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Paper prepared for presentation at the EAAE 2014 Congress 'Agri-Food and Rural Innovations for Healthier Societies'

> August 26 to 29, 2014 Ljubljana, Slovenia

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THE SHARE OF AGRIBUSINESS IN NATIONAL ECONOMY IN RELATION TO THE LEVEL OF ECONOMIC DEVELOPMENT IN THE EUROPEAN UNION COUNTRIES ¹

Abstract

The aim of the article was to present the dependency between the share of agriculture and total agri-food sector in the national income and the level of gross value added per capita in European Union countries. The article compares the internal structure and share of agribusiness in the national economy in relation to gross value added. The main research method was input-output analysis. In the countries with a high level of the national income per capita the decreasing tendency in the share of agribusiness in the national economy is reversed because of the demand for highly processed foods.

Key words: agribusiness, internal structure, share of agribusiness in national economy, gross value added per capita.

KODY JEL: 013, P52, Q13

Introduction

The analysis of socioeconomic structures and their transformations is an important problem in the theory of economic development. Within those structures the share and role of individual sectors of economy (industry, agriculture and services) in the economy of a particular country is significant (Fiedor, Kociszewski 2010). The analysis of the share and significance of individual sectors of the national economy in food production holds an important position in the country's economic development.

Agribusiness, also known as the food economy or agri-food sector, is a subsystem of the national economy, which has developed its own internal connections and which is simultaneously strongly integrated with other sectors of the national economy. One of the comprehensive theories investigating the share and importance of individual sectors of the national economy in food production is the agribusiness theory, which was developed by J.H. Davis and R.A. Goldberg². J. H. Davis understood agribusiness as the total of all operations of agricultural production, including the production and distribution of the entire supply stream providing farms with means of production and production services, as well as all operations related with the turnover, storage, processing and distribution of agricultural

¹ Article was financed by the National Science Centre allocated on the basis of the decision number DEC-2012/07/B/HS4/02837

 $^{^{2}}$ The essential study on the theory of agribusiness, its internal structure and connections with the national economy is *A Concept of Agribusiness* by Davis J.H and Goldberg R.A, Boston 1957.

products. According to the classic formula, agribusiness is part of the economic system which produces food and provides raw materials from the farm to consumers. Agribusiness as a national economy sector consists of three main economic aggregates (groups), which are used in this analysis. Zone I includes the industries manufacturing means of production and services for agriculture and the food industry, zone II - agriculture, zone III - the food industry (Davis, Goldberg 1957).

The mechanism of development of the agri-food sector (agribusiness) comprises changes in the proportion between the national economy and food economy and between individual components of agribusiness. Showing these proportions significantly influences assessment of the degree of modernity of agribusiness structures in individual countries. According to global tendencies the agribusiness structure changes in a manner that the share of agriculture decreases, whereas the share of the food industry, turnover and services increases (Czyżewski 1995, Wilkin 2001). This means that the leading component of agribusiness changes along with the evolution from agriculture to the food industry and consumer (Zalewski 1989, Kowalczyk 1998). Agriculture and the entire agri-food sector constantly affect the development of the national economy, but they are more and more dependent on the situation in the other sectors of the national economy.

The main aim of the article is to show the importance of the food economy (agribusiness) in the national economy of the European Union³ depending on the level of socioeconomic development in a particular country.

Method and scope of research

According to Woś (1979), in order to assess the degree of development and modernity of agribusiness and to illustrate its importance in the national economy it is possible to use the group of five indexes. These are the values illustrating the production potential (employment, gross value of fixed assets and investment outlay), production output (global production) and income output (gross value added). Only the gross value added of agribusiness were used for comparative analysis to show the importance of the agri-food sector in the national economy in the EU countries. The values were calculated by means of the formula suggested by Woś (1979):

³ Due to the insufficient data the analysis does not include such EU countries as Cyprus, Malta and Luxembourg.

$$X_{A} = x_{r} + x_{p} + \sum_{i=1}^{n} x_{i} b_{ir} + \sum_{i=1}^{n} x_{i} b_{ip}$$

where:

X_A – global production of agribusiness in country,

xr – global production of agriculture,

xp – global production of the food industry,

xi – global production of i-th sectors (branches) related with agriculture and the food industry $(i + 1,2, ..., n, n \neq r,p)$, which indirectly participate in food production,

bir – the coefficient specifying the flow of products and services of the i-th sector (branch) to agriculture, expressed with the percentage of indirect demand of the i-th sector (branch),

bip – the coefficient specifying the flow of products and services of the i-th sector (branch) to the food industry, expressed with the percentage of indirect demand of the i-th sector (branch).

