

The poultry products subcomplex in the system of the Agro-industrial complex: digitalization capabilities

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Abstract – The importance of the poultry product subcomplex of the agro-industrial complex of Russia is due to its ability to provide the population with high-grade protein products. Poultry meat is sold most often in the low price segment, which makes this product affordable for almost any family. The development of the poultry product subcomplex is promising. It is consistent with the policy of import substitution and ensuring food security of the Russian Federation. However, there are “pitfalls” of fulfilling plans to improve the industry. Firstly, there are problems with the domestic feed base and the quality of the supplied feed. Secondly, the rapid return of production makes it an attractive business, and the market is growing rapidly. This leads to a crisis of overproduction and a reduction in profits and, as a result, a reduction in domestic poultry farms and the replacement of domestic products with imported ones. The solution to the problem is in the application of digital technologies. This will make it possible to justify government measures for the optimal development of the poultry product subcomplex.

Keywords – *agro-industrial complex (AIC), poultry products subcomplex, statistics of poultry, AIC digitalization.*

I. INTRODUCTION

The poultry product subcomplex is part of the agro-industrial complex, whose development depends on other elements of the system. This is to some extent realized at the state level: for example, the Poultry Industry Development Concept of the Russian Federation for the period 2013–2020 indicates the increase in production will be carried out in cooperation of poultry organizations with farms and private farms, and while ensuring the optimal structure for the development of grain production and legumes to fully meet the poultry organizations in balanced feed. Regulation of the poultry market is also envisaged. However, such regulation will not be effective for the industry without processing a huge amount of statistical data and taking into account the influence of various factors on work. The agro-industrial complex should be considered as a system of interrelated elements when using digitalization technologies. The development of these elements is inextricably linked with each other.

II. THE RESEARCH METHOD

The understanding that agriculture is not a separate, self-sufficient industry came in the 30s-40s of the 20th century in the USA. It seems that the Great Depression contributed to this. Farmers could not sell their products due to overproduction and a sharp drop in prices for it. At that time, the Roosevelt government decided to stimulate a reduction in agricultural output. In fact, there was state intervention in the economy, and attempts at state regulation of agriculture began. It is believed that the formation of the agro-industrial complex was begun in the 1940s in the United States [12].

The search for ways to increase the efficiency of the work of new agricultural enterprises was going on in this period in the USSR. Therefore, the policy of mechanization and cooperation in the agrarian policy of the state was taken - these were the prerequisites for the creation of the agro-industrial complex. The services of machine-tractor stations - state-owned enterprises were offered to farmers in the late 1940s. These enterprises provide agricultural machinery assistance to large agricultural producers [3]. This can be considered as the first steps to create an agro-industrial complex in Russia.

The term AIC (agro-industrial complex) arose at the turn of the 1970s. And, at first, it was about agro-industrial associations - “a complex of geographically, organizationally and technologically united specialized agricultural enterprises with a group of industrial processing enterprises” [2].

The agro-industrial complex was considered as a combination of agriculture and industry. So, Bauerly defines it as the progressive integration of agriculture and industry to meet market requirements [11].

The researchers believe the main elements of the agro-industrial complex are:

- farming (animal husbandry and crop production) - the core of the entire agro-industrial complex;
- industries that produce means of production (agricultural engineering, the production of mineral fertilizers, chemical protection against pests and diseases, agricultural construction,

etc.), which contribute to the intensification and industrialization of the AIC in general and agriculture in particular;

- logistics (harvesting, storage, transportation of agricultural products), processing industries (food industry, mixed fodder production), the sphere of circulation [9].

This approach is reflected in the definition of B.A. Reisberg with co-authors: AIC – is a set of sectors of the country's economy, including agriculture and industries that are closely related to agricultural production. These industries also carry out transport, store, and process agricultural products, supply them to consumers, provide agriculture with machinery, chemicals, and fertilizers that serve agricultural production [7].

However, we propose to consider the AIC as a complex system consisting of interconnected subsystems. The following definition can be given: the agro-industrial complex is an economic system, in which the subsystems are branches of the national economy, interconnected by economic relations regarding production, distribution, exchange, and consumption of agricultural products.

