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The features of development of agricultural land use in the Republic of Buryatia and Mongolia (the Selenga River basin)

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Abstract. This study seeks to identify the distinctive features in agricultural land use in the upper (Mongolian) and lower (Russian) parts of the basin. An analysis is made of the main indicators reflecting the economic-geographical characteristics of agricultural land use, the structure of agricultural lands, the level of agricultural development, the dynamics of the area and efficiency of use of croplands, the availability of natural forage lands, and crop yield of grains. This implies a higher yield level of grains and the preservation of the sown area. A decrease in the area of the cropland at the beginning of the agrarian transformations was observed throughout the territory of the basin. In the Mongolian aimags within the Selenga basin, the area of the cropland decreased by 27.5%. In the subsequent period, the sown area remained stable. In the Russian part of the basin, the area of croplands at the beginning of the agrarian transformations decreased by 21.5%. The tendency for a decrease in croplands has persisted to date. During 1999–2016 the area of croplands decreased by a further 25%. The main directions of the transformation of the agricultural land use system in the Mongolian and Russian parts of the basin are formulated.

1. Introduction

Fundamental changes in the system of agricultural land use were in the mid-1990s. In Mongolia, private ownership of land resources spread widely. Currently, up to 48% of the total area of agricultural land is concentrated in private farms of arats (the Mongolian peasants) [1]. In the period of agrarian transformations throughout the basin, there was a sharp decline in agricultural development, due to the collapse of collective enterprises, the main holders of land. The area of agricultural land in Mongolian aimags was gradually restored due to the active participation of arat farms in the land reform, which received lands to ownership. A distinctive feature of land use in the Mongolian part of the basin is the high amplitude of fluctuations in arable land for individual years. But if you analyze the long period of time, for example 10-15 years, in general you can note the preservation of the crop area. In dry years the arable lands area is sharply reduced, but in subsequent years it is restored. The arable area became stable after the 21% decrease in 1994-1999. Since 1999, there has been no reduction in arable land. The Russian part of the basin is characterized by a constant decrease in arable land. From 1994 to 1999 the area of arable land decreased by 27.5%. From 1999 to 2016, the sown area decreased by 25% ha [1, 2].

The highest agricultural development is characteristic for the southern part of the Selenga midlands, as well as for the Selenga delta surrounding area. The agricultural land is located as a continuous range here and its share reaches 59% of the total land use area. The arable lands are



confined to broad river valleys, steppe and forest-steppe intermountain basins. The share of arable land in the structure of agricultural lands varies from 57% in the lower reaches to 8% in the upper part of the basin. The Bichurskaya, Tugnuyskaya, Kudarinskaya and Borgoyskaya steppes, the slopes of the Tugnui ridge are notable for the highest level of ploughness [2]. The share of pastures in the structure of agricultural land is increasing in the south direction of the basin. In the dry-steppe aimags of Mongolia, located in the foothills of Khentii and Khangai mountains, pastures account for up to 92% of the agricultural area [1]. The aridity of the climate, historical traditions and labor skills of the population, with a high saturation of the territory with natural forage lands, have conditioned the livestock specialization of the region's agriculture.

2. Models and Methods

Objects of researches were agricultural grounds of Selenga river basin. For the comparative analysis of efficiency and intensity of their use in the high and the low parts of the basin complex methods were used: forwarding researches, identification of the most essential contrasts in development of agricultural land use system, comparative and geographical, division into districts.

Information base for this research was made by the materials provided by territorial subdivisions of Rosreestr, Rosstat and the State Statistics Committee of Mongolia.

3. Results and Discussion

Agricultural development of the study area is very uneven. In Mongolia, the share of agricultural land reaches 84.8 - 91.4% of the land area [1]. At the beginning of the agrarian reforms throughout the basin, a sharp decline in agricultural development occurred. The main reason for the reduction in the area of agricultural land is the disintegration of collective enterprises, the main holders of land. The area of agricultural land in Mongolian aimags was gradually restored due to the active participation of arat farms in the land reform, which received lands to ownership.

A distinctive feature of agricultural land use of the Mongolian part of the basin is the integrated use of natural forage land. Hay is harvested in the river valleys from July to September. In winter and spring river valleys are used as pastures. Agriculture plays a secondary role. The main arrays of arable land are concentrated in the steppe aimags with high atmospheric precipitation (Salenge, Tov, Khentii).

