

TRENDS OF FORMING AGRI-FOOD CHAINS OF VALUE ADDED IN UKRAINE

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Abstract

The scientific and methodological principles of agro-food chains functioning in Ukraine as an economic system, which consists of numerous participants, which promote bringing of products to the end user on basis of providing additional services, are systematized. The main production, market and institutional tendencies and environment for interaction in creating effective chains of value added and attracting them to small-scale agricultural producers are analyzed. The proposals for increasing added value in the grain chains based on diversification of grain use in production of livestock products are developed. It is proved that the maintenance of competitiveness of domestic agro-food chains will contribute to the implementation of quality and safety management systems in agricultural enterprises for cultivation of products of plant and animal origin.

Keywords: *agri-food chains, added value, integration links, agricultural market infrastructure, PLM system*

JEL Classification: Q10, G35

1 Introduction

Market transformations in the agri-food sector of Ukraine's economy, as well as globalization processes and European orientation of the country, bring about the necessity for search for directions of formation of competitive agri-food chains. It is obvious that ensuring profitability of agrarian enterprises in a competitive environment is achieved mainly through cost management and formation of added value of products in agri-food chains. Under current conditions, full value functioning of agri-food chains, which create high indices of added value, is provided

by vertically-integrated structures. However, the issue of increasing value added by small commodity producers, in particular through the involvement of the latter in integration associations, as well as provision of high quality and safety of agricultural products and foodstuffs, as well as improvement of relations between participants in chains based on the principles of long-term partnership and transparency, remain unresolved.

Studying the peculiarities of functioning of agri-food chains is vital for Ukraine and allows to evaluate relations between all actors within them, and helps to understand economic and social benefits and losses in these relations for all participants. On the other hand, the analysis of the agri-food chain shows where the largest added value is formed, accumulated and realized, and gives the opportunity to establish relative importance of different actors in this process, both inside and outside the chain. This approach includes analysis of the institutional environment that promotes the development of key actors in the chain and allows to substantiate the directions of achieving rural development goals when agricultural producers are involved in the process of obtaining their part of added value.

2 Data and Methods

The methodology of this research is based on the theory of chain approach, developed by M. Porter, G. Gereff, M. Moris and R. Kaplinski. It is also based on the evaluation and analytical works, on the generalization of expert and practitioners' ideas in Ukraine's agri-food sector. The research includes the analysis of modern trends and institutional environment in agriculture, processing industry and trade, peculiarities of agri-food chains formation. We have used scientific works of key foreign and national scientists, research results of state research and statistical institutions related to production, processing, commercialization and consumption of agricultural products and foodstuffs. The additional information was received from regional agricultural authorities, technical assistance projects, associations and international donor organizations, operating on the territory of Ukraine. All these data allowed to carry out empirical research on the functioning practice of added value chains in some agro-food sectors.

3 Results and Discussion

Foreign scientists define agri-food supply chains as "a set of interconnected companies that work closely together to target the flow of goods and services across the whole chain of value added of agricultural and food products, which

will bring this flow to consumers at the lowest possible cost" (Beske, 2014), or as "an activity that covers the stages from production to distribution, which ensures bringing products to final consumers" (Aramyan, C., 2006). At the same time, the agri-food chain is the basis for conducting the analysis of managerial activities of the enterprise in relation to bringing the product from production stages to final consumers (Gereffi, 1999). In addition, the agri-food chain is considered through activities that include "production of input materials used for agricultural production, processing, wholesale trade and logistics, retail trade and final consumers" (Mattiacci and Vignali, 2004). It is worth paying attention to the approach to managing the agro-food chain, which involves coordinated and targeted activities to fully meet the needs of consumers (Mikkola, 2008). Under the current conditions, an important requirement is to guarantee not only the quality and safety of agricultural food, but also respect for the principles of sustainable development. In this direction, it is of importance to develop innovative products that are different from traditional ones, that is, innovations should lead to development of new production technology and emergence of the market for bio-products, as well as functional food products that are more useful (Caiazza and Volpe, 2012). We believe that the most complete definition of agri-food chains is proposed by FAO (United Nations Food and Agriculture Organization): it is a set of agricultural producers and organizations (or actors) that consistently coordinates creation of added value in production of certain types of agricultural products and their processing for the purpose of obtaining food products sold to the final consumer and after consumption are sent to waste, ensuring profitability at each stage, creating wider benefits for the society without permanent depletion of natural resources (FAO, 2014).

