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НАУЧНЫЙ ВЕСТНИК БУХАРСКОГО ГОСУДАРСТВЕННОГО УНИВЕРСИТЕТА

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The journal is intended for professors and teachers of higher educational institutions, senior researchers, students, scientific staff of scientific research institutions, teachers of academic lyceums, professional colleges, as well as researchers in general secondary education and various fields.

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deformation (compression deformation), the fraction of electronic transitions with an energy of 1.4 eV is dominant, but the fraction of tensosensitivity in the region of all other transitions is significantly reduced. In contrast, with positive crystal deformation (tensile strain), the fraction of transitions with an energy of 1.4 eV is the smallest, and the fraction of the tensosensitivity for all other transitions noticeably increases. Based

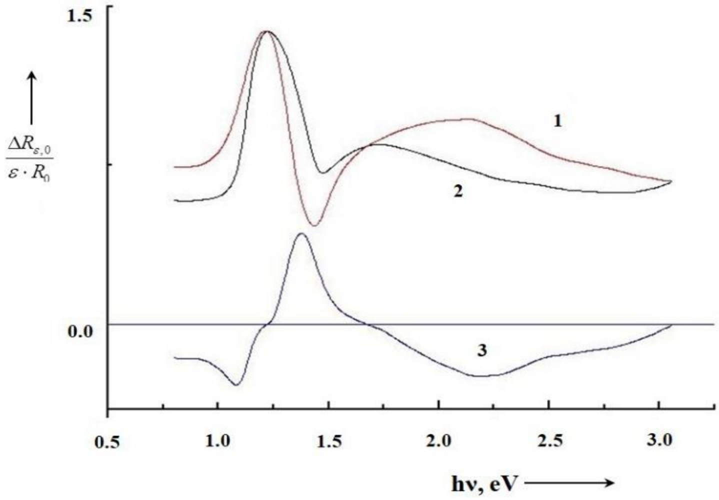

Fig. 5. Normalized spectral distributions of the photo stimulated tensosensitivity of negatively deformed (1), positively deformed (2) $TlInSe_2$ crystals and the difference 2 and 1 (3).

Therefore, we concluded that the tensosensitivity mechanism of $TlInSe_2$ crystals is indeed due to the mechanism of charge flow from one valley to another, due to a change in the energy positions of the valleys upon deformation.

The above results, as well as the results obtained in [13, 14], show that semiconductor converters can be created from $TlInSe_2$ single crystals, in which the resistance changes depending on the applied (mechanical) voltage, is substantially linear over the entire voltage range, and strongly depends on temperature. Although an amplifier is required with $TlInSe_2$ strain gauges, the linearity is very high and the temperature effect can be easily compensated. In addition, these strain gauges have certain advantages:

- have small dimensions and weight;
- are low-inertia, which makes it possible to use strain gauges both for static and dynamic measurements;
- have linear characteristics for all physical parameters;
- allows for remote measurement and at many points, by the method of multi-point strain gauging;
- the method of installing them on the investigated part does not require complex devices and does not distort the deformation field of the investigated part.

Conclusion. It was found that the tensosensitivity of $TlInSe_2$ crystals is due to the multi-valley mechanism, i.e. overflow of charges from one valley to another, due to changes in the energy positions of the valleys during deformation. The presence of a strong piezo - photoresistive effect in $TlInSe_2$ crystals makes it possible to create on their basis highly sensitive sensors of displacement, force, pressure, acceleration, and torque sensors. Such sensors make it possible to create powerful low-resistance strain gauges with a small (miniature) surface of connection with the sample, which reduces leakage currents at high temperatures and gives a higher isolation voltage between the sensitive crystal and the base (substrate). It is possible to significantly increase the sensitivity of $TlInSe_2$-based sensors to measured values using heating and optical illumination.

It is shown that under compression and tension deformations in the [001] direction, a change in the spectral distribution of the photocurrent is observed not only in the long-wavelength, but also in the short-wavelength region of the spectrum as compared with the maximum of the photocurrent. This result indicates that in $TlInSe_2$ crystals there are indirect band transitions not only in the low-energy, as compared to the direct band transition, but also in the high-energy region of the spectrum. It was found that the band gap increases under uniaxial compression, and decreases under tension.

At positive and negative deformations, the maxima in the spectral distribution of the tensosensitivity coefficient of $TlInSe_2$ crystals caused by electronic transitions from different valleys are redistributed, which indicates that the mechanism of the tensosensitivity of $TlInSe_2$ crystals is caused by the flow of charges from one valley to another due to changes in the energy positions of the valleys upon deformation.