According to the definition of agribusiness, the global production of this sector includes the total (complete) value of global production of agriculture (x_r) and the food industry (x_p) . These are the components (branches) which directly produce food. The procedure applied to determine the input of the branches that indirectly participate in food production is slightly more complicated. Only parts of their products and services can be found in the value of food produced. These values are proportional to the volume of the flow of tangible goods and services of the i-th sector from other sectors of the national economy to agriculture and the food industry, which are calculated on the basis of intersectoral flow balances, i.e. inputoutput analysis. By means of the supplier-recipient analysis (input-output) the monetary model of intersectoral flow specifies the ideas of the economic (market and budget) mechanism functioning, its internal connections, dependences and the effects which are decisive to reproduction processes (Czyżewski 2008; Leontief 1936, 1949). The model illustrates functioning of the economy (Tomaszewicz 1994). Intersectoral flow balances are also the only available statistics which enable determination of the significance of the entire agri-food sector in the national economy. The comparison of the internal structure of agribusiness in terms of its income output, its share in the national economy and calculation of the dependence between the level of gross value added per capita and the share of agriculture and total agribusiness in generation of the national income is a spatiotemporal analogy in individual countries of the European Union. It can provide basis for conclusions about the trends and depth of transformations faced by the agri-food sector in individual

countries. Such investigations also enable determination of the influence of the macroeconomic environment on the agri-food sector and its effect on the entire national economy (Schiff, Valdes 1998).

The time range of the research is the years 1995, 2000 and 2007, i.e. the latest available data on 'Intersectoral flow balance' for individual countries of the European Union.

The share of agribusiness in the national economy in the EU countries

The results concerning the share of individual agribusiness areas in gross value added of agribusiness in individual EU countries generally point to the decreasing importance of agriculture and the increasing importance of the food industry or the industries providing means of production and production services for agriculture and the food industry (table 1). In the most socioeconomically developed countries the share of the second zone (agriculture) in generation of the gross value added in agribusiness decreases the most rapidly, whereas it is chiefly the first zone that has the greatest importance. This group of countries includes Belgium, Denmark, Ireland, Germany and the United Kingdom, where in 2007 the share of agriculture in gross value added was low and ranged between 19.0% and 25.0% on average. On the other hand, the industries generating means of production and production services for agriculture and the food industry had a significant share. In those countries there was also an increase in the share of the first zone in material flow to agriculture and the food industry (Mrówczyńska-Kamińska 2010a). This fact is a proof of modern agribusiness structures, as opposed to the other countries of the European Union. However, there is still a group of countries in the European Union where the share of agriculture in generation of gross value added of the entire complex is extremely high (about 50.0%), whereas the significance of the first or third zone is relatively low. These countries include e.g. Bulgaria, Romania, Poland, Slovakia, Latvia, Greece, Slovenia and Lithuania. Although there have been significant changes since 1995, it is still agriculture that has decisive influence on the income output of agribusiness (Mrówczyńska-Kamińska 2013).

