

# Agricultural production planning taking into account the factor of "location" of producers

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**Abstract.** With transition to market economy for the majority of agroformations there was a problem which level of development does not correspond to its theoretical and practical importance in relation to modern conditions, it is a problem of efficiency of expenses for production of agricultural production in borders of separate rural territories. In the conditions when the formation of prices for products occurs according to the laws of the global market, the economic efficiency of its production is determined primarily by the specific production costs. The latter are caused not only by soil and climatic potential of economic entities, but also to a large extent by their geographical location and economic conditions. In other words, the cost and profitability of agricultural products vary in individual rural areas, not only in accordance with the yield, but also depending on the factors of "location" of producers, which, in turn, under the influence of the same natural conditions.

## 1. Introduction

The issue of significant conditionality of the cost and / or profitability of agricultural products from the "location" of economic entities in the domestic economic literature is not sufficiently covered. And only in recent years, in connection with the extension of market principles to land relations, models of land valuation have been developed, in which there is necessarily a factor of "location", which has a significant impact on the value of land in its commercial use. It follows that the favorable location of land increases the profitability of agricultural business, for example, by saving on transport costs, with a developed production infrastructure, etc.

Planning, as we know, is the process of making and evaluating an interconnected set of decisions in advance. It is therefore very important to determine the values of the input controlled parameters that will support the system (agriculture) on the optimal trajectory under any uncontrolled external influences.

Due to the complexity and multifactorial nature of economic processes, the number of parameters that affect the managed process is usually very large. But active influence is possible only by controlling free parameters. Among these free parameters, only a part that is an instrument of active influence on the behavior of the economic system can be practically used. It should be borne in mind that as the process progresses, some parameters lose their importance, and others – act as paramount. Therefore, it is necessary to determine in advance the minimum number of key parameters by which it will be possible to change the trajectory of the control object in the desired direction.



## 2. Results and discussion

The most important quantitative characteristics of economic conditions, which together with natural conditions practically predetermine the economic efficiency of production within the boundaries of individual territories, at the same time are absolutely uncontrollable on the part of the producers themselves, in our opinion:

- the percentage of ploughed agricultural land –  $X_1$  (with a greater share of natural pastures and hay in the composition of agricultural land, the land is used less intensively, less choice for the land user to diversify production, the possibility of their transfer to arable land is practically absent or economically unjustified);
- density of rural population, people/km<sup>2</sup> –  $X_2$  (the more rural population in a limited area, the land can be used more intensively and with greater impact).

As can be seen from the table 1, these two indicators of "location" have a constant in time and quite a strong influence on the performance indicator (in all analyzed years, the "direction" and the relative "strength" of the influence of factors remain virtually unchanged). They "act" in the opposite direction, that is, the higher the density of the rural population and the level of intensity of use of agricultural land, the lower the unit costs of production. The "strength" of their influence on different types of crops (industries) varies from "moderate" to "significant". As for the interdependence of these exogenous factors, they showed a close positive relationship ( $r = 0.74$ ;  $t \text{ St.} = 7.88$ ), which gives grounds to use the percentage of farmland ploughing ( $X_1$ ) as a single integrated factor of "location" of agricultural lands of agricultural formations (degrees of freedom, as a rule, equal to 52, except for individual crops that are not cultivated in some areas).

Along with the statistical characteristics of the "strength and direction" of the impact of these factors in the context of rural areas of the Republic of Bashkortostan, the table shows also the coefficients of pair correlation ( $r$ ) based on the cost of production ( $Y$ , RUB/centner) of yield ( $X_3$ , centner/hectare) crops. Their comparison with the coefficients of pair correlation between the cost and ploughing of farmland confirms our assumption that the factor of "location" of economic entities "participates" in the formation of the cost (profitability) of agricultural products is not less than soil fertility (expressed in terms of productivity).

**Table 1.** Dependence of production cost on the "location" of areas and crop yields <sup>a</sup>.

Indicators	Y : $X_1$		Y : $X_2$		Y : $X_3$	
	r	$t_{Cr.}$	r	$t_{Cr.}$	r	$t_{Cr.}$
Winter rye	-0,714	7,344	-0,394	3,093	-0,672	6,551
Spring wheat	-0,653	6,214	-0,443	3,564	-0,714	7,349
Oats	-0,561	4,886	-0,372	2,888	-0,620	5,702
Barley	-0,676	6,610	-0,417	3,313	-0,599	5,389
Peas	-0,488	3,875	-0,282	2,032	-0,469	3,676
Millet	-0,410	2,203	Not different from zero			
Sugar beet	-0,514	2,747	Not different from 0		-0,676	4,200
Vegetables	-0,775	4,588	-0,606	2,846	Not different from 0	
Milk	-0,610	4,280	Not different from 0		Correlation	
Weight gain cattle	-0,662	5,160	-0,410	2,600	coefficients were not	
Increase in live weight of pigs	-0,613	5,090	-0,450	3,310	calculated	

<sup>a</sup> Data of the Ministry of agriculture of the Republic of Bashkortostan were used.

