

## Assessment of Structural Transformations Factors in the Agro-food Complex of Russia

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### Abstract

*The article analyzes the factors that influence structural changes in the value chains of the national agro-food system. The analysis of the dynamic and structural functioning characteristics of the agro-food complex of Russia made it possible to assess the impact of the identified factors on the status of food security, the competitiveness of national producers, and the effectiveness of the state regulatory system. The positive dynamics of agricultural and food production have stabilized the situation on the national food market and increased the level of self-sufficiency in basic food products.*

*The material and financial balance of the agro-food complex is justified as an important factor of its sustainable development in changing economic conditions. The authors have analyzed the causes of the mismatch of material and financial proportions in the agro-food complex of Russia and revealed a significant impact of the growth of world prices for agricultural raw materials and food products in 2020 on the formation of the material and financial balance proportions of intersectoral food chains. The uneven dynamics of prices in the agricultural sector, processing industries, and industries that produce means of production for the agro-food complex contributed to the violation of the parity of intersectoral relations in the food chains of the Russian agro-food complex.*

*The assessment of the level of protection of national producers based on the indicators used by the OECD (Organization for Economic Co-operation and Development) and FAO (Food and Agricultural Organization) allowed revealing a steady trend of declining support for agriculture in Russia, while the level of support for the agricultural sector in the USA and the European Union is constantly growing. This has an impact on the competitiveness of national producers, as well as trends in the modernization of the agro-food complex structure.*

*The identified factors allow substantiating the short-term and long-term strategic priorities for the development of the Russian agro-food complex, ways to implement them taking into account national development goals, as well as opportunities for the full use of their competitive potential.*

**Key-words:** Agro-food Complex, Structural Changes, Food Chains, Factors, Balanced State, State Support, Self-sufficiency.

## 1. Introduction

The structural balance of intersectoral value chains, along with satisfying demand, is one of the characteristic features of a developed agro-food market. The issues of the content, factors, and driving forces of structural shifts in the economy have been actively studied in Russian and foreign economic science [1-4]. The directions and rates of structural changes are the main determinants of the dynamics of economic indicators [5-8]. In the current context, the structural imbalance of the main factors of production remains, and growth potential does not match the amount of available financing. Structural transformations depend on industry differences in technological progress, capital intensity, and interchangeability between capital and labor [9, 10]. Ensuring balanced development becomes the determining factor in the priority system of the state regulatory system of the agro-food complex. Contemporary scientific research considers structural changes as one of the sources of economic growth [11, 12], rather than a consequence, and analyzes the significance of structural changes depending on the levels of per capita income [13]. The study of economic structures and structural changes, their impact on long-term growth and stagnation, the transformation of institutions, the features of global value chains, and international fragmentation is receiving the increasing attention of both Russian and foreign scientists [14-16].

The balanced state of economic systems is interpreted as the commensuration, proportionality, and compatibility of the structural components of the economic system that ensure its sustainable functioning [17, p. 9]. As a criterion of structural balance, the authors consider the presence of intersystem equilibrium in terms of volumes, rates of changes, the intensity of connections, completeness of functions, as well as spatial and temporal consistency of processes and projects. Structural balance is becoming the most important factor of competitiveness in the context of growing economic openness. The main criteria for the effectiveness of structural changes can be considered the compliance with modern trends in the development of the global agro-food system, the changing structure of food needs, the requirements of intersectoral competitiveness and innovation of the changes being implemented, a rational combination of domestic production opportunities, including ensuring technological sovereignty, as well as foreign economic relations. Contemporary structural changes should also ensure inclusive (comprehensive, for all segments of the population) sustainable growth. The strategic orientation of the structural modernization of the agro-food complex of Russia includes the elimination of structural imbalances through the

development of the scientific area and production infrastructure, stimulating the formation of long-term competitive advantages [18].

