

# Solving problems of poultry subcomplex in the conditions of agriculture digitalization

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**Abstract – Industrial poultry farming in Russia is the most dynamic and knowledge-intensive industry, which makes a significant contribution to the food security of the country. However, the rapid development of the industry, a significant increase in poultry can have negative consequences in the future. It is about overproduction of products and the difficulties of its sales. Therefore, the growth of the competitiveness of the industry is expected due to the development of new markets, the use of innovative developments in the field of deep processing of poultry meat and eggs, the formation of new marketing niches (environmental production). The problems of large organizations of the poultry industry are to create and maintain a favorable microclimate for the cultivation of poultry, the fight against avian influenza, the sale of finished products, the provision of fodder. There is also a marketing problem for farmers. The existing problems in the poultry complex can be solved with the help of modern tools of the digital economy. Digital technologies are able to offer solutions for all categories of poultry producers: organizations, farmers, private households.**

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

## I. INTRODUCTION

The development of agro-industrial complex is devoted to many scientific articles and monographs; there have been enough attempts to analyze the system of promotion of agro-industrial complex. Currently, some results of theoretical research on the development of agro-industrial complex have been accumulated [10]

There are objective prerequisites for the effective development of agriculture in the Russian Federation. Thus, agricultural lands occupy 222.1 million hectares [3] (which is 13% of all land); among the rural population 21 million people of working age [4]; the capacity of enterprises producing agricultural machinery is sufficient for further production growth (so, in 2017, Russian agricultural machinery was produced by 21% more than in the previous year [8], which allowed to significantly increase the share of domestic agricultural machinery in the market). Also in 2016-2017

Russia has fully provided itself with fertilizers, both mineral and organic, as shown by recent studies [2]. In addition, the sanctions, which have been in effect since 2014, orient the Russian economy to support the policy of import substitution and the development of domestic producers. Under these conditions, improving the efficiency of the domestic agro-industrial complex in General and poultry subcomplex in particular comes to the fore. This is due to the fact that it is necessary to ensure the food security of our country.

## II. THE RESEARCH METHOD

Industrial poultry farming in Russia is the most dynamic and knowledge-intensive industry, which makes a significant contribution to the food security of the country, as the main producer of high-quality animal protein, the share of which in the daily diet of Russians reaches 40% due to the consumption of dietary eggs and poultry meat. Poultry (first of all, chicken breeding) is the most developed branch of domestic animal husbandry. Its development is facilitated by the high profitability of production (although it decreases every year) and stable demand for products, which is explained by the low price of chicken compared to other types of meat. Breeding of other species of poultry (such as geese, ducks, quails) is less common, while in Russia small amounts of Turkey meat are produced, but the increase in the capacity of existing farms and the announced new projects allow us to talk about the existence of this direction of prospects. But while the share of other species of birds does not exceed 5%. The share of poultry meat in the total output of meat in Russia increases annually. In accordance with the departmental program "poultry development in the Russian Federation for 2013-2020" the volume of poultry meat production should reach 4.5 million tons in slaughter weight, of which 92% will be produced by agricultural organizations [6].

The advantage of the poultry industry is the precocity of poultry, low feed costs for production. Poultry meat is superior to all other livestock industries in terms of feed conversion. The production of 1 kg of broiler meat consumes 1.5 and 2.5 times less feed than the same amount of pork and beef. The conversion of feed protein into protein products is higher in poultry compared to other animals: broilers 1.9 kg / kg, cows-2.7, laying hens-3.9, pigs-4.1, bull's fattening-10.6 kg/kg. [2]. Poultry products are also in demand in the Russian market due

to their lower cost compared to beef (this is important in the low level of welfare of the majority of the population) and greater availability. It is not surprising that the share of poultry meat in agricultural production was 55.8% in 2017 [9].

However, the rapid development of the industry, a significant increase in poultry can have negative consequences in the future. It is a question of overproduction of production and difficulties of its sale. Therefore, the growth of the competitiveness of the industry is expected due to the development of new markets, the use of innovative developments in the field of deep processing of poultry meat and eggs, the formation of new marketing niches (environmental production), the development of new digital

technologies. At the same time, it is necessary to develop the domestic feed base of the poultry product subcomplex.

More than 75% of livestock products are produced by agricultural organizations (figure 1).

This is a positive factor. It facilitates the collection and processing of statistical data on the development of the poultry industry in the state, region, from a single agricultural producer. This is necessary for state support of the industry, creation of favorable economic conditions, identification of negative trends, and balance of poultry subcomplex.

