NATURAL RESOURCE POTENTIAL OF MOUNTAIN LANDSCAPES OF THE CHECHEN REPUBLIC FOR THE DEVELOPMENT OF REGENERATIVE ANIMAL HUSBANDRY

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Abstract

The article discusses the regional features of the natural components and landscape structure of the Makazhoy basin as a natural resource potential for the potential development of regenerative animal husbandry in the mountainous part of the Chechen Republic.

Keywords: Chechen Republic, mountain landscapes, landscape diversity, climate change, soil cover, sheep breeding, regenerative animal husbandry

I. Introduction

The abandonment of the traditional system of animal husbandry in the mountainous landscapes of the North-Eastern Caucasus, in which sheep graze on the foothill lowlands in winter and are driven to the mountains in summer, has led to significant cultural losses and still poorly studied environmental consequences in the region.

The purpose of the study is to study the spatial and temporal differentiation of natural components and landscapes of the region in order to develop practical recommendations for the economic development of the territory of Mountainous Chechnya for the potential development of regenerative animal husbandry, rational use and protection of natural resources.

The study of the landscapes of the territory of Chechnya began in the 60-80s of the XX century. During this period, A. Fedina [1], A. Alieva [2], V. Bratkov [3], N. Beruchashvili [4] and others made a significant contribution to the study of mountain landscapes of the region. At the beginning of this century, a significant number of publications on the mountain landscapes of the Chechen Republic were published, including the works of V. Bratkov [5], Z. Gagaeva [6], A. Golovlev [7], V. Bratkov et al. [8], R. Idrisova [9], Sh. Zaurbekov, etc. [10, 11], Z. Ataev et al. [12, 13], L. Bekmurzaeva [14], I. Bayrakov [15], A. Gunya et al. [16-18], U. Gayrabekov et al. [19], R. Gakaev [20], I. Bayrakov et al. [21], L. Bekmurzaeva et al. [22, 23] and many others.

II. Methods

The work on studying the natural resource potential of the mountain landscapes of the Chechen Republic for the development of regenerative animal husbandry was carried out at key sites of the experimental landfill of the Kadyrov Chechen State University in the Vedensky administrative district of the Republic (Fig. 1, 2).

The work is based on field studies of natural components and landscape structure of the Makazhoy basin and its surroundings. In the cameral period, comparative geographical and cartographic methods were used, as well as the analysis of data from literary sources.