Countries	I zone			II zone			III zone			Agribusiness		
	1995	2000	2007	1995	2000	2007	1995	2000	2007	1995	2000	2007
Austria - AT	0,9	0,8	1,1	2,6	2,0	1,8	2,5	2,1	2,0	6,0	4,9	4,9
Belgium - BE	1,5	1,5	1,6	1,5	1,4	0,9	2,6	2,4	2,1	5,6	5,3	4,6
Bulgaria - BG	3,4	2,6	5,2	12,0	13,7	8,5	5,6	3,6	3,0	21,0	19,9	16,7
Czech Republic - CZ	2,0	1,7	0,8	5,0	3,9	2,4	3,5	3,5	2,4	10,5	9,1	5,7
Denmark - DK	1,6	1,6	1,5	3,2	2,4	1,0	3,1	2,6	2,1	7,9	6,6	4,7
Estonia - EE	2,8	1,7	1,6	5,2	4,5	3,0	5,5	3,1	2,2	13,6	9,3	6,8
Finland - FI	1,1	0,8	1,0	4,4	3,4	2,9	2,6	1,6	1,6	8,0	5,8	5,5
France - FR	1,0	0,7	1,1	2,9	2,7	2,1	2,1	2,1	1,8	6,1	5,5	5,0
Germany - DE	0,8	1,0	1,0	1,3	1,3	0,9	2,1	2,0	1,7	4,2	4,3	3,7
Greece - GR	1,0	1,0	0,8	6,1	6,1	3,1	2,8	2,8	2,5	9,9	9,9	6,4
Hungary - HU	2,7	3,0	2,4	8,0	5,4	4,0	3,8	3,2	2,2	14,5	11,6	8,6
Italy - IT	0,8	0,9	0,9	3,1	2,7	1,9	2,2	2,1	1,8	6,1	5,6	4,7
Ireland - IE	3,9	2,2	1,7	6,6	3,0	1,4	6,1	4,1	3,9	16,6	9,4	7,0
Latvia - LV	2,2	1,0	0,4	8,7	4,3	3,5	12,0	3,8	2,2	22,9	9,0	6,1
Lithuania - LT	4,5	1,9	2,7	10,9	6,3	3,9	5,9	4,5	3,7	21,3	12,6	10,3
The Netherlands - NL	1,8	3,2	1,7	3,4	2,6	2,0	3,2	2,6	2,6	8,4	8,4	6,3
Poland - PL	2,3	1,3	1,5	8,0	4,9	4,3	3,8	3,3	2,7	14,0	9,5	8,5
Portugal - PT	0,8	0,9	1,0	5,2	3,3	2,2	2,3	2,3	1,9	8,3	6,4	5,0
Romania - RO	3,2	2,4	2,1	19,2	12,1	6,5	6,6	7,1	6,3	29,0	21,6	14,9
Slovakia - SK	2,8	3,1	1,8	5,9	4,5	4,0	3,5	3,0	1,9	12,2	10,5	7,8
Slovenia - SI	1,3	0,9	1,1	4,4	3,3	2,5	2,8	2,7	1,7	8,5	6,9	5,3
Spain - ES	1,3	1,4	1,3	4,2	4,1	2,7	3,0	2,5	2,1	8,5	7,9	6,0
Sweden - SE	1,0	1,0	0,9	3,0	2,0	1,7	1,8	1,7	1,3	5,8	4,7	3,9
United Kingdom - UK	1,0	0,8	0,7	1,8	1,0	0,9	2,8	2,3	2,1	5,6	4,1	3,7

Table 1. The share of gross value added of agribusiness in the national economy in the EU countries in 1995, 2000 and 2007 (%)

Source: Own calculations based on 'Intersectoral flow balances in the EU countries in 1995, 2000 and 2005 or 2007, <u>www.epp.eurostat.ec.europa.eu</u> and data from the 'National accounts' for the EU countries in 1995, 2000 and 2007, <u>www.epp.eurostat.ec.europa.eu</u>.

The correlation between the level of gross value added per capita and the share of agriculture and total agribusiness in the national income

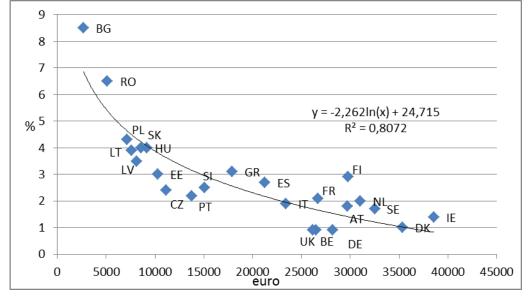
In order to illustrate the correlation between the level of gross value added per capita and the share of agriculture and total agribusiness in generation of the national income in the countries of the European Union the results of calculations of these correlations were shown on graph 1. An analysis of these results shows that the correlation between the share of agriculture in the national income and gross value added per capita in 2007 is best expressed with a logarithmic curve, whose values decrease asymptotically to zero. The curve is expressed with the following formula:

$$y = -2.26 \ln (x) + 24.71^4$$

⁴ The coefficient of determination is 0.81 and the significance level is α =0.05.

Graph 1

The correlation between the share of agriculture in gross value added in the national economy (%) (y) and the level of gross value added per capita (euros) (x) in the EU countries in 2007



Source: Own elaboration based on Eurostat data.

