure continuity of education, a new alternative form of distance learning, called Emergency Remote Learning (ERL), has been created for unplanned and sudden shifts from traditional to remote learning in the event of emergencies. The past two years have confirmed that ICT and the internet are strongly influencing the learning environment. ICTs have enabled the transition from the physical classroom to the virtual classroom, changing the way we learn and communicate through new features. The paper summarizes the experience gained, identifies problem areas from the period of emergency education at FEM SUA, and can be a starting point for the development of a comprehensive methodology of distance education. In general, the challenge for education

systems and schools is to further develop modern digital education (with ICT support) so that they are prepared and able to respond flexibly to similar, unexpected situations in the future.

Acknowledgement

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References

- [1] Airfocus. (n.d.). *What is Digital Transformation? Definition and examples*. Airfocus. Retrieved February 12, 2022, from <https://airfocus.com/glossary/what-is-digital-transformation/>
- [2] Anderson-Connolly, R., Grunberg, L., Greenberg, E. S., & Moore, S. (2002). Is lean mean? *Work, Employment and Society*, 16(3), 389-413. doi:10.1177/095001702762217407
- [3] Arquilla, J., & Guzdial, M. (2020, April). Transitioning to distance learning and virtual conferencing. *Communications of the ACM*, 63(7), 10–11. <https://doi.org/10.1145/3398386>
- [4] Bailenson, J. N. (2021). Nonverbal overload: A theoretical argument for the causes of zoom fatigue. *Technology, Mind, and Behavior*, 2(1). <https://doi.org/10.1037/tmb0000030>
- [5] Bílik, M. (2020, July 23). *Výsledky prieskumu – Dopad COVID-19 na študentov*. ŠRVŠ. Retrieved February 18, 2022, from <https://srvs.eu/2020/07/23/vysledky-prieskumu-dopad-covid-19-na-studentov/>.
- [6] Cerf, V. G. (2020). Implications of the COVID-19 pandemic. *Communications of the ACM*, 63(6), 7–7. <https://doi.org/10.1145/3397262>
- [7] Douglas, E. (2021, May 20). *Feeling drained? You may have 'digital fatigue'*. HRD Canada. Retrieved February 4, 2022, from <https://www.hcamag.com/ca/specialization/mental-health/feeling-drained-you-may-have-digital-fatigue/255616>
- [8] Evans, R. (2017, February 23). Four dimensions of education: 21st century teaching & learning. Message posted to <https://www.utschools.ca/blog/content/four-dimensions-education-21st-century-teaching-learning>.
- [9] Fadel, C., Bialik, M., & Trilling, B. (2015). *Four-dimensional education*. Boston, MA; Center for Curriculum Redesign
- [10] Ferrari, P. (2018, October 31). *"Versatility" is the key 21st Century skill*. cApStAn. Retrieved February 21, 2022, from <https://www.capstan.be/versatility-is-the-key-21st-century-skill/>
- [11] Hall, R., Drál, P., Fridrichová, P., Hapalová, M., Lukáč, S., Miškolci, J., & Vančíková, K. (2019). *Analýza zistení o stave školstva na Slovensku: To dá rozum*, Bratislava: MESA10, 2019. Retrieved from <https://analyza.todarozum.sk>
- [12] ITakadémia. (2020, October). *Návrh Programu digitálnej transformácie vzdelávania na Slovensku a Akčného plánu na obdobie 2021-2024*. Digitálna koalícia. Retrieved February 19, 2022, from https://digitalnakoalicia.sk/wp-content/uploads/2020/10/Program_DT_vzdelavania_navrh_20201016-1.pdf
- [13] Jordan, K., David, R., Phillips, T., & Pellini, A. (2021). Education during the COVID-19: Crisis opportunities and constraints of using EdTech in low-income countries. *Revista De Educación a Distancia*, 21(65). <https://doi.org/10.6018/red.453621>
- [14] Lacko, L. (2021, August 30). *Pandemie nás nutí zvyšovať rozpočty na digitálnu transformáciu*. CFOWorld. Retrieved February 15, 2022, from <https://www.cfoworld.cz/autori/luboslav-lacko/>
- [15] Maldonado, J. E., & De Witte, K. (2021). The effect of school closures on standardised student test outcomes. *British Educational Research Journal*, 48(1), 49–94. <https://doi.org/10.1002/berj.3754>
- [16] Malkawi, E., & Khayrullina, M. (2020). Digital human skills form the corporate economy and business development. *Ekonomicko-Manazerske Spektrum*, 15(1), 64–74. doi:10.26552/ems.2021.1.64-74
- [17] Marinoni, G., Land, H., & Jensen, T. (2020, June). The impact of COVID-19 on higher education around the world, IAU Global Survey Report, Published by the International Association of Universities, Paris.
- [18] Momani, A.M., & Jamous, M. (2017). The Evolution of Technology Acceptance Theories. *International Journal of Contemporary Computer Research (IJCCR)*. 1. 50-58.

- [19] Monroy-Gómez-Franco, L., Vélez-Grajales, R., & López-Calva, L. (2021). *The potential effects of the COVID-19 pandemic on learning*. Retrieved February 17, 2022, from <https://mpira.ub.uni-muenchen.de/110043/>
- [20] Neelakandan, N. (2021, July 16). *Hybrid learning in Education*. eLearning Industry. Retrieved February 18, 2022, from <https://elearningindustry.com/hybrid-learning-in-education>
- [21] OECD. (2021, July). *The state of Higher Education One Year into the COVID-19 Pandemic*. OECD Publishing, Paris. Retrieved February 19, 2022, from <https://doi.org/10.1787/83c41957-en>
- [22] Oláhová, E. (2010). *Efektívne využívanie informačných a komunikačných technológií na podporu riadenia v agrosektore*. (dizertácia). Slovenská poľnohospodárska univerzita (Nitra, Slovensko), Fakulta ekonomiky a manažmentu. Katedra informatiky
- [23] Oláhová, E. (2018). Using the Office 365 Cloud Solution in the education process. *International Scientific Days 2018. Towards Productive, Sustainable and Resilient Global Agriculture and Food Systems: Proceedings*. <https://doi.org/10.15414/isd2018.s10.09>
- [24] Oláhová, E. (2020). The digital age and its pros and cons for society. *International Scientific Days 2020. Innovative Approaches for Sustainable Agriculture and Food Systems Development: Proceedings*. Gödöllő: Szent István University, 2020, s. 456-464. doi: 10.18515/dBEM.ISD.P01.2020.p051
- [25] School Education Gateway. (2020, June). *Survey on online and distance learning*. Retrieved February, 2022, from <https://www.schooleducationgateway.eu/sk/pub/viewpoints/surveys/survey-on-online-teaching.htm>
- [26] Schwabe, M. (2019). *Teaching and Learning International Survey (TALIS) Slovak Republic - Country Note*. OECD. Retrieved February 27, 2022, from https://www.oecd.org/education/talis/TALIS2018_CN_SVK.pdf
- [27] Tulaskar, R., & Turunen, M. (2021). What students want? Experiences, challenges, and engagement during Emergency Remote Learning amidst COVID-19 crisis. *Education and Information Technologies*, 27(1), 551–587. <https://doi.org/10.1007/s10639-021-10747-1>
- [28] United Nations. (2020, August). *Policy Brief: Education during COVID-19 and beyond*. United Nations. Retrieved February 20, 2022, from <https://unsdg.un.org/resources/policy-brief-education-during-covid-19-and-beyond>
- [29] Vardi, M. Y. (2020). Efficiency vs. resilience. *Communications of the ACM*, 63(5), 9–9. <https://doi.org/10.1145/3388890>

Employability of University Graduates in Slovak Labour Market

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Abstract

Currently, there are even more discussions about the employment of university graduates in the labour market in relation to the quality of universities and higher education. Universities face many of the challenges posed by the concept of sustainable development. One of them is the preparation of students to develop the ability to integrate social, environmental and economic considerations in future decision making. Employers require not only professional knowledge from graduates, but even more, they emphasize soft skills. Our results of the survey show that most university graduates are satisfied with their study programs, although the proportion of satisfied graduates varies statistically significantly among the fields of study. However, we must not forget the dissatisfied students and take adequate measures to increase the proportion of students that are satisfied with their study program in each field of study, which can contribute to reducing the outflow of students abroad.

Keywords: *employment, labour market, quality of education, university graduates*

JEL Classification: *I00, J40, E24*

1. Introduction

Education is widely considered to be the most important form of human capital (Becker, 1993). In order for education to fulfill this role, it must accept the demands of the labor market at the national and international levels. Nowadays, the skills, such as specific skills, high-tech skills, creativity and adaptability of employees are needed in the labour market. There is increasing awareness in the academic and societal debate on sustainable development and some of the most urgent global problems such as food insecurity, climate change, biodiversity loss, and persisting poverty (Lazarus, 2009; Meckling, 2011; Levin et al., 2012). The need for sustainable development has become evident during the last decades, implying that universities are expected to prepare students to develop the ability to integrate social, environmental and economic considerations in future decision making (Czykiel, R. et al, 2015; Lozano et al., 2013; Sibbel, 2009). These changes in the labour market and in society should be reflected by the whole education system, including universities (Kittová, Druzbacka, 2020). Moreover, the role of universities in education for sustainable development has been encouraged in many declarations and initiatives (Brundtland, 1987; Dlouhá et al., 2013). According to Milutinovic and Nikoli (2014), the vision of sustainable development in higher education is a world where everyone has the opportunity to benefit from quality education and learn the values, behaviours and lifestyles required for a sustainable future and for positive societal transformation.

A necessary condition for economic development and raising living standards in Slovakia is to address employment issues in a way that would inter alia contribute to employment

sustainability (Švábová et al., 2019). EU labour markets have improved significantly. The job vacancy rate, indicating a lack of labour supply for available labour demand, had been rising since 2014 and at the beginning of 2018 reached 2.1% at the EU level (Štefánik et al., 2018). The Slovak labour market is following the EU trend and in the first half of 2018, the unemployment rate was, for the first time since Slovakia joined the EU, slightly below the EU-28 average (Švábová et al., 2019) but compared with the labour markets of the Visegrad group, Slovakia has long been showing the worst values of this indicator (Štefánik et al., 2018) in spite of the fact that the number of graduates in Slovakia is after the mid of the 90's still increasing. However, the Slovak higher education graduate population is still below the European Union level (Mitková et al., 2018). On the other hand, among EU countries, Slovakia has the second-highest share of students in tertiary education enrolled abroad (Guzi, Fabo, 2020). Martinák and Varsik (2020) find that most Slovak students enrolled in Czech universities study ICT (20 %), engineering (17 %) or medicine (15 %) programmes. Moreover, students complain about insufficient traineeship and education that teaches them foreign language and transferable skills (Minarechová, 2021). Therefore, in our article, we focused on a survey of employability and satisfaction of university graduates according to the field of study.

In Slovakia, there are many universities and higher educational institutions that provide higher education in various fields of study. However, Slovakia has no university in the top 500 ranking of the world's best universities. Slovak universities are not competitive internationally and therefore less appealing to young Slovaks, who seek education abroad (Guzi, Fabo, 2020). On the other hand, Kittová and Druzbacka (2020) find out that a high level of science and research at a university is not a necessary precondition for the success of its graduates in the labour market. However, Gora et al. (2019) confirmed that the students' chances of employment in the labour market were positively and directly influenced only by the quality of the educational process and by the research activities. Taking into account these differing views and findings, mainly the question arises if the university graduates in Slovakia are satisfied with their selected study program and what reasons they signed under the dissatisfaction of university graduates.

2. Data and Methods

The aim of the article is to find out how many university graduates have been employed in the labour market and whether they are satisfied with the selected study program. To this end, the following partial targets have been set

- division of graduates into groups according to the field of study
- finding out the share of employed graduates according to the fields of study
- finding out statistically significant differences in the satisfaction of employed graduates of individual study specializations with their studies
- proposals for further surveys and research questions

Data collection was conducted as a part of implementation of a national project and has been made available for the purposes of research activities of the project VEGA-1/0504/21. The database contained answers from 19,518 respondents who completed their studies in the time period from 2008 to 2014. Of these, 2,760 respondents indicated bachelor's degree, as the highest level of achieved education (14.14 %); 12,816 respondents identified master's degree as the highest reached level of education (65.66 %); 539 respondents identified the doctoral type of the study as the highest level of education (2.76 %) and 3,403 respondents did not

provide an answer to this question (17.44 %). The research focused on graduates of the master's degree, because the graduates of the master's degree are looking for a job in the labor market since most of the bachelor's degree graduates continue to study at master's degree and graduates of the PhD study remain usually to work at universities, moreover, they were only a small group of respondents. Of all graduates of master degree, only 11,676 responses were available (91.10 % of all master's degree graduates), as 1,140 respondents (8.90 % of all master's degree graduates) were excluded from the research, as the vast majority of the answers to the key questions, were not answered.

The data was processed by elementary statistical methods, graphs, and tables. The Kruskal - Wallis test was used to find out statistically significant differences between graduates of particular fields of study in terms of their satisfaction with the study. The Kruskal-Wallis test was used because of ordinal data that expressed a level of satisfaction with the study. The test statistics of the Kruskal - Wallis test can be calculated from the following formula:

$$H = \left(\frac{12}{N(N+1)} \cdot \sum_{j=1}^k \frac{R_j^2}{n_j} \right) - 3 \cdot (N + 1) \quad (1)$$

H – Kruskal – Wallis test statistics

N – number of study specializations

R_j – overall ranking for each group

n_j – the number of respondents in each of these groups

k – number of groups

The table value is calculated as CHINV (alfa; k-1), where alpha is 0.05 and the number of degrees of freedom is given by k (number of fields of study) minus one.

The statistically significant differences between the individual fields of study were evaluated by means of contrast tests in the Statgraphics program. We presented the results of Fischer's LSD test as the most appropriate. Fischer's LSD test confirms a statistically significant difference between two average values of objects included in the relevant group, if the following relation applies:

$$|\bar{y}_i - \bar{y}_j| \geq t_{\alpha, m(n-1)} \sqrt{\frac{2s_r^2}{n}} \quad (2)$$

where $t_{\alpha, m(n-1)}$ is the critical value of the t-distribution at m (n-1) degrees of freedom; n is the total number of observations, s_r is the standard error of the mean difference and $|\bar{y}_i - \bar{y}_j|$ is the distance in rank between the pairs of treatment means to be compared; the means of the two groups being compared.

3. Results and Discussion

An analysis included 11,676 respondents with a master degree education, out of which 9,684 (82.94%) answered the question about their employment positively, meaning they are employed; only 431 (3.69%) is continuing with their studies; 422 (3.61%) is taking care of a child, or another family member and 1,139 (9.76%) were unemployed (Figure 1).

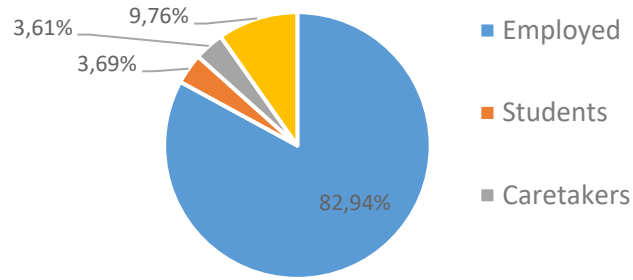


Figure 1: Structure of the respondents by their further activities

Source: own calculations

Graduates of the master study programmes (11,676 respondents) came from different universities, with different specializations and backgrounds. For the purpose of the analysis, we divided them into eight groups based on the fields of their studies (economists and lawyers were separated from the social sciences into their own groups, as they represented a large portion of respondents). The particular groups are (Figure 2):

- economics and management (ECO) – 3,026 respondents,
- medical sciences (MS) – 403 respondents,
- pedagogical sciences (PS) – 750 respondents,
- agricultural and forestry sciences (AFS) – 449 respondents,
- law (LAW) – 645 respondents,
- natural sciences (NS) – 459 respondents,
- social sciences and humanities (SSH) – 2,122 respondents,
- technical sciences and informatics (TSI) – 3,822 respondents.

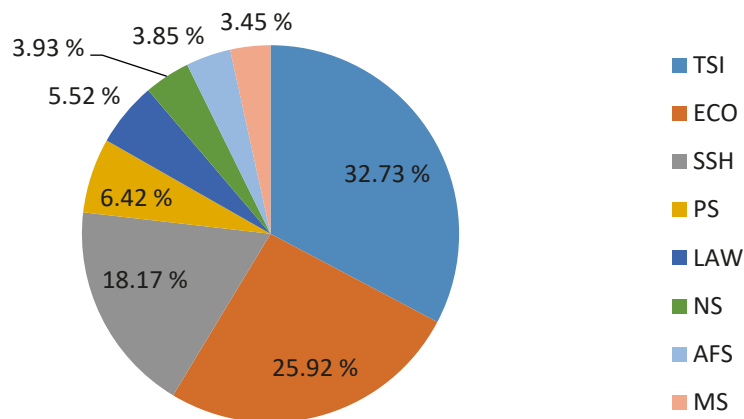


Figure 2: Structure of the employed respondents by their fields of study

Source: own calculations

3.1 Employment of graduates in the labour market according to the fields of study

Subsequently, it was analysed whether the respondents found employment, decided on further continuation of their studies, or started taking care of family members taking into account their fields of study. The results are documented in Table 1.

Table 1: Structure of employment of the university graduates according to their fields of study

Field of study	Total number of respondents	Employed respondents		Unemployed respondents		Other respondents (caretakers, students)	
		Absolute number	Absolute number	Relative number in %	Absolute number	Relative number in %	Absolute number
ECO	3,026	2,544	84.07	295	9.75	187	6.18
MS	403	331	82.13	39	9.68	33	8.19
PS	750	607	80.93	75	10.00	68	9.07
AFS	449	344	76.61	53	11.80	52	11.58
LAW	645	544	84.34	70	10.85	31	4.81
NS	459	324	70.59	55	11.98	80	17.43
SSH	2,122	1,664	78.42	277	13.05	181	8.53
TSI	3,822	3,326	87.02	275	7.20	221	5.78
Together	11,676	9,684	82.94	1,139	9.76	853	7.31

Source: own calculations

Table 1 shows that the highest share of unemployed respondents in the labour market is represented by graduates of social sciences and humanities, 13.05 % of the total number of respondents in this field of study (especially study programs such as social work, culturology, art history, public policy, philosophy, ethics, andragogy, political science, mass media and marketing communication). In the second and third place, with a share of almost 12%, are graduates of study programs focusing on natural sciences (especially environmental sciences) and agricultural sciences (especially human nutrition, horticulture and landscape engineering). On the contrary, the least unemployed respondents are in technical sciences, followed by medical sciences and economics (low employment particularly in environmental management, tourism, regional development, public administration, economics and business management). From the above mentioned, it can be concluded, that the labour market in Slovakia does not have enough opportunities for graduates with an environmental focus and with a focus on culture, art and public administration. Technical sciences, law, economics and management, followed by medical and pedagogical sciences, have the largest share of respondents who found employment in the labour market.

3.2 Satisfaction of employed graduates with the choice of their study program

It was the group of employed respondents (9,684 respondents), meaning respondents employed in the labour market, which was crucial for further analysis of the satisfaction with the choice of higher education. The structure of respondents according to their satisfaction with the choice of the study program is documented in Figure 3.

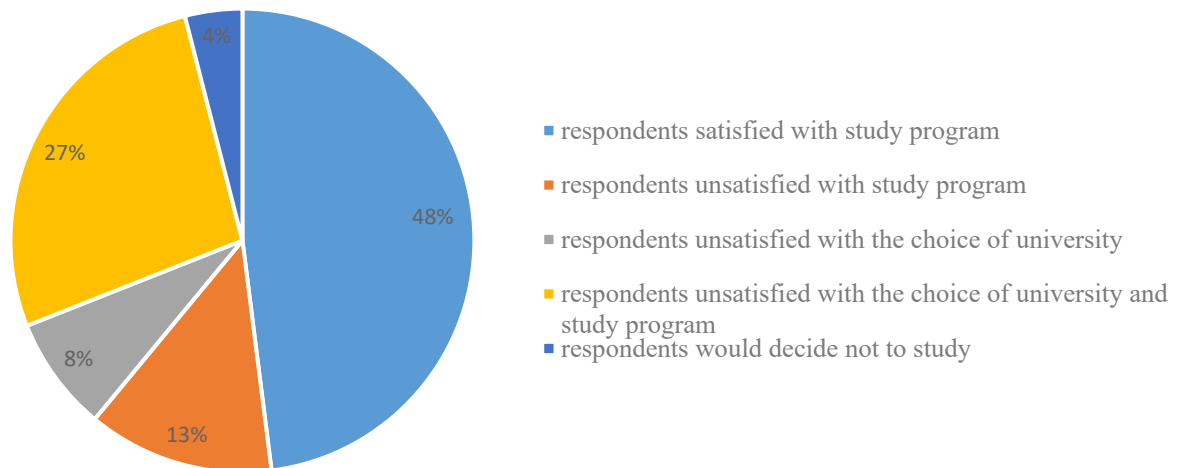


Figure 3: The structure of respondents in terms of satisfaction with university studies in general

Source: own calculations

Out of the total number of 9,684 employed graduates, 48% are satisfied with their university studies and in case of reselection; they would opt for the same study program at the same university.

A deeper analysis according to fields of study shows that in each field of study, the largest group of respondents chose satisfaction with the study. The largest share of satisfied respondents was achieved by technical sciences (54.90% of all respondents from technical science). The lowest share was found in the natural and social sciences (38% of all respondents with a relevant study program) (Table 2).

Table 2: Structure of respondents according to the field of study and satisfaction with the study

Field of study	Satisfaction with the study	Respondents satisfied with study program (1)	Respondents unsatisfied with study program (2)	Respondents unsatisfied with the choice of university (3)	Respondents unsatisfied with the choice of university and study program (4)	Respondents would decide not to study (5)
ECO	Count	1,228	284	201	717	114
	Percentage	48.27	11.16	7.90	28.18	4.48
MS	Count	150	20	41	106	14
	Percentage	45.32	6.04	12.39	32.02	4.23
PS	Count	246	100	40	196	25
	Percentage	40.53	16.47	6.59	32.29	4.12
AFS	Count	149	32	28	115	20
	Percentage	43.31	9.30	8.14	33.43	5.81
LAW	Count	261	38	40	178	27
	Percentage	47.98	6.99	7.35	32.72	4.96
NS	Count	124	41	25	122	12
	Percentage	38.27	12.65	7.72	37.65	3.70

SSH	Count	642	213	168	563	78
	Percentage	38.58	12.80	10.10	33.83	4.69
TSI	Count	1,826	500	225	620	155
	Percentage	54.90	15.03	6.76	18.64	4.66

Source: own calculations

Respondents who would choose another study program at the same school (option 2) may not be satisfied with the chosen study program, either because they did not estimate their interest in what to do professionally or were disappointed by the chosen study program. Therefore, it would be appropriate to broaden the question and find out whether they would choose a related study program (e.g. accounting instead of business economy) or a completely different discipline from another faculty of this university (e.g. biotechnology instead of regional development), otherwise it is not possible to determine whether the respondent is disappointed with the study program or professional orientation he has chosen. The fewest respondents dissatisfied with the choice of the study program are in the fields of law, medical sciences and agricultural sciences. On the contrary, most of them are in pedagogical and technical sciences.

The third option has a greater explanatory power - the respondent would have chosen the same study program, but at a different university. It follows from the above that the respondent is firmly determined for his professional orientation, but he was disappointed by the university, which did not provide him with what he expected, respectively what the labour market expects of him. The fundamental question of the further sustainability of the study program arises here, especially if these answers of the respondents are not negligible. This is a clear signal to the university that the study program must undergo certain changes. The highest percentage of responses in this category was recorded by the medical sciences (12.39%) and the social sciences and humanities (10.10 %). On the contrary, the least dissatisfaction is in pedagogical sciences (6.59%) and technical sciences (6.76%).

The second-largest group of respondents (one-fifth to one-third of respondents depending on the field of study) consists of those who would choose a different study program at another university (option 4). From the answers of the respondents, it can be deduced that these respondents did not estimate their professional orientation correctly. Again, however, as in option 2, it would be appropriate to find out whether their choice would lead to a related study program, where the school did not seem to offer the graduates what they needed to enter the labour market or a completely different field of study, which would confirm the presumption of incorrect professional orientation of graduates. Given the high percentage of answers, it is necessary to broaden this question and find out the real cause of the wrong choice. Otherwise, adequate remedial measures cannot be taken, whether it is necessary to adapt the study program more to the needs of the market or whether it is necessary to increase the awareness of secondary school students about study opportunities at universities. It can be assumed, that secondary schools probably lack counsellors for further studies, who would be able to guide students correctly, especially in grammar schools, as these students usually go study specializations with the highest proportion of dissatisfied students. With a high percentage of respondents in each field of study, the highest share exceeding 30% is achieved by natural sciences, social sciences and humanities, pedagogy, agriculture, medical sciences and law. The least respondents dissatisfied with the choice of study program at a given school are in economics (28.18%) and technical sciences (18.64%).

The lowest percentages of respondents (from 4% to 6%) are respondents who would decide not to study at university if they should make the decision again today (option 5). These are

mostly graduates (68.31% of them) who work outside the field of their study, or they work in positions where university education is not required, but also those graduates who work in their field of study, but the chosen professional orientation probably does not fulfil them (31.69% of them).

We used the Kruskal - Wallis test for independent groups to find out if there are statistically significant differences between graduates of individual fields of study in terms of their satisfaction with the study. We can confirm the statistically significant differences by this test (test statistics is 185.575 at p-value = 0.000, based on which we reject the null hypothesis of no statistically significant differences).

Statistically significant differences were found especially between the four groups of fields of study. The results are documented by the Fisher’s LSD test, which found the most statistically significant differences by comparing pairs and created up to four groups of fields of study (Figure 4).

Figure 4 Results of Fisher’s LSD test

Col_1	Count	Mean	Homogeneous Groups
8	3326	2,03127	X
1	2544	2,29442	X
5	544	2,39706	XX
3	607	2,42998	XX
2	331	2,43807	XXX
4	344	2,49128	XX
7	1664	2,53245	X
6	324	2,55864	XX

*ECO – 1, MS – 2, PS – 3, AFS – 4, LAW – 5, NS – 6, SSH – 7, TSI - 8

Source: own calculations

According to table 4, the first group consists of technical sciences, where satisfaction with studies is highest. The second group, which is less satisfied with the field of study consists of economics and management and the third group consists of law, pedagogical and medical sciences. The fourth group consists of the rest of the sciences (AFS, SSH and NS).

4. Conclusion

The career success of graduates is viewed as a direct measure of the quality of higher education (Teichler, 2009). The shift from student to employee status has become an important aspect of the labour market for students and for universities (Butum, 2017). Our results of the survey show good news that most university graduates are satisfied with their study programs, although the proportion of satisfied graduates varies statistically significantly among the fields of study. However, we must not forget the dissatisfied students. It is necessary to look for the causes of their dissatisfaction and take appropriate measures accordingly, e.g. better information of secondary school students when choosing to study at a university, a signal to the university that the given study program must undergo certain changes. The current role of the higher education system involves not only a series of technical skills, but also other competencies, such as communication skills, teamwork skills, project and time management skills, and emotional coordination capacities (Gilar-Corbi, 2019) are usually sought by employers. The universities should provide a complex education, that also focuses on adapting educational offers to the needs of the labour market (Sá, Serpa, 2018) and need to discover

new ways of attracting students and, moreover, prepare them for the current job market and ensure the sustainable development of society (Zartner, 2018).

The article contains the ongoing results of the survey. In the next survey, we will focus on identifying the factors that have the greatest impact on the satisfaction of graduates with their studies. In addition, it would be appropriate to repeat the survey after another seven years (2015- 2022) to see if the situation has changed for the better.

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References

- [1] Becker, G. S. (1993). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: Chicago University Press.
- [2] Brundtland, G. H. (1987). *Our common future (Brundtland report 1987)*. Report of the World Commission on Environment and Development, United Nations. Retrieved from <https://www.are.admin.ch/are/en/home/media/publications/sustainable-development/brundtland-report.html>
- [3] Butum, L.C. (2017). *The role of international competences in increasing graduates' access to the labor market*. In: Proceedings of the International Conference on Business Excellence, Bucharest, Romania, 2017, 513–522.
- [4] Czykiel, R., Schmitt Figueira, P., & Machado do Nascimento, L. P. (2015). Incorporating education for sustainability into management education: how can we do this? *International Journal of Innovation and Sustainable Development*, 9(3-4), 343-364.
- [5] Dlouhá, J., Huisingh, D., & Bartron, A. (2013). Learning networks in higher education: universities in search of making effective regional impacts. *J. Clean. Prod.* 49, 5-10.
- [6] Gilar-Corbi, R., Pozo-Rico, T., & Castejon-Costa, J. L. (2019). Improving Emotional Intelligence in Higher education Students: Testing Program E_ectiveness in Tree Countries. *Educ. XXI 2019*, 22, 161–187.
- [7] Gora, A.A., Ștefan, S.C., Popa, Ș.C., & Albu, C.F. (2019). Students' Perspective on quality assurance in higher education in the context of sustainability: A PLS-SEM approach. *Sustainability*, 2019, 11, 4793. doi:10.3390/su11174793
- [8] Guzi, M., & Fabo, B. (2020). *Employ Slovakia*. Final report. Luxembourg: ESPON
- [9] Kittová, Z., & Druzbacka, B. (2020). *Evaluation of Slovak universities according to the employability of their graduates*. In: ICERI2020 Proceedings, 13th annual International Conference of Education, Research and Innovation, 6491-6499 (online conference)
- [10] Lazarus, R. J. (2009). Super wicked problems and climate change: Restraining the present to liberate the future. *Cornell Law Review*, 94, 1153–1234.
- [11] Levin, K., Cashore, B., Bernstein, S., & Auld, G. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sci.* 45, 123-152.
- [12] Lozano, R., Lozano, F.,J., Mulder, K., Huisingh, D., & Waas, T. (2013). Advancing higher education for sustainable development: international insights and critical reflections. *J. Clean. Prod.*, 48, 3-9.
- [13] Martinák, D., & Varsik, S. (2020). Odliv mozgov I: Necestuj tým vlakom! [Brain drain I: Do not take that train!]. Bratislava: Ministerstvo školstva, vedy, výskumu a športu Slovenskej republiky.
- [14] Meckling, J. (2011). *Carbon coalitions: Business, climate politics, and the rise of emissions trading*. Cambridge: MIT Press.

- [15] Milutinović, S., & Nikolić, V. (2014). Rethinking higher education for sustainable development in Serbia: an assessment of Copernicus charter principles in current higher education practices. *J. Clean. Prod.*, 62 (1), 107-113.
- [16] Minarechová, R. (2021, October 1). Survey: Most schools in Slovakia fail to properly prepare their students for working life. *The Slovak Spectator*. Retrieved from <https://spectator.sme.sk/c/22753576/survey-most-schools-in-slovakia-fail-to-properly-prepare-their-students-for-working-life.html>
- [17] Mitkova, L., Pšenák, P., & Kovac, U. (2018). University Graduates in Slovakia in Context of the Europe 2020 Strategy. In: *Vision 2020: Sustainable Economic Development and Application of Innovation Management*. Conference: 32nd International Business Information Management Association Conference (IBIMA), Seville, Spain, 8379 – 8389
- [18] Sá, M.J., & Serpa, S. (2018). Transversal Competences: Their Importance and Learning Processes by Higher Education Students. *Educ. Sci.* 2018, 8, 126.
- [19] Sibbel, A. (2009). Pathways towards sustainability through higher education. *Int. J. Sustain. High. Educ.*, 10 (1), 68-82.
- [20] Svabova, L., Durica, M., Kramarova, K., Valaskova, K. & Janoskova, K. (2019). Employability and Sustainability of Young Graduates in the Slovak Labour Market: Counterfactual Approach. *Sustainability*, 2019, 11, 4462. doi:10.3390/su11164462
- [21] Štefánik, M., Džambazovič, R., Gerbery, D., Karasová, K., Lichner, I., Miklošovič, T., Polačková, Z., Radvanský, M., Rubliková, E., & Studená, I. (2018). *Labour Market in Slovakia 2019+*. Bratislava: ŠEVT.
- [22] Teichler, U. (2009). *Higher Education and the World of Work – Conceptual Frameworks. Comparative Perspectives. Empirical Findings*. Rotterdam: Sense Publishers, Taipei.
- [23] Zartner, D., Carpenter, K., Gokcek, G., Melin, M., & Shaw, C. (2018). Knowledge, Skills, and Preparing for the Future: Best Practices to Educate International Studies Majors for Life after College. *Int. Stud. Perspect.*, 2018, 19, 148–169.

Selected Aspects of Distant Online Education of Study Programmes Economics and Management

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Abstract

We have been encountering the distance form of distance learning practically since the 18th century, and its significance lies in the fact that teaching takes place at a distance through various communication channels. We moved to distance online learning to a large extent in early 2020, when the SARS-Cov-2 coronavirus pandemic broke out. This form of teaching has affected virtually all levels of education not only in the Slovak Republic but also around the world. In our article we deal with how distance online teaching affected the two most numerous study programmes at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra at the bachelor's and engineering level through a questionnaire survey in May 2021, when only online distance learning was taught. Students already had experience with online teaching and senior students could compare the full-time and distance form of education.

Keywords: distance teaching, economics, management, online teaching, questionnaire survey

JEL Classification: I20, I21, I23, I29

1. Introduction

Year 2020 was very dramatic because of expansion of a new Coronavirus called SARS-Cov-2 (Cucinotta, D., Vanelli, M., 2020; World Health Organization, 2021). Due to the rapid spread of this virus schools of each level of education were closed all around the world (UNESCO, 2020). In a very short time full-time learning was reorganized to distance learning and teachers, students and their parents had to adapt to a new situation – distance learning.

Bruder (1989) defines distance learning as a type of education in which students and their lecturers are separated. In other words, they reside in different physical locations, and the instruction between them is communicated using different technologies.

The origin of distance education dates to the first correspondence-based course. This course took place via the postal service in Boston, USA, in the 18th century. It is therefore not a new way of education. Nowadays the distance education moved to the virtual world thanks to development in information and communication technologies (video streaming, audio streaming, internet connection, hardware, and software development) (Pregowska et al., 2021).

Caleb Phillips was the first who used distance learning, which was known as correspondence education at that time. He led training in shorthand, which is an abbreviated symbolic writing method. Lessons were taken weekly via the United States postal service (Phillips, 1728; Clark, 2019). Women were the first entrants of distant courses. Other example of distance learning course was Sir Isaac Pitman who included students' feedback to his distance learning courses.

Again, it was a course in shorthand. Shorthand texts were sent via post to students. Students after receiving these texts were obliged to send them back using the same communication source for grading and corrections. Students obtained a certificate of expertise in stenographic skills after completion the correspondence course (Matthews, 1999).

People of lower financial status were able to study thanks to this new way of education. After three years an institution was founded to take care over the correction of shorthand exercise, called the Phonographic Correspondence Society (Verduin, 1991).

Nowadays people thanks to information and communication technologies can attend world-class lectures and courses online which are available for everyone from any place at the world just to stay at home. It was impossible several decades ago because students had to physically attend classes. Now they must only register online and be online on the course. As mentioned before, this form of education is not very expensive and almost everyone can participate. The only limits are technically – students must have an adequate hardware, software, and a steady Internet connection. Distance courses are both for beginners as for advanced students. Almost everything can be learned online (from the basics of physics to quantum chromodynamics) (Coursera, 2021).

Modern information and communication technologies, e. g. computers and high speed internet is used in modern distance education as a communication channel as letters were used in the past, with at least 80 percent of the course content delivered online (Allen, Sieman, 2011; Shelton 2005).

Today we don't need a stationary computer to study. The content of the lecture or course can be displayed on a laptop (Kapenieks et al., 2015; Albó et al., 2019), a tablet (Fraszczyk, 2020; Nasongkhla, Sujiva, 2015), a smartphone (Stotz, Lee, 2018; Cotwright et al., 2020), or with the use of VR (Virtual Reality) goggles (Lee et al., 2010; Taxén et al., 2002). These technologies enable students to obtain knowledge, information and understanding. Students and lecture participants can also read and respond to emails at any time via these technologies. There is also cost reduction because instructions for students are delivered cheaper than before, and much less time is needed to deliver these instructions. Distance education is therefore more viable and accessible in many cases.

2. Data and Methods

In our article, we dealt with the distance form of education at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra and its impact on students. We conducted a questionnaire survey in May 2021, which was attended by a total of 261 students of the faculty = 100 %, specifically the study programs Business Economics (99 first - and second-degree students = 37,93%) and Business Management (162 first - and second-degree students = 62,07%). These two study programs are represented at the faculty by the largest numbers of students and are also very similar in content as we can see in following tables.

Following aspects were examined in the questionnaire survey (each aspect contained more parts, but for this article only the most important were chosen):

- *Conditions for teaching - technical problems* - what was the most common technical problem in the implementation of distance online teaching by students.
- *Use of digital technologies* – how can students use digital technologies and modern software for distance learning and which form of teaching material do they prefer most or how can they access or gain teaching materials.

- *Process of online teaching* – if the distance online teaching is restrictive for selected study programs and how students compare the quality of distance online teaching to the full-time form.
- *Evaluation of student results* – how students evaluate their own performance during online teaching and what form of testing they prefer most.
- *Social and psychological aspect* – how much time students spend on distance online teaching and if they can concentrate the whole time on lectures and how they work on exercises, where they must be more concentrated and prepared when the teacher asks a question.

Table 1: Matching compulsory subjects of both study programs – first and second degree

	Number of compulsory subjects	Compliance with the second study program	Proportion
Business Economics (1 st degree)	33	30/33	91 %
Business Management (1 st degree)	33	30/33	91 %
Business Economics (2 nd degree)	16	13/16	81,25 %
Business Management (2 nd degree)	16	12/16	75 %

Source: Own processing based on study plans FEM SUA in Nitra

Table 2: Matching compulsory elective subjects of both study programs – first and second degree

	Number of compulsory subjects	Compliance with the second study program	Proportion
Business Economics (1 st degree)	16	6/16	37,5 %
Business Management (1 st degree)	13	6/13	46,15 %
Business Economics (2 nd degree)	8	2/8	25 %
Business Management (2 nd degree)	7	2/7	28,57 %

Source: Own processing based on study plans FEM SUA in Nitra

3. Results and Discussion

The distance form of education always brings with it certain problems, not only technical, but also personnel or psychological. We found out the students' opinion on these individual problems in a questionnaire survey.

Conditions for teaching - technical problems

The most common technical problems were internet / audio / video dropouts (68.16%). Students cannot solve these technical problems on their own because the mistake may not be on their side, but rather on the side of the internet provider or teacher. Other problems formed a minority of the problems that are unfortunately part of distance education.

Use of digital technologies

Level of ability to work with technologies - students are mostly handy and have no problem connecting to online lessons. Applications and technical environments do not cause them serious problems or stress in teaching. For some problems, they can handle themselves (35,89%) or rarely need help (41,99%). 22,12% of students surveyed need occasional or frequent help.

Balanced development of students' technological skills in higher education is crucial for their personal, social, and professional future and consequently, for their quality of life, with the integration of digital technologies being relevant in the change of the academic work organization, in the relations between learners, teachers, and institutions, and in the new ways of teaching and learning (Rodrigues, A.L., Cerdeira, L., Machado-Taylor, M.d.L., Alves, H., 2021).

Similar research was conducted at the Secondary Voational School of Tourism and Gastronomy in Nitra, Slovakia. According to the research the the majority of students are ready for distance online learning. A great percentage of students have Internet access and are the owners of technological devices that can be used for educational purposes. Furthermore, students are able to work individually on their own and do not require any help from other people while working on assignments. Although they prefer different teaching methods, the synchronous online courses are their priority because it enables them to have direct contact with their teachers and peers. Both teachers and students are familiarised with this new learning environment and it shows that distance online learning is possible (Poláková, P., Klímová, B., 2021).

Form of teaching materials - despite distance learning, students prefer teaching materials only in printed form (14,9%) or rather in printed form (37,92%). This represents a total of 52,82% compared to digital forms of teaching materials, which are preferred by 38,38% of respondents. 8.8% of students cannot judge whether they would prefer printed or digital learning materials. This attitude is related to the study program, respectively subjects that are taught and the fact whether teaching materials in printed or digital form are available.

The script store of the SUA in Nitra also switched to the possibility of purchasing scripts or textbooks in the form of an online order. Thus, students can order the necessary study literature for their home, even in the event of a deteriorating pandemic situation, provided that the study literature is in stock. However, some educators provide their students with study materials in the form of PDF documents, video recordings, or other digital means via LMS Moodle, MS Teams or other platforms.

During the recent vast growth of digitalization, e-learning methods have become the most influential phenomenon at higher educational institutions. E-learning adoption has proved able to shift educational circumstances from the traditional face-to-face teaching environment to a flexible and sharable type of education (Saeed Al-Marroof, R., Alhumaid, K., Salloum, S., 2021). It is also important to identify the critical success factors for E-learning using various methods, like multi-criteria Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) techniques to enhance the educational process (Alqahtani, Y. A., Rajkhan, A. A., 2020).

Process of online teaching

Online teaching is or is not restrictive of the study program - for these study programs, the overall online or distance form of teaching should not be a major problem, as these are study

programs that do not teach e.g., in laboratories and practical and theoretical subjects can also be implemented online. According to a questionnaire survey, it is almost 50 % to 50 %. For 40,18% of respondents, online teaching is not restrictive at all or almost at all. For 32,06% of respondents this is already limiting, and 27,77% of students could not comment on this question. It is possible that there would be more significant differences in responses for more demanding study programs or programs with a focus other than economics and management.

The truth is that online teaching affects not only students but also university teachers. It is therefore important to monitor the influence of factors on each side (student and teacher) in online teaching: (1) the impact of COVID-19 on higher education institutions, and challenges faced by these institutions; (2) the use of various tools and teaching strategies employed by these institutions; (3) the teaching and learning experience of schools and school teachers; (4) the impact of COVID-19 on the training of healthcare workers; (5) the learnings about COVID-19, and treatment strategies from patients; and (6) the mental health of students as a result of COVID-19 and e-learning. (Vijayan, R., 2021).

Also, creation and application of partial individual study plans for study programmes will be more helpful in case of distance online teaching (Virágh et al., 2020).

The quality of online teaching compared to the full-time form – up to 51,02 % of students are of the opinion that online form of teaching is definitely or rather of lower quality. At the same time, only 14,22% are of the opinion that the online form is sooner or definitely better than the full-time form of teaching. 34,76% of students think that online teaching is as good as full-time teaching. The results may also be related to the approach of teachers to the teaching process, and the experience of students with full-time teaching also plays a role here, so there are more relevant results from senior students who have also experienced full-time teaching. Surveys have already been conducted in other countries to compare the full-time and distance forms of teaching, e. g. in United Kingdom (Limniou, M., Varga-Atkins, T., Hands, C.; Elshamaa, M., 2021) or in Spain. The main conclusion of the study in Spain was that the students prefer to continue with the face-to-face learning process (49%) rather than online teaching (7%) or, failing that, mixed or blended learning (44%), where the theoretical classes could be online and the practical classes could be face-to-face (Costado Dios, M.T.; Piñero Charlo, J.C., 2021).

Evaluation of student results

Evaluation of own performance during online teaching - when evaluating students' results, it is often important not only how the students are evaluated by the teacher, but also how they know how to evaluate their performance during online teaching by themselves. 33,86% of students rate their performance during online teaching as worse and 26,65% rate their performance as better during online teaching. 39,5 % students rate their performance as the same during online as during full-time teaching.

Preference in the implementation of the test - the presentation of study results during the semester, continuous testing as well as final testing and the form of testing - online test, online oral exam, elaboration, and presentation of the project are related to one's own performance. In general, students prefer an online test (71,33%) to written tests (23,02%) or an oral form of examinations, either online (1,58%) or full-time (3,16%).

Social and psychological aspect

Although students may perceive online teaching as an easy activity, even more so in higher grades, the time they have to study is certainly more than in full-time teaching. The questionnaire survey shows that up to 31.38% of respondents state that they devote much more

time to distance learning than full-time. This statement is certainly related to the fact that students do not concentrate during teaching, respectively they also perform other activities occasionally (63,88%) or often (22,57%), such as watching a lecture or exercise. Exercises require a higher concentration, but it also depends on the subject and the subject matter. Lectures are rather passive, where students largely just listen to the interpretation of the curriculum and get less involved, even more so only at the request of the teacher.

Online teaching certainly has an impact on students' overall performance, which is what it has to do with social settings (Kümmel, E., Moskaliuk, J., Cress, U., Kimmerle, J., 2020).

4. Conclusion

The distance form of teaching is certainly the way to achieve education, but perhaps only in the exceptional situation we are currently experiencing, or a combination of full-time and distance forms is more effective. Unfortunately, the situation where the full-time form of teaching was changed to the distance form through online teaching, or partly combined, has been going on for almost two years (at the time of writing). From a questionnaire survey conducted at students of the Faculty of Economics and Management, Slovak university of Agriculture in Nitra, we learned the views of students on the distance form of teaching carried out online and what problems students encounter in this form of education. The survey shows that even though these are study programs, which to a large extent may not require full-time teaching, the full-time form of teaching is still more acceptable for students.

The opinion of the other party, namely university teachers, on the distance form of education certainly deserves attention. Because not only students, but also university teachers themselves have some difficulties, respectively at the beginning of the use of this form of education certainly had. However, this issue is the subject of further research.

It was a new situation for both parties that needed to be addressed in a relatively short time. So we all had to adapt, and only time will tell what consequences this pandemic has had on the teaching of tertiary education, in this case at FEM SUA in Nitra.

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References

- [1] Albó, L., Hernández-Leo, D., & Moreno Oliver, V. (2019). Smartphones or laptops in the collaborative classroom? *A study of video-based learning in higher education*. *Behav. Inf. Technol.* 2019, 38, pp. 637–649.
- [2] Alqahtani, Y. A., & Rajkhan, A. A. (2020). E-Learning Critical Success Factors during the COVID-19 Pandemic: A Comprehensive Analysis of E-Learning Managerial Perspectives. In *Education Sciences*, 2020, 10, 216; doi:10.3390/educsci10090216
- [3] Allen, I. E., & Seaman, J. (2011). Going the Distance: Online Education in the United States. *The Online Learning Consortium*. 2011. Retrieved from: http://sloanconsortium.org/publications/survey/going_distance_2011
- [4] Bruder, I. (1989). *Distance learning: What's holding back this boundless delivery system?* *Electron. Learn.* 1989, 8, pp. 30–35.
- [5] Clark, J.T. Chapter 62. (2019). In *Distance Education in Clinical Engineering Handbook*, 2nd ed.; Academic Press: Cambridge, MA, USA, 2019; pp. 410–415.

- [6] Costado Dios, M.T., & Piñero Charlo, J.C. (2021). Face-to-Face vs. E-Learning Models in the COVID-19 Era: Survey Research in a Spanish University. In *Education Sciences*, 2021, 11, 293. <https://doi.org/10.3390/educsci11060293>
- [7] Cotwright, C.J., Bradley, H., Celestin, N., Hall, J. N., Stotz, S.S., & Birch, L. (2020). *Determination eLearning preferences to inform beverage policy training for early care and education teachers*. *J. Nutr. Educ. Behav.* 2020, 52, pp. 732–741.
- [8] Coursera. Retrieved from: <https://www.coursera.org/>
- [9] Cucinotta, D., & Vanelli, M. WHO Declares COVID-19 a Pandemic. *Acta Biomed.* 2020, 91, 157–160.
- [10] Faculty of Economics and Management, Slovak university of Agriculture in Nitra. (2022, January 17). Business Economics bachelor study programme plan. Retrieved from: https://fem.uniag.sk/tl_files/fem/documents/blok%20STUDIUM/Bakalarske%20studium/studijne%20plany/2016/Studijny%20program%20EP.pdf
- [11] Faculty of Economics and Management, Slovak university of Agriculture in Nitra. (2022, January 17). Business Economics master study programme plan. Retrieved from: https://fem.uniag.sk/tl_files/fem/documents/blok%20STUDIUM/Inzinierske%20studium/studijne%20plany/2016/Studijny%20program%20EP.pdf
- [12] Faculty of Economics and Management, Slovak university of Agriculture in Nitra. (2022, January 17). Business Management bachelor study programme plan. Retrieved from: https://fem.uniag.sk/tl_files/fem/documents/blok%20STUDIUM/Bakalarske%20studium/studijne%20plany/2016/Studijny%20program%20MP.pdf
- [13] Faculty of Economics and Management, Slovak university of Agriculture in Nitra. (2022, January 17). Business Management master study programme plan. Retrieved from: https://fem.uniag.sk/tl_files/fem/documents/blok%20STUDIUM/Inzinierske%20studium/studijne%20plany/2016/MAPIIdenni.pdf
- [14] Fraszczyk, A., & Piip, J. (2020). Barriers to eLearning in rail. *Transp. Res. Procedia* 2020, 48, pp. 168–186.
- [15] Kapenieks, A., Zuga, B., Gorbunovs, A., Jirhensons, M., Kapenieks, J., Sr., Kapenieks, J., Jr.; Witolina, I., Majore, G., Jakobson-Snepste, G., & Kudina, I. (2015). User behaviour in multi-screen eLearning. *Procedia Comput. Sci.* 2015, 65, pp. 761–767.
- [16] Kümmel, E., Moskaliuk, J., Cress, U., & Kimmerle, J., (2020). Digital Learning Environments in Higher Education: A Literature Review of the Role of Individual vs. Social Settings for Measuring Learning Outcomes. In *Education Sciences*, 2020, 10, 78; doi:10.3390/educsci10030078
- [17] Lee, E. A. L., Wong, K. W., & Fung, C. C. (2021). Learning with Virtual Reality: Its Effects on Students with Different Learning Styles. In *Transactions on Edutainment IV*; Pan, Z., Cheok, A.D., Müller, W., Zhang, X., Wong, K., Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2010; p. 6250.
- [18] Limniou, M., Varga-Atkins, T., Hands, C., & Elshamaa, M. 2021. Learning, Student Digital Capabilities and Academic Performance over the COVID-19 Pandemic. In *Education Sciences*, 2021, 11, 361. <https://doi.org/10.3390/educsci11070361>
- [19] Matthews, D. (1999). The origins of distance education and its use in the United States. *Journal* 1999, 27, pp. 54–59.
- [20] Nasongkhla, J., & Sujiva, A. (2015). Teacher Competency Development: Teaching with Tablet Technology through Classroom Innovative Action Research (CIAR) Coaching Process. *Procedia Soc. Behav. Sci.* 2015, 174, pp. 992–999.
- [21] Philipps, C. (1728). Caleb Philipps. Teacher of the new method of shorthand. *Boston Gaz.* 1728, 436, 2.
- [22] Poláková, P., & Klímová, B. (2021). The Perception of Slovak Students on Distance Online Learning in the Time of Coronavirus—A Preliminary Study. In *Education Sciences*, 2021, 11, 81. <https://doi.org/10.3390/educsci11020081>
- [23] Pregowska, A., Masztalerz, K., Garlińska, M., & Osial, M. (2021). A Worldwide Journey through Distance Education—From the Post Office to Virtual, Augmented and Mixed Realities, and Education during the COVID-19 Pandemic. In *Education Sciences*, 2021, 11, 118; 26 p.; <https://doi.org/10.3390/educsci11030118>

- [24] Rodrigues, A. L., Cerdeira, L., Machado-Taylor, M. d. L., & Alves, H. (2021). Technological Skills in Higher Education—Different Needs and Different Uses. In *Education Sciences*, 2021, 11, 326. <https://doi.org/10.3390/educsci11070326>
- [25] Saeed Al-Marouf, R., Alhumaid, K., & Salloum, S. (2021). The Continuous Intention to Use E-Learning, from Two Different Perspectives. In *Education Sciences*, 2021, 11, 6. <https://dx.doi.org/10.3390/educsci11010006>
- [26] Shelton, K., & Saltsman, G. (2005). *An Administrator's Guide to Online Education*. Information Age Publishing: Greenwich, CT, USA, 2005.
- [27] Stotz, S., & Lee, J.S. (2018). Development of an online smartphone-based eLearning nutrition education program for low-income individuals. *J. Nutr. Educ. Behav.* 2018, 50, pp. 90–95.
- [28] Taxén, G., & Naeve, A. (2002). A system for exploring open issues in VR-based education. *Comput. Graph.* 2002, 26, pp. 593–598.
- [29] UNESCO. (2020). *COVID-19 Impact on Education*. Retrieved from: <https://en.unesco.org/covid19/educationresponse>
- [30] Verduin, J. R., & Clark, T. A. (1991). *Distance Education*, Jossey-Bass Publishers: Oxford, UK, 1991.
- [31] Vijayan, R. (2021). Teaching and Learning during the COVID-19 Pandemic: A Topic Modeling Study. In *Education Sciences*. 2021, 11, 347. <https://doi.org/10.3390/educsci11070347>
- [32] Virágh, R., Hallová, M., Stuchlý, P., Janšto, E., Virághová, S. (2020). Creation of partial individual study plans by students as a possibility to increase the attractiveness of higher education at FEM SUA in Nitra. In *International Scientific Days 2020*. Gödöllő : Szent István University. (2020), pp. 530--538. ISBN 978-963-269-918-9. URL: <https://doi.org/10.18515/DBEM.ISD.P01.2020>.
- [33] World Health Organization. (2021). Coronavirus Disease (COVID-19). Retrieved from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19>



SESSION 5.2

**NEW DIMENSIONS OF ICT
(NETWORK AND INFORMATION TECHNOLOGY)**

REMLABGRAB – Data Providing System for Remote Laboratories Extensions Building

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Abstract

This paper represents a new era for the REMLABNET system, which is approaching new possibilities and the use of Remote Laboratories (RLs). The new, improved system brings the possibility of access to various platforms for building RLs, but also a reduction in the costs associated with building a computer-controlled experiment. The paper presents the REMLABGRAB (RLG) cloud platform for the provision of remote laboratories using the new concept of Remote Laboratory as a Service (RLaaS). The platform is primarily focused on simplifying the control of RLs individuals and allows superusers access not only to data, but also to the overall control of the laboratory at the level of Measure Server (MS). The main goal of RLG is to facilitate programming activities for those who want to add any added value to all these educational tools, such as artificial intelligence (AI), any form of virtual reality (VR) or feedback systems (FS).

