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MONITORING THE DEGRADATION OF PASTURE PLANT COVER NORTH-WESTERN KYZYLKUM BASED ON ANALYSIS NDVI MEAN SPACE SHOOT LANDSAT

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Abstract
This article presents the results of studies on the real ecological and economic condition of the main types of pastures of the North-Western Kyzylkum and the degree of vegetation degradation, using satellite imagery, and determining the degree of territory degradation depending on vegetation indices based on the results of geobotanical monitoring of these changes. The application of the NDVI vegetation index allows for a quantitative assessment of the development of plant green mass during the growing season.

Keywords Pasture, degradation levels, vegetation cover, NDVI index, vegetation period.

Introduction

Currently, one-third of the world's land area is under threat of desertification, which especially requires the implementation of technologies that will help in monitoring, assessing, and mapping the state of vegetation cover and pasture degradation, as well as increasing their accuracy and efficiency.

Desertification, land degradation, and drought are serious economic, social, and environmental problems that threaten food security in many countries worldwide. According to the latest data, desertification poses a serious threat to the health and well-being of nearly 1.5 billion people living in more than 100 countries of the world In our republic, a number of reforms have been carried out aimed at the rational use of pasture lands, preventing their desertification and salinization, and certain results have been achieved. The Development Strategy of New Uzbekistan for 2022-2026 defines such tasks as..."efficient use, restoration and increase of pasture productivity." Also, the Decree of the President of the Republic of Uzbekistan dated October 23, 2019 No. UP-5853 "On approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030," the minutes of the meeting of the Cabinet of Ministers of the Republic of Uzbekistan dated March 10, 2017 No. 03-35-14 "On measures to organize the efficient use of pastures and hayfields" and the Resolution of the

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Cabinet of Ministers of the Republic of Uzbekistan dated April 23, 2018 No. 299 "On measures to further improve the procedure for determining the boundaries of administrative-territorial units, inventory of land resources and conducting geobotanical research on pastures and hayfields," as well as other regulatory legal documents related to this activity, provide for a number of tasks.

Degree of study of the problem. Scientific research works of foreign scientists R.Jafari, K.Ostir, E.Thorarinsdottir, A.Roder, K.Brinkmann, S.Zhang, X.Yang, K.Kawamura, I.Numata, L.Kiage, G.Pickup, P.Klintenberg, R.Washington-Allen, G.Bastin, D.Saltz, M.Ajorlo, J.Gao, U.Fischer-Zujkov, A.Huete, N.Karpov, E.Troeva, A.Saidov, M.Makhambetov and others are devoted to the study of the state and degradation of pastures, assessment and monitoring of the relief, vegetation cover, erosion, salinization, desertification of degraded lands, remote sensing technologies and geoinformation systems were used. Research related to the soil layer and vegetation cover of pastures in some regions of our republic has been extensively studied by P.Zakirov, A.Granitov, S.Arabov, R.Kuziyev, S.Ganiyev, M.Teshaboyev, A.Chertovitskiy, A.Avezbayev, Sh.Narbayev, M.Ruzmetov, M.Reymov, Z.Mamatkulov, O.Davronov, M.Norkulov, R.Djaxibayev, N.Beshko, T.Mukimov, V.Sherimbetov, T.Rajabov, M.Nasirov, D.Aralova, Sh.Narbayev, O.Davronov, M.Norkulov, and others.
However, research on collecting data on the real ecological and economic condition of the main types of pastures of the North-Western Kyzylkum and the degree of vegetation degradation, conducting field observations to study the current situation in pastures, and the current system of rules for their use on the ground is insufficient.

One of the main objectives of this research **research** is to study changes in vegetation related to land degradation in the pasture ecosystem of Northwestern Kyzylkum using satellite imagery and determine the degree of degradation of the territory depending on the vegetation indices of the results of geobotanical monitoring of these changes.

Research Methods

In the research process, field work on monitoring the degradation of pasture vegetation cover, geobotanical research, cartographic, remote sensing of land, geostatistical, geoinformation systems and technologies, comparison, geodatabase, aerospace and geovisual research methods were used

Research Results

Today, when analyzing degradation processes using remote sensing, a number of satellite images are available, mainly the Landsat and Sentinel space imagery archives are widely used, which are open and free for all users. In this research work, only Landsat satellite images were used to utilize long-term remote sensing data. In the study, to determine the impact of livestock grazing in semi-desert and desert environments, vegetation indices obtained from satellite data were used and evaluated, and compared with the results of geobotanical studies. The first objective of the study was to assess the "Normalized Vegetation Index" (NDVI) and "Soil-

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Adapted Vegetation Index" (SAVI) for observing the impact of grazing in semi-desert and desert conditions based on a 2010 Landsat Surface Reflectance image. The vegetation index NDVI (Normalized Difference Vegetation Index) is the normalized relative index of plants, which is one of the most studied and relatively simple indicators of the amount of photosynthetically active biomass. This index is calculated as the ratio of the magnitudes of the absorption and reflection of rays by plants in the red and near-infrared regions of the spectrum. Usually, the index values for plants range from 0.20 to 0.95 The NDVI index indicator has the highest values during the plant's vegetation period.

Thus, the application of the NDVI vegetation index allows for a quantitative assessment of the development of plant green mass during the growing season.