The equations shown above prove that as the economic growth progresses, the correlation between the total gross value added per capita and the share of agriculture in the national income5 is weaker. The economic growth is accompanied by a drop in the share of agriculture in the national income, but when the national income per capita is high, the drop is relatively low. The situation results in supplementary relations and the rate of economic growth is the function of autonomous factors, triggered by earlier structural changes. In highly developed countries one can observe stabilisation of the share of agriculture by itself in the national income at a low level of 3-8%. It should be emphasized that the reduction of the role of agriculture in the national economy in developed countries does not mean that this sector is weak and no longer relevant. In general, agriculture in these countries is well developed and generates the value added growth, while food security remains an important economic priority of these countries (Kiryluk-Dryjska, Baer-Nawrocka 2013).

In view of the fact that in consequence of the social division of labour new branches of productive activity and different productive processes are separated from agriculture, where most of them result in food production, the problems of the food production sector cannot be viewed only from the perspective of agriculture. In practice at present it is more important to

 $^{^{5}}$ It is also proved by the increasing simple correlation between the variables (from -0.72 in 1995 to -0.77 in 2007) and by the increasing determination coefficient (from 0.64 in 1995 to-0.81 in 2007).

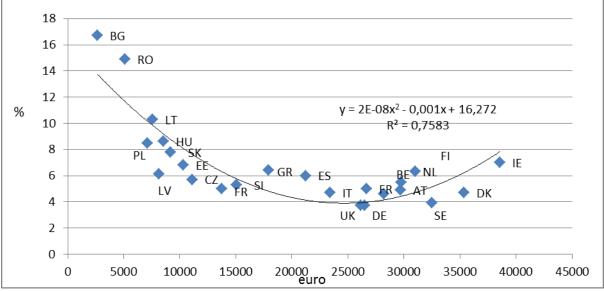
investigate the significance of the entire agri-food complex in generation of the national income.

Graph 2 show the correlations between the share of agribusiness in the national income and the level of gross value added per capita in the countries of the European Union. The distribution of points referring to the EU countries in 2007 is best expressed with the parabolic curve and the following formula⁶:

$$y = 2E - 08x^2 - 0.001x + 16.27^2$$

Graph 2

The correlation between the share of agribusiness in gross value added in the national economy (%) (y) and the level of gross value added per capita (euros) (x) in the EU countries in 2007



Source: Own elaboration based on Eurostat data.

The results shown above indicate that in the countries where the values of the national income per capita are the highest in the entire European Union the share of total agribusiness in the national income decreased though the rate of decrease was much slower than in the other EU countries. The countries with the slowest rate of decrease were: Germany, Ireland, Denmark, Sweden, Finland and Holland. It is also possible to conclude that society in these countries is rich and the people buy not only the cheapest but also highly processed or even luxurious food. The phenomenon may be related with the fact that in rich countries the share of expenses on consumption in total income begins to decrease but much more slowly and in the most recent period it even began to grow. Between 2000 and 2010 this situation could be seen in the United Kingdom, Holland and Sweden. Both the increasing rate of expenses on food in

⁶ In 2007 the simple correlation between the variables was 0.66, whereas the coefficient of determination was as high as 0.76, which indicates the high value of explanation of the model in comparison with the previous years.

⁷ The coefficient of determination is 0.76 and the significance level is α =0.05.

absolute terms and the increasing share of expenses on food in total expenses could be observed (between 2000 and 2010 the rate of increase in this share ranged between 2% and 4%). On the other hand, in Germany and France the share of expenses on food in total expenses did not change considerably (in Germany it was 11.49% in 2000 and 11.05% in 2010; in France – 14.14 % in 2000 and 13.18% in 2010) (Rembisz et al. 2011)⁸. This situation is caused by the increasing share of more expensive food, which is highly processed and refined. As the income grows, consumers do not physically consume larger amounts of food products, nor do they buy more kilograms of food, but they consume other forms of food, which is better packaged, easier to prepare and eat (Heady 1962). As a result of this situation, the increase in the production in agriculture and the entire agri-food sector becomes dependent on the consumer's choice and thus, on the final market of food products. In consequence, the food economy and food production have tendency to be subordinated to the factors related with consumption rather than agricultural production. Increasing number of factors that are decisive to evolution move from the area of production to those of consumption, distribution and trade (Senauer 1989). This fact plays significant role to the agricultural sector in a particular country. The consequence of diversion towards the consumer is the increasing role of trade, services, innovations introduced in the category of food products, full availability of various products, creation of new needs and enrichment of the utility value of agri-food products. It also involves higher expenses on the services provided by processors of agricultural products⁹.

