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Morphological Condition of Irrigated Soils of Gijduvan District of Bukhara Oasis, Salinity Levels and Increase of Their Fertility

HafizaTuymurodovnaArtikova[1], HilolaHamroevnaSalimova[2]

[1]**HafizaTuymurodovnaArtikova,** Candidate of Biological Sciences, Associate Professor of Department of Soil Science of Bukhara State University
[2]**HilolaHamroevnaSalimova,** Lecturer of Department of Soil Science of Bukhara State University

ABSTRACT: The article deals with the morphological structure and condition of irrigated soils of Gijduvan district of Bukhara oasis, salinity of irrigated soils, nutrients in the soil, soil absorption capacity, physical and chemical properties of soil, as well as negative and positive processes in maintaining soil fertility and ecologically clean products. information about

KEYWORDS: landscape, alluvial deposits, agro-irrigation layer, reclamation condition, ancient irrigated meadow-alluvial soils, humus, tillage layer, morphological structure, parent rock, nutrients, absorption capacity, water-soluble salts.

Two billion years before the emergence of life on Earth. more than a year has passed, and the history of plants and soils on earth includes 1-1.5 billion years. covers the time around the year. During this time many different compositions and characteristic landscapes were formed. This landscape is a natural landscape that includes vegetation, soil, surface and groundwater, and soil parent rock.

Biological processes are rapidly taking place in the irrigated soils of the country. Therefore, organic matter decomposes and mineralizes quickly. This leads to a decrease in humus in the soil, loss of structure, deterioration of its physical properties. Crop rotation prevents the above negative indicators.

Moving humus in the soil also depends on the crops planted. Under rice cultivation conditions, it was found that the assimilating form of humus occurs up to the lower layers. The humus status of rice soils depends on the process of alluvialization.

Currently, the low soil fertility of winter wheat fields on some farms, the inability to select a good past crop for winter wheat and the fact that they have been planted in the same field for several years, and other reasons have reduced grain yields by 15-20% [1].

Geomorphology of Gijduvan district

The Republic of Uzbekistan is located in the Turan lowlands in many parts of the country, bordered on the west by the systems of the Tianshan and Pamir Alay Mountains. Therefore, the geomorphological structure of the Republic and the various relief forms here are directly connected with the mountainous and highland regions of Central Asia on the one hand, and the Karakul and Kyzylkum deserts on the other. The area we are monitoring is mainly located on the second route of the Zarafshan River. It occupies the main part of the Gijduvan district and consists of small micro-and macro-reliefs in some places. These relief forms are developed on the left and right banks of the Zarafshan River at a distance of 10-20 mm and have little effect on the division of soils.

The terrain of the district consists of a plain descending to the west. Most of the north is occupied by the Kyzylkum desert. To the north and northeast are the western edges of the Karatag Range. Some parts of this low plain of the Kyzylkum Barkhans on the west side are now mastered. Many

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areas are composed of sands and gravels. These landforms are involved as factors in the soil formation of the farm.

Thus, the studied area encounters low-developed areas on the western sides of irrigated fields, even though barkhans of different heights and shapes are formed. The level of groundwater and their local development are shown above. In the reliefs, their level is located at a depth of 1-2 meters, depending on the development of strongly saline soils. Due to the fact that the total land area of the district under study is flat, the depth of the subsoil is on average 1-3 meters, which leads to the development of ancient irrigated meadow-alluvial soils.

The mineralization action of groundwater averages 3-5g / l. However, in the degraded areas, their mineralization increases to a lesser extent due to poor drainage. It is in these relief forms that the salinization processes of this soil are observed [3,4].

Plants. Climate shows that relief forms develop in different plant species, in different bioclimatic conditions. Therefore, the typical plants of the desert regions of the vegetation cover iloq, arpagon, yaltirbosh, cherkez, karrak, oqpechak, shuvoq, selin, sassiqkovrak, achchiqmiya, sho‘ra, partak, singren, qongirbosh, donashor, oqjangal,yulg‘un, qandim, qorasaksovul.

