

Ecological and geographical aspects of land using in forming agrolandscapes

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Abstract. The study of agro-landscapes for agricultural use is of the utmost importance in assessing their potential and premeditatedly organizing their change as a result of anthropogenic impacts. The use of nature in the irrigated lands of the Kashkadarya oasis is illustrated in terms of nature protection for landscapes restoration. The article discusses the role of the principles of optimizing the use of natural and anthropogenic resources in highly developing landscapes in order to increase the competitiveness of agriculture in landscape development. The scientific significance of the research results is the scientific-theoretical conclusions, recommendations, cartographic and other primary materials in the dissertation, the separation, description, evaluation of agrolandscapes in the Kashkadarya region for agricultural purposes, and strict control in order to eliminate the negative effects of desertification processes on the environment. It is determined by taking it under and serving to eliminate the problems related to them. The landscape-ecological conditions of the irrigated areas for use in the activities of agricultural departments, ecology and environmental protection were evaluated and described on the example of the Karshi deserts.

1 Introduction

Landscape is the environment in which human life and activity takes place, the natural laboratory and the source of aesthetic perception, and in human relations landscapes are natural systems with natural resources and gene pool. In the study of human economic activity, it is important to assess not only the production and socio-economic situation, but also the natural properties of the anthropogenic landscape and the geo-ecological situation that arises in it. Today it is vital to study the formation and development of agro-landscapes to improve the material well-being of people, increase the productivity of agricultural lands, and also to assess the natural properties of the anthropogenic landscape and the geo-ecological situation. The main task of the study is to examine the interaction of cultural and natural landscapes in the Kashkadarya oasis, to assess the impact of natural and anthropogenic factors on the formation of agro-landscapes and to develop ecological

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geographical bases for protection. The article deals with the analysis as well as sources of land resources and agro-landscapes in the Kashkadarya oasis.

2 Materials and methods

Methods such as field research, cartographic, aerospace, ecological-landscape principle, systematic approach, landscape indication GIS technologies, statistics, literature and working with fund materials were used in conducting the research. Some theoretical and methodological issues of studying the landscapes of the Kashkadarya basin and compiling landscape maps are covered in the works of L.N. Babushkin and N.A. Kogay (1964, 1965), T.V. Zvonkova (1965), S.A. Nishanov (1967), Poslavskaya, M.F. Rasulov (1968), M.U. Umarov, I.A. Hasanov, S.I. Abdullaev and R. Usmanova (1997-2002) and other researchers.

3 Results and Discussion

From time immemorial, agro-landscapes have been formed as a result of the cultivation of plants by humans. V.A. Nikolaev (1987) described "agro-landscape - a geosystem that produces natural and anthropogenic resources and changes the environment, the objects of agricultural activity". According to him, the development and transformation of landscapes occurs as a result of various anthropogenic influences. Agro-landscape is not understood as any agricultural system, but only a certain (regional) dimension at the level of the same geosystems inherent in the natural landscape. This is a natural landscape altered by agricultural production [2]. It should be noted that currently, one of the main challenges in social and industrial development is to reduce the impact of anthropogenic factors on the stability of natural landscapes, including the stability of agro-landscapes. Sometimes human activity leads to irreversible negative consequences in nature, and this situation can lead to environmental crisis and catastrophe over time.

According to the Food and Agriculture Organization of the United Nations (FAO), 78 percent of the Earth's surface has severe natural constraints on agricultural development, 13 percent have low area, 6 percent have medium and 3 percent have high productivity. In 2019, 37.6 percent of the entire land was used for agriculture, including 10.6 percent for arable land, 25.8 percent for pastures, and 1.2 percent for perennial crops [1]. It is important to note that most of the man-made areas of the entire earth's surface are agro-landscapes. The distribution boundary of agro-landscapes devolves on agro-climatic resources, water level, surface structure, soil and other conditions in certain areas.

According to Yu.G. Firstova and I.V. Kozlova, M.N. Lebedinsky (1989) argues that the transformation of the agro-landscape as an object that changes human activities, as well as a region with a specific complex of natural and anthropogenic agriculture, affects the efficiency of nature management and should be considered as human habitat [4]. Almost unchanged natural landscapes under the influence of human economic activity are now preserved only in areas of the planet that are difficult to master in agriculture. The Kashkadarya oasis is one of the oldest agricultural areas. Therefore, the natural landscapes here have changed over time due to human activities in large areas.