The share of households producing livestock products is also high. But there is a slight decrease: in 2013, the share of households was 22.7%, in 2017 – 20.4%; the minimum was in 2016 – 19.9%.

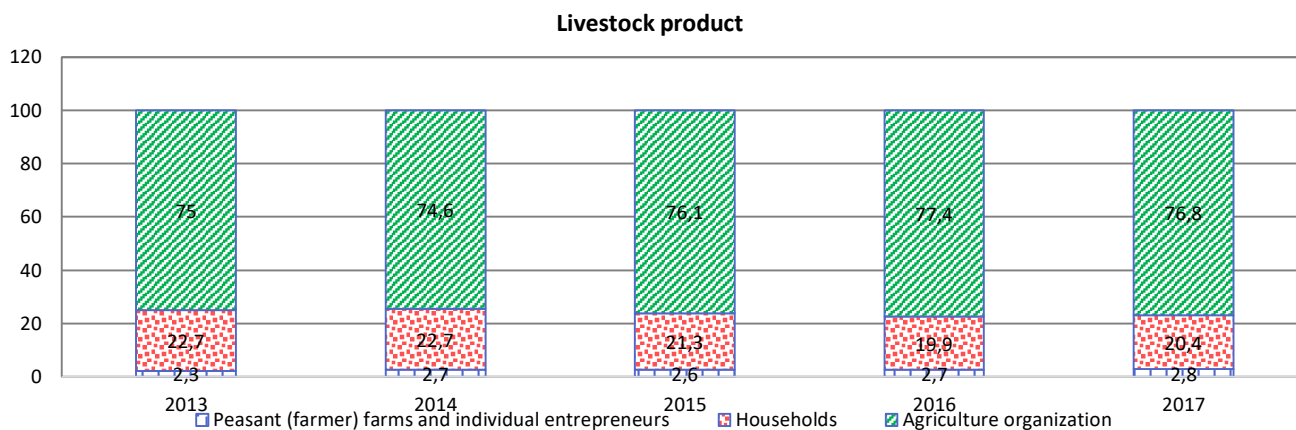


Fig. 1. Structure of livestock production by economic entities [9]

The proportion of farms is negligible, although there has been gradual growth from 2.3 % in 2013 to 2.8 % in 2017. This is due to problems of marketing their own products and competition from large poultry farms.

If you look at the statistics of annual production of meat and eggs per capita, the figures are not large, but their growth is noted (figure 2). The diagram in figure 3 shows that in 2013-2017 meat production increased from 41 to 45 kg per capita or by 9.8 %, but this is a low figure. Egg production in 2013 was 321 thing, and in 2017 – 352 pieces per capita; growth of 9.7 %. Further increases in poultry meat and egg production should be carried out to the full satisfaction of the population, as well as taking into account the entry into foreign markets.

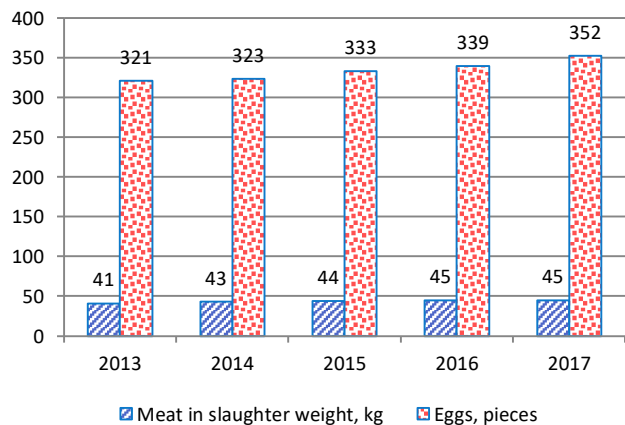


Figure 2 – Dynamics of agricultural production per capita [9]

Table 1 presents the analysis of the dynamics of livestock of poultry by categories of farms.

The structure of the poultry population by categories of farms in 2017 is shown in figure 4.

Table 1 shows that the reduction in the production of poultry meat in 2014, 11.8% was offset by an increase of 18.9% in 2015, This happened at the expense of agricultural organizations, because they account for 97.6 percent of all business entities in price reduction subcomplex is seen in figure 4.

At the same time, the increase in production on farms amounted to only 1.7% in 2015, and on households in General decreased by 8.6 %.

