

Production Process Modeling as a Way of Increasing Efficiency of Poultry Industry in the Sverdlovsk Region

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Abstract— The contemporary agro-industrial sector, and the poultry industry in particular, is an important component of ensuring optimal population's living conditions, quality of life, food safety, which determines the relevance of studying the functioning and development of this industry and developing measures to increase its effectiveness. This article draws out dynamics of production and financial indicators of poultry industry in the Sverdlovsk region, as well as analysis of the existing infrastructure for production of poultry products in the Sverdlovsk region. Development issues of poultry industry in the Sverdlovsk region are identified, a set of measures to improve the efficiency of this industry is proposed. The authors developed a model of integrated production, based on the joining of efforts and establishment of interaction between industry enterprises at the stage of production process, which allows to improve the quality of poultry products.

Keywords—*agro-industrial sector; poultry farming; integrated production; model; organization of production process.*

I. INTRODUCTION

The present-day agricultural industry of Russia is an extremely significant sector in the economy. The presence of areas for the creation of pastures, sowing fields, etc., in the country can undoubtedly be considered as one of the main factors of the agro-industrial sector (hereinafter: the AIS) development. However, in conditions of market economy and intense competition, the desire of manufacturers to achieve minimum costs and lower the final price often leads to deterioration in product quality. This fact affects the state of food market and leads to an increase in demand for agricultural products (of poultry industry in particular) of high quality, without preservatives and chemical elements [1].

The functioning of poultry industry affects the state of the region in the field of food security, economic development of the territory, level and quality of life of the population [2; 3].

II. RESEARCH METHODOLOGY

During the study, methods of scientific abstraction, induction and deduction, systemic, economic, organizational, functional analysis, SADT modeling were used, which constituted the research methodology.

III. RESULTS

The state of poultry industry and its development potential in the Sverdlovsk region should be assessed by a number of indicators: area (194800 sq. km.), agricultural land ratio (13%), ratio of people employed in agriculture (15.4%), provision with agricultural land (0.6 ha/person) [4].

The presented data indicate that the Sverdlovsk region has a high potential for the agricultural industry development. At the same time, only 15.4% of the population is engaged in agricultural activities, which is insufficient for the development of the AIS. It should be noted that the main reason for the unattractiveness of employment at the AIS enterprises is the low level of wages of employees. In this connection, the issue of the formation of a certain system of support measures, including benefits, on the part of the state to attract specialists to the agricultural industry becomes relevant.

Currently, the AIS system of the Sverdlovsk region is represented by the following structure: agricultural organizations (over 300), enterprises engaged in the production of food products (more than 500), farms and citizens, ensuring the functioning of personal farms [5]. The main agricultural products of the region include meat (poultry and livestock), dairy, grain (flour, cereals, and wares containing them), confectionery and other types of products. It should be noted that the poultry complex is an important part of the AIS of the Sverdlovsk region.

Sverdlovsk region produces about 13% of poultry meat relative to the volume of the whole country and fully meets the needs of the population in these products [5]. At the end of 2018, the Sverdlovsk Region occupied the 2nd place in the Ural Federal District and the 5th place in the Russian Federation for egg production, as well as the 2nd place in the Ural Federal District and 16th in the country for the production of poultry meat. The leading position in the structure of poultry meat production in the Sverdlovsk region is occupied by the Reftinskaya poultry farm (53% of the total production). The Severnaya agricultural enterprise takes the second place, it produces 1/5 of the total production (20.9%), the third place is occupied by the Sredneural'skaya poultry farm – 9.3%, the fourth place (7.9%) – the Pervouralskaya poultry farm and fifth place (4.5%) belongs to the Istoki breeding factory.

The poultry stock in 2017 increased by 1.4 million units, however, in 2018 the excess mortality rate of the poultry reduced the number of poultry by 3.5% compared to the previous period. In 2018, some experts associate the case of

poultry above the norm with low-quality feeds and with some shortcomings in production processes. It should be noted that the problem of feed quality is extremely significant for this sub-sector of the AIS.