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FACTORS OF SOIL FORMATION AND THEIR EVOLUTION IN THE SOUTH OF THE ZERAFSHAN VALLEY

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Abstract:

Relevance. *In article is stated main groundforming (the geomorphological-hydra geological land reclamation, climatic and anthropogen) factors, describes the evolution of soils in the lower part. In Zerafshan valley are chosen 3 geomorphological regions. Differ the raised contents a magnesium, high water table on irrigated territory in roast time and heavy expences them on evaporation. Economic activity of the person is reflected and on climate, and on hydralogical condition to surfaces of the land. As a result of reclamation measures, takyr-meadow, old-fallow meadow with bog-meadow and salt marshes, gray-brown soils were transformed into old-irrigated meadow alluvial soils. The increase in irrigated land was due to the development of new, previously unrevealed territories.*

Objective. *Determination of the influence of irrigation on the properties of irrigated meadow soils in the region, to establish the relationship between the chemical properties, the content of nutrients of irrigated soils with their mechanical properties.*

Methods. *The research was carried out in soil-field and analytical-laboratory conditions, in which such guidelines were used as: "Theory and methods of soil physics", "Guidelines for conducting chemical and agrophysical analyses of soils in land monitoring", "Guidelines for conducting field experiments", the reliability of the data obtained was carried out using the Microsoft Excel program based on the "Methodology of field experience" by B.A. Dospekhov.*

Results. *The scientific significance of the research results is explained by the scientific justification of changes in the reclamation state, agrochemical, agrophysical properties of irrigated meadow soils of the Bukhara oasis under the influence of irrigation and anthropogenic factors, the definition of the current state of scientific validity in increasing soil fertility. The practical significance of the research results lies in the fact that recommendations were given to the production on the need for differentiated application of irrigation standards and terms of soil treatment in the effective use of irrigated meadow soils in agriculture, increasing their fertility.*

Conclusions. *The peculiar basic morphological features common in the lower part of the Bukhara soil oasis were formed in the process of long-term irrigation. The soils of geomorphological regions are characterized by a peculiarity in the mechanical composition of soils and consist of sandy loam, light-, medium-, heavy-loam differences. In recent years, as a result of land reclamation measures, an increase in the number of water-bearing aggregates has been observed on soils in the arable layer. According to the content of water-soluble salts in different periods, irrigated heavy-and medium-loamy meadow soils are non-saline and, in some places, slightly saline. The influence of irrigation prescription on the content of nutrients was established: total nitrogen reserves amounted to 0.6–3.2 t / ha, phosphorus 0.6-14.5 t / ha, potassium 43.7-108.0 t / ha. On the irrigated lands of the Bukhara oasis, improving the reclamation state, agrochemical properties and soil fertility, it is necessary to widely use effective crop rotations, differentiated planning, loosening, washing and irrigation, applying organic and mineral fertilizers to the soil and growing plants that enrich the soil with organic matter.*

Keywords: *soil meadow, takyrno-meadow, gray-brown, mechanical composition, humus, salinity, phosphorus, potassium, nitrogen, , salt marsh, carbonate. evolution of ground, typical-light serozem, irrigations, relief, geomorphological, ground water, alluvial sediment.*

Introduction. The Zerafshan Valley is located approximately in the middle part of Uzbekistan and extends from east to west for 400-420 km. The flow-forming part of the Zerafshan River basin is located outside Uzbekistan on the southern slopes of the Turkestan ridge, both slopes of the Zerafshan and northern slopes of the Hissar.

The valley part of the Zerafshan River begins from the borders of Uzbekistan with Tajikistan. The eastern part of the valley (Samarkand basin) is bordered from the south by the spurs of the Zerafshan range, the Karatepe Mountains, to the west of which are the Zirabulak Mountains, from the north and northeast it is covered by the Nuratau, Karatau, Aktau, Malguzar ranges. The Bukhara and Karakul oases of the Zerafshan Valley are bordered on the north and west by the Kyzylkum Desert, and on the south and southeast by the Karshi desert steppe.

The Zerafshan Valley, located in contact with the Pamir-Alaya ridges and the Kyzylkum Desert, has a very diverse surface structure. The features of the valley surface are determined by the geological structure, the history of development, and the variety of terrain-forming factors in the territory. In addition to the general relief, the heterogeneity of the territory depends on the soil-forming rocks, their origin and composition. With all this in mind, the following geomorphological areas are distinguished in the Zerafshan Valley (within the irrigation zone).

I. A belt of typical serozems. The sub-mountain sloping plain, coupled with the IV-V terraces of the Zarafshan River, is composed of proluvial loess-like and skeletal-fine-grained deposits. III-terraces of the Zarafshan, Karadarya and Akdarya rivers, cones of outflows composed of alluvial-proluvial deposits. Floodplain, I and II above-floodplain terraces of the Zerafshan River, composed of layered alluvial deposits.