From the plains developed in the vegetation cover colored wormwood, jasmine, leaf, and others. The change in the relief in the foothills leads to the development of specific meadow-tree vegetation with an increase in precipitation. According to botanists, these plants are semi-savanna plants, which are composed of tall grasses, especially in mountainous areas, such as yarrow, barley, and hawthorn, pistachio, walnut, barberry, and other vegetation.

In the highlands, the flora and fauna of the steppe is rich in vegetation.

On the banks of the rivers of the country - Amudarya, Syrdarya, Zarafshan, Kashkadarya, Surkhandarya, in good places there are willow, poplar, willow and thickets, as well as reeds and other reeds.

Soil-forming parent rocks. The massif area is divided into 2 geographical areas.

1) The middle part of the modern Zarafshan delta.

2) The ancient alluvial-proluvial plain is located in the first geomorphological zone to the fullness of irrigated areas.

These soils consist of a common plain i.e. in some places they are located in areas filled with shallow low humidity. The total thickness of these deposits lies in relatively high areas at 3.7 m and in low humidity at 10-17 m. These deposits are heavy, light, muddy and sandy. Their main feature is that they lie in layers.

The surface of alluvial deposits is covered with agroirrigation deposits, the thickness of which is 0.5-1.5 m.

In some places it may be even thicker.

It is known that the emergence of these deposits is associated with human activity, ie perennial culture.

As mentioned above, these deposits are the same in many places in terms of mechanical composition. They are often salted to varying degrees. In addition, there are signs of swamping in the parent rocks at different depths. This condition is caused by excessive wetting of the parent rock. The parent rocks and the soils formed from them are carbonated and compacted to varying degrees.

Evolution and morphology of grassland-alluvial soils in Gijduvan district. Soil formation, their subsequent evolution, is the product of long and arduous processes. The influence of certain

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factors on a regular basis in the formation of this or that soil type is strong. In particular, the formation of alluvial soils, its complex evolution, and its specific morpholitogenetic structure can be directly linked to the activity of rivers. In particular, the evolution of alluvial soils in the middle reaches of the Zarafshan River is a clear example of this. Meadow-alluvial soils are more common in Gijduvan district and they make up almost a large part of irrigated arable lands. Gijduvan district is located in the north-east of the region, the area of irrigated land is 20032.0 hectares. Geomorphologically, the district is located in the middle reaches of the Zarafshan River. Soil-forming parent rocks are mostly alluvial. The morphological structure of alluvial deposits is slightly more complex: sand, gravel, mud-gravel, gravel-sand, sand-mud, and so on.
Groundwater in the area is mainly 1.5-2.5 m deep. During the growing season, the groundwater level fluctuates over a large range (1-2.5) under the influence of water supplied during the growing season.

Ah (driving) layer is usually 0-30 cm deep, dark in color, slightly grayish, mostly medium and heavy sandy, well aggregated (aggregates are usually coarse-grained), porous, water-resistant, turf and turf birch, the activity of soil animals is much noticeable, no carbonates or other salty compounds are encountered. Beneath this layer is a layer of birch - Aho (under the drive), which is darker in color (probably due to high humidity), heavy sandy, well aggregated, but much denser, with a significant activity of wildlife, does not retain carbonates and other salt compounds. At this point, more attention should be paid to the magnitude of the density of this layer. First, the evolution of this layer is related to human farming activities. Man plows the seed into the ground, so that the top of the soil softens, and the subsoil layer thickens under the influence of driving tools (machines). Then, regardless of the type of crop, irrigation water is given 2-5 times during the entire growing season. As a result of this process, the moving fine particles that come with the irrigation water, or are present in the soil driving layer, move towards the subsurface layer with the capillary water and begin to accumulate here. This process takes a year, ten years, and finally hundreds of years, resulting in the formation of an anthropogenic irrigation dense layer. This layer is rich in humus and other nutrients, and the aggregates are large-grained. There is a V layer that passes after the subsoil, which is sometimes reddish-brown, medium sandy, with well-defined activity of plant roots and soil animals, but without a set of carbonates and other salts, but with rust (redness) and black spots. . The thickness of this layer is 40-60 (80) cm, then it is replaced by a sandy-loamy, sandy-sandy, sandy-gravel alluvial - S layer. The C layer can be melkozyom or large coarse-grained, sandy-loamy in general, depending on the conditions of its formation.
In the Mehnatabad massif of Gijduvan district of Bukhara region, as in a number of other irrigated areas, the intensive increase of agricultural production is achieved through the rational use of land resources, increasing soil fertility, as well as high yields of agricultural crops. At the same time, of course, it is important to take into account the agrochemical properties of the region.
The amount of humus in the soils of the studied area is in most cases 0.28-1.2%. This indicates that these soils are low in humus. The reason for the low content of humus and total nitrogen is explained by the decrease in organic residues, low nitrification ability, which ultimately results in soil salinization.
The amount of humus in the ancient irrigated meadow-alluvial soils was 0.374-0.770%, the amount of humus in the soil layers was 0.7-0.8 in variously distributed plowing and sub-plow layers (0-50cm), their content in the middle and lower layers Ranges from 0.3-0.7%.

