Regional differences determination in the Irkutsk region agricultural land use

D R Chernigova
Irkutsk State Agricultural University named after A.A. Ezhevsky, Molodezhny, Irkutsk district, Irkutsk region, Russia

E-mail: chernigova.dina@yandex.ru

Abstract. For the analysis of regional differences in agricultural land use as the basis of rational and efficient production and procurement of food products of the region it is necessary to study land conditions. To do this, apply the relevant research and identification methods of spatial-temporal trends in the use of agricultural land based on consideration of various economic parameters. Features terms of territorial organization are characterized, as a rule, by their existing natural, socio-economic, historical factors, thereby forming the regional differences of agricultural land use. Analysis of the distribution of municipal areas according to the intensity of agricultural land use describes the state of agriculture in the region, reflecting the peculiarities of the conditions of its territorial organization. The intensity of land use is generally determined by parameters characterizing the quantitative and qualitative characteristics of land use. For these purposes, the following indicators were used as input data: area of agricultural land in municipal districts; acreage of agricultural crops; gross production, technical equipment, and mineral fertilizers. Thus, the paper presents comparative characteristics of land resources of the country and the region. The analysis of agricultural land intensity indicators is carried out among the main agrolandscape areas of the region. Areas with the most intensive and less intensive use of agricultural land are identified.

At all times there are various changes in the social relationships of economic or social nature. In the conditions of market economy and the introduction of private property, issues of evaluation of production and procurement of food products, analysis of land use and territorial organization of agriculture and forestry in order to streamline the further development and increase of its effectiveness requires a thorough analysis [1].

According to the State report on the status and use of land in the Irkutsk region available land of the region within the available land of the Russian Federation, is 77484.6 hectares and its territory is formed of 42 municipalities, of which 9 city districts and 33 municipal district [2,3].

After analysing the data reported on the availability and distribution of land, it should be noted that a large part of the territory of the Irkutsk region is occupied by forest land – 89.48% (69331.4 thousand hectares) of the total area of the available land. The remaining 6 categories have all of 10.52%, of which: the share of the category of agricultural lands accounts for almost 4% (2882.8 thousand hectares), lands of settlements of 0.52% (399.9 thousand ha) 0.74% take up of industrial land and other special purposes (578.1 thousand hectares) and 0.64% - reserve lands (498.5 thousand hectares), the share of specially protected territories and objects have of 2.00% (1552.4 thousand
hectares), lands of water reserve amount to 2.89 per cent (2241.5 thousand hectares). Evaluating the data of the Federal state statistical observation in dynamics it is determined that during the period after the reform was implemented, changes of the areas of land categories changed as well as the land use in each category on the basis of the inventory was specified.

Previous studies have revealed that as a result of redistribution land area among various categories of enterprises (agricultural organizations, peasant (farmer) and personal subsidiary plots) in the 90s of the XX century the existing system of organizing the territory and land use, stability and compactness of land use have been practically destroyed. Thus, continuing to analyse the trend, for the period 1990-2017 the total area of agricultural land in the Russian Federation decreased by 396.6 thousand hectares, and arable land - by 9.5 million hectares (the decrease in arable land is due to its transformation into other agricultural land). The same trend is observed at the regional level. To a greater extent, changes have occurred in the category of agricultural land. The decrease occurred by 2363.3 thousand ha (45%). The main direction of such a significant reduction is mainly the transfer of agricultural land to forest land, because of their overgrowing. Including agricultural land decreased by 231.1 thousand ha, and arable land by 214 thousand ha. [4,5].

In the process of a detailed study of the annual reports on the availability and distribution of land, it should be noted that the transfer of land from one category to another arises as a result of activities such as the provision of land, the removal of land for state and municipal needs, the inclusion of land in the boundaries of settlements, return (previously withdrawn) to the previous category of worked or reclaimed land. Change of category could occur as a result of confiscation of land, termination of rights to the land. Land conservation causes their transfer, as a rule, to reserve lands.

Since agricultural land has undergone significant changes, an economic and geographical assessment of agricultural land use is necessary and underlies the analysis aimed at identifying the features associated with the prospects for agricultural development, defined in the concepts and programs of socio-economic and agricultural development of agricultural enterprises.