The globalization processes have increased the impact of stochastic factors, including the coronavirus pandemic, on the functioning of the agro-food complex. The agro-food complex of Russia has suffered less from the impact of adverse factors associated with the coronavirus pandemic. The delayed response in the development of the system-forming branch of the agro-food complex of the agriculture, the production resources accumulated before the pandemic, and the devaluation of the ruble, as well as the relatively high level of state support for domestic rural producers in previous years, have reduced the risks of losses. However, the long-term economic development strategy of the agro-food complex involves identifying priorities, justifying growth factors and sources of a new quality of economic development of the complex.

The purpose and objectives of the present research are to evaluate the main factors affecting the balanced state of the agro-food complex of Russia based on the analysis of the sources and forms of manifestation of existing structural imbalances and to formulate the directions for proper structural transformations.

## 2. Methods

In the course of the research, the main provisions of structural analysis involving statistical methods of data processing were used. The information base of the study included statistical materials of the Federal State Statistics Service of the Russian Federation (Rosstat) for 2012-2020, the Federal Tax Service of the Russian Federation, as well as information resources of the World Bank "Agriculture, forestry, and fishing, value-added per worker", and the OECD database "Agricultural Policy Monitoring and Evaluation". The intersectoral approach, employed by the authors to study structural transformations in the agro-food complex, as well as consideration of all the relationships, allowed identifying new factors of its structural dynamics.

The assessment of the dynamics and level of personal consumption and self-sufficiency in basic food products was carried out based on annual balances of food resources for the main food categories.

The self-sufficiency ratio ( $K_s$ ) of certain categories of agricultural products, raw materials, and food was calculated as a percentage ratio of the domestic production volume of the  $i$ -category of agricultural products ( $V_{pri}$ ), raw materials, and food to its domestic consumption volume ( $V_{pi}$ ).

The dynamic analysis of changes in the level of competitiveness of Russian products of the agro-food complex was performed using the Producer Nominal Protection Coefficient (NPS), using the OECD database. The NPS reflects the ratio of the domestic and world prices level for a certain product and is calculated by the formula:

$$NPC_i = \frac{P_i^d}{P_i^w} * ER$$

where  $P_i^d$  is the internal price of the product  $i$ ;  $P_i^w$  is the world price of the product  $i$ ;  $ER$  is the nominal exchange rate.

The values of NPC above unity indicate that national producers have the opportunity to sell their products at prices higher than world prices, which means their greater security in the domestic market. Values of the indicator below one indicate the presence of favorable conditions for the competitive presence of national producers in foreign markets. With  $NPC=1$ , producers, intermediaries, and consumers have internal prices equal to world prices.

International comparisons, and assessments of budget support for commodity producers, are conducted using the Producer Support Estimate (PSE) indicator developed by the OECD. The PSE coefficient reflects all transfers to rural producers from both consumers and taxpayers received by producers as a result of the pursuing state policy of agriculture support.

### 3. Results

The outstripping growth in the agro-food complex of Russia in comparison with most sectors of the economy in the last decade has objective reasons. It is associated with the macroeconomic conditions of the industry's functioning and is due to a combination of several factors. The main ones are the expansion of the potential of domestic consumption, including the substitution of imports of final and intermediate consumption goods, the improvement of the global market situation for export-oriented industries, the increase in the effectiveness of state regulation measures, as well as favorable climatic conditions in recent years. Over the past five years, the gross value added in basic prices in the agricultural sectors has increased by 9.0%, including by 0.5% in 2020, and by 109.2% in the food industry (by 0.3% in 2020). The growth of gross value added in the economy in general over the same period amounted to 4.3%, while in 2020 a drop of 2.7% was recorded. In 2020, food imports did not exceed its exports for the first time in recent Russian history. Calculations conducted by the

authors showed that for the period from 2012 to 2018, the share of imports in the intermediate consumption of agriculture decreased from 8.6 to 7.7%, and in the food industry – from 13.3 to 12.4% [19-21].

The increase in the agricultural production volume and efficiency was facilitated by the withdrawal of low-productive resources, such as low-productive land plots, outdated fixed assets, unskilled labor, etc. from the production route.

