NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 9, ISSUE 7, July -2023

THE ROLE OF GAT-TECHNOLOGIES IN THE ASSESSMENT OF SOILS OF DRY LANDS

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Annotation

The article presents the state of dry gray and brown soils, common in the mountainous region, and their assessment based on digital technologies. Also, economic efficiency indicators were studied in the assessment and mapping of soil fertility based on GAT technologies.

Introduction: Today, "agricultural land" in the world is 1.6 billion hectares, of which 1.3 billion are arable land. hectare (81 percent) covers the area. Rainfed agriculture accounts for 60 percent of the world's agricultural production under various conditions. The most efficient non-irrigated farming practices occur in the temperate region of Europe, followed by the subtropical and humid tropical regions of North America. Currently, on the lands where rainfed agriculture is carried out, degradation processes are taking place. With this in mind, one of the important tasks is the development of evidence-based measures aimed at preventing such negative processes as the degradation of dry soil, nutrient depletion, and soil erosion. Scientific research is being carried out in the world aimed at the application of modern technologies of geographic information systems in determining the state and properties of soils, qualitative assessment of soils, increasing their productivity and rational use. In this regard, special attention is paid to the use of modern computer technologies in the analysis of the results of soil research, the assessment of land degradation processes through geographic information systems, the creation of camarador and operational information systems for the analysis of soil conditions, and the implementation of scientific research on digital soil mapping.

One of the most common soil degradation processes is erosion. The relief in mountainous areas is one of the most important natural factors causing erosion processes. The relief affects the morphometric parameters of the soil, the course of erosion processes on slope outcrops, and the distribution of vegetation cover. The morphological description of the soil determines the distribution of moisture and heat from the earth's surface, as well as the rate and volume of water runoff from the slopes, as well as the leaching of nutrients from the soil due to the occurrence of erosion processes. This requires research within the framework of practical scientific and technical research programs on the creation of 3D maps of soil erosion levels in mountainous areas used for rainfed agriculture.

In these processes, the most pressing issue today is the use of modern HAT systems in the conservation and restoration of soil fertility of degraded land plots, and the improvement of soil fertility-limiting properties. The use of modern GAT systems in this area is based on modern computer programs and devices for analyzing complete information about a particular object or area and solving problems in a certain direction, including predicting negative situations in soils with varying degrees of erosion, and this creates the opportunity to restore and manage soil fertility.

Over the past few decades, a number of problems have arisen in the dry farming of the republic. Unpractical grain plowed crop rotation, which is the basis for improving the culture of agriculture in arid regions, continuous sowing of grain crops in one field for several years, a sharp reduction in the area of clean and busy plows, annual and perennial fodder crops, its departure leads to deep degradation of fertility and the structure of dry soils.

The yield of grain and other crops in arid regions depends entirely on the amount of precipitation: in dry years, the average yield is 3-5 centners, and in dry years, 8-10 centners. A clean plow plays an important role in capturing the natural moisture in the soil and using it efficiently. On average, 720-800 cubic meters of moisture per hectare is collected in the fields left under clean plowing by the season of autumn sowings of grain, and in high-water years - 1000-1200 cubic meters of moisture per hectare. agrotechnical measure to clear weeds (Khaidarov, 2023).

Given that the cultivation of agricultural crops in arid regions is carried out only due to the moisture accumulated due to precipitation in the soil layers, the average annual rainfall is 200 mm. Dry crops are planted only on lands exceeding the location of soil areas, arid lands are divided into moisture-rich, low-rich and poor lands. Brown and dark gray soils are located in the highlands and are well supplied with moisture, typical gray soils are common in the foothills in the middle region and are poorly supplied with moisture, and light gray soils in the lower region are dry soils, not supplied with moisture.

Research methods. In studies using ArcGIS Geostatistical Analyst (GA) ArcGIS 3D Analyst, ArcGIS Spatial Analyst, and Python software, digital 3D maps are created to determine the risk of agricultural land erosion and make the right decisions and recommendations for their use.