The reason for such a change in the amount of humus in the soil layers is the periodic

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accumulation of agroirrigation layer and the different structure of their composition [2]. Because along with the change in the mechanical composition of the agroirrigation layers, the processes of plant root development, rot and humus formation in them take place at different rates. Therefore, the amount of humus in the soil layers varies. On average, humus reserves in ancient irrigated meadow-alluvial soils are 50-70 tons at a depth of 0-30 cm.

Scientists note that in subsequent years, humus and other nutrients in irrigated soils are declining sharply, which leads to a decrease in soil fertility. The bulk of the nutrients are removed by plant biomass and, conversely, the amount returned to the soil or given as artificial fertilizer is significantly lower. As a result, the productivity of irrigated lands is declining, their physical and chemical properties are deteriorating.

The amount of humus in one meter layer of meadow soils of the republic is 70-130 tons. This means that the amount of humus in the drive layer is around one percent. Therefore, increasing soil fertility, especially the development and introduction into production of ways to maintain and increase the amount of humus in it, is one of the important tasks of today's agriculture and brings great efficiency. To do this, it is necessary to pay attention to the use of mineral and local fertilizers in the care of agricultural crops, as well as crop rotation, in addition to other agro-technical measures.

Agrochemical performance of soil is one of the properties that determine its fertility. The amount of humus in the soil is high in the surface layer [5].

Experiments carried out by scientists on meadow-alluvial soils have revealed rapid decomposition of organic matter as a result of leveling the soil and driving the grass layer. In newly irrigated meadow-alluvial soils, humus is more or less spread in a layer of 40 cm, and in the lower layer its amount decreases sharply.

In the soils distributed in the region, carbonates are distributed almost evenly along the soil profile and its content is 8.3-9.1%. This indicates the weak alkalinity of these soils []

It should be noted that the magnitude of the negative impact of fertilizers depends on the norm of fertilizers and the degree of violation of scientific and practical technologies in their use.

Table-1

The amount of total and mobile nutrients in the soils of the Mehnatabad massif of Gijduvan district

Kesma № 1	Depth, cm	General, %			Mobility mg/kg		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O
CH-01	0-28	0,076	0,42	1,20	22,4	20,50	395
	28-53	0,048	0,30	1,09	15,4	12,30	270
	53-116	0,026	0,40	0,90	13,2	8,00	201
	116-206	0,016	0,39	0,80	12,1	8,50	196
CH-02	0-29	0,057	0,30	1,12	21,1	14,30	170
	29-47	0,039	0,25	0,96	19,5	10,70	250
	47-120	0,031	0,20	0,85	17,8	10,10	210
	120-178	0,022	0,12	0,72	12,4	9,90	105