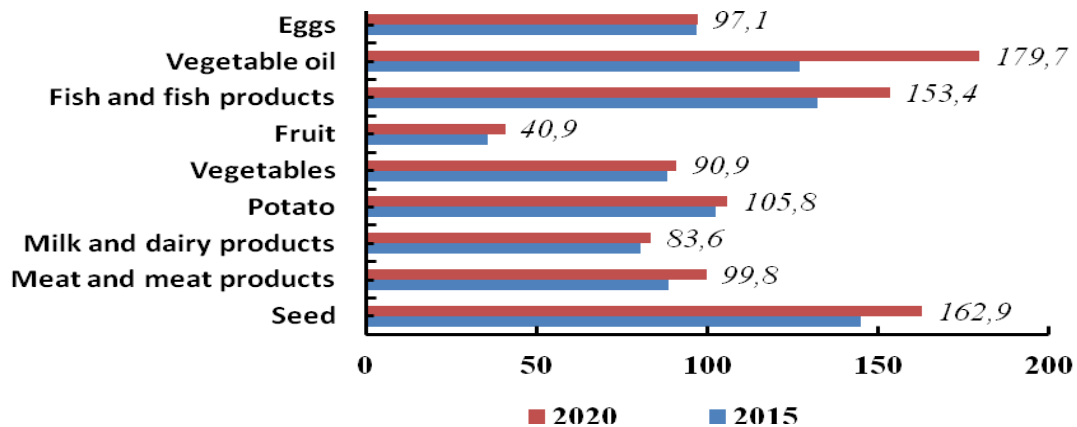
In the period under study, the agricultural sector developed mainly due to large-scale production, and the localization of growth areas was focal. This led to the economic degradation of several rural areas. The corporate sector grew faster than the non-corporate sector, increasing its share in agricultural production from 54.0% in 2015 to 58.3% in 2020. Production in the households of the population decreased by 7.2% (from 34.5 to 27.3%) while in peasant (farmer) farms and individual entrepreneurs increased from 11.5 to 14.3% [22].

The Russian agro-food market is characterized by increased trends in forming oligopolies. Thus, in 2014-2019, the total revenue of the 50 largest companies of the agro-food complex, taking into account inflation, increased by 1.7 times, which was significantly higher than the industry average values of growth dynamics indicators [23]. The negative consequences of the identified trend in the development of the agro-food complex are associated with a weakening of competitive interaction, and increased use of the effects of a monopolistic position.

The growth in agricultural production and food allowed stabilizing the situation on the national food market. Structural analysis of changes in the parameters of food balances in 2020 and the level of self-sufficiency by region indicate the sustainability of food supply. In 2020, the fund of personal consumption of basic food products did not decrease under the impact of shock factors, and remained unchanged or even grew for most products. For example, the increase in the consumption of meat and meat products amounted to 1.1%, milk and dairy products – to 2.7%. Due to the completion of large-scale investment projects in poultry and pig farming in 2020, the country's self-sufficiency in meat and meat products (99.4%), as well as in milk and dairy products (84.1%) has significantly increased. From 2015 to 2020, the self-sufficiency ratio in meat products increased from 88.8 to 99.8%, dairy products – from 80.4 to 83.6%, vegetable oil – from 127 to 179.7% (Fig. 1). In the context of an unstable external environment, domestic producers significantly increased exports of meat products, cereals, and oilseeds.