Obviously these dependencies increase the social costs of food production and they also increase the demand specifically. The increased consumption of luxurious food causes a higher share of food expenses, increases the elasticity of the demand for agri-food products

⁸ However, there is a group of countries in the European Union where the share of expenses in people's personal income is decreasing relatively rapidly. In Poland the rate of decrease in the share of expenses on food in total expenses was one of the most rapid in the European Union (in 2010 in Poland the rate was -11.0% as compared with 2000). It was likewise in Spain and the Czech Republic. On the other hand, in Germany, France and Belgium it was nearly -5.0%. In Poland the share of expenses on food in total expenses was 22.83% in 2000, whereas in 2010 it dropped to 20.2%. A relatively considerable decrease in the share was observed in Romania, where it was 34.89% in 2000, whereas it was 29.69% in 2010 (Rembisz et al. 2011).

⁹ This fact is proved by empirical research. For example, Mellor and Ahmed (1988) indicated that the increase in expenses on food in developed countries is chiefly related with higher expenses on the services related with the processing of agricultural products in the non-agricultural sector. On the basis of research in the USA Heady (1962) concluded that the increase in expenses on food per capita in the USA is related with increased purchase of services connected with food processing (e.g. services related with refrigeration, packaging and preparation of food ready for consumption) rather than the amount of agricultural products. As results from the research on the flow of materials between zones of agribusiness in the countries of the European Union, which was done by the author of this article, in highly socioeconomically developed countries, e.g. in Germany, Belgium, Ireland, Sweden and the United Kingdom, from 1995 to 2007 there was increasing importance of the first zone, i.e. the supply zone, in the flow to agriculture, especially to the food industry, chiefly in terms of all sorts of services. There was also growing importance of the products of the paper industry and packages in the flow to agriculture (Mrówczyńska-Kamińska 2010 a, b, c).

and decreases barriers to the growth of food production. It is one of the reasons why in developed countries the share of agriculture itself in the gross value added in the national economy is stabilised at a low level, at the expense of increased share of other sectors related with food production. Thus, demographic changes, a change in the model of food consumption and a relative growth in the social costs of food production cause a rapid increase in the demand for food products. Initially this inhibits a decrease in the share of agriculture in the generation of the national income. The share is stabilised at a low level of several per cent. However, if the economic development is at a very high level, the rich society, which has satisfied its demand for other non-food products, begins to purchase more luxurious food. Thus, it is possible to conclude that the process of polarisation of the market of food products takes place. This means that there is an increasing share of the highest quality products and the cheapest products, whereas the market importance of average quality products is decreasing¹⁰. The main determinant of changes in the structure of demand on the food market is the level of consumers' income – their living standard.

As a result of the analysis of data on the share of agriculture and total agribusiness in gross value added of the national economy and the volume of gross value added per capita, the share of agriculture and total agribusiness in the national income is lower in richer countries and it is higher in poorer countries. It confirms the principle about the secular decrease in the importance of the food production sector in the national economy. There are two groups of theories which account for the phenomenon¹¹. Some of them are related with the demand, the others with production and supply. T.W. Schultz (1952 a, b, 1964), F.B. Johnston, J.W. Mellor (1961) were the supporters of the former theory. The theory relates the tendency of secular shrinkage of the share of agriculture in the national economy with low income and price elasticity of demand for agricultural products. Because of the fact that these elasticities are lower than one, the possibilities of market expansion of agriculture are slowly coming to an end. The authors of this theory think that if there is no demand, there are no natural stimuli to increase production. The supporters of the other theory (e.g. S. Kuznets (1966)) say that the shrinkage of the share of agriculture in the national economy is caused by differences in

¹⁰ For example, in West Germany the market share of highest quality products increased from 28.0% in 1973 to 36.0% in 1990, whereas the share of the cheapest products grew from 23.0% in 1973 to 34.0% in 1990. At the same time the share of average quality products decreased considerably from 49.0% to 30.0%. The process of market polarisation is a phenomenon that came to be seen in the 1980s (Poczta 1994 after Hamm 1991).