Results of the study and their discussion. Research is being carried out in the mountainous region of our republic, i.e, in the areas of the Chotkal ridge with scattered gray and brown soils, in the identified base massifs. The data obtained as a result of the study will become the scientific basis for the formation of an electronic database using modern geoinformation technologies to assess the state of eroded soils, determine measures for effective use in rainfed agriculture.

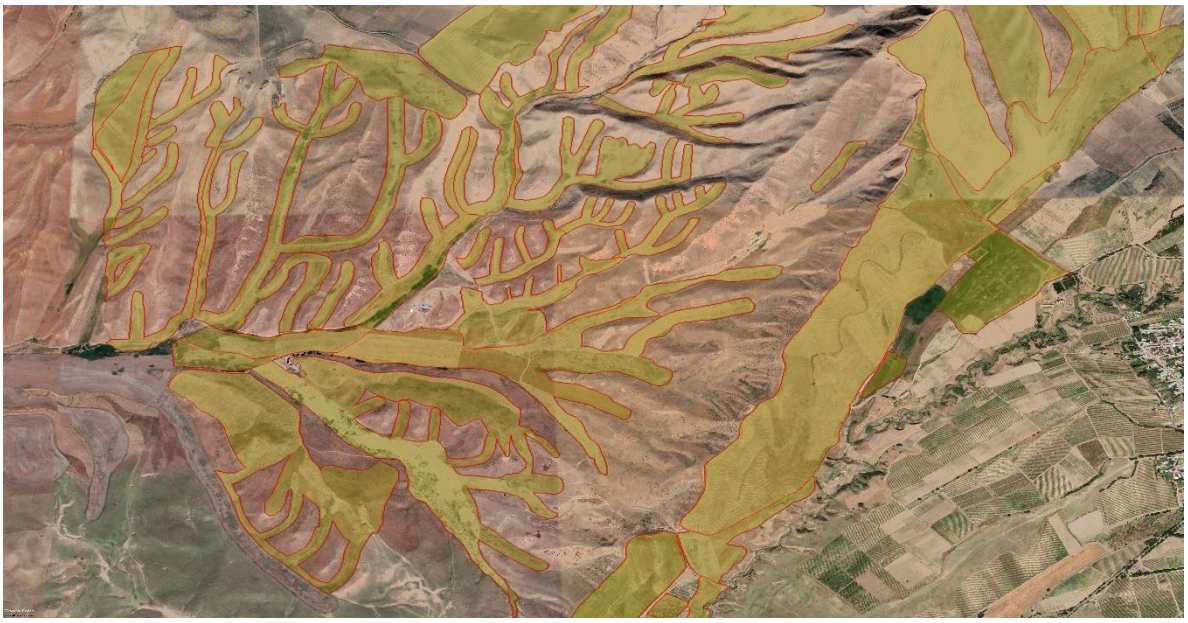
Scientific studies of the morphogenetic properties and properties of eroded dry soils, as well as the increase and evaluation of productivity, carried out by foreign and republican scientists in D.K. Bulgakov, I.A. Dubrovina, V. Medvedev, A.A. Shpedt, B.K. Ukenov, T.G. Muller, I.A. Kimberg, A.M. Rakulov, H.M. Maksudov, L. Tursunov, I.T. Turapov, O. Tadzhiev, R.K. Kozieva, N.Yu. Abdurakhmonova, O.E. Khakberdieva, L.A. Gafurova, M.F. Fakhrutdinova, G.M. T.Sh.Shamciddinov, A.Kh.Koraev, M.I.Rozmetov and many other scientists. by, and research includes information on soil genesis, geography, ecology, erosion, biological activity, some agrochemical and agrophysical properties.

The research provides for a comprehensive study of the genesis, development, formation of fertility and changes in the ecological and genetic state of soils in eroded dark gray soils. For this purpose, comprehensive studies of soils are being carried out in the scattered base massifs of the Chotkal Range, which are used for rainfed agriculture with varying degrees of erosion.

