

# Digitalization and innovative development of the poultry subcomplex

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**Abstract** — The purpose of the research article is to identify the problems of digitalization and innovative development of the poultry product subcomplex, conduct research, and suggest ways to improve it. State programs aimed at developing the poultry and food subcomplex of Russia have yielded results: the share of poultry meat is already more than half of the livestock production. However, at this stage problems arise due to market saturation, which is reflected in a slowdown in growth or a decrease in production and sales. It is necessary to widely introduce innovative developments at the enterprises of the poultry product subcomplex in combination with digitalization methods and tools to achieve the set development strategies.

**Keywords** — agro-industrial complex, AIC, poultry subcomplex, digitalization of poultry subcomplex, innovations in poultry subcomplex, poultry farming, poultry statistics

## I. INTRODUCTION

The agro-industrial complex in the modern sense is considered from a systematic approach, and its components are subsystems forming various connections with each other. In this regard, we propose defining the agro-industrial complex as a complex intersectoral economic system consisting of interconnected complex subsystems - agriculture, production, logistics, trade, and service units. Subsystems are responsible, on the one hand, for the production, processing, transportation, storage, sale of agricultural raw materials and products, and on the other hand, for providing agricultural subcomplexes with machinery, equipment, technologies, chemicals and fertilizers, technological innovations, modern tools, and methods digitalization.

The subsystem of the agro-industrial complex (hereinafter - AIC) is agriculture, which consists of subcomplexes, including poultry products. The terms "complex", "subcomplex" are identical to the concepts of "system", "subsystem", respectively. Consequently, the poultry product complex is a subsystem, not only of agriculture but of the entire agro-industrial complex. This can be explained in the following hierarchical chain: AIC (system) - agriculture (subsystem I level) - livestock (subsystem II level) - poultry subcomplex

(subsystem III level). On this basis, systemic relationships are traced - their study provides an assessment of the impact of the development of individual subcomplexes, subsystems on each other, and the agro-industrial complex as a whole. Each subsystem requires the use of digital technology. However, the introduction of innovations related to digitalization is not fast enough in the poultry product subcomplex.

So, according to analysts, agriculture is in the last place among industries using digital technology (Figure 1).

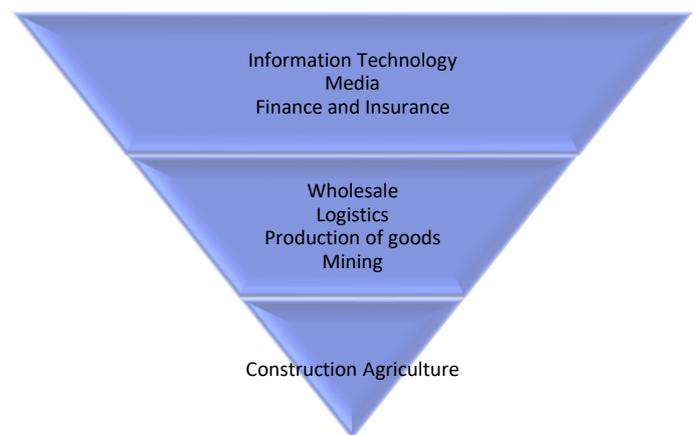


Fig. 1. Distribution of global economy sectors in terms of digitalization (based on source [11])

In our opinion, the poultry product subcomplex is a subsystem consisting of many interconnected functional and organizational elements that make up the logical chain: Innovative developments, digitalization; Transport support → (Resource support for the production of poultry products → Production of poultry products → Processing, storage → Bringing to the consumer).

Innovative developments and digitalization are out of the question, since they, being the basis of efficiency, should be used at each stage for each link. Lack of development of digital

technologies negatively affects the activity of the functional blocks of the poultry product subcomplex.

II. MATERIAL AND METHODS

Innovations involving the use of digitalization methods and tools have a key role in the development of the poultry product subcomplex. These innovations lead to increased output in quantitative terms and to improve product quality. Innovative digital technologies can solve some significant problems of the poultry product subcomplex: increase egg production of laying hens, provide an increase in the mass of meat breeds by improving the composition of the feed, and also by maintaining an optimal microclimate in the place of poultry rearing.

The important role of poultry business entities is illustrated by the diagrams in Figures 2 and 3, which show the share of poultry in the world and Russian production.

Figure 2 shows the share of poultry in world meat production - approximately 36%. Since supply creates its own demand, the diagram shows the importance of poultry farming in the structure of consumption of the population as a whole throughout the world.