At the same time O. Borodina defines agri-food chains as not simply interrelated links of one process (including six stages: from producers of raw materials to consumers of final food products), but also (and above all) as mutually beneficial links between groups of producers, sellers, processors and service companies that unite together to increase productivity and create value-added based on understanding of common benefit and equitable distribution of the results achieved. The implementation of the concept of agri-food chains formation can positively affect incomes and employment in the agri-food sector by providing access to the market for small-scale agricultural producers and establishing business ties with small and medium-sized processing enterprises (Borodina, 2014). Consequently, the above-mentioned definitions of agri-food chains allow us to distinguish the following key components: production of raw materials, supply of products, transportation logistics, economic feasibility, creation of value added, sustainability of operation.

It should be noted that in the process of studying existing interpretations of added value we have identified the concept of "value chain" introduced by M. Porter, which in other scientific works is called value added chain (Porter, 2000). He introduced the value chain as an agreed set of activities that create value for the enterprise, from its input sources of raw materials to finished products delivered to the consumer, including its maintenance and utilization of waste. Consequently, the chain of creating value involves economic processes that generate value added (production, logistics, marketing, provision of additional services).

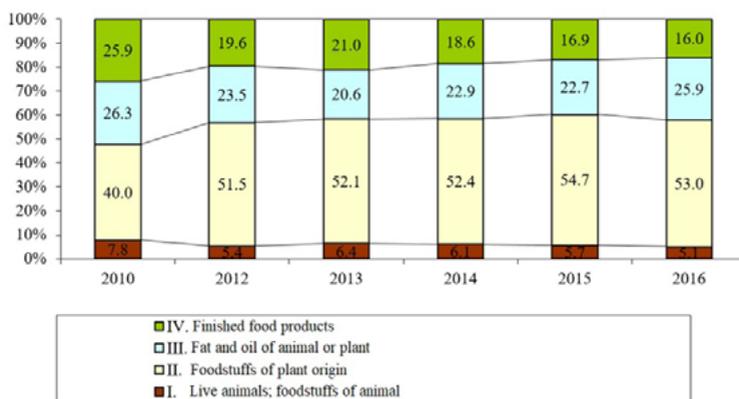
The notion of value chain is treated as a process of adding value to a product that begins with purchase of material and technical elements necessary for production, and ends with sale of goods and services to customers (Chukhray, 2008). Thus, the definition of the value chain based on a set of value added activities that are geared towards more complete satisfaction of consumers' needs is found in (McCormick, 2000; Sturgeon, 2001), the definition of cost based on the cycles of its creation involves allocation of production, marketing and logistics processes that are responsible for the formation and implementation of the appropriate value (Baker, 1985).

Consequently, the agri-food value added chain is an economic system consisting of different chain operators represented by suppliers of raw materials, providers of services, agricultural producers, processing organizations, distribution logistics organizations, marketing firms that promote delivery of products to the final consumer on the basis of providing additional services. That is why added value of the agri-food chain is considered by us as value of goods formed during the process of agricultural production, processing, storage and sale in the enterprise, which requires its transparent and equitable distribution among all the participants in the technological chain. Value added to the product includes labor costs, depreciation, taxes and profits.

Let us consider the potential of Ukraine's agri-food sector in shaping the increased value added. One of the ways of resolving this issue under domestic conditions is extension of agri-food chains, which will allow to export finished farm products instead of agricultural raw materials. In addition to an important social function, the production process in the agrarian sector provides a stable inflow of currency to the national economy, forms a raw material base for the development of processing industry and determines one of the main specializations in the world market. In general, the share of the agri-industrial complex in the structure of total export volumes has a steady tendency for growth. Since 2000, Ukraine has witnessed a tendency to increase the volumes of gross agricultural and food production, in particular, from 2005 to 2016, the gross agricultural output increased by 30%. At the same time, there is a steady increase in export volumes in the agrarian sector (an increase of 28%) and a positive foreign trade balance.

The growth of production of export-oriented agricultural products is accompanied by deformation of sectoral and product structures of production. It is established that among the export-oriented agricultural branches the highest value added index is formed by production of sunflower oil, (in 2016, the supply of Ukrainian oil accounted for 54.8% of world exports). The next export-oriented chain is grain (in 2016, 39 million tons of export), but it is characterized by formation of low value added, as the object of delivery is grain (Figure 1).