The following tasks are solved during the research:

- to determine the morphogenetic characteristics, agrophysical and agrochemical properties of dry soils and study the effect of erosion processes on them;

- creation of 3D maps of eroded soils of the research object using modern geoinformation systems based on the processing of satellite images (Sentental-2 and Landsat-8);
- development of recommendations for the efficient use of land in rainfed agriculture based on the created 3D maps.



Picture 1. Agricultural map of the territory of Parkent district Sokok and aerial view of dry areas

The amount of humus and nutrients in the soils of the study area is different. Mountain brown soils are characterized by a large amount of humus compared to dark gray soils. This situation can be explained by the fact that under moderately moist and warm soil conditions in the highlands, the humification process prevails over the mineralization process, which makes it possible to accumulate a large amount of humus. The largest amount of humus and nitrogen is contained in non-washed and washed-out soils, common in the watershed and lower parts of the slope, and in washed-out soils on the slopes, their amount is small. This situation is associated with a significant reduction in humus and nitrogen reserves as a result of leaching during the washing period of the upper, humus-rich soil layer, where plant roots are located. In addition, it varies depending on the exposure of the slope (Jalilova G., 2009).

The amount of total phosphorus and potassium also changes relatively little along the soil profile. The accumulation of these elements due to biological factors is observed in the upper layers. Although there are no differences in the total amount of phosphorus and potassium in soils, they differ significantly in the number of their mobile forms. Mountain brown soils are characterized by an increased content of mobile forms of phosphorus and potassium in comparison with other types. The low number of mobile forms of nutrients in mountainous brown-carbonate soils is associated with the sparseness of the flora that feeds the soil with organic matter.

In dark gray, mountain-brown calcareous, mountain-brown typical, and mountain-brown demineralized soils, the amount of gypsum SO4 is low, and the amount of CO2 varies with height. As a result of the washing out of the upper layers, the exposure of the lower less alkaline layers to the surface leads to an increase in the amount of carbonates in the soil. Due to soil erosion, their boiling under the action of acid, the carbonate layer often rises.

Thus, as the degree of soil erosion increases, the amount of carbonates also increases, while the amount of humus sharply decreases. An increase in the amount of carbonates in the soil and a decrease in the amount of humus are one of the characteristics of eroded soils. A decrease in the ratio of humus to carbonate increases the susceptibility of soils to dusting and erosion. Based on the above information, at present, due to the effective use of agricultural land in the Sogok district of the Parkent district, land tax revenues in the amount of 16 million 364 thousand soums per year, except for 654.56 tons, have been collected through the GAT system. crop and land users receiving funds from this crop in the amount of 1 billion 7 million 712 thousand soums.

Table 1 Table of achieving economic efficiency through the rational use of agricultural land based on the creation of 3D maps of dry land in the Sokok and Nomdanak districts of the Parkent district

№	Territory name	Total area of the territory	Total arable land assigned to the territory	Average annual land tax (thousand soums)	Average output (tons)	Income from the harvest (thousand soums)
1	Dead and	5180	761	16 364,02	654,56	1007 712,61
2	Nomdanak	6114	1673	35 975,04	1 439,00	2215 378,71

Conclusion:

In our republic, new 3D maps are being developed that provide such opportunities as identifying areas of land that have become unproductive due to erosion, efficient use of eroded lands, meeting the population's need for food, strengthening the forage base in animal husbandry, and improving soil structure.

Such maps provide a quick way to obtain information such as changes in soil structure, slope structure and exposure in mountainous areas where there is a risk of erosion and which are eroded to varying degrees. The results obtained in the research and cartographic materials, first of all, make it possible to improve the ecological and reclamation state of soils, assess water-resistant aggregates, prevent calving processes due to the risk of erosion, restore their productivity, and stratify crops based on the degree of dry soil erosion and slope exposure. It serves as a scientific basis for the implementation of measures aimed at creating an economy, determining the productivity of dry crops and allocating non-agricultural land. This ensures economic stability through the development of the agricultural sector.

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