¹¹ At the turn of the 19th century the share of agriculture in the national income dropped from 40-50% to 10% and in some cases even to 3%. At the same time the volume of agricultural production increased 4-5 times and agricultural production per capita increased by nearly 70%, whereas the industrial production increased 40 times and the industrial production per capita rose 15 times. At the time the average annual rate of agricultural production increase per capita was 0.5%, whereas the industrial production grew at the average annual rate of 2.6% (Petel S. J. 1964).

labour productivity in the agricultural sector and non-agricultural sectors¹² and by constant changes in employment proportions in both sectors. What underlies these theories is the assumption that both the low elasticity of demand for food (lower than one; based on well-known Engel's law)¹³ and relatively lower workforce productivity in the agricultural sector autonomously trigger adaptive processes, which result in relative shrinkage of the agricultural sector. For obvious reasons the statement about the secular decrease in the significance of agriculture in the national economy may be transferred to the entire agri-food sector, because the process of reduction of agriculture is largely the consequence of social division of labour. New branches of productive activity and various productive processes stem out from agriculture. It is transformed from a fully autarchic food-providing sector into the sector generating raw materials for food production. A considerable part of the activities traditionally done in an agricultural enterprise is taken over by non-agricultural sectors and branches of production, as a result of which the field of purely agriculture and industry¹⁴ (Woś 1979).

Conclusions

To sum up, we can say that although as far as agriculture on its own is concerned, the empirical research confirms the thesis about the secular decrease in the importance of agriculture in the national economy, when we talk about the entire agri-food sector, the share of this sector in the national income decreases in the beginning. However, when the gross value added per capita is at a very high level, the share begins to be stabilised at a higher level. This points to the fact that the shrinkage of agriculture and its share in generation of the national income does not mean that its role in the development of the entire economy decreases, nor does it indicate the shrinkage of the food-producing sector. According to all available data, including those concerning highly developed countries, the structure of the agri-food sector is changing. The importance of the first zone (the industries manufacturing means of production and production services for agriculture and the food industry) and

¹² This occurs especially in countries that have joined the EU in recent years, especially in Romania, Bulgaria and Poland. Agriculture in these countries is characterized by unfavorable agrarian structure and significant role of labor in the production process, which determines the low labor productivity in the sector (Baer-Nawrocka, Markiewicz 2012). ¹³ The coefficient of income elasticity of demand for food products, beverages and tobacco is 0.628 in Poland, whereas it is

¹⁵ The coefficient of income elasticity of demand for food products, beverages and tobacco is 0.628 in Poland, whereas it is 0.477 in Germany, 0.492 in France, 0.503 in Spain, 0.507 in Belgium, 0.513 in Sweden, 0.583 in the Czech Republic, 0.612 in Hungary (Rembisz et al.2011).

¹⁴ In consequence of the economic development in individual countries the farmer's traditional relations with the consumer are broken. The role of agriculture boils down to being a supplier of raw materials for processing and shopping centres (Riston C. 1992).

especially of the third zone (the food industry) is growing. Owing to this fact the macrostructure of the national economy is undergoing profound changes. These changes are progressive, because they lead to the increase in the social workforce productivity and in the volume of the national income.

A comparison of the importance of agribusiness in individual countries of the European Union in terms of the achieved production and income output shows that in less socioeconomically developed countries agribusiness is at an early stage of its way to modernity. In the countries which joined the European Union after 2004, the agribusiness structure is mostly dominated by the sectors of direct food production, i.e. agriculture and the food industry. Furthermore, in the other, more economically developed countries it is the food industry and the first zone (the industries manufacturing means of production and services for agriculture and the food industry) that play the main role in the generation of global production and gross value added in agribusiness. Although during the analysed period in poorer countries there were observable changes in the share of agribusiness in the national economy and its internal structure, the changes were very slow. The situation in those countries is still rather traditional and it is undergoing relatively small changes. On the other hand, in rich countries where the gross domestic product per capita is high, the share of agriculture in the national income is decreasing, but the importance of the entire agri-food sector is increasing. The results of the correlation between the GDP per capita and the share of agribusiness in the national income indicate that the process of secular decrease in the importance of this sector in the national income is inhibited if the economic development in a particular country is at a very high level. This confirms the occurrence of the situation where in families with high income the share of expenses on consumption in total expenses begins to grow rather than fall. This situation is caused by rapid growth in the share of expensive and very expensive, highly processed and refined food in the consumption structure. This points to the final stage of development of food economy, where the consumer makes decisions about the situation in agriculture and the entire agri-food sector, whereas the entire food economy and food production is subordinated to the factors related with consumption, distribution and trade. The results of the analysis show that the level of socioeconomic development measured with gross value added per capita is the most important factor influencing the degree of development in agribusiness, its internal structure and the share of this subsystem in the national economy.

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