Figure 1 - Changes in the self-sufficiency level in basic food products in the Russian Federation in 2015 and 2020, %  
 Calculated according to Rosstat data:

[http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/enterprise/economy/](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/economy/)



In the context of increased risks of the adverse impact of shock factors of economic dynamics, the financial position of agricultural organizations strengthened in 2020. This was facilitated by the state's agrarian policy implemented in recent years. Agricultural producers have benefits on income tax and VAT. The volume of accrued taxes, fees, and insurance contributions to the budget system of the Russian Federation for the type of economic activity "Crop and livestock production, hunting and the provision of relevant services in these areas" amounted to 6.4% in relation to gross value added in basic prices of 2020, while for the economy, in general, this figure amounted to 27.9% [24]. In 2020, the balanced financial result for the above-mentioned type of economic activity increased 2.7 times compared to the previous year, while it decreased by 33.5% in the economy in general [25]. The profit amounted to 157.7% compared to the level of 2019, and the loss was 34.1%. The proportion of profitable organizations in the agricultural sector increased to 81.7%.

While the development dynamics are positive, the intersectoral structure of the agro-food complex remains imbalanced, which is manifested in the predominance of the raw material component and the lack of an effective mechanism for intersectoral capital overflow. The processes of complicating the processing industry structure of the complex are quite slow. The ratio of gross value added, produced in the agricultural and food industries is relatively stable. In 2014, it was 181.7%, in 2020 – 184.0%. The stagnation of effective demand for food in Russia and the favorable situation in the world markets of agricultural goods contribute to maintaining the currently established equilibrium.

The growth of world prices for agricultural raw materials and food products in 2020 had an impact on forming the proportions of the material and financial balance of intersectoral food chains

and the parameters of effective demand for different income groups of the population. This period was characterized by a redistribution of the created added value between product chains, export- and internally oriented supplies, producers with different margins of product groups, etc.

The level of price changes in the country has significantly exceeded the inflation targets, set by the government of the Russian Federation for 2020. Food prices in Russia grew significantly faster than the consumer price index in general. In December 2020, compared to December 2019, the consumer price index was 104.9%, while the food price index amounted to 107.21%. These types of changes have negatively affected the purchasing power of the population. Together with changes in the exchange rate, they increase the risks of reducing the level of food security for low-income groups of the population. According to the assessment, the tightening of demand restrictions in the domestic market was the main reason for the decline in profitability. According to Rosstat, in 2020, compared to 2019, real cash income decreased by 3%, and real disposable personal income – by 3.5%.

The uneven price dynamics have led to a violation of the parity of intersectoral relations in the food chains of the Russian agro-food complex. The analysis of changes in relative prices for the period 2014-2020 shows deterioration in the functioning conditions of agricultural producers. The price index of agricultural producers for the study period amounted to 124.4%, while similar indicators in related industries were higher. The price index for industrial goods and services purchased by agricultural organizations amounted to 135.9%, in the production of food products – 132.0%; consumer prices for food products – 140.3%.

The new development stage of the structural transformations should be focused on achieving technological superiority in the sectors of promising specialization. Only by ensuring the unity of the functioning of scientific, technological, and industrial complexes, it is possible to overcome the backlog and ensure technological sovereignty. The implementation of the state program on scientific and technological development involves the allocation of seven main priorities that are associated with the transition to advanced digital intelligent production technologies, highly productive and environmentally friendly agro- and aquatic farming, creating safe and high-quality food products, etc. Within the framework of the Federal Scientific and Technical Program for the Development of Agriculture of the Russian Federation for the period up to 2025, 15 subprograms are being developed in the field of seed production and breeding. At that, ten of them relate to crop production and seed production of crops with high import dependence and export orientation.

The prospects for growth and strengthening the competitive position of any industry are associated with the ability to ensure the inflow of investment. In recent years, implementing the import substitution strategy and increasing the efficiency of budget support have contributed to the growth of investments in the fixed capital of the agricultural sector. Since 2016, in agriculture, and since 2017 in the food industry, investment activity highly increased in comparison with the economy in general. From 2016 to 2020 the increase in investments in fixed assets in the agricultural sectors amounted to 17.3%, in the production of food products – to 16.1%, and in the economy in general – to 10.1% [26]. But the investment dynamics in the main branches of the agro-food complex are not stable, which complicates the implementation of long-term development priorities. Over the past two years, the volume of investments in the agricultural sector has decreased by 7.9%. The state's priorities in the investment sphere are focused on improving competitiveness by eliminating the imbalance in the development of branches of the agro-food complex. An important place is occupied by infrastructure projects that can significantly improve the general conditions for the functioning of agricultural organizations in all sectors and forms of management.

