Digital mapping of soil research results in Ujar region using a methodological approach

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Abstract.
Based on soil and plant studies carried out in the Ujar region, the article presents some important results obtained during monitoring with constant control of the territory using remote sensing. The research area is one of the important agricultural centers in Azerbaijan Republic and subject to degradation due to the impact of anthropogenic factors. The spotting of irrigated fields reflected in satellite images has a different nature. Interpretation of remote sensing materials requires a mandatory study of the characteristics and substantiation of the causes of spotting based on field work and laboratory analyzes of soil samples.

Keywords:
aridization
monitoring
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land bioproductivity
degradation
**Introduction.** In the context of the development of agriculture and rural areas in the country, the efficient use of land, which is the main means of production, is of particular importance. The issue of preventing the further development of desertification through rational environmental management in the arid regions of the country is relevant. Preventing desertification processes requires the development and implementation of a whole set of measures aimed at preserving surviving, restoring and rehabilitating degraded and disturbed steppe ecological systems. One of the most important strategic directions of the agricultural sector is the development of livestock farming in Azerbaijan, which is impossible without a strong forage base, which consists of winter and summer pastures. It is very important and relevant today to carry out research work on winter pastures in order to identify their ecological state and develop agrotechnical, agrochemical, and reclamation work to improve and rationally use them. In agriculture, technology for forecasting and continuous observation systems are important for environmental control and monitoring. One of the urgent tasks of genetic and reclamation Soil science in arid conditions is intended to obtain objective information about saline soils, distribution areas and the dynamics of salt processes, without knowledge of which it is impossible to predict methods of their reclamation. An important issue facing young soil scientists is the use of remote sensing in determining the area of land constantly used for various crops and taken out of use [3,4,5]. On the territory of the Ujar region of the Shirvan steppe, the development of aridization and desertification processes, the impact of climate change and anthropogenic load on ecosystems on them, was studied using aerospace monitoring tools for geobotanical indicators. In the Ujar region, meadow soils have unfavorable water-physical properties due to their heavy granulometric composition and layering. Particularly noteworthy are the cultivated meadow soils of household plots, which are characterized by high fertility and lumpy structure. In meadow soils, the metabolic capacity increases with the content of magnesium and absorbed sodium. The structure of the soil cover is characterized by
the widespread development of shallow contours, which is largely due to the significant distribution of solonetzes and other saline soils. Here there are dark meadow, meadow and light meadow solonchak soils and malts. The system of measures for the development of arid lands should be focused on a systematic transition from resource-intensive methods of environmental management to adaptive landscape ones. One of the main reasons for the secondary salinization of lands in the Ujar region is the formation of perched water against the background of the existing collector-drainage network and its unsatisfactory operation. Climate/CM >1.0; Index of Dryness - 0.23-0.33; Sum. 0,10-0,25; >10°C, Total radiation - 3900-4840, Duration of process of soil formation $t_{\text{air}} >10^\circ-300-330$ days; $t_{\text{soil}} >5^\circ-350-360$ days. Indexing of soil structure: $\text{AY'acaz-AYa''ca-BCAn-Cacasc}$.

**Methods.** In selected areas, soil sections were laid out for individual landscape complexes and soil and plant samples were taken for laboratory research. To solve the set tasks, monitoring was chosen using remote and geobotanical indicators, and indicators of vegetation degradation based on satellite imagery from the Landsat-5 satellite. The NDVI vegetation index has become a tool for assessing the state of vegetation cover and compiling bioproductivity cartograms. As an artificial dimensionless indicator, it is intended to measure the ecological and climatic characteristics of vegetation [1,2]. The satellite images used for monitoring cover the territory of the Ujar region. Processing of the material and compilation of thematic maps were carried out using the ENVI and MapInfo software packages. The selected area in Ujar region has 25 hectares of land, 12 hectares of barley, 10 hectares of alfalfa, 3 hectares of vegetables and industrial crops are sown [6,7].

**Results.** It is important to emphasize one property of climatic desertification - the reversibility of the process. With the processes of climate aridization and irrational land use and high anthropogenic pressure on ecosystems occurring in recent decades, the probability of self-healing of ecosystems and stopping the development of desertification without land management measures on an ecological basis tends
to zero. Reducing the area of arable land as destabilizing land in such conditions is not advisable. The most acceptable and less expensive solution would be the introduction of fallow-grass and grain-grass crop rotations. Due to the presence in them of a large proportion of perennial grasses (45–50%), the task of increasing environmental sustainability and preventing the development of desertification processes will be solved. Accounting for areas of saline soils for monitoring purposes was carried out using aerial photographs or space high resolution pictures. We have identified decipherable signs of soil salinity from large-scale aerial photos.

Picture 1

A – Multispectral image of irrigated lands obtained from Landsat – 5 satellite on 10/05/2021, B – Combination of a multispectral image

By visually or using special programs vectorization of irrigation arrays, fields with different crops and fallow lands, could automatically calculate the areas of all objects. The surface of irrigated fields is often characterized by heterogeneity spotting, is clearly recorded on remote materials. Depending on the properties of the soil, the image of the fields differs.
Irrigation systems along the Goychay Canal. On a satellite image (obtained from the Landsat - 5 Satellite on 14/05/2021. Legend: 1 - lands for dry farming, 2 - irrigated lands, 3 - irrigated areas with an increased area, 4 - abandoned irrigated lands, 5 - irrigation area, 6 and 7 - irrigated soils.

Fields with different crops and perennial fallow lands on a satellite image obtained from Landsat - 5 on 14/05/2021. Legend: 1 - winter cereals, 2 - forage lands, 3 - mown fodder, 4 - fallow arable land, 5 - perennial fallow.

It has been established that the patchiness of surface carbonate soils is stable, does not depend on the groundwater level and is clearly visible in the field and on satellite images of any survey period. It appears on the open soil.
surface, in fields with winter grain crops, and reaches a size of $10-25 \times 10^3 \text{ m}^2$. In fields with alfalfa (irrigation in furrows), surface-carbonated soils cause crop fallouts of up to $2-3 \times 10^3 \text{ m}^2$. Irrigated soils with a high content of carbonates (>2-4%) promote the formation of crust when drying out and affect the agrophysical and agrochemical properties of the soil and prevent the emergence of crop seedlings. In general, an environmental assessment of the main types of soils common in the Shirvan Plain was carried out. Bonitet points of gray-meadow light soils varied within 76-78 points, gray-brown light soils within 75-79 points, meadow-gray soils within 84-87 points, meadow-gray soils light within 74-77 points, swamp-meadow soils – 78 points.

References:
MEDICINE AND PHARMACY