Key words: cloud, computing, virtual, platform, datacenter, service, remote labs, thin client

JEL Classification: L86, D85, L63

1. Introduction

The REMLABNET consortium started a new era of building remote laboratories (RLs), which was caused both by the problem of budget cuts and by the Covid19 pandemic. During the pandemic, of course, students and the entire pedagogical community got into the online world, where it is mostly to this day, and the teaching of natural sciences in particular had to be moved from the laboratory exclusively to the theoretical level of online lectures. With the help of RLs, we try to prevent this as much as possible, and we present our students with new methods by which they can experiment and acquire the necessary skills. It is proven that students simply acquire knowledge if they can be perceived by multiple senses. Jan Amos Komenský already developed this principle theoretically and practically when he wrote: *"Let it be the golden rule for learners that everything be served in all possible senses. Namely, things visible to the eyes, audible hearing, audible smell, palatable tastes and palpable touch, and if some things can be perceived simultaneously by several senses, let them be administered simultaneously to several"* [1].

The logical structure for the remote laboratory is very simple and is shown in Figure 1, where we see the standard laboratory equipment (right), the interface for communication with a computer or server and a video camera. The main communication server (computer) follows, where the data from the experiment are encoded on a standard website and distributed to the client (left).

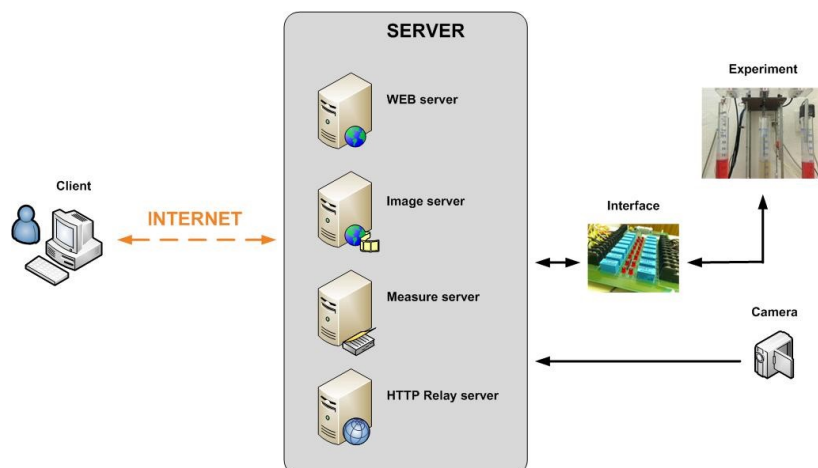


Figure 1 – Basic system structure block diagram [02]

According to the name of the consortium, our complex system is called REMLABNET [03], which has already undergone many modifications, proposals and strategies, but is now built to be able to accommodate experiments based on other architectures than the Internet School Experimental System (ISES). [04] for example: Electrochemical cell [05], Energy in RLC [06], Incline [07], Electromagnetic induction [08], Radiation [09], Wave laboratory [10], described too in [11].

All remote laboratories are located in RLMS REMLABNET, where they are supervised and monitored for operation [12]. Some of the mentioned RLs are equipped with built-in and synchronized simulations [13]. A simple diagram of the REMLABNET network is shown in Figure 2 with the following sections [14]:

- **Data warehouse (DW)** - is a part of the system for data storage and analysis.
- **Reservation and administration server** - part of the content management system (CMS) - generates a service enabling individual remote reservation of the experiment for a given period of time.
- **Communication server** - another part of CMS is a system designed for information transfer and communication in real time, interaction and cooperation in the teaching and learning process with RE.
- **Virtualized Cloud** - The Virtualized DTC contains physical and virtual servers that serve a variety of services, including web services, file services, and more.

On top of this were recently added following servers:

- Diagnostic server – of I and II level [15],
- Embedded simulations server[16].

All this component parts of RMLS were placed on the cloud of Trnava University in Trnava [17].

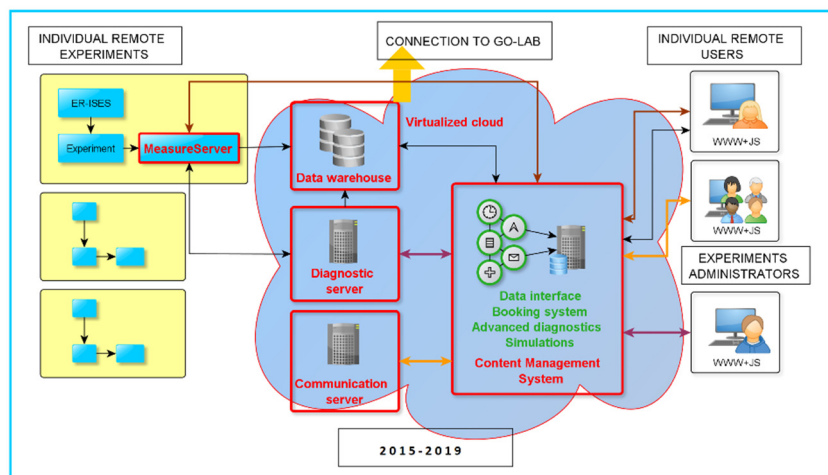


Figure 2 – Block scheme of REMLABNET with cloud embedded [18]

Of course, we consider the ISES system to be the most progressive method developed by our collaborator doc. Lustig at Charles University in Prague [19], but circumstances and times have progressed. We necessarily had to reach for new methods that we will use in the development of RLs. One such method is to replace ordinary PCs used to involve each expert. We have made great strides in this area in the deployment of thin client technology.

Another of the new methods in the use of RLs technology is our new concept of API style interface, which we are called REMLABGRAB (RLG).

RLG concept

RLG basically serves for easy access to all bidirectional data between the supervising client and the RL management server. This differs from a regular client that only has access to selected data. The supervising client thus has access to all data corresponding to the correct function of the RL, but can also change the functioning of the RL.

Simple scheme of RLG is in Figure 3 including ISES RL blocks and Measure Server (MS) unit (in orange). Of course, the block called ISES, for us no longer means not only ISES technology, but we are also able to involve other technologies for building RLs, which include, for example, the use of experiments based on Arduino or Raspberry PI [20]. In principle, REMLABNET enters the RLG system with all RLs, followed by the basic unit DATA Supply, whose function is to provide all cumulative RL data from the REMLABNET communication server by parsing. The PHP CLI block is used to directly create PHP communication commands. The WEB block is used to set up a communication website for client supervision, which contains a list of RLs (Figure 4) and items of inputs, outputs, IPs and camera addresses for individual RLs (Figure 5).

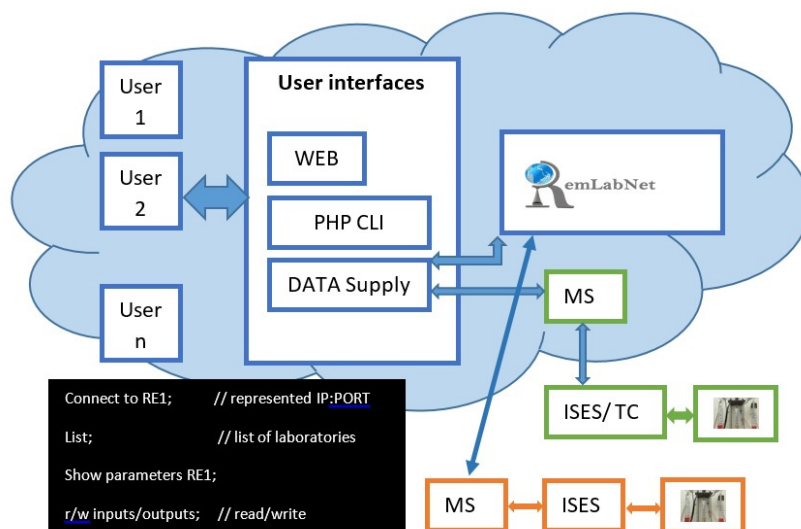


Figure 3 – RLG main idea

The function of the unit of RLG is following:

1. Supervising client must choose the RL in question
2. Communication with RL must be established in order to generate RL data
3. Supervising client can now control RL and may make full use of the data and functioning of RL

Supervising client thus can read the data from measure server of RL addressed with given IP address and corresponding PORT(Figure 4). Visible in Figure traffic light indicates the availability of RL.

In the list Figure 4 we can see the access IP addresses. Of course, the private IP address is used exclusively inside the cloud. This allows access, for example, from another RL that needs to use the information contained here. Such an example can be, for example, the external light intensity from RL Meteo Trnava for RL Photovoltaics, where the use of photovoltaic cells is compared.

Another IP address with a port is public, to which an authorized superuser (supervising client) connects in order to gain direct access to the laboratory.

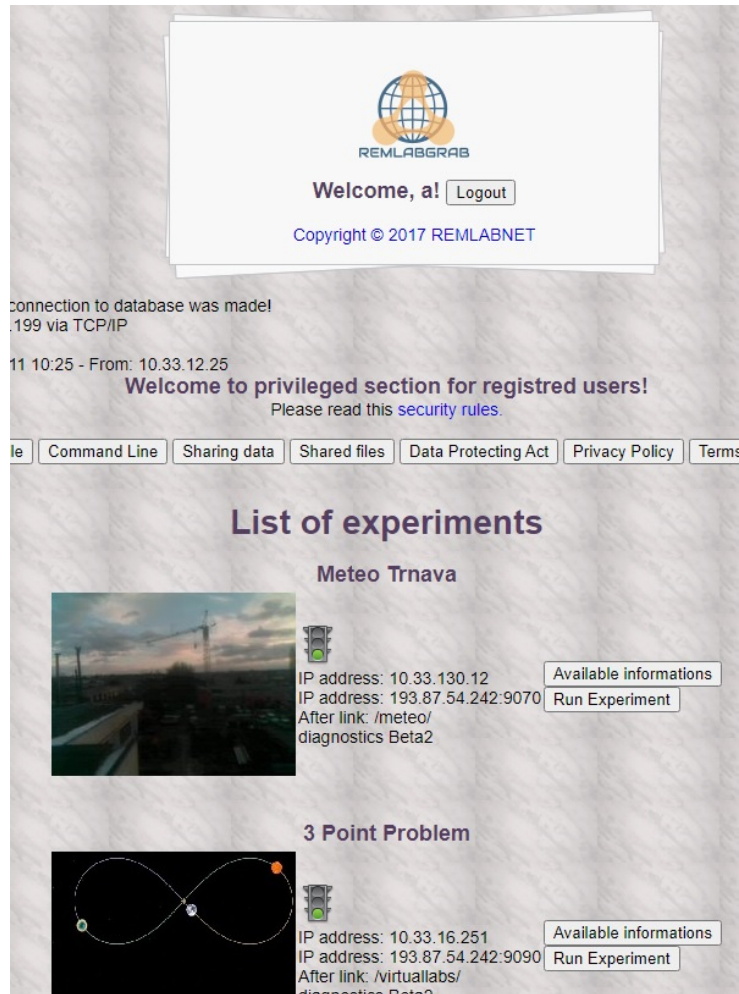


Figure 4 – RLG, list of experiments with example Meteo Trnava RLS

In general the supervising client gains general data comprising inputs, outputs, camera address or else, what is need to work for each RLS. Example of possible data for electromagnetic induction is in Figure 5.

Basically, RLG serves for an easy access to all bidirectional data flux between supervising personnel and the RL. Supervising personnel has the approach to all the data, corresponding to proper functioning of a RL, but also possesses the possibility for changing its functioning. In schematical representation (Figure 6), are represented two kinds of connectivity, one by measuring client via REMLABNET (green line) and one via REMLABGRAB by the supervising personnel (orange line).

Here is an example of using RLG for the Electromagnetic induction experiment (Figure 7), values of parameters adjusted to measurement:

Controlling voltage on electromotor:

$$indukce_napeti = \{0, 2, 4, 6, 8, 10\} V$$

Number of coils at time:

$$indukce_sim_windings_count = 18 \text{ coil (for } 0 - 13.484 \text{ s)}$$

$$indukce_sim_windings_count = 36 \text{ coil (for } 13.484 - 27.8 \text{ s)}$$

ELECTROMAGNETIC INDUCTION		
Available informations		
1. INPUTS		
indukce_motor	[-10000 to 10000]	(1/1000V)
indukce_sim_frequency	[0 to 7]	(Hz)
indukce_sim_windings_count	[1 to 50]	(--)
indukce_sim_magnetic_flux	[0.1 to 1.2]	(Wb)
2. OUTPUTS		
indukce_motor	[-10000 to 10000]	(1/1000V)
indukce_napeti	[-10 to 10]	(V)
indukce_sim_napeti	[-10 to 10]	(V)
indukce_sim_frequency	[0 to 7]	(Hz)
indukce_sim_windings_count	[1 to 50]	(--)
indukce_sim_magnetic_flux	[0.1 to 1.2]	(Wb)
3. IP ADDRESS		
195.178.94.35:8889-		
4. CAMERA		
IP address 10.33.179.2:8899		

Figure 5 – Available information for Electromagnetic induction laboratory, each laboratory have own information like this one



Figure 6 - REMLABNET and REMLABGRAB: Possible connections in our system of RLs: clients via REMLABNET for the measurements on RLs (green line) and supervising personnel via REMLABGRAB to inspect measurements and control data (orange line)

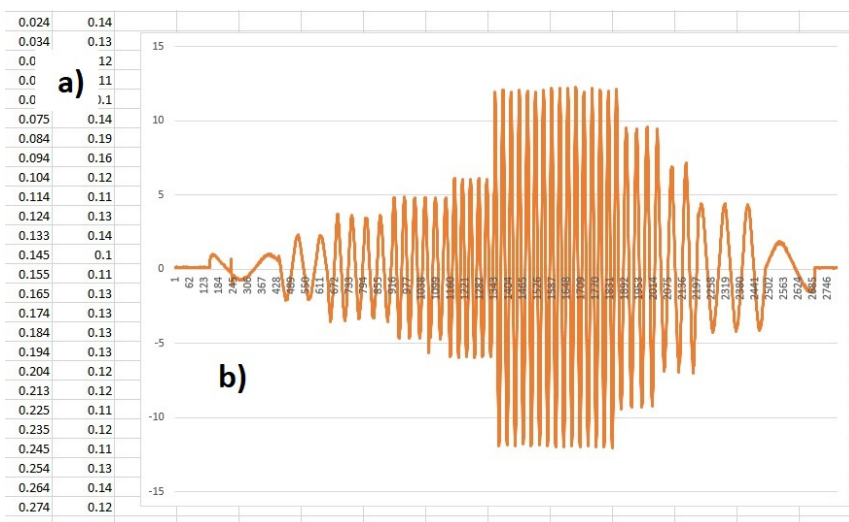


Figure 7 - Measurement of „Electromagnetic induction“ via REMLABGRAB – a) part of the measured data, b) the graph of the measured induced electromotive voltage for controlling voltage on driving motor {0, 2, 4, 6, 8, 10, 9,7,5,3 }

RLG Thin client

To describe Figure 3 completely, it is well to mention that in connection with building of the interface RLG we used a new idea of exploitation of thin client (TC) communication unit, transferring all the functions of controlling server of RL to the cloud. This is depicted already in Figure 3 (in green). The TCs used in REMLABNET have also undergone many changes. The old version used TC company Sun Microsystems/Oracle, but here was many disadvantages. The new version of Huawei allowed us to access the source code, so we were able to modify the communication structure and get the most suitable use for REMLABNET / REMLABGRAB from the TC (Figure 8) used. The major advantage of this approach rests in the possibility to transfer all controlling and steering SW to a cloud. Simultaneously there is a possibility to multiplex many virtual clients (VM), with one physical HW, resulting in substantial, financial asses (Figure 9).



Figure 8 – Thin clients used in REMLABNET (new version of TC - left, old version of TC - right)

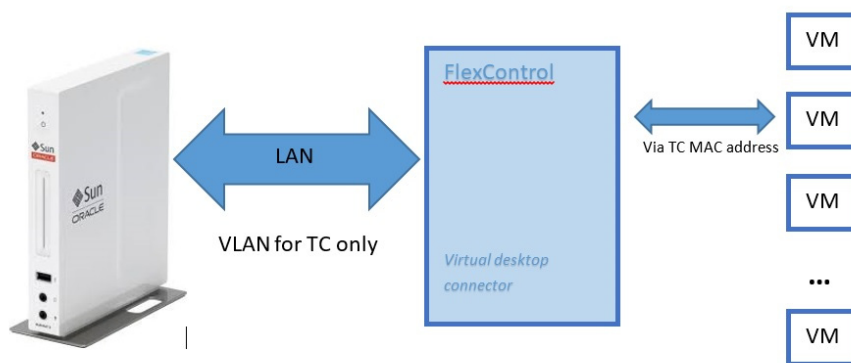


Figure 9 - Architecture of TC in RLG, with Flexcontrol API

RLG contributions

The main assets of a new interface of RLG is by providing new cloud service, Remote Laboratory as a Service (RLaaS) for our clients, teachers, students and any interested in RLGs of Science via Internet. We will inform about the services within REMLABNET in new contributions, because Cloud Computing of REMLABNET is under global reconstruction and we are moving to new, more modern solutions. However, new solutions always bring with them new demands on the computer / digital literacy of clients and therefore it is often necessary to educate them [21] and guide them. Ideally, if this is already happening within the schools where they are gaining education. With a new possibility to use TC technology the possibility is open to for create experimental basis of massive remote laboratories. On top of this substantial functional reduction results with the possibility of increase number of clients working with one experimental physical HW.

At this point, it is necessary to note that in the world of RLGs there is still no similar management system and no one has yet implemented it with the system we have used and proved to be. The use of TC in connection with cloud services brings many advantages. This brought us a considerable saving of financial costs and a huge saving of RLGs administration time. As we mentioned, RLGs have a great deal of credit for allowing our students to do laboratory exercises. Of course, the students of Trnava University are not the only ones who approach our laboratories. First of all, they are all students of our REMLABNET consortium, which consists of three universities: Charles University in Prague, Tomas Bata University in Zlín and, of course, Trnava University in Trnava. However, especially during the Covid 19 pandemic, the laboratories were visited by others. Our records include universities and high schools from all over Slovakia, Czechia, but also Spain, Italy and Austria.

2. Conclusions

We can formulate following conclusions for introduction of REMLABGRAB module:

1. Accessibility of complex data of every RLG in REMLABNET system
2. Possibility of building extra sophisticated modules for RLG bringing additional application
3. Possibility of REMLABNET monitoring and its simplified supervising
4. General possibility of easy laboratories maintenance computer oriented school

We do not yet know what the future will bring us, but the REMLABNET system is constantly being improved and built on solid foundations by ISES systems. New methods of solving RLs bring new problems, but also new experiences and knowledge that we can use for continuous improvement.

What we can say and estimate is that the near future of using remote laboratories will only be bigger. On the one hand, the Covid 19 pandemic has influenced this, and on the other hand, it has been shown that RLs not only greatly help to save costs for organizations, but also keep students more interested in experimental knowledge. Times have changed and today's generation lives online. So why not take advantage of their weakness for the online world and show them something useful?

Acknowledgement

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References

- [1] Beňo P., Cloud computing solutions and security of EU remote interactive laboratories network, Univerzita Tomáše Bati ve Zlíně, Zlín, 2019
- [2] Beno P.: Cloud Computing concept for digital consumers, SIT 2018 – International Scientific Days, 16.-17. May.2018, Nitra – Slovakia
- [3] BEŇO, P.: Cloud computing solutions and security of EU remote interactive laboratories network. Zlín. FAI UTB. March 2016. Postgradual Exam.
- [4] Fernández-Pacheco, A., S. Martin and M. Castro, "Implementation of an Arduino Remote Laboratory with Raspberry Pi," 2019 IEEE Global Engineering Education Conference (EDUCON), 2019, pp. 1415-1418, doi: 10.1109/EDUCON.2019.8725030.
- [5] GERZA, Michal a Frantisek SCHAUER.: Advanced Modules Diagnostics in ISES Remote Laboratories, IEEE 10th International Conference on Computer Science and Education (ICCSE) Location: Brunel Univ London, Cambridge, ENGLAND Date: JUL 22-24, 2015, 10TH INTERNATIONAL CONFERENCE ON COMPUTER SCIENCE & EDUCATION (ICCSE 2015) Pages: 583-589 Published: 2015,
- [6] Horvath, Roman, Phenomenon of Digital Literacy in scope of European cross-curricular comparison, 1877-0428 © 2014 Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>). Peer-review under responsibility of the Organizing Committee of CY-ICER 2014. doi: 10.1016/j.sbspro.2014.07.468
- [7] KOMENSKÝ, J. A.: Veľká didaktika. Bratislava : SPN, 1954, s. 159
- [8] Krbecek M., Das S., Schauer F., Ozvoldova M., Lustig F. (2019) Poster: "Radiation Remote Laboratory" with Two Level Diagnostics. In: Auer M., Langmann R. (eds) Smart Industry & Smart Education. REV 2018. Lecture Notes in Networks and Systems, vol 47. Springer, Cham. https://doi.org/10.1007/978-3-319-95678-7_36
- [9] Schauer F. , Krbeček, M.: Communication and diagnostic interfaces in remote laboratory management systems. International Journal of Online Engineering. Kassel University Press GmbH 2015; DOI: 10.3991/ijoe.v11i5.4926
- [10]Schauer F. , M. Krbeček, P. Beňo, M. Gerža, L. Pálka, P. Špilakova, T. Komenda, M. Ožvoldová, Ž. Gerhátová and L. Tkáč. REMLABNET IV — LTI federated laboratory management system with embedded multiparameter simulations. 2017 14th International Conference on Remote Engineering and Virtual Instrumentation (REV). 15,-17 March 2017, Columbia University, New York, USA. Pg. 340-350.
- [11]Schauer F. et al., „Easy to build remote laboratory with data transfer using ISES - Internet School Experimental System,“ rev. *REV International Conference*, Dusseldorf, 2008.

- [12] Schauer F., Gerza M., Krbecek M., Ozvoldova M. (2018) "Remote Wave Laboratory" with Embedded Simulation – Real Environment for Waves Mastering. In: Auer M., Zutin D. (eds) *Online Engineering & Internet of Things. Lecture Notes in Networks and Systems*, vol 22. Springer, Cham. https://doi.org/10.1007/978-3-319-64352-6_18
- [13] Schauer F., Gerza M.: Intelligent processing of experimental data in ISES remote laboratory; *International Journal of Online Engineering*. Kassel University Press GmbH 2016; DOI: 10.3991/ijoe.v12i03.5538.
- [14] SCHAUER, F. and col.: REMLABNET II - open remote laboratory management system for university and secondary schools research based teaching. 12th International Conference on Remote Engineering and Virtual Instrumentation (REV). 25-28 February 2015, Bangkok, Thailand, 978-1-4799-7838-0/15/\$31.00 ©2015 IEEE
- [15] Schauer, F., Michal Krbecek, Pavel Beno, Michal Gerza, Lukas Palka and Petra Spilakova "REMLABNET - open remote laboratory management system for e-experiments", REV 2014, Porto University, 26-28 February 2014
- [16] Schauer, F., Kuřitka, I., Lustig, F.: Creative Laboratory Experiments for Basic Physics Using Computer Data Collection and Evaluation Exemplified on the Intelligent School Experimental System (ISES), *Exploring Innovation in Education and Research, iCEER-2005*, Taiwan, 1-5 March 2005.
- [17] Schauer, F., M. Ožvoldová, L. Tkáč and M. Krbeček, "INCLINE - The remote experimental kit for research based teaching in the class," *Proceedings of 2015 12th International Conference on Remote Engineering and Virtual Instrumentation (REV)*, 2015, pp. 105-108, doi: 10.1109/REV.2015.7087272.
- [18] Schauer, F., Ozvoldova, M., Tkac, L.: *INTE-L: wide open door for education by remote and virtual experiments exemplified on electricity, magnetism and electromagnetism*; ISBN 978-84-15759-16-4; University of Deusto, Bilbao 2013.
- [19] Schauer, F., Z. Gerhatova, M. Ozvoldova, P. Cernansky and L. Tkac, "Electrochemistry remote experiment - galvanic cell - II," *2012 9th International Conference on Remote Engineering and Virtual Instrumentation (REV)*, 2012, pp. 1-6, doi: 10.1109/REV.2012.6293184.
- [20] Schauer, ozvoldova: *MONOGRAPH Remote Laboratories in Research-based education of real world phenomena*, Peter Lang, Int. Acad. Publ. Frankfurt, 2018, 157 pages ISBN: 978-80-224-1435-7
- [21] Tkáč, L., František Schauer, *Energy Balance in Real Electronic RLC Circuits by Remote Experimentation*, *Procedia - Social and Behavioral Sciences*, Volume 89, 2013, Pages 158-162, ISSN 1877-0428, <https://doi.org/10.1016/j.sbspro.2013.08.827>.
(<https://www.sciencedirect.com/science/article/pii/S1877042813029583>)

REMLABNET – BaaS, Backup as a Service in Remote Laboratories and Increase Sciences and Research’s Data Security Precautions against Ransomware

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Abstract

The article focuses on the importance of the REMLABNET system, which deals with the backup of scientific research and student data. The system helps scientists keep their data safe from destruction or theft. The article also discusses the introduction of the REMLABNET Cloud computing service called Backup as a Service (BaaS). The service provides data backup for researchers, teachers, and students. Every part of the university will find applications for the security of its data here. The service contains a large number of battles with Ransomware, right at the level of disk arrays. Like everything in CC-REMLABNET, we provide these services through the list of services listed on our website. Here we present the Beta version of our new portal for access to our laboratories and also the services that REMLABNET provides.

Keywords: remote laboratories, virtual laboratories, backup, services, cloud computing, education, REMLABNET, science

JEL Classification: L86, D85, L63

1. Introduction

We have been dealing with the topic of remote laboratories (RLs) for more than a decade, and during our career we have already researched and created a lot in this area. This is one of the reasons why it probably doesn't make sense to describe the issue itself, as it has become an ordinary part of our lives. We meet her especially in the distance education of students, which exacerbated the pandemic covid19 and thus pointed out the need to conduct lessons (lessons) in a different way than the school was used until recently. Today, RLs are dealt with by more and more institutions around the world. The traditional way of teaching process had to be changed from the ground up, and as teaching methods changed, so did RLs. They are constantly evolving and are gaining more and more popularity.

Our new structure has changed radically compared to the flood design. We have moved from the usual RLs solution (described here (Schauer, 2014)) to a fully cloud solution, which is a priority for us. This is because the cloud solution allows the migration of individual RLs across connected data centres (DTCs). The floods aimed at integrating all RLs into the cloud, called Cloud computing REMLABNET © (CC-REMLABNET ©), are coming true and becoming a reality. Figure 1 shows our proposed timeline for integration and creation of a new solution.

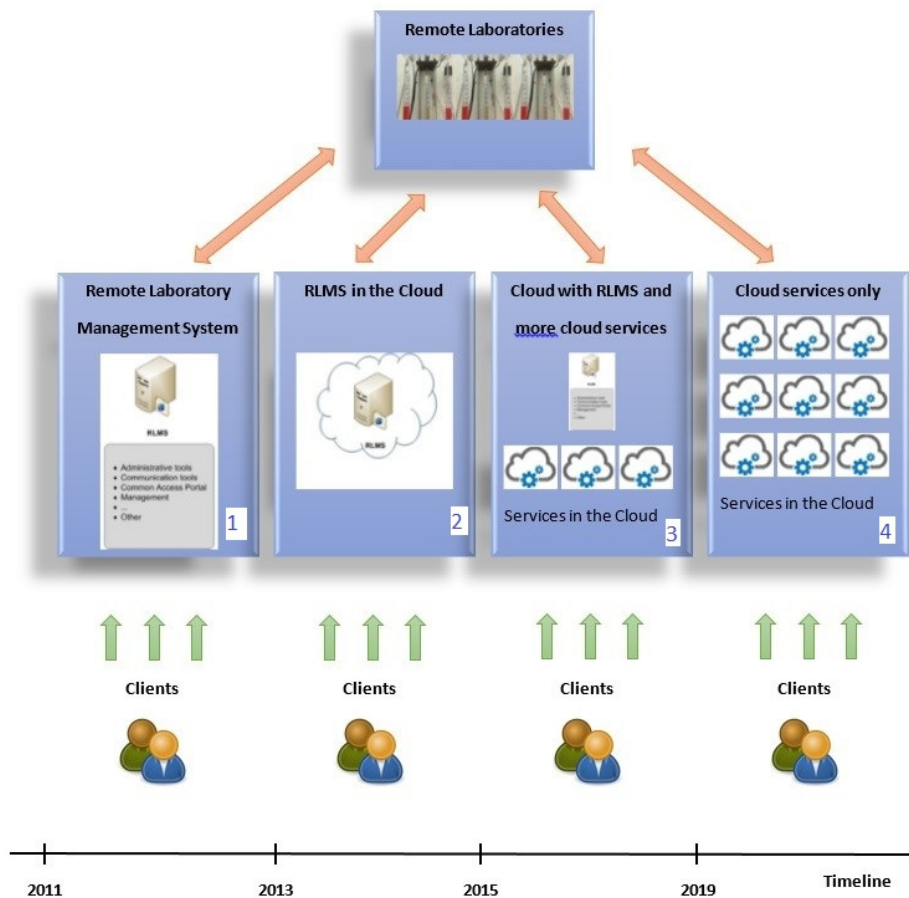


Figure 10 - Steps and timeline of REMLABNET and RLs embedding into the cloud

Source: Author

When we look at the timeline of what was built, we can see the progress in RLs. In the first place, it is obvious that the main functionalities of individual RLs are not changing, but some functionalities, ensured by the cloud, are added. First, of all, REMLABNET (without cloud) provided functionalities, summarized below (Panel/Block 1). In 2013, we started installing cloud computing and placed our REMLABNET in a virtual cloud (Panel/Block 2), providing basic IaaS, PaaS and SaaS services (Panel/Block 3). Later, we begun creating additional services and options that our cloud might provide, and we built many extended options. According to our experience, the real interest is only in three, the most commonly used: Remote Laboratory as a Service (RLaaS), Simulation as a Service (SIaaS) and Storage as a Service (STaaS). In this paper, we will focus primarily on STaaS technology and its modification for Backup as a Service (BaaS). The virtualization and cloud solutions are the main topic of IT technologies nowadays, when servers, networks, disk arrays, individual luns on the storages are being virtualized. The trend touches also the field of RLs (Panel/Block 4). We have to conclude that at present, the approaches in RLs world community, takes similar trajectory of building RLs, to provide RLs as service (Tawfik, 2014) (Garcia-Loro, 2019).

No matter how the structure changes, it is necessary that the main functions and advantages of using RLs remain. For that, summarizing, the functions of REMLABNET are:

- To embed individual RLs and provide their functioning,
- Enable Diagnostics of RLs,
- Enable communication in the virtual classes,
- Enable connectivity with another RLMS,
- Provide connectivity of clients from arbitrary locality,
- Provide unification of interfaces,
- Provide booking system,
- Ensure storing of measured data.

When we focus on integrating the RLs itself into the cloud, we must realize that there is no longer a service computer for each experiment, but all the software components run in a virtualized cloud storage. An example of this is in Figure 2, where you can see that there are really only HW devices such as Camera and converter, respectively LAN connection interface, in the experiment itself.

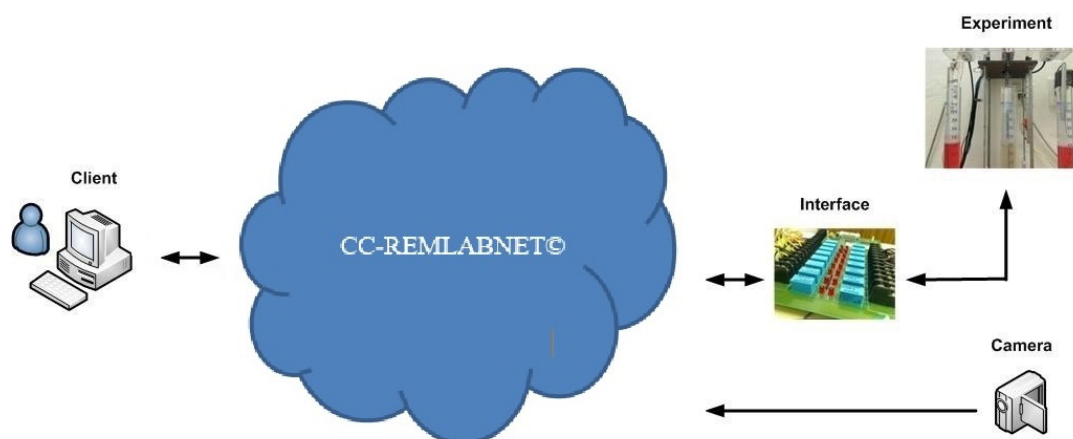


Figure 11 - Basic scheme of the server-client communication in RL embedded in cloud CC - REMLABNET[©]

Source: Author

A description of the connection between CC-REMLABNET © and the expert himself is beyond the scope of this publication. In short, we will at least state that the main cloud blocks for this purpose are shown in Figure 3. On the fig 3, we see how the user comes to the CC-REMLABNET © portal, which serves as a user interface. Subsequently, using the FlexConnect block, it is redirected to selected RLs that no longer need service PCs, but the control software is located on separate virtual machines (VMs). Currently Remlabnet (<https://remlabnet.eu>) is undergoing reconstruction and its new version is located on the domain <https://remlabnet.truni.sk>, where the individual RLs are divided into logical blocks:

1. Virtual laboratories - where there are completely virtual or simulation tools that help in the teaching process. For example, simulation of a rocket flight with the possibility of adjusting the mass and fuel, where the student sees how to model the model in the gravitational field of the earth (flight height), Mendelian periodic table of elements showing the atomic structure for each element (number of electrons in the envelope,...), Solar system , where real data and orbiting planet orbits are used with the ability to track the difference between the orbits of the two planets, and more.
2. Physical laboratories - where RLs are located on the basis of ISES (Schauer, 2008) but also the newly supported Poseidon, Arduino or Rasbery PI systems. Examples are electromagnetic induction, measuring weather conditions in the city, measuring heat transfer on various materials, and more.
3. Experiments according to the curriculum of the Ministry of Education - where we have created and are constantly supplementing the individual RLs needed for teaching physics and science at primary and secondary schools in the Slovak Republic and the Czech Republic. This section is governed by approved curricula for each class of individual schools.

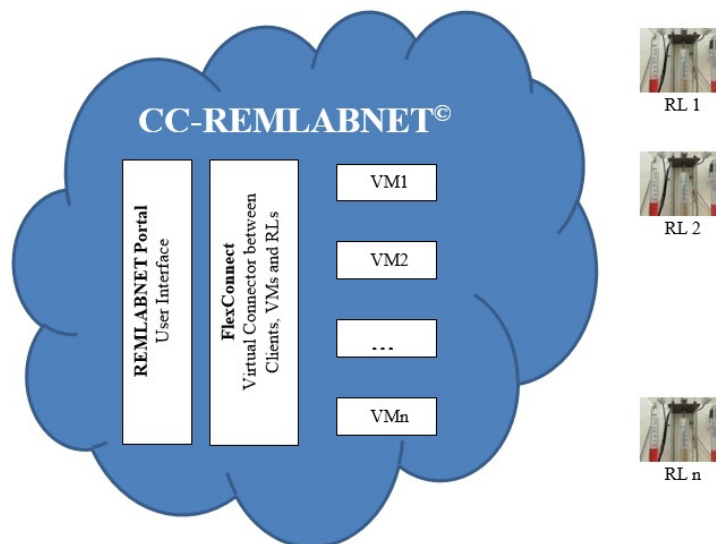


Fig 3 - FlexConnect in block diagram of the CC-REMLABNET©

Source: Author

The whole description of the cloud solution design is also described here (Schauer, 2020). In this paper, we want to primarily deal with the service that the cloud provides us automatically for REMLABNET clients - Backup as a Service (BaaS). It is no coincidence that we have worked on this issue. In the past, we have created both the possibility of establishing research activities and also the possibility of providing disk space for clients of the REMLABNET, like advanced technology in our cloud. Advanced technology has also invited some severe security threats, like the cyber threat. Moving your data to the cloud is considered to achieve their maximum safety (Ismail, 2018). Cloud storage refers to the online space where data can be stored. This online space resides across multiple remote servers housed inside massive DTCs, built on virtualization technology, which means that storage space spans across different servers and possibly even multiple and geographically different locations.

The Storage as a Service (STaaS) takes care about storing all generated data both by measurements, calculation and modelling on one side and control traffic data on the other. The

added value is a possibility to distribute the cloud storage locally to even very remote localities and thus suppress vulnerability of both storage HW and data stored.

Every day, internet users create trillions of bytes of information, an inconceivable mass of ones and zeros, that are then stored in the cloud computing farms run by the world’s biggest companies (Decker, 2018). In the REMLABNET is situation “little bit” better, but our clients are producing data every day in measurements, or they are sharing the data. In addition to their processing, this data must also be stored and, of course, backed up, which has a great impact on storage capacity.

2. Purpose

The proposed solution has a very wide application. First of all, we need to realize where the RLs are going, and that is education and, of course, research. As far as school activities are concerned, it is, of course, necessary to back up the various works of students. Within the RLs, these are mainly measurement protocols and submitted laboratory work - measurement outputs. Due to the legislation, it is necessary to maintain these parts of teaching for at least 5 years. It is useless for such work to be accessible on fast disk arrays, taking up space for applications and more up-to-date data. For this reason, the system is designed so that the current data is located on fast disks together with applications running under the university DTC - Fig. 4. The same is true for research activities, research data and development work not only in the development and development of REMLABNET, but also within the whole university with running applications. As part of the University of Trnava in Trnava, all research teams use our proposed concept.

The data collected by the application and REMLABNET itself are stored and worked on fast SAS disk arrays, which are then backed up to slower SATA disk arrays. Backup as well is unnecessarily described. They are clearly among the basic issues of IT issues. An incredibly large amount of time and energy is devoted to him. But why is that so? The answer is always clear. The need to go back to the data in time. There may be a number of phenomena that affect our stored data. On the one hand, there is a possibility that we will damage them ourselves, whether by careless handling or simply deleting something that we find useful. For example, the measurement of electromagnetic induction from 2019 (Beňo, 2019). The second reason for having a backup is disaster recovery. This is an external intervention, where current data can be damaged by equipment failure or hacker attacks. Both options are very common.

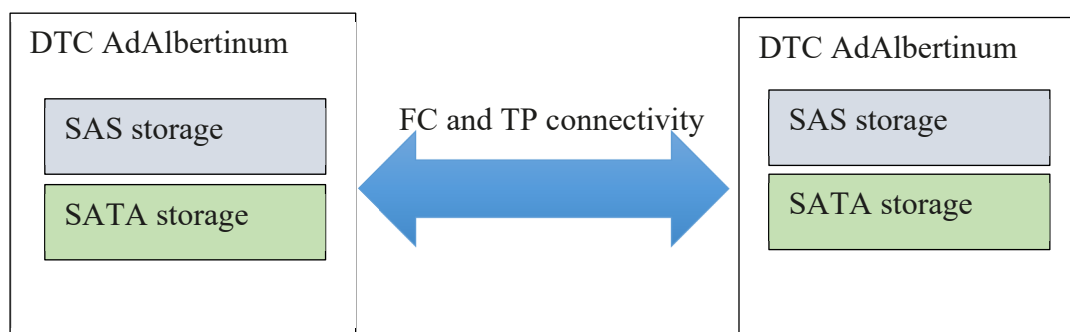


Fig 4 - Distribution of the disk arrays for REMLABNET applications

Source: Author

In general, we can say, that data backup is a process of duplicating data to allow retrieval of the duplicate set after a data loss event. Backups have two different purposes. The primary goal is to recover data after it is deleted or damaged. The secondary goal of the backup is to restore the data from the previous period in accordance with the determination of the data retention policy that is normally configured in the long-term backup application for how copies of the data are needed. Although backups are a necessary form of disaster recovery and should be part of the REMLABNET disaster recovery plan.

In forming the scheme of the storage we stick to the rule „2+1= Data backup best practice“, that means for critical data of all activities we should make two full copies, maintained on separate physical devices. Of course, this only applies to data marked with priority “1”. Our systems adhere to the university's security guidelines, which specify the priority of systems and their relevance. In addition, a third copy should be kept offline, preferably situated at another location.

Let us look at how we archive the data of REMLABNET. Data archiving is the process of moving data that is no longer actively used on a separate long-term storage device. Archival data consists of legacy data that remains relevant to the organization or must be retained for future use or for regulatory reasons. Data archives are indexed and have search capabilities, so needed files can be located and retrieved (Rouse, 2019).

At this point, we need to mention one important thing and the crucial thing that is going on. Ransomware. Ransomware knows about everyone. It is quite possible that he met him in person when he found the encrypted data on his PC in the morning. Ransomware is a type of malicious software that is used by cybercriminals to block the work of an infected system. It attacks both local PCs and large systems. We have already encountered encrypted data found in the HyperV environment. However, this publication is not aimed at ransomware and how to defend against it. A number of publications have already been published about this, and some of them are very good and, in addition, offer some solutions to problems. For example (Eset, 2022) (Kharraz, 2018). We also want to point out how the backup system can protect our data from Ransomware.

3. Methods

We have described and presented ways of connecting and creating backup snapshots in our publication ROAD TO STRENGTHEN OF VIRTUAL INFRASTRUCTURE AND SECURITY OF REMOTE LABORATORIES ON TRNAVA UNIVERSITY IN TRNAVA (Schauer, 2020). In short, we can say that the snapshots that we create are set up so that they save a huge space on disk arrays and their creation and restore are much faster, because it does not copy such a huge amount of data.

In the first phase, our NetApp FAS2700 series data storage completely replaced three old data storages from various vendors. Because it natively allows the combination of block and file protocols on a single disk space, it can be very flexibly integrated into the infrastructure. Flexibility plays a huge role in creating data backup and archiving. Scientific data needs to be backed up at the lowest level. We are helping our scientists not to have to think that it is necessary to solve some backup, thus relieving them of unnecessary effort and so that they can devote themselves fully to their work. It is the same with student data, as students back up data in this way throughout the semester. Thanks to the ability to create a Storage Virtual Machine (SVM), we can provide each application with the necessary protocol, dedicated logical interface (LIF), resources and define Quality of Service (QoS). Subsequently, simple SVM /

LIF transfer between individual controllers or between multiple disk arrays within a cluster allows us to implement maintenance and future technological upgrades without the need to interrupt service provision. Moving data to faster layers of the cloud is seamless and transparent to applications. The integrated Non-Volatile Memory Express (NVMe) cache on the controllers acts as an excellent accelerator for IO operations, which were insufficient for the original data storage and slowed down the operation of applications.

Thanks to the new ONTAP® storage operating system, we can automatically create images with virtually no restrictions and without negatively affecting performance (1023 images per volume). A copy of a snapshot is an image of a file system at a specific time. Low-overhead image copying is possible thanks to the unique features of Write Anywhere File Layout (WAFL®) storage virtualization technology, which is part of Data ONTAP®. Like a database, WAFL uses pointers to actual blocks of data on disk, but unlike a database, WAFL does not overwrite existing blocks; writes the updated data to a new block and changes the pointer. The NetApp Snapshot copy simply manipulates block pointers and creates a "frozen" read-only view of the WAFL volume, which allows applications to access older versions of files, directory hierarchies, and / or logical unit numbers (LUNs) without special programming. Because the actual blocks of data are not copied, copies of the slides are extremely efficient in terms of the time required to create them and the storage space (NetApp, 2011).

The creation of the snapshot itself is in Figure 5. The snapshot is captured in Figure 5. In Figure 6, the changed data is written to the new block and the pointer is updated, but the snapshot pointer still points to the old block, giving you a live view of the data and a historical view. The next snapshot will be created in Figure 7 and you now have access to 3 generations of your data without taking up disk space, which would require 3 unique copies: live image, snapshot 2 and snapshot 1 in order of age.

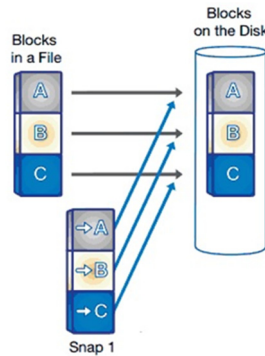


Figure 5 - Take a snapshot (resource NetApp)

Source: *NetApp Snapshot Technology, Datasheet DS-2477-1111, 2011*

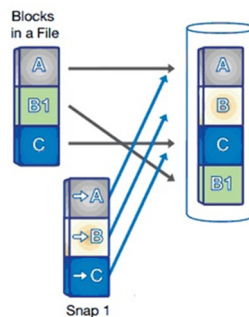


Figure 6 - Write data to a new block (resource NetApp)

Source: *NetApp Snapshot Technology, Datasheet DS-2477-1111, 2011*

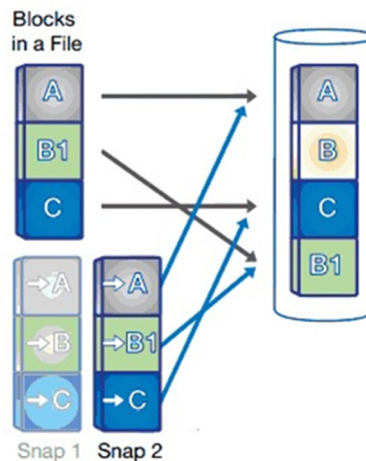


Figure 7 - Create another snapshot (resource NetApp)

Source: NetApp Snapshot Technology, Datasheet DS-2477-1111, 2011

Snapshot technology forms the basis of a unique ecosystem of high-availability, disaster-tolerant, and data protection solutions. The great advantage of setting up our snapshot system is that each user can manage their snapshots and their backups.

Ransomware protection is also a very important part of this technology. We have been dealing with the fight against Ransomware since the very beginnings of this technology. Much of our research focuses on cloud services, as we mentioned above. One service that we tried a long time ago was also Ransomware as a Service (RWaaS), but we also cancelled this technology after the deployment and creation of the service, because we do not consider it moral to offer another such tool. There is more scope and technology to combat Ransomware, but we are already working at the disk array to achieve data security. Gartner also has an interesting look at this:

Gartner's requirements of next generation cyber storage: "By 2025, 40% of all enterprises will require storage products to have integrated ransomware defence mechanisms, up from 10% in 2021".

The systems we use currently have basic anti-Ransomware features:

- Real-time detection using file system analytics and file activity entropy calculator
- Upon ransomware detection:
 - Alerts administrators to attack
 - Triggers automatic snapshot, to minimize damage and simplify recovery
- Included in new Anti-Ransomware Suite

Gartner also defined requirements of next generation cyber storage, which consist of mainly (figure 8):

Identify

- Assess your data protection and security posture
- Classify type of data, location, and permissions

Protect

- Block malicious data from being written to disk
- Create granular, immutable copies to thwart infection
- Prevent data deletion with indelible data copies

Detect

- Monitor user behavior for suspicious activity
- Detect storage behavior anomalies

Respond

- Initiate NetApp® Snapshot™ copies if an attack is identified
- Block malicious user accounts

Recover

- Restore data in minutes and bring applications back online
- Apply intelligent forensics to identify the source of the threat



Figure 8 - Gartner’s requirements of next generation cyber storage (Identify, Protect, Detect, Respond, Recover)

Source: Author

4. Conclusion

Our idea of using cloud computing has been confirmed and discussed with experts in this research section. The way we work is good and has made great progress. We can provide the new Remote Labs as a Service (RLaaS) service in our cloud system. Our clients are primary school teachers, students and the brainwashing of universities and high schools, but access is possible for all consumers via the internet. This shows how heavily the university network is in terms of communication and transport. This states that the network and all parts of the IT structure must be free of failure and latency. And stay safe for research data management and protection.

Snapshots allow us to efficiently back up, go back in time with unwanted changes with extremely high granularity, and last but not least, we have a tool to easily recover from a possible ransomware attack (Snapshots are ransomware resistant), because NetApp Copy Snapshot is a read-only, static and fixed copy. Using SnapManager, we can set up an automatic backup cycle, application runtime, and retention policy. The high performance, scalability and stability of NetApp Snapshot technology means it provides the ideal online backup for user-driven recovery. Other solutions allow you to copy backups to disk offline or to tape and archive them.

This is really the most reliable ransomware protection we’ve found in REMLABNET and universities. Our Consortium want to continue with research of the increase data protection and bring absolutely or best security of data.

Acknowledgement

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References

- [1] Beňo P., Cloud computing solutions and security of EU remote interactive laboratories network, Univerzita Tomáše Bati ve Zlíně, Zlín, 2019
- [2] Decker, S., "Bloomberg Businessweek," 17 10 2018. [Online]. Available: <https://www.bloomberg.com/news/articles/2018-10-17/the-future-of-the-cloud-depends-on-magnetic-tape>. [Accessed 20 03 2019].
- [3] Garcia-Loro, Felix; San Cristobal, Elio; Diaz, Gabriel; et al., "PILAR: Sharing VISIR Remote Labs Through a Federation," in PROCEEDINGS OF 2019 IEEE GLOBAL ENGINEERING EDUCATION CONFERENCE (EDUCON), Dubai, 2019.
- [4] <https://www.eset.com/sk/ransomware/>
- [5] Ismail, N., "Benefits of cloud computing security tools for data storage," Information Age, 17.1.2018. [Online]. Available: <https://www.information-age.com/cloud-computing-security-data-123470411/>. [Accessed 4 3 2019].
- [6] Kharraz, A., W. Robertson and E. Kirida, "Protecting against Ransomware: A New Line of Research or Re-stating Classic Ideas?," in IEEE Security & Privacy, vol. 16, no. 3, pp. 103-107, May/June 2018, doi: 10.1109/MSP.2018.2701165.
- [7] NetApp, Inc. – NetApp Snapshot Technology, Datasheet DS-2477-1111, 2011
- [8] Rouse, M., "data archiving," TechTarget, [Online]. Available: <https://searchdatabackup.techtarget.com/definition/data-archiving>. [Accessed 20 3 2019].
- [9] Schauer F. et al., "Easy to build remote laboratory with data transfer using ISES - Internet School Experimental System," in REV International Conference, Dusseldorf, 2008
- [10] Schauer F., Beno P., Sprinkova S., Komenda T., Optimization of the Cloud for Setup of Hardware of Re-remote Laboratories in International Journal of Online and Biomedical Engineering (iJOE), Vol. 16, No. 12, 2020, Vienna, Austria, Auer M. E. et al., Eds. Vienna, Austria: Kassel University Press, 2020, Pg. 18-32, Available at : <https://doi.org/10.3991/ijoe.v16i12.16699>
- [11] Schauer F., Beňo P., Šprinková S., Komenda T., Šimko M., Road to Strengthen of Virtual Infrastructure and Security of Remote Laboratories on Trnava University in Trnava in International Journal of Online and Biomedical Engineering (iJOE) – Vol. 16, No. 12, 2020, Vienna, Austria, Auer M. E. et al., Eds. Vienna, Austria: Kassel University Press, 2020, Pg. 33-46, Available at : <https://doi.org/10.3991/ijoe.v16i12.16699>
- [12] Schauer F., Ozvoldova M., Remote Laboratories in Research-based education of real world phenomena, U. o. D. S. Prof. Dr. Javier Garcia Zubia, Ed., Frankfurt: Peter Lang GmbH, 2014.
- [13] Schauer, F., M. Krbeček, P. Beňo, M. Gerža, L. Pálka a P. Špiláková, „REMLABNET - open remote laboratory management system fo e-experiments,“ Porto, 2014.
- [14] Tawfik, Salzman, Gillet, Lowe, Saliyah-Hassane, Sancristobal and Castro, "Laboratory as a Service (LaaS): A Novel Paradigm for Developing and Implementing Modular Remote Laboratories," International Journal of Online and Biomedical Engineering (iJOE), vol. 10, no. 4, pp. 13-21, 2014.

Analysis of the Possibilities of Paid and Unpaid Systems for the Management of Academic Conferences

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Abstract

This article focuses on online systems for conference administration. The aim is to analyse the available systems for academic conferences administration. The theoretical part describes the process of conference organization, user roles and the process of adding articles. The current state of the use of conferencing systems was determined by analysing secondary sources. We analysed the most used conference management systems and compared their functionality. The research compares different systems, revealing the shortcomings of each system but also their strengths. It shows the differences in paid and unpaid conferencing systems and compares the functionality between the most used paid and unpaid systems. Each conference organiser has different requirements for the system. Based on the comparisons, we draw conclusions that show the advantages and disadvantages of each system.

Keywords: administration, conference, reviewer, conference system, conference administration.

JEL Classification: M000, O1

1. Introduction

A conference is a social gathering of scientists, experts, or members of a particular community, at which all of them inform each other about a particular issue. Most often this takes the form of presentations of papers from pre-defined thematic sections that correspond to the focus of the conference. For the exchange of information to take place as efficiently as possible, a well-managed conference organisation process is necessary. To some extent, the conference organisation can be supported by an information system with appropriate functionality. An information system can be understood that ensures the systematic collection, processing, storage and accessibility of information. It includes (Vorisek, 2006) the information base, technical and software resources, procedures, technologies, and personnel.

Conferences tend to recur at certain intervals, such as annually, and grow in popularity each year. The COVID-19 pandemic has become a key event that has changed our lives. Businesses had to change their daily operations and working from home has become the norm. (Stalmachova, Chinoracky & Strenitzerova, 2021). Conference management systems are of great benefit to organizers. As the number of participants and contributors grows, these systems help them with sending out mass emails, invitations to authors, reviewers, and administrators when needed. It also facilitates the process of uploading abstracts or articles into the system, assigning them to reviewers, and then evaluating and approving them.

The success of the conference is measured by the efficiency of information exchange and the achievement of the conference objectives. The quality of the conference organisation plays an important role in the success of the conference, influencing the subjective feelings that participants take away from the conference, related specifically to the “public” accessibility. (Mikusova, 2014). If there are no serious problems and the participants are provided with quality food and accommodation throughout the conference according to their wishes, this will have a positive effect on their subjective feelings. If the organisers include, for example, an interesting excursion in the conference programme, the participants may then remember the conference for a long time to come (Bohm, Vojtekova & Stofkova, 2017).

Every year, many conferences are organised around the world that deal with different topics. Many of them are organised on a regular basis, and the organisers strive to improve the quality every year. To maximize quality, it is therefore necessary to have several people involved in the organization. Recommendation for project teams is to not focus only on how to finalize the project to a successful end but to try to bring the project to its excellence. (Vartiak, 2015). The naming of individual people or groups varies from programme to programme, but in general they can be referred to as the conference chair (administrator), the conference vice-chair, the organising board, and the programme (scientific) board (Hudak & Madlenak, 2016).

At Slovak universities we can find several conferencing systems that are created by our own efforts. However, they mostly lack some of the important components of the compared conference systems, e.g., assigning reviewers and reviewing articles directly in the conference system. For example, at the FEM SPU in Nitra (FEM SUA in Nitra), the conference system is built under CMS Joomla and has the mentioned disadvantage, although there is overall satisfaction with it and it is used in many conferences and seminars organized by the faculty (e.g., UNINFOS when SUA in Nitra was organized, as well as in SIT seminars and ISD conferences). When using CMS, the User support is important. It means responsibility of the organization and operation of the IT infrastructure of each organization (Olahova, 2016).