Poultry production in the Sverdlovsk region has a certain upward trend. Poultry production in the Sverdlovsk region in 2016 amounted to 76.9 thousand tons, in 2017 – 76.8 thousand tons, in 2018 – 81 thousand tons; growth rate – 109.1, 99.9, 105.5, respectively [6; 7].

The development of the AIS, including the poultry industry, is significantly affected by scientific and technological progress, the economic and political environment, the socio-cultural factor, however, it should be noted that the creation of a natural product (environmentally friendly, without impurities and additives) requires optimization of the production of the poultry industry. In this case, it is necessary to take into account certain specific features of the production process in the industry.

Hence, about 70% of the costs in the production of poultry products are for the feed purchase [8]. In order to obtain a high-quality final product (poultry meat, eggs), it is necessary to control the quality of the feed, which in turn is affected by the professionalism of the staff determining the recipe, the compliance of technological equipment with the norms of scientific and technological progress, etc. [9; 10]. It must be understood that if the quality of feed in the poultry industry does not meet the existing requirements, then the final product will not have a sufficient level of quality.

Currently, the existing regulatory framework does not fully regulate the quality issues of poultry products (for example, the GOST does not have any indication of the rate of crude protein). Such legislative gaps lead to the fact that price becomes the main criterion for the selection of feed products for producers. In connection with this, poultry farmers prefer cheaper feeds, but with a lower protein content, which negatively affects the productivity of the bird (the reason is the low content of amino acids in the feed) [9]. In 2017, in the context of a sharp increase in the prices of vitamins that make up the feed, poultry producers faced the problem of a large amount of counterfeit food.

Indeed, feeds differ in price depending on the composition, concentration, production technology; however, unfortunately, the price of feed does not always correspond to the quality of the products. Also, there is a trend in which some feed mills raise prices for their products, but the quality is quite low. Consequently, poultry farmers have a distrust of suppliers and their products, and as a result, the consumer has a desire to produce feed himself, but this option is not always advisable, as often the factories lack the equipment necessary to create high-quality feed [9].

The analysis of indicators of the poultry industry in the Sverdlovsk region allows us to conclude that there is a positive trend in the industry, but in the future there may be a stagnation in the poultry market, which can be triggered by a number of factors.

Firstly, by the decreasing demand for these products. Consumption was lower than supply in 22 regions of the country; the opposite was true for the remaining 60. Prices for poultry meat fell by 21.3%, due to an increase in supply [11].

Secondly, technological capabilities do not allow manufacturers to manage waste in a safe way, which leads to soil destruction and, as a result, in some cases, to litigations.

Thirdly, the inefficient management at the poultry industry enterprises, which leads to higher costs, penalties from the regulatory authorities of the Russian Federation and, consequently, lower profits.

Fourthly, inadequate animal care and inaccurate prediction of mortality leads to significant losses (for example, at the Reftinskaya poultry farm), and this is reflected in the regional indicator.

One of the key factors inhibiting the growth and quality of poultry farming is the insufficiently effective organization of the production process. The lack of a coordination system between enterprises and units that determine the production technology, quality of raw materials, and performance standards adversely affects the production of high-quality feed, and, as a consequence, the poultry market, the quality of eggs and poultry for residents of the region.

Feed and poultry producers also have internal problems that hamper the improvement of feed: lack of highly qualified specialists.

In order to maintain positive dynamics in the poultry industry of the Sverdlovsk region, changes in the organizational structure of poultry farms, changes in the feed market, and a balance of supply and demand in this market are necessary [12].

The authors propose a comprehensive system of measures to improve the efficiency of the poultry industry, as well as to minimize processes stagnating in this sector of the AIS.

The first measure to improve the condition of the poultry industry should be the updating and addition of regulatory legal acts to regulate the industry as a whole. The existing legal framework regulates for the most part the process of production of poultry products, while there are no requirements for the process of manufacturing feed in terms of the content necessary for a high-quality final product (poultry meat). The issues of production waste elimination are not regulated as well. This circumstance negatively affects the quality characteristics of poultry products and lead to negative environmental consequences. In this connection, it is necessary to specify the requirements for the process of manufacturing feed and waste disposal at the legislative level.

