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## Main Problems of Feed Industry in the Regional Agro-Industrial Complex

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### ABSTRACT

The efficiency of production activities in the regional agro-industrial complex is an urgent and significant problem. A special place in the scientific research is occupied by the assessment of the level of instability and uncertainty in the field of feed production. In turn, the sustainable development of the feed base in the region determines, ultimately, the improvement of the livestock industry and the level of provision with essential foodstuffs for the population of a given territory. However, at the present stage of agrarian reforms, the formation of favorable conditions and the main factors of functioning and development of the regional feed production system are not fully studied, its impact on the efficiency of the livestock industry of the agrarian sector is not fully substantiated; including at the level of individual territories and municipalities. The problems of risk assessment in the regional feed production system remain unresolved. The article substantiates the main aspects of the stable functioning of the feed industry as one of the main factors in the development of animal husbandry. The basic conditions and determinants of reducing production risks in the field of feed production using the elements of correlation, regression and factor analysis are investigated.

**Keywords:** agricultural sector, fodder production, agrarian risks, assessment of the sustainability of fodder production, sustainable development of animal husbandry

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## INTRODUCTION

At present, feed production in the region is characterized by relative instability in its development, which is caused by the instability of the agrarian regional economy, overcoming the effects of the financial crisis, and the decline in the efficiency of the crop and livestock industries. In addition, the limitation of material, financial, labor and other resource capabilities of individual agricultural enterprises and organizations in the near future may cause increased tensions in the development of the industry, including lead to further exacerbation of problems in the process of preparation, production and storage of feed [5, 8].

In these conditions, special importance is attached to the continuous monitoring of the main parameters of the feed resources market, among which such important components as the demand for certain types of feed and quality, the supply of feeds and their distribution among agricultural uses are highlighted. It is the timely assessment of patterns and trends in the development of forage production for the future that determines the efficiency of managing the conjuncture processes in the agricultural markets of agricultural products [6].

Studies have shown that for 2015-2017 with an increase in the total area of crops in the region from 2.7 to 2.9 million hectares, or by 8.6%, the area under fodder crops has noticeably decreased (from 315.2 to 216.5 thousand hectares), including corn for silage and green fodder - by one third, annual grasses - by a quarter, perennial fodder crops - by 32.8%. During the same period, the feed consumption per 1 conv. Goal. livestock in agricultural organizations decreased from 30.7 to 27.0 c. units.

In the near future, the growth in demand for various types of feed and, above all, for concentrated feeds will continue. The problem of harvesting and production of feed will be exacerbated, especially in such municipal areas of the region as: Andropovsky, Grachevsky, Kirovsky, Krasnogvardeysky, Kursky, Levokumsky, Mineralovodsky.

According to our calculations, these areas occupy a quarter of the area of the region and at the same time the total area of its agricultural land. Meanwhile, only one tenth of the region's forage lands is concentrated here, while the share of livestock and poultry accounts for about a third of its total population. The proportion of forage crops in the total area of farmland in this zone is 1.5%, or 2.4 times less than the average edge. Not by chance s.-kh. the organizations of municipal districts of this cluster group in 2017 harvested only 13.2% of the total feed production in the region, including: per 100 hectares of agricultural land. land - 4.4 thousand tons of feed units, and for 1 con. Goal. cattle - 12.6 centners to. units, respectively, 2.1 and 1.9 times lower than the average for the region.

The efficiency of animal husbandry, determined, ultimately, by the volume of gross output per 100 hectares of agricultural land. land for the specified group of municipal districts amounted to 8.1 million rubles, or 14.7% below the average regional level. Therefore, in these municipal areas there is an imperfection of the feed production system in the region, associated with the organizational and managerial aspects of production activities in medium and large agricultural organizations, as well as in farms.

A major role in the development of fodder production should play: reasonable optimization of field crop rotations, modern technological modernization of irrigated fodder production, effective recultivation of natural pastures, innovative approaches in the system of material incentives for working activities of forage.

On this basis, the problem of providing agricultural organizations with fodder (and to a certain extent, personal households of the population) will take a dominant position in the agrarian social and economic policy of the municipalities of the region.

## MATERIAL AND METHODS

Studies have shown that the main factors for the development of feed production in the region and in municipal districts for the future are: growth in total feed production per 100 hectares of agricultural land; increasing the proportion of forage crops in the structure of crops; stabilization of the level of sustainability of feed production for a certain long period of time; increase in feed production per 1 standard head of cattle and

poultry; constant increase in the yield of fodder crops; intensification of fodder production; introduction of innovative technologies in the harvesting, storage and use of feed.

Among all sorts of factors and conditions that increase the risks in the regional feed production system, some authors distinguish organizational and economic, external and internal, objective and subjective determinants [1, 4, 9].