II. The zone of light gray soils. The sub-mountain sloping plain, coupled with the IV-V terraces of the Zerafshan River, is composed of proluvial loess-like and skeletal-fine-grained deposits. The third terrace of the Zarafshan River, composed of alluvial-proluvial deposits. I and II above-floodplain terraces of the Zerafshan River, composed of layered alluvial deposits.

III. Desert zone. Ancient Peripheral Plain (Ancient the outflow cone of the Zerafshan River), composed of proluvial-alluvial deposits. The upper and middle parts of the inner modern Bukhara delta of the Zerafshan River, composed of proluvial-alluvial deposits. The lower part of the inner modern Bukhara delta of the Zerafshan River, composed of proluvial-alluvial deposits. Floodplain, I and II above-floodplain terraces of the Zarafshan River, composed of layered alluvial deposits.

Karakul part of the Zerafshan River delta, composed of layered alluvial deposits. The irrigation zone of the Samarkand region covers flat areas represented by sub-mountain slopes associated with the V and IV terraces of the Zerafshan River, as well as its low terraces, which are most intensively used for irrigated agriculture. Foothill sloping plains, coupled with the upper terraces of the Zerafshan River, border the Samarkand part of the Zerafshan Valley with a wide strip. Their geomorphological heterogeneity is determined mainly by the genesis of soil-forming rocks.

The sub-mountain proluvial plains are represented by completely flat or wide-undulating spaces. Their development is due both to the accumulation of sediments of temporary, mainly non-oil water flows flowing down from the mountains surrounding the plains, and to the ancient, now deforested, deposits of Praserafshan.

The soil-forming rocks within the foothill plains and high terraces are proluvial skeletal-fine-grained and loess-like indistinctly layered deposits. The foothill areas have quite favorable relief conditions for irrigated agriculture.

The upper level of the most ancient irrigation zone is formed by the III above-flood alluvial-proluvial terrace. It is separated from the alluvial plain by a cliff up to 15-20 m, smoothed in places. The structure of its surface is quite simple, especially in the eastern half of the valley. Large scale sloping the flat surface only in some places cut through by ravines. Thick strata of weakly layered loess-like loams are overlain over large areas by cultural and irrigation loam deposits reaching a thickness of 2-3 m. The first and especially the second terraces of Zarafshan form a vast alluvial plain, reaching within the Samarkand oasis in a diameter of 10-20 km. In Bukhara Oasis II, the terrace occupies the predominant part of the delta. The flatness of the relief is broken here only by artificial mounds, adjacent ramparts, and on the first terrace – by the dry beds of the former channels of the river. In some places, the "cup" relief characteristic of ancient oases is formed.

Pebble accumulations at the base of the alluvial plain reach tens and hundreds of meters. They are underlain by Neogene deposits, and in the surface horizons they are overlain by fine-grained sediments of variegated mechanical composition and different thickness: on the first terrace – 0.5-3 m, on the second – up to 3-5 m.

According to the research of A.I. Shevchenko[1], the foothill plains bordering the eastern part of the Samarkand basin are intensively drained by the river. Fresh ground water here lies at a depth of 5-6 to 17-18 m. Irrigation and development of the foothill plains for irrigated agriculture is accompanied by changes in hydrogeological conditions. Ground water in the territory with a slow outflow rises to 2-3 m from the ground surface.

The territory of the western part of the Zerafshan Valley within the Samarkand region is characterized by a higher occurrence of groundwater and increased mineralization, although the Zerafshan riverbed drains the adjacent massifs here as well. In the areas of the ancient and modern valleys of the Zerafshan River (from the village of Khatyrchi to the meridian of Ziaetdin-Kermine), groundwater lies at a depth of 1-3 (5) m, sometimes wedged to the surface. Due to local water stops, they are locally stagnant. Mineralization 2-3 g / L, sometimes 3-5-10 g/L. With the advance along the valley to the border with the Bukhara oasis, the groundwater level changes from 2-7 to 1-2 m. Their mineralization increases to 5-10 or more g / L, which determines the severe reclamation condition of the territory.

The area up to the strip of wedging of underground water in the form of springs in Karasu has a groundwater level of 2-5 m, closer to the mountains they are buried up to 20 m. The oscillation amplitude is 0.6-0.7 m. Mineralization is 0.3-0.7 g / l, the type is bicarbonate with an increased content of magnesium and calcium. For irrigated areas in general, there is a decrease in mineralization in the growing season to 0.1-0.2 g/l.