The first references to web-based conference support systems date back to 1996, when several programmers who were also conference organisers started working independently on the development of these systems. These include EDAS Conference Manager (Schulzrine, 2013) (EDAS stands for Editor's Assistant), which was developed from 1996 onwards by Henning Schulzrinne, professor and chair of the computer science department at Columbia University, with the help of several other authors. Until 2002, this system was used primarily to support the IEEE Infocom conference and several other conferences, and since 2002 it has been used to support hundreds of smaller and larger conferences.

Another early system is CyberChair (Van de Stadt, 1996), developed by Richard van de Stadt of the University of Twente between 1996 and 2000. It is a free system distributed under the GNU GPL license, which, like EDAS, has been used by hundreds of conferences. Its development was stopped in 2000 and only bugs are being fixed. The successor to this system is CyberChairPRO, but it is no longer freely distributed.

Several other similar systems were developed between 1997 and 2000, and dozens more were developed after 2000.

A web-based conferencing system is a service that offers conference organisers to create, organise and manage conferences. Mobile applications can do that for them, making traveling much simpler (Genzorova, Corejova & Stalmasekova, 2018). Furthermore, the system is a simple and efficient tool to collect many articles, papers, and abstracts, to assign them to different categories and then to assign them to individual users who review these papers using

review forms and rate them. Based on these reviews, the system allows the selection of papers to be accepted and subsequently presented at the conference. According to their activities and tasks, users of conference management systems are mainly divided into three basic user roles, namely contributor, reviewer, and administrator. Sometimes there are additional roles in the system, such as advocate (Van de Stadt, 1996). If a conferencing system allows for the simultaneous hosting of multiple conferences, an additional role is needed, namely system administrator, who manages these different conferences within the system.

Users of conferencing administration systems fall into several categories. The different categories differ from each other in several aspects (Eren, Pala & Yavuz, 2012).

The main difference between user roles is their authorization. These authorizations define users' powers to perform actions and changes in the system, access rights, and view certain data and information. The user role administrator has the most rights among all the basic roles of the system, he manages the entire conference, and therefore he needs to have powers that allow him to manage the conference and make changes to the system. The other roles have only the rights assigned to them by the conference administrator. This means that they can carry out the activities that the administrator assigns to them and their access to information is limited. (Spala, 1999).

Another difference between user roles is the intention with which users use the conferencing system. As a rule, a contributor does not need to meet any additional requirements, and thus any author of an article who submits that article to the mailing list can become a contributor. In contrast to this role, the role of reviewer requires that the user be selected by the conference organizer and subsequently invited into the system as a reviewer of papers (Spala, 1999). The last basic role of a conference management system is the role of administrator; this role is superior to both contributor and reviewer. The administrator has the most extensive authority and access to almost all information and data in the managed mailing list.

Each **contribution** may be in one of the following states during its **lifecycle**:

Post for assignment - A post enters this state when the post is uploaded to the system. The post has a completed title, the topic section it falls under, and is accompanied by a post file (most commonly in .doc or .pdf format). If one of the above information is not filled in or the paper is not attached, the system will not allow the paper to be uploaded.

The paper proposed for review - for each paper to be assigned has administrator has the option to select one of the pre-recommended reviewers and send him/her a proposal for assigning the paper. If he/she sends the proposal, then the paper is in this status. Suggestions for assigning the paper are displayed to the reviewer and can be accept or reject. If he accepts the paper, the paper will be put into the state Allocated paper. If he or she rejects the proposal, the paper is moved back to the Paper to be assigned along with the information that it has been rejected by that reviewer.

Assigned Paper - In this state, the paper is assigned to a reviewer and is waiting for the reviewer to complete the reviewer form and submit it. Once all fields of the form have been completed, the reviewer will be notified that the review has been completed and the result will be passed on for processing. In the form, the reviewer will evaluate the paper according to the specified criteria, to which he/she may add any comments and finally recommend the paper for acceptance, rejection, or revision.

Paper with review - this status of the paper indicates the reviewer's work is complete. An administrator wishing to decide whether to accept the paper will first view the reviewer's form,

which can be used to decide what to do next with the paper. He or she can take the reviewer's recommendations or decide otherwise. He is not obliged to follow the reviewer's assessment. He can add his additional comments for the author, as well as the reviewer, directly in the reviewer's form.

Paper for revision - the paper has been returned to the author by the administrator for revision. Once reworked and re-uploaded into the system, a new version of the paper will be created, which will start its new paper life cycle and reach the status of paper to be assigned.

Accepted Paper - The paper is accepted by the administrator on the recommendations of the reviewers and is included in the proceedings. The author can specify preferential conditions to his/her paper and present the paper at the conference.

Rejected Paper - The paper is rejected on the reviewer's recommendation (e.g., due to formal or content deficiencies) and the author cannot revise the paper.

Journal Contribution - only the best papers will be placed in this status. After the conference, they are included in the journal whose title corresponds to the name of the conference. This status will only be assigned if the paper is in the accepted paper status.

The process of working with the contribution can be seen in Figure 1.

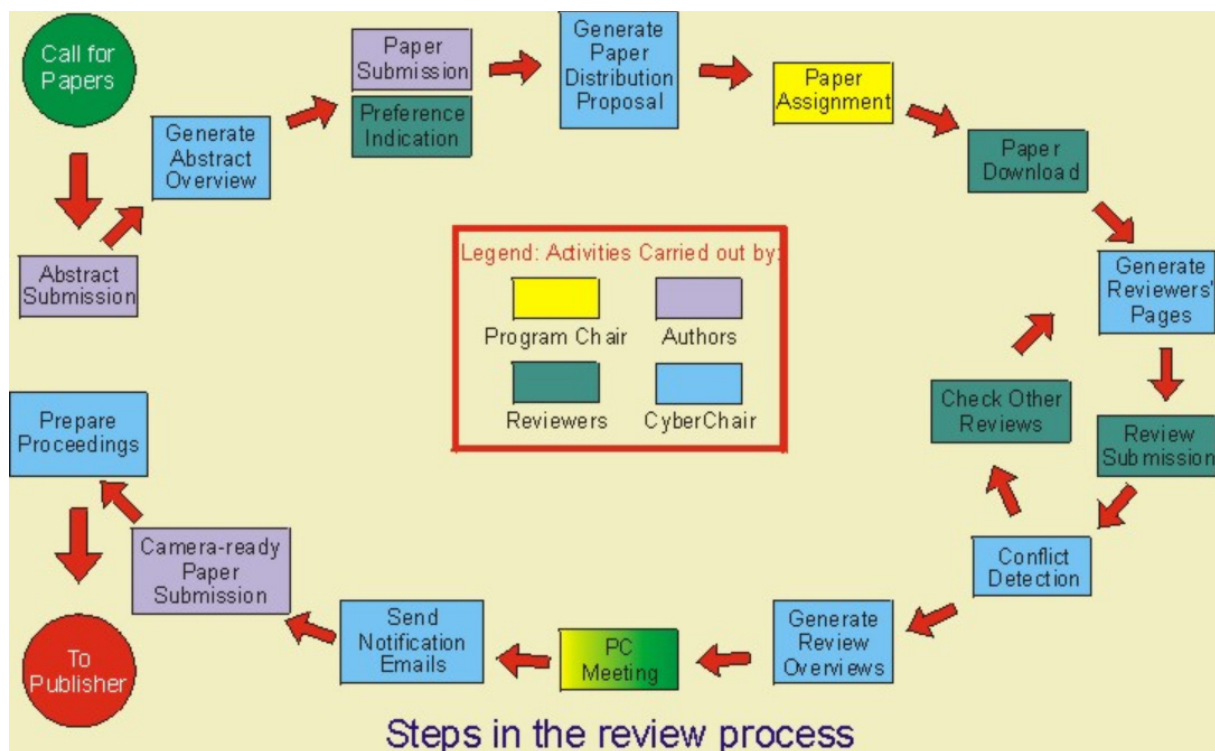


Figure 1: Steps in the review process in CyberChair system

Source: Author

2. Data and Methods

Colleges and universities in Slovakia use the services of conferencing systems to organise their events. For example, at the Technical University of Košice, Faculty of Electrical Engineering and Computer Science, SCYR and Informatics scientific conferences are held. In the past they used the OpenConf conference system to organise these conferences, but now they are using the EasyChair system.

SCYR stands for Scientific Conference of Young Researchers, which means Scientific Conference of Young Researchers. In the past, this conference used an unpaid version of the OpenConf system, which they have replaced and are currently using the EasyChair conference system (Scyr, 2013).

The name of the Informatics Conference is behind the English name International Scientific Conference of Informatics. It is an international scientific conference that deals with informatics. It is organized by the Slovak Society of Applied Cybernetics, the Department of Informatics in Košice, the Union of Slovak Scientific and Technical Societies, Embraco and Lynx. Like the SCYR conference, it has in the past used the OpenConf system, which has also been replaced by the EasyChair conferencing system (Informatics, 2013).

The Deans Graduate Student Research Conference uses OCS software for conference administration. It aims at cultivating a shared and trusted digital environment (Kremenova & Gajdos, 2019).

The 2017 World Wide Web conference which took place in Australia 3-7 August 2017 was administered using the EasyChair system (www.easychair.org).

Conferences such as the China IEEE International Electrical and Energy Conference (CIEEC) 2019 Beijing, China, or the Texas EMS Conference 2019 Fort Worth, Texas, USA (www.openconf.com) were administered using the OpenConf system.

In the following, we review the 3 most popular systems for conference organization. We selected them based on the highest number of positive user ratings and comments.

The first of the systems is OpenConf, which is used to manage processes related to the organization of conferences. The system is implemented using the PHP (Hypertext Preprocessor) language and the system data is stored in a MySQL (My Structured Query Language) database. The system can be tested in an online demo version on the provider's website or by downloading and installing it on a local web server. The system is offered in three versions. The versions are called Community edition, Plus edition and Professional edition.

ConfTool was developed on the campus of the University of Hamburg and, like the previous system, was developed using PHP and MYSQL technologies. ConfTool is also offered on the provider's website (www.conftool.net) in two versions. This is the basic (limited) version, which is called VSIS ConfTool, it is designed for non-commercial small-scale events with up to 150 participants. This version is offered without technical support and is intended for local installation only. In contrast, the second version, called ConfTool Pro, is an extended version, with technical support, and its license price is based on the number of participants. The ConfTool Pro version also includes a module for facilitating payments by conference attendees (e.g., PayPal, Skrill, Moneybookers, optional modules for credit card gateways, etc.) and allows for scheduling of the conference program, which are the main extra features that this system tries to differentiate itself from other competing systems.

EasyChair is the most widely used system for conference organization and program management (www.easychair.org), which allows:

- Managing papers, evaluating them and submitting them;
- automatic assignment of papers to reviewers based on their preferences;
- sending notification emails;
- displaying the results of reviews;
- online discussion;

- creation of the conference programme;
- creation of the conference proceedings.

The provider's website states that almost 72,000 conferences have been organized in EasyChair and over 3 million users have registered. This system focuses more on the management of program papers, which it has very well elaborated in all phases. Therefore, it is not a general system for conference administration, but rather a system for managing conference program papers. The system cannot be run locally, it is hosted on a server. Administration of the actual conference is free in the system; technical and user support can be obtained for a fee. The system includes some extra features, for example it can automatically generate articles in LNCS1 format. There is also 1 LNCS - there are full text (in PDF format) online versions of the proceedings, custom LaTeX1 stylesheets for the papers. It also offers 3 versions which are called EasyChair Free which is free, EasyChair Professional and Easy Chair Executive/Group which have more options but are chargeable.

In the research we further focused on comparing existing online conference administration systems, we analysed 10 different versions, 5 paid and 5 free. We compared the features of these systems more closely and focused on their shortcomings and strengths. By comparing the paid and unpaid versions, we wanted to highlight the functionality of each system.

Among the freely available systems we compared:

- Easychair
- Conftool
- Openconf
- OCS
- Cyberchair

Of the paid systems available, we compared:

- EasyChair - Professional
- EasyChair - Executive/ Group
- OpenConf - Plus Edition
- OpenConf - Professional Edition
- ConfTool Pro

3. Results and Discussion

From the analyses we have found that there is a sufficient number of conferencing systems, and it depends only on the requirements of the potential user which of them he chooses. When choosing, aspects such as the size of the conference and whether the organizer is willing to pay for a license play a major role.

For small conferences, an open-source version of the conferencing system is sufficient. For larger conferences with many participants, it is advisable to choose a paid version that provides easier and more automated management of individual processes and technical support. Another factor in the decision may be the hosting support on the provider's server. For example, the EasyChair system also offers hosting for its free version. In contrast, the OCS system does not offer hosting services and thus we must use our own server.

Choosing the right system for conference administration is individual for each user, it depends on the size of the conference and its type and on the special requirements of this user and thus we cannot say which system is the most suitable. In the following tables 1 and 2, the functions of the compared conferencing systems are listed.

This clear comparison of the features of the different systems can make it easier to choose the right system for a potential user.

Table 1 Features of free conferencing systems

Features	EasyChair Free	OCS	MyReview	OpenConf Community	ConfTool VS'S	CyberChair
Need for your own server	X	✓	X	✓	✓	X
Technical support	X	X	X	X	X	✓
Online submissions	✓	✓	X	✓	✓	✓
Option to choose your own topic	✓	✓	✓	✓	✓	X
Automatic assignment of reviewers	✓	X	✓	✓	✓	✓
Support for email communication	✓	✓	✓	✓	✓	✓
Possibility of custom installation	X	✓	X	X	✓	X
Conflict of interest detection	✓	X	✓	✓	✓	✓
Bidding phase	✓	X	X	X	✓	✓
CVS export, XML, EXCEL, SQL	✓+PDF	✓	X	✓	✓+PDF	X
Demo version	✓	✓	✓	✓	✓	✓
Slovak/Czech localization	X	✓	X	✓	X	X

The systems that are free have limited functionality and cannot be used to their full potential compared to the paid versions. However, if the user is satisfied with the basic functions for organizing a small conference, the open-source version meets his requirements, or he can try this version as a demo version and based on its functionality decide whether it is sufficient for his needs or he needs the paid version.

Table 2 Features of paid conferencing systems

Features	EasyChair Professional	EasyChair Executive	OpenConf Plus Edition	OpenConf Professional	ConfToolPro
Custom hosting	✓	✓	✓	✓	✓
Multilingual interface	✓	✓	✓	✓	✓
Technical support	✓	✓	✓	✓	✓
Import settings from other conferences	✓	✓	X	X	✓

Add audio, video, and zip files	✓	✓	X	X	X
Online forum for the program committee	✓	✓	✓	✓	✓
AAAI module	✓	✓	X	X	X
Bidding for papers	✓	✓	✓	✓	✓
Publishing the proceedings in the system	✓	✓	X	✓	X
Mobile application	X	X	X	✓	✓
Support for multiple file types	✓	✓	X	✓	✓
Plagiarism detection	X	X	X	✓	X
Automatic periodic backup	X	✓	X	X	✓

However, process automation must not be overestimated. Communication via a computer screen with the help of a form located in a web browser has its specific pitfalls. Probably the biggest such pitfall in terms of organising conferences is that electronic communication is impersonal, and it is often not possible to 100% verify the identity of the person with whom we are communicating. Despite all efforts to make any Internet activity as secure as possible, it will probably never be possible to eliminate the various security holes, both in the conferencing support systems themselves or the platforms on which they are run, and in the computers of all the parties involved. For example, an unauthorised person may gain access to a reviewer's credentials and send deliberately fraudulent paper reviews. In a worse case, such a person may be able to get directly into the server where the conference is hosted or into its administration environment. The issue of security is therefore critical for all parties involved and is closely related to their computer literacy. Another problem of electronic communication is also the removal of emotion and the non-verbal components of communication. However, in the case of conferences, where much of the information is of a scientific nature, this is not very significant.

4. Conclusion

There are many conferencing systems available today, but in many cases these systems only offer full support and functionality in paid versions. The freely available systems provide only partial functionality and have many shortcomings compared to the paid ones. Problems occur mostly in the limited payment system as well as in cases where the administrator wants to organize several conferences in one system. Another problem is that modifications such as customizing review forms for different groups of contributors are not possible. However, when organizing conferences with smaller numbers of people, the freely available versions of these systems are also sufficient.

At present, conference management systems are not widely used in Slovakia. Conference systems are mainly used by universities to organise scientific and professional conferences. Conference organisers in Slovakia largely prefer face-to-face meetings in hotels adapted for conferences and their organisation and management are not fully automated, basic information is published on the conference website.

Based on an analysis of the features of each system, we concluded that without specifying specific requirements for a conference system, it is not possible to determine which system is the best, nor is it possible to determine the best system from the categories of paid and unpaid. Each potential organiser has different requirements for the conferencing system.

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References

- [1] Bohm, P.; Vojtekova, M.; Stofkova (2017), Z. Motivational approach to teaching mathematics in bachelor and master study. 9th International Conference on Education and New Learning Technologies, Barcelona, JUL 03-05, 2017. Valencia: IATED Academy: EDULEARN Proceedings, pp. 4699-4704. 2017.
- [2] ConfTool: Conference and Event Management Software, <http://www.conftool.net/>
- [3] EasyChair. <http://www.easychair.org>
- [4] Eren, K., Pala, A. & Yavuz, M (2012): CENG 491 Proposal: A Conference Management and Hosting System, http://negizover.weebly.com/uploads/1/6/7/9/16798506/proposal_report-cengizoverconfman.pdf
- [5] Genzorová, T., Čorejová, T., & Stalmašková, N. (2018). COMPARING THE USE OF DIGITAL PLATFORMS IN TOURISM. CBU International Conference Proceedings, 6, 152–155. <https://doi.org/10.12955/cbup.v6.1148>
- [6] Hudák, M., & Madleňák, R. (2016). THE RESEARCH OF DRIVER'S GAZE AT THE TRAFFIC SIGNS. CBU International Conference Proceedings, 4, 896–899. <https://doi.org/10.12955/cbup.v4.870>
- [7] Informatics. <http://informatics.dci.fe.i.tuke.sk>
- [8] Kremenova, I., & Gajdos, M. (2019). Decentralized Networks: The Future Internet. Mobile Networks and Applications, 24(6), 2016–2023. <https://doi.org/10.1007/s11036-018-01211-5>
- [9] Mikušová, M. (2014). Sustainable Structure for the Quality Management Scheme to Support Mobility of People with Disabilities. Procedia - Social and Behavioral Sciences, 160, 400–409. <https://doi.org/10.1016/j.sbspro.2014.12.152>
- [10] Oláhová, E. (2016). Management of IT environment end users and the impact of new technological solutions. International Scientific Days 2016 :: The Agri-Food Value Chain: Challenges for Natural Resources Management and Society :: Proceedings. <https://doi.org/10.15414/isd2016.s9.03>
- [11] OpenConf Peer-Review, Abstract and Conference Management. <https://www.openconf.com>
- [12] Schulzrinne, H (2013). EDAS: Conferences. <https://edas.info/doc/web.html>
- [13] SCYR. <http://hron.fe.i.tuke.sk/scyr/>
- [14] Spala, M. (2015): Recenze – Posouzení- Peer review. <http://info.sks.cz/users/sp/informace/18%20Text%20003%2015%20Recenze%20-%20Peer%20review%20%20Last%2009.pdf>
- [15] Stalmachova, K., Chinoracky, R., & Strenitzerova, M. (2021). Changes in Business Models Caused by Digital Transformation and the COVID-19 Pandemic and Possibilities of Their Measurement—Case Study. Sustainability, 14(1), 127. <https://doi.org/10.3390/su14010127>
- [16] Van de Stand, R. (1996). CyberChair: A Free Web-based Paper Submission and Reviewing System. <http://www.borbala.com/cyberchair>
- [17] Vartiak, L. (2015). Achieving Excellence in Projects. Procedia Economics and Finance, 26, 292–299. [https://doi.org/10.1016/s2212-5671\(15\)00855-2](https://doi.org/10.1016/s2212-5671(15)00855-2)
- [18] Vorisek, J. (2006): Strategické řízení informačního systému a systémová integrace. 1. vyd. Praha: Management Press. 324 s. ISBN 80-85943-40-9

Internet as a Tool of Digital Communication

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Abstract

The Internet has become an integral part of modern people in the information society. It is also an important tool for digital communication. The digital communications market is constantly expanding with new multimedia services and applications. In this context, the aim of the article is to identify individual tools of digital communication at the NUTS II level in the conditions of the Slovak and Czech Republic in the period 2017-2021. The data were drawn from the Eurostat database. The analysis showed that the biggest share of the population uses the Internet for internet banking services in both countries. In the Czech Republic, 73% of the population use the Internet for this service and in Slovakia 58% of the population. On the contrary, the Internet is the least used for services related to the sale of goods and services. Only 10% of the population of the Czech Republic and 27% of the population of the Slovak Republic use this service. In the individual regions of Slovakia and the Czech Republic, the share of households connected to the Internet as well as the use of the Internet for formal and informal communication increased significantly in 2021 compared to 2017.

Keywords: digital communication, EÚ – 27, internet banking, using of internet

JEL Classification: R2, O3, L86, M15

1. Introduction

Information and communication technologies have brought remarkable progress in ways of gathering information and building awareness of the world and its events (Arcos & Smith, 2021). Digital applications and communication media contain an unbelievable volume of information, containing social networking, geolocation, Internet browsing behaviour, and timestamps (Ehrenreich et al., 2021). The entry into the era of digital communication was conceived as an exceptional leap for the entire technological but especially social development of mankind. The reality of real-time communication over vast distances would have seemed like a mere fantasy or a trick of dangerous magic several centuries ago. For modern people, this reality has been so experienced that it is already becoming an everyday, natural reality, necessary for everyday activities (Cucu & Lenta, 2020).

The Internet can be considered a new communication medium that follows its own logic and has its own language. But at the same time this environment is not isolated, communication on the Internet has a social character. The main reason for using the internet should be communication for socialization, not for fun (Ivanov, 2013). More than 90% of teenagers use social platforms to link with their virtual friends (Lenhart et al., 2015). According to Subrahmanyam et al. (2006), the digital environment is psychologically related to the offline life and development of adolescents. Even Kearns & Whitley (2019) state existing evidence of

the negative effects of internet use, which he divides into three categories: lower social connections; negative effects on mental health; and a lower level of physical activity.

Scheuer (2014) also adds to another differences in the use of the Internet. The difference is between the use of the Internet for the work and recreational use of the Internet, the first relating to the use of the Internet for work (eg job search, career development, etc.) and the second to entertainment via the Internet (Scheuer et al., 2004). Since the general spread of the Internet since the early 1990s, the structural conditions that form the framework for people's communication have changed radically with the emergence of new technologies, market participants and types of governance. In particular, the dominant position of what is popularly referred to as FAANG (Facebook, Apple, Amazon, Netflix and Google) and the regulatory challenges associated with them have attracted increasing expert attention in recent years (Flensburg & Lai, 2020). The Internet has thus become not only an organizational structure but also a global communication system accelerating the processes of globalization (Tytelova et al., 2021). In this system, it is possible to monitor the procedures of consolidation of many sets and societies, the progress of new standards, personal ethics, but the base of all this is still existent life. Network ethics is still in its growth and shaping phase, but it is built on common morals inducing to certain properties of net space. From this point of view, the Internet has come to be a novel medium for connection, where individuals have accede with a number of ancient customs and unresolved issues (Sergeev, 2011, Kostin et al., 2021). Social media can be used according to Frison & Eggermont (2020) passively, actively publicly and actively privately. Passive usage is considered by watching the contented of other users devoid of straight communication. Dynamic communal usage means position contented to a bigger societal media audience, such as tweets or status updates on Facebook. Dynamic private use is direct communication with some individual or a minor team of persons in a private setting (eg direct messaging). However, Ehrenreich et al. (2021) note that societal media platforms contain societal lanes (e.g., by means of hashtags to rise belonging), characteristics limits (e.g., attractive in self-presentation through virtual posts), mental limits (e.g., via YouTube to progress skills), and emotional preferences (e.g., signalling an emotional response through content liking). Digitization thus leaves traces in the daily practices of interpersonal interaction (Košovská et al., 2020, Drábeková et al., 2018). Straight somatic interaction is substituted by communication in the layout and rendering to the instructions of virtual reality. Societal relations in virtual reality, containing individuals at the relational level, have a non-committal, dormant character, where the focuses of contact insincerely make a picture, equipping it with those illustrative qualities that they do not have in unbiased realism. The uniqueness of modern digital systems lies in several key components: modularity (the ability to function as a whole independently of other components with freedom of consumer choice); customization (the ability to create a customized digital offering as well as customize the product for any platform); principle of multilateral relations - multilateralism (all members of the system are interconnected); coordination (organic interconnection of digital platforms and regulation of interaction with a set of application programming interfaces API) (Cheredniakova et al., 2021).

2. Data and Methods

Digital communication enables the transmission of information via the Internet and is used at both formal and informal levels. The aim of the article is to identify individual tools of digital communication at the NUTS II level in the conditions of the Slovak and Czech Republic in the period 2017 - 2021. The database is presented by data from the Eurostat database, which presents the results of the national statistical institutes on the basis of a Eurostat questionnaire,

through which a survey is carried out in individual member countries. The results of the survey are presented from the point of view of households and from the point of view of individuals. Households participating in the survey include those households in which there is at least one member in the age group 16 to 74. The survey population of individuals consists of all individuals aged 16 to 74 years.

3. Results and Discussion

Household internet access is the percentage of households that have access to the internet, so anyone in the household can use the internet. Over time, the Internet has become our daily part not only at work but also at home. Table 1 shows that in the analysed time period 2017-2020, the share of households with the Internet in the EU-27 was 67-99%. Compared to 2021 and 2017, the share of households connected to the Internet increased in all countries, with the exception of Denmark, Germany and Sweden. However, these countries, already in 2017, compared to other countries, showed a high percentage of households connected to the Internet, and in 2021 there was only a slight decrease in their share. In 2021, more than 95% of households in the EU - 27 connected to the Internet were achieved by Denmark, Ireland, Spain, Luxembourg, the Netherlands, Austria and Finland. This trend is also confirmed by Flensburg & Lai (2021), who state that Denmark is today one of the most digitized countries in the world and that the number of activities and services - directly or indirectly - dependent on digital infrastructures is constantly increasing.

Table 1: Households with access to the internet at home in EU-27 (Percentage of households)

	2017	2018	2019	2020	2021
Belgium	86	87	90	91	92
Bulgaria	67	72	75	79	84
Czechia	83	86	87	88	89
Denmark	97	93	95	95	96
Germany	93	94	95	96	92
Estonia	88	90	90	90	92
Ireland	88	89	91	92	97
Greece	71	76	79	80	85
Spain	83	86	91	95	96
France	86	89	90	*	93
Croatia	76	82	81	85	86
Italy	81	84	85	88	*
Cyprus	79	86	90	93	93
Latvia	79	82	85	90	91
Lithuania	75	78	82	82	87
Luxembourg	97	93	95	94	99
Hungary	82	83	86	88	91
Malta	85	84	86	90	91
Netherlands	98	98	98	97	99
Austria	89	89	90	90	95

Poland	82	84	87	90	92
Portugal	77	79	81	84	87
Romania	76	81	84	86	89
Slovenia	82	87	89	90	93
Slovakia	81	81	82	86	90
Finland	94	94	94	96	97
Sweden	95	93	96	94	93

* data not available, Source: Eurostat, own processing

The time period 2019-2021 was marked by the Covid-19 pandemic, this significantly changed households as well. Practically day by day, they became schools as well as offices. In this context, the number of households introducing the Internet also began to grow. This is also confirmed by the increase in the share of households connected to the Internet in 2019 compared to the previous year, as well as the subsequent increase in the share in the following years. This trend is also confirmed by (Tytelova et al., 2021) who states that even users who were sceptical of the digitization process and online formats eventually started using them, increasing the% use of new communication channels and new technologies. Of the V4 countries, the highest share of households connected to the Internet in 2021 was in Poland, while less than 90% of households in the Czech Republic were connected to the Internet.

Table 2: Households with access to the internet at home in NUTS II in Slovak and Czech Republic (Percentage of households)

	2017	2018	2019	2020	2021
Prague	89	93	93	95	94
Central Bohemia	87	87	88	88	89
Southwest	82	86	86	88	92
Northwest	78	82	79	82	86
Northeast	80	84	86	87	87
Southeast	85	87	88	90	88
Central Moravia	82	83	84	88	88
Moravia-Silesia	81	88	90	86	89
Bratislava Region	85	89	84	90	96
Western Slovakia	79	81	82	85	89
Central Slovakia	81	78	81	86	91
Eastern Slovakia	83	78	83	84	87

Source: Eurostat, own processing

Table 2 shows that the coverage at individual NUTS II levels within the Czech and Slovak Republics was almost the same in the period 2017-2021. In 2021, household connectivity in individual regions ranged from 86 to 94%, in Slovakia from 87 to 96%. Although we are seeing an increase of the share of households connected to the Internet in the Czech Republic in 2021 compared to 2017, it is possible to observe regional differences. The highest share of households connected to the Internet is in Prague, while the lowest share is in the Central Moravia and South-East regions (88%). A similar trend can be observed within Slovakia, the highest share of households is recorded in the Bratislava region, and the lowest in Eastern

Slovakia. These regional disparities in household connectivity to the Internet are closely linked to socio - economic development. Regions that are economically advanced (Prague, Bratislava region) create enough job opportunities and this is one of the reasons for increasing the population in the area, which also results in an increase in the number of households connected to the Internet. In the pandemic year 2020, in which the first cases in Slovakia and the Czech Republic appeared, the share of households connected to the Internet in individual regions also increased compared to the previous year, with the exception of the regions of Central Bohemia and Moravia-Silesia. Developments in the area of smartphones in particular have seen rise in the popularity of many digital communication media in the last decade, especially message sending and societal media, especially among the adolescent generation (Ehrenreich et al., 2021, Országhová, 2021). This is also confirmed by the development of the share of households that use the Internet primarily for communication via social networks. While in 2017 59% of households in Slovakia used the Internet for these purposes, in 2021 it was 65% of households. The Czech Republic also has a similar development - in 2017 48%, in 2021 62% of households. The Covid - 19 pandemic also contributed to this increase, isolating the population in their homes and making social networks temporarily the only social medium. However, when comparing the years 2020 and 2021, it is possible to observe a slight decrease in the use of the Internet for contact via social networks (Prague, Western Slovakia, Eastern Slovakia) in some regions of Slovakia and the Czech Republic. One of the reasons may be related to the gradual easing of anti-pandemic measures in both countries, which meant, albeit to a limited extent, the return of children to school and employees into the work. However, Kostin et al. (2021), points out that in addition to benefits, the use of social networks also has some limits. In specific, this communication takes place only concluded societal nets, only through a certain technological "layer", which does not always reflect reality (eg failure to include true data in profiles on social networks) and thus ultimately allows owners of social content to censor or hide some information.

Table 3: Using of Internet: participating in social networks (creating user profile, posting messages or other contributions to Facebook, twitter, etc.) in NUTS II in Slovak and Czech Republic (Percentage of individuals)

	2017	2018	2019	2020	2021
Prague	56	63	65	72	62
Central Bohemia	47	57	63	53	57
Southwest	51	57	62	55	60
Northwest	44	55	59	56	63
Northeast	42	52	57	60	61
Southeast	48	52	52	58	62
Central Moravia	50	53	56	58	61
Moravia-Silesia	51	57	61	61	66
Bratislava Region	59	62	53	64	71
Western Slovakia	59	61	62	66	64
Central Slovakia	55	55	53	65	66
Eastern Slovakia	62	61	63	62	61
Czechia	48	56	59	59	62
Slovakia	59	60	59	64	65

Source: Eurostat, own processing

With technological innovation and lifestyle changes, business interactions between consumers and banks are gradually changing. From handling transactions with customers in person directly at banks, banks are gradually moving to Internet banking and mobile banking (Zahid et al., 2010, Rahi et al., 2021) consider internet banking even a revolution in the banking sector. These financial activities may include transferring funds, recharging, paying energy bills, paying taxes and withdrawing account statements. Internet banking provides an alternative channel for delivering banking operations and brings simplicity of banking operations. In addition, internet banking provides greater security thanks to the highly protected privacy of the account (Wu et al., 2014). The use of these benefits also increased during the pandemic, when the population was "forced" to use on a bigger scale of Internet banking services. This is also confirmed by Table 4, which shows that in 2021, compared to 2019, the percentage of people using the Internet for Internet banking services increased in both countries, not only in the whole country, but also within individual regions. The use of Internet banking services is primarily linked to the availability of internet connection in the territory. The growing popularity of this service is confirmed in 2021 by a 28% increase in the use of this service in the Czech Republic compared to 2017. In Slovak conditions, this increase was lower only at the level of 13%.

Table 4: Internet use: Internet banking in NUTS II in Slovak and Czech Republic (Percentage of individuals)

	2017	2018	2019	2020	2021
Prague	58	68	77	79	80
Central Bohemia	61	66	69	68	73
Southwest	55	61	66	66	69
Northwest	51	59	58	68	65
Northeast	58	66	70	71	75
Southeast	58	61	69	68	74
Central Moravia	54	57	64	68	71
Moravia-Silesia	56	62	68	70	73
Bratislava Region	51	56	56	68	71
Western Slovakia	48	51	55	54	55
Central Slovakia	56	48	55	61	57
Eastern Slovakia	51	47	53	57	57
Czechia	57	62	68	70	73
Slovakia	51	50	55	58	58

Source: Eurostat, own processing

E-shopping is a procedure in which clients directly purchase things or services from the supplier in actual time, without an transitive service, over the Internet (Anitha, 2015). It is a kind of e-commerce that has become prosperous in societies where Internet-enabled facilities have facilitated virtual shopping for consumers that encourage and interest consumers to e-shopping by convincing them to trust that the e-seller is truthful and interested about their consumers. It is necessary because most consumers demand the reliability and credibility of the e-seller when executing an electronic operation (Wu et al., 2014). E-retailers therefore need to persuade consumers to believe their shopping webpages, as it is clear that credit considerably effects e-shop intent and performance (Tang et al., 2021). Compared to internet banking, this service is still used by a small percentage of the population. This is also due to the fact that

some users still have no confidence in using this service, for example in terms of security of payment for goods. This is also confirmed by the trend of online shopping not only at the level of Slovakia and the Czech Republic, but also within individual regions. While in 2017 this service was used by 11% of Czechs and 12% of Slovaks people, in 2021 there was a decrease of 9% in the Czech Republic, but in Slovakia there was a more than 2-fold increase.

Table 5: Internet use: selling goods or services in NUTS II in Slovak and Czech Republic (Percentage of individuals)

	2017	2018	2019	2020	2021
Prague	20	18	20	15	17
Central Bohemia	18	16	13	13	6
Southwest	13	14	14	10	9
Northwest	6	14	7	6	8
Northeast	8	13	11	13	14
Southeast	9	13	10	11	9
Central Moravia	8	11	10	9	12
Moravia-Silesia	9	14	14	8	9
Bratislava Region	15	29	22	29	32
Western Slovakia	10	26	26	25	24
Central Slovakia	13	17	22	25	27
Eastern Slovakia	12	24	17	25	28
Czechia	11	14	12	11	10
Slovakia	12	24	22	25	27

Source: Eurostat, own processing

Based on research results Gburová (2017) notes that the most frequent group of products bought on the Internet is clothing, footwear and accessories (25.14%), with 60.70% of the products in this group being clothing and sporting goods. In addition, most people buy tickets and travel tickets, cosmetics, books, electronics, nutritional supplements online. The respondents of the research most often stated unlimited opening hours (67.97%) as the reason for the purchase.

4. Conclusion

The Internet has become a common part of people's lives. In this context, however, it is also important to speak from digital literacy and digital security. Children in primary schools are already facing digital literacy. Therefore, the current young generation is more digitally skilled compared to the older generation. Between these generations, the so-called digital divide. The solution is continuous education in this area, especially for the older generation. This fact was also confirmed by the analysis of internet use, where up to 62% of people in the Czech Republic and 65% in Slovakia use the internet for communication via social networks, which is the domain of young people in particular. With the rapid development of the Internet, the possibility of data misuse is also increasing. This fact is most sensitively perceived by people in relation to paying for online purchases. This could be one of the reasons for the low interest of people to use these services, as the analysis has shown. Nevertheless, in the next period will be expected massive use of the Internet in all areas and in the context of the transition to the concept of Industry 4.0.

References

- [1] Anitha, N. (2015). Consumer Preference Towards Online Retailing. *ICTACT Journal on Management Studies*, 01(02), 74–80. <https://doi.org/10.21917/IJMS.2015.0011>
- [2] Arcos, R., & Smith, H. (2021). Digital Communication and Hybrid Threats. Presentation. *Comunicación Digital y Amenazas Híbridas. Presentación.*, 19(1), 1–14. <http://10.0.28.27/ri14.v19i1.1662>
- [3] Cheredniakova, A., Lobodenko, L., & Lychagina, I. (2021). A Study of Advertising Content in Digital Communications: The Experience of Applying Neuromarketing and Traditional Techniques. *Proceedings of the 2021 Communication Strategies in Digital Society Seminar, ComSDS 2021*, 9–13. <https://doi.org/10.1109/COMSDS52473.2021.9422887>
- [4] Cucu, M., & Lența, O. (2020). The Myth of Technology and The Risks of Desecration in Digital Media Communication. *Postmodern Openings / Deschideri Postmoderne*, 11(4), 183–192. <http://10.0.72.230/po/11.4/229>
- [5] Drábeková, J., Pechočiak, T., & Matušek, V. (2018). Mathematical competencies of students entering university studies. Case study of Slovakia. *Math Educ Res Appl*, 4, 1. <https://doi.org/10.15414/meraa.2018.04.01.23-30>
- [6] Ehrenreich, S. E., George, M. J., Burnell, K., & Underwood, M. K. (2021). Importance of Digital Communication in Adolescents' Development: Theoretical and Empirical Advancements in the Last Decade. *Journal of Research on Adolescence*, 31(4), 928–943. <https://doi.org/10.1111/JORA.12643>
- [7] Flensburg, S., & Lai, S. S. (2020). Comparing Digital Communication Systems: An empirical framework for analysing the political economy of digital infrastructures. *Nordicom Review*, 41(3), 127–145. <http://10.0.9.174/nor-2020-0019>
- [8] Flensburg, S., & Lai, S. S. (2021). Networks of power. Analysing the evolution of the Danish internet infrastructure. *Internet Histories*, 5(2), 79–100. <http://10.0.4.56/24701475.2020.1759010>
- [9] Frison, E., & Eggermont, S. (2020). Toward an Integrated and Differential Approach to the Relationships Between Loneliness, Different Types of Facebook Use, and Adolescents' Depressed Mood. *Communication Research*, 47(5), 701–728. <https://doi.org/https://doi.org/10.1177/0093650215617506>
- [10] Gburová, J. (2017). Faktory ovplyvňujúce nákupné rozhodovanie spotrebiteľa pri online nákupe. *Journal of Global Science*, 2(4), 1–6. http://jogsc.com/pdf/2017/4/faktory_ovplyvnujuce.pdf
- [11] Ivanov, V. F. (2013). *Mass communicatione*. Academy of Ukrainian Press.
- [12] Kearns, A., & Whitley, E. (2019). Associations of internet access with social integration, wellbeing and physical activity among adults in deprived communities: evidence from a household survey. *BMC Public Health*, 19(1), 860. <https://doi.org/10.1186/s12889-019-7199-x>
- [13] Košovská, I., Pietriková, M., & Váryová, I. (2020). The assessment of students' achievements from the subject Basics of Accounting in the study program Accounting at FEM SUA in Nitra. *Math Educ Res Appl*, 6(2), 2020. <https://doi.org/10.15414/meraa.2020.06.02.64-71>
- [14] Kostin, G. A., Chernykh, A. B., Andronov, I. S., & Pryakhin, N. G. (2021). Perception and Interpretation of General Humanistic Values through Communication Technologies in the Digital Transformation of Society. *Proceedings of the 2021 Communication Strategies in Digital Society Seminar, ComSDS 2021*, 162–165. <https://doi.org/10.1109/COMSDS52473.2021.9422839>
- [15] Lenhart, A., Smith, A., & Andreson, M. (2015). Teens, Technology and Romantic Relationships. In *Numbers, Facts And Trends Shaping The World*.
- [16] Országhová, D. (2021). Seminary projects in the process of obtaining mathematics knowledge, digital skills and time management competences. *Math Educ Res Appl*, 7(2), 2021. <https://doi.org/10.15414/meraa.2021.07.02.96-103>
- [17] Rahi, S., Othman Mansour, M. M., Alharafsheh, M., & Alghizzawi, M. (2021). The post-adoption behavior of internet banking users through the eyes of self-determination theory and expectation confirmation model. *Journal of Enterprise Information Management*, 34(6), 1874–1892. <https://doi.org/10.1108/JEIM-04-2020-0156>
- [18] Scheuer, C., Boot, E., Carse, N., Clardy, A., Gallagher, J., Heck, S., Marron, S., Martinez-Alvarez, L., Masarykova, D., Mcmillan, P., Murphy, F., Steel, E., Ekdorf, H. Van, & Vecchione, H. (2004). Digital

- inequality: From unequal access to differentiated use. *Physical Education and Sport for Children and Youth with Special Needs Researches – Best Practices – Situation*, 355–400. <https://doi.org/10.2/JQUERY.MIN.JS>
- [19] Sergeev A.S. (2011). Communication act in virtual space: ethical regulators. *Bulletin of St. Petersburg University*, 2, 6.
- [20] Subrahmanyam, K., Smahel, D., & Greenfield, P. (2006). *Connecting Developmental Constructions to the Internet: Identity Presentation and Sexual Exploration in Online Teen Chat Rooms*. <https://doi.org/10.1037/0012-1649.42.3.395>
- [21] Tang, H., Rasool, Z., Khan, M. A., Khan, A. I., Khan, F., Ali, H., Khan, A. A., & Abbas, S. A. (2021). Factors Affecting E-Shopping Behaviour: Application of Theory of Planned Behaviour. *Behavioural Neurology*, 1–15. <http://10.0.4.131/2021/1664377>
- [22] Tytelova, L. G., Lisovitskaya, V. N., Shevchenko, E. S., & Shevchenko, V. D. (2021). Communication Strategies of Provincial Cultural Facilities in Digital Environment. *Proceedings of the 2021 Communication Strategies in Digital Society Seminar, ComSDS 2021*, 31–36. <https://doi.org/10.1109/COMSDS52473.2021.9422877>
- [23] Wu, W.-Y., Lee, C.-L., Fu, C.-S., & Wang, H.-C. (2014). How can online store layout design and atmosphere influence consumer shopping intention on a website? *International Journal of Retail & Distribution Management*, 42(1), 4–24. <https://doi.org/10.1108/IJRDM-01-2013-0035>
- [24] Zahid, N., Mujtaba, A., & Riaz, A. (2010). Consumer Acceptance of Online Banking. *European Journal of Economics, Finance and Administrative Sciences*, 27(1), 44–51.

Possibilities of Using and Implementing of Serious Games in Education to Improve Skills, Knowledge and Abilities

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Abstract

Main goal of this paper is describe possibilities of integrating of serious games (SG) in education and their perspectives in education. These kind of games represent a specific category of games that is intended mainly for achieving an educational, affective or psychomotor goals. Today, we are a witnesses of increasing rise in many subjects. Today, games not represent just a fun, but also could be use as a tool for improve of knowledges, skills or abilities and competences. Of course, SG projects could be categorized from different points of view from science, art, humanities to medical SG. These games we are implementing at the schools from elementary, secondary schools, high schools to universities. We are presenting some of our design and development of SG focused on English prepositions, Paedagogos and Planetary Geography.

Keywords: serious games, design, development, programming, testing, feedback

JEL Classification: D80, L86, C88

1. Introduction

Kids, pupils or students, adults encounter the term game early in their childhood. We met with this term especially or mainly in its practical form. One of the form of games not just in childhood but also in adulthood are educational games. Games are often connected with the school, as well. Štubňa et al. (2007a, 2007b) claim that, each teacher tries to make her subject or subjects as interesting for kids, pupils or students as possible and acquire the knowledge or ability which can be build on in the future. Also, we believe and claim that the game's potential could be used not only in the area of entertainment but in education, as well. Part of games are methods, that include activating methods inducing intellectual and cognitive activities. Petlák (2004) claims that these methods or ways also include didactic games. How the progress of technologies is growing and technologies are more and more our part of our needs and are more implemented in people's lives we distinguish several types and forms of games.

The development of information and communication technology (henceforth ICT) brought new methods of their application. Today, they can be seen in all sectors of the economy, such as agriculture (digital monitoring of fields, need-based irrigation, autonomous agricultural machines, drone pesticides application, etc.), industry (autonomous assembly lines, robotization, automatization and optimization of production lines, quality control, logistics and many others), services (registration, shopping, search for entertainment, online music and TV and many other services) as well as the quaternary sector. Štefková (2016) claims that from the point of the teaching process itself, ICT can be used in every part of the teaching process starting with the motivational phase, then expositional, fixating, checking and finally application phase; their implementation depends on material possibilities and creative

capabilities of the teacher. Digital technologies to a meaningful degree can be integrated into teaching not only at universities but at all levels of education, starting with primary schools, through high schools, including universities of the third age.

1.1 Serious games and digital competencies

New technologies were being implemented not just in science but also in all sectors of the economy including of education from elementary schools to universities. Overall technological innovations and the massive spread of IT resulted in the transformation of society into the so-called information society. This coincides with the birth of new types of services, completely unknown before, such as e-shops (enabling people to order goods and services from their homes), electronic or mobile banking, online trading, online seminars, and lectures, etc. Practical application of IT devices, however, necessitates the ability to use them. The inability to use modern technologies today can become a significant handicap, negatively influencing a person's schooling or free time but also his or her ability to find work.

In line with the above, one of the forms, where we could develop digital literacy are serious games. Development of digital literacy, which has been increasingly used as a result of new technological trends appearing almost daily. Some of these trends become incorporated into real life as soon as they appear. There is up to a particular society to decide which of these trends are going to be considered a priority and, vice versa, which would be refused or considered secondary. This is also the reason for differences in digital literacy between countries but also between particular regions within a country.

As Kokles et al. (2017) state, in May 2010, the European Commission adopted the “Digital Agenda for Europe” in which a strategy for the support of the digital economy until 2020 was introduced. It describes seven priority areas:

1. the establishment of a larger, single digital market,
2. interoperability,
3. increasing the trustworthiness and security of the Internet,
4. faster access to the Internet,
5. greater investments into research and development,
6. improving digital literacy and
7. including and employing ICT in solving problems societies deal with, such as climate change and an ageing population.

Lapinová (2016) says that the acquired information and digital literacy is considered a necessity and is becoming important as the traditional literacies related to reading, or languages and mathematics. In this context, a document called Learning Slovakia – National Program of Education Development states that just as with the technical skills and basic “technical literacy” of the past, also today the “digital literacy” and various digital competencies are formed not only through the school but also through the everyday life. Another definition implies that digital literacy involves the ability to understand information, to use it in various formats and from different sources that are introduced through different IT (Weiszerová, 2014).

1.2 Serious games

In line of context with digital games, Vaculík (2020) asks himself a key questions about digital games: How does playing digital or electronic games influence players' social interactions? If does playing games lead to social isolation? Is there a relationship between playing games – other free-leisure activities? Does playing electronic games develop social skills? Answers for these questions could be answered by serious games. Serious games represent one of the most purposeful and useful activities at any age. Lot of teachers try to make a subject as interesting

for pupils as possible and build their knowledge. Their purpose is not only to enjoy oneself, spend excess energy or regenerate but also to socialise, educate and train inducing intellectual and cognitive activities. From another of view these games could be implemented and could develop, train or educate sport, movement, psychomotor or cognitive ability. We use these games for socialise, doing with phobias, educate or spend free time or just for relax, have a good time and experience new things. Minhua et al., (2014) show if serious games could be alongside or combined with conventional educational or therapeutic approaches, it could provide a more powerful means of knowledge/skill transfer, promoting healthy behaviours, restoration and rehabilitation.

Games and education have had a long-standing partnership throughout much of human's history. One of the form of game, which is rising and growing thanks to new digital technologies are serious games. The first time any mention of serious games was made in a book by Clark Abt (1970). Abt claims that simulations and games to improve education, both in and outside of the classroom. Further, the term serious games refers to games that not only primarily entertain, but more importantly educate, train and the player obtains something in some area as cognitive, psychomotor or other skills or competences. Such games are aimed at achieving a certain set goal, which can be verified by feedback in the form of measurement or testing, repetition of a virtual motor skill, and so on.

Serious games are an increasingly important medium with respect to education, training, and social change (Michael et al., 2006). Nowadays, serious games are becoming increasingly more and more favourite and still popular. Serious games constantly grow in number and their importance in society grows as well. In the past, they were not quite so popular and useful. It was caused by low technical standards, inadequate software possibilities and poor Internet coverage in regions. However, over time the situation started to change with innovative software being developed, faster Internet connections becoming standard and more advanced hardware available.

In the line with Agogué et al. (2015) who found that a serious game could support the specificity of learning processes and creativity generation in the ideation context and help participants to collectively explore new alternatives of knowledge acquisition. Hesmer et al. (2013) emphasize that good ideas are often the result of the creativity of a single person or of a group of collaborating persons. An analysis of how innovation “arise” shows that the process is mainly carried out in small discrete steps with or without a given timeframe.

2. Examples of serious games

In the next lines we are going to introduce some of serious games, which has been developed in our cooperation. Some of them were introduced and tested at chosen schools. We have selected the serious games that we characterize below according to their distribution.

The first from serious games is designed for learning and improving English prepositions. Prepositions are one of the most challenging areas that students go through and need to learn. The quality of using a foreign language is immediately known by, among other things, the correct use of prepositions. Therefore, we decided to design and program a serious game for elementary school students. We believe that already primary school children should use and learn English prepositions correctly. For this reason, the 2D graphics of the rooms and the scene are adapted to this target group.

The second serious game is designed for beginning teachers or students of teacher training programs. The game is designed in a cartoon style, i.e. to make the university student feel relaxed and comfortable and to ensure that the game does not create stress in him/her. Wickham states (2015): “While the word cartoon usually refers to animation or a funny drawing, in an art historical context, it can also refer to a full-scale preparatory drawing for a fresco, oil painting or a tapestry. The word we use today comes from the Italian *cartone*, which simply means a large sheet of paper or card.” The game deals with specific teaching situations from real practice, ranging from so-called specific situations to non-specific situations.

The last third serious game is designed to promote the development of spatial perception. This is one of the areas of mathematics in which students generally score lower on tests. For this reason, we decided to create a game oriented in this way. The player, following the pattern of a generated group of geometric shapes, has to put together the same composition. He has a choice of three geometric shapes: a sphere, a cube, and an ihlan. After correctly evaluating the example, the player is credited with the time he will need in the next math problem.

2.1 Serious game for English

This was the first serious game, we developed. It was designed and focused to teach on foreign languages – English. Serious game is focused on English prepositions of place. The main goal is to increase cognitive level of pupils in English prepositions (Fig.1). Target group are pupils of elementary schools.

In terms of the characteristics and description of the game, the aim of this serious game is to find all the highlighted objects (glass, chair, table, cube, first aid kid...) through the sprite (character Pillipi). When Pillipi come to an object, the game pauses and displays the sentence with the missing preposition. Three possibilities are always given below the sentence and a player chooses one of them options. If a player chooses wrong choice, a player has got second the attempt to choose another option. In the upper left corner, the total number of objects are displayed. After each found an object, this number decreases. In this way, each player knows immediately how many tasks (objects) still left. In addition, the number of correct and incorrect answers is displayed in the same corner. A correct answer is only counted if a player answers (selects) the correct answer the first time. Even if the player is allowed to select the answer again, the correct answer is no longer counted on the next attempt. However, if the player selects an incorrect answer, it is counted in the incorrect answer category. A player has allowed to move around three different rooms (Fig.2). He can also move between them without restrictions, as long as he does not find all the highlighted objects and does not answer all the tasks. The whole game is composed of two separate levels. In each level there is a total of tasks. The first level takes place in the apartment, the house and the next level in the garden.

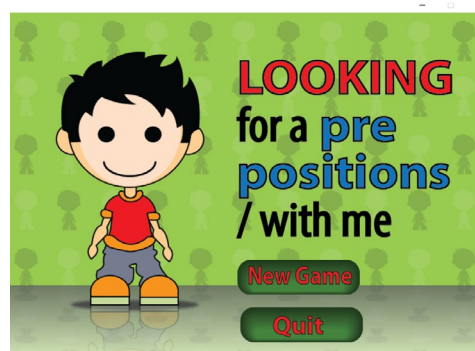


Figure 1: Splash screen of ENGLISH PREPOSITIONS

Source: own source



Figure 2: Screens from 3 different rooms types

Source: own source

2.2 Serious game for Pedagogy

Another serious game, which is introduced in following lines is a serious game, which is focused on specific and non-specific pedagogical situations, named Paedagogos (Fig.3). This serious game is designed for beginning teachers and students in the last years of teacher study programs.

Student or beginning teacher especially during their field training (mainly during performance-based teaching practice), students of teaching may find themselves in need of guidance or a way to approach a given situations correctly. This designed a serious game could help us deal with the situation adequately so that no one from students and teachers are faced with negative effects. It is no possible and we are no able to cover all possible pedagogical situations from pedagogical practice. We chose just the most frequent ones, but also included situations that may be rare but may result in serious adverse events and that are difficult to solve.

Teachers are often presently facing various situations that occur either directly during classes or breaks. Every teacher has a unique personality, which means that we may all respond to a given situation differently. Some teachers might take a more responsible approach than others. Some are short-tempered, while others are perhaps far too terse. Some teachers try to deal with a given situation through shouting at students, some tend to stay calm and learn from a newly arisen situation. Variety of situations that one may encounter brings a variety of challenges for the teachers (Fig.4). This is the reason why we believe it could be beneficial to design a video game that would describe situations every educator may sooner or later be confronted with:

- *specific pedagogic situation*: describes situations that occur during classes and that are not considerably life-threatening or health-threatening to students, teachers or other staff.
- *non-specific pedagogic situation*: describes situations that may be life-threatening or health-threatening to students, teachers or other staff, or may cause damage to the school property.