TABLE I. THE LIVESTOCK OF POULTRY BY CATEGORIES OF FARMS (END OF YEAR) [9]

| Years                           | Bird, thousand heads | Growth rate, % to the previous year |
|---------------------------------|----------------------|-------------------------------------|
| <b>Farms of all categories</b>  |                      |                                     |
| 2013                            | 13184,1              | -                                   |
| 2014                            | 11634,0              | 88,2                                |
| 2015                            | 13741,0              | 118,1                               |
| 2016                            | 14389,8              | 104,7                               |
| 2017                            | 13841,0              | 96,2                                |
| <b>Agriculture organization</b> |                      |                                     |
| 2013                            | 12764,3              | -                                   |
| 2014                            | 11258,7              | 88,2                                |
| 2015                            | 13389,2              | 118,9                               |
| 2016                            | 14051,1              | 104,9                               |
| 2017                            | 13512,7              | 96,2                                |

| Households   |       |       |
|--|-------|-------|
| 2013   | 324,0 | -     |
| 2014   | 290,6 | 89,7  |
| 2015   | 265,7 | 91,4  |
| 2016   | 263,5 | 99,2  |
| 2017   | 269,1 | 102,1 |
| Peasant (farmer) farms and Individual entrepreneur |       |       |
| 2013   | 95,8  | -     |
| 2014   | 84,7  | 88,4  |
| 2015   | 86,1  | 101,7 |
| 2016   | 75,2  | 87,3  |
| 2017   | 59,2  | 78,7  |

The existing problems in the poultry complex can be solved with the help of modern tools of the digital economy. The approach to this concept is multifaceted. However, more accurate, in our opinion the following definition;

"The digital economy is a multidimensional, multifunctional interacting traditional-innovative system of economic, social and cultural relations based on the use of digital information and communication technologies" [7].

The digital economy is inextricably linked with digitalization, which is proposed to be considered as a new, innovative stage in the development of Informatization with pronounced features: the use of digital technologies for generation, processing, transmission, storage and visualization of information. The reasons for the development of digitalization are the emergence, widespread distribution of new hardware and software solutions.

Digitalization is aimed at creating information and digital platforms and operators that can solve various economic problems at different levels of the economy-from strategic public administration to management of poultry farming. As a result, there is a change in the nature of production or economic relations, the change of their subject-object orientation, when the control, management functions takes over the software connected to the production complex [5].

### III. RESULTS AND DISCUSSION

Digital technologies are able to offer solutions for all categories of poultry producers: organizations, farmers, private households.

The problems of large organizations of the poultry industry are to create and maintain a favorable microclimate for the cultivation of poultry, the fight against avian influenza, the sale of finished products, the provision of fodder. The last problem is particularly relevant in 2019, as at the end of 2018-the beginning of 2019 there was an increase in prices for feed grain, and additives, and veterinary drugs, and energy.

By 2017, the poultry meat market was saturated, which led to a decrease in prices by 4.5 % (figure 5). This combination (lower product prices and rising costs) has created a tense situation in the market, the closure of poultry farms, reducing the number of birds and the growth of imports.

In 2016 the pace of production slowed down. In 2017, production decreased by 3.8 % also due to agricultural organizations.

2016-2017 years for farms were unfavorable, as the decline in poultry production was respectively 12.7 % and 21.3 %. From 2014 to 2016, households reduced the number of birds, although this reduction slowed. In 2017, for the first time in four years, the growth of poultry population by 2.1% was noted.

Periodic reduction of poultry population is explained by fluctuations in effective demand, losses due to diseases, natural losses, the desire to reduce the cost of poultry (this is typical for households). Competition becomes an important problem. In addition, retailers prefer to work with large farmers, and farmers are struggling to sell their products.

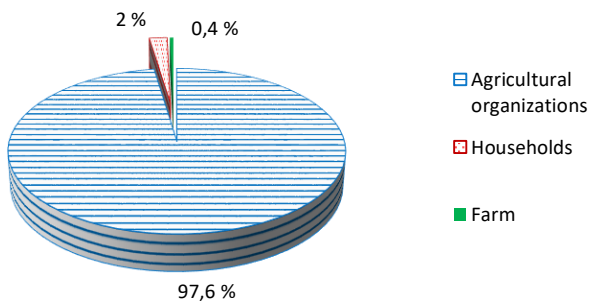


Fig. 2. Structure of poultry population by farm categories [9]

