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SOILS OF THE DRIED PART OF THE ARAL SEA AND PROBLEMS OF DESERTIFICATION

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***ABSTRACT**--This article deals with the specific soil formation conditions of the dried part of the Aral Sea, as well as the agrochemical and other properties of semi-automorphic, semi-hydromorphic coastal solonchaks and desert-sandy soils.*

***Keywords**-- Aral Sea, solonchaks, soil, mineralization, automorphic, hydromorphic, groundwater, texture, fraction, deflation.*

I. INTRODUCTION

Specific soil formation conditions prevailing on the dried bottom of the Aral Sea predetermined the isolation of a special subtype of salt marshes – coastal ones. They are divided into automorphic, hydromorphic and transitional. In addition to coastal salt marshes, desert sandy soils and sands have developed here. Many of these soils form complexes and combinations, reflecting the diversity of the soil cover of the dried up seabed.

Primorye salt marshes are semi-automorphic - these soils develop under conditions of weakened soil moisture, resulting from a decrease in groundwater levels due to continued drying of the Aral Sea. Due to the decrease in the groundwater level to 3-3.5 m, the semi-hydromorphic conditions of soil formation were replaced by semi-automorphic ones. Mineralization of groundwater ranges from 19 to 72 g / l, that is, from mineralized to brines. The type of mineralization is chloride and sulfate-chloride magnesium-sodium. On the dried bottom of the Aral Sea, semi-automorphic coastal salt marshes are distributed mainly in the peripheral parts of the forewell and in the relict coastal zone. The bottom surface here is flat, sometimes micro-lumpy, and in areas subject to wind erosion, with small sandy tubercles. Plant cover - rare dried or vegetative hodgepodge, sometimes young tamarisks. There are many seashells on the surface of the soil. Semi-automorphic coastal salt marshes are subdivided into cortical, cortical-puffy and puffy.

II. LITERATURE REVIEW

The study of the irrigated soils of the Aral Sea region, the study of their agrochemical, physico-chemical, biological and other properties, land reclamation, soil evolution, their humus state, soil quality assessment, conservation, restoration and improvement of their fertility were carried out by many domestic and foreign scientists. Such as L. T. Tursunov [3], V. G. Popov [3], N.V. Kimberg[1], R.K. Kuziev [2], M.M. Tashkuziev, S. Abdullaev, R. Kurvantaev, V.E.Sektimenko [2, 3,4, 5], N.Yu. Abdurakhmonov[12], A.Zh. Ismonov [8], A.U. Akhmedov[12], B.R.Ramazonov [10, 11, 12, 13, 14], T.M.Tairov [9], V.M.Borovskiy [7], B.Zollybekov [6], and

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others. However, information about The changes that have occurred in the soil cover of the Aral Sea region, under the influence of desertification, are currently insufficient. Scientific studies to determine changes in soil properties due to drought and desertification processes resulting from global climate change and the drying up of the sea, as well as to prevent or mitigate the negative processes occurring in the soil cover, have not been carried out adequately.

III. THEORY AND METHODOLOGY

The profile of semi-automorphic coastal salt marshes is very heterogeneous. The upper half-meter layer of soil is composed mainly of loamy-clay deposits, sometimes from the surface overlain by a thin layer of light loam, sandy loam or sand. Heavy deposits are characterized by a profile below 1.5-2 m. The middle part of the profile is represented by a layered complex of light loam and sandy loam with interlayers of heavy loam and clay. In the relict coastal zone adjacent to the alluvial plains and remnant hills, the upper horizons of the soil are often sandy-sandy. The granulometric composition of semi-automorphic solonchaks is characterized by the predominance of coarse dust fractions in lightened horizons and finely dusty fractions in clay ones. The salt content in salt marshes is very diverse, but their maximum in the cortical and subcortical layers is from 7.8 to 20.6%. With depth, the salt content decreases and ranges from 0.2-0.4 to 1.0-3.1%. The distribution of salts along the profile shows a correlation dependence on the mechanical composition of genetic horizons.