To determine the level of agricultural land use, a more detailed assessment of the status and dynamics of agricultural land use in municipal areas of the Irkutsk region is important.

Thus, analysing the area of agricultural land at the level of municipal regions of the region, there is a tendency to increase the development of the territory from north to south. This is especially true for the steppe and forest-steppe zones, as well as for areas adjacent to the Trans-Siberian Railway. These territories are characterized by rather favourable climatic conditions and labour resources. This feature determines their high level of agriculture relative to other areas of the region, in connection with this, the arable land of these areas is more than 50%. Northern areas in the structure of which hay and pasture lands prevail, often exceeding the area of arable land are characterized by a distinctive feature [6,7].

The efficiency of land use, taking into account its specific conditions, is due to the development and implementation of a system of agronomic, veterinary, technical, organizational and economic measures aimed at increasing the potential of the territory to increase agricultural production from each hectare of land characterizing the intensity of agricultural land use. A comparative assessment of the intensity indicators in dynamics and in different areas will reveal regional features of agricultural land use and areas for further improvement in the territory use.

For the development of the agro-industrial complex, analysis of the agricultural land use is of some importance. Therefore, the level of use of agricultural land is usually judged by the output of gross output per unit area. But for a more objective assessment of the intensity of use, it is necessary to take into account additional factors for improving production. For example, to increase the share of arable land, resist the development of degradation and increase fertility through the use of mineral and organic fertilizers.

To analyse the intensity of agricultural land use, the districts of the Irkutsk region, which are part of the main agricultural zones and agrolandscape districts of the region, were selected. The northern districts of the region were not included in the analysis due to the insignificant use of agricultural land [8].
As indicators, the average values of the total area of agricultural land, sown area, agricultural production, technical equipment, and the use of fertilizers in each of the districts of the Irkutsk region for the period 2010-2018 were used (table 1).

To analyse the average values of indicators of the agricultural land use intensity by region, a point estimate is proposed that allows to determine the level of agricultural land use intensity in the region.

According to a point estimate, for each indicator, the average value over a multi-year period was determined according to the data of municipal districts. Then, each indicator was assigned a rank in ascending order, after which the level of agricultural land use intensity was determined on the basis of the assigned serial numbers. As a result of statistical processing, the rating of each municipal district was calculated. According to the results of the indicators analysis, the district with the largest sum of places is considered the best, and with the smallest- the worst (table 2).

Thus, according to the results characterizing the degree of agricultural land use in each municipal district of the region, five intensity levels are formed.

Analysing the results obtained, the districts included in the first and second groups with low and moderate levels of land use intensity belong to the northern regions, with the exception of Olkhon, Slyudyansky and Shelekhovsky, which in turn have small agricultural land and sown areas. This is primarily due to the peculiarity of the climatic and landscape-territorial conditions of these areas. The boundaries of these areas extend along the southeast of Lake Baikal.