In the Republic of Buryatia, river valleys and intermountain hollows, gently sloping foothills have been developed for farming and livestock farming. The agricultural lands of the Selenga midlands and the Selenga delta are located in a continuous range at an altitude of 540 - 720 m above sea level and cover the watershed areas of the Selenga River and its main tributaries, the Djida, Hilok, Chikoy and Tugnui. For several centuries this territory was the main center of agrarian nature management. Relatively smooth relief of the Selenga middle mountains, soil and climatic conditions, historical features of settlement led to a high plowing of the territory. In the valley of the Tugnui-Sulkhara rivers practically all the slopes and flat watersheds are plowed. High plowing of the Tugnui-Sulkhara basin is facilitated by fertile soils (black, chestnut, dark chestnut soils). Thus, in the farms of the Mukhorshibirsky district, the proportion of black soils reaches 32.5% of the arable land area and 21.4% of the total agricultural land area.

The agricultural lands of the Mongolian part of the basin are concentrated in the narrow, deeply embedded valleys of the rivers of the Mongolian plateau at an altitude of up to 1500 m above sea level. Distant pastures are located throughout the territory, including the foothills of Khentii and Khangai at an altitude of 2000 m above sea level. The natural boundaries of the agricultural area in the northwest are the Khan-Khuhey, Ulaan Taiga, Eastern Sayan ranges, which do not form a single massif, in the central part - the Khangai Ridge, in the northeastern part - the Khentii Mountain Range.

A distinctive feature of land use in the Mongolian part of the basin is the high amplitude of fluctuations in arable land for individual years. But if we analyze the long period of time (10-15 years), then we can note the conservation of the crop area as a whole. In dry years the plowland area is sharply reduced, but in subsequent years it is restored. Decreasing by 21% in 1994-1999, the

arable area further becomes stable. Since 1999, there has been no reduction in arable land. The Russian part of the basin is characterized by a constant decrease in arable land. From 1994 to 1999 the area of arable land decreased by 27.5%. From 1999 to 2018, the sown area decreased by 25% ha [2].

The main producers of market grain are the southern steppe regions of the Selenga middle mountain range (Bichursky, Kyakhtinsky and Mukhorshibirsky). The main crop in the grain structure is spring wheat. The great majority of grain areas are concentrated in agricultural organizations. In the upper Selenga, in Mongolia, arable land is evenly distributed among land users of different forms of ownership. The cultivation of grain crops is carried out by both collective and farming (arat) enterprises. They account for respectively 45% and 55% of the sown area [3]. The fodder crops predominate in the structure of crops.

Livestock in Mongolia account for up to 80% of the gross agricultural product. The nomadic grazing system predominates in the southern part of Mongolia, so the technology of livestock's resettlement and natural selection of animals are of decisive importance. Depending on the natural and climatic conditions, especially the wind regime, different types of landscapes are used as seasonal pastures. "... the northern slopes of the mountains are suitable for dwelling of ... cattle" in the summer, because the prevailing north winds "blows" cattle at this time of the year. [3, p. 146]. In winter, breeders resettle with herds to the hills and the lowlands sheltered from the winds. In the middle and lower parts of the Selenga river basin the main animal husbandry system is stall-pasture, which demands quality of fodder and animal keeping conditions. In stall and pasture form, the ecological status and productivity of pastures and hayfields are of great importance. Seasonal pastures occupy treeless interfluvial areas in the steppes and forest-steppes, the upper parts of the slopes of the valleys, steppe terraces, sometimes high mountain meadows, intermountain basins and foothills. A part of the Selenga has been developed for pastures in the Kabansky district. The specific density of land suitable for haymaking is very low. The exception is the Kabansky district. The abundance of moisture and smooth relief create favorable conditions for the development of vegetation, providing rich hayfields for the economy of the area. Due to the lack of natural hayfields hay is harvested in abandoned plots of arable land, forest glades and laylands. A large number of rough feed is produced in field crop rotations, which raises the cost of livestock products. In the Mongolian part of the basin, in the field feed rotations, hay is practically not harvested. The area of natural forage lands remains relatively stable. The state of livestock depends entirely on their yield. In dry years, there may be a significant drop in livestock. Restoration of the livestock occurs as the productivity of pastures increases.

Cultivated areas and grain yields in the aimags of Mongolia are much higher than in the regions of the Republic of Buryatia. The absolute size of the arable land, depending on the aimag, varies from 0.599 to 105.8 thousand hectares. Significant differences in the size of cultivated areas are due to the nature of the hydrographic network, the features of the relief and the nature of the humidification. Almost half of the aimags (45.6%) have an average annual yield of more than 14 c / ha. In the Republic of Buryatia, only 3 regions out of 14 (21%) achieve such indicators [1]. The highest yield of wheat is observed on the plots in the steppe and forest-steppe zones of the Selenga, Tuul and Kharaa valleys, with predominance of dark chestnut and black soils. In the aimags of Orkhon, Bulgan, Selenge and Tov, the average annual indicators are respectively 22.9; 15.0; 14.6 and 15.1 centner / ha. As we move to the east, the precipitation decreases and the yield decreases to 13.9 - 7.7 centner / ha.