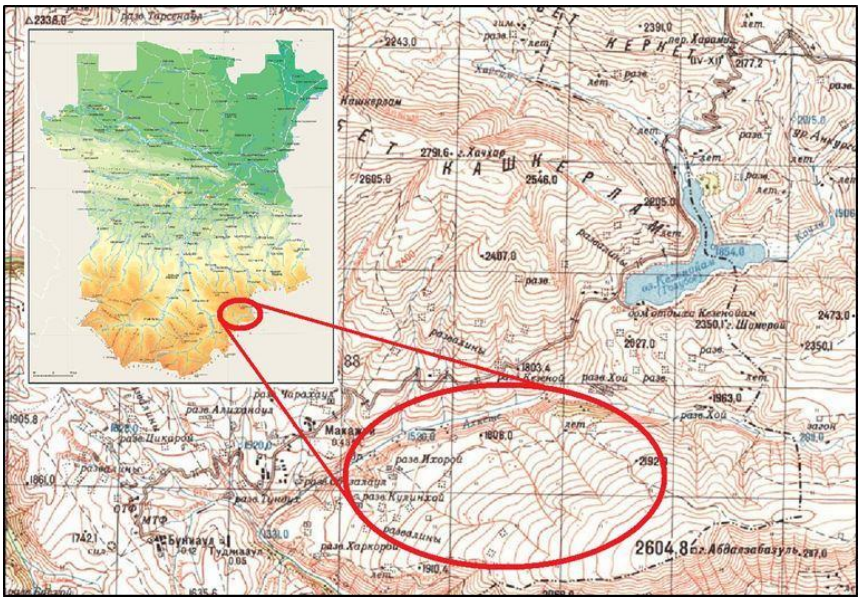

Fig. 1: *Geographical location of the experimental test site*

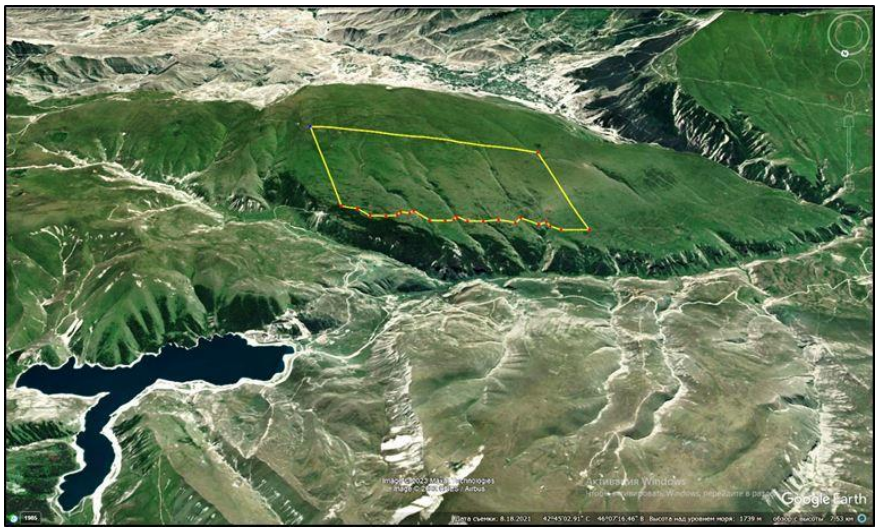

Fig. 2: *The location of the experimental test site (Google Earth)*

III. Results

According to the scheme of physical and geographical zoning of the North-Eastern Caucasus [1], the studied territory is located within the Andi-Salatau district of the Terek-Andi district of the North Caucasian Mountain Province of the Greater Caucasus. The landscapes of mountain-meadow and mountain-forest high-altitude zones prevail in the area.

The main factors of spatial differentiation of landscapes of the considered territory of Mountainous Chechnya are the geological and geomorphological factor and climatic conditions.

Orographically, the polygon is located in the Makazhoy basin (Fig. 3), the wings of which represent the Kashkerlam ridge in the north (the highest point is the Kashkerlam mountain of the same name, with a maximum height of 2806.9 m), in the west – the Baskhoylam ridge (with the

peak of the same name Mount Baskhoylam, 2594.2 m) and the Khindoylam ridge (with the highest point of the same name Mount Khindoylam, 2658.2 m), in the south – the Abdalzabazul ridge (the highest point of the mountain of the same name is 2604.8 m), in the east – the Gagotytlyura ridge (the highest point is Mount Azal, 2657.9 m). The highest point of this area is Mount Kashkerlam (2806.9 m), the lowest point is at the place where the Ansalta River breaks out from the basin (the height of the cut is 1331.0 m). The amplitude of the variation in the height of the terrain is 1475.9 m. The area of the basin is 205 km^2.

Fig. 3: *Makazhoy basin. General view from the east. The polygon is on the left side of the photo. Photo by A. Bersaev*

The tectonic structure is represented by a syncline fold complicated by local forms, and in fact represents the largest syncline plateau in the Caucasus. The axial part of the fold (plateau, basin) is flat, from which wings gradually rise to the north and south, which become steeper up the slope. The surface is composed of Upper Cretaceous limestones, Paleogene deposits have been preserved in the axial part of the syncline.

Erosive relief forms are represented by valleys flowing from the wings to the axial part, along which gorges are formed, the first hundreds of meters deep. When cutting through the wings, the depths of the gorges increase sharply, up to 1000-1500 m. Landslides are almost everywhere developed in the upper parts of the slopes, anthropogenic landforms (agricultural terraces) are widely developed.

The climatic features of landscapes are influenced by the location of the territory in the very south of the temperate climate zone, the altitude factor and the isolation from the south by the orographic barrier of the Main Caucasian Ridge and Bokovoy Ridge, the dominance of western air mass transfer. The climate of the area is moderately continental. Winter is cool. The temperature of the coldest month (January) is -2.5 – -10 °C. Summer is moderately warm. The temperature of the warmest month (July) is 14-20 °C. The average annual precipitation varies from 500 to 1000 mm, with a maximum in spring and summer. The hydrothermal coefficient is 2-2.2. Accordingly, the terrain affects the spatial redistribution of climatic elements and the differentiation of landscapes.

The product of climate is surface and groundwater. In the Makazhoy basin, despite its insignificant size (205 km2), the territory belongs to the basins of two rivers – Sulak (Andian Koysu) and Terek (Sharo-Argun, Sunzha). The eastern and central part of the basin is drained by the Ansalta River, called the Akhkete River here, and its small tributaries. The river originates on the southern slope of Mount Azal, at an altitude of approximately 2300 m. In the Kazenoyam Lake (Alkhar, Blue), the Kharsum and Kauha rivers flow. The extreme western third of the basin is drained by the Keloyakhk River, a right tributary of the Sharo-Argun River. The rivers of the basin

have a mixed nutrition with the participation of snow, rain and groundwater. On the lower slopes of the ridges and in the valleys of the rivers, groundwater comes out in the form of springs with fresh water. Large springs are located in the talweg of the Akhkete River, 1.0 km below the Kazenoyam landslide body, they represent an underground discharge from the lake.