On the II and III right-bank above-floodplain terraces, the level of groundwater occurrence varies from 0.5-1.0 to 3 or more m. The amplitude of level fluctuations is on average 0.4-0.9 m. Mineralization is 0.5-1.1 g / l, in some places at high standing – 1-3 g/l. In the newly constructed channels, the mineralization of groundwater decreases from 2-4 to 1.0-1.5 g / l, and the sulfate type of salinity is replaced by a bicarbonate-sulfate one. With the development of adjacent lands, there was a slight increase in mineralization to 1.5-2.0 g/l.

In the left-bank western part of the valley, the level of groundwater occurrence varies from the upper reaches of irrigation systems to their end parts from 11-12 m to 1-5 m. The salinity of groundwater increases from 0.3-0.6 to 1.1-1.5 g / L. The amplitude of fluctuations reaches 2.3-2.5 m. In the area of Mesopotamia – the island Miankal – ground water table at a depth of 1-5 m. Desalinated ground water (0.3-0.8 g/L) has a bicarbonate type of mineralization with a high content of sulfate and magnesium. Stability in time of these indicators is noted.

Filtration water from canals and irrigated fields plays a huge role in feeding the ground water of irrigated and adjacent territories. Groundwater is used for outflow and to a lesser extent for evaporation and transpiration. In the area of the bedrock bridge separating the Samarkand basin from the Bukhara oasis, in a significant part of the territory, ground water, approaching the surface, begins to be consumed for evaporation and their mineralization increases to 3-5-10 g/l.

The irrigation zone of the Bukhara region is located in the lower reaches of the Zerafshan River, south-west of the Khazarian Gorge. It covers the Bukhara and Karakul parts of the Zerafshan delta, as well as partially adjacent territories of the ancient Zerafshan outflow cone and wide-undulating plains and plateaus. At the exit from the Khazarian Gorge, Zerafshan forms a vast Bukhara subaerial delta, on which the floodplain of the river and two above-floodplain terraces stand out. The first above-floodplain terrace was formed on both banks of the river with a width of several meters to 2 km. Its excess over the water level is 1-1. 5 m. The terrain is flat, broken in places by depressions and depressions. The soils are composed of layered alluvial deposits mainly of light loam, sandy loam and sand with an admixture of pebbles. The thickness of the fine-grained layer covering the pebble deposits varies from 1 to 2 m. Sometimes pebbles are opened from 0.3-0.4 m and come out on the day surface. Ground water lies at a depth of 0.5-2 m.

The rest of the Bukhara delta is represented by surfaces equated to the second above-floodplain terrace of Zerafshan. According to the conditions of relief and the composition of soils, it is divided into upper, middle and peripheral (lower) parts. The upper part of the delta, which is the top of the Zerafshan outflow cone, is a slightly elevated plain with a slight slope to the southwest and lowered edges. Pebbles covered with fine-grained alluvium lie at a depth of 2-5 m, which contributes to a relatively good drainage of the territory and local outflow of groundwater lying at a depth of 2-3 m. Mineralization of ground water in the range of 1.5-3 g/L.

The middle part of the delta is located hypsometrically below the upper one and has a flattened relief. It is composed of loamy alluvial deposits. Pebbles lie under the cover deposits at a depth of 5-10 m. The outflow of groundwater is difficult. The depth of their occurrence in the predominant part of the territory is 1-3 m. The mineralization of groundwater is kept at the level of 2-5 g/L.

The peripheral (lower) part of the delta is characterized by an almost complete absence of surface slopes and poor drainage. The soils are composed of loam, with 5-10 m of fine-grained sand underlying. The outflow of groundwater, which lies at a depth of 1-2 m and has an increased mineralization (5-10 g / L), is very weak. In terms of land reclamation, this is the most unfavorable part of Bukhara.

On a large area of the Bukhara part, alluvial deposits, represented by a layered complex of loams, sandy loams, sands and pebbles, are overlain by agro-irrigation sediments, the thickness of which in most cases exceeds 0.5-1.5 m. According to the mechanical composition, they are different, but medium and heavy loams predominate.

According to the conditions of groundwater flow, the Bukhara part as a whole belongs to a low-flow area. The inflow is about 4-5 times higher than the outflow. The main volume of water entering the oasis is spent on feeding groundwater, transpiration by vegetation and physical evaporation. Such an imbalance in the flow and flow of water causes the rise of groundwater and leads to the tension of the salt marsh process.

It is established that as the conditions of groundwater flow from the top of the delta to its periphery deteriorate, in addition to increasing the degree of groundwater mineralization, the type of mineralization changes from bicarbonate-sulfate to sulfate-chloride and even in some places chloride. The content of magnesium and alkalis also increases.