Figure 1 Dynamics of the structure of export of agri-food products by volume of cash receipts, %



Source: Calculated according to the State Statistics Service of Ukraine.

The data presented in Figure 1 indicate that during the research period, the growth of the share of crop and livestock production, which in 2016 amounted to 53% and 5.1% correspondingly, is considered to be a negative tendency. In addition, the share of food products in the structure of exports does not take a prominent place in 2016, only 16%, or decreased during the research period by 9.9 pp. Consequently, the given data convince us about the necessity of forming added value while exporting products due to the increase in volumes of food products export.

The positive dynamics in provision of value added growth are observed in the egg chain, where a limited number of producers (three powerful agrarian holdings) provide up to 75% of egg production and almost 100% of products of deep procession. As for other livestock sector chains, they are mainly oriented at the domestic market and are unable to generate value added gains due to the inability to guarantee quality and safety of products.

In order to extend the agricultural chain, it is necessary to create favorable conditions for investing in new technologies of grain processing, in the development of infrastructure and logistics. It should be noted that significant export volumes of certain types of crop production to date have objective preconditions. The domestic market is not able to absorb the entire volume of supply, and therefore, nowadays, significant volumes of grain exports and certain types of oilseeds are quite a logical phenomenon that "unloads" the domestic market, prevents price reduction and ensures the inflow of currency to the country and financial resources in agricultural sector.

We have calculated the effect of increase of value added on the basis of comparing the effectiveness of existing and potential uses of crop products produced in Ukraine on the example of grain and soybeans in terms of finding options for increasing value added inside the country (Bodnar&Shpichak, 2013; Bodnar&Pedorchenko, 2015).

As the experience of the leading countries of the world convinces us, there is an economic expediency to diversify the use of grain produced, which ensures a higher competitiveness of the country in different conditions of the world market. Thus, global producers and exporters of grain, at full satisfaction of domestic needs in grain and livestock products, export not only grain crops, but also supply to the world market dairy and meat products, bioethanol, for which grain is used, and by doing this they occupy their niche in the world's distribution of labor. For example, in France, 1094 kg of grain is produced per person, which is 14% lower than the best Ukrainian indicators, the share of grain exports in production is 51%. The level of meat consumption in this country is 86.7 kg, milk consumption is 246.6 kg, which is correspondingly 70 and 17% more than in Ukraine. At the same time, France exports livestock products 24.3 kg of meat and 165.5 kg of milk per 1 person.

A similar situation in Ukraine took place in 1990, in particular, it produced 981 kg of grain per capita, with its export of only 3 million tons, while the amount of feed stock was 28 million tons. With the provision of domestic consumption of meat at the level of 68 kg and milk at the level of 373 kg, 5.2 and 2.2 times more of these products were exported outside the country. Currently, the capacity of the domestic grain market in Ukraine is limited due to the low purchasing power of the population.

It is obvious that the increase in the purchasing power of the population will determine the need to expand the use of grain: to meet domestic needs at the level of rational norms, including livestock products, grain and livestock exports, and the use of cereals to produce bioethanol. This will result in manufacturing products with significantly higher value added. Ukraine already has the experience

of reorientation from export of raw materials, in particular sunflower seeds, to export of sunflower oil, a product with higher added value (Table 1).

Table 1 Calculation of variants for formation of incremental value added (on the example of grain)*

Indicators	Cereal total	Wheat	Barley	Corn
Grain production				
Amount of product, thousand tons	100	23	11	66
Sales price, UAH for 1t on including VAT	x	3367	3195	3581
Share of value added in production, %**		50,5	45,5	46,5
Added value created while producing grain, UAH million	164,9	39,1	16,0	109,8
Grain export				
Price FOB, UAH per 1 ton	x	3550	3825	3755
Share of value added in export logistics, %	48			
Added value created when exporting grain, UAH million	32,2	4,0	7,3	20,9
Total value added when producing and exporting grain, UAH million	198,4			
Alternative variants of grain use in livestock production	Milk production		Meat production (pork)	
The amount of product that can be obtained when using 100 thousand tons of grain, thousand tons	258,4		18,6	
Sales price of livestock product, UAH for 1 ton including VAT	5336		29617	
Share of value added in production, %**	48,7		38,1	
Added value created while using grain in livestock, UAH million	219,5		270,8	
Total value added when producing and processing grain for livestock product, UAH million	384,3		436,2	
Increase in aggregate value added created while producing and processing grain for livestock product in comparison with export, times	1,94		2,20	

Indicators	Cereal total	Wheat	Barley	Corn
Increase of value added while processing already harvested grain for livestock product in comparison with export, times	6,80		8,40	
The number of additionally created jobs	900		400	

Source: Calculated according to the State Statistics Service of Ukraine.

