

# Land resources of the Republic of Tyva and their rational use

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**Abstract.** The Republic of Tyva (Russia), located at the junction of the South Siberian taiga and Central Asian desert landscapes, has a diverse potential of natural resources, including land. The natural conditions of the republic are difficult: a very harsh climate, the relief of the territory is mountainous and hollow, which make it difficult to develop natural resources. Many scientists of pre-revolutionary Russia and the Soviet Union were engaged in the problems of developing the natural potential of the republic, now research is conducted by scientific collectives of the country. They studied natural conditions and natural resources, published fundamental works on the rational development of the republic's wealth. In a small area, soils from rich, ordinary and southern chernozems, various variants of chestnut to mountain-taiga and mountain-tundra soils are common. Tuva's land resources are formed with a small and uneven distribution of precipitation, deep freezing of soils in open steppe areas, different capacities and mechanical composition of soil-forming rocks, their unequal infiltration ability, forming the soil cover and distribution of landscapes. Due to the low soil fertility, the republic belongs to the areas of risky agriculture. The work is devoted to the analysis of Tuva's land resources and their rational use.

## 1 Introduction

Taking into account the limited land resources of the world, the annual growth of the world's population, as well as the high degree of development of territories suitable for food production, Russia has the greatest potential in the world for the development of agricultural production to ensure food security for both the Russian state and the planet as a whole [1].

Many scientists of pre-revolutionary Russia and the Soviet Union were engaged in the problems of developing the natural potential of the Republic of Tyva, and now large scientific teams of the Russian Federation are conducting research. They studied and researched natural conditions and natural resources, published fundamental works on the rational development of the republic's wealth [2, 3, 4].

Prior to the entry of the Tuvan People's Republic into the USSR (1944), under the sole economy of the nomadic Arats, the efficiency of development and productivity of land was determined by weather and climatic conditions. Since 1945, the increase in cultivated areas has occurred at a higher rate, especially since 1955, when mass collectivization ended in Tuva

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and the development of virgin and fallow lands began. During the development of new lands in the Soviet period, many mistakes were made, which led to irreversible processes in the use of land resources, especially agricultural land. Unjustified plowing of land without taking into account the terrain, weather and climatic conditions, the mechanical composition of soils, the depth of the arable horizon and the humus reserve worsened the qualitative condition of arable lands. This causes a reduction in the area of arable land and a decrease in crop yields [5, 6].

## 2 Materials and methods

The land fund of the Republic of Tyva as of 01.01.2023 is 16860.4 thousand hectares, the total area of agricultural land [7] is 3363.9 thousand hectares (19.9% of the total area of the land fund of the republic). Of these, 2,653.6 thousand hectares (78.9%) are agricultural land, 710.2 thousand hectares (21.1%) are non-agricultural land. As part of agricultural land, arable land areas amount to 135.5 thousand hectares, deposits – 61.4 thousand hectares, hayfields – 54.8 thousand hectares, pastures – 2401.9 thousand hectares [8]. There are 220 agricultural organizations in the republic, 865 actually operating peasant (farmer) farms and individual entrepreneurs, 27.2 thousand personal subsidiary farms in rural areas.

After the reform of agriculture in Russia, since 1991, their transfer to self-sufficiency in Tuva led to the exclusion of 284.6 thousand hectares of arable land from circulation. Currently, farmland in the republic occupies more than 20% of the total area of agricultural land, where pastures predominate (Table 1).

**Table 1.** The structure of agricultural land areas as of 01.01.2023, thousand hectares.

Total area	Agricultural land		Forests and shrubs	Under surface water bodies	Building lands	Under the roads	Swamps	Disturbed lands	Other lands
	Total	Of these, arable land							
3363.9	2653.6	135.5	215.0	18.5	6.9	15.2	47.2	1.0	406.5

## 3 Results and discussion

According to the agricultural and natural-economic zoning of the East Siberian region, the Republic of Tyva, with the exception of its eastern mountainous taiga part, is classified as a steppe sheep-breeding and cattle breeding zone. However, the republic has large territorial differences in agricultural production conditions caused by geographical location, diversity of soils, topography and vegetation, climate differentiation, specifics of economic factors related to the location of industrial enterprises, concentration of urban population, etc. With this in mind, in order to more efficiently locate and scientifically-based specialization of agricultural production, along with natural (soil and climatic), the following agricultural zones are allocated [9]:

1. The central forest-steppe zone, which includes 5 administrative districts (Kaa-Khemsy, Kyzylsky, Piy-Khemsy, Tandinsky, Ulug-Khemsy kozhuuns), which are divided into forest-steppe and steppe subzones. The economy of the zone is engaged in grain production, vegetable and potato growing, forage production, meat and dairy cattle breeding, meat and wool sheep breeding, poultry and pig farming.

2. The Western steppe zone consists of 4 administrative districts (Barun-Khemchiksky, Bai-Taiginsky, Dzun-Khemchiksky, Mongun-Taiginsky). Beef cattle breeding, meat and wool sheep breeding, goat breeding and egg farming are developed here.
3. The southern zone of the dry steppes – 3 districts (Tes-Khemskey, Ovyursky, Erzinsky). Of all the branches of agriculture, meat and wool sheep breeding, beef cattle breeding, goat breeding, herd horse breeding and camel breeding are of little importance. The possibilities of agriculture are limited by the small size of arable land and the extremely insufficient amount of precipitation.
4. The eastern zone of the forest–steppe is the Todzhinsky and Terekholsky kozhuuns. The agricultural lands are suitable for meat and dairy cattle breeding and reindeer husbandry. Due to the unfavorable regime, the set of crops is extremely limited.