According to the definition of V.V. Lyutova (2013), agro-landscape is an anthropogenic landscape created on the basis of modification, taking into account the specific features of the natural landscape. In the process of emergence of agro-landscape for use in agriculture, the activity of some components, i.e. the evolutionary relationships between landscape components, changes [7]. According to M.I. Lopyrev's (1995) definition, agro-landscape refers to the mass of land with interconnected natural components, elements of agriculture

and land management system, relatively autonomous water, heat and other regimes that are common ecological system features. It presents a natural and economic system of agro-landscape structure [6]. For the efficient use of agricultural land, it is important to create an ecological landscape in areas where the means of production – agro-landscape is available and natural landscapes are primary. It is to be noted that in the study of agro-landscape systems it is possible to comprehend the laws of change of matter and energy, to adapt them to agricultural production, to determine its ecological safety and economic acceptability. In this regard, the main features of agro-landscapes and the main directions of their alteration in the process of human activity were studied by V.A. Kovda (1972), A.I. Kurakova (1976), V.A.Nikolaev (1979), V.M. Chupakhin (1982) and others. . L.I. Kurakova (1976) distinguishes the following types of agro-landscapes: arable, irrigated, pasture and forestry landscapes. The changes that occur in each landscape type are explained by concrete evidence (hydrothermal, physico-mechanical, chemical and other conditions) [5]. A.Abdulkosimov (1966) depicts the landscapes of the oasis as follows: in the deserts of the oasis is a unique landscape complex, formed under the influence of human activity for centuries, covered with trees, shrubs, grasses, irrigated agriculture [2].

According to A.A. Yurtayev (2011), the content and area of agricultural land is determined by the level of specialization and intensity of agriculture. The agro-landscape resources and specialization of agriculture are specific to each region and vary by region [8]. In fact, agricultural production resources combine the following types of resources involved in the cultivation of agricultural products: a) agroclimatic - heat and moisture resources required for crop production or pasture; b) soil-land resources - biomass - soil is also considered as a natural resource and means of production; c) plant nutrient resources - resources of biocenoses that serve as a fodder base for livestock; d) water resources - resources used for irrigation in agriculture and animal husbandry. In addition, it is vital to take into consideration the characteristics of the relief as a natural condition in the organization of agricultural production.

The formation of anthropogenic landscapes and population distribution in the Kashkadarya region are inextricably linked. According to the conducted researches, it can be seen that the most densely populated anthropogenic landscapes are located in Shahrisabz, Yakkabog, Kitab districts, located in the middle high mountains and foothills.

The population of Kashkadarya region is growing from year to year, as can be seen in Figure 1. The population of the province has increased by 600,000 in 10 years, but the level of urbanization is low. This is due to the improvement of socio-economic conditions and well-being in rural areas, as well as high birth rates in rural areas.

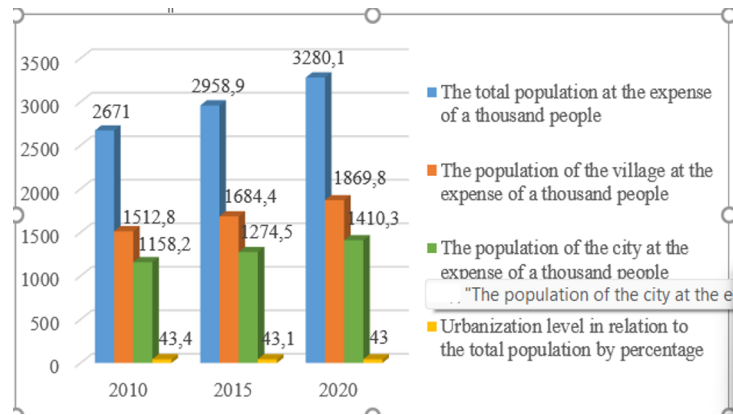


Fig. 1. The population of Kashkadarya region.

The Kashkadarya Basin, located in the center of the southern part of Central Asia, has a mountain-plain relief, and the horizontal and elevation zonal features of landscapes ride on heat and humidity conditions, population characteristics, relief, and man-made lands and other factors.

Landscapes of the Kashkadarya oasis have long been used in human economic activity. Therefore, in a large part of the oasis, especially in its plains, the landscapes have undergone various anthropogenic changes, and the role of anthropogenic factors in their description must be taken into account.

The Kashkadarya oasis has a number of favorable climatic conditions for agricultural production. The geographical location of the Kashkadarya oasis and its surface structure play an important role in the composition of the agro-climate of this region. Experts from Central Asian agroclimatic science L.N. Babushkin and N.A. The Kogays divide the plain part of the Kashkadarya basin into three agro-climatic regions: Lower Kashkadarya, Guzar and Shakhrisabz [3]. As Kashkadarya region is located in both plain and mountainous areas, the group of plain and mountainous agro-climatic regions is separated individually. Underlying this separation is the factor of regional variation of humidity and heat in the plains, and the reason for the distribution of climatic elements in the mountains on the basis of the law of altitude zoning.