Figure 3: Splash screen of PAEDAGOGOS

Source: own source



Figure 4: Screens from different situations

Source: own source

2.3 Serious game for Mathematics

Mathematics is another subject from spectrum of science education. It belong to the most complex subject where could be develop a lot of applications from from geometry to arithmetic or spatial imagination (Fig.5). The serious game is focused on the design and development of an application for support do develop of spatial imagination of pupils with the support of virtual reality. The application was created in 3D view (Fig.6).

The aim of this serious game is to model the math objects in right part of lab, which are generated in the left part in 3D space lab (Host'ovecký et al., 2019). A player has to arrange the different objects according to this generated model in order to make them match the template. Whenever an object is correctly fitted in the right part by a player, it is evaluated whether it is correctly or incorrectly fitted. The difficulty is higher after each generated objects (shapes).

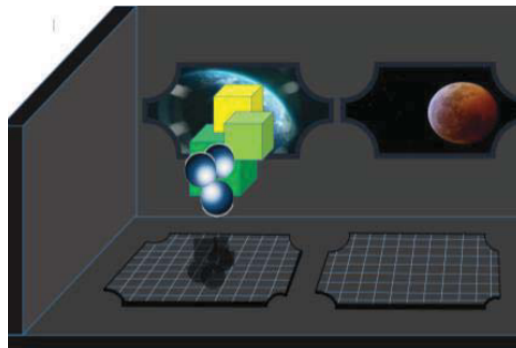


Figure 5: Splash screen of SPATIAL IMAGINATION

Source: own source

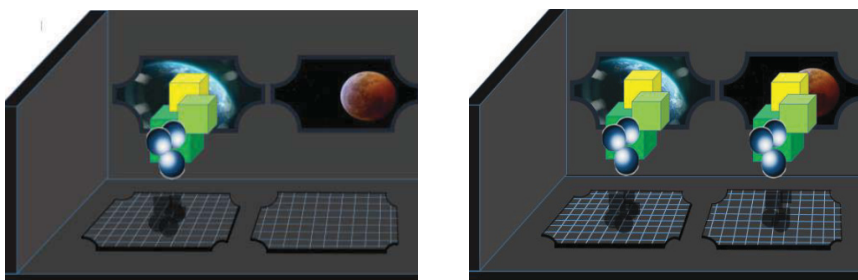


Figure 6: Screens from SpaceLab-spatial imagination

Source: own source

3. Conclusion

Main goal of this paper was describe possibilities of serious games in education. How can we see, there is huge opportunity for students use innovative technologies in education as serious games. These games improve, train, educate and simulate. In our opinion, serious games should be integral part of education from elementary schools to universities. Teachers, students or pupils can identify, which themes from each subjects are problematic, which themes cause problem to understand the topic etc. The create the space to integrate something what should help to students. We are in the line with opinions, that serious games improve skills, abilities, cognitive, psychological, pedagogical or other skills. It depends on subjects, from the difficulty of the topic and experiences of designers of serious games and their creativity.

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References

- [1] ABT, C. C. (1970). *Serious games*. New York: The Viking Press. pp. 176
- [2] AGOGUÉ, M., LEVILLAIN, K., & HOOGE, S. (2015). *Gamification of creativity: exploring the usefulness of serious games for ideation*. In *Creativity and Innovation Management*, 24(3), p. 415-429
- [3] HESMER, A., HRIBERNIK, K., BAALSRUD HAUGE, J., & THOBEN, K. D. (2013). *Supporting the Ideation Process by a Collaborative Online-based Toolset*. In *International Journal of Technology Management*. 55, 2013, pp. 218.
- [4] HOSTOVECKY, M., HURAJ, L., & PRIBILOVA, K. (2019). Virtual reality in mathematics: Design of the serious game improves spatial imagination performance. *2019 17th International Conference on Emerging ELearning Technologies and Applications (ICETA)*.
- [5] KOKLES, M., ROMANOVÁ, A., ZELINA, M., & HAMRANOVÁ, A. (2017). *Research of digital literacy of population in the Slovak Republic*. In *Journal of Technology and Information Education*. Vol. 9, no. 1, s. 175-188. DOI 10.5507/jtie.2017.002.
- [6] LAPINOVÁ, E. (2016). *Informačná a digitálna gramotnosť – dva navzájom prepojené predpoklady rozvoja vzdelávania na vysokých školách v 21. storočí*. In *UNINFOS 2016*. str.1-5. Online: <https://uninfos2016.umb.sk/zbornik/PDF/Lapinova.pdf>
- [7] MICHAEL, D., & CHEN, S. (2005). *Serious Games: Games That Educate, Train, and Inform*, In Muska & Lipman/Premier-Trade, 2005.
- [8] MINHUA, M., LAKHMI, J., & ANDERSON, P. (2014). *Virtual, Augmented Reality and Serious Games for Healthcare 1*. Vol.1. Berlin: Springer, 2014.
- [9] PETLÁK, E. (2004). *VŠEOBECNÁ DIDAKTIKA*. BRATISLAVA: IRIS.
- [10] SVETLÍKOVÁ, J. a kol. (2000). *Výchova hrou*. Bratislava: Humanitas. 110 s.
- [11] ŠTEFKOVÁ, J. (2016). *Postoj pedagógov k elektronickému vydávaniu na Technickej univerzite vo Zvolene*. In: ZOUNEK, J. SUDICKÝ, P. (2012). *E-learning : učení (se) s online technologiemi*. Praha : Wolters Kluwer.
- [12] VACULÍK, M. (2000). *Elektronické hry, sebepojetí, sociální dovednosti a sociální interakce*, Brno : Akademie věd České republiky, Psychologický ústav.
- [13] ŠTUBŇA, J., GNOTH, M., & FULKOVÁ, E. (2007). *Využitie didaktických hier vo vyučovaní prírodopisu v 9. ročníku ZŠ*. In *Zborník Výchova, škola, spoločnosť – minulosť a súčasnosť*, Bratislava : Univerzita Komenského, 2007. 162-167 s. ISBN 978-80-223-2295-9.
- [14] ŠTUBŇA, J., LUKIANENKO, Ľ., BELKOVÁ, V., GNOTH, M., & VREŠTIAKOVÁ, L. (2007). *Medzipredmetové hry v prírodovedných predmetoch na základnej škole*. In *ePedagogium*, 7(4), pp.

-
- [15] WEISZEROVÁ, M. (2014). *Implementácia informačno-komunikačných technológií do vyučovania odborných predmetov*. In *Osvedčená pedagogická skúsenosť edukačnej praxe*. Bratislava : Metodicko-pedagogické centrum, 35 s., [online]: <http://mpcedu.sk/shared>
- [16] WICKHAM, A. (2015). *Art history 101: what is a cartoon?* [online:] <https://www.royalacademy.org.uk/article/daniel-maclise-what-is-a-cartoon>

Increasing Effectiveness of Supply Chains Using SCM Applications

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Abstract

We are currently witnessing a sharp rise in prices, not only in Slovakia but throughout Europe. This price increase is caused by rising prices for many basic commodities on world markets, such as wheat, oil and natural gas. Energy prices, transport costs, as well as the prices of basic raw materials are rising, which must naturally be reflected in the increase in the prices of products intended for the final consumer. However, the prices of many products can also be affected by the efficiency of the supply chain that ensures their production. By clarifying all flows and relationships in the supply chain and optimizing its operation, we can reduce the price of the product. An SCM (supply chain management) application can be a useful tool to plan, record, evaluate and optimize the operation of a supply chain and facilitate mutual cooperation among the subjects that make it up. According to a survey, which we have done, there is not a single company using an SCM application in Slovakia today. The aim of this article is to point out the benefits and possibilities of such applications as one of the possible ways to mitigate the effects of inflation on the population.

Keywords: *business processes, costs reduction, SCM, supply chains, supply chain management*

JEL Classification: *D23, D24, L22, L23*

1. Introduction

In a world of fast-growing information society and growing competition, companies must strive to be part of efficient and reliable supply chains. Otherwise, they may not be able to compete in the global market against other competitors in the market, which may lead to their absorption by other companies or complete extinction. Many companies would not be able to carry out all the activities related to the production and distribution of their products to the final consumer on their own, so the existence of supply chains is the only way for them to establish themselves in the market. Supply chains can consist of a large number of subjects and can be quite complicated in terms of their structure. The larger and more complex the chain, the easier it is to lose track of what exactly is going on in it. To solve these problems SCM (Supply Chain Management) applications may be used, whose task is to clarify all relationships and flows in a supply chain and thus to contribute to streamlining its operation. The initial goal of this article was to find out the experience of Slovak companies with supply chain management applications. In a survey, which we have done, we have found out that there is not a single company using an SCM application in Slovakia today. This finding may seem like a failure, but it is valuable information. After this finding we have had to change our goal. Thus, the actual goal of this article is to highlight the meaning of SCM applications for supporting the cooperation of subjects in a supply chain based on the data in literature and experience of companies abroad.

A supply chain is a system created by business processes of all organizations that are directly or indirectly involved in meeting the requirements of customers of a particular organization. It may consist of the following subjects in particular: manufacturers, suppliers, subsuppliers,

carriers, storage space providers, assembly companies, wholesalers, retail stores and customers. La Londe and Masters proposed that a supply chain is a set of firms that pass materials forward. Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain—raw material and component producers, product assemblers, wholesalers, retailer merchants and transportation companies are all members of a supply chain (La Londe & Masters, 1994). Göpfert (2013) divided the definitions of SCM into two groups. The first group includes definitions of SCM identical with logistics based on rule 7R (i.e. right product, right place, right place, right customer, right time, right condition, right quantity) (Coyle et al., 2002), while the second group includes definitions close to the explanation presented by the CSCMP (Council of Supply Chain Management Professionals, 2018), where SCM is not directly identified with logistics but treated as intra-organizational process management, i.e. the management of the connection networks and cooperation, and, thus, as a new concept (Dobroszek, 2018). Many definitions of supply chain were cited by Mentzer et al. (Mentzer et al., 2001).

The process of products creation and their distribution to the final consumer contains a large number of sub-processes such as procurement of primary and secondary raw materials needed for production, production sub-processes, transport sub-processes (transport of raw materials to the place of production, but also transport of finished products to a warehouse and their gradual distribution to stores), assembly sub-processes, storage-related sub-processes, customer feedback acquiring sub-processes, etc. Thanks to the existence of supply chains, not all of these sub-processes need to be provided by a single company, but several companies specializing in specific sub-processes may be involved in their provision. As a result of the cooperation among the businesses and the interconnection of the activities they carry out, specific products are then available to the final consumer. Stadler states that *„competition has shifted from single companies to supply chains. Obviously, to convince an individual company to become a part of a supply chain requires a win-win situation for each participant in the long run, while this may not be the case for all entities in the short run. Alternatively, a firm may increase its competitiveness by fulfilling a prespecified, generally accepted customer service level at minimum costs.“* (Stadler, 2008).

SCM (Supply Chain Management) is a label for *„systems, means and procedures that serve to coordinate materials, products, services, information and finance from raw material suppliers through processors, manufacturers, wholesalers and retailers to consumers“* (Križko, 2002). On-line dictionary BusinessDictionary.com defines supply chain management as: *„managing material and information flows in the supply chain so that the customer achieves the highest level of customer satisfaction with the chain's outputs at the lowest possible cost“* (BusinessDictionary.com, 2022). Another definition notes a supply chain is *„the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer“* (Christopher, 1992).

In terms of systems theory, a company can generally be considered an open production system that receives inputs from its surroundings, transforms them into outputs, and then surrenders them to the environment. The supply chain as a whole can also be considered as an open production system. However, it is a system made up of separate business entities that seek to harmonize some of the activities they carry out so that such cooperation benefits them as much as possible.

According to Tomek and Tomková, the success of a company in the conditions of globalization and interconnection of companies using information technology becomes a question of success of all companies who are involved in creating the final product. The competition of entire

companies thus changes to the competition of entire supply chains formed by suppliers, manufacturers, carriers, distributors, retailers and other entities up to the final consumer (Tomek, Tomková, 2007). The importance of supply chains is also increasing due to the shortening of the product life cycle and increasing customer expectations regarding product quality, reliability and speed of delivery, flexibility in production and additional service provided after their purchase.

In every supply chain, material, financial and information flows flow in both directions among companies that make it up:

- *Material flows* – it is the distribution of products in the direction from manufacturers to customers or the distribution of materials and raw materials from suppliers to manufacturers. The products are moved in the opposite direction for service, recycling or disposal.
- *Financial flows* – various types of payments, loans, fees
- *Information flows* – transmission of information among companies forming the chain (orders, invoices, different kinds of requirements and documents).

A supply chain can be represented either from a structural or a process point of view. From a structural point of view, it is a network of separate companies with different positions in the chain. The process point of view, in turn, expresses the fact that the whole business process that takes place in the supply chain consists of many sub-processes that follow each other (the outputs of one process are inputs into another) generating the final value for the customer. Individual processes can be modeled using appropriate modeling methodologies and standards, which include for example the ARIS methodology (Architecture of Integrated Information Systems) or BPMN (Business Process Model and Notation) and UML (Unified Modeling Language) standards.

2. Data and Methods

Initially, the main goal of this article was to find out if there are any companies using an SCM application in Slovakia and, if so, what experience and results do they have using it. In January 2022, we conducted a survey in which we asked large companies in Slovakia if they used or are using an application for relationship management in their supply chain and, if so, which one. We included 100 large companies in the survey. We did not include small and medium-sized enterprises in the survey. We consider a large company to be a company with at least 250 employees and an annual turnover of more than 50 million EUR, which is in accordance with the document *Aid to determine the size of the company for state aid for the programming period 2014-2020* issued by the Ministry of Environment of the Slovak Republic in 2015 (Ministry of Environment of the Slovak Republic, 2015). According to the report on the state of the business environment in the Slovak Republic published by the Ministry of Economy of the Slovak Republic on 12 April 2021, 642 large enterprises were registered in Slovakia in 2020 (Ministry of Economy of the Slovak Republic, 2021). Therefore, we can consider a sample of 100 randomly selected companies in our survey to be statistically significant.

The questionnaire contained a single question only, namely whether the company in question used or is using an application for relationship management in their supply chain and, if so, which one. We sent the questionnaire by e-mail and received 62 answers of the total number of 100 addressed companies. Subsequently, we planned to send another questionnaire to the companies that used or use an SCM application, which would contain more questions, and in

which we would intend to find out what experience these companies have with the application and whether they feel any real benefits from its use. However, this second questionnaire was never done, because we found out that none of the addressed companies in Slovakia uses or used any SCM application. All 62 responses were negative. Based on personal interviews and contacts, we know of one company in the Czech Republic and another company in Austria that uses an SCM application, but we have not been able to find any company in Slovakia with such an experience. This finding may seem like a failure, but it is valuable information.

Due to this finding, we could not analyze the experience of Slovak companies in terms of their supply chain management. So we had to change our goal and collect data published on the Internet and in the literature originated from companies abroad and analyze their experience. We hope that this will motivate and inspire some companies in Slovakia to look for new ways of making their supply chain more transparent and effective.

3. Results and Discussion

Supply chains can consist of a large number of subjects (companies) and can be quite complicated in terms of their structure. The larger and more complex the chain, the more easily we can lose track of what exactly is going on in it. Unnecessary lengthening of individual processes, inefficient use of funds, overpricing of the final product and other problems may occur. The task of SCM applications is to clarify all relationships and flows in the supply chain and thus contribute to streamlining its operation. The SCM application shall support the following activities in particular (Martiško, 2005):

- joint planning of deliveries of all suppliers and subcontractors in the chain in connection to the production plan,
- support and evidence of information flows and exchange of relevant documents in both directions in the chain,
- management of physical realization of deliveries and their coordination,
- integration of information systems of companies participating in the supply chain,
- supporting other processes that are specific to individual industries and companies can also be an advantage.

Initially, the need for planning and control of material flows in supply chains was emphasized, but in the era of the growing information society, in which we live currently, the rapid and efficient exchange and evidence of information is also very important. The right information must be available to the right subject (company) at the right time. This fact reinforces the need to connect subjects in the supply chain with a quality information system that will facilitate and streamline communication among them. When managing the supply chain, it is necessary to work with information from inside the chain (in other words, with internal information), but also with information from its surroundings (with external information). External information is e.g. information on competition, information on technological innovations in the world, information on the current state of financial markets, information on changes in the legislation of individual countries in which the supply chain operates, etc. Internal information includes in particular:

- *Purchasing information* – information on what materials, products or semi-finished products need to be purchased in order to produce the final product of the supply chain, information on their prices, delivery times, required delivery points, payment terms, etc.
- *Production information* – information on what products and in what quantities are to be produced, what technologies, production machines and equipment are to be used in their

production, in which production plant the product is to be produced, what is the order of production of individual products and other information.

- *Distribution information* – information on what shall be transported and where, at what transport costs and under what transport conditions,
- *Storage information* – information on what materials, semi-finished products and products there are in which warehouse, in what quantities, where they come from, etc.
- *Sales information* – information on customers and their requirements. In other words, who demands what, at what price, at what time, in what quality and quantity, and what is the history of the requirements of the individual customer.

According to the SCOR (Supply Chain Operations Reference) model, a comprehensive and effective supply chain management should focus on five basic areas, including planning, purchasing, production, shipping and handling of complaints (Basl, Blažiček, 2012; APICS, 2012). Let's focus on these areas individually:

- *Planning* – all resources in the chain need to be managed in order to meet the customer's requirements and expectations related to the final product of the supply chain. Therefore, metrics shall be defined to monitor and evaluate the performance of the whole chain so that it generates a high value for the customer at lowest cost possible. The degree of efficiency of a chain can be measured, for example, by its throughput, which represents the number of products produced by the chain per unit of time, but also by the degree of customer satisfaction regarding purchased products.
- *Purchasing* – a part of the purchase is not only monitoring the movement or flows of materials, raw materials, products and semi-finished products from one subject in the supply chain to another and records of related documentation, but also the selection of the optimal supplier with regard to current production requirements. It is not just about the selection of suppliers of materials and raw materials, but also the services needed to create the final product for the customer (e.g. assembly, independent testing, warehousing, etc.). It is necessary to take into account not only the price conditions of individual suppliers, but also their delivery, quality and payment conditions.
- *Production* – this area includes not only activities within the processing of materials and raw materials and their transformation into the final product, but also activities related to the temporal and spatial scheduling of all activities that are part of the production process. E.g. product testing (we distinguish between continuous testing of selected parts of the unfinished product and final product testing), product packaging and preparation for shipment. These parts of the supply chain are the most demanding in terms of requirements for measuring output quality as well as productivity of employees involved in production.
- *Dispatching* – the term dispatching includes mainly the preparation (e.g. packaging) of a certain shipment for dispatching and its subsequent sending to the addressee. However, the storage of materials, products and semi-finished products at the level of various subjects (companies) in the supply chain and their consistent evidence are also part of the the dispatching process. Transport shall be optimized so that all items are transported to their destination, while minimizing shipping time and/or minimizing shipping costs.
- *Complaints handling* – i.e. solution of problems related to the receipt and registration of damaged or incorrectly delivered (unwanted) goods returned by the customer and the handling of customer complaints. Complaints are not necessarily bad because they are a valuable source of information for individual subjects in the supply chain about the various shortcomings that need to be addressed. Therefore, it is important to pay adequate attention to the evidence of complaints and their proper handling.

The purpose of introducing SCM applications into supply chains is to strive for improvement, especially in the following areas (Jurík, 2016; Martiško, 2005):

1. *Minimization of supply chain operating costs.* In particular, cost reduction shall be achieved through:
 - increasing the transparency of relations in the supply chain,
 - increasing productivity of the supply chain by increasing productivity of the relationships of the individual subjects in the chain,
 - minimization of warehouse stocks, which shall also reduce the costs of warehouse operations,
 - reducing the costs of material procurement,
 - reducing production and distribution costs.
2. *Creating opportunities to increase company turnover.* This can be achieved in particular in the following ways:
 - increase the throughput of the supply chain (quantity of products produced per unit of time),
 - acceleration of the responses to market demands (i.e. flexibility increase),
 - acceleration of the response time related to serve specific, unexpected requests,
 - more detailed and accurate information on the current status of processing individual orders shall be obtained.
3. *Return on corporate assets.* In particular, the following factors may contribute to its increase:
 - shortening of the duration of the various sub-processes in the supply chain
 - inventory turnover acceleration,
 - capital investment requirements decrease,
 - improvement and increased transparency of the "cash flow" of the company
 - obtaining fast and accurate information on actual demand (it is an evaluation of how sales are developing compared to previous periods, which allows the volume of output from the chain to adjust to the expected market demand),
 - decrease of the stock of materials and raw materials.

From the point of view of the subjects involved in creating value for the customer there are also other benefits of using SCM applications. These are in particular:

- transparency of the whole process taking place in the supply chain and all its sub-processes provided by the individual participants,
- reduction (in ideal case we mean a complete elimination) of unnecessary delays in the interconnection of individual sub-processes and to some extent also internal delays within sub-processes,
- the possibility of planning the procurement of individual types of materials, raw materials, products and semi-finished products based on the evaluation of historical data, taking into account current market developments and customer requirements,
- the ability to automate purchasing activities using electronic data interchange (EDI) standards,
- support for determining the optimal location and form of the supply chain in a specific case (Basl, Blažiček, 2012),
- the possibility to process material requirements using electronic procurement (so-called e-procurement) or purchasing using an electronic marketplace (so-called e-marketplace) in

order to obtain an offer from several suppliers. Based on the evaluation of the obtained offers it is possible to choose the one that seems most appropriate (Basl, Blažiček, 2012),

- making information on requirements and their current fulfillment available to all members of the chain,
- expanding opportunities for cooperation and communication among members of the chain.

From the point of view of the customer, there are also several benefits of using an SCM application in the supply chain:

- possibility to formulate and enter customer requirements regarding the final product, 7
- the possibility to be informed continuously at any time about the status of processing the entered order,
- reducing delivery delays, as well as reducing the fact that deliveries are incomplete or incorrect (i.e. incorrect goods shall not be delivered) as a result of the transparency of the whole product creation process and its distribution to the customer,
- the possibility to participate in solving unexpected situations electronically regardless of which supply chain subject the situation arose on,
- the possibility of reducing the final price of the final product due to more rigorous monitoring of processes within the chain and optimization of their implementation.

The top 10 SCM applications in terms of their overall ranking from the perspective of their users who voted in a poll are listed in table 1. The overall ranking in this table is an aggregated indicator calculated as an average of the following partial indicators: inventory management, logistics and transportation, mobile capabilities, procurement and supplier management, purchase order management, supply chain analytics, supply chain planning, warehouse labor management, warehouse management, integrations and extensibility (SelectHub.com, 2022).

Table 1: The top 10 SCM applications in 2022

<i>Vendor</i>	<i>Application</i>	<i>Overall ranking (max. number is 100)</i>
Oracle	Oracle SCM Cloud	92/100
BlueYonder	BlueYonder	89/100
SAP	SAP Supply Chain	88/100
Microsoft	Microsoft Dynamics 365 SCM	86/100
IFS	IFS Applications	80/100
Epicor	Epicor SCM	79/100
Sage	Sage Business Cloud X3	77/100
Manhattan	Manhattan Supply Chain	74/100
Infor	Infor Supply Chain Management	74/100
Oracle	Oracle NetSuite	71/100

Source: SelectHub.com, 2022

In 2020, the SAP SCM software was the most commonly used and it covered 18.8% of the revenues in the global SCM software market. Oracle’s SCM application came in second, covering 12.4% of the revenues SCM software market. The third most commonly used SCM

application on the global market was Blue Yonder SCM, which covered 3.6% of the revenues (Statista.com, 2022).

According to Appsruntheworld.com SAP SCM was the leader on the global SCM software market with 14.1% of the total revenues in 2020. On the second place was the Oracle SCM followed by the Blue Yonder SCM (Appsruntheworld.com, 2021).

Now, let's focus on the costs reduction problem in a supply chain. We will present three case studies of large companies that successfully managed to reduced their costs by optimizing their supply chain:

- *John Deere* – it is a large american company with diverse product range, which includes a mix of heavy machinery for the consumer market, and industrial equipment, which is made to order. The company was replenishing dealers' inventory weekly, using direct shipment and cross-docking operations from source warehouses located near John Deere's manufacturing facilities. This operation was proving too costly and too slow, so the company launched an initiative to achieve a 10% supply chain cost reduction within four years. The company undertook a supply chain network-redesign program, resulting in the commissioning of intermediate "merge centers" and optimization of cross-dock terminal locations. John Deere also began consolidating shipments and using break-bulk terminals during the seasonal peak. The company also increased its use of third-party logistics providers and effectively created a network that could be optimized tactically at any given point in time. As a result the John Deere supply chain cost-management achievements included an inventory decrease of \$1 billion, a significant reduction in customer delivery lead times (from ten days to five or less) and annual transportation cost savings of around 5% (LogisticsBureau.com, 2019).
- *IBM* – it is one of the largest high-tech companies in the world, which was founded in 1911. In 2010, IBM expanded its supply chain environmental management program to require all suppliers with whom IBM has a direct relationship to establish a management system that addresses their social and environmental responsibilities and to cascade these requirements to their suppliers. IBM strongly believes that sound social and environmental management can help suppliers maintain a competitive edge and contribute to more efficient and sustainable operations and aid in decreasing operational costs and improving margins (Epa.gov, 2018). As a result, in 2016, IBM met its 2020 goal of purchasing 20 percent³ of its electricity from renewable sources and its goal for 2020 of reducing operational CO₂ emissions by 35 percent from a 2005 base year. In 2017, the Clean Energy Ministerial awarded IBM the Energy Management Insight Award for achieving cost and emission reductions through certifying its energy management program to the ISO 50001 standard for energy management systems. In 2018, IBM received a Climate Leadership Award in the Goal Achievement category, issued jointly by the Center for Climate and Energy Solutions and The Climate Registry (Epa.gov², 2018).
- *Avaya* – Avaya is a global force in business collaboration and communications technology. The company was suffering from a range of supply chain maladies, including a long cash-to-cash cycle, an imbalance in supplier terms and conditions, excess inventory, and supply chain processes that were inefficient and wholly manual. To that end, the company put its trust in cloud technology, which was relatively immature at the time, and migrated all processes onto one platform, which was designed to automate non-value-added activities and integrate those critical to proactive supply chain management, namely:

- point of sale analysis,
- procurement analysis,
- supplier communication,
- supply and demand planning,
- inventory planning.

By making a conscious effort to lead the enterprise into a new way of thinking, change business culture, and unify technology under a single platform, Avaya has improved inventory turns by more than 200%, reduced cash tied-up in stock by 94%, and cut its overall supply chain expenditure in half (SupplyChainChannel.co, 2020).

- *Sunsweet Growers* – it is the world’s biggest producer of dried fruits. The company needed to redesign the network in order to reduce the total costs. Sunsweet was using a manual forecasting approach, with spreadsheets being the only technology involved. After evaluating some 30 different software solutions, the company finally settled on a supply chain planning software. The aim was to reduce production costs, and although the company hasn’t published hard figures to quantify the total financial gain, it has claimed the following wins (O’Byrne, 2020):
 - forecasting accuracy was increased by 15 to 20%,
 - overtime was reduced from 25% to 8% in production facilities,
 - spoilage in finished-goods was reduced by 30%,
 - number of warehouses in the United States was cut from 28 to just 8.

4. Conclusion

The main goal of this article was to find out if there are any companies using an SCM application in Slovakia and, if so, what experience and results do they have using it. We have conducted a survey with 100 large companies in Slovakia and found out that there is not a single company using this kind of software in Slovakia. This finding may seem like a failure, but it is valuable information. After this finding, we summarized some data from the literature about the experience and results of large companies abroad. Hopefully, this will motivate and inspire some companies in Slovakia to look for new ways of making their supply chain more transparent and effective.

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References

- [1] APICS. (2012). *SCOR: Supply Chain Operations Reference Model*. Retrieved January 4, 2019, from www.apics.org/apics-for-business/frameworks/scor
- [2] Appsruntheworld.com. (2021). *TOP SCM Software Vendors, Market Size and Market Forecast 2020-2025*. Retrieved April 7, 2022, from <https://www.appsruntheworld.com/top-10-scm-software-vendors-and-market-forecast/>
- [3] Basl, J., & Blažíček, R. (2012). *Podnikové informační systémy*. Praha, Česká republika: GRADA Publishing, a. s.
- [4] BusinessDictionary.com. (2022). *Supply Chain Management (SCM)*. Retrieved March 23, 2022, from <http://www.businessdictionary.com/definition/supply-chain-management-SCM.html>
- [5] Christopher, M. L. (1992). *Logistics and Supply Chain Management*. London, England: Pitman Publishing.
- [6] Coyle, J. J., Bardi, E. J., & Langley, C. J. J. (2002). *Zarządzanie logistyczne*. Warszawa, Poland: PWE.

- [7] Council of Supply Chain Management Professionals. (2018). *CSCMP Supply Chain Management Definitions and Glossary*. Retrieved April 5, 2022, from https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx?hkey=60879588-f65f-4ab5-8c4b-6878815ef921
- [8] Dobroszek, J. (2018). The measurement of costs and results in supply chain management: the case of Poland. *Financial Sciences*, 23(3), 34–45. <https://doi.org/10.15611/fins.2018.3.03>
- [9] Epa.gov. (2018). *Success Stories: Case Studies in Supply Chain Engagement*. Retrieved April 4, 2022 from <https://www.epa.gov/climateleadership/success-stories-case-studies-supply-chain-engagement>
- [10] Epa.gov2. (2018). *2018 Supply Chain Case Study*. Retrieved April 4, 2022 from https://www.epa.gov/sites/default/files/2018-10/documents/ibm_case_study_draft_10012018_ibmeditsincorporated_epafinaledit_compliant.pdf
- [11] Göpfert, I. (2013). *Logistik. Führungskonzeption und Management von Supply Chains*. München, Germany: Franz Vahlen.
- [12] Jurík, P. (2016). *Informačné systémy v podnikovej praxi*. Nové Zámky, Slovenská republika: AZ Print, spol. s. r. o.
- [13] Križko, I. (2002). *SCM: Supply Chain Management*. Retrieved March 23, 2022, from <https://www.systemonline.cz/clanky/scm-supply-chain-management.htm>
- [14] La Londe, B. J., & Masters, J. M. (1994). Emerging Logistics Strategies: Blueprints for the Next Century. *International Journal of Physical Distribution and Logistics Management*, 24(7), 35–47.
- [15] LogisticsBureau.com. (2019). *7 Mini Case Studies: Successful Supply Chain Cost Reduction and Management*. Retrieved March 26, 2022, from <https://www.logisticsbureau.com/7-mini-case-studies-successful-supply-chain-cost-reduction-and-management/>
- [16] Martiško, B. (2005). Systémy SCM a CRM v podnikovej praxi (3). *AT&P journal 2005*(11). Retrieved March 23, 2022 from <https://www.atpjournals.sk/buxus/docs/atp-2005-11-70.pdf>
- [17] Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining Supply Chain Management. *Journal of Business Logistics*, 22(2), 1–25.
- [18] Ministerstvo životného prostredia Slovenskej republiky. (2015). *Pomôcka k určaniu veľkosti podniku pre účely štátnej pomoci na programové obdobie 2014 – 2020*. Retrieved January 5, 2022, from <https://www.opkzp.sk/wp-content/uploads/2015/12/Pomocka-k-urceni-u-velkosti-podniku-pre-ucely-SP.pdf>
- [19] O'Byrne, R. (2020). *7 mini case studies: successful supply chain cost-reduction and management*. Retrieved April 4, 2020, from <https://trans.info/en/7-mini-case-studies-successful-supply-chain-cost-reduction-and-management-174252>
- [20] SelectHub.com. (2022). *Best Supply Chain Management Software*. Retrieved March 26, 2022 from <https://www.selecthub.com/supply-chain-management-software/>
- [21] Stadtler, H. (2008). Supply chain management – an overview. *Supply chain management and advanced planning*, 9-36.
- [22] Statista.com. (2022). *Supply chain management software companies*. Retrieved April 7, 2022, from <https://www.statista.com/outlook/tmo/software/enterprise-software/supply-chain-management-software/worldwide#revenue>
- [23] SupplyChainChannel.co. (2020). *Mini Case Studies: Supply Chain Cost Reduction*. Retrieved March 26, 2022, from <https://supplychainchannel.co/mini-case-studies-supply-chain-cost-reduction-and-management-part-2/>
- [24] Ministry of Economy of the Slovak Republic. (2021). *Správa o stave podnikateľského prostredia v Slovenskej republike*. Retrieved April 7, 2022, from <https://www.teraz.sk/ekonomika/pocet-firiem-a-zivnostnikov-na-sloven/454466-clanok.html>
- [25] Tomek, G., & Tomková, V. (2007). *Řízení výroby a nákupu*. Praha, Česká republika: GRADA Publishing, a. s.

Issues and Trends of Information-Communication Technology Incorporation in Mathematics Education

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Abstract

University education is significantly affected by the global pandemic caused by Covid-19. Opportunities for maintaining or improving the quality of current mathematics education are associated with the implementation of information and communication technologies (ICT) in university studies. Methods and forms of e-learning have impact on the content and the course of key phases of the educational process: motivation, curriculum exposure, fixation, and knowledge diagnosis. In the paper, we focused on selected issues and trends of incorporation of ICT in the mathematics teaching. Analysis of pedagogical aspects and measuring the outcomes of education in the context of ICT support belong to the basis of changes for improving the quality of mathematics education. Research material and data were obtained from teaching process at the Faculty of Economics and Management of the Slovak University of Agriculture in Nitra. We concentrated on methodology of teaching with the support of ICT during the distance education introduced because of the pandemic. Obtained results showed that both students and teachers have successfully mastered the new technologies needed for distance learning, especially tools of the platform MS Teams for the face-to-face-learning. Comparison of the level of mathematical knowledge was realized in the sample of selected tasks of linear algebra and exam grades of two compulsory mathematical study subjects.

Keywords: *mathematics education, information-communication technology, e-learning, MS Teams, tests evaluation, study outputs*

JEL Classification: *I20, I21, C02*

1. Introduction

The implementation of information and communication technology (ICT) in higher education is a current trend and university teachers face many new pedagogical issues. Distance education during the 2020 - 2022 pandemic has shown demands for new ways of applying electronic study materials and e-media to the process of education. Results of pedagogical research brings answers and new solutions, while the incorporation of digital applications in education needs enthusiastic and prepared teachers who actively master modern ICT tools (Országhová, Gregáňová, Baraníková, & Tóthová, 2010).

Digitization and automation are the main concepts of the skills revolution. Social practice places new demands on the professional competencies of graduates. Necessary skills are changing rapidly, and real facts of companies confirm that they face to difficulty to find employees with the determined profile (Pechočiak, & Kecskés, 2016). The European Pillar of Social Rights states, as a first principle, that “everyone has the right to quality and inclusive education, training, and lifelong learning, to maintain and acquire skills that will enable them to participate fully in society and to manage change successfully. Strengthening skills development is one of

the goals of the vision for a European learning area where the potential of learning can be used to create jobs" ("Council Recommendation", 2018).

Technology transforms companies and the development of key competences is also an important goal within the European education system and presupposes the strengthening of the connection between practice and research and educational institutions ("Strategy of digital transformation of Slovakia 2030", 2019). This trend became even more pronounced during the pandemic, when mastery of information technology tools was necessary to realize the process of university education and prepare graduates for their professions.

The quality of the educational process is conditioned by many factors and is dependent on the expertise and erudition of the university teacher, while his pedagogical work also enhances the environment of the university, the specific faculty, and the department. The role of the university teacher is still important because teacher's activity is the basic impulse for successful realization of education and important motivator of students in acquiring new knowledge (Pietriková, Hornyák Gregáňová, & Papcunová, 2018). Next important factor is self-motivation of a student determining own activation and many different motives are interrelated and constitute a form of hierarchy of everyone (Ferenczi Vaňová, Hornyák Gregáňová, Váryová, & Košovská, 2015).

Universities prepare trainings for teachers, or online courses for creators of electronic educational materials, which are also innovating because of rapid development of IT tools and expand support for e-learning in individual study subjects. E-learning via tools of LMS MOODLE at the Slovak universities and faculties is carried out by many workplaces and electronic courses in many subjects (Cápay, & Tomanová, 2010; Váryová, 2021). The initiators of the creation of electronic courses for various subjects were teachers from institutes and centers of informatics, who also provided methodological support to their colleagues at the university (Tothova, 2018).

Based on a survey among students, we found out that students mainly use own notes from mathematics lectures and via printed textbooks with exercises they acquire computing skills. Subsequently, they use electronic study resources, welcoming the possibility that these study materials can also be printed (Országhová, & Hornyák Gregáňová, 2020). During distance learning, writing own notes by students is minimized, i.e., students use either electronic resources or textbooks in printed form in preparation for tests and exams.

MS Teams provides various communication options (chat, video conferencing, lectures, screen sharing) and offers new options for creating content for studying a selected topic in a group (Krašna, & Pesek, 2020). "Information technologies facilitate the use of constructive teaching methods, provides teachers with quick feedback of student activities and new resources for developing individual learning" (Nazarova, Shmalko, Nazarov, & Sevryugina, 2021). According to Ploj Virtic, Dolenc, & Šorgo (2021), the usage of MS Teams increased significantly during the pandemic of distance learning, while the use of other applications increased in the range from low to medium (e.g., e-mail, Moodle, electronic textbooks). Distance education caused some problems during testing knowledge of students. Teachers of mathematics courses have experience with testing a small and a large group of students via e-assessment interface (Misut, & Misutova, 2017).

2. Data and Methods

The aim of the paper is to present the usage of created educational materials and courses in the mathematics teaching with a focus on new options of the platform MS Teams. Seminary

projects and tests were basis of evaluating the level of mathematics knowledge of students in the first year of bachelor's degree at the Faculty of Economics and Management (FEM). Topic “Linear algebra” is included in the compulsory study subject “Mathematics IB” that finishes with final exam. During the academic years 2019/2020 and 2020/2021 we conducted pedagogical research, in which the research sample consisted of students of the FEM faculty. In seminary projects and tests students solved tasks about matrices, systems of linear equations and determinants. These tasks became a set of data for analysis of knowledge and competence level via students’ points score and average grade on exams.

Test sample in the study subject “Mathematics IB”

Task 1: Find the inverse matrix for given matrix B and check the result.

Task 2: Solve the non-homogeneous system of linear equations by the complete Gaussian elimination method and express solution in general form (if it exists).

Task 3: Solve a system of linear equations using determinants (Cramer's rule).

Theoretical questions to the topic of linear algebra:

- a) Write a theorem on elementary row adjustments of matrices (4 types).
- b) Give an example of a matrix size 5 x 3 that has a rank 3.

In the Figure 1 we see examples of matrix B and two systems of linear equations.

Task 1:	Task 2:	Task 3:
$B = \begin{pmatrix} 1 & -1 & 2 \\ 2 & -3 & 2 \\ 3 & 1 & 13 \end{pmatrix}$	$\begin{aligned} 3x_1 - 2x_2 + x_3 &= 11 \\ x_1 + x_2 - 3x_3 &= 7 \\ 11x_1 - 4x_2 - 3x_3 &= 10 \\ x_1 - 2x_2 + x_3 &= 0 \end{aligned}$	$\begin{aligned} 2x_1 - 4x_2 + 3x_3 &= 1 \\ x_1 - 2x_2 + 4x_3 &= 3 \\ 3x_1 - x_2 + 5x_3 &= 2 \end{aligned}$

Figure 1: Tasks from exam test in the study subject “Mathematics IB”

Source: author

In the next part we will present results to these areas of mathematics education with the support of ICT tools:

- Digital applications in mathematics education,
- Creations of tests and seminary projects variety,
- Analysis of outcomes of mathematics education using non-parametric statistical tests.

3. Results and Discussion

Tools of ICT caused changes in mathematics teaching, especially during the period of pandemic. The emphasis is on the active self-study, tutorials of students with teachers and elaboration of seminary projects. Study was (and still is) realized via e-learning tools and supported with new electronic teaching and learning applications (on-line or off-line). The usage of computer technology and multimedia in mathematics teaching is aimed to conduct education in more attractive form for students, to create innovative multimedia study aids, websites, educational videos, computer-aided testing, etc.

3.1 Digital applications in mathematics education

During pandemic period teachers and students started to apply digital tools to continue mathematics teaching in the form of lectures and seminars. It was necessary to gain experience with new contact between teacher and student via digital educational application.

Tools of the Microsoft 365 platform are used for the distance learning at SUA in Nitra. It allows students and teachers to work in groups (teams) where members can share files, videos, and access to integrated programs. The teams enable the access of assignments and tests for large groups of students, the uploading of completed assignments by students, automatic control of deadlines, evaluation, and classification by teachers. Teachers have started to use these options of distance learning in all study subjects, where it is possible to pass on information and the content of the subject to students in this way.

Model of online lecture in mathematics in the environment of MS TEAMS:

- Explanation of the new subject matter (PowerPoint presentation, verbal commentary),
- Solving demonstration tasks (using a graphics tablet, short presentations, and videos),
- Control tasks and questions on a mathematical topic (problem solving),
- Recording the teaching process in the MS TEAMS in the form of a video.

Figure 2 display list of created videos from lectures and study materials for students in MS Teams. Students could create own study library with lectures, seminars and database of solved tasks which could be used in the preparation for mathematics exam test.

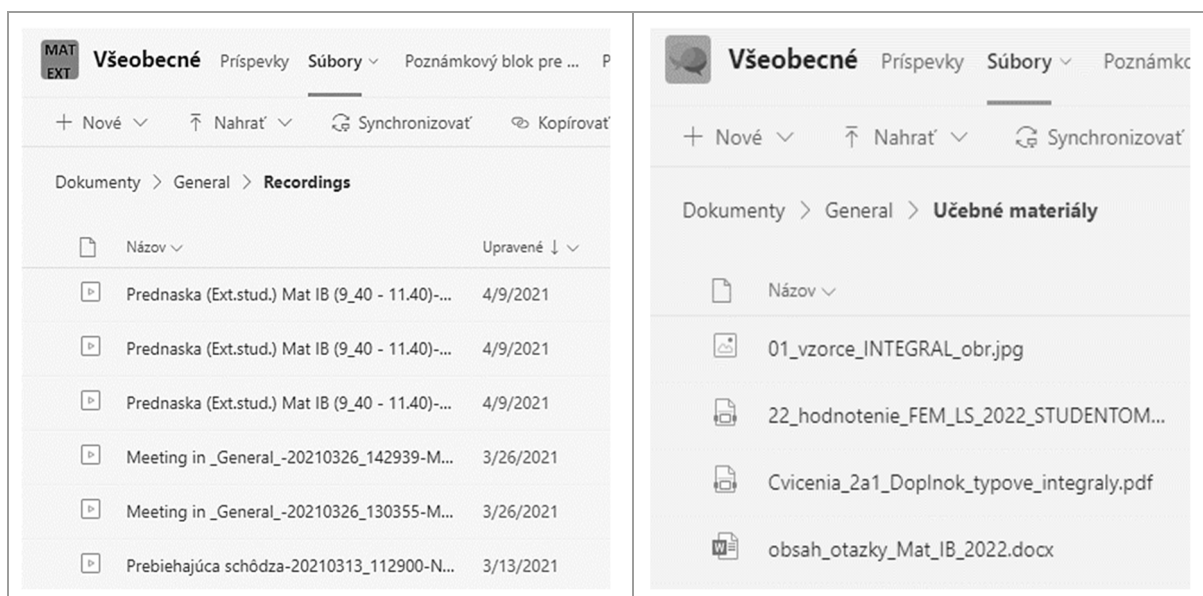


Figure 2: Content of the team for study subject Mathematics IB

Source: author

Experience with e-learning and the use of various tools of IT confirms that students are interested in studying mathematics using modern methods. Students in the part-time study appreciate the access to electronic educational resources and use them in individual study of mathematical subjects and during the preparation for the exam. In addition to mathematics knowledge, students also acquire skills and competences for working with ICT, which they can apply in other subjects or job after graduating.

Because students must solve tasks on exam test it is necessary to gain calculation skills and develop abilities for applying mathematical methods. Therefore, teachers of mathematics

created a series of presentations to selected type of tasks with a detailed comment on the solution. Presentations are placed in the “MOODLE SPU”. In presentations, mathematical objects are shown using animations, thereby approaching the student's graphical interpretation of mathematical concepts. In the subject Mathematics I B it is included the topic “Definite integral”. Figure 3 shows the task about the area a plane figure solved via definite integral.

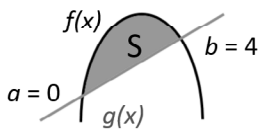
Task: Find area of a plane figure which is enclosed by functions

$f : y = -x^2 + 6x - 5 \quad g : y = 2x - 5$

Solution: We find intersection points of enclosed functions

$f \cap g$
 $y = y$
 $-x^2 + 6x - 5 = 2x - 5$
 $-x^2 + 4x = 0 \quad / \cdot (-1)$
 $x^2 - 4x = 0$
 $x \cdot (x - 4) = 0$
 $x = 0, \quad x = 4.$
limit a limit b

$f: y = -x^2 + 6x - 5$ Concave down function
 $g: y = 2x - 5$ Increasing function



$S = \int_a^b [f(x) - g(x)] dx$
 $S = \int_0^4 [-x^2 + 6x - 5 - (2x - 5)] dx = \frac{32}{3} [J^2]$

Figure 3: Slide from presentation on the topic Area of a plane figure
Source: author

3.2 Creations of tests and seminary projects variety

Testing mathematical knowledge of students studying in distance form is associated with the question: how to guarantee independent elaboration of tasks by students. In order not to pass on results of tasks among students, it is necessary to create for each student particular test. The student must transform the elaborated tasks or projects into electronic form and then send them to the teacher for evaluation. Distance learning increased demands on students' digital competencies so that they can combine the acquisition of mathematical knowledge and information technology competences.

Example 1: Find inverse matrix to the matrix A (size 3×3).

Solution:

$$A = \begin{pmatrix} 1 & 3 & 2 \\ 3 & 8 & 6 \\ 2 & 7 & 3 \end{pmatrix}$$

$$\left(\begin{array}{ccc|ccc} 1 & 3 & 2 & 1 & 0 & 0 \\ 3 & 8 & 6 & 0 & 1 & 0 \\ 2 & 7 & 3 & 0 & 0 & 1 \end{array} \right) \begin{array}{l} / \cdot (-3) / \cdot (-2) \\ \leftarrow \\ \leftarrow \end{array} \sim \left(\begin{array}{ccc|ccc} 1 & 3 & 2 & 1 & 0 & 0 \\ 0 & -1 & 0 & -3 & 1 & 0 \\ 0 & 1 & -1 & -2 & 0 & 1 \end{array} \right) \begin{array}{l} \leftarrow \\ \leftarrow \\ \leftarrow \end{array} \sim$$

$$\left(\begin{array}{ccc|ccc} 1 & 0 & 2 & -8 & 3 & 0 \\ 0 & 1 & 0 & 3 & -1 & 0 \\ 0 & 0 & -1 & -5 & 1 & 1 \end{array} \right) \begin{array}{l} \leftarrow \\ \leftarrow \\ / \cdot (2) \end{array} \sim \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & -18 & 5 & 2 \\ 0 & 1 & 0 & 3 & -1 & 0 \\ 0 & 0 & 1 & 5 & -1 & -1 \end{array} \right) \Rightarrow A^{-1} = \begin{pmatrix} -18 & 5 & 2 \\ 3 & -1 & 0 \\ 5 & -1 & -1 \end{pmatrix}$$

Inverse matrix

In the process of education raised new circumstances for evaluation of students' knowledge via tools of IT and question how to avoid cheating on exams because they have access to Internet. Teachers started to prepare different assignments and tests for students. This fact increased teachers time on creating tasks and then with correcting so many various assignments, especially in mathematics.

We will present this process on the topic "Inverse matrix" via variety of possibilities how to find the inverse matrix. In the Example 1 we can see traditional mathematical process of solution this task. Next way of solution is to use command: {=MINVERSE (array)} in MS Excel. On Figure 4 there are presented input and output matrices of this task.

matrix	1	0	3	matrix	1	0	1
C =	2	-1	1	D =	3	-1	1
	-1	1	1		0	1	1
inverse	-2	3	3	inverse	-2	1	1
C(-1)=	-3	4	5	D(-1)=	-3	1	2
	1	-1	-1		3	-1	-1

Figure 4: Inverse matrix presented in MS Excel

Source: author's calculations

This option is very useful for teachers in creating assignment variations. In each matrix we can change the order of the rows, thus obtaining six options for the task based on one matrix. If we change the order of the columns in the same matrix, we get another 5 different options. This is together 11 different assignments for seminars or tests created from one matrix. Using the "MINVERSE" function in MS Excel, we can create assignments that will have an integer solution. We can use these tasks about regular matrix to create assignments for systems of linear equations, which we will solve using determinants.

Next scheme of solving task on inverse matrix was created via free program "Inverse of a Matrix Calculator". Students were inventive and used this Internet free application for solving tasks in seminary projects. We present a few steps of the procedure with the same matrix as in the Example 1.

Scheme of finding inverse matrix: outputs of application *Inverse of a Matrix Calculator*.

Size of the matrix:

Matrix:

<input type="text" value="1"/>	<input type="text" value="3"/>	<input type="text" value="2"/>
<input type="text" value="3"/>	<input type="text" value="8"/>	<input type="text" value="6"/>
<input type="text" value="2"/>	<input type="text" value="7"/>	<input type="text" value="3"/>

SOLUTION

To find the inverse matrix, augment it with the identity matrix and perform row operations trying to make the identity matrix to the left. Then to the right will be the inverse matrix.

So, augment the matrix with the identity matrix:

$$\left[\begin{array}{ccc|ccc} 1 & 3 & 2 & 1 & 0 & 0 \\ 3 & 8 & 6 & 0 & 1 & 0 \\ 2 & 7 & 3 & 0 & 0 & 1 \end{array} \right]$$

In each step the program is modifying only one element.

Subtract row 1 multiplied by 3 from row 2: $R_2 = R_2 - 3R_1$.

$$\left[\begin{array}{ccc|ccc} 1 & 3 & 2 & 1 & 0 & 0 \\ 0 & -1 & 0 & -3 & 1 & 0 \\ 2 & 7 & 3 & 0 & 0 & 1 \end{array} \right]$$

Program provides next steps:

Multiply row 3 by -1 : $R_3 = -R_3$.

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 2 & -8 & 3 & 0 \\ 0 & 1 & 0 & 3 & -1 & 0 \\ 0 & 0 & 1 & 5 & -1 & -1 \end{array} \right]$$

Subtract row 3 multiplied by 2 from row 1: $R_1 = R_1 - 2R_3$.

$$\left[\begin{array}{ccc|ccc} 1 & 0 & 0 & -18 & 5 & 2 \\ 0 & 1 & 0 & 3 & -1 & 0 \\ 0 & 0 & 1 & 5 & -1 & -1 \end{array} \right]$$

We are done. On the left is the identity matrix. On the right is the inverse matrix.

From pedagogical point of view, we can appreciate that at the end of solution it is presented “answer” to the task:

Answer

The inverse matrix is $\begin{bmatrix} -18 & 5 & 2 \\ 3 & -1 & 0 \\ 5 & -1 & -1 \end{bmatrix}$

Except English programs students can use Slovak application (e. g. Matrix calculator, Figure 5) and result of inverse matrix will be without mistakes.

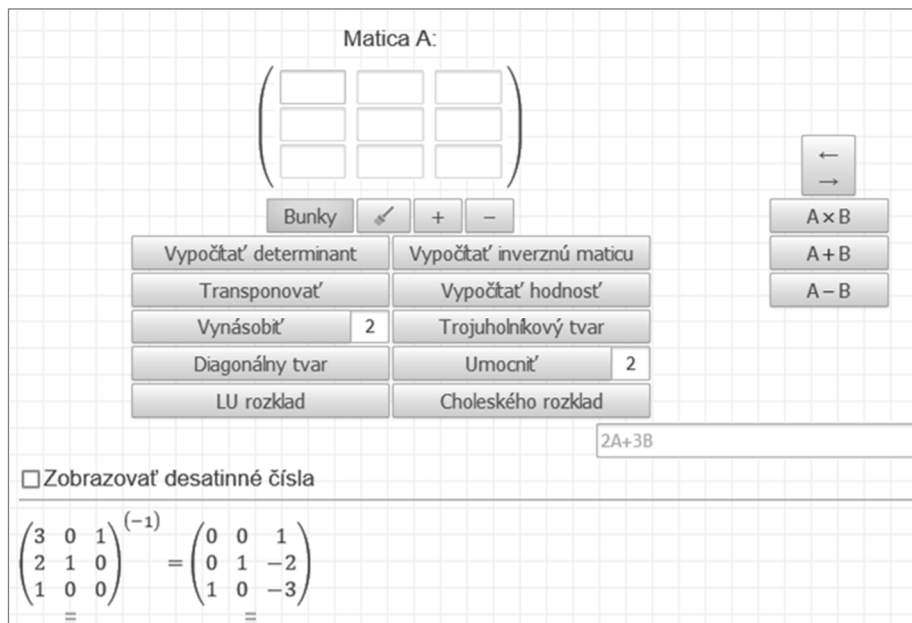


Figure 5: Presentation of calculator input step for finding inverse matrix

Source: Matrix calculator, own processing

3.3 Outcomes of mathematics education

The evaluation of the quality of education via study outcomes and evaluating mathematical knowledge is a part of pedagogical diagnostics. In this part we present results of pedagogical research conducted in the academic years 2019/2020 and 2020/2021. Research sample included students of the study programs “Accounting” and “Business Economics”, both in part-time study in the 1st study year: 26 students in year 2019/2020, and 39 students in year 2020/2021.

We compared the points score in these four kinds of tasks (tasks are from study subject Mathematics IB): inverse matrix, system of linear equations with one solution, system with infinitely many solutions, and system of linear equations solved via determinants. Values are presented in percentage on Figure 6. The lowest success rate (65%) was achieved in the task number 3, where students have a problem with expressing the parameters of the system of equations and presenting a general solution of the system. In other problems we state the high success of students in solving problems from linear algebra.

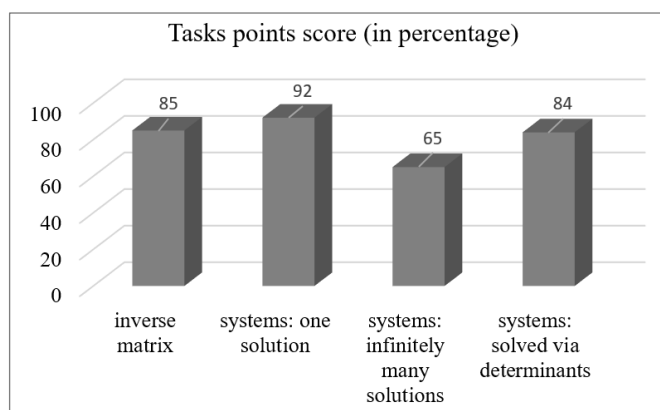


Figure 6: Students points score in selected tasks from linear algebra

Source: author

In the same research sample of students (external form of study), we compared students' achieved grade in study subjects Mathematics IA and Mathematics IB. The data about exam grades are summed up in Table 1. FN means that a student did not register for the exam (and did not finish the course in a given academic year).