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The low thickness of the cover Quaternary sediments and the presence of weakly permeable underlying bedrock create conditions for the formation of an unstable groundwater regime. With the change in the balance of ground water in the direction of increasing the arrival of their level quickly rises to the surface of the earth, which determines the increase in mineralization of ground water and salinization of soils.

The proximity of the high-altitude part of the Zerafshan River valley to the western end of the Pamir-Alai mountain structures and their transition to open desert plains determine the climate features that are common to the whole of Central Asia. They are manifested in sharp continentality, aridity, seasonal contrast and belonging to the group of warm subtropical climates.

A wide range of vertical altitudinal zoning-from the foothill plains to the middle categories-determines vertical climatic zoning, which is manifested in a decrease in air temperatures and an increase in the amount of precipitation with increasing terrain height. The complex mountain-geomorphological structure determines frequent regional climatic features, different thermal resources on the territory and moisture content by precipitation.

In General, the climatic heterogeneity into the framework of conventional soil-climatic zoning, according to which the allocated zone with the climate of the mountain steppes, gray zone climate semi-arid steppe and desert area with arid (desert) climate. In the desert zone, as well as in the belt of light and typical gray soils, the values of the average annual air temperature and the duration of active vegetation periods of non-heat-loving (above +5o) and heat-loving (above +10o) plants are very close to each other. Against the background of minor differences between the lower vertical soil-climatic zones, as well as within the latter, individual massifs have different heat input. So, the belt of light serozems is noticeably warmer than the rest of the territory. The belt of typical serozems is the most variegated in this respect. The Zerafshan Valley looks more moderate, where the average annual air temperature ranges from 12.2-12.8 o.

The distribution of precipitation over the territory of the valley to a greater extent than the temperature regime is linked to the altitude position and the structure of the surface. With the advance from deserts to foothills and mountains, i.e. with an increase in the average climatic (considered) altitude of the area, the annual amount of precipitation increases from belt to belt by 80-100 mm. In the belt of light gray soils, the annual precipitation ranges from 202 to 176 mm. According to the degree of moisture, the belt of light gray soils is characterized as a very dry Belt of typical gray soils is more uniform in terms of precipitation. Absolutely most of its territory receives them in the range of 317-365 mm with a decrease to 282-312 mm in the border with light gray-earths band. This is a dry, sparsely hydrated area.

The annual course of precipitation in all zones is characterized by the following common features: the greatest moisture in the spring and winter periods, slight moisture in autumn and especially in September, the contrast between spring and almost rainless summer. Precipitation falls mainly in the form of rain.

The irrigated lands of the belt of typical serozems are located in a moderately hot thermal zone with the sum of effective temperatures of 2140-2300^{o}. The duration of the growing season here is 208-212 days. The frost-free period lasts 207-216 days. The raininess of the pre-sowing period is quite high. In March-April, 105-120 mm of precipitation falls. This, on the one hand, makes it difficult to carry out normal pre-sowing and sowing operations, but on the other hand, it provides good shoots before the onset of soil drought.

In the irrigation zone of the belt of light gray soils, there is an increase in thermal resources, that is, an increase in the sum of effective temperatures by about 200-300^{o}. The duration of the growing season and frost-free periods increases by 8-10 days. Flowering of cotton begins at

9-10 days, and the opening of the boxes-half a month earlier than in the belt of typical serozems. The weather of the spring and autumn periods becomes noticeably more favorable for field and harvesting operations.

The irrigation zone of the lower part of the Zerafshan Valley is located in the desert zone. According to long-term data of the weather stations "Karakul" and "Bukhara", the average annual air temperature is in the range of 14.2-15.0^{o}. The temperature of the hottest month (July) is 28.0-29.3^{o}, and the coldest (January) is minus 0.4-0.6^{o}. The average monthly air temperature for the growing season (April-September) is 23.3-24.3^{o}.

Positive air temperatures are established in early February, and in early March, the average daily temperatures steadily pass through 5^{o}C, the vegetation of grass, grain and fruit crops begins. At the end of March-beginning of April, the average daily temperatures pass the limit of plus 10^{o}, favorable conditions are created for sowing heat-loving crops. The duration of the frost-free period is 213-214 days. The sum of effective temperatures (above 10^{o}) during this period reaches 2600-2700^{o}, which exceeds the physiological need of medium-fiber cotton varieties.

The average annual precipitation in the Bukhara and Karakul oases is in the range of 123-144 mm. The predominant part of them (80-85 %) falls in the autumn-winter-spring period. The precipitation that falls in the spring period is not enough to ensure normal germination of cotton and other agricultural crops, so it is necessary to carry out replacement or feeding irrigation every year.