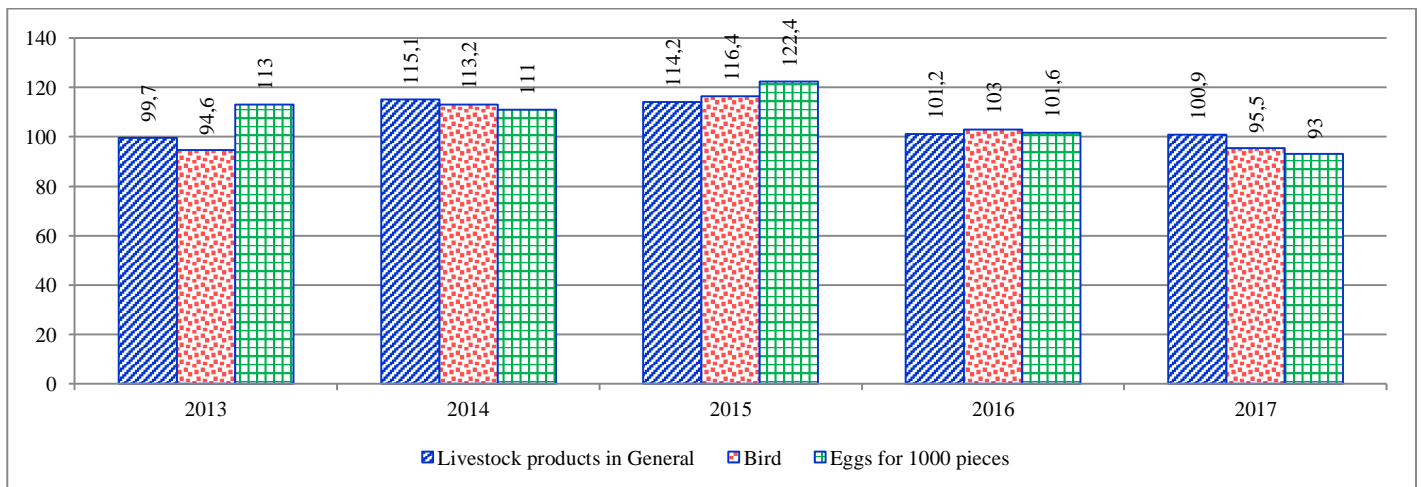


Fig. 3. Price Indices of agricultural producers (as a percentage of the previous year) [9]

What help can digitalization provide at different levels of the economy? For example, consider the macro level-the level of the state, which took a course on import substitution. Oddly enough, but the introduction of the digital economy, you can refer to the experience of the USSR. Planning of all spheres of the national economy resulted in a shortage of one or the other products due to the imperfection of the planning framework.

In modern market conditions, planning is also carried out, but it is not strictly Directive. It is necessary to identify the needs of the economy and ways to improve its efficiency.

Analysis of large volumes of databases using digital technologies will allow more accurately predict market demand and supply, the need for resources, taking into account the specified parameters (population, income level, price level, etc.). This will serve as the basis for the state's actions to contain or stimulate the development of the poultry industry in order to avoid oversaturation of the market and deterioration of product quality. This will also make it possible to calculate the need for the production of their own feed, drugs for veterinary purposes. Marketing opportunities of enterprises will improve. The balance of the poultry product complex on the basis of digitalization should become the basis of food security in Russia.

The second major task of digital technologies in the poultry product subcomplex (this is the level of production) is to control the microclimate of the premises (fixing the excess level of ammonia, carbon dioxide in the air, uncomfortable air temperatures), the presence of pathogenic bacteria in the feed, litter, changes in the physical conditions of birds with the first symptoms of avian influenza or other diseases. This can be done by robots that collect all the information and signal a person in case of deviations from the norm. Robotic delivery of feed, egg collection allows the use of sensitive analyzers that detect poor-quality food (stops its supply), spoiled eggs.

But robots here not only state changes, but also make decisions on the basis of special software products: they set the optimal illumination, air temperature, its circulation to increase the productivity of the bird.

Chipizatsiya population will automatically lead to a database of laying hens and broilers, to track their weight gain, consumption of feed, water, temperature change of the body reaction to these or other feed additives. Currently, it does not seem fantastic, as used on advanced farms in developed countries.

Of course, large poultry organizations will get the maximum opportunities from the use of digitalization. However, the development of digital technologies is gradually becoming available to large farms. You can start with simple sensors connected to your computer.

The role of the digital economy in the marketing of products through various electronic platforms and electronic exchanges is also significant. At the same time, the products offered for sale are accompanied by automatic determination

of the necessary parameters: weight, microbial composition determined by robotic devices, etc.

#### IV. CONCLUSION

Thus, the digitalization of the poultry product subcomplex will solve a number of key tasks both at the state level and at the level of poultry organizations, farms and even private farms that focus on the production of poultry for themselves. Digitalization will allow:

- increase the productivity of poultry meat and eggs;
- reduce the risk of death of livestock or losses from poultry diseases, due to violations of the microclimate in the room, the supply of substandard feed;
- to predict the development of poultry products and related complexes, and to develop measures to support them;
- eliminate the problems of labor shortage when using robotic technology.

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