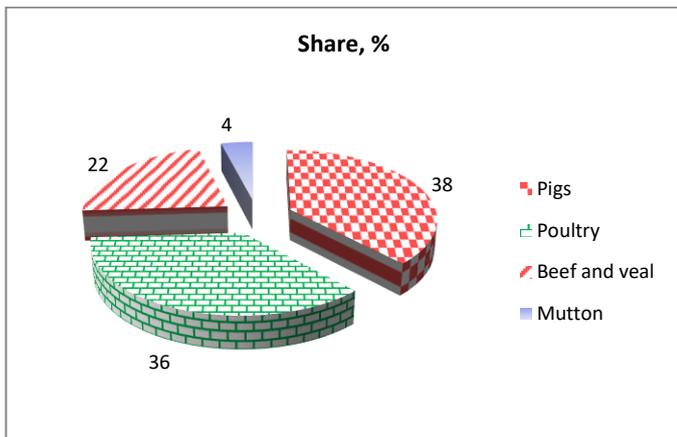


Fig. 2. The structure of world meat production and the place of production of poultry subcomplex, in percent (2015) (according to [5])

The share of poultry production (in slaughter weight) in Russia is more than half of all meat, as shown in figure 3.

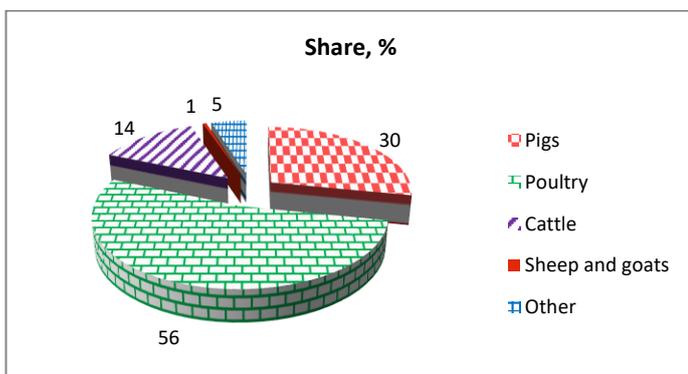


Fig. 3. Structure of livestock and poultry production for slaughter (in slaughter weight) by individual species in farms of all categories, in percent (2017) [10]

According to the Ministry of Agriculture of the Russian Federation, the share of poultry in the overall structure was 32.4% in 2008, in 2016 - already 44.2% [3, p.5]. According to our calculations based on the data of the Federal State Statistics

Service, the share of poultry production for slaughter reached only 17.3% in 1992, and 1995 - 14.8%. The turning point was designated only in the 2000s. The calculation results and data for recent years are presented in Figure 4 reflecting the dynamics of the specific gravity of poultry production in slaughter weight.

The diagram demonstrates the sharp increase in poultry production over the past 25 years. Moreover, there was a low level of domestic production since in the early 1990s the Russian market was open for imported products, including for the "famous" American "chicken legs of Bush". When the country's leadership turned to face domestic poultry and food subcomplex, the volume of poultry meat production increased sharply.

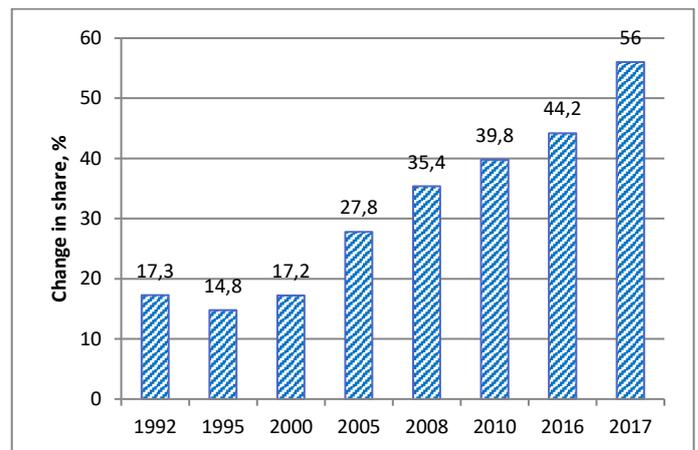


Fig. 4. Change in the proportion of poultry meat in the total production of livestock and poultry meat (from 1992 to 2017) (by [10])

The productivity of poultry of egg-bearing poultry breeds also showed a positive trend in the 2000s (Figure 5), although the resource for increasing productivity was almost exhausted by 2016.