The coronavirus epidemic has had a significant impact on the formation of food chains both at the global and local levels. This is due to the mass closure of public catering and hotel businesses. The negative dynamics are observed in the fish and seafood market, where the segment of live, fresh and chilled fish accounted for 45% of the global consumption of fish products. These trends can also be traced to the Russian export of fish products. Demand for meat products, especially in the premium segment also dropped. The retail turnover of food products decreased, although to a lesser extent than for non-food products. In this context, guaranteeing food security requires a shift in emphasis in assessing the priorities of the current and long-term effectiveness of the value chains functioning towards increasing the reliability of providing essential goods. The flagship report of the International Food Policy Research Institute (IFPRI) "On Global Food Policy 2020" emphasizes the need to support the formation of inclusive food systems, whose effects extend to all participants, to ensure long-term sustainability [27]. The McKinsey Global Institute study "Risk, resilience, and rebalancing in global value chains" draws attention to the importance of protecting global supply chains that are under threat by forming emergency stocks of raw materials and products to ensure the sustainability of both their own business and key counterparties [28]. The necessary level of resilience of production systems is achieved due to the growth of diversification and interchangeability of value chain fragments, and a variety of supply sources, rather than due to authorization of self-sufficient development [29]. Among the factors shaping the choice of



competitive stability strategies in intersectoral value chains, the importance of the foreign markets' attractiveness has increased. It is caused by the accumulation of overproduction for individual product groups in the context of stagnant domestic demand, rising prices that outstrip real incomes of the population, the devaluation of the national currency, etc.

Additional opportunities for the growth of production volumes and increasing the productivity of the Russian agro-food complex can be achieved through the participation of national producers in global value chains. The stability of the competitive positions of the agro-food complex will be promoted by reaching a higher level of production cooperation, forming national intersectoral segments of reproduction systems. The development prospects of competitive production and its integration into global value chains are determined by several factors. It is believed that in addition to the availability of excess resources (land, water, etc.) and logistical advantages, the possibilities of foreign trade interactions with countries having developed and diversified economies are important as well [30-32]. Another factor for the successful inclusion of countries in the global value chains or their extension is the presence of a developed institutional environment, i.e. the openness of the economy, standards for the protection of entrepreneurship, etc. This factor is especially important for forming complex chains, whose specific feature is the repeated crossing of national borders by intermediate consumer goods. Global value chains in the agro-food sector differ from most industrial sectors. Direct participation in these chains in the agricultural sector, estimated by the share of exports that are used in other countries as an intermediate product and subsequently exported, is relatively large. About 20% of agricultural exports are re-exported after processing by the first importing country [33].

The high level of competitiveness of Russian products, determined by the dynamics of the producer nominal protection coefficient (NPS), is noted for traditional export positions, such as cereals, and sunflower seeds. For some other commodity items, such as pork, poultry, etc., the level of relative competitiveness is growing, which creates conditions for the competitive presence of Russian commodity producers on world markets. However, opportunities for successful competition exist only in limited segments of the world market due to the higher price level in the domestic market for many commodity items (Table 1).

Table 1 – Dynamics of the Producer NPC

NPC by product	2013	2018	2019
NPC in general	1.136	1.069	1.059
Wheat	0.995	0.920	0.990
Sunflower seeds	0.787	0.940	0.916
Milk	1.324	1.444	1.156
Beef and veal	1.606	1.180	1.273
Pork	1.642	1.218	1.244
Poultry meat	1.218	1.077	1.067
Sugar	1.418	1.429	1.205

Compiled by: OECD database "Agricultural policy monitoring and evaluation". Retrieved May 10, 2020 from <http://www.oecd.org/agriculture/topics/agricultural-policy-monitoring-and-evaluation/> (accessed: 10.05.2020).

