

## Pork Meat and Meat Products Market in the Slovak Republic

**Kristína Predanócyová<sup>1</sup>, Ľubica Kubicová<sup>2</sup>, Zdenka Kádekóvá<sup>3</sup>, Ingrida Košičiarová<sup>4</sup>**

Slovak University of Agriculture in Nitra <sup>1, 2, 3, 4</sup>

AgroBioTech Research Centre <sup>1</sup>

Faculty of Economics and Management <sup>2, 3, 4</sup>

Institute of Marketing Trade and Social Studies <sup>2, 3, 4</sup>

Trieda A. Hlinku 2

Nitra, Slovakia

e-mail: kristina.predanocyova@uniag.sk<sup>1</sup>, lubica.kubicova@uniag.sk<sup>2</sup>,

zdenka.kadekova@uniag.sk<sup>3</sup>, ingrida.kosiciarova@uniag.sk<sup>4</sup>

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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

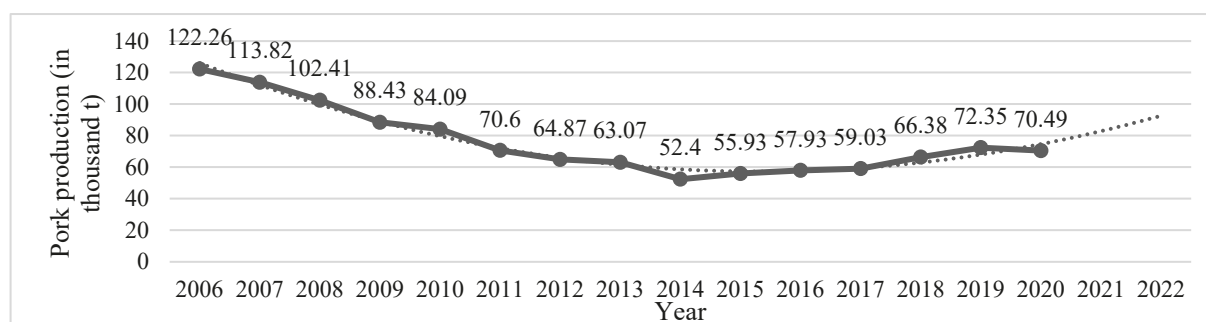
The trend in pork production was accompanied by an average annual decline of 3.86% ( $k' = 0.9614$ ). In 2020, 70.49 thousand tons of pork were produced, which represents a decrease compared to the first year of the analyzed period by up to 42.34% (Figure 1). The Slovak Republic accounts for approximately 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.



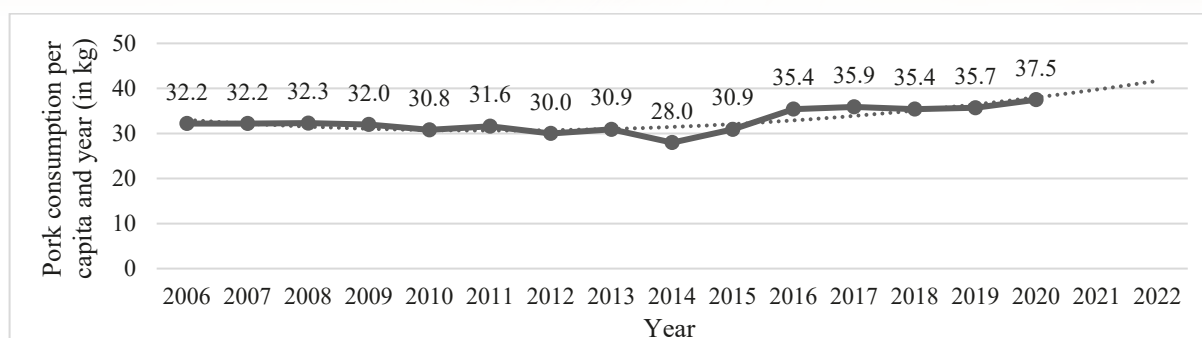
**Figure 1: Pork meat and meat products production in the Slovak Republic in the years 2006-2020 (in thousand t)**

*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>
		<b>1,311 (100%)</b>	<b>Low 422 (32.19%)</b>	<b>Middle 99 (7.55%)</b>	<b>High 790 (60.26%)</b>	
<b>Gender</b>	<i>Men</i>	556	104	35	417	<b>&lt;0.0001</b>
	<i>Women</i>	755	318	64	373	
<b>Age</b>	<i>&lt;25 years</i>	498	215	41	242	<b>&lt;0.0001</b>
	<i>26-35 years</i>	282	66	24	192	
	<i>36-50 years</i>	293	88	21	184	
	<i>&gt;50 years</i>	238	53	13	172	
<b>Education</b>	<i>Elementary</i>	45	10	1	34	<b>&lt;0.0001</b>
	<i>Secondary</i>	635	172	43	420	
	<i>University</i>	631	240	55	336	
<b>Residence</b>	<i>City</i>	695	242	58	395	<b>&lt;0.0001</b>
	<i>Countryside</i>	616	180	41	395	
<b>Number members</b>	<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>&gt; 4 members</i>	222	68	14	140	
<b>Monthly income of household</b>	<i>&lt; 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>&gt; 3,0001 €</i>	120	38	7	75	
<b>Dietary preference</b>	<i>Meat consumption preferences</i>	1219	375	96	748	<b>0.0013</b>
	<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>	<b>0.899</b>	0.207	0.092
<i>Product fragrance</i>	<b>0.822</b>	0.246	0.152
<i>Proportion of meat</i>	<b>0.789</b>	0.346	0.023
<i>Product appearance</i>	<b>0.781</b>	0.199	0.163
<i>Country of origin</i>	<b>0.761</b>	0.322	0.165
<i>Durability</i>	<b>0.729</b>	0.215	0.306
<i>Previous experience</i>	<b>0.723</b>	0.124	0.289
<i>Product price</i>	<b>0.701</b>	0.096	0.248
<i>Producer</i>	<b>0.687</b>	0.336	0.246
<i>Health aspect</i>	<b>0.627</b>	0.403	0.335
<i>Product information on the packaging</i>	<b>0.548</b>	0.344	0.479
<i>Saturated fatty acid content</i>	0.175	<b>0.841</b>	0.256
<i>Salt content</i>	0.222	<b>0.807</b>	0.249
<i>Water content</i>	0.336	<b>0.789</b>	0.108
<i>Fat content</i>	0.275	<b>0.773</b>	0.277
<i>Emulsifiers</i>	0.382	<b>0.762</b>	0.089
<i>Energy value</i>	0.220	<b>0.751</b>	0.318
<i>Package appearance</i>	0.230	0.141	<b>0.832</b>
<i>Product promotion</i>	0.133	0.206	<b>0.843</b>
<i>Package size</i>	0.331	0.133	<b>0.730</b>
<i>Preparation speed</i>	0.154	0.246	<b>0.703</b>
<i>Ecological aspect (organic food)</i>	0.183	0.425	<b>0.611</b>

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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