Table 1 Landsat images used in the study

	Landsat Image ID	Sensor	Spacecraft ID	Information date	Cloud (%)
1.	LC81550322014135LGN01	OLY_TIRS	LANDSAT_8	17.05.18	0.09
2.	LC81550322015138LGN01	OLY_TIRS	LANDSAT_8	18.05.19	1.31.
3.	LC81550322016141LGN01	OLY_TIRS	LANDSAT_8	22.05.20	0.06
4.	LC81550322017127LGN00	OLY_TIRS	LANDSAT_8	09.05.21	2.68.
5.	LC81550322020152LGN00	OLY_TIRS	LANDSAT_8	24.05.22	0.07
6.	LC81550322022157LGN00	OLY_TIRS	LANDSAT_8	05.06.23	0.08

During the research, the selection and dissolution functions were used using the ArcGIS software, which allowed us to select the research area for use as the research area layer (area of interest - AOI) in the image processing process. The Erdas Imagine 2014 software was also actively used in the image processing and analysis process. In particular, controlled and uncontrolled classification of digital images (supervised and unsupervised classification), focus analysis (Focal analysis) were conducted using the NDVI and SAVI methods. During this research work, distance inverse weighing interpolation (IDW) was used to map degraded pastures. During the 3 main stages of the growing season, an interpolation map was developed with the determination of pasture biomass in the study area during the field geobotanical study period. During the seasons, plant biomass was collected from 10 m2 of the transect in the studied areas, and the obtained results were used to create a biomass map. The analysis used the Erdas Imagine 2014 program, which supports IDW interpolation using GIS software. As a result, the electronic land map was visually compared for NDVI values in certain areas of the studied object. To determine the relationship between the results of field geobotanical studies and the remote sensing data of the object, the Pearson correlation method was used. Pearson correlation was performed using the "R Studio" software. Pearson's correlation is the most frequently used method of statistical analysis. This method was implemented using the "R Studio" program to analyze the results of field geobotanical studies conducted in 2010 and remote sensing data for the current year.

Since the region is very diverse, the mean values of 5*5 adjacent pixels of the NDVI and SAVI result images (NDVI mean and SAVI mean) were also calculated using focal analysis. Therefore, when analyzing the relationship between the results of field geobotanical studies and remote sensing data, 4 methods were selected: NDVI, NDVI mean, SAVI, SAVI mean.

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According to the results of this analysis, the NDVI mean method showed the highest correlation, i.e., the correlation result was 82%. Taking this into account, the NDVI mean method was chosen to analyze pasture remote sensing data using the IDW interpolation method. Then, based on the results of this correlation, based on the Landsat image and the results of field geobotanical study of the territory obtained in May 2010, the NDVI mean values corresponding to 5 degradation levels were determined. "NDVI mean" values corresponding to degradation levels, range of NDVI mean values:

Degradation degrees

0.10-0.13 very strong

0.13-0.17 strong

0.17-0.21 average

0.21-0.25 weakly

0.25-1.00 no degradation.

In North-Western Kyzylkum *Salsola arbusculiformis* is clearly manifested in sporadic distribution (only in remnants), as in the Northern Turan province, it is one of the main price-formers in the small hill phytocenochore. Furthermore, the role of the Northern Turan species *Artemisia terrae-albae* is partially reflected only in the clay soils of the intermountain lowlands. In various ecotopes of the studied territory, the dominance of another representative of this genus - *Artemisia diffusa,* originating from southern Turan, was observed. *Salsola arbusculiformis* and *Artemisia terrae-albae* unlike *Anabasis salsa Anabasis salsa,* very characteristic of Northern Turan, occurs on saline soils of the southern half of the Northwestern Kyzylkum, at the southern boundary of its range, and exhibits certain activity. The phytocoenotic role of the South Turanian species is increasing in the region. At the same time, it should be noted that the species' ecological adaptation changes, as it becomes a petrophyte in the region, occupying the gravelly gray-brown soils of the remains and their slopes. A distinctive feature of plants is the presence of small shrub communities, as there are dominant and participating communities in the region *Astragalus villosisimus* and *Convolvulus korolkowii.*

The results of this study show that, along with anthropogenic factors, the amount of precipitation also influences the degradation of pasture vegetation cover. When conducting this research, the mapping of pasture vegetation cover degradation is carried out in several stages.

Conclusion

1. The effectiveness of using remote sensing methods and geographic information system technologies in monitoring the degradation of pasture vegetation cover, its development, and the use of modern technologies to eliminate such a negative process, monitoring pastures covering large areas, assessing the negative processes occurring in their general condition, as well as erosion in pastures, determining the general condition of vegetation, has been proven.

2. In pasture monitoring, in particular, in the operational determination of grazing norms based on the distribution of existing vegetation, vegetation process, and current pasture yields, the most acceptable is the use of satellite images, including Landsat, TM/ETM+ images, which has been substantiated by the results of a number of scientific studies. It is recommended to have appropriate software and, as a result of processing satellite images, calculate the vegetation

index of pasture plants, i.e., "Normalized Vegetation Index" (NDVI), as well as "Soil-Adapted Vegetation Index" (SAVI).

3. IDW interpolation was used to map degraded pastures. During the 3 main stages of the growing season during the field geobotanical study period, an interpolation map was developed with the determination of pasture biomass in the studied area. In this case, based on the obtained results, it is possible to create a biomass map by collecting plant biomass per 10 m2 of transect during the seasons in the studied territories.

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