We believe that the following should be attributed to them:

- reduction in the quality of food supply and the optimal structure of feed production in the territory of this region, which leads to tensions in the market of livestock products;
- reduction of the share of forage crops in the structure of crops and in the total area of agricultural land in a given territory;
- insufficient amount of harvested feed per 1 conventional head of livestock and poultry, as well as per unit area of agricultural land in the region;
- non-compliance or lack of a reasonable diet of farm animals.

On the other hand, there are certain positive factors and conditions that reduce the risks in the production of feed. These include:

- introduction of innovative technologies for harvesting, production and storage of feed;
- Increasing the proportion of concentrates in the diet of animals within a scientifically based optimum;
- biologically justified increase in the yield of forage crops used for green fodder, silage and hay;
- introduction of efficient, environmentally friendly technologies for field and grassland forage production and seed production of perennial grasses;
- balance of supply and demand of feed in the region.

In order to clarify the likelihood of risks in the feed production system, we interviewed 9 experts on the problems of food supply development. They were 7 specialists from the regional agriculture departments of the region and 2 leading specialists from the Ministry of Agriculture of the region. Professionals were asked to rank the factors that, from their point of view, can most contribute to the risk in the feed production market in the short term.

According to the results of the survey, in accordance with the methodology of the expert survey and data processing technology [1], we determined the corresponding weighting coefficients of significance for the following main factors: the optimal structure of feed production ( $k = 0.327$ ), the proportion of concentrates in the diet of animals ( $k = 0.105$ ); the volume of forage prepared per 1 conditional head of livestock and poultry ( $k = 0.223$ ); increasing the share of forage crops in the structure of crops ( $k = 0.119$ ); introduction of innovative technologies for harvesting, production and storage of feed ( $k = 0.226$ ).

Next, the concordance rate was determined  $K_{kon} = 0,778$ , confirming the degree of consistency of expert opinion on the formula (1):

$$K_{kon} = \frac{12 * S}{n^2 (m^3 - m)}, \quad (1)$$

$S$  – the sum of the squares of the deviations of the sum of the ranks of each object of expertise from the arithmetic mean of the ranks;

$n$  – number of experts;

$m$  – number of examination objects.

On the other hand, the significance of expert responses was also evaluated using correlation and regression analysis. In this case, the multiple correlation index was 0.862, which generally confirmed the existence of a relatively high degree of agreement between experts.

Such a probability distribution for these factors indicates certain priorities for the further development of feed production in the region, and, therefore, will allow to take measures to reduce the level of production risks.

## RESULTS AND DISCUSSION

In the process of economic and statistical analysis, it was determined that the level of functioning and development of the feed production industry in the region is determined by the following main factors:

- first, the yield of forage crops (in this case, annual and perennial grasses for hay and green fodder, corn for silage and green fodder, root and tuber crops were considered);
- secondly, the share of forage crops in the total area of crops and their share in the structure of agriculture - x. land;
- thirdly, the production of forage crops per unit area and per 1 conditional head of livestock and poultry.

Moreover, the above factors have a direct impact on the level of development of the fodder production industry, as well as on the sustainability of the livestock industry as a whole. This was confirmed by relevant groups and factor analysis data at the level of municipal rural territories of the region, in which agriculture (and the availability of food) plays a prominent role.

As a result of correlation and regression analysis according to the data of 26 regions of the Stavropol Territory for 2015-2017. reasonable production models were obtained (parabolic regression dependency equations) and their main statistical parameters were calculated, characterizing the efficiency of the livestock industry, depending on the level of development of fodder production in the region (2) - (8).

$$Y = -0,092x_1^2 + 1,143x_1 + 2,439; R^2(\text{correlation index}) = 0,296 \quad (2)$$

$$Y = -0,035x_2^2 + 0,451x_2 + 2,808; R^2 = 0,252 \quad (3)$$

$$Y = -0,073x_3^2 + 0,336x_3 + 1,958; R^2 = 0,438 \quad (4)$$

$$Y = -0,009x_4^2 + 0,523x_4 + 2,417; R^2 = 0,677 \quad (5)$$

$$Y = 1,765x_5^2 - 2,863x_5 + 5,122; R^2 = 0,193 \quad (6)$$

$$Y = -8,502x_6^2 + 14,483x_6 - 3,821; R^2 = 0,117 \quad (7)$$

$$Y = 0,751x_7^2 + 1,960x_7 + 2,388; R^2 = 0,474 \quad (8)$$

In this case, the following factors were taken into account:

- $x_1$  - the proportion of feed crops in the structure of the village - x. land,%;
- $x_2$  - the proportion of forage crops in the structure of crops,%;
- $x_3$  is the volume of fodder prepared per 100 hectares of agricultural land. land, thous. tons unit
- $x_4$  - the volume of harvested feed per 1 conv. Goal. cattle and poultry, ck.
- $x_5$  - feed production index for 1 standard Goal. livestock and poultry to the previous year, coefficient;
- $x_6$  is the integral index of the yield of fodder crops to the previous year, the coefficient;
- $x_7$  is the integral coefficient of natural and climatic conditions in the region;
- Y - gross livestock production per 100 ha of agricultural land. land, million rubles.