Table 1: Exam grades in mathematical study subjects

Exam grade	Academic year 2019/2020		Academic year 2020/2021	
	WS 2019	SS 2020	WS 2020	SS 2021
	Mathematics IA	Mathematics IB	Mathematics IA	Mathematics IB
A (1)	3	13	8	17
B (1,5)	2	2	8	7
C (2)	4	3	12	5
D (2,5)	4	1	2	1
E (3)	6	4	4	3
FX (4)	2	0	0	1
FN	5	3	5	5

Source: author's calculations

Because research samples are small, and they do not have a normal distribution we applied non-parametric tests. In each realized test we determined two observed characters: X represents grades in first subject, Y represents grades in second subject. We tested the null hypothesis about the equality of the medians of the observed characters X , Y against the two-sided alternative hypothesis at the significance level $\alpha = 0.05$. Results are listed in the Table 2.

Table 2: Results of non-parametric tests ($\alpha = 0,05$)

Test	Character X	Character Y	p -value	Conclusion
Sign Test	WS 2019	SS 2020	0.10	not significant
	Mathematics IA	Mathematics IB		
Sign Test	WS 2020	SS 2021	0.41	not significant
	Mathematics IA	Mathematics IB		
Mann-Whitney U Test	WS 2019	WS 2020	0.41	not significant
	Mathematics IA	Mathematics IA		
Mann-Whitney U Test	SS 2020	SS 2021	0.37	not significant
	Mathematics IB	Mathematics IB		

Source: author's calculations

In all cases, we have the same conclusion: we cannot reject the null hypothesis at the chosen level of significance ($\alpha = 0,05$). We found that the observed differences between grades in evaluated subjects and study years are not statistically significant.

Based on the long-term experience of teachers, it can be stated that students in the external study form have a responsible approach to the study to obtain the best possible evaluation in the mathematics exams.

4. Conclusion

The incorporation of ICT into education was accelerated by a global pandemic, where students could only learn through digital tools. The right combination of digital tools in the learning process allows students to fully acquire knowledge and develop professional skills. Based on the results of the analysis of online teaching, individual study of mathematics and outputs of mathematical subjects, it is necessary to strengthen the following factors of the educational process for students:

- internal motivation of students to acquire new knowledge and develop their education,
- interest in studying mathematics and its applications,
- inclusion in the study of mathematics computer and graphics software,
- developing students' ability to interpret results obtained by mathematical calculation,
- strengthening the methods of individual study needed in the context of lifelong learning.

Important findings for math teachers are:

- inclusion of seminary projects in the mathematical subjects,
- time consuming to create different assignments for students,
- problems with cheating and copying the solution of the task,
- using computational applications instead of solving the problem itself.

The knowledge society and the labor market need graduates who know to use digital tools. ICT-free education is becoming obsolete and uninteresting for students. Innovation in mathematics education in the context of the use of ICT is a permanent and irreversible process.

References

- [1] Cápaj, M., & Tomanová, J. (2010). Enhancing the Quality of Administration, Teaching and Testing of Computer Science Using Learning Management System. In *WSEAS Transaction on Information Science & Applications*, Vol. 7, no. 9(2010), pp. 1126-1136.
- [2] *Council Recommendation of 22 May 2018 on key competences for lifelong learning* (Text with EEA relevance). (2018/C 189/01). Retrieved from [https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:32018H0604\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/SK/TXT/PDF/?uri=CELEX:32018H0604(01)&from=EN)
- [3] Ferenczi Vaňová, A., Hornyák Gregáňová, R., Váryová, I., & Košovská, I. (2015). Analysis of motivation factors of students in selected subject at the FEM SUA in Nitra. In *ICABR 2014*. Brno: Mendel University. (2015), pp. 202-211. Retrieved from <http://www.icabr.com/fullpapers/icabr2014.pdf>
- [4] *Inverse of a Matrix Calculator*. Retrieved from <https://www.emathhelp.net/en/calculators/linear-algebra/inverse-of-matrix-calculator/>
- [5] Krašna, M., & Pesek, I. (2020, September). Influence of Moodle and MS Teams on teaching-learning-studying (TLS) processes. In *2020 43rd International Convention on Information, Communication and Electronic Technology (MIPRO)* (pp. 612-616). IEEE.
- [6] *Matrix calculator*. Retrieved from <https://matrixcalc.org/sk/>
- [7] Misut, M., & Misutova, M. (2017). Software Solution Improving Productivity and Quality for Big Volume Students' Group Assessment Process. *International Journal of Emerging Technologies in Learning*, 12(4). <https://doi.org/10.3991/ijet.v12i04.6608>
- [8] *MOODLE SPU*. Faculty of Economics and Management in Nitra. Retrieved from <https://moodle.uniag.sk/course/index.php?categoryid=36>

- [9] Nazarova, O. V., Shmalko, S. P., Nazarov, A. V., & Sevryugina, N. I. (2021). Freeware Software in the Implementation of Interactive Educational Content. In *CEUR Workshop Proceedings* (Vol. 2914, pp. 199-210).
- [10] Országhová, D., Gregáňová, R., Baraníková, H., & Tóthová, D. (2010). *Multimedia in mathematics teaching*. 1st edition. Nitra: Slovak University of Agriculture, 2010.
- [11] Országhová, D., & Hornyák Gregáňová, R. (2020). *Evaluation of Mathematical Competences in Era of Skills Revolution*. 1st edition. Nitra: Slovak University of Agriculture, 2020.
- [12] Pechočiak, T., & Kecskés, N. (2016). Mathematics and statistics in global education. In *International Scientific Days: The Agri-Food Value Chain: Challenges for Natural Resources Management and Society*, 668-674. <http://dx.doi.org/10.15414/isd2016.s8.13>
- [13] Pietriková, M., Hornyák Gregáňová, R., & Papcunová, V. (2018). Study of agricultural sciences and employment of graduates. In *International scientific days 2018*. Praha: Wolters Kluwer ČR. (2018), pp. 2017-2029. <https://doi.org/10.15414/isd2018.s9.13>
- [14] Ploj Virtic, M., Dolenc, K., & Šorgo, A. (2021). Changes in Online Distance Learning Behaviour of University Students during the Coronavirus Disease 2019 Outbreak, and Development of the Model of Forced Distance Online Learning Preferences. *European Journal of Educational Research*, 10(1), 393-411.
- [15] *Strategy of digital transformation of Slovakia 2030*. (2019). [Electronic resource]. Retrieved from <https://www.mirri.gov.sk/wp-content/uploads/2019/06/Strategia-digitalnej-transformacie-Slovenska-2030.pdf>
- [16] Tothova, D. (2018). E-learning at Slovak University of Agriculture in Nitra. In *DIVAI 2018*, The 12th international scientific conference on Distance Learning in Applied Informatics, pp. 195-204.
- [17] Váryová, I. (2021). Distance Teaching of Accounting at the Faculty of Economics and Management. In *Zborník príspevkov z konferencie UNINFOS 2020*. Prešov: Prešovská univerzita. (2021), s. 104-109.

The Influence of Information Strategy and Management on the Quality of the Information System

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Abstract

The article addresses the issue of managing the initial stages of the information system life cycle. The existence of the position of CEO and its inclusion in the organizational structure is important for the management of the entire information system. The article monitors the inclusion of the CEO in the organizational structure of non-agricultural and agricultural enterprises. Equally important for a quality information system is the existence of an information strategy. The correct classification of the CEO and the existence of an information strategy has a positive effect on increasing the competitiveness of the company.

Keywords: *information strategy, organizational structure, information manager, information systems*

JEL Classification: *Q19, Q13, C83, I25*

1. Introduction

Data and information enriched with knowledge are the driving force of today. In order to succeed in the competition, data and information must flow where they are needed during the decision-making process. The owner of the knowledge is usually someone who needs up-to-date data and information to use it. Information is a corporate resource with specific features. Unlike other commercial resources that are consumed in the recovery process, it is a renewable resource that even generates itself. It can therefore be said that those who do not have the necessary information at the required time and place lose their position. In this sense, we can talk about critical information needs that define the necessary requirements of the control body to ensure successful action. Those who own information resources on time often create the advantage of access to additional information and increase the quality of their position in the entire market environment. In today's overpressure of information, their quality and ability to communicate is fully dependent on the quality of the information system. Keřkovský (2003) states that without the information we provide, companies cannot further develop their business activities and increase their competitiveness.

Modern management concepts place great importance on business information and management. Information has become a strategic weapon for business, an important source of competitive advantage. Internal and external information is best obtained from an enterprise information system. The quality of a business information system is directly related to the ability to create an information strategy in the company and its quality. The information strategy fully supports the requirements of individual users of the company for information

support of their needs - the needs of the economic unit, sales department, production, human resources, management and more. Information strategy is becoming one of the most important documents in any business. The created information strategy is an important element of the information system life cycle and plays an important role in the quality of the implemented and operated system.

Information strategy is one of the most important documents in companies, as is corporate strategy. The process of creating an information strategy is influenced by a number of factors:

- the composition of the team involved in its creation - the team should be composed of employees of the company and employees of the external company. The employees of the company for which the information strategy is created should be represented by the company's management, including the ICT department manager, and user representatives from all departments of the company, who will regularly work with the system at the company's operating level.
- the economic situation of the company
- the amount of financial resources that the company can invest in information systems and information and communication technologies. In the first years of the introduction of the new information system, investments often exceed the average annual amount invested in the field of informatics, which ranges from 6 to 10% of all company expenses. In the first year, the amount invested in building an information system is around 25% of all the company's annual expenses. The stated amount consists of expenditures on the creation of an information strategy, the creation of an information system architecture, the building of an information system and the implementation of the system, the training of employees during the commissioning of the system
- the existence or non-existence of documents necessary for the creation of information strategies - information strategies must be based on corporate standards and must support business processes. The quality of the information system and the quality of the information corporate documents used to create the strategy - such as corporate strategy, organizational rules, financial regulations, study and examination regulations and other documents according to business focus. Enterprise documents are used in the creation of information architecture to design functions, processes, access rights and more.

The quality of the entire information system is mainly affected by the initial stages of the information system life cycle - ie the creation of an information strategy, the creation of an information system architecture. There are many examples that are almost identical, and the problems with the initial stages after the implementation of the information system are the same. In many companies, when building information systems, a lot of informal information is spread, the quality of which is very diverse - from true to semi-true information. Managers must create a schedule for the timing of the solution, must not forget the correct composition of the team involved in the whole process and must inform in a timely manner about the training of all employees and the commissioning process. In recent years, the development of automated systems in agriculture gained increased interest, which led to that the research teams devoted to exploring the development of rational and adaptable. (Sørensen et al., 2010). Tvrdíková (2015) says that cloud solutions can be used, but the problem is that we take data out of business (or that we use applications stored outside the company) and the data travels through "space", so we do not have 100% control over them. "IS administration is a specific but still integral part of corporate governance today. Understanding information and communication technologies as a purely service activity brings a number of problems for the further development of the company and the same problems are brought about by the superiority of the IT department over all other departments. In large companies, the

information manager is perceived as the "second position" after the CEO. However, this situation is not ideal, because it may appear as a superior department to others, and therefore the position of IT in the company has a "more important function" - Cienciala (2011). He also deals with the issue of IT management in the companies Drucker (2002), Hennyeyová (2010), Sodomka (2006). Related studies Lawson et al. (2011) solves potential benefit for the introduction of agricultural information management systems.

2. Data and Methods

2.1. Data

Information systems and information and communication technologies are one of the most important sources of a company's competitiveness. The quality of each information system and the method of obtaining information is determined by a number of factors that can be assessed according to measurable and non-measurable benefits. One of the immeasurable advantages is the quality of information and managerial knowledge. This indicator is based on the ability of users to define requirements for their needs and on the ability to further use and work with information. The quality of the entire information system is fully dependent on the ability to manage the information technology department, to manage the creation of the information strategy, the creation of the information systems architecture and the entire life cycle of the information system. The aim of the article is to define the requirements for the organizational structure of the company in relation to the integration of the IT department manager, the ability to develop an information strategy, its existence, or the reason for lack of information and the ability to obtain information. Requirements for the integration of an IT employee into the organizational structure, methods of obtaining information, the existence of an information strategy in the company will be presented in a survey conducted on a selected sample of companies.

The ever-increasing amount of information, both external and, of course, internal, creates requirements to ensure its quality. This requires efficient setting up of in-house information channels, appropriate data aggregation and determination of characteristic values. In order to optimize and exchange data, information and knowledge between business units, business processes are supported by various information system modules and related organizational processes. The quality of the whole process is directly dependent on how the company's management manages the development and operation of information systems and information and communication technologies.

The aim of the article is to confirm or refute the established research questions:

research question 1 - in the non-agricultural sector, there is an increase in the existence of information strategies in companies. In the monitored sample of companies, 65% of the monitored companies have an information strategy. In agricultural enterprises, an information strategy is created for 1% of enterprises.

research question 2 - assumes that in the organizational structure, the employee of IT management in non-agricultural companies is included in the top management in 46% of enterprises, in agricultural enterprises in 5% of the monitored enterprises.

2.2. Methods

The article was prepared on the basis of scientific methods - using holistic methodology, analysis and deduction. The theoretical part was prepared on the basis of the study of scientific and professional articles, the study of secondary literary sources. Based on the established

hypotheses, a questionnaire was compiled consisting of 10 questions - 7 questions were closed and 3 were open. A total of 148 enterprises were contacted, of which 65 agricultural enterprises - the return rate of the questionnaires was 75.6% (a total of 112 enterprises responded, of which 48 agricultural enterprises). Based on the results of the questionnaire survey, direct surveys were conducted in 76 enterprises, of which 32 were agricultural enterprises. The ratio of enterprises to non-agricultural enterprises was chosen in the same proportion as the enterprises which responded to the questionnaire survey with the closed questions. The companies of the direct survey were selected on the basis of the results of the questionnaire survey. The questions for direct questioning were given to the respondents on the basis of long-term experience of the authors of the article (cooperation with practice) with the issue of business management of information systems. The results of the questionnaire survey were used to draw conclusions from established hypotheses and proposals for optimal solutions supporting the development of companies.

3. Results and Discussion

What is the position of the IT department in the company? Historically, the main task of the data processing department was to ensure the timely processing of accounting, payroll, warehousing and similar agendas, depending on the company's focus. During this data processing period, it was necessary for the data processing unit to be directly subordinate to the economic unit. Most of the processed data "came" from the economic unit. At that time, the data processing department usually had the name of the information system unit and provided the data to the user in a certain time interval (this processing was called batch processing). The length of the time interval was directly dependent on the focus of the company - in the economic section, the most common processing interval was a decade or one month. The development of information and communication technologies has shown that the potential of data processing is completely different - the amount of data stored in the company has increased and it was possible to use this data very well to process analyzes, forecasts, use for decision-making. Many companies have responded to this situation by keeping the IT department in the hands of the economic unit to which it has historically belonged. The situation was handled differently in the companies, mostly the IT department remained part of the department that managed it, or in the area that used the most information technology. It also means the organizational integration of the IT department

- the IT department remained in the economic unit,
- the IT department was included in the company under another department - sales, technology, production,
- the IT department has become an independent unit with a manager directly in the company's top management.

Welch and Welch (2007) state that the management of the entire company significantly affects the proper integration of the IT department into the organizational structure of the company and the existence of an information strategy according to which the entire IT is managed in the company.

In the company's organizational structure, the IT department should be directly part of the top management, but should not be superior to the other departments (as already mentioned), ie directly to the company's "CEO" (who represents the company and is responsible). When the IT department is directly subordinate to the CEO, there are often situations where other departments (eg economic, personnel, production, sales, etc., depending on the company's

focus) are subject to proposals for information systems and the use of information and communication technologies. technology Department of ICT Enterprise. Due to the requirement for quality information for individual departments of the company, it is desirable that the ICT department supports other departments of the company and does not impose "blind" requirements on employees "artificially created by ICT employees. The whole area of informatics is only a supporting activity in the company. It must meet the requirements of the company's employees for data and information, it cannot happen that the company's employees are subject to the processes set in the information system, go through the "dating" phase and try to make the most of the system's functionality. In this case, business processes are often adapted to the processes set up in information systems.

The management of the IT department in the company is very demanding. In many cases where problems with information systems occur, full responsibility is transferred to the information manager. Unfortunately, most of the problems can often be wrong assignments, poor definition of requirements, problems in determining business processes, inconsistencies in the terminology used, neglect of the original user in the team and others depending on the situation in each company. For these reasons, it is very important to pay close attention to the entire information system lifecycle management process. "Informatics" must be carefully devoted to the entire top management of the company, which is responsible for the quality of the information system, there must be cooperation of individual departments according to the management structure - strategic, tactical, operational. A climate must be created in the company that supports the development, operation and quality of the entire information system. The organizational structure in companies is characterized by the following data. It can be seen that the management of the IT department is very different in companies. In large companies, the IT department is most often a separate unit, whose manager is directly in top management – 33,78%. Historically, one of the highest representations of the IT department is still part of the economic unit, where it is incorporated – 22,97%. There is also a high percentage of crowding out IT management from the company (prefers 12,16% of companies) and there is no need to manage IT in the company. Such companies only control the relationship with suppliers. Further integration of the IT department into the company's organizational structure is completely random, depending on how the company has developed, who has worked in the IT business, and of course the business owners also manage the IT department themselves. The situation is very different on farms. The position of IT manager is only in 7% of companies surveyed and is included in the economics department. The individual position of the information manager is not at all in the top line of the monitored companies. All managers require quality information for their decisions, which should be as sensitive and relevant as possible to the problem. Non-context information has little value. The context is determined by the specific content or issue that requires an active solution.

One of the main reasons for the failure of the implementation of information systems is the absence or imperfect strategic management of IS / ICT. Most authorities agree on this diagnosis - see. for example Cash, McFarlan, McKeney, Donovan, Earl, Ward. Unfortunately, "strategic IS / ICT management" often still remains on the fringes of management interest - this is also influenced by inappropriate placement in the organizational structure. An information strategy is a process that helps ensure the optimization of the management process of building, implementing and operating an information system. The architectural design of the information system is an information strategy - defining the requirements for the information system so that it supports the company's business strategy, ongoing business processes and the performance of individual employees as much as possible. It is verified that the costs of the information strategy range between 5 and 10% of the price of the information system. The

costs of the system, built according to the determined strategy, then move with a tolerance of 10% to the estimated price. On the other hand, the costs of an information system built without an established information strategy tend to be several times higher than originally expected. Therefore, many projects are never successfully completed in this way due to the lack of an information strategy.

The results of the survey conducted in 2021 reflect the situation in non-agricultural and agricultural enterprises. It is clear from Graph 1 that the information strategy in the non-agricultural sector is created in 57% of the surveyed enterprises. Multinational enterprises and large enterprises (measured by number of employees and company turnover) and enterprises where they actively work with data, information and knowledge have the most developed information strategy in the non-agricultural sector. The situation is very different for farms. Enterprises with a size of over 2000 ha have an information strategy in place for 24% of enterprises, enterprises with a size of 1000-1999 in 12% and enterprises up to 1000 ha in 1.2%. In agricultural enterprises, an information strategy is developed in enterprises that work better with data, actively use it for management and have more extensive information systems that they use in a wide range of departments - economic, personnel, crop production, animal production, trade. For small farms, the use of business data is minimal. Information systems are used only for registration purposes. For non-agricultural and agricultural enterprises that do not have an elaborated information strategy, a direct survey was conducted. The questions focused on the way of IT management in the company, processing and use of data and information and the development of information and communication technologies. Based on the survey, it can be stated that the situation is very similar in agricultural and non-agricultural enterprises. The management of these companies (companies that do not have an information strategy) is 75% subordinate to the economist, the remaining 25% of companies manage IT randomly, according to current needs - eg the need to change software based on legislative requirements, inadequate hardware (eg insufficient memory capacity or inability to communicate with the external environment). Companies without developed information strategies do not place much emphasis on further processing and use of data and management information. Based on the survey, it is possible to state the research question 1 - it was confirmed only in the part set for the existence of an information strategy for agricultural holdings. In the research question, it was stated that 1% of agricultural holdings have developed an information strategy. The survey showed that the information strategy is developed in 1.2% of the monitored farms. Of the monitored non-agricultural enterprises, it was found that 57% of enterprises had an information strategy. The research question was assumed by 65% of companies. The research question was confirmed only on agricultural holdings.

For research question 2, which assumed the inclusion of an IT department employee in top management in non-agricultural enterprises in 46% and in 5% in agricultural enterprises. The assumed hypothesis was not fulfilled - in non-agricultural enterprises it is only in 33.78% of enterprises and in agricultural enterprises it is not included in the leading role of informatics at all. In the monitored sample of agricultural enterprises, it is directly subordinated to the economist of 7% of enterprises, in other enterprises the management is very random (mostly an employee interested in information and communication technologies).

Information needs in companies and institutions are directly dependent on their focus and on the skills of those who use information resources as a management and planning tool. The focus of the activities of companies and institutions has long been determined by the corporate strategy, mission and goal of each entity. This is where the information strategy development process comes from. The goal of the IT department is to provide the right information at the right time. If the IT department is integrated into the organizational structure at the right level

of management, then the information and knowledge will be delivered in time for the right user. The way the IT department is managed is also reflected in the financial demands of the department, in the complexity of the user's knowledge and skills. The quality of the information system of the provided information is fully dependent on the method and quality of ICT management. Companies need to build a system that allows managers to develop their queries based on a specific situation: - contextual information - managers should be provided with information on the situation being created to be effective, - individually generated alerts - each manager must have a specifically addressed alert in order to be able to act on the situation, - development of rules and procedures based on experience. To create a corporate value paradigm, it is necessary to create an information infrastructure that respects the central role of managers. Managers should be able to personally choose the way they want to participate in co-creating this corporate value. Access to information systems is currently focused on the implementation of portal solutions that enable web access to information and applications with the possibility of efficient administration and administration. There are groups of users with relatively specific information needs, for which a specialized portal is very suitable. It offers "everything in one place" practically all the services and information they need for their activities - they do not have to waste time looking for this information and services elsewhere and can devote more time to their own activities. Information systems strategy is an important part of the information system life cycle. The quality of the entire system is also significantly affected by the monitoring of individual steps of the life cycle methodology. In companies where no emphasis is placed on the creation of information strategies and IS / ICT architecture, support for all business processes is also lower and vice versa. From a quote by M. Dell: "When you do a bad business and make it online, it's a bad business online." Therefore, any change in the corporate information system must be based on the corporate strategy and must be embedded in the information strategy. Otherwise, even in a well-functioning company, problems can gradually arise. The role of each module of the information system is significantly increased with the use of information and knowledge that the system provides for management. According to Vymětala (2006), a proper organizational structure is necessary for the proper management of the IT department, where the information manager should ideally be placed directly in the top management.

4. Conclusion

Agriculture is gradually becoming a knowledge sector, where what employees know (what data and information they obtain) is a key factor in profitability. In particular, managers require up-to-date data and information for their decisions. The same situation is in non-agricultural enterprises. The quality of the obtained data and information depends on the quality of the information system and depends on the quality of proper IT management and the existence of an information strategy. The survey concluded that the quality of management of the initial stages of the information system life cycle significantly affects the quality of the information system, ie the existence of an information strategy and the correct inclusion of the information manager in the organizational structure. The identified status of the monitored issues does not support the quality development and use of information systems. The results of the survey should be repeated and combined with the findings of the use of reports from information systems for management and their impact on the competitiveness of companies.

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References

- [1] Drucker, P. F. (2002): *To nejdůležitější z Druckerův v jednom svazku* (in Czech), Prague: Management Press, 304 p. ISBN 80-7261-066-X.
- [2] Cienciala, J. a kol. (2011): *Procesně řízená organizace*. Professional Publishing. Praha. 203s. ISBN 978-80-7431-044-7
- [3] Hennyeyova, K. and Depes, P. (2010): Analysis of the exploitation of information and communication technologies in the agri-food sector companies, *Agricultural Economics*, Vol. 56, No. 9, pp. 403 – 408. ISSN 0139-570X. DOI 10.17221/100/2009-AGRICECON
- [4] Keřkovský, M.; Drdla, M. (2003): *Strategické řízení firemních informací*, Praha: C.H.Beck, 2003. ISBN 80-7179-730-8
- [5] Sodomka, P. (2006): *Informační systémy v podnikové praxi*. Brno: Computer Press. s.341 ISBN80-251-1200-4
- [6] Tvrđiková, M. (2016): Increasing the Business Potencial of Companies by Ensuring Continuity of the Development of their Information Systems by Current Information Technologies,,*Journal of Business Economics and Management*, Vol. 17, No. 3, pp. 475-489. ISSN 1611-1699. DOI 10.3846/16111699.2013.839475. DOI: 10.3846/16111699.2013.839475
- [7] Vymětal, J.; Diačiková, A.; Váchová, M. (2006): *Informační a znalostní management v praxi*. Praha: LexisNexis CZ, 2006. 399s. ISBN 80-86920-01-1
- [8] Welch, J.; Welch S. (2007): Komu podřídít útvar IT?, *Moderní řízení*, No. 2, s. 45 – 46. ISSN 0026-8720
- [9] Lawson, L. G., Pedersen, S. M., Sørensen, C. G., Pesonen, L., Fountas, S., Werner, A., Oudshoorn, F. W., Herold, L., Chatzinikos, T., Kirketerp, I. M., Blackmore, S. (2011): A four nation survey of farm information management and advanced farming systems: A descriptive analysis of survey responses. *Computers and Electronics in Agriculture*, Vol. 77, No.1, pp. 7–20. ISSN: 0168-1699. DOI: 10.1016/j.compag.2011.03.002
- [10] Sørensen, C.G., Pesonen, L., Bochtis, D.D., Vougioukasc, S.G., Suomi, P. (2011): Functional requirements for a future farm management information system. *Computers and Electronics in Agriculture*, Vol. 76, No. 2, p. 266–276. ISSN: 0168-1699. DOI: 10.1016/j.compag.2011.02.005



SESSION P

**CONCEPT OF SHORT FOOD SUPPLY CHAINS AND ITS
INTERACTION WITH THE COMMON AGRICULTURAL POLICY
OF THE EU**

Slovak Spirits Industry and its Position on Domestic and International Markets

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Abstract

The Slovak spirits industry represents a stable part of the national food and beverage industry. Its position was determined as competitive on the national and international market by national authorities. The manuscript investigates the position of the industry on the domestic and international markets. Quantitative data relating to the number of enterprises and employment show positive change within the observed period of time. However, the production was basically on the same level in the last observed year 2018 compared to the year 2018. Our investigation of the domestic market shows a sign of premiumization of spirits produced within the Slovak Republic with a focus on vodka and spirits aromatized with Juniperus. The international trade with Slovak spirits shows decreasing competitiveness among the dominant categories. There were two of three main categories competitive on the European Single market while there was only one competitive category in the last observed year 2018.

Keywords: *competitiveness, trade, the spirits industry*

JEL Classification: *L66, P33, Q17*

1. Introduction

The Slovak spirit industry represents a traditional branch of the food and beverage industry within the Slovak Republic and almost any developed country in the world. The food and beverage industry represents the most important industry within the EU manufacturing sector (FoodDrinkEurope, 2019) The precise start of history is not clear in relation to this time. The mass production of spirits was determined to start in the 12th century (Hartmann and Schwarz, 2018). There were about 700 commercial distilleries on the territory of the Czech and Slovak Republic in the year 1848 (Nydrle, 1920). A decrease in the number of distilleries was apparent from the year 1945 when the collective ownership introduced by the Communist party in the year 1945 took its consequences.

The global spirits industry represents about one-third of the global alcoholic beverages industry whose revenues are projected to reach 1665.7 bln USD in 2021 (Statista, 2022). The spirits industry plays an important role within the EU territory when it achieved revenues of 29.6 bln. EUR in the year 2018 (Eurostat, 2022). The European spirits industry is composed of 7 411 enterprises and 61 144 employees (Eurostat, 2022).

The spirits industry has been identified as one of the “competitive” branches by the Ministry of Agriculture of the Slovak Republic in its “Concept of development of the Food Industry 2014-2020” (Ministry of Agriculture of the Slovak Republic, 2014).

To determine the position of the Slovak spirits industry we have decided to focus further research on this industry, including its domestic and international position within the territory of the EU.

2. Data and Methods

The research aimed at national and international data and its use within its own calculations. The national data were collected by the Statistical Office of the Slovak Republic and the Research Institute of Agricultural and Food Economics (Resort statistics – results of agriculture and food commodities). Eurostat database (structural business statistics and international trade database) was used to investigate international trade with Slovak spirits. To determine the international trade we focused on the main partner in the form of the EU.

The investigated period was from 2009 to 2018. We have decided to focus on the period of ten continuous years to determine basic dynamics within the Slovak spirits industry.

The research object were spirits and their individual categories according to the binding classification set by the Regulation (EU) 2019/787 of the European Parliament and of the Council of 17 April 2019 on the definition, description, presentation and labelling of spirit drinks, the use of the names of spirit drinks in the presentation and labelling of other foodstuffs, the protection of geographical indications for spirit drinks, the use of ethyl alcohol and distillates of agricultural origin in alcoholic beverages, and repealing Regulation (EC) No. 110/2008. Within the international trade, we focused on categories of spirits within HS2,4,6 and CN8 classification. Classification refers to the Combined Nomenclature based on the Council Regulation (EEC) No. 2658/87 of 23 July 1987 on the tariff and statistical nomenclature and on the Common Customs Tariff. The territory relating the international trade was restricted to the European single market of the EU as the dominant partner of the Slovak spirits industry. The focus was on the following nomenclatures:

- 220830 – Whiskies
- 220870 - Liqueurs and cordials
- 220890 - Ethyl alcohol of an alcoholic strength of < 80% vol, not denatured, spirits and other spirituous beverages.

Our calculations were also enhanced by measuring the comparative advantage of selected categories of spirits. These calculations were based on the Balassa (1965) index which set the bottom line for measuring international competitiveness many years ago. The basic formula can be written in the following form:

$$RCA_a^i = \left(\frac{x_a^i}{x_c^i} \right) / \left(\frac{x_m^i}{x_c^i} \right) \quad [1]$$

Where:

X- represents the export and subscript m refers to combined exports,

a - refers to a particular product,

i - refers to a particular country,

c - refers to all observed countries.

The further development of competitiveness measurement has led to various modifications of this Balassa index (Bowen, 1983; Vollrath, 1991; Yu, 2008). We have used a modified form of the Balassa index first introduced by Vollrath (1991). The revealed comparative advantage

is calculated based on the relative export advantage and relative trade advantage. The basic formulation can be written in the following form:

- RXA – relative export advantage

$$RXA_a^i = \left(\frac{X_a^i}{X_n^i}\right) / \left(\frac{X_a^r}{X_n^r}\right) \quad [2]$$

- RTA – relative trade advantage

$$RMA_a^i = \left(\frac{M_a^i}{M_a^c}\right) / \left(\frac{M_m^i}{M_m^c}\right) \quad [3]$$

- RCA – revealed comparative advantage

$$RCA_a^i = Ln(RXA_a^i) - Ln(RMA_a^i) \quad [4]$$

Where:

X - represents export,

M – refers import,

i - refers to selected country,

r – refers to all countries (except the country i),

a – refers to a specific product,

n – refers to all products (except the product a).

The RCA index divides the object of research into two directions. Values with $RCA > 0$ represent competitive categories of the Slovak spirits industry. Values with $RCA < 0$ represent categories of the Slovak spirits industry with competitiveness disadvantage.

3. Results and Discussion

We have investigated the changes within the Slovak spirits industry from two individual angles. The research was first oriented on the dynamics within the Slovak spirits industry on the domestic market between the years 2009 and 2018. The Slovak spirits industry has a stable and important role within the international trade of the country related to the food industry. Thus, to gain a complex view of the Slovak spirits industry, we also conducted an investigation of the industry concerning the European single market of the EU.

3.1 Dynamics within the Slovak spirits industry on the domestic market

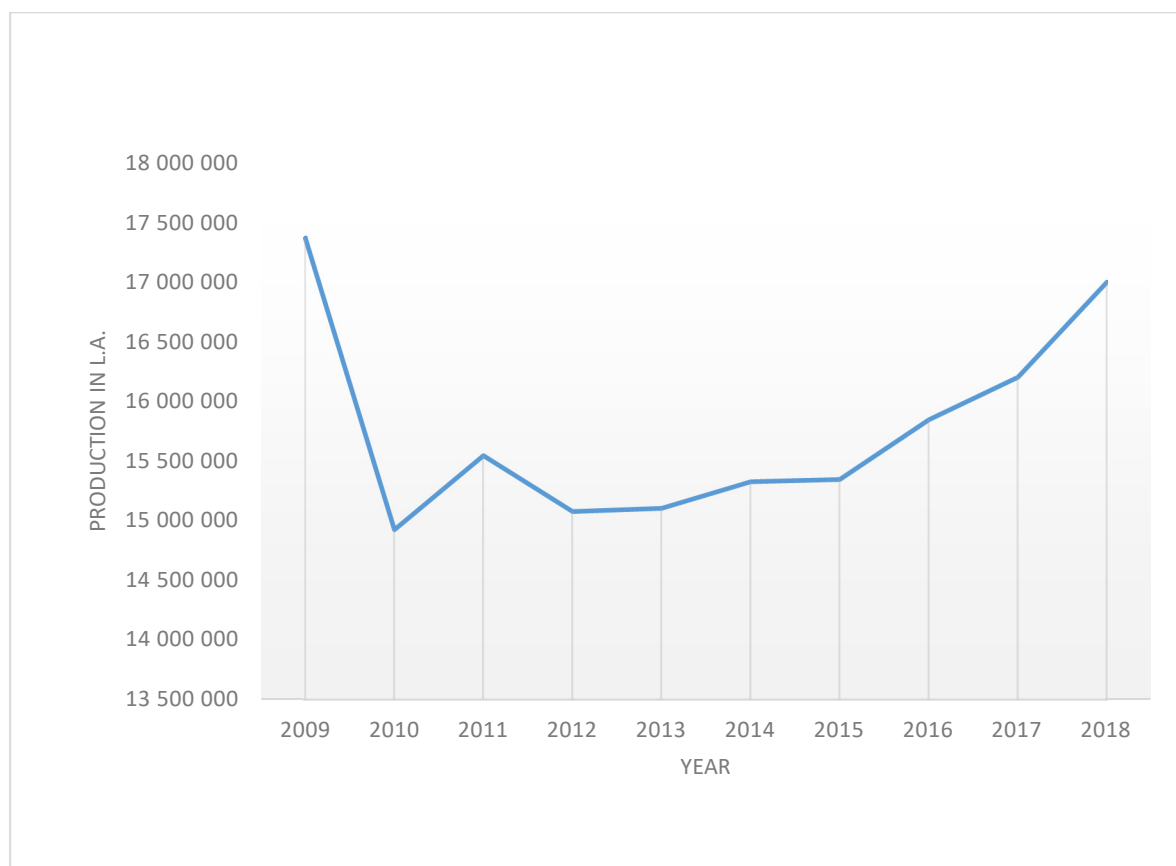
The spirits industry represents a traditional branch of the food and beverage industry within probably all countries of the world. The Slovak Republic has also a relatively stable situation within this branch of the national food and beverage industry.

Table 1: Number of enterprises and employment within the Slovak spirits industry between years 2009 and 2018

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Persons employed	624	575	622	700	619	773	748	776	864	880
Number of enterprises	43	88	103	85	103	107	101	112	108	119

Source: EUROSTAT, processed by the author

Our investigation proves this hypothesis if we compare the employment and number of enterprises. We see growth both in the number of employees and number of enterprises within the Slovak spirits industry during the observed years 2009 and 2018. During the ten observed years, we observed a growth of 41.03% in the number of employees despite some slighter decrease in the year 2010, 2011 and 2013. Even higher change was observed in the number of enterprises. According to the data available by the EUROSTAT, the number of enterprises almost tripled (2.76x) between the years 2009 and 2018. If we compare registrations of new enterprises within the Slovak spirits industry published by the Ministry of the Agriculture and Rural Development of the Slovak Republic, we see clearly that this significant change was caused by a high number of new registrations of small fruit distilleries. This positive dynamic influences the competitiveness of the industry when new, modern and flexible companies are entering the market pursuing on many occasions a higher quality transparency of products.


Figure 1: Production (liters) within the Slovak spirits industry between years 2009 and 2018

Source: EUROSTAT, processed by the author

The spirits production within the Slovak Republic achieved two opposite trends. First, we observed a sharp decline in spirits production between the years 2009 and 2010. This negative trend may be a result of the financial crisis that started in late 2008 and had its consequences for many industries within the EU countries from the year 2010. The decline in the production of spirits is also supported by the decrease in the number of employees within the Slovak spirits industry in the year 2010. The spirits production remained at the lower production rate until the year 2015. After this year we see a definitive positive pathway in production growth lasting until the last observed year 2018. Despite this growth in production towards the end of our observations, it was not enough to bring the production to the level that was achieved in the year 2009. The production of spirits within the Slovak spirits industry was at 17 004 295 liters in the year 2018, missing 370 350 liters to equal the production from the year 2009.

Table 2: Most important types of spirits produced within the Slovak spirits industry (thsd. liters)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Vodka	4361	4040	4275	4489	4975	5186	5157	5336	5674	6166
Spirits aromatised with Juniperus	3520	2713	3311	3245	3226	3288	3474	3530	3401	3617
Liquers	665	414	448	440	406	476	411	695	481	482

Source: EUROSTAT, processed by the author

The higher observed production volatility within the Slovak spirits industry was not uniform within all types of spirits. Our observations show changes in both directions within individual types of spirits when investigating the production.

The most important type of spirit produced within the Slovak Republic is vodka. This type of spirits also made a decline when comparing trends between the years 2009 and 2010. If we follow our investigation in next years, we clearly see an opposite trend. Vodka experienced a relatively gradual growth in terms of production within the Slovak spirits industry. Its growth caused a change in the production of 41.38% when comparing production from the years 2009 and 2018.

The second-largest category is represented by spirits aromatised with Juniperus. This category represents traditional spirits very popular in the country explaining its relatively high production. Opposite to the vodka production, there was a different pathway observed within this category of spirits during our investigations. If we compare the first and last year of our research period, we determine only 2.76% growth in the production. There was also a substantial drop of 22.93% in production between the years 2009 and 2010.

The third-largest category of spirits produced by the Slovak spirits industry is the category of liqueurs. This category already shows the lower influence on the total production of spirits in the country when the production was almost thirteen times lower compared to the production of vodka in the year 2018. Its change in production was similar to the change already observed within the category of spirits aromatised with Juniperus between the years 2009 and 2010. The production dropped by 37.74% between these two years. The actual rate of the decline was the highest from all the three investigated categories. In opposite to the category of spirits aromatised by Juniperus, this category was not able to recover from this decline. The category of liqueurs experienced the highest decline in production of 27.52% between the years 2009 and 2018.

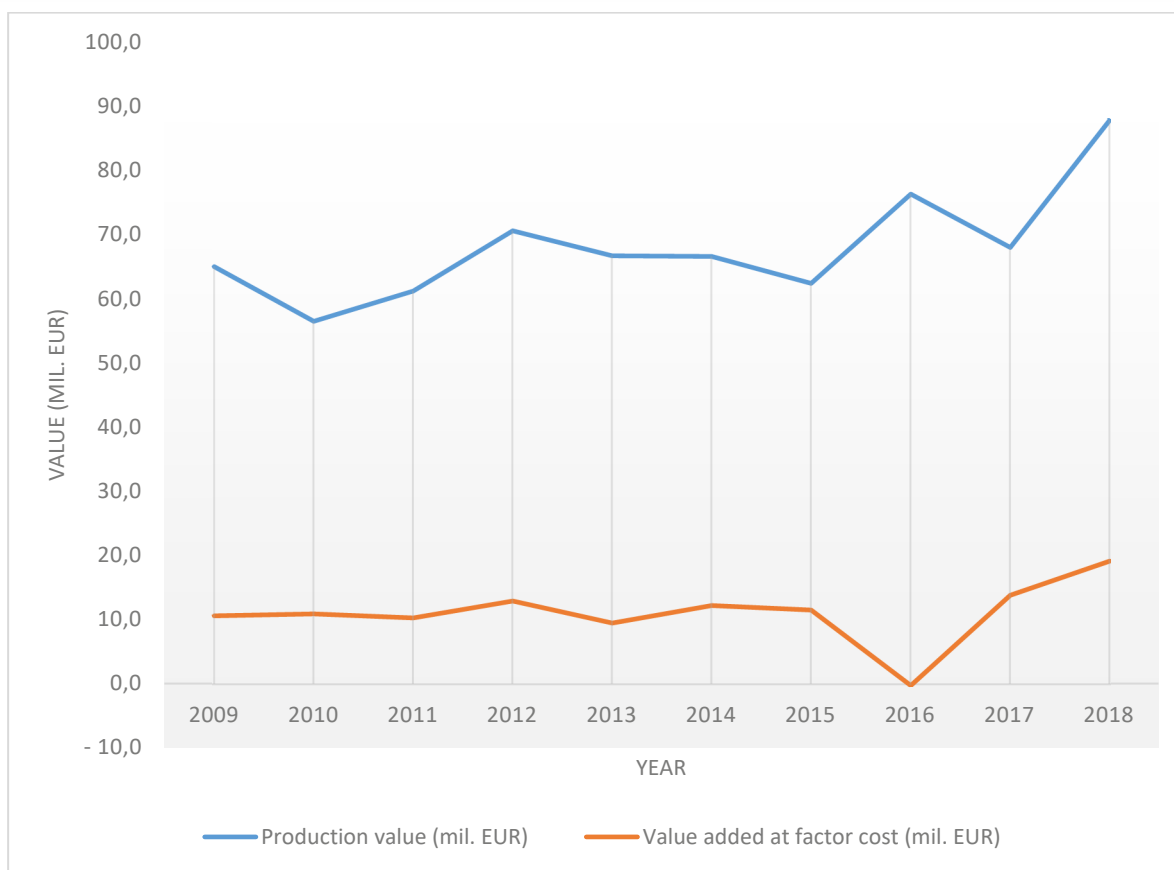


Figure 2: The production value and value added at factor cost (mil. EUR) within the Slovak spirits industry between years 2009 and 2018

Source: EUROSTAT, processed by the author

The production value represents only one quantitative side of the Slovak spirits industry. There is a continuous change within the industry when many sources refer to the premiumization of the spirits production (<https://bevalcinsights.com/how-the-premiumization-trend-will-impact-retail/>, <https://spirits.eu/a-spirit-of-innovation/premiumisation-brand-elevation>, <https://www.rankincork.co.uk/the-future-of-the-drinks-industry-how-premiumisation-is-changing-the-way-we-drink-and-vice-versa/>).

This abovementioned trend can be identified also within the Slovak spirits industry. While the production of spirits declined by 2.13% between the years 2009 and 2018, the total value of spirits production grew by 35.08%. This disproportion between the production itself and the value in EUR clearly shows that the Slovak spirits industry experienced premiumization of its production during the investigated period of time.

Even more evident proof of the abovementioned statement can be documented by the investigation of the value-added at the factor cost. It has achieved a positive change (2.83%) between the years 2009 and 2010 despite a decline in production (-14.10%) and production value (-7.85%) within the same period of time. If we compare the value added at factor cost between years 2009 and 2018, we observe a growth of 80.19%. This is the most significant change within the Slovak spirits industry declaring a clear pathway in direction of better quality products production.

3.2 Slovak spirits industry and its position on the European single market of the EU

The second part of our research was oriented on the international trade with products of the Slovak spirits industry. We have investigated the export and import of the industry including a more detailed investigation of the international trade with the most important types of spirits. We have conducted also a more detailed analysis of the three most important types of spirits in relation to their share of the total international trade.

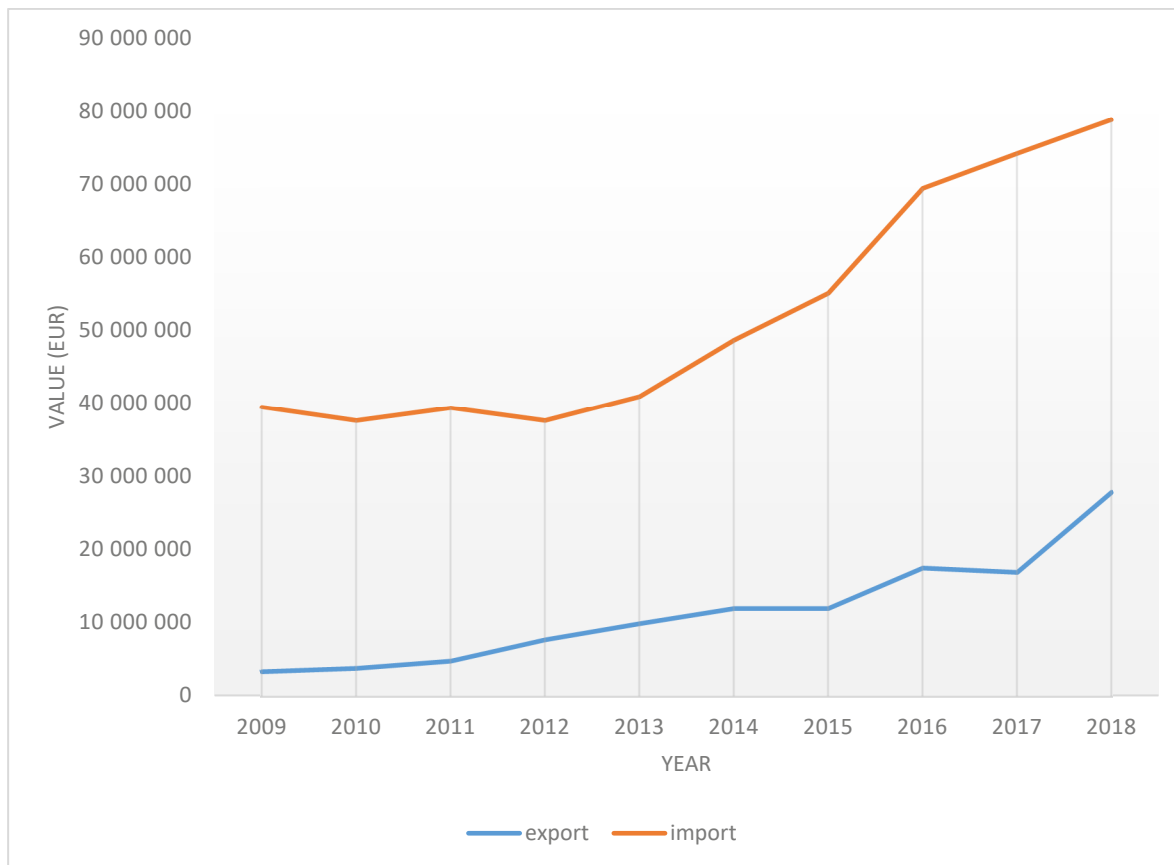


Figure 3: The Export and import value of the Slovak spirits industry between years 2009 and 2018

Source: EUROSTAT, processed by the author

First, we have compared the export and import value of the Slovak spirits industry as a whole. As shown in figure 3, international trade with spirits has a negative trade balance. The negative trade balance continued during the whole period of time but the percentual increase was only in the amount of 9.37%. A positive sign in international trade with spirits can be determined by the analysis of the import and export values. The import value shows an increase of 99.93% but the export value has increased by 8.16-times. The increase in export value shows a positive trend within the Slovak spirits industry on the European single market of the EU.

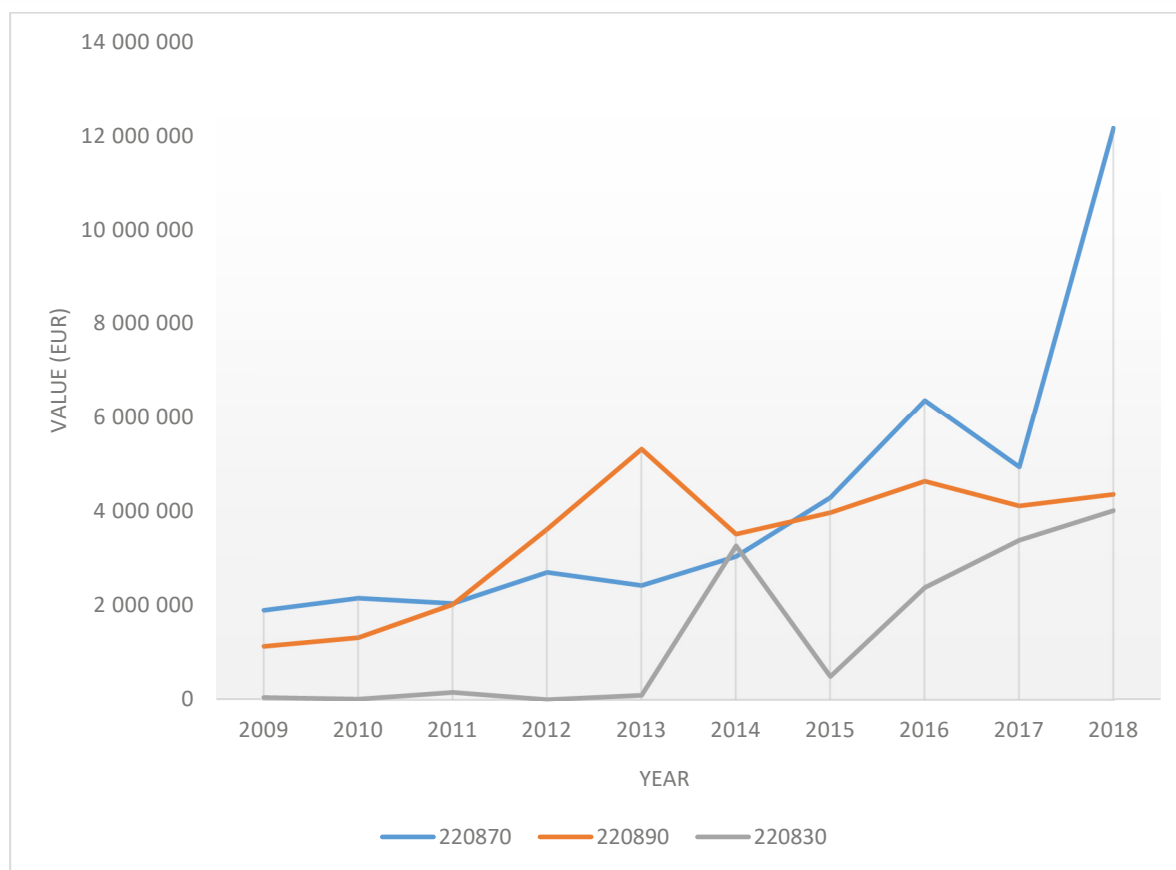


Figure 4: The export value of the three most important spirits within the Slovak spirits industry between years 2009 and 2018

Source: EUROSTAT, processed by the author

The most important type of spirits was the category of liqueurs and cordials (nomenclature 220870), if we compare export values in years 2009 and 2018. The growth of export value was higher 6.4x in the year 2018 compared to the year 2009, representing a gain of 10 260 946 EUR. This is the most significant gain in export value among all investigated categories of spirits between the years 2009 and 2018. The highest export growth can be seen from the year 2014 onwards (see Figure 4).

The second most important category of spirits relating the export value were spirits listed under nomenclature 220890 (Ethyl alcohol of an alcoholic strength of < 80% vol, not denatured; spirits and other spirituous beverages). This category is represented by various spirits that can not be clearly assigned to any dedicated category. The export value grew 3.85x between years 2009 and 2018 representing a change in export value of 3 229 196 EUR. This category also outperformed the category of liqueurs and cordials in the years 2012, 2013 and 2014.

The third-largest share on the export of spirits can be assigned to the category of whiskies (nomenclature 220830). This category experienced the most significant change in terms of percentual change when the export value grew 85.55x. The change in the export value was in the amount of 3 972 095 EUR. The nomenclature 220830 experienced the highest percentual change and the second-highest change in total export value if we compare export values between years 2009 and 2018.

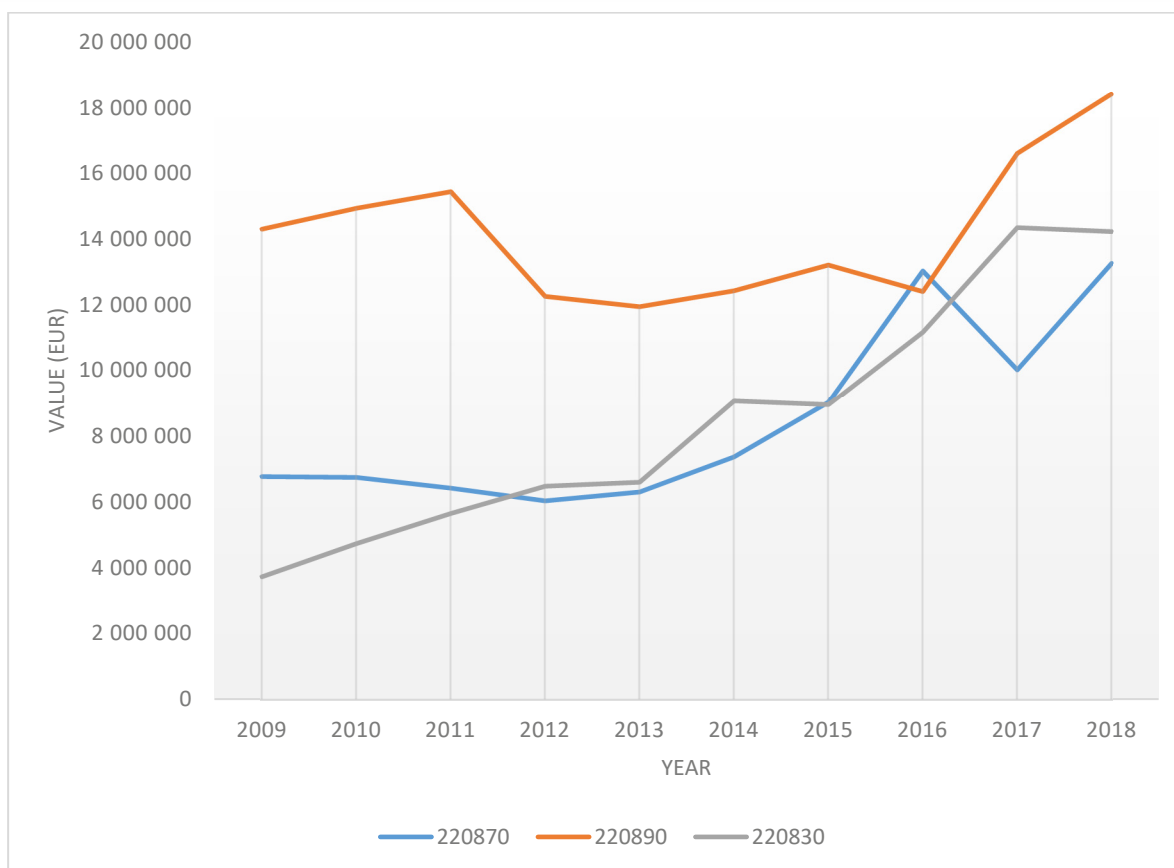


Figure 5: Import value of the three most important spirits within the Slovak spirits industry between years 2009 and 2018

Source: EUROSTAT, processed by the author

We have observed a diverse situation within the import structure of spirits compared to the already investigated export structure. The most important category of imported spirits is represented by the nomenclature 220890 (Ethyl alcohol of an alcoholic strength of < 80% vol, not denatured; spirits and other spirituous beverages). This category of imported spirits lost its dominant position only in the year 2016 when it was overtaken by the liqueurs and cordials category by a small margin (623 350 EUR). The import value of this category of spirits grew by 28.6% between the years 2009 and 2018 representing an incline of 4 099 033 EUR. This percentual change was significantly lower compared to the change in export. Despite this fact, the total growth in value was higher compared to the export value (difference of 869 837 EUR).