* on the example of 100 thousand tons of grain and in the conditions of the year 2015

** the indicator adjusted in compliance with the production structure according to categories of farms

The next direction in ensuring increase in value added of agri-food chains is involvement of small commodity producers of agricultural products into competitive integration chains. It is known that in Ukraine a large part of the individual sector is included in agricultural activity and a large part of rural population exists due to family farming (although it is not officially called so). Thus, it cannot be assumed that 2.6 million rural residents at the age of being economically active, who currently produce agricultural products on private farms, will potentially be included in chains. In particular, 40% of rural households with insignificant resources that produce foodstuff for their own consumption (self-sufficiency) can potentially not be included in supply chains. We believe that in order to create conditions for attracting private peasant farms to competitive agricultural chains, it is necessary to introduce wide-ranging measures of rural development, including creation of non-rural workplaces in rural areas.

It is obvious that integration of small agricultural producers into modern chains of supply of necessary materials, technology, capital and marketing of manufactured products will increase the possibility of access of the individual sector to markets that will ensure full use of potential opportunities regarding prices and revenues. Therefore, corporate structures should be interested in initiating processes for attracting small-scale producers to agri-food chains. That is why, a system of economic incentives for these structures to interact with small and medium-sized producers should be introduced on the basis of tax exemptions, which are now unjustifiably used by corporate structures. In addition, support for the development of agricultural co-operation is one of the areas for strengthening the market power of small commodity producers on the basis of their group participation. The benefits of group participation in chains are obvious; for the agro-enterprise and other chain members, cooperation with a group

is more attractive than with a large number of small producers; for a group of small producers it is possible to get more benefits from integration to combine their resources and access to credit and services in order to introduce innovative technology and ensure competitiveness of products.

We believe that in order to increase the competitiveness of agri-food chains, which are created by small agricultural producers, it is economically feasible to organize processing of raw materials. Currently, the majority of small and medium-sized agricultural enterprises do not have the capacity to harvest and store harvested crops, which makes it necessary to sell to intermediary structures during the harvesting campaign, when the level of purchasing prices is the lowest.

For example, vertically-integrated structures have elevators in their structure, which makes it possible to store grain and sell it in the period of maximum prices. Most vertically-integrated structures independently sell products to final consumers, including the foreign market, receiving additional income in the form of VAT refunds, as well as the difference between prices on the domestic and foreign markets.

Among the main factors that prove the economic feasibility of diversifying production through establishment of in-farm processing are as follows: a strong source of raw materials and availability of free production facilities; orientation of commodity producers towards a fuller and more efficient use of production potential; financial factors need for cash, risk minimization, financial stabilization; surplus of skilled labor (due to seasonality of agricultural production, general decline of dynamics of the industry); the need for prompt response and flexible adaptation to changing market conditions; the need for a perfect competitive environment and elimination of the monopoly of processing enterprises.

Introduction of systemic safety methods in agricultural enterprises will ensure competitiveness of agri-food chains. Cultivation of products of plant origin and breeding products of livestock origin will largely depend not only on the level of compliance with the minimum requirements of basic programs, but also on the interest of food processing enterprises in obtaining safe and quality raw materials. Under the current conditions, creation of agri-food chains takes place without a clear identification and appropriate fixing of specific obligations in the Agreements. Neither the specifics of economic relations and technological requirements on both sides are taken into account in order to bring products and food processing production to regulatory parameters. This issue is unresolved in rural production, which has 77.4 thousand subjects, however, only 1.1-1.5 thousand agricultural enterprises have implemented Safety Systems (HACCP or DSTU ISO 22000: 2007), or conducted an audit regarding conformity of production to minimum requirements of the basic programs (ISO / TS 22002-3: 2011 Program of mandatory preliminary measures for food products safety).