Thus, the rational placing of agricultural crops and livestock industries needs to be assessed from the point of view:

- maximize the commercial efficiency of agribusiness;
- maximize the efficiency of land use while maintaining fertility of the soil;
- to ensure the rational use of available labor resources (high socio-economic efficiency).

Since the territorial features ultimately determine the standard of living of the rural population living in the study area, the account of the climatic characteristics of the territory becomes a prerequisite for optimizing the structure of acreage and the choice of industry orientation. To do this you must first on a single methodological basis to assess the soil and climatic resources of cultivation of more crops, then agriculture should be placed in agricultural zones so that local conditions have a positive influence on production efficiency in a broad sense – the results of the activities should meet the interests of producers to be commercially effective and meet the criteria of socio-economic and ecological-economic efficiency.

Taking into account the established objective links of economic efficiency of production with the factors of "location" is not only possible in assessing the existing location of various crops and animals at all levels-soil and climatic zones, administrative areas and economic entities, but also necessary in the development of measures of state regulation of agriculture aimed at creating normal, corresponding to the average level of socio-economic conditions for the population living in areas with unfavorable natural and economic parameters. For these purposes, the developed statistical models of costs for the production of crop production can be used, where the percentage of plowed agricultural land and the long-term average crop yield in the administrative regions of the Republic are taken as exogenous parameters. At the same time, the first of them reflects the influence on the productive factor of the "location" of producers, the second-the soil fertility of the arable land they use [1-5].

In the forecast decisions should also be presented indicators of the cost assessment of the damage caused to soil fertility, both for individual productions, and for individual crop rotations and lands. The latter is particularly relevant due to the fact that the loss of soil fertility associated with agricultural production tend to grow and become comparable in monetary terms with the crop production obtained from these lands. In these conditions, therefore, it is no less important, based on the so-called structural forces, "...which put into a single economic whole various crops and branches of agriculture" [6], the definition of a rational combination of branches of agriculture and correct crop rotations for, including, economic entities, in order to minimize the negative difference between the removal of nutrients by the crop yield and their compensation at the expense of crop residues. The missing part (negative difference) of soil nutrients is subject to compensation through the application of organic and mineral fertilizers.

To what extent, that is, at the level of simple or extended reproduction of soil fertility, and at whose expense, the land user or the state-will be decided, probably, depending on the agricultural policy, which will be developed taking into account the norms and standards of the world Trade Organization. But the requirement, at a minimum, of simple reproduction of soil fertility, must be fulfilled, without any exception, over the entire area of land used in agricultural production. The solution of this problem is closely related to the main economic task facing agriculture – to bring the production of basic products to the level of food security of the country. But it is impossible to meet the current needs of society at the expense of exhausting the use of land productivity in short periods of time. The fate of future generations should not be forgotten either.

According to some scientists [7, 8], incomplete reproduction of soil fertility due to the annual reduction in the use of organic and mineral fertilizers will not immediately affect the value of the current crop yield, that is, the effective fertility of the soil, but will require more and more resources in the future only in order to "hold" on the achieved level of productivity. As a result, a sharp rise in the price of products is possible, due to the need to compensate for the loss of the natural potential of systems, expensive anthropogenic investments [9, 10]. It is in the conditions of market economy will lead to further degradation of the agricultural production and make it unprofitable from the point of

view of profitability [11]. Thus, the continuation of the trend of accelerated "wear" of soil fertility may lead in the future to a steady decrease in the number of products produced and, for this reason, the cessation of agricultural production in a significant part of the country, including in the Republic of Bashkortostan with difficult to predict consequences. Consequently, the main focus should be on sustainable land use.

### 3. Conclusion

The transition of agricultural production to sustainable agriculture requires a fundamental revision of investment priorities with a change in the direction of resource use to economically and environmentally efficient production, changes in the production structure of farms and the choice of new resource-saving and environmental technologies.

Measures of state support should be aimed at reorienting producers to produce those types of products that have a high level of demand both within the country and abroad. In the future, it is necessary to implement measures of state support for farms, including those, first of all, located in less favorable and "extreme" areas for agriculture, which, under the current structure and system of agricultural production, are not able to provide even a full return on their material costs.

Such a strategy can make it possible to achieve the goals of the state agrarian policy laid down in the Federal law "On the development of agriculture", the main ones of which are:

- ensuring sustainable development of rural areas, employment of the rural population, improvement of its standard of living, including remuneration of workers engaged in agriculture;
- conservation and reproduction of natural resources used for agricultural production.

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