Table 1: The results of chemical analyzes of semi-automorphic coastal salt marshes,%

Depth, cm	Solids	Total alkalinity in HCO_3	Cl	SO_4	Physical clay content	CO_2 carbonates	SO_4 gypsum
Salt marshes crusty-chubby							
0-1,5	10,5	0,009	4,46	1,73	24,7	9,5	4,79
1,5-7	5,0	0,009	1,95	0,92	46,8	10,7	2,63
7-25	3,1	0,012	1,22	0,58	64,1	11,3	1,24
25-53	1,5	0,015	0,54	0,37	70,5	11,1	1,05
53-62	0,5	0,018	0,13	0,15	27,8	8,5	4,30
62-71	0,2	0,018	0,06	0,09	14,8	9,4	0,36
71-87	0,5	0,018	0,16	0,14	55,7	9,4	0,45
87-111	0,4	0,021	0,14	0,11	30,0	9,0	0,24
111-140	0,3	0,015	0,11	0,09	16,8	9,1	0,29
200-250	0,8	0,018	0,26	0,22	74,7	9,1	0,42

300-350	1,0	0,015	0,35	0,26	71,8	9,1	0,43
400-450	1,3	0,012	0,48	0,35	61,7	9,6	0,55
Salt marsh							
0-6	1,1	0,028	0,14	0,54	7,0	Not determined	
6-14	3,3	0,009	1,17	0,88	75,2		
14-32	2,1	0,015	0,83	0,52	66,6		
32-40	1,4	0,015	0,55	0,28	51,4		
40-52	0,2	0,021	0,04	0,07	2,3		
71-88	1,7	0,015	0,43	0,70	76,3		
119-150	0,7	0,021	0,24	0,22	11,4		
170-200	0,6	0,015	0,20	0,43	8,9		
225-235	1,0	0,009	0,22		34,7		

The type of salinization of the soil profile according to the anions is sulfate-chloride and chloride-sulfate; in the upper horizons, it is predominantly chloride, according to cations sodium, less often calcium-sodium and sodium-calcium.

Primorye salt marshes are semi-hydromorphic — they form when groundwater occurs at a depth of 2-3.5 m, under conditions of somewhat weakened feeding by ascending capillary currents. Groundwater mineralization is 21-49 g / l, the type of mineralization is mainly chloride, rarely sulfate-chloride, magnesium-sodium.

The surface of semi-hydromorphic solonchaks is flat, micro-tuberous-lumpy, in the predominant area covered with rugged grass stock of vaults and quinoa, bare in areas. There are a lot of drying cracks that are partially filled with foreign material. Often, especially along half-filled cracks, whitish efflorescences of salts form. Sometimes there are whitewashed white spots of salts that are easily deflated. Soils are also subject to wind erosion, where the upper horizons are represented by sandy loam and sand. In some places where the seabed is composed of light-weighted rocks or is covered by sands from above, tamarisks, saxaul and often dense cover of quinoa self-overgrow soils simultaneously with deflation processes. Tamarisk-reed thickets are formed at the places where waste water penetrates, which reliably protects the soil surface from wind erosion.

Semi hydromorphic solonchaks form on deposits of various mechanical composition, often have a very layered profile, sometimes of mixed alluvial-marine origin. In sharply stratified soil, clay-loamy interlayers are randomly interspersed with sandy, sandy and light loamy soils. Sometimes in the upper 1-2 meter thickness, a predominance of lighter deposits is noted, and below - heavy loam and clay. The surface of semi-hydromorphic salt marshes with a heavy mechanical composition is often covered with a 5-10 cm layer of light loam, sandy loam or sand. Sometimes the entire profile of these salt marshes is formed by sandy-sandy deposits with interlayers of loam and clay.

Desert sandy soils - formed on bumpy flat sand, can be attributed to automorphic soils. They are widespread in the contact zone of the former sea and land - in the southern parts of the former Gulf of Adzhibay and Akkala - the Uzunkai massif, where groundwater lies beyond 5 m. Here, fixed sand formations alternate with deep foci of deflation. In places, sandy deposits are demolished to clay horizons. The surface of sandy soils in large areas is covered with vegetation consisting of individual tamarisks 1-2 m high, tamarisk young thickets, saltwort and vaults. The soil profile in the upper part is radicular. The maximum number of roots is located under the inspired sand in the horizon from 3-5 to 15-20 cm, forming a loose turf. The total penetration of living or already dead roots can be traced to a depth of 1.5-2 m. The mechanical composition of the soil is sandy, less often sandy loam from different depths, depending on the thickness of the sandy deposits, lined with clays or heavy and medium loams. In the sandy-sandy horizons, finely sandy and coarse dust fractions prevail. In clay-loamy deposits, the content of finely dusty and silty fractions significantly increases.