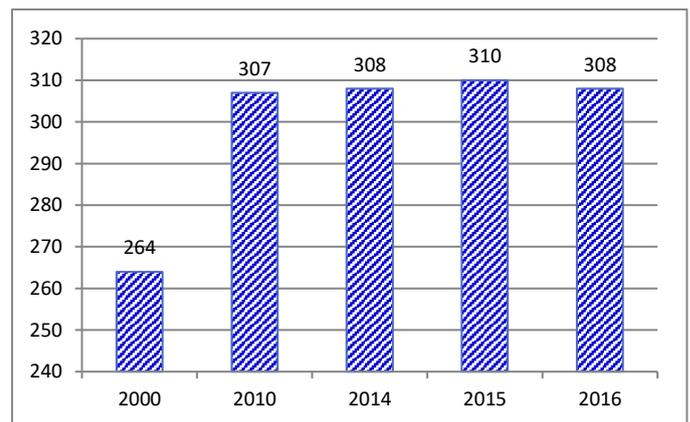


Fig. 5. Average annual egg production of laying hens in agricultural organizations (based on [7])

The growth in demand for poultry meat (chicken and turkey) is due to the insufficiently high-income level of the population. A significant increase in the supply of these products from manufacturers has led to a saturation in the market. Consider a specific region, for example, the Sverdlovsk region: there is a slowdown in growth and a decrease in poultry meat production in live weight and an increase in egg production (Table 1).

TABLE I. DYNAMICS OF LIVESTOCK PRODUCTION [10]

Indicator	2013	2014	2015	2016	2017
1. Livestock and poultry for slaughter in live weight were produced, 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. Eggs produced, million					
Sverdlovsk region	1387,9	1397,5	1442,9	1468,3	1523,6
Yekaterinburg	872,5	877,0	888,6	911,9	934,4
1. Livestock and poultry for slaughter in live weight were produced,% of the 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. Eggs produced,% of the 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

From table 1 we can conclude that meat and poultry in 2013-2015 in the Sverdlovsk region there was a slowdown in production, and in 2016 - a slight decrease - by 0.1%. For egg production, no reduction was observed in the Sverdlovsk Region and Yekaterinburg. In 2014-2015 there was a reduction in the production of meat and poultry by 2.3-7.2%.

According to the Ministry of Economy and Territorial Development of the Sverdlovsk Region, egg production increased by 0.7% in 2017. Production of livestock and poultry for slaughter (in live weight) also increased by 0.7% [9]. These are very low growth rates: the situation in the production of eggs has not changed, and in the production of meat there has been a slowdown in growth.

Thus, the bet on the growth of domestic production of poultry products has yielded results, however, 2018 brought new realities. Demand in the domestic market was fully satisfied, which led to lower prices for the products of the poultry product subcomplex (Figure 6), and this decrease led to unprofitable production and, as a result, the closure of many large poultry enterprises.

Indeed, the diagram in Figure 6 shows the instability of price dynamics: in 2013 they decreased by livestock and poultry by 5.4-7.9%, and in 2017 also by the egg (by 1-7%).

According to experts, the only growth factor could be access to foreign markets [2, p. 67]. However, the enterprises of the poultry product subcomplex in this regard are left to their own devices, which complicates the development of the export component of the industry.

A study conducted by the «Deloitte» research center showed that agricultural enterprises consider the stability of legislation, state support, the availability of funding sources, and the increase in production and technical potential as the main factors of competitiveness. The manufacturers name the following as the main development strategies: growth in sales

volumes, commissioning of new capacities, cost reduction, access to new markets, etc. [7, p. 10, 23].

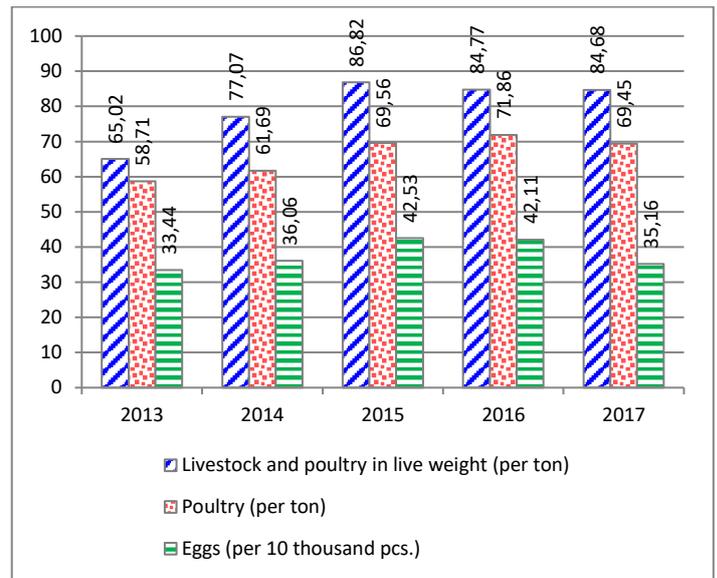


Fig.6. Dynamics of average producer prices for eggs, poultry, and livestock, in thousand rubles [8]

### III. RESULT AND DISCUSSION

Thus, the polls showed an undervaluation by entrepreneurs of digitalization and innovation. This can be explained by the fact that representatives of the poultry product subcomplex have a low level of awareness of the benefits of digitalization at the current stage of economic development, and are also not familiar with the digital technologies used in the agricultural sector of developed countries. This is not due to an unwillingness to keep up with the times. The reasons for this situation are insufficient financing of the agricultural complex and its subcomplexes, including poultry products.