During the observed period of time, there was a change between the second and the third most imported type of spirits. The whiskies category (nomenclature 220830) has been able to overtake the category of liqueurs and cordials between the years 2009 and 2018 (see Figure 5). The import value grew 3.81x representing an incline of 10 502 730 EUR. This change in value is the most significant increase among all imported categories of spirits.

The third place in imports was represented by the category of liqueurs and cordials. This category grew by the second slowest pace from all three most important categories relating to the import value. This category, registered under nomenclature 220870, grew 1.96x between the years 2009 and 2018. This percentual change represents an incline of 6 497 116 EUR within the investigated period of time.

Table 3: Revealed comparative advantage of the three most important types of spirits relating export and import within the Slovak spirits industry within the years 2009 and 2018

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
220830	-2,15	-3,77	-1,72	-7,26	-3,02	0,50	-1,50	-0,14	0,09	-0,26
220870	1,77	1,70	1,29	1,02	0,57	0,58	0,99	0,87	0,91	1,28
220890	0,27	0,10	0,34	0,68	1,05	0,22	0,53	0,53	0,16	-0,34

Source: EUROSTAT, calculated by the author

The last part of the investigation was the estimation of the revealed comparative advantage of the three most important categories of spirits regarding international trade. We have calculated the data using the modified Balassa index. Our calculations show a significant change in the competitiveness of investigated spirits categories. Two of the three investigated categories (nomenclature 220870 and 220890) had a positive value of the RCA index in the year 2009. The highest-ranking was achieved by the nomenclature 220870 representing the category of liqueurs and cordials in the year 2009. There was only one category of spirits that was able to achieve a positive value of the RCA index in the year 2018. The category of liqueurs and cordials was the only category with a positive RCA value in the year 2018. However, there was a significant inconsistency between individual years.

The nomenclature 220890 (Ethyl alcohol of an alcoholic strength of < 80% vol, not denatured; spirits and other spirituous beverages) achieved a negative RCA value in the year 2018. It was the highest negative value among all three compared types of spirits categories in the last observed years. Despite this fact, it remained a category of spirits with a positive revealed comparative advantage until the last investigated year 2018.

The last category, observed by our research, was the nomenclature 220830 referring to the category of whiskies. This category of spirits had a negative value of the RCA index as the only type of spirits within our group of spirits in the year 2009. This negative value was observed during most of the time during the years 2009 and 2018. In fact, it only was able to achieve a positive value of the calculated index in the years 2014 and 2017. Despite the negative value of the RCA index in the last observed year, it is a positive sign that this category of spirits was able to achieve a decline in the negative value of the index.

4. Conclusion

The research activity of the Slovak spirits industry was aimed both at the domestic and international market represented by the European single market of the EU. Different aspects influencing the overall condition of the industry were examined.

We have observed in detail the number of enterprises, employment and production within the Slovak spirits industry on the domestic market. The industry achieved a positive change in the number of enterprises (growing 2.76x) and the number of employees (growth of 41.03%). Despite these changes recorded within the Slovak spirits industry, the overall production declined by 2.13% (370 350 liters) between the observed years 2009 and 2018. We have experienced a significant dynamics within various categories of spirits during investigated years. The category of vodka and spirits aromatised with Juniperus represent more than half of the overall production. Vodka has experienced the highest dynamics between the years 2009 and 2018 when the increase in production was 41.38%.

We have identified also a sign of premiumization of the production when the production value grew by 35.08% despite the mentioned decline in the overall production of 2.13% within the investigated period of time.

The second part of our research was aimed at the international trade of the Slovak spirits industry. Both export and import grew substantially during investigated years while the export significantly outperformed the import value (growing 8.16x). Nevertheless, the import still dominated in the last observed year 2018. The highest dynamics has been observed within the category of liqueurs and cordials (growing 6.4x between years 2009 and 2018). On the other hand, imports have grown substantially within the category of whiskies (growing 85.55x) within the same period of time. The examination of the export and import structure revealed that on both sides are apparent the same categories of spirits. Thus, we have focused our research to unfold the position of these categories on the European single market of the EU. This research activity has shown that there was a negative quantitative development in the competitive types of spirits. When using the modified Balassa index we have determined two out of three investigated categories of spirits in the year 2009. There was only one competitive category of spirits on the European single market of the EU in the year 2018. Thanks to the significant increase in export could the category of liqueurs and cordials achieve a positive value of the RCA index (1.28 in 2018 compared to 1.77 in 2009) also in the last investigated year.

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References

- [1] BevAlc Insights Team. (2020, June 24). How the ‘Premiumization’ Trend Will Impact Retail. BevAlc Insights. <https://bevalcinsights.com/how-the-premiumization-trend-will-impact-retail/>
- [2] Bowen, H. P. (1983). On the theoretical interpretation of indices of trade intensity and revealed comparative advantage. *Weltwirtschaftliches Archiv*, 119(3), 464–472. <https://doi.org/10.1007/bf02706520>
- [3] Council Regulation (EEC) No 2658/87 of 23 July 1987 on the tariff and statistical nomenclature and on the Common Customs Tariff
- [4] Eurostat (2022). Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E) (sbs_na_ind_r2). Retrieved Jan. 5, 2022 from <https://ec.europa.eu/eurostat/data/database>
- [5] Eurostat (2022). EU trade since 1988 by HS2,4,6 and CN8 (DS-645593). Retrieved Jan. 5, 2022 from <https://ec.europa.eu/eurostat/data/database>
- [6] FOODDRINKEUROPE. (2019, October 1). DATA & TRENDS 2019. FoodDrinkEurope. https://www.fooddrinkurope.eu/uploads/publications_documents/FoodDrinkEurope_-_Data_Trends_2019.pdf
- [7] Ministry of Agriculture and Rural Development of the Slovak Republic. (2014). Aktuality - Konceptia rozvoja potravinárskeho priemyslu 2014 – 2020 - Ministerstvo pôdohospodárstva a rozvoja vidieka SR. Aktuality - Ministerstvo pôdohospodárstva a rozvoja vidieka SR. <https://www.mpsr.sk/koncepcia-rozvoja-potravinarskeho-priemyslu-2014-2020/59---8878/>

- [8] Ministry of Agriculture and Rural Development of the Slovak Republic (2022). Register for /permissions granted based on par. 7 §4 Act No. 467/2002 Col. On the production and marketing of alcohol. Retrieved Jan. 10, 2022 from <https://www.google.com/search?q=google+prekladac&oq=google+prekladac&aqs=chrome..69i57j0i51219.1687j0j7&sourceid=chrome&ie=UTF-8>
- [9] Regulation (EU) 2019/787 of the European Parliament and of the Council of 17 April 2019 on the definition, description, presentation and labelling of spirit drinks, the use of the names of spirit drinks in the presentation and labelling of other foodstuffs, the protection of geographical indications for spirit drinks, the use of ethyl alcohol and distillates of agricultural origin in alcoholic beverages, and repealing Regulation (EC) No. 110/2008
- [10] Seo, B. (2020, April 9). The Future of the Drinks Industry: How Premiumisation is Changing the Way We Drink, and Vice Versa. Rankin Brothers & Sons. <https://www.rankincork.co.uk/the-future-of-the-drinks-industry-how-premiumisation-is-changing-the-way-we-drink-and-vice-versa>
- [11] SpiritsEUROPE - A Spirit of Innovation - Premiumisation & brand elevation. (2022). SpiritsEurope. <https://spirits.eu/a-spirit-of-innovation/premiumisation-brand-elevation>,
- [12] Statistical Office of the Slovak Republic (2022). Consumption selected types of food per capita. Retrieved Jan. 5, 2022 from http://datacube.statistics.sk/#!/view/sk/VBD_SLOVSTAT/ps2041rs/v_ps2041rs_00_00_00_sk
- [13] Vollrath, T. L. (1991). A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage. *Weltwirtschaftliches Archiv*, 127(2), 265–280. <https://doi.org/10.1007/bf02707986>
- [14] Yu, R., Cai, J., & Leung, P. S. (2008). The normalized revealed comparative advantage index. *The Annals of Regional Science*, 43(1), 267–282. <https://doi.org/10.1007/s00168-008-0213-3>

Evaluation of the Insemination doses Additives Using CASA Technology - Maca Peruana

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Abstract

The artificial insemination (AI) represents the most effective biotechnological method used in horse breeding. Therefore, the optimization of already established protocols and their novelization are an important research topic globally with the one goal - to preserve and improve the quality of insemination doses and thus improve the fertility rate. The purpose of the study was to investigate the activity of Maca peruana and determine changes in physiological functions of stallion spermatozoa by adding a solution of Maca dissolved in DMSO and diluted with saline to concentrations 0, 2, 4 and 8% (CON, A, B, C, respectively). The samples were incubated at 37°C throughout the experiment and the measurements were performed in time intervals 0, 60 and 120 minutes. The quality of samples was evaluated by CASA and mitochondrial toxicity test. Motility and progressive motility of spermatozoa of stallions showed stimulative tendency in Maca treated samples especially in experimental group A that exhibited the highest percentages in all measured intervals. The mitochondrial toxicity test showed changes in Maca treated samples, whose survival was several percent higher than the control sample. In conclusion, the beneficial effect of Maca on spermatozoa has been partially confirmed but mainly when spermatozoa were treated with very low concentrations of additive. The study brings an attention to not widely used plant substance (Maca peruana) and offers numerous opportunities for further research concerned with male reproduction and AI in particular.

Keywords: *Lepidium meyenii*, fresh cooled semen, Peruvian maca, spermatozoa, stallion

1. Introduction

Spermatogenesis is a complex process highly sensitive to exogenous factors. Many of these factors are associated with the current lifestyle. Male infertility is becoming a global problem in both humans and animals (Tafari et al., 2021). In horse breeding, artificial insemination provides many benefits such as prevention of problems with the transport of animals, prophylaxis and moreover to improve or maintain the characteristics of the horse breed. Addition of antioxidants and other adjuvants to insemination doses is an essential tool for maintaining the quality of stallion spermatozoa. They can be used *in vivo* as a dietary supplement or *in vitro* as a medium supplement (Ciani et al., 2021). The main task of antioxidant additives is to prevent oxidative damage of spermatozoa caused by the preparation and manipulation with ejaculate *in vitro*. Oxidative damage in spermatozoa can be manifested by decreased motility, viability, DNA damage, or impaired membrane and acrosome integrity.

Oxidative stress has been shown to significantly reduce the success of assisted reproduction (Agarwal et al., 2017).

Numerous studies are currently examining the effects of naturally occurring antioxidants. Plants and their fruits are a source of many natural antioxidants and other substances that have been shown to have beneficial effects on animal cells *in vitro*, including spermatozoa. Peruvian maca is attracting more and more attention because it has many uses, for example against fatigue, improves spermatogenesis and increases fertility. Recently, Maca has been shown to have high antioxidant activity, especially Maca polysaccharides (Zhang et al., 2017). The continuing interest in this plant is based on the expected effects on male mammalian fertility due to the presence of certain partially specific secondary compounds (Clement et al., 2009).

1.1 Peruvian Maca

The Peruvian Maca (*Lepidium meyenii*, syn. *Lepidium peruvianum*) was domesticated probably between 4000 and 1200 BC on the high plateaus of Peru's central Andes. This biennial plant belongs to the family Brassicaceae (Toledo et al., 1998). The plant adapts well to extreme conditions at high altitudes (cold weather, strong UV radiation, low oxygen levels and unstable climate) (Zhang et al., 2016). Hypocotyls are widely used as a nutritional supplement in human medicine to increase fertility and sexual function. Dried Maca hypocotyls are rich in high nutritional elements such as carbohydrates, proteins, lipids, essential amino acids, and free fatty acids. Maca also contains several secondary metabolites, such as macamides, macaridine, alkaloids and glucosinolates. Macamides are specific Maca alkalamides that are known for their antioxidant effect (Tafari et al., 2019). The purpose of this study was to investigate the activity of Maca peruana and the effects on physiological functions of spermatozoa.

2. Data and Methods

2.1 Material

Ejaculate samples were obtained from breeding stallions (n = 6) from breeding stables in western part of Slovakia. The age of stallions was 5-26 years. The collection was realized from stallions of the Holstein horse breed. The horse feed consisted of hay and oats and stallions were housed in stables with straw bedding.

2.2 Ejaculate collection

Ejaculate collection was performed in the morning hours. Preheated artificial vagina (40 – 42°C; Colorado type, Minitube, Tiefenbach, Germany) was used for the collection. After filling with water, the pressure was adjusted by adding the required amount of air. The vagina was lubricated with indifferent sterile vaseline. Ejaculate collection from stallions was performed by phantom jump (Halo et al., 2019).

2.3 Preparation of Maca solution

A stock solution was prepared from maca powder (Bio Maca; GymBeam). In the experiment, 20 mg of maca powder was diluted in 1 ml of DMSO. The DMSO solution was prepared from a commercial solution (Sigma Aldrich, St. Louis, USA) and saline (0.9% NaCl; Braun Melsungen AG, Germany) and adjusted to a concentration of 20%. After extracting the bioactive substances from the maca, we filtered the solution through filter paper. The filtrate thus obtained was prepared in final Maca concentrations of 2, 4 and 8%.

2.4 Preparation of samples

Stallion ejaculate was diluted in ratio 1:2 with three prepared maca DMSO-based solutions diluted in saline: A - 2% solution; B - 4% solution; C - 8% solution. Control samples (CON) were prepared by diluting ejaculates only with saline and DMSO. Spermatozoa motility was assessed at three time intervals: 0, 60 and 120 minutes at temperature 37°C.

2.5 CASA – Computer Assisted Semen Analysis

The basic principle of the CASA microscopy-based system is to obtain a series of sequential images of motile spermatozoa in a static imaging field (Budai et al., 2014). Spermatozoa analyzes were performed by computer sperm analyzer (CASA) with SpermVision software (Minitube, Tiefenbach, Germany) and an Olympus BX 51 microscope (Olympus, Japan). Diluted ejaculate samples (10 µL) were pipetted on the Makler counting chamber (Sefi-Medical Instruments, Germany) pre-heated to 37°C for each analysis. Following parameters were observed - total motility (MOT; %), progressive motility (PRO; %) and other trajectory and velocity parameters (Halo Jr. et al., 2021).

2.6 Determination of cell viability

Spermatozoa viability was determined using the mitochondrial activity test (MTT test) according to Mosman (1983). This method is based on the conversion of the yellow tetrazolium salt (3- (4,5-dimethylthiazol-2-yl) -2,5-diphenyltetrazolium bromide) to blue formazan particles, which catalyzes the mitochondrial enzyme succinate dehydrogenase of intact mitochondria inside living cells, with intent Formazan staining of samples can be quantified spectrophotometrically using an ELISA microplate reader.

The tetrazole salt (Sigma Aldrich, St. Louis, USA) was dissolved in PBS (Dulbecco's Phosphate Buffer Saline, Sigma Aldrich, St. Louis, USA) at a ratio of 5 mg/mL and 10 µL of this solution was added to wells of 96 chamber microplate containing spermatozoa samples. After two hours of incubation, the tetrazole and succinate dehydrogenase reaction was stopped using isopropanol (Centralchem, Bratislava, Slovakia) (Tvrđá et al., 2015). The optical density at 570 nm versus 620 nm as a reference value was determined with a microplate Elisa reader (Multiskan FC, ThermoFisher Scientific, Vantaa, Finland). The resulting data were expressed as a percentage, while the value of the control sample was standardized to 100%.

2.7 Statistical analysis

Statistical software GraphPad Prism 5 software (GraphPad Software, Inc. La Jolla, California, USA) was used for statistical processing of the results using paired Student's t-test. Significant differences of the control group compared to the experimental groups were determined at the level of statistical significance: * P <0.05; ** P <0.01; *** P <0.001.

3. Results and Discussion

We evaluated the effect of Peruvian maca in three different concentrations for individual parameters of stallion spermatozoa motility *in vitro* during cultivation at 37°C temperature. The effect of Maca (*Lepidium meyenii*) was evaluated at time intervals of 0, 60 and 120 minutes.

The Peruvian persimmon has a somewhat positive effect on spermatozoa. The percentage of spermatozoa motility (MOT) was reduced during the first measurement compared to the control sample. However, it increased over the cultivation time where samples A (2%) and B (4%) recorded higher MOT than CON in time intervals 60 and 120 minutes. The obtained

results indicate a positive effect of maca in lower concentrations in all monitored time intervals. However, higher concentrations imply negative effects (Figure 1).

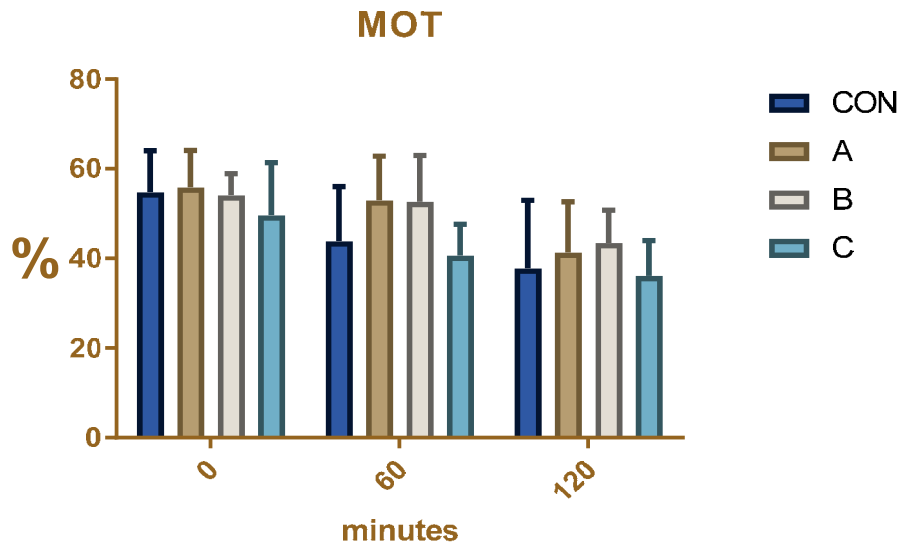


Figure 1: The effect of Maca on the total spermatozoa motility (%) at 37 °C. A – 2%; B – 4%; C – 8% solution of Maca

The highest decrease in progressive motility (PRO) occurred in sample C (8%) after 60 and 120 minutes (Figure 2). No samples showed significant differences compared to the control sample. For sample A (2%), we observed a slight increase in progressive motility compared to the control at all time intervals.

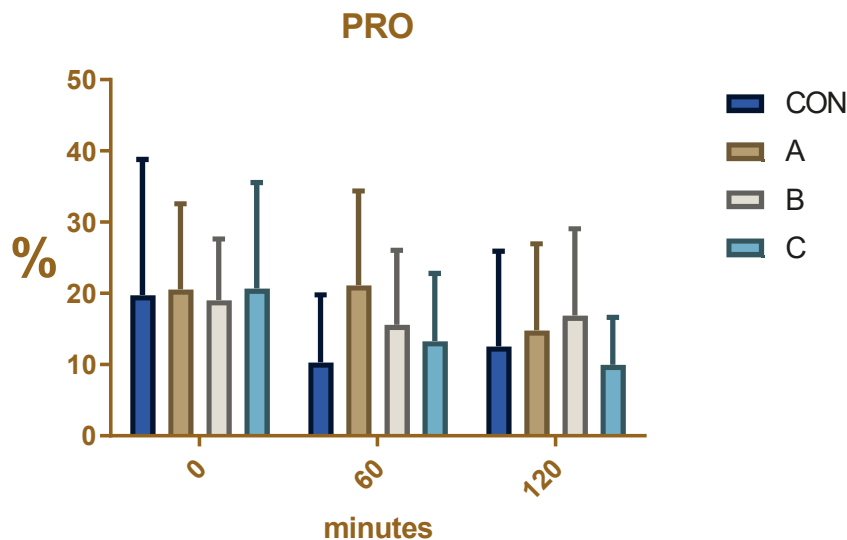


Figure 2: The effect of Maca on the progressive spermatozoa motility (%) at 37 °C. A – 2%; B – 4%; C – 8% solution of Maca

We tested the mitochondrial activity of spermatozoa using the MTT assay after experimental treatment with Peruvian maca. MTT detects succinate dehydrogenase activity and thus we determine mitochondrial activity. The test was performed after 120 minutes of cultivation, the results are compared in Figure 3. Increased spermatozoa viability was noticeable in each

experimental sample enriched with Maca. From the results of this analysis, we can state that mitochondrial activity was the most increased in the sample C (8%) compared to the control.

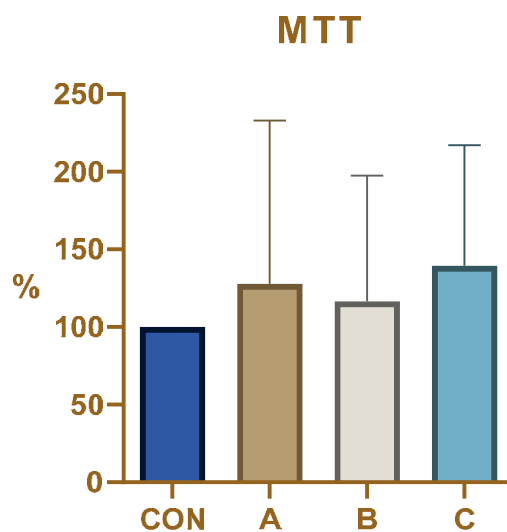


Figure 3: The effect of Maca on the viability (%) of stallion spermatozoa after 120 minutes of incubation at 37 °C. A – 2%; B – 4%; C – 8% solution of Maca

A previous *in vivo* study on humans showed that Peruvian maca improves ejaculate volume, spermatozoa count (concentration), motile spermatozoa count and spermatozoa motility, although it does not affect the levels of relevant serum hormones, including serum luteinizing hormone, follicle stimulating hormone (FSH), for testosterone or estradiol. This suggests that the improved quality of ejaculate observed because of Maca administration may be due to an increase in bioavailable testosterone or testosterone receptors and an improved Sertoli cell response to FSH (Aoki et al., 2018).

Aoki et al. (2018) examined whether the addition of Maca to the culture medium improved the *in vitro* fertilization (IVF) success rate. As expected, in fertilization, the rate of fertilization in maca-enriched medium was significantly increased compared to control medium. The results showed that human tubal fluid (HTF) medium containing Maca extract at a concentration of 4% was the most suitable for IVF in mice.

The study conducted on bulls reports that ejaculate volume and spermatozoa density were evidently increased with time in the control group and Maca-treated bulls. The same results were proven for spermatozoa density and total spermatozoa count per ejaculate. The percentage of motile spermatozoa increased over time in bulls with the addition of Maca. This study demonstrated positive effects of supplementing ground dried Maca hypocotyl in prepubertal bulls. Supplementation of Maca hypocotyl improved mating patterns, spermatozoa count, and quality. Further research is necessary before definitively recommending of this approach. This could include using higher doses of maca, applying the most effective form of maca, black hypocotyls, and extending the experiment by using more bulls with lowered spermatozoa quality (Clement et al., 2010).

The use of Peruvian maca also induces an increase in testicular size and stimulation of spermatogenesis in rats and mice. Maca reduced spermatogenic damage in mice and prostate size in rats and restored stress-induced homeostasis in mice (Valentová et al., 2006).

Basic research is required to fully understand the mechanism of action of Maca on spermatozoa parameters. Potential bioactive substances in Maca include macaridine, macamides, macaene,

glucosinolates, alkaloids and Maca nutrients. However, these data are insufficient to determine whether the maca is clinically effective (Lee et al., 2016).

4. Conclusion

From the results of the study, we can state that lower concentrations of Peruvian maca have positive effects on motility (MOT) and progressive motility (PRO) of stallion spermatozoa compared to higher concentrations where a negative impact was observed. Interestingly the highest concentration was effective in the case of viability/mitochondrial activity (MTT) of spermatozoa. However, none of the monitored parameters showed significant differences compared to the control. Despite this fact, the effects of this plant on spermatozoa bring interesting results. As it is a not widely used plant, its effects *in vitro* are still worth further research. In the future, more specific analyses need to be performed to confirm or refuse its positive effects on the spermatozoa quality.

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References

- [1] Agarwal, A., & Majzoub, A. (2017). Role of Antioxidants in Assisted Reproductive Techniques. *The World Journal of Men's Health*, 35(2), 77. <https://doi.org/10.5534/wjmh.2017.35.2.77>
- [2] Aoki, Y., Tsujimura, A., Nagashima, Y., Hiramatsu, I., Uesaka, Y., Nozaki, T., Ogishima, T., Shirai, M., Shoyama, Y., Tanaka, H., & Horie, S. (2019). Effect of *Lepidium meyenii* on *in vitro* fertilization via improvement in acrosome reaction and motility of mouse and human sperm. *Reproductive Medicine and Biology*, 18(1), 57–64. <https://doi.org/10.1002/rmb2.12251>
- [3] Ciani, F., Maruccio, L., Cocchia, N., d'Angelo, D., Carotenuto, D., Avallone, L., Namagerdi, A. A., & Tafuri, S. (2021). Antioxidants in assisted reproductive technologies: An overview on dog, cat, and horse. *Journal of Advanced Veterinary and Animal Research*, 8(1), 173–184. <https://doi.org/10.5455/javar.2021.h500>
- [4] Clément, C., Kneubühler, J., Urwyler, A., Witschi, U., & Kreuzer, M. (2010). Effect of maca supplementation on bovine sperm quantity and quality followed over two spermatogenic cycles. *Theriogenology*, 74(2), 173–183. <https://doi.org/10.1016/j.theriogenology.2010.01.028>
- [5] Halo, M., Massanyi, P., Gren, A., Lasak, A., Slanina, T., Ondruska, L., Muchacka, R., Galbavy, D., Ivanic, P., Schneir, E. R., & Formicki, G. (2019). Time and Dose-Dependent Effects of *Viscum Album Quercus* on Rabbit Spermatozoa Motility and Viability *In Vitro*. *Physiological Research*, 955–972. <https://doi.org/10.33549/physiolres.934223>
- [6] Halo Jr, M., Buřka, K., Antos, P. A., Greń, A., Slanina, T., Ondruška, L., Tokárová, K., Massányi, M., Formicki, G., Halo, M., & Massányi, P. (2021). The effect of ZnO nanoparticles on rabbit spermatozoa motility and viability parameters *in vitro*. *Saudi Journal of Biological Sciences*, 28(12), 7450–7454. <https://doi.org/10.1016/j.sjbs.2021.08.045>
- [7] Lee, M. S., Lee, H. W., You, S., & Ha, K.-T. (2016). The use of maca (*Lepidium meyenii*) to improve semen quality: A systematic review. *Maturitas*, 92, 64–69. <https://doi.org/10.1016/j.maturitas.2016.07.013>

- [8] Mosmann, T. (1983). Rapid colorimetric assay for cellular growth and survival: Application to proliferation and cytotoxicity assays. *Journal of Immunological Methods*, 65(1), 55–63. [https://doi.org/10.1016/0022-1759\(83\)90303-4](https://doi.org/10.1016/0022-1759(83)90303-4)
- [9] Tafuri, S., Cocchia, N., Carotenuto, D., Vassetti, A., Staropoli, A., Mastellone, V., Peretti, V., Ciotola, F., Albarella, S., Del Prete, C., Palumbo, V., Esposito, L., Vinale, F., & Ciani, F. (2019). Chemical Analysis of *Lepidium meyenii* (Maca) and Its Effects on Redox Status and on Reproductive Biology in Stallions. *Molecules*, 24(10), 1981. <https://doi.org/10.3390/molecules24101981>
- [10] Tafuri, S., Cocchia, N., Vassetti, A., Carotenuto, D., Esposito, L., Maruccio, L., Avallone, L., & Ciani, F. (2021). *Lepidium meyenii* (Maca) in male reproduction. *Natural Product Research*, 35(22), 4550–4559. <https://doi.org/10.1080/14786419.2019.1698572>
- [11] Toledo, J., Dehal, P., Jarrin, F., Hu, J., Hermann, M., Al-shehbaz, I., & Quiros, C. F. (1998). Genetic Variability of *Lepidium meyenii* and other Andean *Lepidium* Species (Brassicaceae) Assessed by Molecular Markers. *Annals of Botany*, 82(4), 523–530. <https://doi.org/10.1006/anbo.1998.0715>
- [12] Tvrdá, E., Kováčik, A., Tušimová, E., Massányi, P., & Lukáč, N. (2015). Resveratrol offers protection to oxidative stress induced by ferrous ascorbate in bovine spermatozoa. *Journal of Environmental Science and Health, Part A*, 50, 1440–1451. ISSN: 1532-4117
- [13] Valentová, K., Buckiová, D., Křen, V., Pěkníková, J., Ulrichová, J., & Šimánek, V. (2006). The in vitro biological activity of *Lepidium meyenii* extracts. *Cell Biology and Toxicology*, 22(2), 91–99. <https://doi.org/10.1007/s10565-006-0033-0>
- [14] Zhang, J., An, M., Chen, Q., Liu, A., Jiang, X., Ji, S., Lian, Y., & Wen, X. (2016). Electrochemical Study of the Diffusion and Nucleation of Gallium(III) in [Bmim][TfO] Ionic Liquid. *Electrochimica Acta*, 190, 1066–1077. <https://doi.org/10.1016/j.electacta.2016.01.027>
- [15] Zhang, L., Li, G., Wang, S., Yao, W., & Zhu, F. (2017). Physicochemical properties of maca starch. *Food Chemistry*, 218, 56–63. <https://doi.org/10.1016/j.foodchem.2016.08.123>

Antioxidant and Biochemical Characterisation of Cornelian Cherry (*Cornus mas* L.)

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Abstract

Cornelian cherry (Cornus mas L.) is a naturally growing plant especially in Europe and Asia used mainly in traditional medicine in the past. At present, it is beginning to be given the importance again, as it can be an excellent source of bioactive substances with a high antioxidant activity. In this study, antioxidant capacity, total polyphenols, phenolic acids, flavonoids, anthocyanins, basic dry matter components and carbohydrates were investigated. The antioxidant activity was determined by DPPH method, the total polyphenols, phenolic acids, flavonoids, and anthocyanins were determined by spectrophotometric analyses. Analysis of selected bioactive substances showed that cornelian cherry is a rich source of polyphenols, which was reflected in its high antioxidant activity, especially in the stone due to significantly higher values ($p < 0.001$) of total antioxidant capacity, total polyphenols and total phenolic acid content when compared to the pulp. The stone of cornelian cherry also showed positive values of polyunsaturated fatty acids and carbohydrates content. This study contributes to the analysis of cornelian cherry, which can be used in the preparation of functional foods or in the medicine.

Keywords: antioxidants, Cornelian cherry, polyphenols

1. Introduction

The consumption of plants with a high antioxidant potential plays an important role in the maintenance of health and in disease prevention, such as *diabetes*, inflammation, cardiovascular disease, cancer, and other metabolic disorders (Terry, Terry & Wolk, 2001). Cornelian cherry (*Cornus mas* L.) is a plant with a high content of bioactive substances, which are characterized by antioxidant activity. It is a shrub or a small tree that grows mostly in Europe and Asia and its fruits are standing out sour taste (Celik, Bakirci & Şat, 2006). The use of cornelian cherry is abundant, whether in traditional medicine or in food production. In China, cornelian cherry is used in herbal medicine because of its analgesic and diuretic properties. It is also known that cornelian cherry can improve liver and kidney functions and has anti-microbial, anti-histamine and anti-allergic characteristics (Vareed, Reddy, Schutzki & Nair, 2006). Food products from cornelian cherry include for example jam, marmalade, pestil, syrup, paste, sherbet or it can be consumed directly (Celik et al., 2006). In addition to fruit, the use is found also in leaves that are rich in tannins, from the wood and the bark is obtained a dye and from the seed is obtained an oil. The flowers can be used in the treatment of diarrhoea (Demir & Kalyoncu, 2003). Compounds found in fruits such as phenolics, anthocyanins, flavonoids, carotenoids, and vitamins contribute to varying degrees to the antioxidant activity of individual fruits (Pantelidis, Vasilakakis, Manganaris & Diamantidis, 2007). In recent years,

the interest in nutraceuticals and functional foods has led to initiate selection of crops with higher than normal phenolic antioxidant compounds, such as cornelian cherry, blueberries, sea buckthorn, strawberries, plums and peaches (Yilmaz, Ercisli, Zengin, Sengul & Kafkas, 2009). The objective of this study was to analyse biochemical properties, a total antioxidant capacity, total anthocyanins, total polyphenols, flavonoids, and phenolic acids content in cornelian cherry (*Cornus mas* L.) pulp and stone.

2. Data and Methods

Cornelian cherry was obtained from the Institute of Plant and Environmental Sciences of Slovak University of Agriculture in Nitra, Slovak Republic. Cornelian cherries were washed and separated from stones. Pulps and stones were crushed separately in a mortar with a pestle and used for future analyses. Variability of basic dry matter components and carbohydrate content in evaluated plant parts was determined by chemical analysis in accredited laboratories. An ethanol extract (2 grams of cornelian cherry were weighed and dissolved in 10 mL of 96% acidified ethanol) was formed from the pulp and the stone, which was needed to determine the parameters. A total antioxidant capacity was determined by DPPH method of Sanchez, Larrauri & Saura (1998). Total polyphenols were determined by using the Folin-Ciocalteu reagent method by Singleton & Rossi (1965). Flavonoids were analysed by the procedure of Willet (2002), phenolic acids analysis were followed by protocol of Polskie Towarzystwo Farmaceutyczne (1999). For anthocyanins determination, a weighed sample (2 grams of pulp) was transferred to a beaker, quenched with 10 mL of acidified ethanol, and heated to reflux. The extract was poured after filtration into a 100 mL volumetric flask and the residue was repeatedly extracted with small portions of acidified ethanol (8-9 times). After extraction, the volume of the flask was made up to the mark and the flask was placed into the dark for 15 minutes. After that the absorbance was measured at 535 nm. The results of anthocyanins were calculated based on the formula:

$$\text{anthocyanins (g/kg)} = \frac{A * r * Mv * V}{e * n}$$

Legend: A – absorbance, r – dilution, Mv – molecular weight of the dominant anthocyanin [g/mol], V – volume of the solution [cm³], e – molar absorption coefficient of the dominant anthocyanin [dm³/mol.cm³], n – weight of the sample [g]

All these analyses were performed in triplicate and analysed by spectrophotometer (Jenway 6405 UV/Vis, UK) at different wavelengths and the resulting values were expressed as means ± standard error of the mean (SEM). Statistical software GraphPad Prism 6 was used for statistical analysis. All data were analysed using unpaired parametric t-test to compare the stone and the pulp content values in cornelian cherry and significant differences were set at the level $p < 0.001$.

3. Results and Discussion

Cornelian cherry has been recognized as a natural treatment for centuries. Its properties are linked with the secondary metabolites like polyphenols or tannins. These polyphenols are characterized by their antioxidant activity (Szczepaniak, Clsowska, Kusek & Przeor, 2019).

For this reason, the total content of antioxidants in the pulp and the stone was determined and the results were compared with each other. When comparing the stone with the pulp, we obtained a significantly higher antioxidant activity in the stone (Figure 1), which may be due to the presence of a larger amount of total polyphenols present in the stone. The antioxidant activity measured in the stone was 7.84 ± 0.27 mg Trolox equivalent antioxidant capacity per gram (mg.TEAC/g) and the antioxidant activity measured in the pulp was 4.19 ± 0.29 mg.TEAC/g.

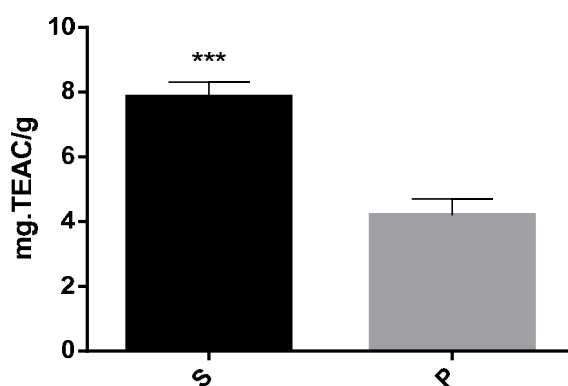


Figure 1: The total antioxidant capacity

Legend: S – the stone of cornelian cherry, P – the pulp of cornelian cherry, *** means a significant difference at $p < 0.001$

The comparison of bioactive compounds showed a significantly higher content of total polyphenols (Figure 2) and phenolic acids (Figure 3) in the stone compared to the pulp. Values of the total polyphenols in the stone were 29.61 ± 0.33 mg gallic acid equivalents per gram (mg.GAE/g) and the total phenolic acids content in the pulp were 6.66 ± 0.16 mg caffeic acid equivalent per gram (mg.CAE/g). Higher amount of polyphenols in the stone may be due to solid character of the stone that is more concentrated compared to the pulp, which contains a larger amount of water (Antolovich, Prenzler, Robards & Ryan, 2000). Polyphenols found in plants are influenced by environmental factors as well as post-harvest processing conditions (Kadir, Sezai, Yasar, Memnune & Ebru, 2009).

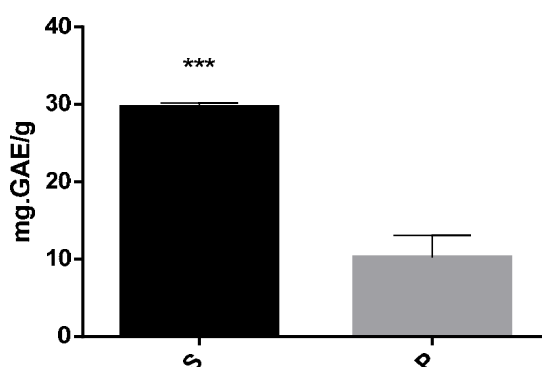


Figure 2: The total polyphenols content

Legend: S – the stone of cornelian cherry, P – the pulp of cornelian cherry, *** means a significant difference at $p < 0.001$

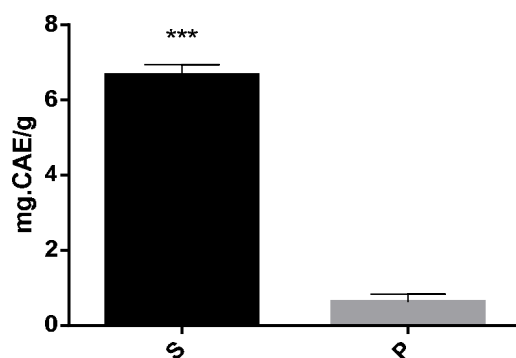


Figure 3: The total phenolic acids content

Legend: S – the stone of cornelian cherry, P – the pulp of cornelian cherry, *** means a significant difference at $p < 0.001$

When comparing the content of flavonoids (Figure 4), higher levels were measured in the pulp, but no significant difference between the groups was recorded. Our data of total flavonoids content were expressed in mg quercetin equivalent per gram (mg.QE/g). The role of flavonoids is protecting plants against various biotic and abiotic stresses and they play an important role in the interaction between the plant and their environment (Samanta, Das & Das, 2011).

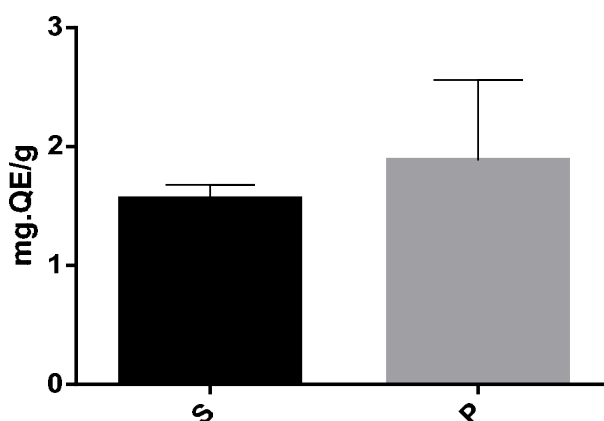


Figure 4: The total flavonoids content

Legend: S – the stone of cornelian cherry, P – the pulp of cornelian cherry

Of the total weight of 2 grams of cornelian cherry pulp, the value of anthocyanins was 0.54 ± 0.02 g/kg (Figure 5). In the study of Hamid, Yousef, Jafar & Mohammad (2011), the genotype can influence content of anthocyanins found in cornelian cherry, however they did not find any statistically significant correlation between antioxidant activity and content of anthocyanins. David, Danciu, Moldovan & Filip (2019) identified three main anthocyanins in cornelian cherry, which are cyanidin-3-O-galactoside, pelargonidin-3-O-glucoside and pelargonidin-3-O-rutinoside, responsible for antioxidant activity in this fruit.

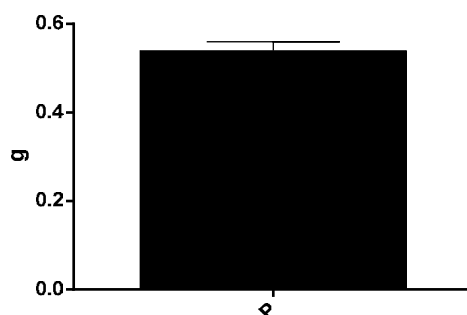


Figure 5: Anthocyanin's content

Legend: P – the pulp of cornelian cherry

Results from basic dry matter components are stated in Table 1 and carbohydrate content in evaluated plant parts is stated in Table 2. It is known that saturated fatty acids can increase low-density lipoprotein (LDL), which is a strong risk factor for cardiovascular disease (Briggs, Petersen & Etherton, 2017). Our results showed that Cornelian cherry stone has less content of saturated fatty acids when compared to the pulp and also the stone showed higher values of polyunsaturated fatty acids, which have positive effects on health. Determination of carbohydrate content showed that pulp has higher amount of fructose. At present, researchers are developing foods that have lower sugar content and become alternative sources of sweeteners, which would reduce dietary sugar intake and reduce the risk of diseases such as *diabetes*, high cholesterol, obesity, and cardiovascular disease (Edwards, Rossi, Corpe, Butterworth & Ellis, 2016). Results of our analyses indicate that cornelian cherry stone has much more potential in preparation of healthy foods due to its better properties than the pulp.

Table 1: Basic dry matter components

Component	SI	Stone	Pulp
Dry matter	%	90.73	85.59
Proteins	%	2.41	4.03
Ash	%	1.07	2.75
Lipids	%	4.42	1.68
Saturated fatty acids	g/100 g fat	12.20	39.70
Monounsaturated fatty acids	g/100 g fat	21.70	12.50
Polyunsaturated fatty acids	g/100 g fat	64.10	33.00

Table 2: Carbohydrate content

Carbohydrates	SI	Stone	Pulp
Fructose	g/kg	2.6	69.5
Maltose	g/kg	<0.5	<0.5
Sucrose	g/kg	2.5	<0.5
Lactose	g/kg	<0.5	<0.5

4. Conclusion

As a conclusion, this study clearly shows the potential value of cornelian cherry. Cornelian cherry could be considered a valuable source of natural antioxidants. Particularly high values of bioactive substances, polyunsaturated fatty acids, carbohydrates, and antioxidant capacity were shown by the stone of cornelian cherry in comparison with the pulp. The use of cornelian cherry can be in a functional food production, a nutraceutical supplementation and possible in a medicine or a pharmacy.

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References

- [1] Antolovich, M., Prenzler, P., Robards, K. & Ryan, D. (2000). Sample preparation in the determination of phenolic compounds in fruits. *Analyst*, 125(5), 989-1009. doi:10.1039/B000080I
- [2] Briggs, M. A., Petersen, K. S. & Etherton, P. M. K. (2017). Saturated fatty acids and cardiovascular disease: replacements for saturated fat to reduce cardiovascular risk. *Healthcare*, 5(2), 29. doi:10.3390/healthcare5020029
- [3] Celik, S., Bakirci, I. & Şat, I. G. (2006). Physicochemical and organoleptic properties of yogurt with cornelian cherry paste. *International Journal of Food Property*, 9(3), 401-408. doi:10.1080/10942910600596258
- [4] David, L., Danciu, V., Moldovan, B. & Filip, A. (2019). Effects of in vitro gastrointestinal digestion on the antioxidant capacity and anthocyanin content of cornelian cherry fruit extract. *Antioxidants*, 8(5). doi:10.3390/antiox8050114
- [5] Demir, F. & Kalyoncu, I. H. (2003). Some nutritional, pomological and physical properties of cornelian cherry (*Cornus mas* L.). *Journal of Food Engineering*, 60(3), 335-341. doi:10.1016/S0260-8774(03)00056-6
- [6] Edwards, C. H., Rossi, M., Corpe, C., Butterworth, P. J. & Ellis, P. R. (2016). The role of sugars and sweeteners in food, diet and health: alternatives for the future. *Trends in Food Science & Technology*, 56. doi:10.1016/j.tifs.2016.07.008
- [7] Hamid, H., Yousef, H., Jafar, H. & Mohammad, A. (2011). Antioxidant capacity and phytochemical properties of cornelian cherry (*Cornus mas* L.) genotypes in Iran. *Scientia Horticulturae*, 129(3), 459-463. doi:10.1016/j.scienta.2011.04.017
- [8] Kadir, U. Y., Sezai, E., Yasar, Z., Memnune, S. & Ebru, Y. K. (2009). Preliminary characterisation of cornelian cherry (*Cornus mas* L.) genotypes for their physico-chemical properties. *Food Chemistry*, 114(2), 408-412. doi:10.1016/j.foodchem.2008.09.055
- [9] Pantelidis, G. E., Vasilakakis, M., Manganaris, G. A., Diamantidis, G. (2007). Antioxidant capacity, phenol, anthocyanin and ascorbic acid contents in raspberries, blackberries, red currants, gooseberries and Cornelian cherries. *Food Chemistry*, 102(3), 777-783. doi:10.1016/j.foodchem.2006.06.021
- [10] Polskie Towarzystwo Farmaceutyczne (1999). *Farmakopea Polska VI*. Polskie Towarzystwo Farmaceutyczne, Warszawa, PL.
- [11] Samanta, A., Das, G. & Das, S. K. (2011). Roles of flavonoids in plants. *International Journal of Science Technology*, 6(1), 12-35.

- [12] Sanchez, M. C., Larrauri, A. & Saura, C. F. (1998). A procedure to measure the antioxidant efficiency of polyphenols. *Journal of the Science of Food and Agriculture*, 76(2), 270-276. doi:10.1002/(SICI)1097-0010(199802)76:2<270::AID-JSFA945>3.0.CO;2-9
- [13] Singleton, V. L. & Rossi, J. A. (1965). Colorimetry of total phenolics with phosphomolybdic-phosphotungstic acid reagents. *American Journal of Enology and Agricultural*, 6, 144-158.
- [14] Szczepaniak, O. M., Clsowska, J. K., Kusek, W. & Przeor, M. (2019). Functional properties of Cornelian cherry (*Cornus mas* L.): a comprehensive review. *European Food Research and Technology*, 245, 2071-2087. doi:10.1007/s00217-019-03313-0
- [15] Terry, P., Terry, J. B. & Wolk, A. (2001). Fruit and vegetable consumption in the prevention of cancer: an update. *Journal of internal medicine*, 250(4), 280-290. doi:10.1046/j.1365-2796.2001.00886.x
- [16] Vareed, S. K., Reddy, M. K., Schutzki, R. E. & Nair, M. G. (2006). Anthocyanins in *Cornus alternifolia*, *Cornus controversa*, *Cornus kousa* and *Cornus florida* fruits with health benefits. *Life Sciences*, 78(7), 777-784. doi:10.1016/j.lfs.2005.05.094
- [17] Willett, W. C. (2002). Balancing life-style and genomics research for disease prevention. *Science*. 292, 695-698.
- [18] Yilmaz, K. U., Ercisli, S., Zengin, Y., Sengul, M. & Kafkas, E. Y. (2009). Preliminary characterisation of cornelian cherry (*Cornus mas* L.) genotypes for their physico-chemical properties. *Food Chemistry*, 114(2), 408-412. doi:10.1016/j.foodchem.2008.09.055

Short Food Supply Chains – the Case Study of Particular Enterprise in SR

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Abstract

Short supply chain means a supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors, and consumers. It represents a relatively young concept in the Slovak Republic, that is underdeveloped at national level, but has received considerable attention at the international level. The objective of the paper is to evaluate the operation of a selected agricultural enterprise in a short food supply chain based on the example of the case study.

Keywords: Short Food Supply Chains, Rural Development, Regional Products

JEL Classification: Q18, R11, R51

1. Introduction

Short food supply chains (SFSC) represent a relatively young concept in the Slovak Republic, that is underdeveloped at national level, but has received considerable attention at the international level. The SFSC concept uses mainly local human and material resources, which is an essential feature of local economic development, which is based on the endogenous development concept and the internal resources of the locality.

Agriculture is one of the major sectors of the national economy, as well as one of the most important sectors, providing employment opportunities, especially in rural areas of Slovakia. As a sector using mainly local material resources, it plays an important role in the development of local economies. According to Rovný and Nagyová (2007), agriculture also "plays a significant role in the creation of a rural economy that is created outside large cities and forms the primary economy producing material goods, subsequently linked to services, industry and trade". However, as stated by e.g. Ilbery et al. (2004), agriculture "remains as the economic backbone of lagging rural regions with long-established endemic problems, which include geographical remoteness, poor infrastructures, low population densities, limited employment opportunities and poor development capacities", but according to De Fazio (2016), "implementation of farming methods, which are getting more and more intensive, put pressure on the environment, on the sustainability of the agricultural industrial production process and increase the number of kilometres the goods have to travel in order to be distributed". As De Fazio (2016) further notes, "the lengthening of the supply chain developed over the last decades – due to the multiplication of intermediaries - has produced effects from an environmental, economic, social and territorial point of view cannot pass unnoticed". The shortening of the supply chain with its important effects such as "economic gains provided by less transportation" (Rong et al., 2011), but also "the emergence of synergies between agriculture and other rural activities, like tourism and handicraft" (Graltion and Vanclay, 2009),

seems to be a logical solution to the situation. According to Kneafsey et al. (2013), “shortening the number of links in the supply chain results in increased local sales, increased demand for local services, and increased labour markets”. Further study of short supply chains reveals that in this concept the term “local” is endowed with a particular set of values, such as principles of endogenous development, ethical trade, fair treatment of workers, social inclusion, environmental sustainability (Kneafsey et al., 2013).

As the term “short” indicates, there is a significant emphasis put on minimising the distance which the food has to overcome travelling from the producer to the consumer’s table. Consumers don’t need to travel long distances in order to purchase their desired favourite food from the farmer, food producer or processor. Galli and Brunori (2013) stress the importance of SFSC, especially for SMEs, which “are often less competitive in the conventional chains due to their higher costs of production (because of the lack of economies of scale and the different organisation of production processes) and the higher prices” and which can increase their economic viability thanks to the fair access to the market.

Legislation represents the basic tool for public authorities to define qualitative and quantitative characters of SFSC. Legal documents clearly determine basic terms – short supply chains and local markets, on which the support is provided. To allow the demarcation between these two, the quantitative limitations should be defined, taking into account specific geographic features of the area concerned. Last but not least, it is necessary to define the qualitative aspects, especially concerning the hygiene rules and obligations of producers.

Two European legal documents determine limitations of short food supply chains. According to the Article 2, par. m) of the Regulation (EU) No 1305/2013 of the European Parliament and of the Council, "short supply chain": means a supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers. Delegated Regulation (EU) No 807/2014 and Regulation (EU) No 1305/2013 represent the basic European legislation determining SFSC from the point of view of distance and number of intermediaries. In accordance with the Article 11 of the Commission Delegated Regulation (EU) No 807/2014:

support for the establishment and development of short supply chains, as referred to in Article 35(2)(d) of Regulation (EU) No 1305/2013 shall cover only supply chains involving no more than one intermediary between farmer and consumer;

support for the establishment and development of local markets, as referred to in Article 35(2)(d) of Regulation (EU) No 1305/2013 shall cover markets for which the rural development programme sets out a kilometric radius from the farm of origin of the product, within which the activities of processing and sale to the final consumer have to take place.

Rural Development Programme of the Slovak Republic 2014-2020 (RDP) sets out the 100 km radius for local market from the place of origin of product or within the territory of Higher Territorial Unit where the enterprise resides.

Specific rules for support of short food supply chains are defined in the Rural Development Programme of the Slovak Republic 2014-2020 (RDP). In terms of the main priority 3 – Promoting Food Chain Organisation, Including Processing and Marketing of Agricultural Products, Animal Welfare and Risk Management in Agriculture, the RDP defines conditions for support of actors within SFSC, addressing focus areas 3A – improving competitiveness of primary producers by better integrating them into the agri-food chain through quality schemes, adding value to agricultural products, promotion in local markets and short supply circuits,

producer groups and organisations and inter-branch organisations, 6A – facilitating diversification, creation and development of small enterprises, as well as job creation and 6B – fostering local development in rural areas.

The support especially concerns investments into properties in terms of selling and processing agricultural products, starting the production of new and traditional products, introduction of new technique / technologies, and creation of small places for selling agricultural products. The support is provided within the Measure 4 – Productive investments, sub-measure 4.2 – Support for investments for processing/placing on the market and/or developing agricultural products.