The main amount of moisture evaporates during the growing season (1630-1708 mm). The average monthly relative humidity in this period is 51-53 %, and in July-August it drops to 17-25 %.

In summer, the lower reaches of Zerafshan are dominated by winds. Only 16-17 days a year are windless. Dust storms occur about 15 times during the growing season. Dry winds invade mainly in the period from May to September. They strongly dry up the soil and depress the growth and development of crops.

High air temperatures, low relative humidity and frequent winds contribute to high evaporation of moisture from the soil, which increases the intensity of the salt marsh process and creates the need for frequent vegetation watering.

Many scientists [2.3.4.5.6] note that by cultivating crops, cultivating, fertilizing, irrigating, draining and brining the soil, a person has a direct impact on it. Human economic activity affects both the climate and the hydrological conditions of the earth's land. Regulation of the surface flow of rivers, the construction of reservoirs, the use of surface and underground water for irrigation and water supply, regulation of the groundwater regime change the conditions of soil moisture, affecting their development and properties. Human impact on soil formation depends on the level of development of science and agricultural technology.

Irrigation dramatically changes the water regime of soils. It makes it possible to maintain the soil in a moist state during the entire growing season. Therefore, the activity of microbes-mineralizers sharply increases and flows freely until the onset of low temperatures, limited only by the reserves of energy material in the soil (the content of organic substances). In the first years of irrigation, serozems are sharply depleted of humus and nitrogen. In the future, apparently, with a sufficiently deep occurrence of groundwater, humus reserves stabilize, and with the increase in the process of olugoveniya – increase. Long-term irrigation is usually accompanied by soil compaction, and in monoculture, the destruction of microaggregates and the formation of crust after irrigation and precipitation.

On old-irrigated lands, the soil layer is gradually increased by silty material brought to the fields by irrigation water and large masses of earthy fertilizers. irrigated agriculture in the ancient oases of Uzbekistan has existed for more than 2 thousand years and the capacity of irrigation sediments reaches 1-2 m or more. Irrigation sediments are mostly high-carbonate (7-9 % CO_2) and contain a significant amount of organic substances (0.4-0.5 % in suspensions of large channels and 0.6-0.9 % in suspensions of ok-aryks). In addition, the sediments contain a significant amount of nitrogen, phosphorus and potassium. Cultural and irrigation horizons on unsalted soils are usually permeated by a dense network of earthworms, mainly earthworms, which improves the water-air properties of soils. In the conditions of modern irrigation agriculture, with proper soil treatment, the introduction of a large amount of mineral fertilizers, the fertility of ancient irrigated soils has significantly increased. Irrigation has a particularly great positive effect in the development of low-fertile desert takyr and gray-brown soils.

The above examples show how great the influence of agricultural culture on soils is and how diverse it is depending on the methods of land use and the level of development of agriculture.

The lower part of the valley of river Zarafshan settles down in the desert zone differing in climate. Development of zone soils (gray-brown, desert sandy and also saline soils) happens on desert type of soil formation here. In hydro morph mode of moistening a zonal soils, and also transitional from a zonal to desert or on the contrary are formed. At the same time influence of the desert affects all soils, first of all in salinization of soils.

According to many scientists [1-6], during soil researches in the thirties in left-bank part of the Bukhara oasis, along Zerafshan's course, on his elation were formed old irrigated (cultural and irrigation), meadow soils at a bedding of ground waters during the summer period at a depth of 3-5m. In the winter ground waters rose to 2-3m and in a certain measure influenced soil formation processes. Ground waters were generally fresh and low-mineralized. In right-bank part of the delta probably the soils irrigated meadow soils also dominated. There are no direct certificates on it, but soil shooting of 1963 has revealed the significant areas occupied with the soils which are old irrigated meadow soils in this part of the delta. The profile of soils has been put powerful (1,5-2m) by the agro irrigational horizon which had the same light gray coloring. On mechanical structure of the soil were mainly heavy. On a soil surface as a result of her drying after watering the soil jointed crust was formed.

The maintenance of a humus in the arable horizon of these soils made 1,5-2,5 %. In the below-lying horizons the quantity of a humus didn't go down to 2-2,5m lower than 0,5 %.

The soils which are old irrigated meadow soils were mainly not salted and weakly salinized (the dense rest of 0,1-0,5%). Average salinized soils met much less often. The type of salinization was sulphatic. In places in soils the weak salinized came to light in the analytical way, but morphologically it wasn't shown.

Only gross content of phosphorus and potassium is shown in [1, 6] analyses provided in work. Their contents in an arable layer fluctuated respectively from 0,08 to 0,20 % and from 1,01 to 2,63 %. Thus, these soils were rich with reserves of potassium and are poor in phosphates. The maintenance of CO_2 of carbonates on a profile fluctuated from 6,8 to 9,8 %.