In the Kashkadarya oasis, the region's agriculture has been developing in the traditional way since ancient times. Therefore, the largest area in the oasis is occupied by agricultural landscapes – agro-landscapes associated with anthropogenic activities. Analysis of the land fund of Kashkadarya region and structural changes in its composition, identification of their main and priority directions play an important role in the effective use of agro-landscapes and the organization of cultural landscapes (Figure 2).

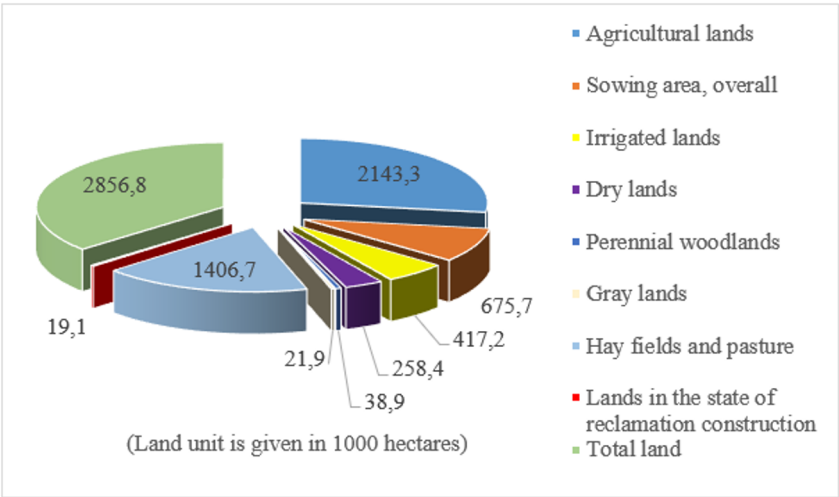


Fig. 2. Kashkadarya region land fund structure of agriculture (as of January 1, 2020).

Kashkadarya region is one of the largest regions of Uzbekistan in terms of land area, with a total land area of 2,856.8 thousand hectares. According to the Statistics Department of Kashkadarya region, as of January 2020, there are 2143.3 thousand hectares of agricultural land in the region, including 109.1 thousand hectares of forests, 35.7 thousand hectares of gardens and vineyards. There are 417.2 thousand hectares of irrigated lands and 253.2 thousand hectares of dry lands. Dry lands are areas where the average annual rainfall exceeds 250 mm, and the cultivation of agricultural crops is carried out only at the expense of precipitation.

The existing land resources of the Kashkadarya oasis allow for large-scale use in arable farming. In Kashkadarya region, the area of arable land is 670.5 thousand hectares or about 23.7% of the total area, of which 253.2 thousand hectares or 9.1% of the total arable land is used for non-irrigated farming.

20.2 thousand hectares or 0.70% of the area of the region are gardens, 9.9 thousand hectares or 0.35% are vineyards, 8.6 thousand hectares or 0.30% are mulberry groves, 1.5 thousand hectares or 0.01 % of the area is seedlings, 21.9 thousand hectares or 0.76% is gray lands, 1406.8 thousand hectares or 49% is pasture. The areas of the region used as pastures are natural-anthropogenic lands that have not undergone profound changes.

All types of anthropogenic landscapes are found in the Kashkadarya oasis. The area is particularly prone to ancient settlements, arable lands and agro-landscapes associated with arable and subsistence farming. Based on the analysis of the above, the following types of agro-landscapes can be distinguished in the Kashkadarya oasis: irrigated landscapes; dry landscapes; gardens and saplings; vineyards; mulberries; gray lands; pastures and other types of landscapes. It is also possible to further subdivide this type of landscape into smaller types depending on the type and purpose of use in agriculture. For example, natural pastures can be divided into mountain, steppe, desert, dry tugai and forest pastures. Landscape of cotton, grain, vegetable growing areas in irrigated areas and so on. The climatic conditions of the semi-desert landscapes are favorable for agriculture and animal husbandry. Areas with mountainous-semi-desert landscapes are used for grain farming. In addition, horticulture, viticulture and meat and dairy farming are also developed here. Landscapes of hills and low mountains are used as pastures and hay fields.

Irrigation is a powerful factor in the intensification of agriculture and the transformation of natural landscapes, which includes a number of complex economic activities: construction, irrigation systems (canals, reservoirs, etc.), land management, irrigation of agricultural lands and settlements, re-cultivation of agricultural crops and so on. As a result, the components of nature (relief, fauna and flora, soil, groundwater, microclimate, etc.) in irrigated lands change significantly. Irrigation of the Karshi desert lands of Kashkadarya region with arid climate leads to re-salinization, swamping, irrigational erosion, subsidence and other negative effects.

According to available data, more than 45% of irrigated lands in the province are currently saline to varying degrees. Expansion of irrigated lands is expanding mainly as a result of re-salinization of irrigated lands in the Karshi desert.