4 Conclusions

One of the directions for increasing value added of agri-food chains is the diversification of the use of agricultural products in compliance with alternative options for increasing value added within the country. In particular, it is proved on the example of grain that when it is grown and processed for production of milk or pork, aggregate added value is created, which is, correspondingly, 1.94 and 2.20 times higher than the aggregate value added created while only producing and exporting grain. In addition, with the use of 100 thousand tons of grain for production of pork, creation of 400 additional jobs is provided and for production of milk 900 additional jobs. Moreover, under domestic conditions, the possibility of increasing value added created by small forms of agri-business is not used, which, through the development of agricultural co-operation and integration with large commodity producers, can increase the economic strength in the market of agri-foodstuffs and promote rural development.

Integration of Ukraine into the European Union increases the need to address the issue of compliance to regulatory parameters of quality and safety of food raw materials by agricultural producers, where there are no functional management systems. The gradual adaptation of the agrarian sector of Ukraine to European requirements regarding safety and quality of food products is a prerequisite for development of regional and national agri-food chains to a transnational level, which will facilitate a rapid access of food products to European markets, and creation of added value and new opportunities for small producers to have an access to these markets.

The following areas of study of the problem of value added in agri-food chains should be the study of practice and justification of introduction of a closed technological cycle of non-waste production of quality and safe agri-foodstuffs on the basis of innovations, for which it is expedient to use production and technology modules of a closed cycle developed by world-wide practice that allow introduction of PLM system (product lifecycle management). This is confirmed, for example, by the fact that in Ukraine only 30% of the by-product of crop production is used and contributes to formation of value added.

References

1. ARAMYAN, C., ONDERSTEIJN, O., Van KOOTEN, O., LANSIK, A. (2006). Quantifying the Agri-Food Supply Chain, Wageningen UR Frontis Series, 15, p. 244.

2. BAKER, M. (1985). *Marketing Theory and Practice* / [red. Baker M.] – London: Macmillan Press Ltd. London. 385 pp.
3. BESKE, P., LAND, A., SEURING, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry A critical analysis of the literature. *International Journal of Production*, 152, p. 131-143.
4. BODNAR, O. V., PEDORCHENKO, A. L. (2015) Prospects of increase of added value on the market of soybeans and products of their processing in Ukraine. *Economy of agro-industrial complex*. No. 3. p. 51-60.
5. BODNAR, O. V., SHPICHAK, O. M. (2013). The benefits and problems of exporting grain from Ukraine. *Economy of agroindustrial complex*. № 10. P. 5-15.
6. BORODINA, O. M. (2014) Integration of small agricultural producers into the agro-food chains of added value: methodological approaches and empirical studies. *Economy and Forecasting*:(2), P. 73-84.
7. CAIAZZA, R., VOLPE, T. (2014). “Agro-food firms' competitiveness: made in Italy in the world”, *International Review of Management and Business Research*, Vol. 3 No. 2, pp. 1790-1796.
8. CHUKHRAI, N. I. (2008). Evaluation and development of relations between business partners: monograph / N.I. Chukraj, Ya.Yu. Krivoruchko; for sciences Ed. N. Chukhrai. - Lviv: Raster-7. 360 p.
9. FAO (2014). *Developing sustainable food value chains – Guiding principles*. Rome. Retrieved from <http://www.fao.org/3/a-i3953e.pdf>.
10. GEREFFI, G. (1999). “International trade and industrial upgrading in the apparel commodity chain”. *Journal of International Economics*, Vol. 48, pp. 37-70.
11. MATTIACCI, A., VIGNALI, C. (2004). “The typical products within food 'globalization' the makings of a twenty-first-century industry”, *British Food Journal*, Vol. 106 Nos 10/11, pp. 703-713.
12. McCORMICK, D. (2000). Value chains, production networks, and the business system / D. McCORMICK. Bellagio: Bellagio Value Chains Workshop. P. 9-18.
13. MIKKOLA, M. (2008). “Coordinative structures and development of food supply chains”, *British Food Journal*, Vol. 110 No. 2, pp. 189-205.
14. PORTER, M. (2000). *Competition* / M. Porter. M. : Izd. house Williams. 308 pp.
15. STURGEON, T. J. (2001). How do we define the chain and production networks / T.J. Sturgeon // *IDS Bulletin*. Vol. 32. No. 3. P. 9-18.