Along with the soils irrigated meadow soils in left-bank part of the delta meadow soils at a bedding of ground waters of 1-3 m were formed. They occupied the central part of the described territory along the canal Shakhrud and further all east suburb of the delta. They settled down on poorly raised relief elements among surrounding their superfluous hydromorphy soils and saline decreases. Meadow soils were old deposits with the agro irrigational horizon. The profile on mechanical structure was heavy, is more rare sandy loam.

Being formed at a close bedding of fresh or low-mineralized ground waters, meadow soils became covered by the violent vegetation promoting formation of a powerful turf (10-12 cm) with pronounced structure of soils. The maintenance of a humus in the cesspits horizon reached 3,5 %. In the powerfully saline soils the vegetable cover was rare, a turf fragile and less powerful. The maintenance of a humus in her made 1,0-2,2 %. Content of gross phosphorus in soils fluctuated in a profile within 0,168-0,117 %, potassium – 1,797-2,354 %. The quantity of carbonates on a profile varied from 7 to 8 % meadow alluvial soils in various degree were subject to salinization: from weakly salinized to average and the highly salinized. In the horizon the content of salts reaches 1,6-4,0 %, in underlying – to 0,3-0,6 %.

On Karakul part of the delta of Zarafshan before construction of the Amu-Karakul canal at a deep bedding of ground waters (3-5m) soils irrigated meadow soils developed [10]. They on properties were close to the soils of the Bukhara part of the delta of Zarafshan which are old irrigated meadow

The genetics land-reclamation soil background dominating in the lower, deltoid part of the valley of river Zarafshan on whom soils of nowadays developed soil cover developed further was it 80 years ago.

In 1963 year republican soil expedition of Uzgiprozem institute has conducted researches of soils in the Bukhara region in scale 1:10000. As a result of the conducted researches have shown that capital melioration actions the meadow soils 40 years ago dominating in the central and east parts of a left bank in a complex with marsh and meadow soils and saline soils were transformed to the old irrigated meadow alluvial soils. Virgin meadow and marsh and meadow soils and saline soils remained slightly. The translation on soil cards of meadow soils in the old irrigated meadow was lawful as all rejuvenated meadow soils and even marsh and meadow soils had the agro irrigational horizon of various power that spoke about their long former use under the irrigated agriculture.

The humus horizon reached the power of 70-100 cm. The arable horizon of these soils contained 1,2-1,4 % of a humus. It is much less, than in the cesspits horizon the old salinized structured meadow soils. But it is clear, the humus which is contained in the 10-12cm cesspits horizon, was redistributed in an arable layer which power is 2-3 times more. Nitrogen soils have held 0,103-0,135 %.

Gross phosphorus in soils there were 0,117-0,210 % that exceeded his contents in initial soils a little.

In the melioration relation the old irrigated meadow soils became slightly better: among them the weakly salinized and washed-out soils prevailed, average salinized met seldom, highly salinized was almost not. Nevertheless, saline soils, quite considerable on the area met here. Along with development the rejuvenated meadow soils use meadow soils in the irrigated agriculture continued. There was probably a gain of the irrigated lands due to development of the new, earlier not mastered territories. Again developed soils have been also presented by generally old deposits.

The intensive use meadow soils under an irrigation has led almost to universal raising of ground waters that has caused return (the return evolution) speak rapidly the semi - hydro morphed soils in hydro morphed meadow.

Researches of 1963 have shown [8,11] that in a left bank of the Bukhara delta the small areas of the old irrigated meadow soils remained only in her upper courses and in the southern part, between Kagan and Bukhara, along the canal Sheihang. In right-bank part the soils which are old irrigated meadow soils have been widespread more widely – in Peshku, Shafirkan and Gizhduvan districts. But the prevailing space in right banks was occupied by the meadow alluvial soils which are mainly old irrigated. Also saline soils meadow met here.

In the territory of the Karakul delta of Zarafshan the soils which are old irrigated meadow soils evolved in the old irrigated meadow alluvial. A significant area was occupied here by meadow saline soils, and also very strongly salted deposits.

The old irrigated meadow alluvial soils of the Bukhara delta of Zarafshan which predecessors were soils irrigated meadow soils had (according to RPE of Uzgiprozem institute) the agro irrigational horizon with power from 1,0 to 2m. He was generally average salinized mechanical structure. The humus horizon reached 70-100cm. The maintenance of a humus and nitrogen in the arable horizon of these old irrigated meadow soils was lower (0,9-1,1 % and 0,05-0,07 %), than in the old irrigated meadow soils, and also in the old irrigated meadow soils which predecessors were rejuvenated meadow alluvial soils.