Horizontal and vertical cooperation of farms organised in SFSC, cooperation between SFSC actors when creating logistic platforms for promotion of SFSC and local markets, and dissemination activities can be supported, too. Farmers and producers / processors of agricultural and food products can be supported within the sub-measure 16.4 – Support for horizontal and vertical cooperation between the supply chain actors in setting up and developing short food supply chains and local markets and for promotional activities in the local context related to the development of short food supply chains and local markets. The support is focused on activities, such as creation of studies or plans concerning the SFSC and local markets development, recovery of the relevant logistic platform, resp. the SFSC or local market, measurements and tests of relevant samples, operating costs for the business plan implementation, rental costs directly linked to the implementation of logistics platforms, short food supply chains or local markets (all for merchandise-like outlets – classical, mobile or portable or stand-alone) and promotion and marketing costs.

The objective of the paper is to evaluate on the example of a case study the operation of a selected agricultural enterprise in a short food supply chain.

2. Data and Methods

When selecting an enterprise for the collection of primary data, we proceeded in accordance with the quantitative criteria on the basis of which short supply chains are defined within the RDP:

- a radius of 100 km from the place of origin of the product or as the territory of a higher territorial unit in which the enterprise of origin of the product is located for the local market within which the farmer provides his products to consumers,
- a maximum of one intermediary between the farmer and the consumer,
- Agricultural Paying Agency (Summary overview of the RDP SR 2014 – 2020 project measures) for 2017 and 2020. For the sub-measure 16.4 Support for horizontal and vertical cooperation between the supply chain actors in setting up and developing short food supply chains and local markets and for promotional activities in the local context related to the development of short food supply chains and local markets, we collected the data for the following indicators: number of accepted applications for grant, total requested grant, number of approved projects, total approved grant and contracted percentage. Additionally, in the „beneficiaries section“, we monitored the amount of individual types of direct payments approved to some enterprises in 2017, 2018 and 2019,
- Register of Financial Statements of the Ministry of Finance of the Slovak Republic, where from the financial statements of the monitored enterprises, we monitored data on the

following indicators for the current accounting period: operating income, operating expenses and profit/ /loss from operations.

3. Results and Discussion

As an example of good practice we have chosen the company TBS, a.s. (hereinafter referred to as the company), which operates in the municipality of Podkylava belonging to the Kopanice region. We have focused on this company for the following reasons:

- the company has been developing integrated cooperation with another entity in a short supply chain based on the family partnership for a long time (since 2013),
- the company does not have more than 9 employees for agricultural production during the whole monitored period and the net turnover does not exceed 2 mil. EUR. In accordance with Article 2 of the Annex I to the Commission Regulation (EU) No 182/2011. 651/2014 of 17 June 2014 for a certain part of the aid as compatible with the internal market under Articles 107 and 108 of the Treaties classifies micro-enterprises.

The company was founded in 1998 as a joint-stock company with two subsidiaries - Radvaň Limited Liability Company., Nová Bošáca and Stará Turá Private Hotel Academy. The company gradually grew and from 1997 it began to focus on animal production (Charolais cattle breeding). It currently consists of four main parts:

1. Farm (crop and livestock production), returned for sale from the yard
2. Agropension Adam
3. Regional processing plant of fruit, chocolate, craft brewery
4. Agrotourism (except agropension) - children's summer camps, bike paths.

The company is based in Stará Turá (Nové Mesto nad Váhom district), but agricultural production is concentrated on a farm in Podkylava in the Myjava district, in the Trenčín region.

Within agricultural production, the company applies production methods, i.e. primary production and processing. According to the statistical classification of economic activities in the European Community, NACE, the main activity of the holding is focused on dairy farming, specifically on the breeding of meat cattle without marketable milk production. In addition to the activities mentioned above, the company also processes veal into semi-finished products. In the surveyed period of 2010 - 2019, the area on which the company farmed, the amount of farmed animals and the amount of employees in agricultural production gradually decreased. Data in the surveyed period are presented in the Table 1. The stated amount of employees refers only to employees in the agricultural production.

Table 1: Area, amount of animals kept and amount of employees in the surveyed period

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Area (ha)	315	315	300	300	300	300	275	275	275	275
Amount of animals	150	150	130	130	130	130	130	125	125	125
Amount of employees	6	6	5	5	5	5	5	5	5	5

Source: TBS, a.s., own processing

As part of the secondary data obtained from the Register of Financial Statements, the Table records revenues from economic activity, costs of economic activity, profit from economic activity and revenues from sales of the company's own products in the surveyed period.

Table 2: Development of economic data of the company in the surveyed period

Year	Revenues from economic activities	Costs of economic activity	Economic result from economic activities	Sales of own products	Direct Support
2010	1 827 448	1 359 662	467 786	1 112 120	44 856
2011	986 597	950 864	35 733	561 056	48 938
2012	1 176 068	1 116 721	59 347	599 213	52 185
2013	1 004 423	976 649	27 774	17 711	56 562
2014	984 415	959 430	24 985	10 346	61 671
2015	956 988	971 662	-14 674	10 963	103 409
2016	902 435	860 402	42 033	13 643	105 462
2017	949 490	924 089	25 401	9 686	107 376
2018	813 495	793 557	19 938	18 498	109 618
2019	756 962	787 987	-31 025	9 426	107 795

Source: Register of Financial Statements of the Ministry of Finance of the Slovak Republic, Agricultural Paying Agency

In the table, we also monitor the primary data, namely the amount of direct support in the period under review, which we obtained partly from the questionnaire and partly from the available database of Agricultural Paying Agency.

All indicators (except of direct payments) in the surveyed period had a declining trend, which can be rationally explained by shifting part of production and sales to a partner (which owns a fruit processing plant) within the short supply chain, as well as reinvesting funds in production by repairs and maintenance.

As part of the project measures, the company drew support in the previous programming period. Within the Rural Development Program of the Slovak Republic 2007 - 2013, the company drew support for measures 1.1 Modernization of farms, 1.2. Adding value to agricultural and forestry products, 2.3. Agri-environment payments: Subsidies for organic farming and 3.1. Diversification towards non-agricultural activities. Within the Rural Development Program of the Slovak Republic 2014 - 2020, the company submitted to the call no. 6 / Rural Development Program / 2015 for submission of “application for a non-repayable financial contribution” for sub-measure 4.1 Support for investments in agricultural enterprises, project for purchase of equipment for animal production. The project was not approved due to the lack of funds. From 2010 to 2014, the company successfully applied for a single area payment and a supplementary national payment for livestock units, from 2015 to 2019 it successfully applied for the following direct payments:

(a) decoupled direct payments

- single area payment,
- agricultural practices beneficial for the climate and the environment,

(b) coupled direct payments

- payment for fattening selected categories of bovine animals,

(c) aid in connection with Rural Development Program measures

- agri-environment - climate measure,

- organic farming,

- payments for areas with natural or other handicaps.

Receiving these types of payments requires a number of requirements to be met in terms of environmental protection, food and feed safety and animal welfare. The above mentioned facts indicate that the company met the requirements and thus created favourable conditions for the production of quality value-added products.

Operating in a short supply chain

The company sells its products directly at the place of production, as well as at the market in the district town of Myjava, 10 km away. It is active in the "Sales from the Yard" initiative, with the company selling 90% of the total amount of products produced under the initiative in 2017 and 2018 and up to 95% in 2019.

Since 2013, the company has been cooperating within the family partnership with the self-employed farmer Ing. Vojtech Tlčík CSc. within the short supply chain. The cooperation mainly concerns fruit processing and the production of fruit products, with SHR being the owner of the fruit processing plant. Processed fruit products include:

- apricot, strawberry and cherry jam,

- plum jam,

- 100% apple juice,

- dried fruit and fruit in chocolate,

- 4 types of unfiltered and unpasteurized beer.

Of these products, the following are marked as traditional specialties guaranteed:

- plum jam - the product received the SK Quality Mark award,

- apricot, strawberry and cherry jam - the products are marked with the "Slovak product" logo, which presents products made in Slovakia by Slovak producers.

In 2019, the "KOPANICE regional product" brand was awarded the product Dried fruits in chocolate - apples, plums, pears. Obtaining these product awards is clearly assessed by the company as an advantage. In addition to co-operation in the production of these products, co-operation between the two actors in the short supply chain takes place through the joint marketing of products as well as through the creation of joint business plans. The cooperation in the short supply chain also includes local self-employed farmers, mainly fruit and vegetable growers, directly in the village, but also in the Kopanice region, from which the company buys fruit and vegetables at reasonable prices. The company generally considers cooperation in the short supply chain to be advantageous, with the following benefits:

- improving product sales,

- production of better quality products and value-added products,

- introducing innovations in production,
- lower production costs.

In addition to the advantages in business, the company (or its statute) also positively evaluates the social situation of its family, respectively confirms its improvement, which is reflected in particular in:

- increasing family and staff incomes,
- improving social status in the circle of friends,
- making new friends,
- strengthening mutual trust with customers - permanently stocked by more than 1000 families in the veal area,
- improving the overall social situation of the whole family and families of employees.

Cooperation of both entities within the short supply chain, i.e. production of products and their sale, take place in the village Podkylava and directly affect it. The company evaluates this impact positively, while the main benefits in favour of the municipality are:

- new job opportunities - this is mainly seasonal work related to hay harvesting and fruit harvesting, mainly in the local population,
- by creating new professions - in addition to investing in innovation and technology in production, the company also invests in human resource development. In cooperation with National Agricultural and Food centre – Food Research Institute, Department of Technology, Innovation and Cooperation with Practice - The BIOCENTRUM Modra department plans to create a so-called "Farm houses" aimed at supporting young, talented people to prepare them for specific professions (e.g. breweries),
- new forms of business - these are mainly relaxation activities, especially for visitors to the region, respectively municipalities, which consist of e.g. the lease of a company brewery, where visitors led by a brewer (a graduate of a newly created profession) can brew their own beer,
- the formation of new types of services - the company plans in cooperation with Trenčín Self Governing Region to create a pedagogical centre in order to create educational programs for managers (e.g. in the field of waste treatment).

It is necessary to take into account the fact that the company was not an applicant for support under school programs or under sub-measure 16.4 of the Rural Development Program of SR 2014-2020. However, the support was obtained by a partner entity (self-employed farmer) within the short supply chain, under sub-measure 4.2, namely for the purchase of beer production technology in the amount of 112,050 EUR and for the construction of a fruit and vegetable processing and storage facility in the amount of 915,431.17 EUR. The support was provided under the call no. 8 / Rural Development Program / 2015, the contracts for the provision of support entered into force in 2016. Thus, the company itself did not invest in innovations and modernization of joint production, but within the short supply chain, the partner entity did so through the support from the Rural Development Program.

4. Conclusion

Based on the analysis of available primary and secondary data, we can evaluate the operation of TBS, joint stock company in the short supply chain only positively. Despite the declining trend in the result of economic activity, the company continues to successfully cooperate with a partner entity, while one of the successes in 2019 was the award of the brand "KOPANICE regional product" with the product of dried fruits in chocolate - apples, plums, pears. The company is the recipient of direct payments, both separate and coupled, as well as aid in connection with RDP measures. In 2016, the partner entity (self-employed farmer) received support under the sub-measure of the Rural Development Program of the SR 2014-2020 for the purchase of technologies and construction of operations. In terms of the added value of products in the short supply chain, both the company and self-employed farmer contribute to improving product quality, both by respecting environmental, food safety and animal welfare requirements and by introducing innovations in production, which resulted in the award of the SK Quality Mark and the Regional quality mark to the selected product. The company evaluates its operation in the short supply chain as advantageous, for the benefit of its own business, for the benefit of the municipality in which the cooperation takes place, as well as for the benefit of its own family, where there is an improvement in its social situation.

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References

- [1] Commission Delegated Regulation (EU) No. 807/2014 of 11 March 2014 supplementing Regulation (EU) No. 1305/2013 of the European Parliament and of the Council on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and introducing transitional provisions.
- [2] De Fazio, M. (2016). Agriculture and sustainability of the welfare: The role of the short supply chain. *Agriculture and Agricultural Science Procedia*, vol. 8., p. 461 – 466.
- [3] Galli, F., & Brunori, G. (2013). Short food supply chains as drivers of sustainable development. Evidence document.
- [4] Gralton, A. & Vanclay, F. (2009). Artisanality and culture in innovative regional agri-food development: lessons from the Tasmanian artisanal food industry. *International Journal of Foresight and Innovation Policy*, vol. 5, p. 193 – 204.
- [5] Ilbery, B. et al. (2014). Forecasting food supply chain developments in lagging rural regions: evidence from the UK. *Journal of Rural Studies*, vol. 20, p. 331–344.
- [6] Information about beneficiaries from the EAGF and the EAFRD. Agricultural Paying Agency. Available online: <https://www.apa.sk/index.php?navID=511>.
- [7] Kneafsey, M. et al. (2013). Short Food Supply Chains and Local Food Systems in the EU. A State of Play of their Socio – Economic Characteristics. *JRC Scientific and Policy Reports*, ISBN 978-92-79-29288-0.
- [8] Ministry of Finance of the Slovak republic (2011) Register of Financial Statements. Available online: <https://www.registeruz.sk/cruz-public/domain/accountingentity/simplesearch>.

- [9] Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005.
- [10] Rong, A., Akkerman, R. & Grunow, M. (2011). An optimization approach for managing fresh food quality throughout the supply chain. *International Journal of Production Economics*, vol. 131, p. 421 – 429.
- [11] Rovný, P. & Nagyová, E. (2007). Úloha a postavenie poľnohospodárstva v národnom hospodárstve na Slovensku a v EÚ. *Acta Universitatis Bohemicae Meridionales: The Scientific Journal for Economics, Management and Trade, České Budějovice, X., (2)*, p. 49-54.
- [12] Rural Development Programme of the Slovak Republic 2014 – 2020.
- [13] Summary overview of the project measures RDP SR 2014-2020 to 31.12.2017. Agricultural Paying Agency. Available online: <http://www.apa.sk/download/12406>.
- [14] Summary overview of the project measures RDP SR 2014-2020 to 31.12.2020. Agricultural Paying Agency. Available online: <http://www.apa.sk/download/16809>.

Development of Selected Aspects of Small Farms in Chosen EU Countries

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Abstract

Despite the opinions of many politicians or economists, it seems that there is some renaissance in finding the importance of small farms for the rural areas. There are many classification systems to identify small and large farms. In the EU this was a difficult task compared to the US since there are many differences in member states. Eventually, it was agreed that economic output should be used to measure small farms. The following article aims at observing the differences between small and large farms in selected EU member states. The difficulties in the complex analysis of all member states lie in the different approaches in collecting the data on small farms. Over half of them does not collect or publish these data. The analytical part of the article focuses on the total utilized agricultural area, the total output of farms, gross farm income and total labour input. The results show us that while the number of small farms is decreasing their economic viability is slowly rising.

Keywords: *small farms, large farms, utilized agricultural area, gross farm income, labour input in agriculture*

JEL Classification: *Q01, Q12, Q18*

1. Introduction (First-level heading, Times New Roman 12pt, Bold)

Small farms are an important part of the agricultural sections. Defining its properties is quite difficult, considering there are different classification criteria around the world. For example, in the United States, these can be with gross income less than 250,000 USD (224,000 EUR). But there are calculated both, commercial as non-commercial farms. There is a decreasing trend of small commercial farms with output within 10,000 to 250,000 USD. Whereas, noncommercial farms with output less than 1,000 USD is rising. In the US, small farms cover 91% of the total farm number. On the other hand, large farms take an 85% share of the market (USDA, 2021). Although many economists labelled these farms as inefficient and unproductive in contrast to large farms with easier access to capital and better technological assets, people are starting to realize their true role in defining the rural areas and biodiversity due to cultivating more than one type of crop. In contrast, large farms are focusing on maximizing their yields and profits which leads to cultivating monocultures dangerous to the biodiversity of regions and excessive use of pesticides to protect it. Hence the favour of multiple roles of agriculture is in the hands of small farmers (Rosset, 1999, Konvicka et al., 2016). Similar results were found when The Ecological Land Co-operative conducted a case study in 2011 and summarized that areas smaller than 10 acres can provide viable and sustainable livelihoods that can also increase the productivity of marginal land.

In Europe, defining the small farm is a difficult task, resulting from differences among all the member states. Since Sicco Mansholt presented his plan, to decrease the number of small farms in favour of larger, more resource-efficient and competitive enterprises, passed almost sixty years. And the important role of smaller holdings is increasing. There are political debates on

their roles in rural development and positive impact on local social and economical conditions. Therefore it is important to accurately define them (FAO, 2011). There are many indicators you can use such as the number of hectares of utilized agricultural area (UAA) or the number of employees which was later defined with the annual working unit, representing 1,800 hours per worker per year (although there are different values in some member states). Categorization of farms started in the late sixties with the first farm structure survey, aimed at creating a common classification system. Several Commission Decisions were forming its final design starting with 78/463/EEC, 85/337/EEC, Decision 96/393/EEC, Regulation (EC) No. 1166/2008 or Commission Decision No. 1242/2008. Based on these decisions an economic size equivalent was agreed. Since 1996, there was a standard gross margin to measure the production of a holding (Commission Decision (EEC) No 377/1985). Later, there were some modifications made and a new measurement was introduced, the standard output introduced by Commission Regulation (EC) No 1242/2008. The basic idea of these measurements is the same. Both try to measure the value of the output per holding, per hectare or a livestock unit. The differences are following:

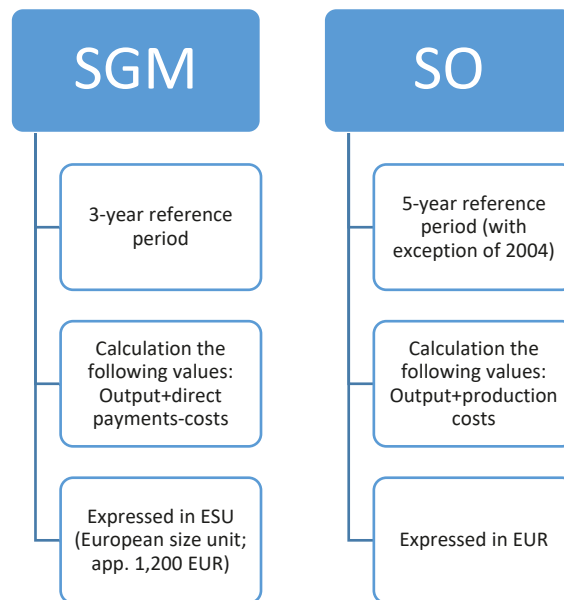


Fig. 1 – Differences between SGM and SO methodology

Source: Eurostat, 2022

The EU is conducting approximately every decade a Farm structure survey (FSS) which aimed at collecting important statistical data from all member states to ease their comparison as well as designing the Common agricultural policy measures. The latest was carried out in 2020 and the results are to be expected by the second half of 2022. Therefore some comparison can be done based on FSS from 2010. Over 12 million farms participated in this census. These farms cultivated and used over 174 million hectares of UAA, app. 40% of the total European land fund. This census also showed that despite the decreasing trend of smallholdings (since Manholt’s plan) almost half of the farms utilized less than 2 ha of UAA, in total less than 3% of the total 174 million ha of UAA. On the other hand, less than 3% of farms used over 100 ha of UAA. The extremes were seen mainly between later member states compared to older ones. The highest number of small farms was in Romania over 2.5 million of them used less than 2 ha of UAA. On the other hand, countries like France, the United Kingdom, Spain and Germany had from 35,000 to 97,000 farms using more than 100 ha. In the European Union (EU) small

farms are located particularly in peripheral regions, such as Northern Scandinavia, Scotland and Ireland, South-eastern Europe and in all the Mediterranean countries (Claros, 2014)

Based on crude data census carried out in 167 countries indicate that there are some 570 million farms in the world (FAO, 2013; Lowder et al., 2016). Contrary, Ritchie and Roser (2021) see that number as crude and inaccurate for two main reasons. Firstly, that census represented estimates of roughly 97% of the population active in agricultural production. But some smaller countries did not have even these estimates and therefore were not calculated, therefore the actual number could be higher. And secondly, as we mentioned previously, many agricultural censuses are outdated, in extreme cases even 60 years old (mainly in African states) and the number of small farms could be even higher. Even in Europe, there exist several organizations trying to improve the situation of small farms. All of these organizations agree, that since the late 1950s-60s in the western part of the EU, there is a decrease not only in the number of small farms but also in their know-how for diverse and multifunctional farming. But they stress out, that in eastern member states, this know-how is still preserved and actively used. Despite the negative trends, still, 2/3 of all farms in Europe use less than 5 ha and their SO is less than 1,000 EUR, or even less than 350 EUR per month. These organizations agree that small farms are beneficial for communities and societies as a whole. (Kania et al., 2014; Fienitz et al, 2017; Guiomar et al, 2018).

Considering the labour force, small farms can be holdings employing less than 1.5 annual agricultural annual work units (AWU). However, there is a problem with collecting the data on the regional level in all member states. From the economic size point of view, farms with less than 8 Economic Size Units (ESU) of Standard Gross Margin (SGM) or 8,000 EUR of Standard Output are considered as small farms. Definitions involving the use of additional criteria to farm size are more comprehensive, particularly those including indicators of the farm economic output, but data availability is often a limitation (Petit et al, 2006; Hubbard, 2009; Ruane, 2016)

To support the smallholdings, the farmers can apply for the Small Farmer Scheme, a simplified income support scheme granting a one-off payment replacing all other forms of the income support payment. The maximum level of the payment is decided at the national level but may not exceed €1,250 (EC, 2021).

2. Data and Methods

This article aims to compare the differences between small farms and mediums and large farms. During the data collection, we found and can confirm the different approaches to agricultural data collecting and publishing among EU member states. Since we wanted to compare differences in both size groups we were able to work with aggregated data from 13 member states. But even then, not all member states provided all the data during the whole period from 2004 to 2019. The data was collected from statistical databases of FADN. First of all, we focused on the development of the total utilized agricultural area, the total output of farms, total outputs/inputs ratio, gross farm income and total labour input expressed in AWU.

These data were compared between small farms, those with standard output less than 8,000 EUR and the medium and large farms with standard output over 8,000 EUR.

3. Results and Discussion

Based on our research we can confirm that the number of small farms is constantly decreasing. The aggregated data suggests a 20% loss from 2014 to 2019. The highest number of small farms in 2014 was in Poland over 300,000. Later, after entering the EU this position fell to Romania with almost 1.2 million farms in 2007. The highest decrease from 2007 occurred in Bulgaria and Romania where the number of smallholdings decreased by 81% and 70% respectively. On the other hand, the number of smallholdings increased in Hungary by almost 5% and in Malta by over 40%.

The median value of the total utilized agricultural area decreased from 7,69 ha in 2004 to 5,73 ha in 2019. The highest average area in 2004 was used in Latvia, almost 27 ha, which decreased by 2019 almost 36%. In 2019, the highest UAA was observed in Estonia (18,22 ha), Latvia (17,28 ha) and Lithuania (12,32 ha). As a result of the total land fund and area, the smallest UAA in 2019 was observed in Malta (1,97 ha) and Cyprus (2,77 ha). Otherwise, the smallest area was between 4 to 7,5 ha.

The economical improvements can be seen with rising in total output per farm. The median value shows a 10% increase from 2004 to 2019. The highest output, over 10,000 EUR was observed in Estonia and Latvia. In other countries, it was on average almost 8,000 EUR. More intriguing is the calculation per ha of UAA. There was observed a 35% increase from 2004 to 2019. Contrary to previous observations, Estonia and Latvia, along with Lithuania had the lowest farm output of less than 700 EUR per ha of UAA, even despite their highest over 100% increase. On average, the other member countries had double the total output per ha of UAA. In general, the total output/input ratio decreased from 1.14 to 1.12 but in the case of „after 2004“ members, it increased.

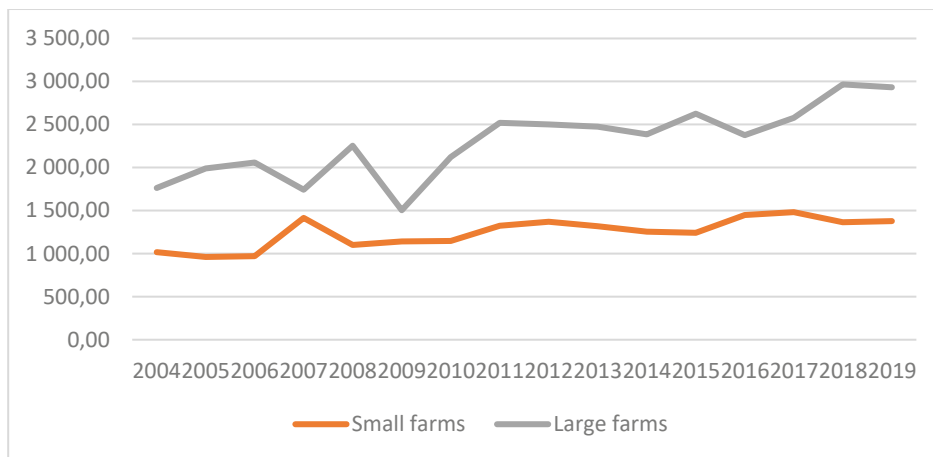


Fig. 2 – Total output per farm per ha in EUR

Source: FADN, 2022

The positive economic development could be seen also in the gross farm income per ha of UAA that increased by almost 8% from 2004 to 2019. In accordance, also the total labour input in AWU per ha of UAA increased from 0.16 in 2004 to 0.18 in 2019.

Observation of statistics on large farms in the selected countries indicates an increase of 6% from 2004 to 2019. Their number is almost four times higher than the number of small farms. Overall in EU-28, this might be deceiving a bit, since half of the member states did not share their statistical data on small farms. The highest number of large farms in 2004 was observed in Poland, with over 400,000 of them, followed by Greece with over 230,000 farms. The

median value of the number of farms is a bit over 77,000. In 2019, Poland kept its first place in the number of large farms, but when considering the change, it increased by 11% while in Latvia the number of large farms increased by almost 24% followed by Lithuania with almost 22% respectively. Of all the 13 observed countries, in two of them, Cyprus and Greece the number decreased by almost 30% and 6% respectively.

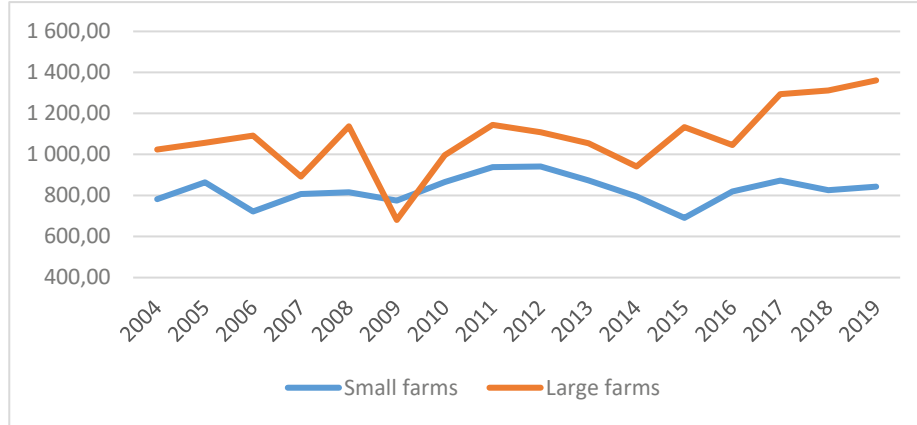


Fig. 3 – Gross farm income per ha in EUR
Source: FADN, 2022

The median value of the total UAA increased by 80% from 259 ha/farm in 2004 to 468 ha/farm in 2019. This is the result of an increase of UAA in Lithuania by over 100%, followed by Greece with 56%, Slovenia with 46%, Portugal with 22% and Malta with 17%. In the rest of the countries, there was a decrease of UAA from 39% in Hungary to 2,2% in Estonia. Total output per farm increased by 87% during the observed period. The highest increase was observed in Lithuania by over 500%, Poland by over 400% and Malta by over 200%. Only in Cyprus and Greece, did the total output decrease by 64% and 5% respectively. The total output per ha increased by over 60% during the 2004-2019 period. The highest increase of total output per ha was in Portugal by 310% and Lithuania by 200%. We can sum up that over half of the observed countries doubled their output per ha of UAA.

Gross farm income increased by 114% from 2004 to 2019 to over 771,000 EUR per farm. The highest increase was in Lithuania (+369%) and Portugal (+390%). Overall in Bulgaria, Estonia, Latvia, Lithuania, Hungary and Romania, it was over 1 million EUR per farm. But, observations per hectare show lower incomes per ha, less than 1,000 EUR.

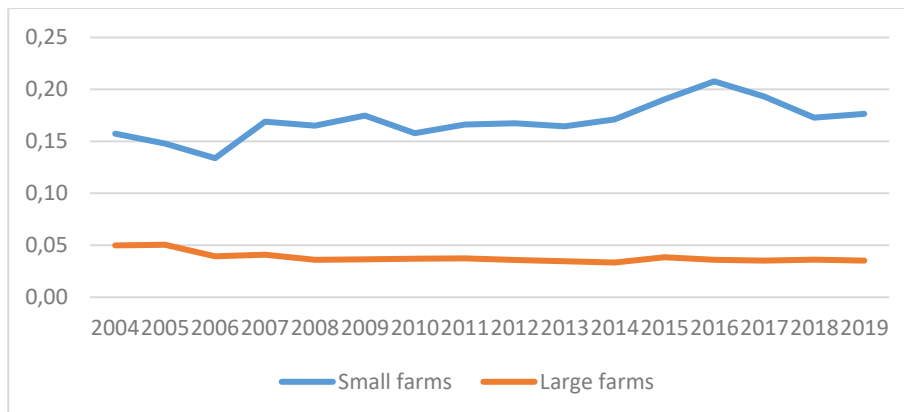


Fig. 4 – Total labour input in AWU per ha
Source: FADN, 2022

The output/input ratio increased only slightly from 1.15 to 1.16. The labour input in large farms of these countries decreased slightly from 0.05 to 0.04 which can indicate higher technological inputs than the human labour force.

We can summarize our observations as follows:

- Continuous decrease of small farms (-20%) and increase of large farms (+6%)
- Continuous decrease of UAA of small farms (-25%) and increase of UAA of large farms (+80%)
- Increase of Total farm output of small farms (+10%; +35% per ha of UAA) and increase of Total farm output of large farms by (+87%; +66% per ha of UAA)
- Increase of gross farm income of small farms (+3%; +7% per ha of UAA) and increase of gross farm income of large farms (+114%; +33% per ha of UAA)
- Increase of total labour input in AWU per ha of small farms (+0,02) and decrease of labour input in AWU per ha of large farms (-0,01).

4. Conclusion

Despite the support and rising importance of small farms, we can see a decrease in small farms in favour of medium and large farms. This decrease also meant a shift of utilized agricultural areas to larger farms. Economically we can see that both groups of farms could be considered viable with increasing total output of farms. Although larger farms have almost five times higher gross income, in both groups can be seen continuous increase which may indicate good economic conditions. But larger farms have better conditions, their incomes and profits are higher and they are also more technologically advanced which can be seen in the decrease of labour input. Small farms are still depending on the labour force. Considering this statement and the previously mentioned advantages of small farms we can state that their importance for rural areas is higher than it was originally thought.

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References

- [1] CLAROS, E. Small Farms. Briefing, European Parliamentary Research Service (EPRS), 140794REV1. Brussels, 2014, 1-6.
- [2] EC. 2021. The small farmers scheme. Online. Available at: https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/income-support/additional-optional-schemes/small-farmers-scheme_en
- [3] Ecological Land Co-operative. 2011. Small is successful. A case study. Online. Available at: https://ecologicaland.coop/sites/ecologicaland.coop/files/Small_is_Successful_0.pdf
- [4] Eurostat, 2022. Glossary. Online. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Main_Page

- [5] EU Farms and Farmers in 2013: an update. EU Agricultural and Farm Economics Briefs, No. 9, November 2015. Retrieved from: http://ec.europa.eu/agriculture/sites/agriculture/files/rural-areaeconomics/briefs/pdf/009_en.pdf
- [6] FADN. 2021. Statistics on farms by economic size.
- [7] FAO. 2011. What is a small farm? In. EU Agricultural Economic Briefs. Online. Available at: <https://www.fao.org/family-farming/detail/en/c/383299/>
- [8] Farm structure survey 2010. Data available in Eurostat databases.
- [9] Fienitz, M. et al. 2017. Small farms in Europe: Viable but Underestimated. Online. Available at: https://www.accesstoland.eu/IMG/pdf/small_farms_in_europe_-_viable_but_underestimated.pdf
- [10] Guiomar, N. 2018. Typology and distribution of small farms in Europe: Towards a better picture, Land Use Polic, Volume 75, 2018, Pages 784 798, ISSN 0264 8377, <https://doi.org/10.1016/j.landusepol.2018.04.012>. (<https://www.sciencedirect.com/science/article/pii/S0264837717305227>)
- [11] Hubbard, Carmen. (2009). Small Farms in the EU: How Small is Small?. European Association of Agricultural Economists, 111th Seminar, June 26-27, 2009, Canterbury, UK.
- [12] KANIA, J.; VINOHRADNIK, K.; KNIERM, A. AKIS in the EU: The Inventory–Final Report Vol. II. Report of the Project “PRO AKIS–Prospects for Farmers’ Support.” “Advisory Services in the European AKIS”, Krakow, Poland, 2014.
- [13] KONVICKA, Martin; BENES, Jiri; POLAKOVA, Simona. Smaller fields support more butterflies: comparing two neighbouring European countries with different socioeconomic heritage. Journal of Insect Conservation, 2016, 20.6: 1113-1118.
- [14] USDA, 2021. Small Farms, Big Differences. 2021. online. Available at: <https://www.usda.gov/media/blog/2010/05/18/small-farms-big-differences>
- [15] PETIT, Sandrine; DOBREMEZ, Laurent; FLEURY, Philippe. Working conditions: a challenge for sustainability of mountain family farming systems diagnosis at farm level and responses designed by farmers in the Alps. Changing European Farming Systems for a Better Future. New Visions for Rural Areas. Wageningen Academic Publishers, Wageningen, 2006, 272-276.
- [16] Ritchie, H., Roser, M. 2021. Farm size. In: Our world in data. 2021. Online. Available at: <https://ourworldindata.org/farm-size>
- [17] Rosset, P.M. 1999. Benefits of Small Farm Agriculture. In: "Cultivating Our Futures," the FAO/Netherlands Conference on the Multifunctional Character of Agriculture and Land, 12-17 September 1999, Maastricht, The Netherlands. Online. Available at: https://www.iatp.org/sites/default/files/Benefits_of_Small_Farm_Agriculture.htm
- [18] RUANE, John; DI CARACALLA, Viale delle Terme. An FAO e-mail conference on exploring the contribution of small farms to achieving food security and improved nutrition: The moderator’s summary. 2016.

Regression Evaluation of Agricultural Production with Direct Payments in the Slovak Republic

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Abstract

Research shows that there is a need to consider a system for allocating aid, which is currently linked mainly to the acreage of agricultural land. Research shows that the higher the area of agricultural land the farm manages, the higher the support in terms of direct payments. On the other hand, it should be emphasized that increasing direct payments increase the values of economic indicators as indicators of sales. On the other hand, in the case of economic indicators such as the economic result, the research results show that with increasing volume of direct payments, the given economic indicator does not increase. The given indicator is important from a macroeconomic point of view, because the given results pay income tax, which is one of the main revenues for the state budget. The question arises as to what a fair and cost-effective model for allocating direct payments is.

Keywords: direct payments, agricultural production, revenues, economical results

JEL Classification: Q18

1. Introduction

Membership in the European Union was one of the most important goals for Slovakia in the previous period. Integration with Western European markets has brought Slovak companies many advantages and opportunities, but also increased competition. Competition in conditions where our farmers and food producers cannot compete in accessing finance for development and innovation with their Western EU counterparts means, in particular, the risk of liquidation of our food industry due to surplus food production throughout Europe. Only small companies focused on specialized products with a gradual possibility of diversification of production by expanding the range of products and services or large companies with the input of foreign capital remained in such conditions. The barrier to their development is the lack of interest of policy actors in supporting this industry and their negative attitude to the national development policy of the food industry based on the production of domestic agricultural products. (Archibugi et.,2005)

The competitiveness of Slovak agriculture in the common market of the European Union is strongly influenced by the economic parameters of production. It is important to monitor the level of economic indicators especially in comparison with geographically close EU countries with a similar production structure (especially with the V4 countries, which had the same starting position). It is important for farmers to be able to make the most of their natural conditions and the corresponding production structure. The efficiency of the use of production factors and production consumption is a key parameter of competitiveness, which makes it possible to assess the ability of the agricultural sector to use its conditions and evaluate the efficiency of the choice of production structure. (Arnold, 2001)

The dimension of agricultural production in the twentieth year following the implementation of the Czechoslovak economic reform (1991) adapted to the changed economic environment. The sector's productivity was most affected by price and market liberalization and changes in support policies. The volume and composition of production were affected by the decline in domestic food consumption amid growing external competition, especially in the consumer processed food market. The disparity in the prices of agricultural products and the prices of production inputs had a significant impact, with an impact on the generation of income from agricultural production. Another factor, still active today, was the business strategies of multinational retail corporations, which significantly dominated the domestic consumer food market. (Petrasova and Valach, 2010)

The system of direct payments, which was created in the EU as a temporary solution to the situation of farmers in 1992, gradually increased in volume. Today, they account for 68% of the Common Agricultural Policy budget for 2014-2020. On the basis of the area they use alone, farmers in Europe are paid an average of € 40 billion a year.

Direct payments constitute a significant part of the EU expenditure on agriculture and represent direct subsidies to support the income of farmers based on pre-determined eligibility conditions. The payments are made in the form of current transfers to entities that directly farm land. The rules for direct payments are governed by Regulation (EU) No. 1307/2013 of the European Parliament and of the Council of December 17, 2013 establishing rules for direct payments to farmers under support schemes within the framework of the common agricultural policy and repealing Council Regulation (EC) No. 637/2008 and Council Regulation (EC) No. 73/2009 as amended.

The direct payment system is based on the principle of separating payments from production, and payments are made per hectare of the acreage of the applicant's agricultural land. Payments are claimable, i.e. payments must be made if a farmer requests them and if he meets payment conditions. It is also possible to introduce several support regimes of payments tied to the year of submission of an application and to the actual production of an applicant's units. In 2019 and 2020, direct payments could be made in the form of:

Decoupled direct payments:

- Single area payment scheme (SAPS) – temporary simplified regime of basic payment
- Payment for climate- and environment-friendly agricultural procedures
- Payments for young farmers

The provision of decoupled direct payments is governed by Slovak Government Regulation No. 342/2014 Coll. laying down rules for providing support in agriculture in connection with decoupled direct payment schemes, as amended.

Coupled direct payments:

- Payment for growing sugar beet
- Payment for growing hops
- Payment for growing selected fruits with high labour intensity
- Payment for growing selected fruits with very high labour intensity
- Payment for growing selected vegetables
- Payment for growing selected protein products

- Payment for growing tomatoes
- Payment for breeding ewes, ewe lambs and goats
- Payment for the fattening of selected categories of bovine animals
- Payment for cows reared within a system with market production of milk

The provision of coupled direct payments is governed by Slovak Government Regulation No. 36/2015 Coll. laying down rules for providing support in agriculture in connection with coupled direct payment schemes, as amended.

Transitional national payments

- Complementary national payment for livestock units
- Complementary national area payment
- Complementary national payment for hops

Additional domestic payment per area and per hops was not granted in 2019 and 2020. The provision of transitional national payments is governed by Slovak Government Regulation No. 152/2013 Coll. on the conditions for the provision of subsidies in agriculture in the form of transitional national payments, as amended. (Green Report, 2021)

2. Data and Methods

In the paper was used the method of regression analysis to evaluate the dependence between indicators. The goal of regression analysis is to find an equation that expresses the relationship between variables. Another goal may be to determine the size of the coefficients of the relationships between the variables, and the goal may also be to predict the value of the dependent variable. The correlation coefficient quantifies the degree of strength of the dependence between the two quantitative variables. Regression analysis assumes that the variable Y is random and the variable X is fixed. Pearson's correlation coefficient was used in the analysis, which expresses the degree of linear dependence of two variables. The numerical values of the given coefficient range from +1 to -1.

Interpretations of the correlation coefficient according to Hinkle, Wiersma, & Jurs (2003).

Table 1 Size of Correlation Interpretation

Value of Persons Correlation Coefficient	Interpretation of Coefficient
.90 to 1.00 (-.90 to -1.00)	Very high positive (negative) correlation
.70 to .90 (-.70 to -.90)	High positive (negative) correlation
.50 to .70 (-.50 to -.70)	Moderate positive (negative) correlation
.30 to .50 (-.30 to -.50)	Low positive (negative) correlation
.00 to .30 (.00 to -.30)	Little if any correlation

Source: Hinkle, Wiersma, & Jurs (2003), <https://oak.ucc.nau.edu/rh232/courses/EP525/Handouts/Correlation%20Coefficient%20Handout%20-%20Hinkle%20et%20al.pdf>

3. Results and Discussion

Development of basic economic indicators in comparison with the development of direct payments

Table 2 shows the development of basic economic indicators in comparison with the development of direct payments together for the Slovak Republic. The data are for primary agricultural production together. The data were drawn from the Green Reports for individual years.

The table shows that the indicator of animal production recorded a declining trend in the observed period 2005-2020. The reason was the fact that the number of animals in Slovakia has been declining for a long time. The situation has long been caused by the negative result of livestock production. Almost all bands in the conditions of the Slovak Republic show a loss.

Table 2 Development of chosen economical indicator in the Slovak agriculture

Indicators (in mil. Euro)	2005	2006	2007	2008	2009	2010	2011	2012	2013
Plant production	964,38	980,02	1 066,55	1 150,30	850,59	867,88	1 202,66	1 195,79	1 210,88
Animal production	980,81	965,08	997,21	1 077,24	813,36	805,17	876,9	959,27	952,11
Agricultural production	2 034,49	2 030,70	2 156,58	2 333,37	1 740,14	1 761,19	2 174,87	2 272,67	2 285,04
Total intermediate consumption	1 593,04	1 559,12	1 670,28	1 775,51	1 567,97	1 525,16	1 760,96	1 818,82	1 809,33
Gross value added at basic prices	576,25	628,66	589,59	669,06	290,1	361,48	534,41	578,24	597,63
Consumption of fixed capital	232,72	245,54	263,19	248,12	196,67	230,64	276,01	285,54	334,62
Net value added at basic prices	343,52	383,12	326,4	420,93	93,43	130,84	258,4	292,7	263,01
Direct payments	204,52	229,6	258,58	370,4	364,1	337,6	365,2	365,19	354,03
Indicators (in mil. Euro)	2014	2015	2016	2017	2018	2019	2020	Index 2020/2005	
Plant production	1 273,13	1 126,96	1 364,46	1 272,44	1 236,37	1 211,62	1 288,88	1,34	
Animal production	871,31	766,73	786,76	859,8	778,71	757,46	755,29	0,77	
Agricultural production	2 273,79	2 043,96	2 273,15	2 267,01	2 159,03	2 105,29	2 209,64	1,09	
Total intermediate consumption	1 790,18	1 686,87	1 765,23	1 738,51	1 776,66	1 740,08	1 706,19	1,07	
Gross value added at basic prices	601,63	473,78	625,86	651,68	541,09	521,05	641,83	1,11	
Consumption of fixed capital	291,75	221,55	252,22	237,72	191,16	216,87	269,12	1,16	
Net value added at basic prices	309,88	252,23	373,65	413,97	349,93	304,17	372,71	1,08	
Direct payments	370,86	385	408,1	410,53	448,33	490,63	448,03	2,19	

Source: Green Reports, 2005 – 2021, own calculation

Other indicators have positive trend especially direct payments. Direct payments as only one indicator increased by index 2,19.

Table 3 Development of indicators Agricultural production and Direct payments in the Slovak agriculture

Indicators (in mil. Euro)	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agricultural production	2 034,49	2 030,70	2 156,58	2 333,37	1 740,14	1 761,19	2 174,87	2 272,67	2 285,04
Direct payments	204,52	229,6	258,58	370,4	364,1	337,6	365,2	365,19	354,03
Indicators (in mil. Euro)	2014	2015	2016	2017	2018	2019	2020	Index 2020/2005	
Agricultural production	2 273,79	2 043,96	2 273,15	2 267,01	2 159,03	2 105,29	2 209,64	1,09	
Direct payments	370,86	385	408,1	410,53	448,33	490,63	448,03	2,19	

Source: Green Reports, 2005 – 2021, own calculation

Indicator Agricultural production has an unbalanced development as indicator Direct Payments. The minimum value of Agricultural production was achieved in 2009 (financial crises in the World) and maximum value in 2013. Development of both indicators has different trend.

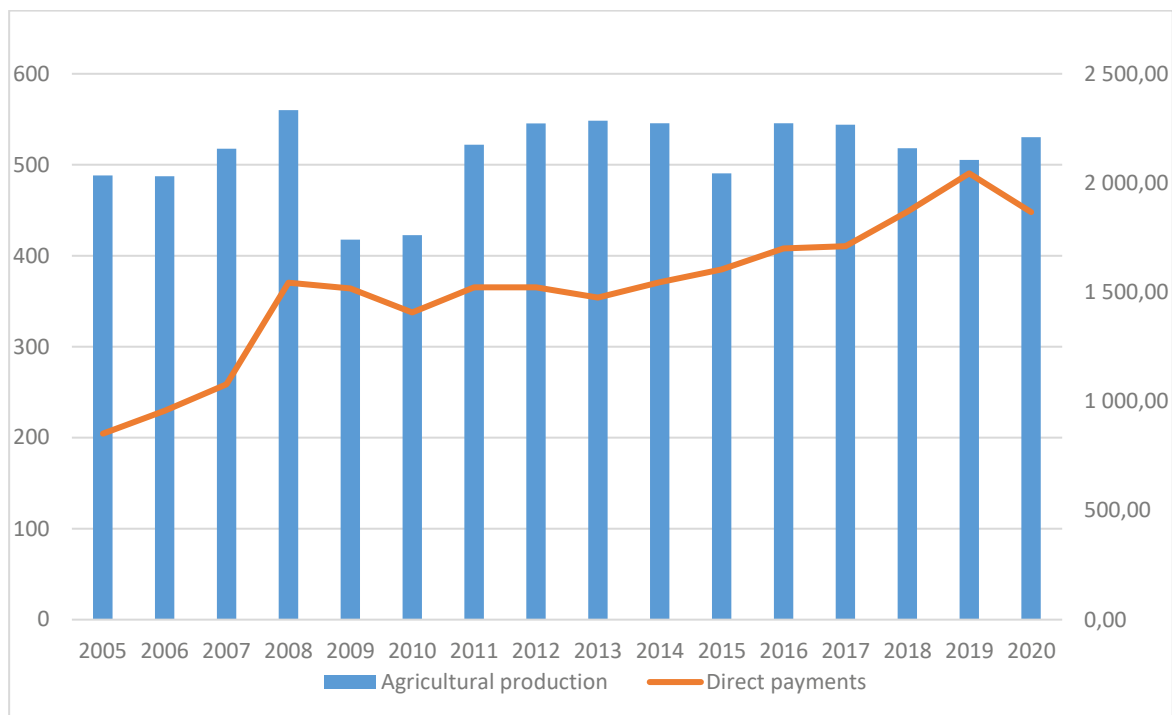


Figure 1 Development of indicators Agricultural production and Direct payments in the Slovak agriculture in mil. Euro (year 2005-2020)

Source: Green Reports, 2005 – 2021, own calculation

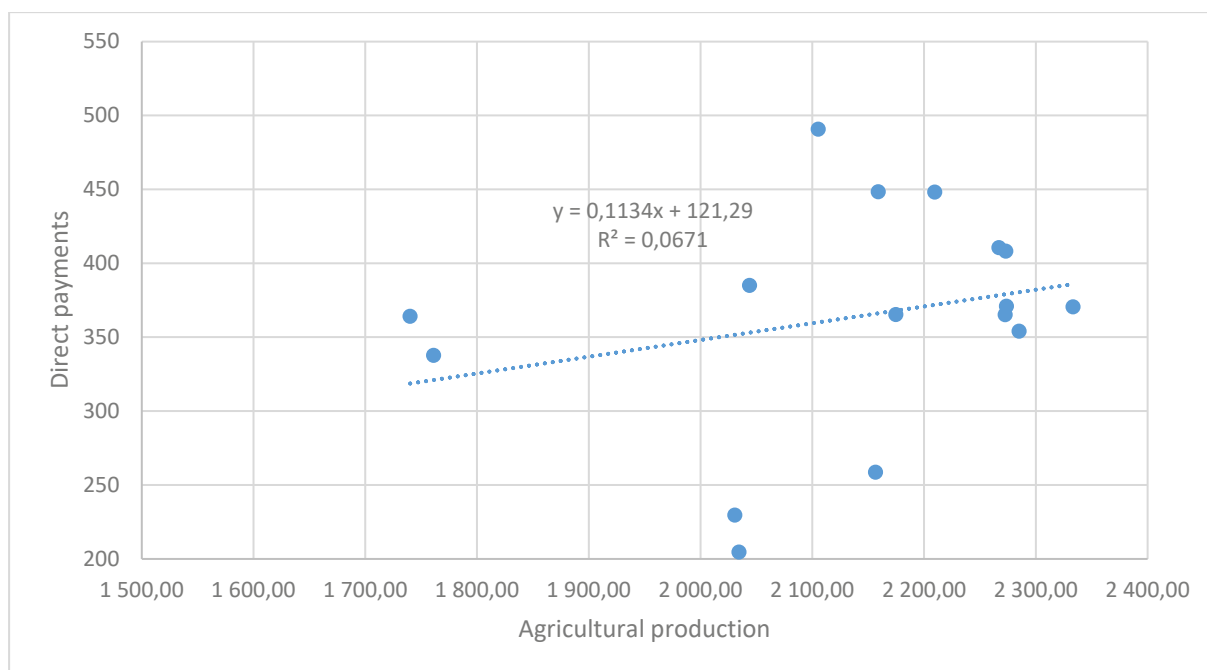


Figure 2 Regression between indicators Agricultural production and Direct payments in the Slovak agriculture (in mil. Euro)

Source: Green Reports, 2005 – 2021, own calculation

In evaluation of the relationship between direct payments and the determinant of agricultural production, there is little or any correlation based on Pearson's correlation coefficient. The dependence between agricultural production and direct payments has a slightly increasing trend.

Table 4 Development of indicators Revenues, Costs, Economical Results and Direct payments in the Slovak agriculture

Indicators (in mil. Euro)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenues	2098,82	2268,84	2366,00	2718,90	1775,80	2019,00	2167,30	2362,90	2349,10	2285,00
Costs	2108,68	2225,39	2355,57	2664,20	1879,30	2032,90	2135,50	2327,90	2351,60	2289,70
Economical results	-9,86	43,45	10,43	54,70	-103,50	-13,90	31,80	35,00	-2,50	-4,70
Direct payments	204,52	229,60	258,58	370,40	364,10	337,60	365,20	365,19	354,03	370,86
Indicators (in mil. Euro)	2013	2014	2015	2016	2017	2018	2019	2020	Index 2020/2005	
Revenues	2349,10	2285,00	2230,70	2231,50	2389,40	2908,50	3005,50	3015,50	1,44	
Costs	2351,60	2289,70	2193,90	2181,10	2329,20	2809,00	2938,90	2952,30	1,40	
Economical results	-2,50	-4,70	36,80	50,40	60,20	99,50	66,60	63,20	-6,41	
Direct payments	354,03	370,86	385,00	408,10	410,53	448,33	490,63	448,03	2,19	

Source: Green Reports, 2005 – 2021, own calculation

Indicator Economical Results have an unbalanced development as indicator Direct Payments. The minimum value of Economical Results was achieved in 2009 (financial crises in the World) and maximum value in 2019. Development of both indicators has different trend.

