Problems of spatial development of the agro-industrial complex of the Krasnoyarsk Region

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Abstract. The spatial development of the agro-industrial complex of the Krasnoyarsk region is very diverse and uneven. This is due to the introduction of high-tech industries in individual territories, which increases their investment attractiveness, and state subsidies on the principle of supporting growth points. The identification of territories requiring a special regime of economic incentives for the purpose of equalizing territorial heterogeneity is proposed to be typified. Generalization of long-term studies of agricultural economists allowed authors to include the natural and climatic conditions and the level of social and economic development, which are characterized by such a set of indicators as (i) the hydrothermal coefficient to the main factors of differentiation of territories; (ii) provision of plants with heat; (iii) soil characteristics; profit per average annual employee; profitability of agricultural production; state support per one agricultural organization; (iv) profit per 1 rub. of state support; (v) level of remuneration of workers; and (vi) rural population growth. Approval of calculations based on data from 36 districts of the Krasnoyarsk region with the use of an integral indicator, as the average value of their score, made it possible to conclude that 8 districts of the region were in a low socio-economic development group and needed to develop measures to stimulate entrepreneurial initiative with the participation of government funding.

1. Introduction

The Krasnoyarsk region has complicated natural and climatic conditions, a huge territory, and a sprawling distribution of markets. Its main priority sectors are non-ferrous metallurgy, electric power, mining and chemical industry, timber production and timber processing. In spite of the fact that the region is one of the foremost in the implementation of large investment projects that would ensure high budgetary figures, the above-mentioned circumstances cause a deepening of the differentiation of the socio-economic development of the territories of the standard of living of the population. The historically established system for locating the productive forces has lost its initial significance, since the accelerated development of high-tech industries that promote rapid growth in labor productivity and the closure of non-competitive industries have led to a flow of people, especially in rural areas. In this regard, the issue of preserving the basic framework for the resettlement of the region is being updated for the regional authorities, which implies a reduction in the outflow of villagers by improving the infrastructure of the territories, increasing the number of jobs, increasing the attractiveness of the
rural way of life and the profitability of the villagers. This approach is relevant in the framework of the developed Strategy of Spatial Development of the Russian Federation until 2025, which presupposes “the improvement of the organization of resettlement of residents, placement of economic, social, transport, energy, and other infrastructures on the territory” [1]. Thus, the primary task is to identify the potentials of the territories of the region to formulate the methodology for the regional economic development, taking into account their differentiation. In order to determine the list of municipal entities requiring a special regime for the implementation of state policy, it is necessary to formulate a methodological tool for assessing their condition, especially in agricultural production, since most of the territories are traditionally associated with agrarian business.

2. Methods

In order to identify the region’s subjects that have similar natural, economic, production, and social attributes for carrying out a policy of socio-economic equalization of territories, it is necessary to resort to a typology. The typologization should consist of two stages, where the first factors are determined by the factors of the delimitation of territories and the indicators that characterize them, while at the second stage they analyze and form the rating of municipalities according to the level of their development.

Starting the study from the first stage, it should be noted that many economists-agrarians were engaged in studying the factors and indices conditioning the territorial heterogeneity. Thus, P. P. Maslov states that territorial differentiation is dictated by the dependence on economic conditions of management, among which the location and density of population are fundamental [2]. V. A. Tyutin also refers to the factors determining spatial heterogeneity, including territorial location, adding natural and climatic conditions and highlighting such indicators as remoteness from industrial centers, the degree of development of communication routes and the state of soil and climate [3]. A. N. Chelintsev believes that the most important factor that determines the differentiation of territories is the population density. However, in later works he argues that the type of organization of agricultural production in a certain territory is determined not only by “... the population per unit area” but also by the remoteness of the markets [4]. A. G. Granberg proposes differentiating the territories according to the level of economic development and the incomes of the population. His hypothesis is based on the fact that heterogeneity has a positive value for the location of production, because it is a consequence of the territorial division of labor [5]. Academician S. S. Sergeev to the principles of agricultural zoning included specialization, distance from major cities as the main markets, and the level of intensification of production [6].

The experience of previous studies gives grounds to draw the following conclusion: for the accuracy of the differentiation of territories to typological factors, their natural and climatic state and the level of economic and social development are the main ones. In this regard, typological indicators are selected with respect to factor characteristics and are based on the available statistical and accounting data. Thus, it is proposed to estimate spatial heterogeneity of territories by such indicators as:

- natural and climatic conditions;
- hydrothermal coefficient;
- provision of plants with heat;
- soil characteristics;
- level of social and economic development:
- profit per average annual employee;
- profitability of agricultural production;
- state support per one agricultural organization;
- profit for 1 rub. of state support;
- level of remuneration of workers;
The districts are divided into 3 groups: 1 group of areas — “green” with high level of indicators, 2 group — “yellow” with an average level of indicators, and the “red” group with a low level of indicators. Therefore, the points correspond to each type in the following way: 1 group – 3 points, 2 group – 2 points, and 3 group – 1 point. In the case of sublevels of our typologization, the score can either increase or decrease by 0.5 points (in some cases by 0.75 points) [8].

