MODELING METHODS FOR IMPROVING AND OPTIMIZING THE INDUSTRIAL STRUCTURE OF AGRICULTURAL ENTERPRISES

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At present, scientific substantiation of the optimal sizes of industries and specialization of agricultural organizations is an important and relevant area of ongoing agroeconomic research. The priority role in the development and selection of a rational system of agricultural management belongs to the definition of the production sectoral structure of agricultural organizations at the level of rural areas.

World experience shows that the developed models are an important tool for determining the optimal production structure of the crop and livestock sectors, prospective volumes of production and consumption of agricultural products, and developing scenarios for the development of the agricultural sector at various levels of management, including at the level of rural areas [1]. The models being developed are aimed at supporting the effective functioning of agricultural production on farms and are associated with imitation and playing out various model situations in the agricultural sector.

The solution of optimization models adapted to the conditions of production development confirmed the possibilities of improving the economic condition of agricultural organizations of the municipal district and, in particular, was expressed in a significant increase in the total profit from the sale of agricultural products compared to the actual value by 22–190% depending on the choice of scenario option. However, the proposed model solutions were not implemented in real production by municipal management structures due to objective reasons.

The agricultural and social sectors of rural areas are developing disproportionately and have not actually achieved their optimal development.

In 2001–2011, the average number of employees at enterprises decreased by 4 times [2]. At the district level, the sown area decreased by 24.3 thousand hectares, or 1.8 times, including grain and leguminous crops – by 17 thousand hectares, or 2.3 times, sunflower – by 0.7 thousand hectares, or 2.2 times, forage crops – by 7.2 thousand hectares, or 1.5 times. Over the same period, the number of cattle decreased by 7.3 thousand heads, or 2.2 times, pigs – by 0.3 thousand heads, or 25%, sheep – by 0.4 thousand heads, or 4.6 times, horses – by 0.4 thousand heads, or 2.1 times. Total sales volumes of grain decreased by 10 thousand tons, or 2.4 times, milk – by 1.3 thousand tons, or 21%, meat – by 0.9 thousand tons, or 3 times, wool – by 0.7 tons, or 2.4 times.

Ineffective development of the agricultural economy has determined the negative impact on the social sphere and infrastructure of the rural area under consideration. During the period 2001–2011, the rural population decreased by 2.2 thousand people, or 11%. In 2011, the mortality rate exceeded the birth rate, and the migration loss of the population amounted to 236 people. During the implementation of the so-called optimization of social sphere sectors in 2001–2011, one pre-school educational institution and 22 general educational institutions, 3 libraries, and 4 club institutions were closed in the district.

In recent years, territorial accessibility of basic social and cultural services for rural residents has been declining. If in 2001 there were on average 56 children per 100 places in a preschool institution, then in 2011 there were already 125 children. Over the analyzed period, the total library stock decreased by 208 thousand copies, or by 40%; the number of seats in cultural and leisure institutions decreased by 1.7 thousand units, or by 29%.

The provision of doctors (per 10 thousand people) in 2011 was 91% of the 2001 level, mid-level medical personnel - 84%, hospital beds - 66%. At the same time, the incidence rates of the rural population of the municipality (for all disease groups)

significantly exceed the national average [3]. In 2001-2011, not a single new educational, cultural or health care institution was commissioned in the territory of the municipality.

In the current conditions, the agricultural sector needs to take anti-crisis measures, the development of which is best based on model solutions. The deterioration of production indicators of agricultural organizations has led to the development of new economic and mathematical models that take into account the structural changes in rural areas that occurred in 2001–2011. Also, from a methodological perspective, it seems interesting to compare the results of the optimization carried out with the actual level of agricultural production achieved in 2001 and 2010.

The algorithm for developing optimization models of the production structure of agricultural organizations includes the following stages:

1. Formulating the statement of the economic and mathematical problem and choosing the optimality criterion (maximum profit received by agricultural organizations from the sale of products).

2. Determining a possible list of basic, additional and auxiliary variables and constraints used in the models.

3. Preparing information support for economic and mathematical models. Solving correlation and regression problems to determine the probable values of crop yields and productivity of farm animals.

4. Compiling models for each agricultural organization within the rural area and implementing them on a computer.

5. Formal and economic analysis of the results of solving the optimization problem.

6. Selecting and expert evaluation of the optimal solution to the economic and mathematical problem.

7. Building alternative scenarios for the development of agricultural production at the level of the rural area.

The pessimistic scenario is based on the principle of a conservative forecast and determines the use of forecast indicators in model calculations. When considering the

parameters of the safe development scenario, average annual actual indicators of the dynamic development of agricultural organizations are used, suggesting the possibility of maintaining the conditions for agricultural development in general without changes. The sustainable development scenario is based on potential prerequisites for a significant increase in the level of efficiency of agricultural production and provides for the use of mainly forecast indicators in models.

In accordance with optimization decisions in agricultural organizations, expansion of sowing areas for rapeseed, sugar beet and sunflower for oil seeds is envisaged. Reduction of sowing of forage crops and corresponding increase of sowing for more profitable commercial crops in farms is achieved by introducing a rational structure of forage production.

Literature

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