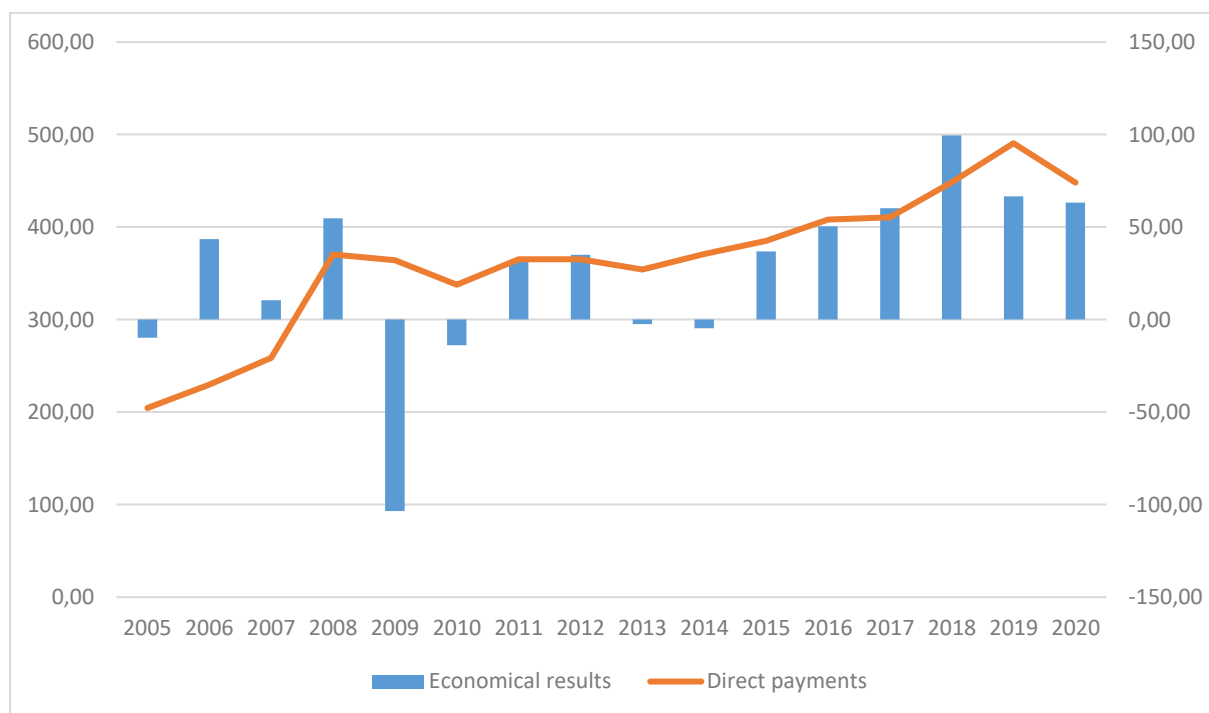


Figure 3 Development of indicators Economical Results and Direct payments in the Slovak agriculture in mil. Euro (year 2005-2020)

Source: Green Reports, 2005 – 2021, own calculation

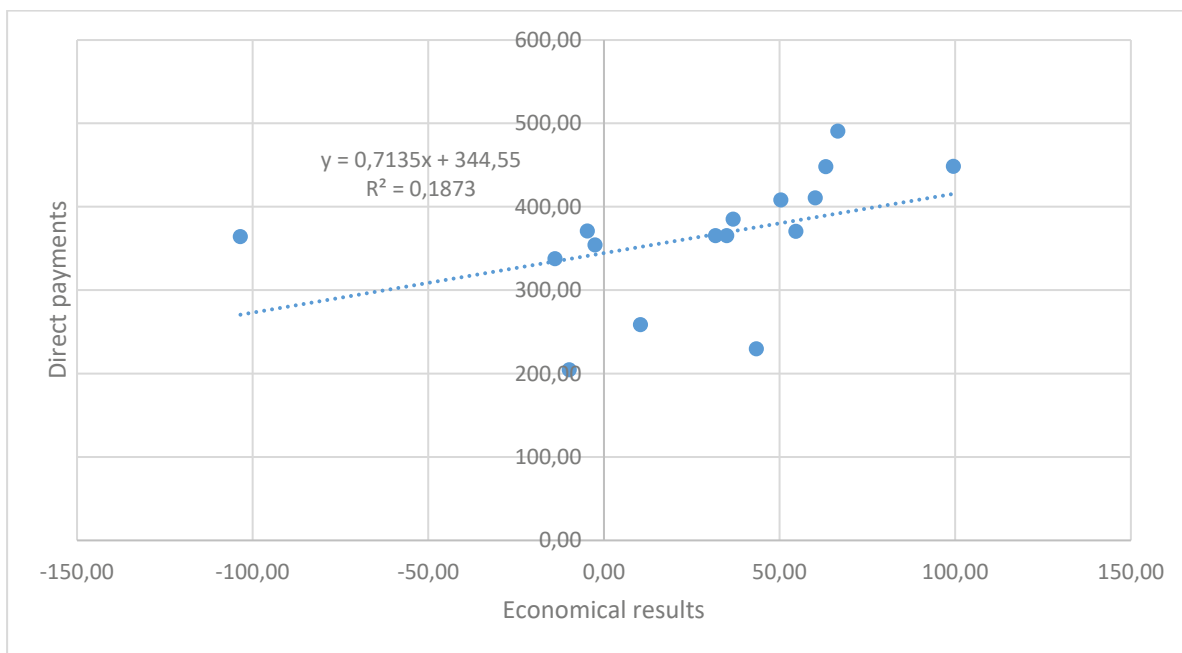


Figure 4 Regression between indicators Economical Results and Direct payments in the Slovak agriculture (in mil. Euro)

Source: Green Reports, 2005 – 2021, own calculation

In evaluation of the relationship between direct payments and the determinant of Revenues, there is moderate positive correlation based on Pearson's correlation coefficient. The dependence between agricultural production and direct payments has a slightly increasing trend. With the increase in direct payments by one unit, agricultural production will increase by an average of 0.12 Euro. Direct payments account for 34.12 % of agricultural production variability.

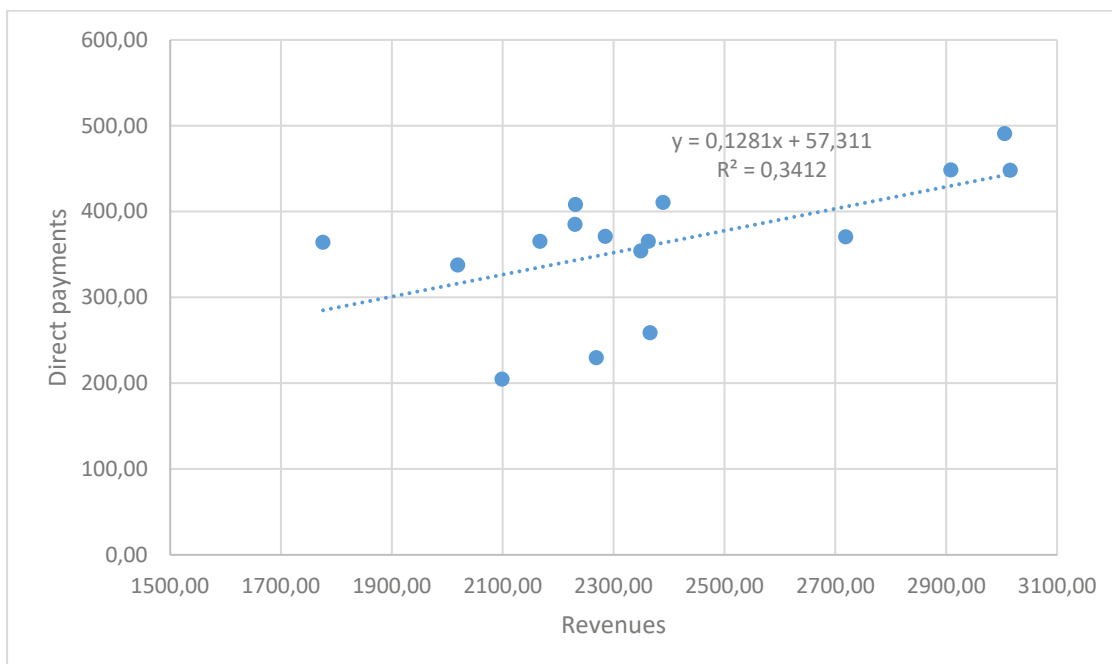


Figure 5 Regression between indicators Revenues and Direct payments in the Slovak agriculture (in mil. Euro)

Source: Green Reports, 2005 – 2021, own calculation

Table 4 Value of Pearson Correlation Coefficient

Indicators	Value of Pearson Correlation Coefficient
Agricultural production	0,258982
Economical Results	0,432792
Revenues	0,584110

Source: Green Reports, 2005 – 2021, own calculation

4. Conclusion

Research shows that there is a need to consider a system for allocating aid, which is currently linked mainly to the acreage of agricultural land. Research shows that the higher the area of agricultural land the farm manages, the higher the support in terms of direct payments. On the other hand, it should be emphasized that increasing direct payments increase the values of economic indicators as indicators of sales. On the other hand, in the case of economic indicators such as the economic result, the research results show that with increasing volume of direct payments, the given economic indicator does not increase. The given indicator is important from a macroeconomic point of view, because the given results pay income tax, which is one of the main revenues for the state budget. The question arises as to what a fair and cost-effective model for allocating direct payments is.

It is also important for Slovak agriculture that it is constantly disadvantaged in terms of the amount of support for farmers. In addition to European-funded support, farmers in Western Europe also receive domestic support. Slovak farmers also receive much less funding from European sources per hectare, such as in Finland, Greece, Luxembourg, Belgium, the Netherlands and other countries. Slovakia achieves the level of the EU average of 84.7% per 1 ha of agricultural land (compared to the EU-15 it is only 75.6%). It is important that in one economic area, which is linked by uniform commodity prices, all businesses have the same conditions for doing business (support mechanisms, tax and social security contributions). It is also very important to emphasize that the Slovak Republic has a lower natural soil fertility compared to most EU countries, which also causes lower incomes for farmers from primary agricultural production.

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References

- [1] ARCHIBUGI, D., and A. Coco. (2005). Measuring technological capabilities at the country level: A survey and a menu for choice. *Research Policy* 34:175-194.
- [2] ARNOLD, E., and BELL, M. 2001. *Some new ideas about research and development*. Copenhagen: Science and Technology Policy Research/Technopolis.

- [3] CHRASTINOVÁ, Z. – UHRINČAĎOVÁ, E. – TRUBAČOVÁ, A.. 2013: Ekonomická efektívnosť poľnohospodárskej výroby z pohľadu podpornej politiky. In *Ekonomika poľnohospodárstva*, roč. XIII, č. 1, s. 36-57. ISSN 1338 – 6336. Online on Internet: http://www.vuepp.sk/EP2013/1/ep_archiv1_2013.htm
- [4] GREEN REPORT 2021, <https://www.mpsr.sk/en/index.php?navID=16>
- [5] HORSKÁ, Elena – NAGYOVÁ, L. - FELIXOVÁ, I.: Cage distance framework among Visegrad countries, Ukraine and Russia and lessons for international business. In: P. Bielik (ed.), *Economics, Social Policy and Citizenship in the European Union: Evidence of V4 Countries and Perspectives for Ukraine*. Nitra: Slovak University of Agriculture.
- [6] HINKLE, WIERSMA, & JURIS (2003). *Applied Statistics for the Behavioral Sciences* (5th ed.). [Online Citation 02.20.2022]: <https://oak.ucc.nau.edu/rh232/courses/EP525/Handouts/Correlation%20Coefficient%20Handout%20-%20Hinkle%20et%20al.pdf>
- [7] PETRASOVA V. and VALACH, M. (2010) Vývoj produkčnej funkcie poľnohospodárstva z hľadiska zvyšovania konkurencieschopnosti Nitrianskeho kraja. In: *NATIONAL AND REGIONAL ECONOMICS VIII*, Herľany, 2010, p. 777 – 788
- [8] Prognóza a vízia vývoja slovenského poľnohospodárstva, potravinárstva, lesníctva a vidieka. [online], Ministerstvo pôdohospodárstva a rozvoja vidieka SR [cit: 2013-08-12] Online on Internet: <http://www.mpsr.sk/download.php?fID=3403>
- [9] Program rozvoja vidieka SR na programové obdobie 2014-2020. 2014. [online], pp. 196-378 [cit. 2014-06-17]. Online on Internet: <http://www.mpsr.sk/index.php?navID=935&navID2=935&sID=43&id=8644>

Migration and Food Insecurity: An Exploratory Review on their Interlinkage and Policy Options

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Abstract

Currently, migration and food insecurity are transboundary challenges that are at the forefront of global agendas as they are entwined with almost all Sustainable Development Goals (SDGs). They significantly impact each other on a household as well as on national levels, being embedded in the context of a particular society, as on a global scale in their relation to human development, world population, and climate issues. Hence, though policy qualities can be universal in theory, in practice they should incorporate local contextual realities. This article, therefore, explores and analyzes the multidimensional relationship between migration and food insecurity and the wide range of applicable policy qualities and constraints. It also provides a methodological procedural approach of tackling the problems in Eastern African countries.

Keywords: Food Insecurity, Livelihood, Migration, Policy, SDGs

1. Introduction

Migration was human's primary livelihood strategy before the Neolithic revolution and has continued to be crucial for survival throughout the centuries (Manning, 2013). People used to move to new places in pursuit of food, water, shelter, and security (Manning, 2013). Migration thus touches the core of our basic needs, although throughout history many of its intricacies have changed (Bade, 2003; Manning, 2013). The industrial revolution, for example, has caused around 50 million Europeans to migrate within and outside of Europe in the 19th and early 20th centuries (Manning, 2013). The phenomenon is still intact and is recognized as a problem than an opportunity (Lindley, 2014; IOM, 2017; FAO, IFAD, IOM, 2018). Indeed, it is defined as one of the world's biggest crises since World War II (IOM, 2017; IDMC, 2019). As such, it has brought lots of wide-ranging controversies and puzzles on policy options (IOM, 2017).

Migration and food insecurity are inexorably intertwined (FAO et al., 2018). One of the most basic push factors of migration is food insecurity. Migration can also expose people to economic crises including food insecurity. To put it differently, migrants can experience food insecurity due to the costs of traveling, challenges of adjustment. Unexpected expenses resulting from uncertainties make food insecurity to be the consequence of migration (FAO et al., 2018). Some food security policies and programs can also latently induce migration unless this covert consequence is taken into account and systematically addressed (Todaro & Smith, 2015). This demonstrates the two-sided relationship between these two variables, migration and food insecurity (FAO et al., 2018). Experts in the area have identified some perspectives and policies at the macro, household, and micro or individual levels to thoroughly analyze this vice versa relationship. It is noted that a thorough understanding of the intricate relationship

among these two variables is a key for designing a comprehensive policy framework that can be applied for alleviating the challenges pertinent to them.

One of the macro-structural perspectives which explain the dynamic relationship between migration and food security is agricultural transformation (Arendonk, 2015). By its nature, an increase in farm production through mechanization shifts labor-intensive farming to capital-intensive farming. In the long run, this process decreases agriculture factor income and its contribution to the national GDP in comparison with to industry and service sector economic activities (Dennis & Talan, 2007; Arendonk, 2015). This means also a gradual decrease in the number of people engaged in agriculture (Dennis & Talan, 2007; Arendonk, 2015). In other words, more people would become potential economic migrants unless they are absorbed by diversified activities in the rural area (Dennis & Talan, 2007; Arendonk, 2015; Todaro & Smith, 2015). The Lewis structural model is a typical example. According to Lewis, the idle population obtained through this process can have an added value to the national economy. They can be used to fill the labor gap in increasing industrial and service sector economic activities. However, due to infant industries and market restrictions in developing countries, the model is more pragmatic in developed countries (Todaro & Smith, 2015). In developing countries, cities are typically struck by a massive rural-urban exodus and infant industries are incapable of absorbing all the rural immigrants (Cohen, 2006; Todaro & Smith, 2015). This urban augmentation, in turn, leads to an escalation of cities' economic, social, and political chaos (Cohen, 2006; Todaro & Smith, 2015).

At the household level, migration and food security have a very straightforward interconnection (FAO et al., 2018). A study conducted by the United Nations in Uganda reveals that the chance of migration is 20 percent higher for food-insecure households compared to the well-to-do counterparts (FAO et al., 2018). Migration is a major coping strategy when one's livelihood is threatened. The strategy offers the household at least double benefits; a decrease in household consumption resulting from the emigration, and remittance, in times when the migrants are blessed with jobs (FAO et al., 2018). In other words, migration can diversify the sources of income giving additional strength to the household to enhance food security. The Department for International Development's (DFID) sustainable livelihood framework also demonstrates the model (Scoones, 1998).

The micro perspectives on migration and food security are specific. According to Todaro's model, rural-to-urban migration is the result of an individual migrant's cost-benefit economic analysis (Todaro & Smith, 2015). When the potential benefits of living in urban areas exceed the rural, more people would be determined to make so-called progressive decisions (Todaro & Smith, 2015). However, there are situations where individuals have limited or no options to make this analysis as staying equals starvation. This is in times of acute food insecurity and crises. In 1984-1985, for example, farmers in Ethiopia massively migrated to different places within the country to escape starvation resulting from drought and famine (Kidane, 1989).

These days, the critical and transboundary nature of migration and food insecurity are not debatable. In fact, there is at least a minimum common ground among experts and policymakers about these two concepts. However, policy options on how to mitigate them is still controversial. This is due to the dynamic nature of the problems, regional socio-economic disparities, and the diverse national interests of countries (Guiraudon & Lahav, 2000). Yet, the continued systematic approaches for creating coordinated efforts on the subjects are gaining momentum. The initiative and agreement made between nations in 2000 and 2015 to achieve the Millennium (UN, 2003) and Sustainable Development Goals (UN, 2015) where migration and food insecurity among the agendas are good examples.

This coordinated joint effort has created an extensive base of literature on the various aspects of migration and food insecurity, albeit some lacuna still exists. Trusting on a review of the existing literature, this paper serves as an add-on to the available evidence through specifically addressing the most common grand policies targeting migration and food insecurity, their opportunities and constraints and a procedural approach for East African countries in tackling the aforementioned challenges.

2. Materials and Research Method

This scientific paper is entirely based on secondary sources data. Accordingly, it has used international reports, books, journal articles, and independent academic research findings, and sources form online official web pages.

3. Result and Discussion

3.1 Common Policy Options on Migration and Food Insecurity

One among the most commonly discussed policy options in migration and food security is inclusive development. Unfair resource distribution has always been a chronic and continuously aggravating problem that results in many problems including migration and food insecurity (Cook, 2006). It impedes the national economy, directly and indirectly, as recently became highly visible through the unequal and inequitable distribution of COVID-19 vaccines within and across countries (Clarke, Ali, Silverman, & Stranges, 2022). Non-inclusive growth and development intensifies violence and conflicts and pushes the destitute to migrate and/or live below the poverty line. This is exemplified by the long-lasting struggles in the resource-rich eastern part of the Democratic Republic of the Congo (DRC) that involve local militias as well as global stakeholders. Due to the ongoing violence and conflict more than a quarter of the Congolese population is acutely food insecure and over 5.6 million people are displaced within the DRC itself, whereas no less than 900, 000 Congolese refugees are living in neighboring countries (Claessens, Bisoka, & Ansoms, 2021). Inclusion policy tries to create a ‘trickle-down’ system to reach the lower sections of the society (Cook, 2006; Gupta, Pouw, & Ros-Tonen, 2015). It ensures that development programs and projects are designed to benefit all members of society, regardless of differences in race, ethnicity, religion, gender, etc. (Cook, 2006; Gupta et al., 2015).

Thus, inclusive development identifies the more vulnerable groups in a society, based on a thorough understanding of local and global disadvantaging dynamics and grants them extra support to not only be part of the developmental transformation but to be the engine of it (Cook, 2006; Todaro & Smith, 2015). This can take the shape of affirmative action, the provision of start-up and fixed capitals (e.g. land), need-based training, and social services at zero or discounted prices. Such pro-poor policies need to counter the growing gap between the poor and affluent members within societies (Cook, 2006; Todaro & Smith, 2015).

Contemporary development policies that deal with migration and food security need to consider the balanced and sustainable nature of rural-urban-growth, the second grand policy. For low-income countries, a common feature of urbanization is the primate urban pattern (Henderson, 2002). A primate city is a city that dominates a region in terms of population size, resources, social services, influence, and other opportunities (Cohen, 2006; Henderson, 2002). This resource monopoly by giant cities serves as a pull factor for immigration from all over the country and/or region (Todaro & Smith, 2015). Primate cities can seem to be in sharp contrast with the countryside and consequently aspire rural people to go and get higher quality

education, health services, good infrastructures, electricity, clean water, etc. (Todaro & Smith, 2015). As a result, a huge number of skilled and unskilled workers migrate to primate cities to fulfill their dreams (Cohen, 2006; Henderson, 2002; Todaro & Smith, 2015). This movement challenges both urban and rural sustainable growth. Rural areas as suppliers of labor and resource to the surrounding urban areas and primate cities further deepen the existing socioeconomic differences (Todaro & Smith, 2015). In relative terms, primate cities take advantage of the process. However, the process also causes the expansion of slums, increasing informal economic activity and criminal activities such as drug dealing and human trafficking, in addition to overcrowding and traffic congestion (Cohen, 2006; Henderson, 2002).

The aim of a balanced rural-urban growth policy is not to cut off the rural-urban chain, nor to let it continue as before. Instead, it aims to reduce the existing rural and urban socio-economic gaps by sustaining urban growth and lifting the rural counterpart (Todaro & Smith, 2015). Resources should be dispatched from the primate cities, development projects should avoid urban biases, and indispensable social services should be extended to rural communities providing education, health care, electricity, clean water, and infrastructures (Todaro & Smith, 2015). Indirectly, these measures reduce rural-urban migration, hence enhancing food security and avoiding urban chaos. Ultimately, the process balances the chain between primate cities and other settlements and maintains sustainable and balanced rural-urban growth through a “win-win policy” chain (Todaro & Smith, 2015).

Historical evidences shows that the large proportion of migration takes place from rural-to-urban areas (Manning, 2013). This is because many of socio-economic problems are more prevalent in rural than urban settlements (Todaro & Smith, 2015). This feature of migration is one among the rationales behind the introduction of integrated rural development policy (Ruttan & Paul, 1984), a policy aimed at enhancing the overall life of the rural people and maintain sustainable rural growth through a comprehensive packages.

Since its introduction in the 1970s, rural development is playing a decisive role in reducing rural-urban migration and maintaining food security (Ruttan & Paul, 1984). These days, the policy is very broad and includes a wide-range of programs in the countryside. It comprises the enhancement of labor productivity, entrepreneurship, and health through agricultural and health extension programs (Nemes, 2005). Moreover, it prioritizes the identification and utilization of local resources through community mobilization. It integrates them to feed each other and enhance efficiency (Nemes, 2005). Part of the policy is the creation of a strong rural institutional system. This gives additional power to solve common sustainability issues that rural communities are encountering. By doing so, the ultimate goal is enhancing the overall living standard in rural areas and consequently balancing out the pros and cons of potential emigration to urban areas (Ruttan & Paul, 1984; Nemes, 2005).

According experts in the field, nurturing democratic culture and institutional frameworks reduces many of the structural challenges encountered pertinent to migration and food insecurity. In fact, one of the leading political causes of migration and food insecurity worldwide is conflict and violence, forming a challenge within and across nations' boundaries (IDMC, 2019). As of December 2018, the conflict has internally displaced 43.2 million people from their original place of residence in 55 countries (IDMC, 2019). The figure is the highest record in human history; Syria, Colombia, and the Democratic Republic of Congo hold the leading positions, contributing 6.1, 5.8, and 3.1 million respectively (IDMC, 2019). The principal source of political migration has been attributed to lack of democratic culture and its outcomes; violence and conflict, dictatorship, unfair resources distribution, lack of accountability and transparency, corruption, poor criminal justice systems, lawlessness, poverty, etc. (Schwarzmantel, 2010; UN, 2013). Hence, this policy quality is driven by the

motto that democratic culture is the basis for a strong economy and sustainable peace (UN, 2013).

Besides, as transboundary in nature migration and food insecurity require global and local partnerships, structural adjustments, asylum regulation, routinization, monitoring, and follow-up (Padilla & Franca, 2016). Strategic policies targeting the issues must be subjected to transparent reviews and modification when necessary. This demands the establishment of strong institutions. The effectiveness of these combined policies relies on the creation of a system for efficient, effective, and sustainable management of migration and food security through institutionalization and international partnership. Otherwise, the policies remain fragile, authorities become lawless, corruption becomes rampant, and transparency and accountability remain ineffective. In this regard, the Sustainable Development Goals (UN, 2015) exemplify the need to work together locally and globally within a shared framework.

Balanced population growth and action on climate change are also among the top grand policy lists discussed on the subject. Sustainable food security and migration policies advocate for a balanced population growth in relation to the country's economic development through programs like family planning practices (Todaro & Smith, 2015). Most low-income countries have a population growth that outweighs their economies (Todaro & Smith, 2015). Farmers are displaced because of farmland fragmentation, deforestation is rampant, pressure on the ecosystem in general is high, and ultimately it is threatening people's livelihood (Todaro & Smith, 2015). Hence, balanced population growth can moderate migration and food insecurity in a sustainable manner. Likewise, it has been more than fifty years since the 1979 international conference on climate change at Geneva, which was considered a wake-up call for the public. Increasingly, we are being confronted with the consequences of environmental and climate deterioration, on stage by the climate strikers and off stage by floods, heatwaves, drought, etc. Many projects are ongoing on the subject and the approach to tackle climate change has become more and more globalized (Kousky & Schneider, 2003). Climate change is a threat to food security and a push factor for migration putting the agenda among the forefront policy dealing with migration and food security (IDMC, 2019).

3.2 The Policy Opportunities and Challenges

Grand policies on migration and food insecurity have brought some manifest and latent opportunities; one of these is enriching global and regional integrations. For decades, efforts on tackling migration and food insecurity were performed by nations unilaterally and it used to have a centralized nature. However, this seems steadily improved and countries are responding in a coordinated and rigorous manner. The concerted response of the UN in MDGs and SDGs is a good illustration of how nations can work together and share experiences for a common goal. Through time, there is a growing realization of the efficiency and effectiveness of coordinated action on the challenges of migration and food insecurity. Recent grand policies are also recognizing the importance of the bottom-up approach at the expense of the long-standing top-to-bottom policy structures. The participatory bottom-up approach is extremely important to comprehend the contextual regional differences and it is playing a decisive role in community mobilization, use of local resources, and circular rural economy, giving the policy additional quality to secure the target group's livelihood (Ruttan & Paul, 1984; Nemes, 2005).

The grand policies have also brought an opportunity to enhance people's well-being through fair resource distribution. This started by challenging the misguided understanding of equating economic growth with development which was apparent in classical times (Todaro & Smith, 2015). The new understanding of development was a breakthrough for the introduction of more inclusive growth and social development policies that focus on the well-being of the nation

(Todaro & Smith, 2015). Bear in mind that marginalized groups are the primary victims of migration and food insecurity, this policy shift has its unique merit in acknowledging and prioritizing the most vulnerable groups, which were previously left out or forgotten. It enables them to share from the national fruits obtained (Cook, 2006; Gupta et al., 2015).

Despite all these opportunities, the aforementioned policies are constrained by several factors, one of which is the lack of knowledgeable and skilled experts, particularly in low-income countries. For a policy to be effectively implemented, it must be translated into programs and specific projects, later continuously monitored and evaluated (Ndyetabula & Hella, 2017). This is done by a team that consists of technically and professionally skilled experts and experienced practitioners. To assemble a team with the necessary knowledge and skills can form a constraint on the foreseen time frame and budget of the program or project. In many low-income countries, policy experts are very scarce due to brain drain (Beine, 2001), sometimes causing policies to end even before reaching the implementation stage (Ndyetabula & Hella, 2017).

Another limitation can be the broad nature of some policies. For example, integrated rural development, climate action, and democratic culture demand a multitude of projects to achieve the mitigation of migration and food security. In order not to get lost in translation, these broad policies need strong coordinating units and resources. Otherwise, integrated rural development policies show little results as observed by previous adaptations of similar policies since the 1970s (ACET & JICA-RI, 2016).

The financial and institutional capacity is the other bottleneck that no program or project can avoid easily (Ndyetabula & Hella, 2017). Organized institutions can propose SMART strategies to maximize their outcome. These approaches are also applicable at national and international levels. For instance, the liberalization of market restrictions can initiate private investors to involve in projects, accordingly saving governments' public expenditures (Todaro & Smith, 2015). Public-Private Partnership (PPP) is another strategy (Osborne, 2000). Governments request private investors to work jointly with the state (Osborne, 2000). Community mobilization is also gaining popularity. In addition to the target goal, this strategy empowers the community, adds value to the sustainability of policy outcomes, builds trust, and smooths the relationship between people and governments. In most cases, external sources of funding play a big role as well in the implementation of policies. For example, to tackle this challenge, the United Nations (UN) and other regional organizations invest billions of dollars in developing countries.

Some policy aspects are already hampered by conflicts of interests among cooperating partners or institutions. For example, Sustainable Development Goal number 13 deals with climate action (UN, 2015). Although climate change is impacting millions of people's livelihood in a negative way (IDMC, 2019), almost none of the international laws on climate action are legally binding. Instead, they trust on consensus because of inconsistent national interests among nations (Stewart et al., 2013). This undermines both the quality of strong institutional frameworks as climate consideration.

In the end, it is worth mentioning that the non-democratic political environment and its consequences such as corruption, violence, unfair distribution of resources, etc. are among the other constraints impacting the success of the policies aforementioned (Todaro & Smith, 2015).

3.3 Methodological Approaches for East African Countries

East Africa hosts mainly low-income countries and is considered as one of the less stable regions in the world with a range of complex socioeconomic and political challenges (Todaro & Smith, 2015). The issues of migration and food insecurity are consequently deep-rooted and

persistent (Connell et al, 2007). The region's economy profoundly depends on agriculture (UN, 2014; Todaro & Smith, 2015). The sector is the main source of employment, national GDP, and foreign hard currency (UN, 2014; Todaro & Smith, 2015). Therefore, regional development policies can benefit from integrated rural development policies with special attention to migration and food security. However, a policy cannot be formulated or adopted without solid evidence (Wills et al., 2016; Howlett, 2017).

According to Wills et al (2016), concerned authorities, at least, should exhaustively consider the following consecutive activities to pass on “best policy options” migration and food insecurity. At first, a detailed analysis of the region should be made. This comprises the investigation of the causes of the problems, the region's Strengths, Weaknesses, Opportunities, and Threats (SWOT), culture, environment, politics, demography, health, etc. A holistic approach should be adopted to make sure that all the facts on the ground are captured. Second, based on the findings, the factors and problems should be ranked and prioritized. Third, the available policy options should be critically and comprehensively examined. Success and failure stories of the policies from other countries' experiences have to be thoroughly evaluated. At last, the appropriate policy should be formulated or adopted. If the policy is alien, contextual adjustments must be made for fitting purposes. The remaining task is the post-policy appraisal. This activity ranges from the translation of policy into programs and projects to monitoring and evaluation of the implementation (Ndyetabula & Hella, 2017).

From the researcher's perspective, keep in mind the above guideline, many of the region's problems demand structural transformation. Hence, the first recommendation is to nurture a democratic culture, meaning a more grassroots and bottom-up approach rather than the continuation of centralized structures. From the people's perspective, it can reduce violence and conflicts, unfair resource distribution, corruption, improve infrastructures, and provide better access to markets. Second, it would be an ignorant decision to adopt policies that prioritize industry or service at the cost of agriculture, because of the sector's spillover effect on the local economy is of vital importance. Therefore, agriculture should be the top development priority. Later on, productivity in agriculture can attract industry and service sector economic activities (Prabhakar & Alemu, 2013). Integrated rural development policy can be one of the best options to achieve agricultural led economies. The Ethiopian economic policy named Agricultural Development Led Industrialization (ADLI) can be exemplary (Prabhakar & Alemu, 2013). With this policy, Ethiopia has managed to achieve around 8 percent GDP growth for more than a decade (UNDP, 2013; WB, 2016; FAO, 2017; NBE, 2017). Third, the other policy qualities lead to the sustainability of the policy. Inclusiveness is crucial for this purpose as well as climate action, strong institutional framework, regional and international partnerships, balanced population growth, sustainable rural-urban growth, and other policy options even not covered in this study can be instrumental.

4. Conclusions

Migration and food insecurity are transboundary challenges that are at the forefront of global agendas. They significantly impact each other at macro, household, and micro levels. It is noted that a thorough understanding of the intricate relationship among these two variables is a key for designing a comprehensive policy framework that can be applied for alleviating the challenges pertinent to them. Besides, albeit many of the policies extensively discussed and debated in the international academics pertinent to migration and food insecurity are too grand and theoretical; in reality they can be applied in different societies with contextual adjustments depending on the regional socio-economic realities.

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References

- [1] ACET, & JICA-RI. (2016). *Integrated Rural Development in Africa Back to the Future?* www.acetforafrica.org
- [2] Arendonk, A. Van. (2015). *The Development of the Share of Agriculture in GDP and Employment: A Case Study of China, Indonesia, the Netherlands and the United States*, Wageningen University. <https://pdfs.semanticscholar.org>
- [3] Bade, K. J. (2003). *Migration in European History*. Allison Brown.
- [4] Beine, M. (2001). Brain Drain and Economic Growth: Theory and Evidence. *Journal of Development Economics*, 64, 275–289.
- [5] Claessens, K., Bisoka, A. N., & Ansoms, A. (2021). Rethinking Communal Land Governance in the Great Lakes Region of Central Africa. *Progress in Development Studies*, 21(2), 6. <https://doi.org/10.1177/14649934211006553>
- [6] Clarke, M., Ali, S., Silverman, M., & Stranges, S. (2022). Global Vaccine Equity to End the COVID-19 Pandemic: A Canadian Perspective and Call to Action. *International Journal of Public Health*, 67, 2022. <https://doi.org/10.3389/ijph.2022.1604729>
- [7] Cohen, B. (2006). Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. *Journal of Technology in Society*, 28, 63–80. <https://doi.org/10.1016/j.techsoc.2005.10.005>
- [8] Connell, J., Zurn, P., Stilwell, B., Awases, M., & Braichet, J. (2007). Sub-Saharan Africa: Beyond the health worker migration crisis? *Journal of Social Science & Medicine*, 64, 1876–1891. <https://doi.org/10.1016/j.socscimed.2006.12.013>
- [9] Cook, S. (2006). Structural Change, Growth and Poverty Reduction in Asia: Pathways to Inclusive Development. *Development Policy Review*, 24(1), 51–80. <https://doi.org/https://doi.org/10.1111/j.1467-7679.2006.00341.x>
- [10] Dennis, B. N., & Talan, B. (2007). Productivity growth and agricultural out-migration in the United States. *Journal of Structural Change and Economic Dynamics*, 18, 52–74.
- [11] FAO. (2017). *Africa Regional Overview of Food Security and Nutrition*.
- [12] FAO, IFAD, IOM, & WFP. (2018). *The Linkages between Migration, Agriculture, Food Security and Rural Development*. <https://doi.org/http://www.fao.org/3/CA0922EN/CA0922EN.pdf>
- [13] Guiraudon, V., & Lahav, G. (2000). A Reappraisal of the State Sovereignty Debate: The Case of Migration Control. *Comparative Political Studies*, 33(2), 163–195. <https://journals.sagepub.com/doi/pdf/10.1177/0010414000033002001>
- [14] Gupta, J., Pouw, N. R. M., & Ros-Tonen, M. A. F. (2015). Towards an Elaborated Theory of Inclusive Development. *The European Journal of Development Research*, 27(4), 541–559. <https://doi.org/https://doi.org/10.1057/ejdr.2015.30>
- [15] Henderson, V. (2002). Urbanization in Developing Countries. *The World Bank Research Observer*, 17(1), 89–112. <https://doi.org/https://doi.org/10.1093/wbro/17.1.89>
- [16] Howlett, M. (2017). The criteria for effective policy design: character and context in policy instrument choice. *Journal of Asian Public Policy*, 00(00), 1–22. <https://doi.org/10.1080/17516234.2017.1412284>
- [17] IDMC. (2019). *Global Report on Internal Displacement 2019*. www.internal-displacement.org
- [18] IOM. (2017). *World Migration Report 2018*. https://www.iom.int/sites/default/files/country/docs/china/r5_world_migration_report_2018_en.pdf

- [19] Kidane, A. (1989). Demographic consequences of the 1984-1985 Ethiopian famine. *Demography*, 26(3), 515–522. <https://doi.org/https://doi.org/10.2307/2061610>
- [20] Kousky, C., & Schneider, S. H. (2003). Global climate policy: will cities lead the way? *Global Climate Policy*, 3(4), 359–372.
- [21] Lindley, A. (2014). *Crisis and Migration: Critical Perspectives*. Routledge.
- [22] Manning, P. (2013). *Migration in World History* (2nd ed.). Routledge.
- [23] Ndyetabula, D., & Hella, J. (2017). *Agribusiness Project Appraisal: Theory and Applications*. Adonis & Abbey Publishers Ltd.
- [24] Nemes, G. (2005). *Integrated Rural Development: The Concept and its Operation* (IEHAS Discussion Papers, No. MT-DP-2005/6). <http://hdl.handle.net/10419/108086>
- [25] Osborne, S. P. (2000). *Public-Private Partnerships Theory and Practice in International Perspective*. Routledge.
- [26] Padilla, B., & Franca, T. (2016). Migration Policies and Institutional Frameworks. Development and Evolution in Portugal. *Comparative Cultural Studies: European and Latin America Perspectives*, 1, 37–52. <https://doi.org/10.13128/ccselap-19987>
- [27] Prabhakar, A. C., & Alemu, Y. (2013). *Agricultural Development-led Industrialization Strategy in Ethiopia: An overview*. 7(5), 237–246. <https://doi.org/10.5897/AJPSIR10.042>
- [28] Ruttan, W., & Paul, S. (1984). Integrated Rural Development Programmes : A Historical Perspective. *World Development*, 12(4), 393–401.
- [29] Schwarzmantel, J. (2010). Democracy and Violence: A Theoretical Overview. *Democratization*, 17(2), 217–234. <https://doi.org/10.1080/13510341003588641>
- [30] Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. In *Working Paper 72, Brighton: IDS*.
- [31] Stewart, R. B., Oppenheimer, M., & Rudyk, B. (2013). A new strategy for global climate protection. *Climate Change*, 120(1–2), 1–12. <https://doi.org/https://doi.org/10.1007/s10584-013-0790-8>
- [32] Todaro, M. P., & Smith, S. C. (2015). *Economic Development Twelfth Edition* (12 ed.). Pearson.
- [33] UN. (2003). *Indicators for Monitoring the Millennium Development Goals: DEfinitions, Rational, Concepts, and Sources*.
- [34] UN. (2013). *Democracy and Development: The Role of the UN* (Issue September).
- [35] UN. (2014). Agriculture is Africa ' s next frontier. In *African renewal :UN Department of Public Information*. www.un.org/africarenewal
- [36] UN. (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*. <https://sustainabledevelopment.un.org>
- [37] UNDP. (2013). *United Nations Development Programme in Ethiopia Annual Report*. www.loreal-finance.com/_docs/0000000136/LOreal_2016_Annual_Report.pdf
- [38] WB. (2016). *Ethiopia's Great Run: The Growth Acceleration and How to Peace it*.
- [39] Wills, A., Tshangela, M., Shaxson, L., Datta, A., Matomela, B., & November. (2016). *Guidelines and good practices for evidence-informed policymaking in a government department*.

Effect of Bee Bread on Growth Performance of Japanese Quails (*Coturnix Japonica*)

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Abstract

Bee bread is a product from the beehive which has unique properties and offers not only well absorbed nutrients such as fat, carbohydrates, and protein, due to the process of fermentation, but also whole spectrum of bioactive compounds. Bee products such as honey, bee venom, royal jelly is widely studied, but bee bread has not been well studied yet and there is a space for further experiments to study its impact. The present study was conducted to evaluate the effect on the growth performance of Japanese quails by adding bee bread into feeding mixture. Japanese quails ($n = 80$) were divided into four groups according to administered bee bread into feed mixture HYD 11, which was given ad libitum, as follows: P1 ($n = 20$) 2 g.kg⁻¹ of bee bread, P2 ($n = 20$) 4 g.kg⁻¹, P3 ($n = 20$) 6 g.kg⁻¹, and the control without additives ($n = 20$). The groups were kept under the same conditions. Data were collected from three weighing done on KERN PLE 4200-2N (Kern & Sohn, Germany) on the 1st day, when they were put into cages, then on the 28th day, and on the 56th day. A significant increase in weight ($P \leq 0.05$) on 28th day in group P1 compared with control group K was noticed. As a result of the research, we can conclude that bee bread has a significant ($P \leq 0.05$) effect on elevating growth performance by addition 2 g.kg⁻¹ of bee bread into feeding mixture. The effect of bee bread on growth performance shows positive impact, nevertheless, the results can be used for further examination.

Keywords: bee bread, bee product, growth performance, Japanese quails

1. Introduction

Bee bread is a valuable source of food for honeybees, because it provides well absorbed nutrients, thanks to the technological process of fermentation, which takes place naturally in honeycombs, bioactive compounds which are vital for a bee hive. It is banned by legislative to use antibiotics or any growth promoters into animal nutrition, therefore there is a significant motivation to find natural alternatives for improving quality of life for animals and also promote growth and being accepted by consumers. Bee bread is formed by the fermentation of pollen mixed with honey, wax and bee saliva in honeycombs. It is characterized by its antibacterial, antioxidant, antiallergic, hepatoprotective and antitumor properties. It is well digested and has a rich nutritional composition (Yucel et al., 2017). Protein digestibility is 94.7%, in contrast to pollen, where digestibility is only between 38.7% and 85.3%. Bee bread contains more than hundred species of fungi, more than 80 types of yeast, more than 40 species

of bacteria from the population of microorganisms. It also contains building and protective substances naturally presented in pollen (proteins, fats, carbohydrates, vitamins, minerals, polyphenols, and flavonoids) (Milojkovic, 2018; Urcan, 2017).

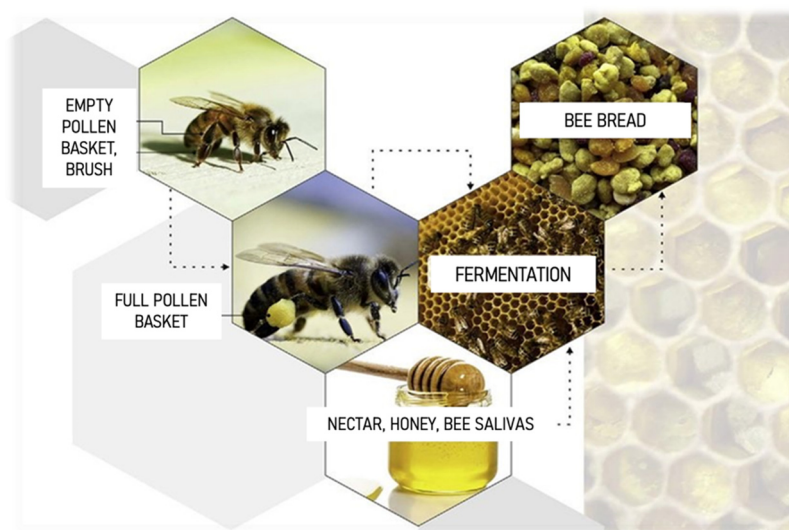


Figure 1: Process of making bee bread (Kieliszek et al., 2018)

The Japanese quail (*Coturnix japonica*) is considered as one of the most widely used animal models in many fields of research for the study of meat and egg quality, but also for the effect of aging and various diseases (Huss et al., 2008). Japanese quails are characterized by their rapid growth rate and sexual maturity, making their generation interval short. They are more resistant to disease compared to other animal models of birds. They are also characterized by their high laying (highest at 8 weeks of age) and low feed and space requirements (Jatoi et al., 2013; Hanusova et al., 2016). Quail eggs and meat are considered a delicacy and we are seeing an increasing trend in consumption in many countries (Hanusová et al., 2013). Due to its nutritional content, meat also has a place in therapeutic nutrition (Cunha, 2009). Nutrition of the quails has a significant effect on meat and egg quality and quantity (Hanusová et al., 2013). Based on previous research on the use of bee products in animal nutrition, our aim will be to determine whether the use of bee bread as a feed supplement in various concentrations affects the growth rate of Japanese quail (*Coturnix japonica*) in both genders.

2. Data and Methods

Bee bread was originated from the National Botanical Garden of the National Academy of Sciences, Kiev, Ukraine. The bee bread was weighed on the analytical weight depending on the feed intake and subsequently homogenized. The feeding mixture HYD 11 with the content of 11.7 MJ.kg⁻¹ ME (Tekro, Slovak Republic) together with bee bread and water were consumed *ad libitum*. The composition of feeding mixture we can see on Table 1. A total number of 80 Japanese quail (*Coturnix japonica*) were divided into four groups. The experimental group P1 (n=20) received bee bread at a dose of 2 g.kg⁻¹, P2 (n = 20) 4 g.kg⁻¹ and P3 (n = 20) 6 g.kg⁻¹ feed mixture. The control group K (n=20) was without the addition of bee bread.

Table 1: The composition of feed mixture HYD 11

Composition	Declared quality features
corn 32 %	nitrogenous substances min 200 g/kg
extracted soybean meal 19.2 %	fibre max 60 g/kg
wheat 15 %	ash max 160 g/kg
CaCO ₃ 10 %	ME min 11.7 MJ/kg
rapeseed meal 7 %	lysine min 7.5 g/kg
sunflower meal 4.5 %	methionine and cysteine min 6 g/kg
animal fat 4 %	linoleic acid min 10 g/kg
malt flower 3 %	Ca min 35 g/kg
monocalcium phosphate 1 %	P min 5 g/kg
premix additives 1 %	Na min 1.6 g/kg

Japanese quails were housed in the Research Institute of Animal Production in Lužianky. Until the 14th day of age, the quails were placed in specialized kennels at a temperature of 30 - 32 ° C, from the 14th day they were transferred to heated aviaries with feeders with a temperature of 20 - 22 ° C and from the 35th day of age they were divided into a four-story cage system. (Venturi, Italy) with a temperature of 21 ± 2 ° C and 64 ± 2 % humidity. The experimental conditions were continuously monitored. The quails were weighed three times by using a KERN PLE 4200-2N analytical balance (Kern & Sohn, Germany). For the first time, 1st weighing, before their placement in the cages and by number, their weights were recorded. The second weighing was performed on day 28 and the third on day 56. Individual weights were recorded by quail number and weight gain was compared between quail groups. The data were analysed using the One Way ANOVA test by using GraphPad Prism 9 statistical software (GraphPad Software Inc., La Jolla, CA, USA). Differences between treatments were tested for significance at $P \leq 0.05$.

3. Results and Discussion

When evaluating the growth intensity, the differences between the individual groups were statistically significant ($P \leq 0.05$) on 28th Day of measurement between the experimental control P1 (114 ± 20.24 g) and control group K (99.39 ± 24.29 g), as we can see on Figure 2. The increased weight is shown on the 56. day, although not significant. The weight of the quail ranged on the 1st weighing from 9.224 ± 0.96 g to 9.398 ± 0.85 g. Weights from the last weighing (day 56) ranged from 198.6 ± 25.03 g to 207.2 ± 32.99 g. The average growth intensity corresponds to the average weight values of quails due to Hanusová et al. (2013).

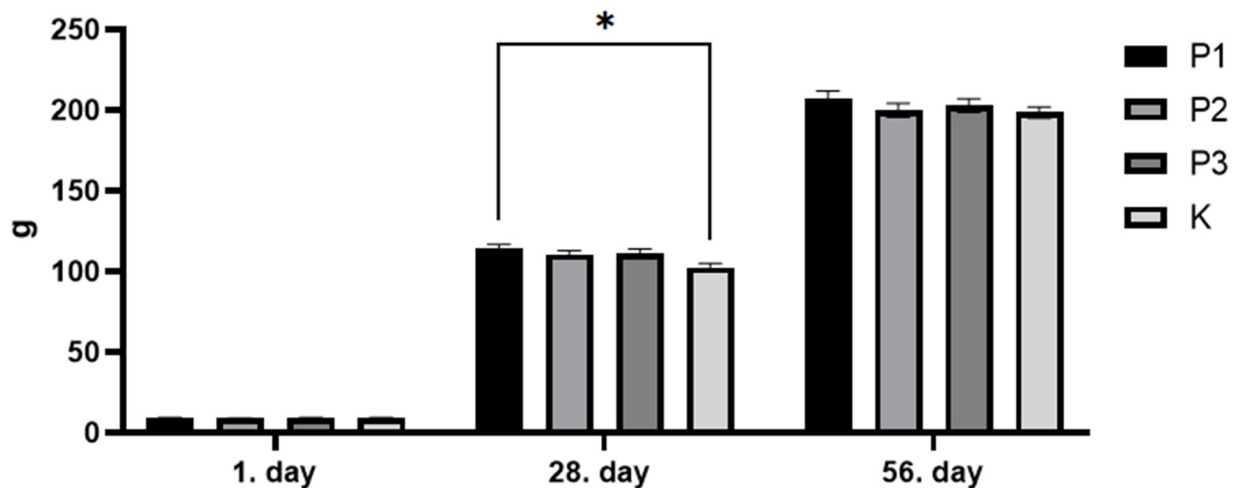


Figure 2: Weights of Japanese quails

Legend: P1 – bee bread in dosage 2 g.kg⁻¹ of feeding mixture, P2 – bee bread in dosage 4 g.kg⁻¹ of feeding mixture, P3 – bee bread in dosage 6 g.kg⁻¹ of feeding mixture, K – control group without adding bee bread

Table 2: Weights of Japanese quails

	P1 (g)	P2 (g)	P3 (g)	K (g)	P value
1 day	9.398 ± 0.85	9.224 ± 0.96	9.311 ± 0.91	9.343 ± 0.87	P > 0,05
28. day	114.0 ± 20.24	110.9 ± 14.92	111.2 ± 20.39	99.39 ± 24.29	P ≤ 0,05
56. day	207.2 ± 32.99	200.0 ± 28.63	203.0 ± 28.56	198.6 ± 25.03	P > 0,05

Due to the small number of studies on the effect of bee bread application in quail feed and growth rate assessment, we also used studies with other applied substances and animal models to compare our results. Babaei et al. (2016) report positive weight gain results after the addition of propolis, pollen, honey, and royal jelly in different concentrations. In addition to the effect on growth intensity, the authors also found a positive effect on increasing the resistance of quails to infections. Biavatti et al. (2003) and Denli et al. (2005) also confirmed the trend of increasing average weight after the addition of propolis extract. The same results as in our experiment were recorded by Acikgoz et al. (2005) on the application of propolis to broiler chicken feed and Canogullari (2009) after the addition of propolis and pollen to Japanese quail. We can also conclude the effect of bee bread on growth performance, which is shown on the 28th day.

Mahgoub et al. (2019), after adding cold-pressed rosemary oil to the feed of Japanese quail, found a trend in increasing weight. In a study done by Guler et al. (2005), where coriander seeds were indicated as a potential growth promoter, also found a positive effect on growth intensity. Hussein et al. (2019) also report results on the positive effect on weight gain after the addition of cold-pressed clove oil. Various natural substances might have positive effect on various markers of health and have effect on increasing the body weight. Determining the

optimal dosage of bee bread is the biggest challenge, because there are not many similarly focused experiments. In comparison with the control group, we observed in our experiment a significant increase of body weight on 28th day in experimental group P1 compared to control group. Our results can contribute to extending the knowledge about bee bread, studying its effect on organism and provide the introduction of new potential natural products we can use in the food technology.

4. Conclusion

There is evidence that natural products when used as feed additives might have a positive effect on animal health and production. A weight gain is one of the indicators of increasing meat yield. The intensity of the growth and weight changes of Japanese quails by adding bee bread into feeding mixture in three different concentrations was monitored. The body weight on day 1, 28 and 56 was evaluated. We did find significant increase in experimental group P1 compared to control group, what indicated that bee bread in certain concentrations might be beneficial for improving growth performance. Further research is needed to evaluate its effects on different indicators, such as effect on quality of meat, eggs, and blood biochemistry.

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References

- [1] Açıkgöz, Z., Yücel, B., & Altan, Ö. (2005). The effects of propolis supplementation on broiler performance and feed digestibility. *Archiv Fur Geflugelkunde*, 69, 117–122. ISSN 0003-9098
- [2] Babaei, S., Rahimi, S., Torshizi, M. a. K., Tahmasebi, G., & Miran, S. N. K. (2016). Effects of propolis, royal jelly, honey and bee pollen on growth performance and immune system of Japanese quails. *Veterinary Research Forum*, 7(1), 13–20.
- [3] Biavatti, M. W., Bellaver, M. H., Volpato, L., Costa, C., & Bellaver, C. (2003). Preliminary studies of alternative feed additives for broilers: *Alternanthera brasiliana* extract, propolis extract and linseed oil. *Brazilian Journal of Poultry Science*, 5, 147–151. <https://doi.org/10.1590/S1516-635X2003000200009>
- [4] Canogullari, S., Baylan, M., Sahinler, N., & Şahin, A. (2009). Effects of propolis and pollen supplementations on growth performance and body components of Japanese quails (*Coturnix coturnixjaponica*). *Archiv Fur Geflugelkunde*, 73, 173–178.
- [5] Cunha, R. G. (2009). Quail meat-an undiscovered alternative. *World Poultry*, 25(2), 12-14. ISSN : 1388-3119
- [6] Denli, M., Cankaya, S., Silici, S., Okan, F., & Uluocak, A. N. (2005). Effect of Dietary Addition of Turkish Propolis on the Growth Performance, Carcass Characteristics and Serum Variables of Quail (*Coturnix coturnix japonica*). *Asian-Australasian Journal of Animal Sciences*, 18(6), 848–854. <https://doi.org/10.5713/ajas.2005.848>

- [7] Guler, T., Ertas, O. N., Ciftci, M., & Dalkilic, B. (2005). The effect of coriander seed (*Coriandrum sativum* L.) as diet ingredient on the performance of Japanese quail. *South African Journal Of Animal Science*, 35, 260–266. <https://doi.org/10.4314/sajas.v35i4.3969>
- [8] Hanusova, E., Hrnčár, C., Hanus, A., Oravcová, M. (2016). Egg traits in Japanese quails. *Acta fytotechnica zootechnica*, 19, 62-67. DOI: 10.15414/afz.2016.19.si.62-67
- [9] Hanusová, E., Baumgartner, J., Hetényi, L., Hanus, A. (2013). *Prepelica japonská*. Nitra: Publikácie CVŽV. ISBN 978-80-89418-30-5
- [10] Huss, D., Poynter, G., & Lansford, R. (2008). Japanese quail (*Coturnix japonica*) as a laboratory animal model. *Lab Animal*, 37(11), 513–519. <https://doi.org/10.1038/labani1108-513>
- [11] Hussein, M. M., Abd El-Hack, M. E., Mahgoub, S. A., Saadeldin, I. M., & Swelum, A. A. (2019). Effects of clove (*Syzygium aromaticum*) oil on quail growth, carcass traits, blood components, meat quality, and intestinal microbiota. *Poultry science*, 98(1), 319-329. <https://doi.org/10.3382/ps/pey348>
- [12] Jatoi, A. S., Sahota, A., Akram, M., Javed, K., Jaspal, M., Hussain, J., Mirani, Dr. A., & Mehmood, S. (2013). Effect of different body weight categories on the productive performance of four close-bred flocks of Japanese quail (*Coturnix coturnix japonica*). *Journal of Animal and Plant Sciences*, 23, 7–13.
- [13] Kieliszek, M., Piwowarek, K., Kot, A. M., Błażejczak, S., Chlebowska-Śmigiel, A., & Wolska, I. (2018). Pollen and bee bread as new health-oriented products: A review. *Trends in Food Science & Technology*, 71, 170–180. <https://doi.org/10.1016/j.tifs.2017.10.021>
- [14] Mahgoub, S. A. M., El-Hack, M. E. A., Saadeldin, I. M., Hussein, M. A., Swelum, A. A., & Alagawany, M. (2019). Impact of *Rosmarinus officinalis* cold-pressed oil on health, growth performance, intestinal bacterial populations, and immunocompetence of Japanese quail. *Poultry Science*, 98(5), 2139–2149. <https://doi.org/10.3382/ps/pey568>
- [15] Milojkovic, V. Bee Bread (Perga) The Source of Health, Vitality and Longevity. In *Proceedings of the Apiquality & Apimedita 2018 the XI-th Congress of the XI-th Romanian Society of Apitherapy*, Sibiu, Romania, 11–16 October 2018.
- [16] Urcan, A. C., Marghitas, L. A., Dezmirean, D. S., Bobis, O., Bonta, V., Muresan, C. I., & Margaoan, R. (2017). Chemical Composition and Biological Activities of Beebread – Review. *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Animal Science and Biotechnologies*, 74(1), 6–14. <https://doi.org/10.15835/buasvmcn-asb:12646>
- [17] Yucel, B., Topal, E., Kosoglu, M. (2017). Bee Products as Functional Food. *Biology*. DOI:10.5772/65477

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