Since the legislative changes have not been adopted yet, an important step to increase the efficiency of producers' activities may be establishing relationships and establishing long-term business relations between feed producers and their customers (producers of poultry products) in order to jointly develop the optimal ratio of substances (vitamins, antioxidants, chemical elements, etc.) in feed for maximum poultry efficiency. This type of long-term cooperation will not only satisfy the needs of each partner, but also achieve common goals – to improve the quality and volume of marketed products, and therefore strengthen the position of manufacturers.

Highly qualified specialists must be involved in the development of the feed composition, while poultry production management should be carried out by specialists who have modern methods of management, marketing and logistics. It is possible to attract and retain such specialists in

this industry due to certain incentive measures: wage growth; increase of scholarships and state payments to students studying in this area; intensification of scientific work in this industry; granting loans for the purchase or construction of housing on preferential terms (with certain obligations of the parties), etc. The costs of attracting and retaining specialists can be shared by partners (feed producers and poultry producers).

It is advisable to develop a state program in order to attract workers to the AIS. It should be noted that in developed countries, the state seeks to equalize the standard of living of the urban population and rural residents. This is done, first of all, in order to maintain the AIS and to preserve a sufficient amount of labor in it.

The study revealed that the main producers in the Sverdlovsk region belong to the region, and attempts to sell part of the poultry farms remain unrealized. Therefore, the most important stage in the development of this industry should be attracting investment from the business community, and this is possible due to tax incentives that can ensure the interest of entrepreneurs.

In addition to the abovementioned measures, in order to increase the efficiency of the poultry industry, the authors developed and proposed a “model of integrated production”, which allows combining the efforts of feed producers and poultry producers at the level of production processes.

The essence of the model is to establish interaction and joint work of divisions of poultry farms and feed manufacturing enterprises in order to develop the optimal compounding of feed, which can provide increased poultry efficiency.

The proposed model includes several basic elements.

Firstly, the conclusion of long-term cooperation contracts between poultry farms and feed producers, one of the conditions of which will be the involvement of poultry specialists in feed production enterprises at the stage of laboratory creation of feed formulations.

This will contribute to the further development of partnerships based on mutual interest: the poultry farm is interested in the successful development of the feed producer, since in this case the feed that meets the necessary requirements will be used to feed the poultry, which will improve the quality indicators of poultry products; the feed producer, in turn, is interested in the efficiency of the poultry farm, as its effective work will ensure constant demand for the feed producer and will become a source of additional labor (poultry specialists) in the development of feed formulations.

The integrated production system implies the joint development of feed formulations, which will make the formulation as efficient as possible from the point of view of profitability and utility.

Secondly, having a common goal for poultry farms and feed producers is to increase poultry productivity. Only with such a “profitable” goal will a comprehensive development of the industry be possible.

In addition, the integrated production model involves the creation of a department for quality control at both enterprises, which will contribute to the truthful fulfillment of manufacturers’ obligations. There is also the option of creating a new legal entity, where both owners (feed producer and poultry producer) are the founders – this will reduce possible risks due to changes in the organizational structure of enterprises.

The integrated production model may have variations: the creation of its own feed production by the poultry farm. However, this variation will be more costly.

The goal setting in the integrated production model has significant differences from traditional goal setting.

Traditional goal-setting does not imply the existence of common goals and does not reflect the interdependence of the poultry farm and feed production enterprises, and therefore cannot be the basis for the integration of efforts.

Any commercial enterprises pursue high profitability as their main goal. However, achieving this goal through reducing costs and product quality (today it is typical for the traditional goal-setting system) is not effective. At present, it is possible to use innovative methods to improve product quality. It should be noted that often an individual enterprise (feed manufacturer) cannot afford to develop and introduce new formulations, production methods (due to high costs), as a result, entrepreneurs are forced to resort to a low cost policy, reducing the quality of products. In turn, poultry farms also seek to increase their own profits by reducing costs, including the purchase of feed. The use of cheaper feed analogs affects the quality of the bird, for the normal development of which, due to its physiological needs, a certain set of vitamins and minerals is needed. Poor quality of birds ultimately affects the final consumer.

