ASSESSMENT OF THE SANGZOR RIVER BASIN FOR AGRICULTURAL USE

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Abstract: *This paper examines the scientific works of foreign and national scholars who have conducted comprehensive geographical assessments of territories. The natural conditions of the Sangzor River Basin are analyzed from the perspective of agricultural land use. The assessment is based on key factors such as climatic conditions, water availability, soil cover, and relief characteristics of the territory.*

Keywords: *Sangzor Basin, relief, climate, soil, agricultural assessment.*

The emergence of assessment theory in geography is directly linked to the deepening analysis of the interrelationships within the nature–population–economy system. Essentially, this process represents an evaluation of environmental quality.

In the second half of the 20th century, issues related to comprehensive territorial assessment developed rapidly within physical geography. A number of Russian scholars—A.A.Mins (1972), L.I.Mukhina (1973), E.B.Lopatina and O.P.Nazarevskiy (1972), V.S.Probrajenskiy (1986), and A.G.Isachenko (1979)—proposed fundamental theoretical foundations in this area.

A.A.Mins analyzed geographical assessment as the scientific basis for the rational use of natural resources, developing an economic–geographical approach and advancing the principles of complexity, spatial specificity, and goal-oriented evaluation.

L.I.Mukhina developed methods for assessing the recreational potential of natural complexes, focusing on the interaction between human activity and landscape components.

E.B.Lopatina and O. P. Nazarevskiy elaborated assessment methods evaluating the impact of the geographical environment on working and living conditions, contributing to socio-geographical approaches in assessment.

V.S.Probrajenskiy proposed geographical assessment as a tool for economically measuring natural conditions and developed methodologies for determining the efficiency of land and water use in river basins.

A.G.Isachenko (1979) theoretically substantiated the "assessment of natural geographic complexes," emphasizing the necessity of a geosystem-based approach.

Collectively, these scholars substantially contributed to transforming geographic assessment into a major scientific-methodological direction within natural resource use, landscape analysis, and regional planning.

Research related specifically to agricultural land use in river basins includes the work of V.A.Kovda (1981), who developed scientific recommendations for irrigated land reclamation and combating salinization, offering strategies for sustainable agricultural development in river basins.

Among Uzbek scholars, A.Rafiqov (1994) studied natural resource use and land–water relations in the Zarafshan and Amudarya basins. M.Mirzajonov (2001) analyzed issues of geographical assessment of irrigated farming areas using examples from the

Syrdarya and Chirchiq basins. A. G‘ulomov (2016) conducted research on the evaluation of natural factors influencing agricultural development in the Sangzor and Zarafshan basins.

K.A.Hakimov (2022) assessed landscapes within the Bakhmal district for agricultural use at the level of “urochishches,” evaluating suitability for irrigated farming, dryland farming, and pasture-based livestock husbandry.

In assessing the Sangzor River Basin for agricultural purposes, we employed a six-level evaluation scale: very suitable (100 points), suitable (80–100), moderately suitable (60–80), marginally suitable (40–60), unsuitable (20–40), and highly unsuitable (below 20 points). The assessment relied on relief structure, climatic characteristics, water availability, and soil cover.

Relief is one of the principal physical–geographical factors determining the spatial organization, specialization, and efficiency of agricultural production. It influences land use patterns, crop distribution, irrigation system formation, and agro-technical measures.

The lower part of the Sangzor valley is relatively flat, with weakly sloping terrain. Moving eastwards and towards the northern and southern valley slopes, elevation gradually increases. Relief variability here affects irrigation suitability, soil fertility, and the spatial differentiation of agricultural sectors.

The plains, especially the G‘allaorol depression and surrounding undulating lowlands (400–800 m elevation), represent the most favorable areas for agriculture. These territories contain grey and meadow grey soils with high productivity, rendering them suitable for irrigated farming, vegetable production, and melon cultivation.

At higher elevations, relief becomes more complex, giving rise to dryland farming and pasture-based livestock systems. Thus, the relief structure of the Sangzor Basin determines the natural–economic orientation of the region and the territorial organization of its agricultural sectors.

Climate is a fundamental natural factor shaping agricultural production, crop placement, yield levels, and agro-technical efficiency. The Sangzor Basin’s climate is continental, dry, and characterized by marked seasonal contrasts, favoring irrigated and dryland agriculture.

Temperature conditions vary with elevation. In the lower plains (G‘allaorol and Jizzakh), average January temperatures reach −2 to −3 °C, while July temperatures range from +26 to +28 °C. In mid-elevation areas (Bakhmal), January temperatures fall to −3 to −5 °C and July temperatures to +22 to +25 °C. Mountain zones experience cold winters and short, cool summers, with July temperatures at +18 to +20 °C.

Such vertical temperature gradients determine agricultural specialization: grains, vegetables, and orchards in the plains; fodder crops and horticulture at higher elevations.

Precipitation distribution also follows relief patterns: 250–350 mm in the plains, 400–500 mm in mid-elevation zones, and 600–800 mm in mountain areas. Uneven precipitation increases the need for irrigation, especially during dry summers, establishing irrigated agriculture as the principal farming system.

Annual potential evaporation ranges from 900–1200 mm in the lower basin to 500–600 mm in the mountains, significantly exceeding precipitation. Consequently, water scarcity is a major limiting factor for agriculture.

Wind patterns—primarily from the west and northwest—create risks of wind erosion in spring and summer. Winter radiational frosts can damage fruit trees and early crops.

Water availability is a decisive factor in agricultural development. In the Sangzor Basin, water supply comes from the Sangzor River, its tributary streams, and the Tuyatortar Canal. These sources support both irrigation and domestic needs.

Recent initiatives promote orchard development in Bakhmal's foothill areas using groundwater resources, increasing employment and enhancing the region's economic and export potential.

However, water distribution is uneven. Northern slopes of Chumqor Mountain, Sangzor valley bottoms, and Tuyatortar Canal zones are well supplied, while the southern slopes of Morguzar Mountain and western undulating foothills of the G'allaorol depression face chronic water shortages due to reliance on seasonal streams.

Soil is the fundamental natural resource of agriculture, determining the spatial structure and productivity of farming. In the Sangzor Basin, soils exhibit clear vertical zonation.

Irrigated meadow–grey soils dominate the plains, particularly in the G'allaorol depression and around the Tuyatortar Canal. They contain 2–3.5% humus and have favorable water-retention properties, supporting high yields of grain, vegetables, and fodder crops.

Ordinary light grey soils occur in the foothills (Bakhmal), with humus content of 1.5–2.5%, suitable for vineyards, orchards, and fodder crops, especially under irrigation.

Dark grey and brown soils are found in higher foothills and lower mountain areas. They contain 1–1.5% humus, have good water infiltration, but experience erosion risks due to slope steepness—making terraced agriculture most effective.

Brown and dark brown soils dominate high-altitude zones (Morguzar and Chumqor), primarily supporting pasture-based livestock.

Overall analysis shows that 60–65% of the basin's territory is suitable for agricultural use, with plains and foothills optimal for farming, while higher elevations serve as pastures and forest land.

Irrigated meadow–grey soils produce grain yields of 40–50 quintals/ha, while mountain pastures generate 5–8 quintals/ha of dry biomass.

Despite high agricultural potential, slope-induced erosion, water scarcity, and uneven irrigation infrastructure impose limitations, necessitating strategic management and protection of soil resources.

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