**Table 1. The average value of indicators of the agricultural land use intensity by district, 2010-2018.**

| №  | District name | Agricultural land area, ha | Sown area, ha | Agricultural production, thousand rubles | Technical equipment, pcs | Fertilizer applied, т |  |
|----|---------------|-----------------------------|--------------|----------------------------------------|-------------------------|----------------------|---|
| 1  | Alar          | 173700                      | 58230        | 1278339                                | 61                      | 1866                 |  |
| 2  | Angarsk       | 17076                       | 1619         | 1202756                                | 39                      | 519                  |  |
| 3  | Balagan       | 9123                        | 8723         | 393539                                 | 44                      | 111                  |  |
| 4  | Bayanday      | 133556                      | 20535        | 939221                                 | 2                       | 0                    |  |
| 5  | Bohan         | 150434                      | 3329         | 964284                                 | 40                      | 583                  |  |
| 6  | Bratsk        | 58400                       | 29501        | 1976323                                | 55                      | 238                  |  |
| 7  | Zhigalovo     | 43016                       | 866          | 221001                                 | 3                       | 0                    |  |
| 8  | Zalari        | 134212                      | 41568        | 1699426                                | 146                     | 1749                 |  |
| 9  | Zima          | 84000                       | 21081        | 2238080                                | 65                      | 1989                 |  |
| 10 | Irkutsk       | 124716                      | 36844        | 3650291                                | 314                     | 8791                 |  |
| 11 | Kachug        | 175032                      | 14809        | 911459                                 | 66                      | 3                    |  |
| 12 | Kuitun        | 160000                      | 65469        | 2415585                                | 166                     | 7238                 |  |
| 13 | Nizhniy Ilimsk| 1433                        | 834          | 334207                                 | 8                       | 0                    |  |
| 14 | Nizhneudinsk  | 67742                       | 23190        | 1549779                                | 98                      | 155                  |  |
| 15 | Nukutsk       | 140259                      | 24718        | 877132                                 | 23                      | 323                  |  |
| 16 | Olkhon        | 56631                       | 252          | 498106                                 | 0                       | 0                    |  |
| 17 | Osa           | 90264                       | 17414        | 829378                                 | 9                       | 0                    |  |
| 18 | Slyudyanka    | 2860                        | 246          | 288834                                 | 0                       | 0                    |  |
| 19 | Taishet       | 119540                      | 34191        | 1727521                                | 245                     | 1421                 |  |
| 20 | Tulun         | 310500                      | 52756        | 1915993                                | 77                      | 1794                 |  |
| 21 | Usol’e        | 74340                       | 35712        | 9605706                                | 335                     | 19885                |  |
| 22 | Ust-Ilim      | 28400                       | 1187         | 433211                                 | 1                       | 0                    |  |
| 23 | Ust’-Uda      | 54232                       | 8143         | 686100                                 | 5                       | 0                    |  |
| 24 | Cheremkhovo   | 167037                      | 84396        | 3759269                                | 210                     | 19397                |  |
| 25 | Chunsky       | 9500                        | 4819         | 615111                                 | 12                      | 0                    |  |
| 26 | Shelekhov     | 8021                        | 977          | 449940                                 | 2                       | 0                    |  |
| 27 | Ekhirit-Bulagat|181340                      | 21942        | 1180383                                | 69                      | 1332                 |  |
The third-middle and fourth-higher than the average level of the group according to the intensity of land use included a significant number of areas characterized by more favourable climatic and economic conditions for cultivating crops. A section of the Trans-Siberian Railway passes through this territory from the southeast to the northwest, the waterway along the Angara River and the Bratsk Reservoir, and the Moscow Highway is a major highway. Such conditions make it possible to stably produce agricultural products and expand their raw material zones to fully utilize the capacities of processing enterprises. Here, agriculture has a grain direction, and animal husbandry - meat and dairy. Vegetable growing and greenhouse farming are developed in the suburban part, especially in large cities of the region - Irkutsk, Angarsk, Usol’e-Sibirskoe.

The fifth group with a high level of land use intensity includes the Usol’e district, on the territory of which large integration agricultural enterprises historically formed, which are the best agricultural producers in the region - Bolsheelanskoye CJSC, Zheleznodorozhnik CJSC, and Belorechenskoye agricultural cooperative.

They work with different productivity and profitability. Their distinctive feature is that they did not limit themselves only to breeding birds and purchasing feed, but attached agricultural enterprises for the production of grain, milk, and meat. Farms are complex. Their basis is poultry, the production of eggs and egg products, which brings the main income. Agriculture (production of food and feed grain, animal feed), animal husbandry (production of meat and dairy products), production of vegetables, potatoes, berries, honey, vermicompost, mushrooms, seedlings are also developed.