The integrated production model is another approach to increasing profits - through increasing the efficiency of poultry. Profit maximization becomes the goal of the second level, the achievement of which is achieved through the satisfaction of the needs of end consumers (Fig. 1).

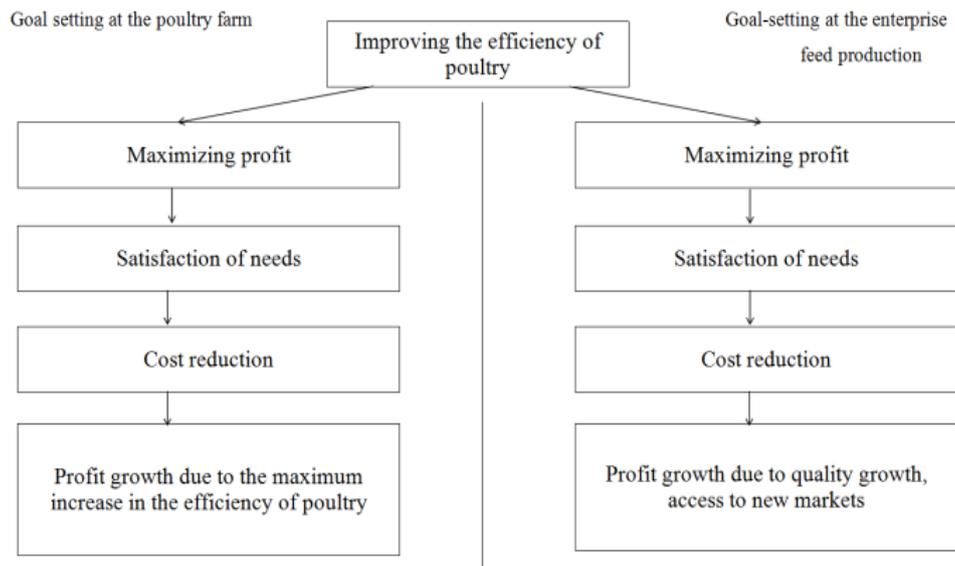


Fig. 1. New approach to goal setting within the framework of the integrated production model.

Cost reduction is limited by the threshold for the implementation of the above goals, as a result of which there is no deterioration in product quality, and the feed market and the poultry market receive a qualitatively new direction of development.

Consider the stages of the production processes of the two enterprises and the interaction of their structural divisions in the system of traditional goal-setting and within the framework of the integrated production model.

The existing system involves the interaction of enterprises only at one stage of production process – the stage of purchase of feed by the poultry farm; it is the implementation stage for the feed manufacturing enterprise. Such a system of narrow interaction does not allow poultry farms to take part in the production of feed, which negatively affects its quality. In turn, an enterprise engaged in the production of feed, as a rule, does not have enough information about the needs of birds in the framework of a particular habitat, bird species and other features, which as a result affects the state of the bird. So, one of the main reasons for the excess mortality of poultry in the Sverdlovsk region in 2018 was the non-compliance with the technology of feeding the bird and the lack of beneficial elements in the feed.

The integrated production model involves the interaction at each stage of the production process of both enterprises, starting with the pre-production stage of the supplier. This allows to create a high-quality feed formulation [10], reduce costs, and reduce the risks of loss of profit.

IV. PRACTICAL SIGNIFICANCE

The practical significance of this study lies in the possibility of implementing the proposed model at the enterprises of the Sverdlovsk region. This will bring poultry to a new level of development. The application of the integrated production model is possible for any agricultural enterprise and for any region, which indicates the universality of the proposed model.

V. CONCLUSION

Despite the all-Russian trend in the development of poultry industry, a stagnation trend in the poultry market of

the Sverdlovsk Region has recently been observed. The authors' integrated production model will be able to raise this industry in the region to a qualitatively new level, thereby increasing its competitiveness. The integrated production model involves improving the production process based on the principles of general goal-setting, improving the quality of the final product and establishing interactions between enterprises, which makes it possible to implement it in practice. The progressive development of poultry industry in the Sverdlovsk Region will increase the economic status of the region, as well as provide the population with the necessary amount of animal protein.

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