The last factor was chosen as a productive sign, since the efficiency of fodder production in a single municipal area, ultimately, should be determined by the output of gross livestock production per unit area of agricultural land in the region.

The multiple correlation equation (9), whose parameters were built on the basis of a multi-step regression and factor analysis, confirmed a certain significance of one or another factor in the presented model.

$$Y = 0,813 + 0,072x_1 + 0,091x_2 + 0,825x_6 + 1,922x_7, \quad (9)$$

$$R^2_{mng} = 0,774; F_{kp}^{tabl} = 4,46; F_{kp}^{rasch} = 28,3$$

On the basis of simulation modeling, using the regression equation (9), we determined the amounts of undersupply of gross livestock production per unit area of agricultural land due to the low level of feed production in some enterprises of the agricultural sector. It was established that as a result of the inefficient management of the feed production industry in about half of the municipal regions of the region in 2017 alone, more than 382.7 million rubles were lost. gross output.

In this regard, the following areas are distinguished: Georgievsky, Krasnogvardeisky, Petrovsky, Thanksgiving, Andropovsky (here, on average, 100.9 hectares of fodder units were produced per 100 hectares of agricultural land against 8.1 thousand tons to. units - as a whole on the edge, or a quarter less). At the same time, in accordance with the principle of asymmetry of territories, in other municipal areas (and, above all, in Kochubeevsky, Predgorny, Budyonnovsky, Kirovsky, Novoselitsky), 10.7 thousand tons of agricultural land was received per unit area of agricultural land, or a third more than the average for the region and 1.4 times more than in areas and a relatively low level of development of feed production.

In order to reduce risks in the field of regional feed production, it is necessary to adhere to the following directions for the development of feed production:

- design and implementation of alternative advanced technologies for the development of fodder production in non-irrigated and irrigated areas;
- the study and use of foreign experience (in particular, Eastern European countries) in the design and forecasting of feed rotations on irrigated and rainfed land;
- justification of technologies for the improvement and rational use of natural forage lands and pastures.

At the same time, in accordance with the proposals of a number of scientists [2, 7], it is necessary to use more large-scale:

- computer-aided design of animal feed rations, the calculation of the need for feed by their species and the sown areas of forage crops;
- intensive use of meadow grass mixtures based on the selection of different varieties and types of forage crops;
- New scientifically based systems of rational feeding of various groups and species of animals;
- economically sound technologies for the improvement and use of natural forage lands;
- innovative technologies for the creation and use of specialized pastures for farm animals;
- progressive system of intermediate crops on irrigated and non-irrigated lands.

We believe that further development and improvement of fodder production should take into account the principle of spatial and spatial accounting of the characteristics of the formation and optimal functioning of this industry, with extensive use of a selective integrated approach to solving the identified problems. Ultimately, this will contribute to smoothing the territorial differences in feed production and in the efficient use of the feed base of municipal territories and the region as a whole, which will significantly reduce the occurrence of production risks in the system of production, storage and use of feed.

## CONCLUSION

The development of feed production in the region predetermines the efficiency of the livestock industry and, ultimately, the agrarian sector of the economy. Therefore, in the future, it is necessary to develop sound organizational and economic measures to strengthen the role of the feed industry in each municipal district of the region, which will positively affect the increase in the level of supply of productive animals with feed, reduce tensions in the market of agricultural food resources, efficiency of measures for timely harvesting, transportation, storage and optimal use of feed.

The following are among the strategic directions for the development of feed production in the region: the use of various alternative and flexible technologies for the rational preparation and use of feed; optimization of animal feed rations and dietary supplements and grass mixtures, taking into account the latest achievements of agricultural science; the use of scientifically based approaches to forecasting forage production on irrigated and non-irrigated lands of municipal territories; development and design of progressive fodder crop rotations, involving a significant reduction in production costs in fodder production and animal husbandry.

Thus, fodder production is an important indicator of the development of the territory's economy, including agriculture, its individual industries and the agro-industrial complex as a whole. In the future, this implies the development of specific measures and strategies to regulate the agrarian sector, taking into account the spatial differences between municipal territories and the peculiarities of the formation of the stern base in the region.

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