According to the Ministry of Agriculture, only 20% of the constituent entities of the Russian Federation show a high level of digital innovation in the poultry and food subcomplex industry, and 29% is an average indicator. The leading regions are Altai, Krasnodar Territory, Kursk, Lipetsk, Samara Regions, the Republic of Bashkortostan and Tatarstan [4]. In 2019, the national platform “Digital Agriculture” was launched.

Thus, innovative developments in the field of digital technology are important to achieve the goals. The introduction of developments in the poultry product subcomplex will allow avoiding negative phenomena in the industry during the period of market saturation and high competition, and entering new markets and new segments.

In our opinion, the costs of technological innovations in the field of poultry subcomplex and animal husbandry are generally small: in 2017 they amounted to 6.4 billion rubles, which is 0.5% in the structure of innovations in all sectors of the economy [10].

Robot systems for poultry rearing processes are most in-demand among innovations in the poultry product subcomplex. In the West, the robot system is equipped with various sensors - air temperature, humidity, biochemical parameters. The priority development, in our opinion, should be systems that

control and establish thermal regimes and feeding regimes themselves. With the help of electronic controls, it is possible to identify diseased animals at an early stage. This will keep epidemics to a minimum. At the same time, the use of CRM-systems responsible for interacting with customers will be more effective in enterprises with a large client base. Innovation is not only a technical means of automation but also the breeding of new breeds with unique qualities. It is important to develop domestic breeding, focusing on breeds that are resistant to disease, able to quickly build up live weight without the use of ambiguous preparations. Innovative technologies for processing raw materials will make products competitive (ready-made frozen products, «liquid eggs», etc.).

In summary, the study of statistical data showed the production of poultry and eggs is kept at the same level or slightly reduced. It is necessary to turn to digital developments at all stages of production and marketing of finished products to correct the situation as part of growth strategies.

### **References**

- [1] The Great Russian Encyclopedia: 30 tons. / Chairman Scientific. - Ed. Council Yu. S. Osipov. Ed. ed. S.L. Kravets. T. "Russia". - M.: Great Russian Encyclopedia, 2004. - P. 535.
- [2] Great Soviet Encyclopedia / Chief ed. A.M. Prokhorov: In 30 volumes. - 3rd edition. - T. 1. -M. Ow. encyclopedia, 1969. - 608 p.
- [3] The Great Soviet Encyclopedia / Ed. S.I. Vavilova: 2nd edition. In 30 volumes. - T. 1. - M.: State Scientific Publishing House "Big Soviet Encyclopedia", 1949. - 640 p.
- [4] Nefedova V.N., Mayorova S.V. Poultry in 2018. Problems and prospects // Economics and business: theory and practice. - 2018.- №1. - p. 65-67.
- [5] Pakhomova A.A. The development of poultry products subcomplex AIC. - Abstract of Diss. doctor econ. Sciences .. - M.: 2013.
- [6] Semin A.N., Karkh D.A., Kondratenko I.S. The poultry products subcomplex in the system of the Agro-industrial complex: digitalization capabilities / 1st International Scientific Conference "Modern Management Trends and the Digital Economy: from Regional Development to Global Economic Growth" (MTDE 2019)
- [7] Raizberg B.A., Lozovsky L.Sh., Starodubtseva Ye.B. Modern economic dictionary. - M.: Infra-M, 2017. - 512 p.
- [8] T. Z.Kh. Problems and directions of increasing the efficiency of the poultry product subcomplex of the region // News of the State Pedagogical University named after A.I. Herzen - 2008. - № 65 [Electronic resource]. - Access mode: <https://cyberleninka.ru/article/n/problemy-i-napravleniya-povysheniya-effektivnosti-ptitseproduktovogo-podkompleksa-regiona>.
- [9] Uskova TV, Selimenkov R.Yu., Chekavinsky A.N. The agro-industrial complex of the region: state, trends, prospects. - Vologda: ISEDT RAS, 2013.
- [10] Bauerly B. The Agrarian Seeds of Empire: The Political Economy of Agriculture in US State Building. – Leiden: BRILL, 2016. – P.3 (322 p.).
- [11] Pustuev A.L., Kondratenko I.S., Pustuev A.A. Poultry products subcomplex: the possibility of interregional cooperation in terms of import substitution / Agrarian Bulletin. - 2017.