### Table 2. The level of agricultural land use intensity.

| №  | Groups by intensity of agricultural land use level | The number of points on the intensity of agricultural land use | District name |
|----|---------------------------------------------------|-------------------------------------------------------------|---------------|
| 1  | Low                                               | up to 29                                                   | Ust-Ilim      |
|    |                                                   |                                                             | Olkhon        |
|    |                                                   |                                                             | Zhigalovo     |
| 2  | Moderate                                          | 30-54                                                      | Shelekhov     |
|    |                                                   |                                                             | Chusnky       |
|    |                                                   |                                                             | Kachug        |
|    |                                                   |                                                             | Ust’-Uda      |
|    |                                                   |                                                             | Slyudyanka    |
| 3  | Middle                                            | 55-84                                                      | Bohan         |
|    |                                                   |                                                             | Taishet       |
|    |                                                   |                                                             | Ekhirit-Bulagat|
|    |                                                   |                                                             | Nukutsk       |
|    |                                                   |                                                             | Bratsk        |
|    |                                                   |                                                             | Tulun         |
|    |                                                   |                                                             | Nizhneudinsk  |
|    |                                                   |                                                             | Bayanday      |
|    |                                                   |                                                             | Nizhniy Ilimsk|
|    |                                                   |                                                             | Osa           |
| 4  | Above average                                     | 85-109                                                     | Cheremkhovo   |
|    |                                                   |                                                             | Irkutsk       |
|    |                                                   |                                                             | Angarsk       |
|    |                                                   |                                                             | Kuitun        |
|    |                                                   |                                                             | Zalari        |
|    |                                                   |                                                             | Alar          |
|    |                                                   |                                                             | Balagan       |
|    |                                                   |                                                             | Zima          |
| 5  | High                                              | Более 110                                                  | Usol’e        |

At the same time, farms are engaged in the processing of their own products using new technologies and developments, which allows to obtain various types of marketable products.
Thus, it should be noted that the high efficiency of the agricultural land use in these municipal areas is due to the historically established distribution of the main productive forces, the presence of major sales markets, proximity of roads, including railways, high population density, number of farms, labour resources, etc.

A study of the agricultural land use intensity in the region, taking into account the further prospects for its development, as well as the established types of agricultural enterprises, will allow to identify promising areas for the organization of rational and systematic use of land in the municipal districts of the Irkutsk region. The application of the obtained developments by the heads of the municipal districts will create conditions for improving the land use system and introducing scientifically based measures ensuring the creation of optimal conditions for the development and deployment of productive forces and sectors of the agro-industrial complex, increasing land productivity, strengthening control over the use, protection, land improvement and efficient use of capital attachments.

References

[1] Regional Nature Management and Fundamental Problems of the Geography of the Future 2001, ed. V A Snytko and B M Ishmuratov (Irkutsk: Publishing House of the Institute of Geography SB RAS)
[2] State report on the state and use of land in the Russian Federation Retrieved from: http://rosagroland.ru/monitoring/analitycs/309/
[3] State report on the state and use of land in the Irkutsk region Retrieved from: http://rosreestr.ru/site/activity/sostoyanie-zemel-rossii/gosudarstvennyy-natsionalnyy-doklad-o-sostoyanii-i-ispolzovanii-zemel-v-rossiyskoy-federatsii/
[4] Agriculture of the Irkutsk region in numbers: stat. comp. 2018 (Irkutsk: Irkutskoblstat) Retrieved from: http://irkobl.ru/sites/agroline/SX_booklet_210x210_2018_4%20(8).pdf
[5] Chernigova D R 2012 Analysis of agricultural land use in the Irkutsk region Proc. of Int. Sci. Conf. on Regional Environmental Response to Global Changes in North-East and Central Asia (Irkutsk: Publishing House of the Institute of Geography named after V.B. Sochava SB RAS) pp 211-3
[6] Chernigova D R 2007 Change in the efficiency of managing agricultural enterprises Proc. of the XIII Sci. Meeting of Geographers of Siberia and the Far East vol 2 (Irkutsk: Publishing House of the Institute of Geography) pp 222-3
[7] Chernigova D R 2007 Reforming land relations in Russia Geographical research at the beginning of the XXI century Proc. of the XVI Sci. Conf. of Young Geographers of Siberia and the Far East (Irkutsk: Publishing House of the Institute of Geography) pp 238- 40
[8] Solodun V I 2006 Scientific Foundations of the Formation of Adaptive Landscape Farming Systems in the Prebaikal Region (Irkutsk: Publishing house of the Irkutsk State Agricultural Academy)