Desert-sandy soils have a very high water permeability and very low water-lifting capacity, which rejects the entry of salts during deep occurrence of groundwater in the upper horizons of the profile. An exception is only the uppermost, although also sandy, horizon, where the salt content reaches 1%. The accumulation of salts in it occurs mainly due to the aeolian and nutrient input, since it is now fixed by vegetation and is weakly fluttering. In contrast to the upper sandy horizons, loamy - clayey interlayers contain a large amount of water-soluble salts (0.7-2.0%). The maximum salt is usually located at a depth of 4-4.5 m, i.e. in the zone of influence of the current level of mineralized groundwater.

The type of salinization of the upper sandy-sandy horizons by anions is mainly chloride-sulfate and sulfate, and the underlying loamy-clay deposits are sulfate-chloride, less often chloride and chloride-sulfate, according to sodium cations. The formation of a sod horizon and the radicular profile are signs of the formation of desert sandy soils on the sandy deposits of the dried bottom of the Aral Sea. These soils go through the initial stage of their development. They still lack such a characteristic feature of fully developed desert sandy soils as the presence in the profile of a compacted illuvial horizon saturated with silty microparticles and carbonate neoplasms. Due to the youth of these soils and very light mechanical composition. The humus content here is very low - 0.3-0.5% in the upper horizon enriched with plant litter and 0.2% in the sandy profile. In the heavy loamy layer, which used to be the former avanthelt surface, the amount of humus increases to 0.6%. There is little nitrogen in the soil - 0.02-0.03%. Soils are also poor in gross mobile forms of phosphorus - 0.10-0.11% and 5-16 mg / kg of soil, respectively. There is little gross potassium (1.87-2.17%) in soils and very few mobile forms (160-259 mg / kg) of soil (table 2).

Table2.: Results of agrochemical analyzes of desert sandy soils

Depth, cm	Humus, %	Nitrogen	P_2O_5		K_2O	
			gross, %	mobile, мг/кг	gross, %	mobile, мг/кг
0-3	0,5	0,03	0,11	16	2,17	259
3-16	0,2	0,02	0,11	5	1,93	174

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16-28	0,2	0,02	0,11	5	1,93	160
28-55	0,2	0,02	0,10		1,87	
55-87	0,6					

The carbonate content is high - from 8,5% in sandy horizons to 10% in heavy loam and clay. Their distribution along the profile is uniform with a small accumulation in the surface horizon and in clay-loam deposits. The gypsum content in desert sandy soils is low (0,17-0,59% SO4). It is slightly larger only in the upper saline horizon (4,5%) and at a depth of 4-4,5 m in the dispersion zone of the capillary rim.

Primorye hydromorphic salt marshes - these salt marshes are located in a wide strip along the modern coast of the sea, as well as near bulk reservoirs, in bottom depressions and around numerous filtration and residual shallow lakes. According to soil classification, the type of hydromorphic salt marshes is subdivided into several subtypes: typical, meadow, marsh, soric and others. But this soil nomenclature is designed for a hydromorphic soil-solonchak series that forms under ordinary conditions, when the predecessors are soils developed under the influence of continental factors of soil formation. And it cannot be applied without certain transformation to the soils of the dried bottom of the Aral Sea.

The drying out of the Aral Sea, accompanied by a decrease in the level of ground water in some parts of the dried bottom, leads both to the extinction of the solonchak process and to the drying of soil. Intensive deflation of silty-sandy-soft-sandy material composing soils begins. Although these salt marshes contain less salt than loamy clay, they nevertheless become a powerful source of salt and dust removal, since they are easier and deeper processed by the wind. The result of such processing and transfer of sand material initially was the formation of an aeolian erosion-accumulative relief along the entire perimeter of the relict seaside. And over time, following the drying of the bottom, such a phenomenon spreads deep into the Aral basin.

Today in the world, the desertification process covers 36-40 percent of the continent's surface and its further growth can be connected on the Rifit plume in Africa, Chad, the Atacama desert in North and South America, in the great basin of the West, in Asia, the disappearance or intensive reduction of Chan, Balkhash, Aral. On June 17, 1994, a convention was adopted in Paris in order to mitigate the impact of the desertification process and to seek their resolution. Improving the properties and characteristics of low-fertile soils subject to degradation and desertification, their reclamation state, as well as effective use is one of the urgent tasks.