Such an approach will make it possible to identify correlations in this system, to determine the influence of factors on the system as a whole and its parts, and to improve the modeling of the processes occurring in the agro-industrial complex and its branches.

One of the key elements of the AIC as a system is a poultry subcomplex. However, many researchers consider it as a separate, open economic system, including such elements as the

production of poultry, meat and egg production areas, processing of raw materials, delivery to the places of realization, implementation [5; 8]. We propose to refer the poultry product subcomplex to the system of the agro-industrial complex as an element of the subsystem of animal husbandry. A systematic approach to the concepts of agro-industrial complex and poultry products subcomplex allows us to consider them not as a set of components, but as interrelations between components.

Such a unit seems appropriate due to the fact that there is a connection between elements within the livestock industry: for example, a reduction in the consumption and production of beef leads to an increase in the consumption of pork or poultry meat. The reasons for this situation most often consist of a change in real incomes of the population, a decrease or increase in effective demand. However, imbalances can also be caused by a lack of poultry meat. Although such situations rarely occur in a market economy.

This can be illustrated graphically (Figure 1). The diagram shows the change in the structure of livestock in Russia in 2001-2018. We see that there was a constant reduction in the proportion of cattle - from 41.9% in 2001 to 15.2% in 2018. This was a result of an increase in the share of poultry from 19.8% in 2001 to 47, 9% in 2017. But the share of poultry in livestock production decreased by 0.9% in 2018. This reflects the saturation of the market with poultry meat and the difficulties encountered with its sale.

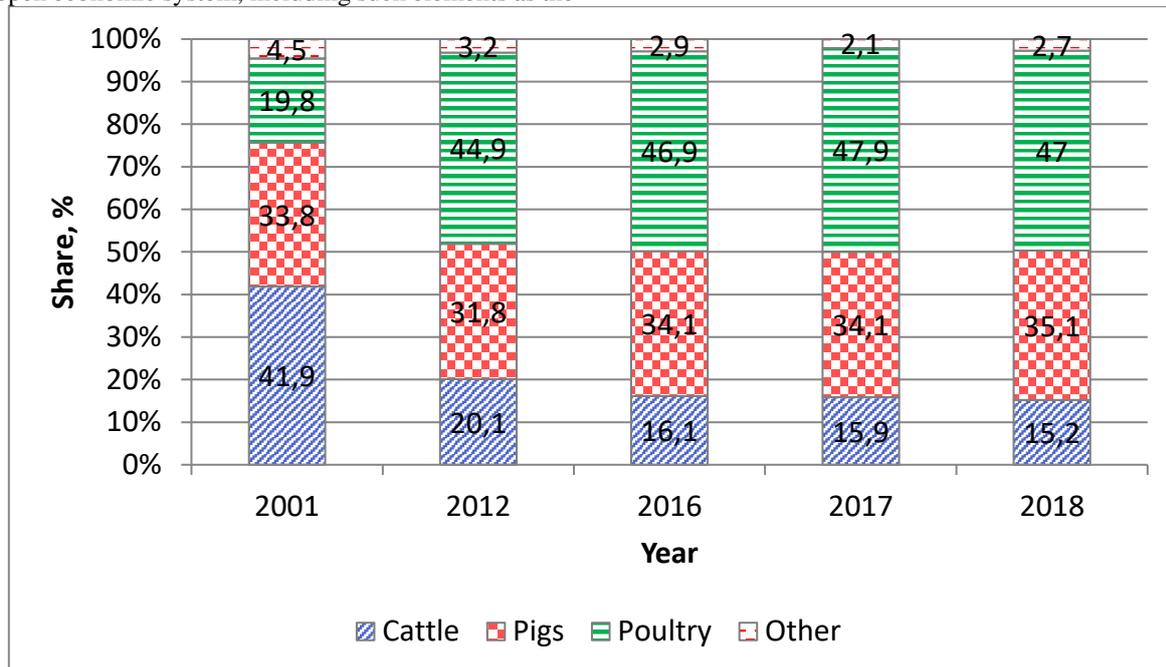


Figure 1. Structure of production of main livestock products (based on [10])

At the same time, the growth in previous years was due to the low-income level of a significant part of the population, which ensured the growing demand for poultry meat. As can be seen, the share of pork increased with a decrease in the production of poultry meat and beef, although from 2001 to 2012 there was a decrease.