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The above data show that if the agrochemical properties of the soil are taken into account, the amount of total nitrogen is high in the stratum and the amount of low-grade is not low. The content of nitrogen in the topsoil was 0.057-0.076%, while in the lower strata it did not decrease to 0.016%. In addition, the amount of mobile phosphorus was observed in these soils with a total phosphorus content of 0.12-0.42%. The amount of mobile phosphorus in the cross section of the section SH-01 is 20.50, in the section SH-02 - 14.30 mg / kg, the amount of low phosphorus is 9.90 mg / kg. This indicates the presence of mobile phosphorus in the soil. There is no need to think deeply about the issue of mobile phosphorus. This is due to the fact that the same situation was observed in all soils, ie before the introduction of mobile phosphorus, during the mowing and at the end of the growing season. It is true that during the cotton growing season the amount of mobile phosphorus in the soil increases slightly, but it is not enough to increase the soil supply. Therefore, the amount of phosphorus fertilizers applied to all soils in Bukhara region is high.

There is no clear direction in the change of the amount of mobile potassium in the soil during the growing season. Such soils can be caused by a certain increase in the amount of phosphorus in the soil.

The amount of nitrate nitases is rapidly changing. In the study, the amount of water in the topsoil did not fall to 21.1-22.4 mg / kg in the upper layers, and 12.1 mg / kg in the lower layers.

The amount of alkalinity in the soil is on average 0.80-1.0%. The amount of mobile potassium is not distributed in the soil profile profile. In some cases, a decrease in the amount of low-grade is observed.

Experiments on the dynamics of soil nutrients in the soil showed that at the end of the cotton vegetation, N-NO3 was preserved in the amount of 75.9 mg / kg in the top layer and 50.1 mg / kg in the bottom layer. At the end of the growing season, the soil is well supplied with mobile nitrogen.

During the mowing period of the cotton plant, the amount of N-NO3 increases to 81.3 mg-kg in the topsoil and 55.0 mgg kg below the topsoil. At the end of the growing season, the amount of N-NO3 decreased to 45.7 and 39.2 mg-kg, respectively, in the layers. However, this amount was about 3 times more than before planting. Hence, an increase in mobile nitrogen can be seen.

The remaining soils of Bukhara region are already provided with low and medium levels, during the lambing period these levels rise to medium and high levels, and at the end of the growing season such levels are maintained. These data lead to the following conclusion: in soils with high nitrogen content at the end of the growing season, nitrogen decreases slightly, in low-nitrogen soils, nitrogen increases slightly [13,15,16].

In the irrigated meadow soils of Gijduvan district, the cotton plant increases sharply during the mating season and remains in the same condition at the end of the growing season. The amount of mobile potassium in the soils of the remaining districts is either slightly increased or unchanged. Such a change can be explained by the fact that the potassium fertilizer is given a waterfall.

Significant activity in changes in the number of microorganisms living in these soils is observed in the summer and early autumn months compared to spring. This can be explained by the improvement of hydrothermal (temperature, humidity) conditions for the growth of microorganisms in summer and early autumn, good aeration as a result of repeated processing, growth and development of cotton plants and increased separation from their roots, as well as the

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presence of small dead roots in soils.

In the group composition of the microflora using organic nitrogen, in the stratum and subgrade strata, in terms of total and relative amounts for all seasons, bacteria make up the majority, followed by actinomycetes and fungi. In their growth dynamics, mainly bacteria develop in the spring (more than 90% of the total number of microflora). In summer, the number of bacteria in the soil decreases compared to spring, while the number of actinomycetes and fungi increases. By autumn, the ratio of groups of microorganisms will change again. The number of bacteria and fungi reaches a maximum, while the number of actinomycetes decreases.

It was found that changes in the amount of trace elements in the soils of Bukhara region are due to certain factors. Due to the lack of mineral micronutrients, the main effect is shown by organic fertilizers, irrigation system, cultivated plant varieties.

In irrigated grassland soils, the mobile amount of copper micronutrient decreased at the end of the cotton plant vegetation period. In all other soils, its amount increased slightly at the end of the growing season. The amount of mobile zinc trace element in the soil also increases slightly in the fall.

The amount of these two micronutrients in mobile form increased under the influence of given organic fertilizers, liquid from the growing plant root, irrigation water, etc., so that it could naturally satisfy both the growing cotton and increase the amount in the soil. In the case of manganese and boron micronutrients, their content in the soil before sowing decreases towards the end of the cotton plant vegetation. Hence, there were factors that increased the mobility of manganese and boron in larger quantities.