Preliminary studies of the Karshi desert for complex development and preparation for irrigation show that 1.0 mln. 200,000 hectares (20%) of the area were not saline, while the remaining 80% showed that the soils in the area were saline to varying degrees. Strongly saline soils are found in the conical distributions of the Guzardarya and Kashkadarya rivers, in the south-eastern foothills and around the ancient remnant plateaus [1].

The results of the study show that according to the Statistics Department of Kashkadarya region (as of January 1, 2020), the total unsalted area in the region is 54.8%, the total salinity area is 45.2%, of which high salinity area is 1.9%, low salinity area is 35.9% and average salinity area is 7.4%. [10].

From the above data, it can be seen that in Dehkanabad, Kitab, Shahrisabz districts saline soils are not observed due to the fact that these districts are located in a mountainous area, are well supplied with running water and have a significant amount of precipitation. Nishan, Kasan and Mubarek districts of Kashkadarya region, which are desert areas, are the leaders in terms of the abundance of highly saline areas. In Kamashi, Karshi and Guzar districts the salinity is average. Variations in inter-district salinity levels occur depending on soil composition and climatic factors. At the same time, the share of non-saline lands in mountainous and foothill areas not only remains high, but also improves under the influence of reclamation and agro-technical measures. As a result of structural changes in

the country's agriculture, cotton fields have been reduced in the districts located in the upper zone, and grain, hay, horticulture and vegetable crops are now occupying large areas. This shows that the quality of the soil has improved as a result of agro-technical measures, which created the possibility of crop rotation.

Table 1. Soil salinity degree of irrigated land areas of Kashkadarya region (as of January 1, 2020).

No.	Districts	Irrigated area under reclamation control, hectare	Division by salinity (0-100 cm thick) hectare				
			Unsalted	Total saline area	Including		
					Low saline	Average saline	High saline
1	Guzor	34979	12231	22748	17888	4242	618
2	Dekhkono bod	2926	2926	-	-	-	-
3	Karshi	50375	27327	23030	20350	2052	628
4	Koson	73632	26722	46910	36035	8175	2700
5	Kamashi	34844	18601	16243	13143	2480	620
6	Kitob	20282	20282	-	-	-	-
7	Mirishkor	63358	37068	26290	24420	1719	151
8	Muborak	35014	6153	28861	20660	5361	2840
9	Nishon	57235	22610	34625	23940	8851	1834
10	Kasbi	50537	19193	31344	26096	5039	209
11	Chirokchi	30227	27999	2228	2028	200	-
12	Shakhrisabz	26125	26125	-	-	-	-
13	Yakkabog	34598	34568	30	20	10	-
	Overall:	514114	281805	232309	184580	38129	9600
	In percent	100%	54.8%	45.2%	35.9%	7.4%	1.9%

Based on the results of the study, the types of desertification processes in the Kashkadarya oasis were identified (Table 2).

Table 2. Types of desertification process in Kashkadarya region.

No.	Desertification types	Usage	Measures against desertification
I	Sandy deserts with eolian processes	Animal husbandary	Phytomelioration (haloxylon, sugar beet, salsola richteri karez)
II	Loess and salty deserts with advanced deflation processes	Animal husbandary	Phytomelioration and planting of perennial shrubs. Pasture regulation
III	Processes of secondary saline soils	Irrigated farming	Agro-technical measures
IV	The process of soil humidification and dehumidification	Irrigated farming since long time	Use of scientific and technical achievements and natural fertilizers
V	Pre-mountainous plains with advanced erosion processes	Rainfed farming and animal husbandary	Measures against erosion processes (planting perennial shrubs)
VI	Bare mountain slopes with developed water erosion	Animal husbandry and recreation	Terracing of mountain slopes(along river and river basins) and carrying out forest agromelioration

In the Kashkadarya oasis there has been a change of landscapes and the emergence of anthropogenic landscapes associated with various human activities. Radically altered man-made landscapes, seliteb landscapes, aquatic (aqual) landscapes have emerged here. However, their area is much smaller than the area of landscapes occupied by agro-landscapes, and most of them can only be distinguished on large-scale maps.

4 Conclusion

Considering that the natural complex of any place is the basis of rational use of ecological-geographical system with its own order of development, individual features, rational use of available lands in Kashkadarya oasis is of great importance for further development of agriculture and soil fertility. It should be noted that agrolandscapes acquire new social qualities in addition to their natural qualities. It is precisely because of the existence of unique development that only complexes that obey natural laws create anthropogenic landscapes. A map of agro-landscapes and landscape salinity of Kashkadarya region on a scale of 1: 300,000 was created.

The above data allow to identify, forecast the development of negative processes in the agro-landscapes of the Kashkadarya oasis and, if necessary, adapt them to the creation of more extensive and environmentally sustainable agro-ecosystems which is important in obtaining high yields of agricultural crops and forecasting the amount of yield in our country.

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