The melioration condition of the old irrigated meadow soils for the thirty-year period (1932-1963) has almost not changed. As old irrigated, meadow soils were generally not salted and weakly salinized and the old irrigated meadow soils which have come from them remained same, only the ratio not salted and weakly salinized became in favor of the last.

The old irrigated meadow alluvial soils of the Karakul delta of Zarafshan which predecessors were (meadow) soils which are also old irrigated meadow soils had less powerful agro irrigational horizon (70-100cm). His mainly average and easy mechanical structure power of the humus horizon made 50-70cm. It is slightly more humus and nitrogen in the arable horizon of these soils

(0,9-1,3 % and 0,08-0,12 %), than in the old irrigated meadow soils of the Bukhara delta which have passed the same evolutionary way. Gross phosphorus there was also more (0,152-0,201 %).

In the melioration relation the old irrigated meadow soils of the Karakul delta were much worse, than similar soils of the Bukhara delta. They were mainly average, met seldom and weakly salinized. There were few weakly salinized soils.

In general in 1963 in lower reaches to Zarafshan's valley the ratio between the old irrigated meadow soils of various extent of salinization looked as follows: not salted - 18, weakly salinized - 53 %, the average salinized – 28 %, highly salinized – 1 %.

Researches of 1963 have shown that during 50 year period the soils which are old irrigated meadow soils in the considerable territory of the Bukhara delta have kept the substandard genetic level. These soils had the powerful agro irrigational horizon. In different parts of the delta power varied him from 1 to 2m. The humus breeding at the same time changed from 50 to 100 cm. The maintenance of a humus in the arable horizon depending on his mechanical structure made from 0,7 to 1,5 %. It is much less, than was with initial to the soil 50 years ago. Nitrogen in soils from 0,05 to 0,09 %, gross phosphorus – from 0,114 to 0,168 %.

The melioration condition of the soils which are old irrigated meadow soils has worsened a little. Before the soil were mainly not salted and weakly salinized, now among these soils which no, aren't salted but have appeared together with weakly salinized soils of average and highly salinized. The ratio between these soils on extent of salinization was the following: the weakly salinized – 80 %, the average salinized – 14 %, the highly salinized – 6 %.

By the researchers conducted by performers in 2013 it is established that the area meadow soils were considerably reduced. The rubles dominating in the territory of Zarafshan are the old irrigated meadow soils. The soil cover for last 50 years (1963-2019) was considerably leveled on the morphogenetic indicators though some distinctions connected with litologohic-geomorphological conditions have remained.

On mechanical structure the old irrigated meadow alluvial soils having the powerful agro irrigational horizon mainly average structured, are more rare sandy. Sandy loam soils are dated generally for upper courses of water sources.

Humus breeding to 70-100cm. the maintenance of a humus in the arable horizons varies from 0,5 to 1,2 %. Comparing these indicators to data of 1963, it is possible to notice that they are close to indicators on humus of meadow soils which predecessors they were meadow soils, and is much lower than indicators of traditionally meadow soils. Nitrogen the soil has held from 0,03 to 0,07 %. Content of gross phosphorus fluctuates from 0,108 to 0,405 %, mobile phosphates – from 4 to 15 mg/kg. Gross potassium in soils from 0,3 to 1,6 %. In the maintenance of mobile forms of potassium also wide spacing – from 3-150 to 175-400 mg/kg of the soil. From these indicators it is possible to notice that the old irrigated meadow alluvial soils mobile forms both phosphorus, and potassium, are provided poorly. The same situation with batteries developed earlier.

Now the old irrigated meadow alluvial soils dominating in the lower part of the valley of river Zarafshan (The Bukhara and Karakul oases) in different degree are subject to salinization. Judging by the materials collected on four key farms, soils on extent of salinization are distributed as follows: weakly salinized – 48 %, the average salinized – 29 %, the highly salinized – 23 %. Thus, the melioration condition of modern soils of Zarafshan has considerably worsened in comparison with the last decades. Evolution of soils of Zarafshan took place at the standard, substandard, patrimonial and specific levels.

The scheme of evolution of the main soils of this region during 1932-2013 looks in the following look:

	OirMT -0,1
	OirMT -1(2,3) OirMa -1,2,3
Bukhara part delta	OirMT -0,1(2)
	OirMa-1,0 → OirMa-1,2,3
Bukhara part delta	OldbedMa-3 → OirMa -1,0(2) → OirM -1,2,3
Karakul part delta	OirMT -1,2 → OirMa -2(3) → OirMa -1,2,3