If we consider a specific region, for example, the Sverdlovsk region, then there is a slowdown in growth and a

decrease in the production of poultry meat in live weight and an increase in the production of eggs (Table 1).

From table 1 we can conclude that in meat and poultry in the Sverdlovsk region there was a slowdown in production in 2013-2015, and in 2016 a slight decrease - by 0.1%. There was no reduction in eggs: in the Sverdlovsk region and in Yekaterinburg. The decline in meat and poultry output was 2.3–7.2% in 2014–2015.

Thus, the rate on the growth of domestic production of poultry products given results, but the year 2018 brought new realities. The demand in the domestic market is fully satisfied, which led to a decrease in prices for poultry products of the subcomplex (Figures 2 and 3). Such a decrease caused the unprofitability of production and, as a result, the closure of many large poultry enterprises.

Indeed, it can be seen from the diagrams in Figures 2 and 3, the price dynamics was unstable: the reduction in livestock and poultry was by 5.4-7.9% in 2013, and an egg (by 1-7%) in 2017.

TABLE 1 - DYNAMICS OF PRODUCTION OF LIVESTOCK PRODUCTS (BY [10])

Indicator	2013	2014	2015	2016	2017
1. Produced livestock and poultry for slaughter in live weight, thousand tons					
-Sverdlovsk region	251,8	261,4	268,7	270,5	270,1
-Yekaterinburg	4,0	4,3	4,2	3,9	4,0
2. Produced eggs, mln.					
-Sverdlovsk region	1387,9	1397,5	1442,9	1468,3	1523,6
-Yekaterinburg	872,5	877,0	888,6	911,9	934,4
1. Produced livestock and poultry for slaughter in live weight,% from previous year					
-Sverdlovsk region	103,8	102,8	100,7	99,9	103,8
-Yekaterinburg	107,5	97,7	92,9	102,6	107,5
2. Produced eggs,% from previous year					
-Sverdlovsk region	100,7	103,2	101,8	103,8	100,7
-Yekaterinburg	100,5	101,3	102,6	102,5	100,5

According to experts, the only growth factor could be access to foreign markets [4]. Enterprises of the poultry product subcomplex in this regard do not receive outside support, which makes it difficult to develop the export component of the industry.

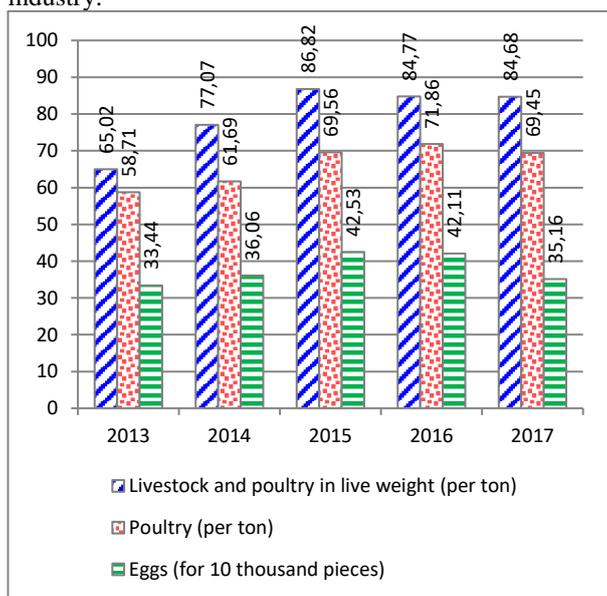


Figure 2. Dynamics of average producer prices (based on [10])

Prices began to increase in 2018-2019, but the previous overproduction led to a drop in demand for feed, vaccine, equipment, etc.