The landscape structure of the basin has a high-altitude and exposure confinement. The mountain-slope tracts of the southern exposure of the Kashkerlam, Kerket and Baskhoylam ranges account for about 40% of the area. Another 40% is occupied by mountain-slope tracts of the northern exposure on the Abdalzabazul and Khindoilam ridges. The lower part (20%) of the synclinal basin is occupied by erosion complexes of valleys and temporary watercourses, as well as anthropogenic residential tracts with adjacent agricultural landscapes (fields in the flat lower part of the basin and terraces up the slopes).

More than 70% of the territory of the basin is occupied by mountain-meadow tracts – grass-mixed, grass-grass post-forest and subalpine settled. Mountain-meadow chernozem-like soils, mountain-meadow subalpine soils in combination with mountain-steppe soils are developed under them. The grass cover is dominated by Bromus variegatus, Festuca rubra, F. varia, Hordeum violaceum, Poa meyeri, Carex caucasica, Medicago glutinosa, Vicia alpestris, Scabiosa gigantea, Betonica grandiflora, Alchemilla oxysepata, Trifolium pretense, T. repens, T. campestre. There are a lot of Rumex confertus, Veratrum Lobelianum, Plantago lanceolata, Alchemilla oxysepata on meadows clogged and etched by cattle (Schiffers, 1953).

Pine and birch forests are confined to the slopes of the north-western exposure of the sides of the basin and the slopes of the northern exposure of the valleys. The rapid development of tree cover is noted, which is clearly seen when comparing satellite images. Mountain-forest brown soils were formed under them. Forests alternate with post-forest settled grasslands and forest meadows of Agrostis alba, Poa pratensis, Dactylis glomerata, Phlum pratense, Trifolium pretense, T. repens, T. campestre, Potentilla reptans, Geranium sanguineum, etc. Meadow chernozem soils are developed under the mid-mountain meadows, a specific soil cover has been formed on the terraces [24], which has been developing over the past 80 years in a trend of convergence with mountain meadow soils.

On the slopes of the northern exposure (Khindoilam ridge, Abdalzabazul ridge) in the post-forest meadows, there is a significant renewal of pine and pine-birch forests on primitive podzolic and mountain-forest brown soils (Fig. 4 and 5).

In the modern economic development of the Makazhoy basin, the meadow vegetation used for summer pastures and partly for haymaking is of the greatest importance. It should be noted that there is a dense network of abandoned settlements and associated arable land. During the existence of these points, agriculture was widely developed in the basin.

Among the modern examples of critical anthropogenic impact on natural complexes , the following can be noted: active construction and expansion of highways, construction of tourist destinations, fires occur in some areas of the basin, limestone is being developed for construction purposes. Landslides and soil erosion are observed in places where vegetation cover is disturbed. In the future, forests should be preserved and restored in the area, the quality of mountain meadows should be improved by regulated grazing and weed eradication, and erosion control should be carried out.

The Makazhoy basin has a significant potential of land resources for animal husbandry and agriculture. A.N. Gunya and coauthors [25] distinguish 2 zones of economic activity in this area: mid-mountain, where year-round life activity is possible, with permanent residential complexes and agricultural agricultural landscapes (mountain-forest, mountain-steppe and mountain-meadow-steppe landscapes); high-mountain-mid-mountain with seasonal vital activity in the form of pasture cattle breeding (mountain-meadow landscapes).

Fig. 4: *Renewal of pine undergrowth. Photo by Z. Ataev*

Fig. 5: *Increase of woody vegetation within the polygon. The top picture is August 2014. The bottom picture is August 2021.*

The first zone with possible year-round vital activity occupies a large part of the basin, is represented by a significant spread of agricultural landscapes of terraces (Fig. 6), modern (Makazhoy, Buni, Tunzha-aul) and uninhabited (Khoy, Ikhoroy, Sadoy, Khindoy, Kharkoroy, Ariaul, etc.) residential complexes. It should be noted that the maximum height of the spread of agricultural terraces on the slope of the northern exposure (within the polygon) reaches 2000 m, and on the slope of the southern exposure reaches 2300 m.