IV. DISCUSSION

The main objective of the study is to establish the transformation of the soil cover of the Aral Sea region under conditions of climate change, to determine changes in the properties and characteristics of common soils, as well as to develop a set of measures aimed at eliminating the negative processes occurring in them. The objective of the research is a comprehensive study of the soil supporting properties selected in the Aral Sea region, the establishment of a modern reclamation state, agrochemical, agrophysical soil properties; compilation of soil maps of selected farms with a scale of 1: 10000, agrochemical cartograms, and on their basis, development of recommendations for restoring soil fertility; study of the features of soil cover transformation due to a sharp change in soil formation processes, under the influence of the drying of the Aral Sea in the ancient and old "living" Amu

Darya delta; determination of changes, including negative ones, resulting from desertification of the territory by comparing research results with data from previous studies; development of a set of measures aimed at preventing and mitigating the negative processes occurring in the soil cover as a result of desertification caused by climate change over the past 60-70 years and improper redistribution of water reserves in the Aral Sea region. The object of the study is irrigated meadow-alluvial, meadow-takyr, takyr-meadow and gray-brown fallow, takyr, desert-sand, solonchak, residual-bog and coastal semi-hydromorphic solonchak soils widespread in the Aral Sea region.

The scientific novelty of our research in the Aral Sea region is as follows: it has been established that due to global climate change in the last 60-70 years, redistribution of water reserves, increased anthropogenic load, desertification of the Aral Sea soil cover and changes in the soil cover are manifested; features of soil cover transformation as a result of a sharp change in soil formation processes in the ancient and “living” river deltas were established; compiled large-scale soil maps of irrigated and virgin areas of typical farms and determined salinization of soils, their supply with nutrients; it was found that in the Aral Sea region under the influence of desertification, the hydromorphic soil formation regime changed to automorphic and the areas of gray-brown, takyr, desert-sand and solonchak soils corresponding to the desert zone increased proportionally; Based on the determination of the negative processes occurring in the soil cover of the Aral Sea region, scientific recommendations have been developed aimed at preventing or mitigating these processes. The scientific significance of the research results is explained by the determination of the properties of manifestation of desertification processes in the Aral soil soil cover and changes in the soil cover due to global climate change in the last 60-70 years, the redistribution of water reserves, the disclosure of soil cover transformation as a result of a sharp change in soil formation processes in ancient and living "river deltas, the establishment of a transition from hydromorphic to automorphic, under the influence of desertification, and in proportion to its increase in area EPO-brown, takyr, desert-sandy and saline soils corresponding to the desert zone. The practical significance of the research results lies in the fact that we developed recommendations to improve soil fertility and productivity, prevent salinization and other degradation processes, compiled soil maps and agrochemical cartograms of a scale of 1: 10,000 providing irrigated areas of typical farms with mobile phosphorus and exchange potassium, these measures serve to preserve, restore, increase soil fertility, obtain high crop yields and rational use of land eh.

In this article we are talking about the soil cover of the Aral Sea region and the state of its study in connection with the drying processes of the Aral Sea, the soil and the history of the study of the soil cover of the territory are given. Literary information on the research on the topic of the dissertation in the republic is also given. The results of scientific research carried out in the framework of domestic and foreign projects on drying the Aral Sea and mitigation of its influence are also described in detail, the need for scientific research to study the current state of the soil in the territory and to develop solutions aimed at mitigating the effect of desertification on them is substantiated.

The studies were conducted under conditions of irrigated meadow-alluvial, meadow-takyr, takyr-meadow, as well as gray-brown, takyr, takyr, desert-sand, residual-meadow, salt marshes, residual-bog soils and semi-hydromorphic coastal areas salt marshes, soil-field research and cameral-analytical work were carried out on the basis of generally accepted methods developed at the Research Institute of Soil Science and Agrochemistry, as well as "Instructions for soil and investigations and compilation of soil maps for maintaining the State Land Cadastre ”(2005).