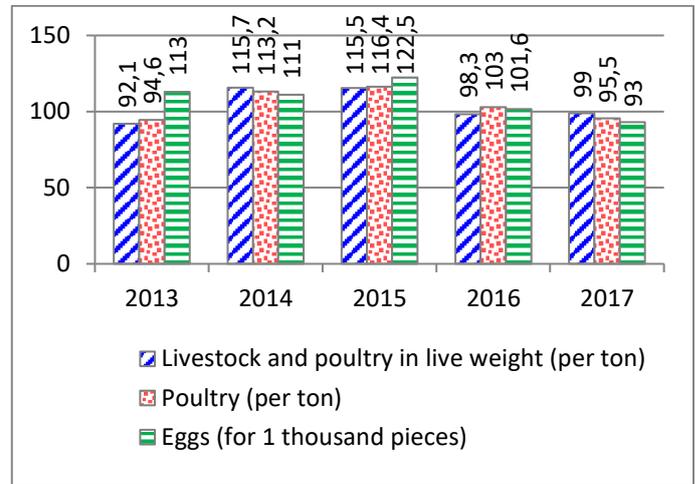


Figure 3. Dynamics of average producer prices (based on [10])

This proves that the poultry product subcomplex is a subsystem of the agro-industrial complex. A new approach to forecasting and planning the development of the poultry product subcomplex is needed to avoid negative developments in the industry. First of all, the approach should be based on an in-depth analysis of large amounts of statistical data on indicators of the agro-industrial complex acts as a whole, and on socio-economic indicators.

III. RESULTS AND DISCUSSION

The most important tasks of digitization of the AIC system and the subsystem of the poultry product subcomplex are:

1) implementation of analytical platforms (Analytics, Big Data system) for all elements-subsystems of the agro-industrial complex (they will allow forecasting the need for meat and poultry, price levels, grain yield, demand for various types of livestock products based on data processing);

2) creation of a digital database for decision support systems in the agro-industrial complex (digitization of databases that will allow modeling the development of sub-complexes and the influence of various macro-level factors - macroeconomic, geopolitical, geobotanical, climatic on the agro-industrial complex); this is solved through the creation of a specialized electronic platform. As a result, government decisions to support the AIC industries will be carried out on a scientific and analytical basis; it will be possible to create a clear system for making optimal decisions in the management of the agro-industrial complex.

Digitalization of the AIC system is proposed to be carried out sequentially. The first stage is the automatic collection of baseline data on the activities of the agro-industrial complex, its units, and the socio-economic situation in the country and in the world. For this purpose, agricultural enterprises, government agencies, institutions should be connected to a single system in order to instantly transfer information from the source to the recipient. Digitization, creation of a single database from disparate information is required.

The second stage is the development and implementation of digitalization tools - specialized portals and applications associated with them. This will be the mega storage of information with wide access to interested parties. The implemented support systems for decisions on the management of the AIC system and its links will help analyze the bases. Digitization of the agro-industrial complex will allow introducing systems for forecasting yields, climate change, justify investing in one or another branch of the agro-industrial complex, and provide manufacturers with ready-analyzed information to obtain a ready-made optimal solution.

Digitalization of the agro-industrial system will allow reaching a new level of innovative economy. The development of production differs according to the possibility of self-improvement and the duration of the innovation process cycle, depending on the use of its own or borrowed technologies. This cycle is much shorter when building products based on other people's innovations, but the effect is usually not so big. The organization of production on the basis of its own innovation has a much longer life cycle. It begins with the creation of innovations and bringing them to the level of technology, then there is a long improvement and commercialization, but this brings additional income. So, there is a constant expanded reproduction on an innovative basis.

IV. CONCLUSION

Thus, the development of the agro-industrial complex and its subcomplexes should be carried out on the basis of digital technologies. This will contribute to a significant increase in the speed of information transfer, the possibility of obtaining ready-made solutions. Digitalization can solve the problem of import substitution and implementation of own innovations, increase the competitiveness of the agro-industrial complex and the poultry product subcomplex.

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