Among the properties of the soil, its absorption capacity plays an important role. Because according to its quantity, it is possible to have information about the processes taking place in the soil. Depending on the nature of the absorbed cations, the physical, chemical and biological properties of the soil vary. The physical properties of soils saturated with calcium cation are good, while those saturated with sodium are much worse. The reaction of the soil solution also depends on the cations absorbed. The higher the absorption capacity of the soil, the higher the fertility of these soils can be considered. Table 2 provides information on the absorption capacity.

Table-2

Absorption capacity of soils of Mehnatabad massif of Gijduvan district

№	Depth, cm	Mg / eq per 100 g of soil				Accumulated ratio	Accumulatedratio			
		Ca^{++}	Mg^{++}	K^{+}	Na^{+}		Ca^{++}	Mg^{++}	K^{+}	Na^{+}
CH-01	0-30	4,77	2,12	0,38	0,21	7,48	64,1	28,1	5,28	2,60
	31-55	4,72	2,12	0,36	0,25	7,45	63,4	28,2	5,01	3,30
CH-02	0-28	4,70	2,16	0,35	0,23	7,40	63,5	28,0	4,90	3,05
	29-51	4,65	2,18	0,33	0,11	7,30	63,9	29,7	4,68	1,45

The data in Table 2 show that the magnitude of the absorption capacity of the soil is high

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in the upper layers, ranging from 7.45–7.48 mg / eq. The share of calcium and magnesium in the absorption capacity is 91.2-91.6%. Calcium predominates in the soil absorption complex and its content is 4.65-4.77 mg / eq. Its percentage is 63.4-64.1%. The amount of absorbed potassium and sodium is 0.46-0.61 mg-eq, and their share is 7.4-8.3% of the absorbed capacity. The amount of calcium absorbed in the lower layers of the soil and its share in the absorption capacity decreases. An increase in the amount of magnesium and sodium absorbed can be observed in studies conducted in recent years. This leads to the formation of a shortening process [6].

Especially in recent years, the lack of calcium-containing fertilizers, the constant washing of soils, the leaching of calcium compounds along with water-soluble salts, the fact that cotton grown on these soils takes a lot of calcium throughout the growing season and increases the amount of magnesium in such soils. shows. All this leads to a structural change in the soil absorption complex in irrigated soils, resulting in a decrease in calcium.

At the same time, it is important to observe changes in Ca and Mg in soil composition. It is known that calcium is present in aqueous absorption in the form of calcium nitrate, bicarbonate and a certain amount of monophosphates. The action of soil organic matter and the composition of the soil absorption complex depend on the abundance or deficiency of water-soluble calcium.

According to the results of the analysis of aqueous absorption to determine the level of salinity of soils, in the soils of the Mehnatabad massif unsalted soils increased by 262.9 (19.5%), weakly saline soils by 734.7 (54.5%), medium saline soils by 267.4 (19.8%), strongly saline soils 64.5 ha (4.8%), very strongly saline soils 19.8 ha (1.5%) and total saline soils 10862.2 ha (80.5%). found to consist mainly of weak and moderately saline soils.

According to experts, among the weak and moderately saline soils of some areas there are 15-20, in some cases up to 50% saline spots. Due to the fact that the existing collector-drainage networks are in poor technical condition, lacking in some places, the saline spots are gradually widening, leading to mass salinization of arable lands and, ultimately, the withdrawal of some from agriculture.

The groundwater level is mainly 70-200 cm during the growing season of plants. At the end of the growing season, they are located at a depth of 2.5-3.0 m, in both cases much higher than the "critical" depth, their mineralization averages 5-10 g / l and is active in soil formation, including salinization. participates [7,8,10,14].

In the conditions of Gijduvan district the reclamation condition of the soil as a result of long-term irrigation from mineralized waters was studied. It was found that the increase in chlorine ion and dry residue in the soil depends on the level of mineralization of the water and the irrigation norm.