It is predicted that the conditions for participation in world trade in agricultural products and food products will tighten, because, according to the joint forecast of the OECD and FAO for 2020-2029, over the next decade, global demand will increase slower than the growth of world agricultural production. This will hold the growth of prices for most commodities, whose prices will remain at the current level or decline. The volume and structure of state support form not only the conditions for the sustainable functioning of producers on the domestic market, but also directly affect the competitiveness of national producers on world markets. The analysis based on the OECD data shows that the values of the percentage producer support estimate (PSE) in agriculture in Russia have a steady downward trend [34]. From 2013 to 2019, it decreased from 18.5 to 9.2%. During the same period, the level of support in the USA increased from 6.7 to 12.1%. In the European Union, the level of support in 2019 was 19.0%, which contributed to forming strong competitive positions of European manufacturers in world markets.

#### 4. Discussion

The successful functioning of the global food system is one of the key factors for the sustainable development of the global economy, which is recognized at the world level [35, 36]. In the face of new challenges, the Russian agro-food complex can become a driver of the national economy's recovery, provide a significant contribution to ensuring global food security based on participation in global value chains and expanding export potential. According to Russian scientists,

the current crisis has created a window of opportunities for the transition to economic recovery based on a systematic policy of economic breakthrough and social renewal, including for the agro-food complex [37]. However, the development prospects of the Russian agro-food complex are affected by global trends, of which the main are changes in the value-added chains and marginality of traditional industries, stricter environmental and ethical requirements for food products, focus on optimizing the use of environmental resources in the production, processing, and distribution of food, accelerating the implementation of digital and robotic technologies, biotechnologies, and alternative sources of raw materials, and changing demand from related industries on this basis. Structural changes in the national agro-food complex, taking into account global trends, require significant financial investments. It is becoming important for the agro-food complex to ensure the sustainability of production and financial relationships. The increase in federal and regional budget expenditures, while limiting the sources and volumes of revenue, creates certain problems for financing development programs for the agro-food complex, and the growth of investments for implementing structural changes. In this context, one of the main problems is attracting alternative sources of financing for the agricultural sector, as well as transforming the investment and structural policy: "The lack of investment in the Russian economy is adjacent to the excess savings of business, state, and the population" [37, p. 23].

Studies have shown an increasing trend towards localization of production and supply of agricultural products, and diversification of production of the agro-food complex within national economies. Forming self-sufficient food systems, and localizing business affect the strategic axis of the functioning of the agro-food complex which is ensuring food security. This requires a critical analysis of the development priorities of the Russian agro-food complex, the optimal correlation between the export-oriented agro-food complex and the formation of internal resources for self-sufficiency with basic food products of the country's population at the level of rational consumption standards, and the concentration of national potential on promising development areas of the agro-food complex, providing the greatest multiplicative effect and the best results for the country's economy.

## **5. Conclusions**

At the present development stage of the agro-food complex of Russia, it is important to form mechanisms for countering external shock impacts based on structural modernization of innovative

orientation, ensuring expanded reproduction in agriculture as a basis for guaranteeing a high level of food security and strengthening the competitive positions of national producers on the world market. In the current context, it is important to develop local production and processing of agricultural products and small businesses without destroying the trend that has developed in Russia towards the growth of regional specialization. This will allow reducing the risks of disruption of product supplies, instability of demand in the markets of certain regions. The implementation of the state program for the integrated development of rural areas currently is of particular importance, since it contributes to creating a balance between the sectoral and territorial approach to regional development. The inclusion of the agro-food complex in the world economy based on its long-term competitive advantages will ensure the formation of intersectoral multiplicative effects contributing to the growth of the domestic food market, as well as expanding access to global resources and technologies. The implementation of the opportunities for the multi-vector development of the agro-food complex, self-sufficiency in many basic food products, and the growth of export volumes will allow Russia to take its place in the system of the international division of labor, corresponding to its competitive potential.

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