The Quaternary, Tertiary, Paleozoic, and Cretaceous deposits participate in the geological structure of the Aral Sea delta, the last three also make up the root bed of the delta. The relief of the root bed is characterized by the presence of depressions up to 84 m below sea level and individual ledges up to 145 m high. The depressions are filled with the latest Quaternary delta deposits of the Amu Darya. The protrusions appear in the form of hills among a flat alluvial plain. On the surface of the delta, ancient deposits are represented in the form of numerous remnants. Paleozoic remnants are located in the south and southeast - Kubetau, Dzhimirtau and Sultanuizdag; Cretaceous - along the modern channel of the Amu Darya - Parlytau, Krantau, Kyzyldzhar, Takmataka and others; tertiary - in the northeast of the delta - Kushkanatau and Beltau. Throughout the Quaternary period, the ancient rocks that participated in the geological structure of the Aral Sea region were overlain by various rocks, the accumulation of which continued to the present. Moreover, alluvial or deltaic deposits, covering vast areas in the lower reaches of the Amu Darya, were of the greatest importance. The modern-Aral or former "living" Amu Darya delta was formed as a result of the accumulative activity of the Amu Darya river. As a result of the fact that diverse hydrodynamic ulsia are created in channels, channels, lakes and swamps, a huge mass of suspended material, deposited, formed a modern delta plain, which is characterized by oblique stratification, variegation, and a rapid change in lithological differences both in horizontal and vertical sections .

The Amu Darya, breaking into the Aral-Sarykakmish depression in the Upper Quaternary, consistently formed a series of deltas. The most ancient of them are Prisarykamish and Akhchadarya; somewhat younger than the old Aral Sea and the youngest - the modern Aral Sea, formed until recently by the channels Akdarya, Kunyadarya, Kazakdarya, Kipchakdarya, Taldykdarya and others.

Based on the research of I.N. Feliciant (1953, 1957) and G.F. Tetyukhin V.G. Popov, V.E.Sektimenko, A.A. Tursunov come to such a conclusion that eight geomorphological regions stand out in the Amu Darya delta:

1. The ancient part of the modern delta;
2. The old part of the modern delta;
3. the dissected elevated surface of the modern delta (paleorusel zone);
4. flat elevated surface of the modern delta;
5. the flat surface of the "slopes" with the broad bottoms of the former lakes of the modern delta;
6. lake-floodplain surface of the modern delta;
7. The coastal part of the modern delta with elements of aeolian processing;
8. anticlinal plateau-like and erosion-dissected uplands (Muinok, Kushkhanatau, KyzyldzharPeninsula) with a torn cover of ridged-tuberous sands.

The most ancient relief is the first and second areas in the southwestern and southeastern parts, south of Lake Sudochye and the Tugyz-Ture reserve. As a result of drying and desertification, a complex erosion-accumulative relief was formed here with tuberous forms of loose in semi-fixed sands, large foci of deflation, powerful drying cracks, karst-suffusion funnels and salt marshes. The third geomorphological region, which occupied an elevated shallow-walled plain, sometimes has a relatively high dissection by the paleo-Rus system according to their level, which corresponds to a high ancient delta and is composed of rocks of the channel and river bed facies. The main part of the modern Amu Darya delta belongs to the fourth and fifth geomorphological regions. This is a significant part of the channel and river channel parts of Akdarya, the Shegekul and Maypost tracts, and the tugai complexes along Kunyadarya and Kazakdarya. Here, sediments of the riverbed and lake facies alternate mainly. Within the former "living" delta, the sixth region of the lake-floodplain surface is relatively clearly distinguished. Its western part was relatively less subjected to drying and, at present, some lakes, as well as reed cultivated hayfields irrigated by waste waters, have been preserved here in places. In the rest of the territory, on the site of dried lakes, solonchak surfaces arise, sometimes weakly overgrowing with tamarisk. Reed thickets, dying, leave on the surface a mass of kupaks and rhizomes.

The spatial variability of the lithological structure of the soil of the lake-floodplain surface of the delta is associated here with a large interweaving of various facies of sedimentation. The coastal part of the modern (seventh region) delta is a contact zone, where in the past an unstable equilibrium was maintained between the avandelta, the "living" delta and the aeolian plain, shifting towards an increase in the proportion of mobile sand and solonchaks

The geological and geomorphological conditions of the Aral Sea region are quite homogeneous. The soils are represented by alluvial deposits of different age deltas of the Amu Darya. The oldest of them are Daudan-Daryalykskaya on the left bank of the Amu Darya and Akhchadarya on the right bank. In the upper part of the Daudan-Daryalyk delta, the Khorezm oasis is located. The lower, northern part of the Kunyadarya plain is currently deserted, in the past it was also largely irrigated and salted.