The following are the results of the aqueous absorption analysis of the soil.

Table-3

Aqueous absorption analysis of soils of Mehnatabad massif of Gijduvan district

Kesma №	Depth, cm	Dryresidue,	Generalalkalinity,	Cl, %	SO_4, %
CH-01	0-28	0,60	0,031	0,015	0,221

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	29-53	0,49	0,055	0,055	0,340
	54-116	0,61	0,072	0,020	0,495
	117-206	1,10	0,035	0,032	0,526
CH-02	0-29	1,20	0,025	0,077	0,840
	30-47	1,40	0,021	0,037	0,912
	48-120	0,80	0,014	0,035	0,663
	121-178	1,08	0,022	0,040	0,405

From the data in the table above, it is clear that the soil is moderately saline. The amount of dry matter in the CH-01 section is around 0.60%. The amount of dry matter has been declining, increasing to 1.10% in the lower strata. In the lower layers of the soil, the amount of water is 0.66%. The total alkalinity is 0.025-0.031% in the stratum, and up to 0.072% in the 54-116 cm layer of the CH-01 section. This area is characterized by a weak soil environment [17].

The amount of chlorine in the topsoil is 0.015-0.077%. The amount of chlorine in the other layers of the soil is not uniform. Chlorides are very mobile in the anions of known salts, the amount of which varies rapidly in the soil profile. The amount of sulphates in the aquifer depends on the amount of dry residue in the soil. This, of course, does not meet the requirements of today. Desalination of irrigated lands as much as possible, less labor, more income, saline washing to dramatically increase the yield of each crop, its water content and transfer times depending on the degree of salinity, taking into account the amount of available salts remain a necessary requirement today.

The amount of gypsum relative to dry weight in the tested soils ranges from a few percent to 30-40 percent, and in some layers to 60-70 percent. In most cases, its amount decreases from top to bottom, and the maximum amount is found in dense, gypsum layers.

The agrochemical properties of the soil are directly related to the duration of irrigation of the soil, the level of agronomic practices, and most importantly, the level of salinity of the soil.

Table-4

Agrochemical indicators of soils of Mehnatabad massif of Gijduvan district

Kesma №	Depth, cm	Gumus %	SO_4gips, %	CO_2 carbonats, %
CH-01	0-28	1,12	0,172	9,15
	28-53	0,72	0,200	8,53
	53-116	0,55	0,192	9,13
	116-206	0,35	0,155	9,15
CH-02	0-29	0,94	0,173	9,13
	29-47	0,66	0,164	9,11
	47-120	0,50	0,091	9,10
	120-178	0,32	0,022	9,31

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The amount of humus in the soil is higher than in the studied section, and this figure is 0.94-1.12%. In the subsurface layer, the content of lowgatomones decreased by 0.66-0.72% to 0.32% [9,11,12]

Studies have shown that when cotton is grown for many years and the amount of mineral fertilizers and pesticides is exceeded, the soil contains a large amount of N, P, K nutrients, but the mineral (especially nitrogenous) fertilizers are removed by microorganisms. Of course, this situation affects the fertility of the soil. The reason for the decline in soil fertility is the deterioration of its ecological condition.

Conclusion. In the implementation of economic reforms in a developing society, it is advisable to update the soil-assessment, reclamation maps and agrochemical maps for farmers, ie long-term users of irrigated lands, every 5 years. This will be the basis for the ability to constantly monitor the activities of users, the level of productivity and the condition of the land.

One of the important measures in maintaining and protecting soil fertility is the organization of passportization and certification of soils. It serves to increase crop yields, maintain soil fertility and control the negative and positive processes in the soil to obtain ecologically clean products from plants, and allows to control the activities of land users, to take the necessary measures. The Mehnatabad massif of Gijduvan district shows a low content of humus and nitrogen in the irrigated soils, which is related to the salinity of these soils. The amount of humus in the soil is around 0.28-1.2 percent. The studied area consists mainly of unsalted, weak and moderately saline soils. Farm soils belong to the group low in phosphorus and moderate in potassium.

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