In western aimags, in the foothills of the Khangai, cryogenic-taiga soils of the highlands prevail. The yield varies from 0.2 to 22.8 centner / ha [1].

Features of the use of natural forage lands disclose data on the area of pastures and hayfields, attributable to 1 conventional livestock head. In the majority of farms in the Selenga middle mountains, 0.8-0.9 hectares are accounted for 1 conventional head. In the delta of the Selenga River there is a shortage of natural forage lands, provision for 1 conventional head is only 0.5 hectares of hayfields and 0.2 ha of pastures. The population uses numerous delta islands as summer pastures and hayfields. The number of cattle in Mongolia considerably exceeds the number of cattle on the territory of the Republic of Buryatia, so the availability of natural forage lands in the Mongolian aimags is lower.

With the traditional system of cattle breeding, the ecosystems of the Selenga River basin are relatively stable [4]. The degree of their violation corresponds to the number of cattle. With an optimal grazing (up to 2 head / ha), a weak degree of disturbance of the soil cover is observed in the pastures, which is manifested in a decrease in the productivity of the underground plant mass to 1.6 times and soil compaction within the norm (for soils of steppe landscapes up to 1.1 g / cm^3). The average degree of disturbed lands (pasture load 2-4 head / ha) is characterized by soil compaction to 1.21 g / cm^3 , a decrease in the mass of plant roots to 4.7 times. With intensive grazing (more than 4 head / ha) and, accordingly, a strong degree of disturbance of the lands, a decrease in the productivity of the roots has been established up to 22 times, as well as soil compaction to 1.46 g / cm^3 and destruction of the sod soil horizon [5].

Most of Mongolia's soil cover needs irrigation. However, intensive washing of lightly-grained soils with light granulometric composition with the removal of mineral, organic compounds and fine earth takes place. In this case, optimization of the soil requires the implementation of a complex of agrochemical and agrotechnical measures and the protection from deflation. Overwatering of loamy soils leads to a deterioration in their temperature regime, intensification of permafrost phenomena and development of salinization processes [6].

The current soil and ecological situation on the studied transboundary territory in connection with the nature management in the Baikal type basins testifies to the potential for the development of the traditional cattle-breeding farm.

4. Conclusions

1. Despite the harsher natural and climatic conditions and the secondary role of crop production in Mongolia's agrarian economy, the intensity of development of the grain farm and the use of arable lands is higher than in the Russian part of the Basin. This is reflected in a much smaller reduction in arable land, compared with the beginning of agrarian reforms in the early 1990s, a more rapid recovery of crop areas after dry periods, as well as the absence of abandoned arable land, and increased crop yields. Privatization of land has positively affected the increase in the efficiency of crop production in Mongolia. Private arat (nomad Mongolian) farms engaged in agriculture are characterized by higher labor productivity, compared with the collective farms of the Republic of Buryatia.
2. Asynchronous development of structures of agrarian nature management is typical both for the Russian and Mongolian parts of the Selenga River basin. Traditional Mongolian grazing technology is preserved in Mongolia, with a high pasture load in different seasons. At the same time, the structure of the herd is formed in accordance with market conditions. In the Republic of Buryatia, nomadic livestock breeding prevailed in almost all areas until the beginning of the XX Century. At present, the system of stall-pasture keeping of livestock is widespread, with the dominance of agricultural farms in land use. Federal and republican programs are of great importance in the development of agricultural sector.
3. The structure of sowing crops with a high share of fodder crops (including grain for fodder purposes) that was established in the Republic of Buryatia, meets the needs of cattle breeding and brings a minimum income to agricultural enterprises.
4. To increase the productivity of stables and pasture livestock, it is necessary to strengthen field and grassland fodder production. This requires restoration of the melioration and fertilization system of hay lands, construction of new long-term artificial pastures. Given the small areas for natural haymaking, it is also advisable to use arable land partially for the production of hay with annual and perennial grasses.
5. The districts of the Republic of Buryatia are characterized by a decrease in agricultural production potential in the suburban area. This is reflected in a decrease in the intensity of agricultural land use of collective farms, their complete decay in certain suburban areas and in the reduction of crop areas.

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