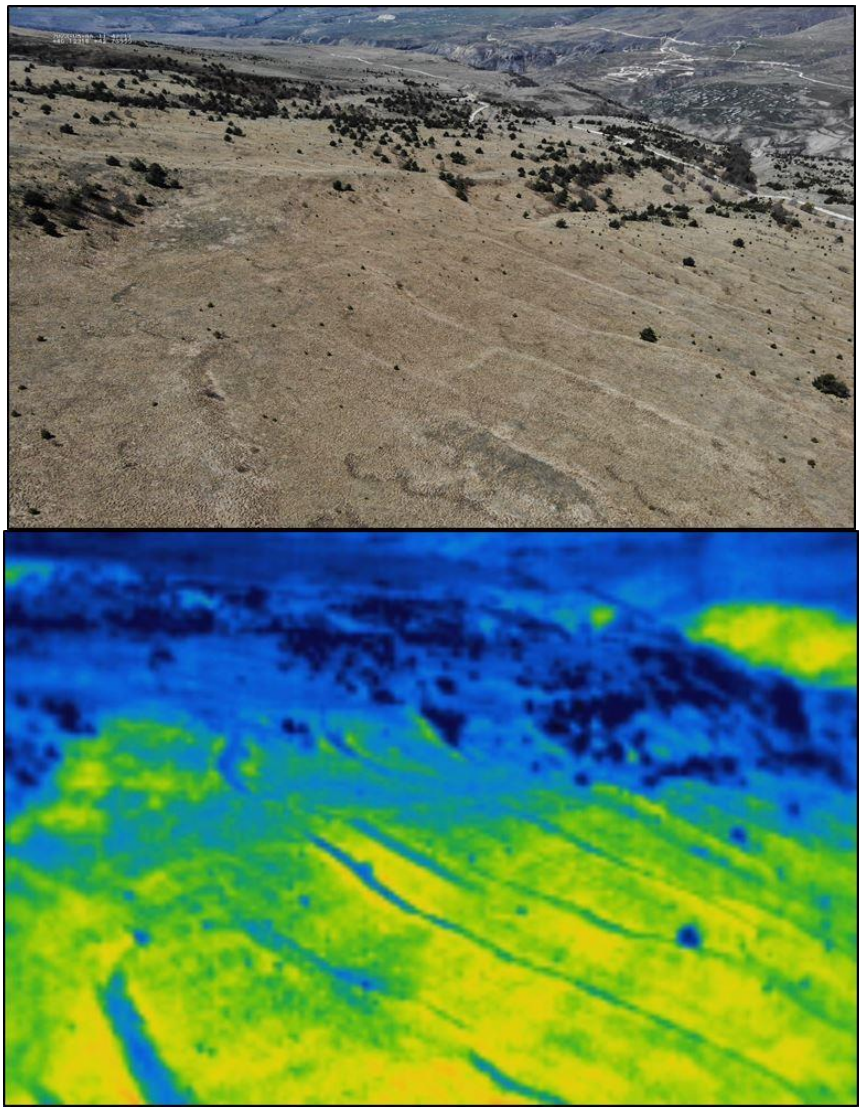

Fig. 5: *Agricultural landscapes of terraced slopes of the Makazhoy basin. Photo and thermal image by I. Idrisov*

The second zone (with seasonal activity) includes the southern slopes of the Kashkerlam ridge (above 2200-2400 m, depending on the exposure of the slopes), with mountain-meadow landscapes.

Terraces have largely transformed landscapes and can be preserved for many centuries after the termination of their use for their original purpose as arable land (Borisov, 2022). Currently, the vast majority of such terraces in different regions of the Caucasus (Stavropol Territory, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechnya, Dagestan) are used as pastures and hayfields. At the same time, the specific features of the terraces, in particular, obstructed runoff and excessive moisture relative to natural slopes, contribute to the progressive overgrowth of woody vegetation. In conditions of reduced grazing, these processes are proceeding at a considerable speed.

The natural and cultural-historical heritage of the Makazhoy basin, the availability of terraced slopes convenient and accessible for agricultural processing, an asphalt highway to the lake. Kazenoyam and the village of Khoy act as an impulse for the sustainable development of the region. This is also facilitated by the entry of the territory into the Argun Historical, Architectural and Natural Museum-Reserve.

IV. Discussion

The analysis of the consequences of modern methods of sheep grazing in the mountainous landscapes of the Chechen Republic showed the heterogeneous use of mountain pasture lands in the late XX – early XXI centuries. The areas most commonly used for sheep farming were distinguished by a large number of pasture potholes, smaller areas of forests and structurally different landscapes than those where pasture digression was not manifested. At the same time, it should be noted that the environmental management of the basin has passed three major stages over the past 100 years: intensive agriculture and animal husbandry until the 1940s; a sharp expansion of animal husbandry and the cessation of agriculture until the 1990s; progressive reduction of animal husbandry until the 2020s.

Similarly, trends towards a decrease in landscape diversity were found in those areas that were not used by sheep during the study period, while the heterogeneity of the landscape persists in those areas where sheep graze.

The conducted research is an original analysis of landscape models and changes due to intensive grazing of sheep using new approaches that combine field studies of key sites, updated satellite time series and modern methods of landscape analysis (GIS technologies). Similarly, our results are a guideline for the future, as they demonstrate the importance of preserving extensive pastures for sheep farming. This is important if we strive to preserve the cultural heritage of the mountain ethnic group, the traditional flavor of the diversity of landscapes and semi-natural meadows in the mountains of the North-Eastern Caucasus.

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