Deposits of the Akhchadarya delta, identical in age to the Daudansky, occupy significant areas to the north and north-east of the Amu Darya in the region of Turtkul oasis. Here, the area of irrigated land is much smaller than on the left bank. The area of former agriculture is also more limited in area.

The Lower Amu Darya District is characterized by large areas of highly cultivated meadow-oasis soils. Their main massifs are located in the Khorezm-Turtkul oasis. Alluvium here is blocked by powerful agro-irrigation sediments, which are both soil and parent rock. They are distinguished by a favorable mechanical composition and, as a rule, are washed from salts.

At the same time, human influence on soil formation processes is multifaceted and diverse. Deforestation, hayfields, animal husbandry, plowing and cultivating land, irrigation, applying various fertilizers and chemicals to the soil, together with the drying of the Aral Sea and desertification, led to a sharp reduction in biogeocenoses and plant formation, and in some cases to the extinction of the latter, also to the extinction of tugai forests. In order to prevent the movement of sand and salts from the Aral Sea on 500 thousand hectares of land, large-scale work is underway to cut furrows to plant forests (saxaul), and so far saxaul has been planted on an area of 389 thousand hectares of dried bottom of the Aral Sea. The discovery of fresh water at a depth of 280-300 meters 200 km from the city of Muynaka, around the island of BorsaKelmes, will lead to an increase in biodiversity and an improvement in the ecological condition of the region.

In the Aral Sea region, hydromorphic and automorphic soils are common. Automorphic soils are widespread in the Aral Sea region and the signs of their soil formation are related to the lithological structure, topography and age of the terrain, the microclimate characteristic of each type of soil, hydrothermal regime, the chemical environment in the process of soil formation and other complex soil characteristics. In the massifs of Zhanadarya and Mulk of the Takhtakupir district, gray-brown, takyr, desert-sand and solonchak soils are widespread.

When studying the genetic horizons of gray-brown soils, it was observed that their profile consists of layered, porous cortical layers, clay and compacted, with humus content in the subcrustal layer, insignificant thickness of soil horizons, and an increase in secondary carbonates formed under the influence of biological factors in the upper soil horizons. Accumulation of gypsum in subsoil horizons, and a predisposition to shale and the formation of salt marshes under the influence of dry climate. The surface of the soil is covered with a light gray crust with a thickness of 1-3 cm, under it there is a light brown horizon, finely layered, with a friable structure, the thickness of which is 10-12 cm. A powerful gypsum horizon begins at a depth of 40-50 cm of gray-brown soils. characteristic of these soils, and beneath it is a parent rock with a very dense deposition.

The mechanical composition of gray-brown soils is loamy, but, despite this, the total number of fractions of coarse sand and pebbles, with a diameter of more than 1-3 mm, does not exceed 2-3% on the surface of the gypsum-bearing layer. The main part of carbonates is located on the surface of soils and is biologically formed for a long time, the gypsum horizon consists of weathered, under the influence of long-term exposure to wind, a combined mixture of fibrous and porous gypsum, its thickness reaches 30-60 cm, and in some cases up to 100 cm The amount of gypsum in this horizon is 30-60%, and sometimes 90%. These soils are solonchak soils, containing at varying depths certain amounts of sulfate and chloride salts, and traces of solonetzization can be found in the crustal horizon.

In the upper horizons of gray-brown light loamy soils, the content of coarse sand particles averages 16.6-43.0%, dust particles - 9.5-19.5%, silty particles - 2.1% and physical clay 29.5% , and have a loamy mechanical composition.

By mechanical composition, takyr soils are mainly light loamy, sandy loamy, and some horizons are made of sand, coarse sand predominates over coarse dust particles. Since these soils are developed in a dry climate, where a small amount of precipitation falls, a slow course of humus formation processes is noted, due to the slow course of mineralization of organic residues. A certain pattern was noted in the distribution and diversity of these soils: insignificant humus contents of 0.5-1.0% and the thickness of the humus horizon range from 15-20 cm. In the sod horizon of gray-brown soils, the humus content averages from 0.966% to 1.146 %, in the lower part of the soil profile, starting from 60-70 cm, its amount on average ranges from 0.356-0.400%. In the upper horizons of takir soils, humus is in the range of 1.016-1.045%, and in the lower horizons it is about 0.76%, the amount of carbonates is on average from 9.131% to 9.820%, gypsum 0.10-0.15%, and they are found in small quantities.