3. Results
To test the proposed methodology for the typologization of territories, statistical data from 36 districts of the Krasnoyarsk region were used.

A study of the soil characteristics of the areas makes it possible to reveal that they do not have enough fertile land. At the heart of the agricultural territory are the sod-podzolic and gray forest soils, with a small amount of chernozem. This, accordingly, makes it possible to divide the areas into such groups according to the state of the soil as with high fertility, characterized by a sufficient amount of chernozem of various types, average soil fertility, where the basis is the gray forest soils and low soil fertility consisting of sod-podzolic soils [9]. During the typologization, it is determined that only 11 districts of the region, which occupy the leading positions in the production of crop production, are included in the group of territories of high soil fertility.

In order to assess the natural climatic state, we use the intervals of the indicator measuring the provision of plants with heat, which is the sum of the average daily air temperatures with a temperature above 10°C. Thus, the following groups of regions with temperature regimes of 12000°C were determined as very cool; 1400-1600°C – cool; 1600-1800°C – moderately cool; 1800-2000°C – not enough heat; more than 2000°C – moderately warm. To clarify the results, an assessment of natural climatic conditions through a hydrothermal coefficient characterizing the moisture content of the soil was also applied, where the unit measures are the normal value. This allowed us to determine the intervals of 1.2-1.6 (sufficient moisture content), 0.8-1.2 (insufficient moisture content), less than 0.8 (dryland) [9]. The calculations show that 24 regions of the region have a normal level of soil moisture.

One of the complex types is the differentiation of regions according to the level of socio-economic development due to the large number of indicators that characterize it. Therefore, it is proposed to break this typologization into three groups: on the efficiency of agricultural production, the level of state support, and social development.

To assess the effectiveness of agriculture, zoning is carried out on two indicators simultaneously: the profit per average employee and the profitability of production. In the course of the calculations being made by authors, areas with a high level of efficiency in agricultural production were identified, in which the profit per one average worker was from 257 to 359 thousand rubles, the profitability was 33 to 23%; the average level at which the profit per employee is from 52 to 257 thousand rubles, the profitability is from 5 to 23%, a low level characterized by the profit per employee of below 52 thousand rubles, as well as the profitability of less than 5%. Proceeding from this, only 12 districts of the region have a high level of the production activity efficiency, and 6 of them are marked with the low level of efficiency, while two of them have a negative level of profitability.

Definitions of the level of economic development are supplemented by the typologization of the state support effectiveness using the values of two indicators: (i) state support per one agricultural organization and (ii) profit per 1 rub. state support. The following intervals were used for the analysis:

– An indicator of state support per one agricultural organization: over 9000 thousand rubles; from 9000 to 3000 thousand rubles; less than 3000 thousand rubles.
The profit made per 1 rub. of state support: over 1.5 rubles; from 0.7 to 1.5 rubles; less than 0.7 rubles.

The combination of these indicators made it possible to reveal that in 8 districts of the province, the state support is used more efficiently, receiving 1.5 rubles for one ruble of subsidies in profit, while it is twice as high as state subsidies in one district (Uzhursky). However, most of the areas do not have a return on investment of public funds, and two of them even got losses.

The next stage of territorial typologization is the assessment of the level of social development conducted according to the indicators of the level of remuneration of workers, thus characterizing the location of the particular district: the nearer the district is to the regional center, the higher the salary and the increase in the number of the rural population [10, 11]. The intervals of indicators were formed in this way:

- Population growth: has a positive trend; does not exceed 1%; over 1% per year;
- Level of remuneration of employees: over 65 to 55%; from 55 to 34%; from 34%; and below 24%.

The calculations revealed a rather negative trend: 19 districts of the region have a critical social status, 7 of which are characterized by very low profitability and rural population growth. And only 4 districts, of which two are in a suburban area, are socially safe.

The final stage of the territorial differentiation is the definition of the integral indicator as the average value of the sum of all the scores of previous typologizations (Table 1).