The state farms of the central zone have the largest land resources and the best opportunities for the development of agriculture. Of the other zones, the western agricultural zone has a higher proportion of arable land in agricultural lands. More than half of all irrigated lands are concentrated here, and more than one quarter of the total area of zonal arable land accounts for them. This is due, firstly, to the presence of a large supply of water resources in this zone, and secondly, to the fact that the cultivation of crops on rain-fed lands is extremely difficult here.

Tuva is dominated by soils of light mechanical composition, which are very susceptible to wind erosion. The latter is intensively manifested on the farmlands of the Ulugh-Khem, Ubsunur and Khemchik basins, which are characterized by an arid climate, high spring and summer air temperatures. The development of wind erosion is facilitated by the lack of rational alternation of crops, the predominance of monoculture of wheat, incorrect agrotechnical methods of tillage. Water erosion is manifested on irrigated lands and when watering crops. These negative phenomena have led to the fact that former arable land has turned into barren deserts unsuitable for plowing and grazing.

In the conditions of the arid climate of Tuva, irrigation and irrigation of farmland is a guarantee of high and sustainable yields. However, the area of irrigated land has decreased significantly due to the unsatisfactory condition of irrigation networks, lack of water during the growing season and moisture-charging irrigation, improper irrigation methods, insufficient funding from federal and regional budgets. Currently, it is necessary to improve the use of irrigated lands by restoring abandoned irrigation systems, reconstructing existing ones and increasing the area of irrigated lands.

During the construction of land reclamation facilities in the Soviet period, scientific research was organized and carried out to study soil cover, hydrogeological conditions, water and land resources, methods of reclamation, determination of the land reclamation fund and performance of reclamation works based on the study of natural and soil-geological conditions, as well as the regime of surface and groundwater.

For the rational use of land resources, in particular agricultural land, and to increase soil fertility in the Soviet period, they fought against wind and irrigation erosion, since the soils of Tuva's light mechanical composition are easily susceptible to destruction and demolition of the fertile layer. At the same time, a set of measures was carried out (agrotechnical methods of tillage, improvement of the structure of sown areas, crop rotations, sowing of single and perennial grasses, afforestation of sands and creation of protective forest strips on erosive and eroded lands, mulching, creation of buffer wedges, virgin strips, curtains of high-stemmed crops), which allowed to prevent soil destruction, increase efficient use of land resources and guaranteed yields.

It should be noted that the use of various methods in combination (taking into account natural conditions, irrigation, drainage, watering, combating wind and water erosion of soils, the use of fertilizers and zoned varietal seeds, compliance with land legislation) in the Soviet

period freed the development of agriculture from dependence on natural conditions and provided the republic with agricultural products of its own production.

As a result of the systemic crisis that engulfed Russia in the late 1980s and early 1990s, huge tracts of arable land were withdrawn from circulation [8]. During the period of reforms in the 1990s, negative trends in the country's economy had a more acute impact on the socio-economic development of the Republic of Tyva, given the complex of unresolved social problems, as well as the relative transport isolation of the republic, which is the only region in Russia that does not have a railway connection with the rest of the country. Factors such as disruption of economic ties between agricultural enterprises, processing and marketing enterprises, lack of state support, disassembly of machine and tractor fleets, as well as their rapid deterioration, disparity in prices for agricultural machinery compared with prices for agricultural products, lack of tax incentives and preferential loans led to the ruin of large farms of the agro-industrial complex, which accounted for more than 99% of agricultural products.

The current state of agricultural land use in the Republic of Tyva requires a more extensive analysis and improvement of the effectiveness of existing legal norms. The main problem of agricultural land use is the lack of demand for land from the local population due to the complexity of agricultural production in the arid climate of the republic, non-compliance with the balance of environmental and economic criteria in agricultural land use, the absence of clear criteria for the concept of "rational land use" in legislation. Among the measures aimed at changing the situation in the field of agricultural land use, it is proposed to improve the information policy in the field of agricultural land use, the development of a monitoring system for the condition of these lands, which is especially important in an arid climate. It is necessary to review existing and develop new measures for the rational use of agricultural land, improve information policy in the field of agricultural land use, and develop a system for monitoring the condition of these lands.

The Russian legislation does not fully reflect the content of the concept of "rational use", there are no criteria by which one can assess how rational a particular type of land use is [9].

The rational use of agricultural land includes an environmental component, expressed in the preservation and improvement of soil fertility and land reclamation, as well as an economic component, which consists in maintaining a high level or increasing crop yields, ensuring the growth of agricultural products. To implement environmental and economic criteria, it is necessary to develop specific legal mechanisms [10].

## 4 Conclusion

Rational use of land, control over proper operation and prevention of violations in the use of land resources require a large amount of work to provide landowners and land users with high-quality planning and cartographic material, the results of soil and geobotanical surveys, cadastral maps, inventory of land settlements, forestry, state land reserves, etc. Inter-farm land management should be carried out on the lands of collective agricultural enterprises in a number of kozhuuns of the Tuvan, Khemchik and Ubsunur basins. The heads of kozhuuns and sumons, specialists of agricultural enterprises and arats (peasants) for effective land development should use available cartographic, soil, geobotanical and land management materials prepared and recommended by research institutes and the Ministry of Land and Property Relations of the Republic of Tyva.

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