In hot and dry climates, where the weathering of minerals is gradual and incomplete, the main components of the mineral part of the soil are inherited from the parent rock. These are, first of all, hydromica formed as a result of weathering of feldspars and forming the basis of the mineral part of finely divided fractions. In the irrigated oases, the main part of the area is occupied by hydromorphic meadow-oasis soils of the desert zone and only soils with groundwater - takyr-oasis soils, usually confined to the periphery of the irrigated zone, where groundwater has not yet risen. The close position of the groundwater mirror, their weak mobility with a significant excess of evaporation over precipitation creates the tension of the solonchak process and the operation of irrigated soils is carried out with annual leaching and artificial drainage.

V. EXPERIMENTAL WORK

As a result of desertification processes, 84,7% of the old irrigated meadow and alluvial soils of the Ravshan massif of the Kungirat district, 50.5% of the irrigated meadow and alluvial soils of the Saryalti massif of the Kanlikul district, 56.7-81.8% of old and newly irrigated meadow and alluvial soils of the massif .Khamza of the

Khojeyli region, 69.7% of the old and newly irrigated meadow and alluvial soils of the Kilichboy massif of the Amudarya region, 74.2% of the newly developed and newly irrigated meadow and alluvial soils of the YangierEllikkalinsky district and 81.8% of the newly irrigated meadow and alluvial soils of the Kiyabad massif of the Beruniy district degradation and degumification processes. In the non-irrigated territories, especially in the modern and former "living" river deltas, as a result of a sharp decrease in the groundwater level, a noticeable change in the vegetation cover and the development of xerophytes were observed. Under these conditions, soil cover development processes occur depending on the lithological and geomorphological conditions of the parent rock. Soil transformation can be represented in the following sequence: marsh → marsh-meadow → meadow takyr (gray-brown, desert-sand, salt marshes) →takyr (takyr, gray-brown, desert-sand) soils. A sharp decrease in groundwater levels, intensive development of desertification processes leads to a violation of the above scheme. Swamp soils pass into marsh-meadow soils without passing into the stage of meadow soils, semi-automorphic and automorphic soils pass into gray-brown, takyr and desert-sand soils. In the course of its evolution, over a 60-70 year period, fundamental changes have occurred in the development of soils and soil cover of this region, associated with the widespread development and irrigation in the region. As far as we know, irrigation processes greatly alters the soil and soil cover. In the early forties, fifties, primitive takyrserozems or takir soils prevailed here, in places with spots of takyr, sand and salt marshes. The lowest parts were occupied by alluvial-meadow, swamp-meadow and swamp, gravitating to the territory of the former "living" Amu Darya delta. Most of the territory is occupied by automorphic desert soils, especially characteristic of the left bank of the lower reaches of the Amu Darya. According to Kimberg, Kochubei, and Shuvalov (1964), several evolutionary genetic transformations took place over several decades of the soil, which were expressed, as a whole, in the begun tearing of natural landscapes. Since the sixties, in connection with the widespread development of irrigated agriculture, the soil and soil cover of the Konlikul region began to change significantly. Tinning processes have intensified, which have now led to the widespread development of hydromorphic meadow, alluvial soils of different irrigation durations. The soils of the irrigation zone of the Konlikul district of Karakalpakstan are located in the northern sub-province of the subtropical desert zone of the modern Amu Darya delta. A characteristic feature of these soils is the complex layering of the lithological structure, composed of layered alluvial deposits, which largely determines the basic properties of the studied soils. In addition, the soils of this region differ in the age of development, cultivation, the degree of salinization and the availability of humus and nutrients. Such soils are widespread in the territory of the region: irrigated takir-meadow, takir-meadow virgin, irrigated meadow, formerly irrigated meadow, virgin meadow and salt marshes. But, despite this, in the late 50-60s, the water flow of the Amu Darya and Syr Darya sharply decreased, this led to significant changes in the natural and ecological situation of the Aral Sea region. With the drainage of the Aral Sea, the process of global desertification and changes in the conditions of soil formation began here. A decisive role in soil-forming processes began to play an arid-zonal factor, which caused a sharp transition of hydromorphic soils to automorphic desert ones. It is such a quick transition, when the level of groundwater has significantly decreased over the course of several years and the desiccation of soils has occurred, predetermined the uniqueness of their evolution at the first stage of aridization. As a result of the development of evolutionary processes, evolutionary soils fell out of the evolutionary chain and the transition from meadow to marsh soils, characteristic of the ancient delta plains of the lower reaches, was erased. The soil genesis at this stage, with the exception of salt marshes, is almost completely determined by the traits inherited from previous, initial soil formation processes. Therefore, the soils of the first stage - the drying stage, which lasts 25-30 years, belong to the residual meadow and residual meadow tugai. And together, with these soils, salt marshes are formed, which also have residual signs of the initial floodplain-alluvial soils.