**Table 1.** The territorial-economic typologization of the Krasnoyarsk Region.

| Characteristics of the defining indicator | Number of districts | Area with characteristic typologization | Points |
|-------------------------------------------|---------------------|----------------------------------------|--------|
| 1. Areas with a high level of socio-economic development of the territory | 4                   | Nazarovskiy, Uzhursky                   | from 3 to 2.5 |
| Subtype 1a. Areas with a very high level of socio-economic development of the territory | 2                   | Uyarsky, Sharypovsky                    | from 2.5 to 2 |
| Subtype 1b. Areas with a relatively high level of socio-economic development of the territories | 2                   | Abansky, Achinsky, Balakhinsky, Bolsheurtinsky, Berezovsky, Bogotolsky, Dzerzhinsky, Emelyanovsky, Idrinsky, Cannes, Kuraginskiy, Kozulsky, Karatuzsky, Krasnoturansky, Minusinsky, Mansky, Nizhneingashsky, Novoselovsky, Partizansky, Pirovsky, Rybinsky, Sayansky, Suhobuzimsky | from 2 to 1.5 |
| 2. Areas with an average level of socio-economic development of the territories | 31                  | Abansky, Achinsky, Balakhinsky, Bolsheurtinsky, Berezovsky, Bogotolsky, Dzerzhinsky, Emelyanovsky, Idrinsky, Cannes, Kuraginskiy, Kozulsky, Karatuzsky, Krasnoturansky, Minusinsky, Mansky, Nizhneingashsky, Novoselovsky, Partizansky, Pirovsky, Rybinsky, Sayansky, Suhobuzimsky | from 2 to 1.5 |
Subtype 2b. Areas with a relatively average level of socio-economic development of the territories

Taseevsky
Bolsheuluysky,
Yeniseisky,
Ermakovskiy,
Ilansky,
Irbeisky,
Kazachinsky,
Shushensky

from 1.5 to 1

7

3. Areas with a low level of socio-economic development of the territories

Subtype 3a. Areas with a low level of socio-economic development of the territories

Tyukhtetsky

below 1

1

Only 4 districts of the region can be attributed to the “green” group with a very high and high level of socio-economic development. A total of 66.7% of the districts are in the “yellow” group of districts with an average level of development. Seven regions are close to slowly transition to the third, ineffective “red” group (Figure 1).

| “Green” group | “Yellow” group | “Red” group |
|---------------|----------------|------------|
| Nazarovskiy   | Abansky        | B.Ulusky   |
| Uzhursky      | Achinskiy      | Yenisei    |
| Ujarsky       | Balakhta       | Ermakovskiy|
| Sharypovsky   | B. Murtinsky   | Ilan       |
| Sharypovsky   | Berezovskiy    | Irbeisky   |
| Sharypovsky   | Bogotolsky     | Kazachinsky|
| Sharypovsky   | Dzerzhinsky    | Shushensky |
| Sharypovsky   | Emelianovskiy  | Tyukhtetsky|
| Sharypovsky   | Idrinsky       |            |
| Sharypovsky   | Kansk          |            |
| Sharypovsky   | Kuraginskiy    |            |
| Sharypovsky   | Kozulsky       |            |
| Sharypovsky   | Karatuzskiy    |            |
| Sharypovsky   | Krasnoturansky |            |
| Sharypovsky   | Minusinskiy    |            |
| Sharypovsky   | Mansky         |            |
| Sharypovsky   | Nizhneingashsky|            |
| Sharypovsky   | Novoselovskiy  |            |
| Sharypovsky   | Guerrilla      |            |
| Sharypovsky   | Pirovskiy      |            |
| Sharypovsky   | Rybinskiy      |            |
| Sharypovsky   | Sayanskiy      |            |
| Sharypovsky   | Suhobuzimsky   |            |
| Sharypovsky   | Taseevsky      |            |

Fig. 1. Typologization of territories by the level of socio-economic development.

Undoubtedly, the territories of the “red” group, subjected to natural and socio-economic risks, need a necessary set of economic incentives. However, to date, all major government funding has been tied up to regions of the 1st and 2nd groups, since it is absolutely clear that the higher efficiency of production leads to the greater the preferences. This principle is also in line with the trends of federal financing, such as supporting points of sustainable growth. But such a path, obviously, leads to the growing differentiation of territories. Therefore, without the state support of the territories of the “red” group, they clearly cannot make it. At the same time, subsidizing should be accompanied by the development of program documents that take into account the specifics of agriculture, contribute to the growth of competitiveness, the development of entrepreneurial initiatives, taking into account the
increased risks of agricultural production. So, for example, natural and climatic conditions are quite conducive to the creation of a center for the collection and processing of wild plants in Kazachinsky, Ermakovskiy and Tyukhtetsky districts. In conclusion, I would like to note that the search for effective ways of developing the territories along with public investment is able to solve the problem of their socio-economic equalization.

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