VI. CONCLUSION

As a result of global climate change, the disturbance of the natural balance for a long time and, first of all, the redistribution of water reserves, the intensification of the drought of the coastal area under the influence of the drying of the Aral Sea, caused a noticeable change in the soil cover. These changes led to a sharp decrease in groundwater in the territories of the former "living" Amu Darya delta, an increase in their mineralization, a decrease in vegetation cover, a manifestation of the evolutionary process characteristic of the soil cover; as a result of the transition of most of the hydromorphic soils of the territory of the ancient and former “living” Amu Darya delta to automorphic, previously widespread soil subtypes such as meadow-bog, silt-bog, peat-bog, residual-tugai, as a result of a sharp decrease in groundwater, they turned into residual - marshy, residual-solonchak, meadow-takyr, gray-brown or sandy-desert subtypes and soil types; the decrease in the intensity of land irrigation and their agricultural use in the territory was the result of a violation of the ratio between salts and water, salinization of soils, and a decrease in soil fertility and crop yields. Under the influence of such negative phenomena, the soils of the previously hydromorphic regime, non-irrigated coastal areas, switched to semi-automorphic and automorphic regimes, therefore, intensified salinization, degradation, and dehumification processes are observed in them; Currently, the soils spread in the Republic of Karakalpakstan are saline to varying degrees. In 1995, territories with a difficult reclamation state of irrigated soils of key sites were noted in the Aral Sea regions, then in 2016 they were joined by the Chimbaysky, Takhtakupyrsky, Shumanaysky, Nukussky and Khojeyliysky districts. The reclamation state of the irrigated lands of these areas is complex, land areas are subject to degradation and desertification; The absorption capacity and composition of the absorbed soil cations are important indicators that determine the properties and characteristics of soils, their degree of fertility and productivity. In the absorbing complex of irrigated soils, the largest share of magnesium and sodium is 40.41-46.70% and 5.62-10.74%, and these soils are brackish, salinity type is sulfate-chloride, chloride; medium and severe saline; in gray-brown and takir soils, the amount of magnesium is 23.1-27.1% and sodium 7.5-16.1%; in residual bog soils, respectively 34.75-56.35% and 12.75-13.49%; on very strongly saline and saline soils of the farms of Tulkun, Amudarya district, SarialtinKanlikulsky and named after Yu.Akhunbabaev of the Kungiratsky region, there is a large number of reserves of readily soluble salts, which in the upper 0-2 meter layer range from 525.0-570.7 tons to 812.1 -973.6 tons, of which 308.7-582.5 tons are in the upper 0-1 meter layer; it was found that 84.7% of newly irrigated meadow and alluvial soils of the Ravshan massif, 50.5% of newly irrigated meadow and alluvial soils of the Saryaltin massif, 56.7-81.8% of old and newly irrigated soils of the Khamza massif are found to be subject to degradation and degumification.

It is also noted that in the Muynak region on hydromorphic salt marshes, salts are found on the surface in the form of a crust, and the soils themselves are saline to a very and very strong degree; Based on the results of the analyzes, soil maps and agrochemical cartograms of the supply of soils with nutrients for selected key areas on a scale of 1: 10,000 were compiled, and based on them, recommendations were given for restoring and improving soil fertility, the rational use of fertilizers, and also the location of crops taking into account soil properties ; the information obtained on the transformation and change in the properties of the soil cover of the territory as a result of climate change and the drying of the Aral Sea will enrich soil science, and can serve as the basis for land monitoring of the republic

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