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EXPERIENCE IN CREATING A SOIL-RECLAMATION MAP OF THE ZARAFSHAN RIVER VALLEY BASED ON THE SYSTEM ANALYSIS OF LITHODYNAMIC FLOW STRUCTURES

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Abstract

Analysis of lithodynamic flows and soil-reclamation studies, based on the plastic relief map, allowed for a systematic analysis of the main components of the natural environment. The ways of migration of chemical elements in the soil are established. For the first time, causal relationships of spatial differentiation of the degree and chemical composition of saline soils in the Zarafshan river valley were revealed. The Zarafshan river basin has a clearly defined border, as we can judge from the map of plastic relief made up in M 1: 100 000. Here three cascade systems are well distinguished, which is very important for the formation of the reclamation state of the territory. The upper part of the studied territory is occupied by the basins of the upper arms of the Zarafshan river, which is formed at the fork of the spurs of the Turkestan, Zarfshan and Hissar ridges. This is the inner mountain part of the valley the width of which in the upper part does not exceed 2 km and in the area of the Panjiken corridor reaches up to 12 km. In this area, that is, the subsystem, on the proluvial-alluvial deposits is the main volume of groundwater, which is closely related to the surface. This subsystem is part of the catchment area of the Zarafshan river basin, which is the main source of removal from the territory of a huge mass of dissolved and solid substances.

Key words: ----------

Introduction. Irrigated agriculture, in particular, the cotton growing zone occupies a special place in the Zarafshan river valley. Over the past 15-20 ears, under the influence of the current water management situation, there has been an increase in the process of salinization and erosion, deterioration of water quality, which led to the degradation of irrigated soils. Every ear, the area of nearlying mineralized groundwater increases. This situation is typical not only for the Zarafshan river valley, but also for the entire Republic. For example, of the water resources used in the national economy in the amount of 60.6 km3, 54.8 km3 or 90.4% of water is spent on irrigation of crops. According to the «Waterproject» Association, only 40% of the water taken from water sources reaches the plants, and the rest of it is lost in the irrigation network (-40%) and during irrigation (-20%). More than 60% of the total water loss forms a return flow. The area of irrigated land in need of drainage is 3.3 million hectares in Uzbekistan, of which 2.4 million hectares are provided with horizontal wells and 0.4 million hectares with vertical wells. Closed horizontal drainage is built on an area of 580 thousand hectares - this is less than 18% of the total area in need of drainage (Antonov, 2000) [1]. Large investments in the reconstruction and construction of the collector-drainage network, water costs for annual washing of saline lands in the amount of 12-13 km3 are ineffective. Studies have shown that the area of medium and highly saline land is continuously increasing.

Materials and methods. Analysis of domestic and foreign experience of land irrigation has shown that the effectiveness of water reclamation is largely determined by the completeness of accounting for all the main natural factors that determine the degree of salinity. The optimal water-salt regime of saline soils is achieved by carefully taking into account the natural features of the territory: the degree of its natural drainage, salinity of soils in the aeration zone, mineralization and pressure of groundwater, mechanical composition and lithological structure of soils in the saturation zone. Not unimportant is also the correct understanding of the structure of the surface of the territory. Under the influence of endogenous and egzogenous processes, the formation of relief forms of convex and concave (increases and decreases) occurs. These forms of relief in the form of lithodynamic flows are reflected on the map of plastic relief. These forms determine the direction and speed of surface and subsurface, as well as biogeochemical runoff-the result of the influence of the gravitational field.

The organization of irrigation, taking into account the above provisions, creates an optimal-rational water-salt regime that provides maximum salinity of saline soils and desalination of groundwater with minimal labor costs and scarce irrigation water. To achieve this goal, it is necessary to conduct comprehensive research based on a systematic analysis of the study area, which is relevant. The object of study is the soil geosystems of the Zarafshan river valley. The purpose of this work is to compile a soil-reclamation map of the Zarafshan river valley in M 1: 200000. The research objective is to study the spatial differentiation of salts in soils within the geosystems of the Zarafshan river valley.

Research result. In the study of soil salinization (Ruzikulova, 2005; Sabitova, Akhmedov, Ruzikulova, 2016) system-structural, comparative-geographical, soil-geographical, soil-geochemical and laboratory-analytical methods, interpretation of aerial photographs, methods of key sites and expert-analytical assessments of the current reclamation state of irrigated soils were used. The soil-reclamation map is based on the map of plastic relief (Stepanov, Loshakova et all., 1987; Sabitova, 1987; Sabitova, Akhmedov, 2005; Ruzikulova,

2005; Dmitriev, 2008) [8,18,10,11,15,8,3].

Stock and published materials, as well as the results of field research, were used as factual material in the preparation of the soil-reclamation map. Full-scale observations were carried out to identify the dynamics of changes in the depth and chemical composition of groundwater, as well as the degree and type of salinization, the content of water-soluble and toxic salts in irrigated soils. To study the process of salt migration and identify their spatial distribution, the objects in the basin of the river were selected. Zarafshan consists of 10 reference (key) farms, including 5 in the second (middle part) (Samarkand basin) and 5 in the third segment (Bukhara and Navoi-Kanimeh). On the reference farms, full-scale studies were carried out using the salt survey method (key sites) on a scale of 1: 10000. In total, 69 main soil sections were laid on the study area and in addition, several auxiliary intermediate pits of the second order (up to 1 m). about 350 soil samples, 32 ground samples and about 30 irrigation and collector-drainage water samples were taken from them, which were examined in the analytical center of the Institute. In the main reference sections, the description of the morphological structure of soils on genetic horizons was performed, and in 15 of the most typical ones, the determination of the volume weight of soil-soils by the cylinder method, in three - five times repetitions, and in some workings water-physical properties were studied.

Analyses of water extract of type I and II were carried out with the determination of the entire composition of easily soluble salts-the dense residue (the sum of salts), CO_3, HCO_3, Cl, SO_4, Ca, Mg, which allowed us to obtain the most detailed characteristic of saline soils. In the selected soil samples, the quantitative content and qualitative composition of salts, the degree and type of salinization were determined, the reserves of water-soluble salts were determined by genetic horizons and by layers 0-1, 1-2 m and 0-2 m. Laboratory studies of saline soils were conducted in the analytical center of the research Institute of soil Science and Agrochemistry (Tashkent, Uzbekistan). The obtained data are used in the preparation of the soil-reclamation map (figura) valley of the river Zarafshan. The morphological basis of the soil-reclamation map, when conducting field research, as well as analysis of the actual material was a map of plastic relief (landforms). The map is made up by establishing the most clearly defined boundaries between the systems of convex and concave forms of relief (method of plastic relief, 1987, Shariy, 1991; Stepanov, 2006; Sabitova, Abdunazarov, Ruzikulova, 2006) [5,21,17,16]. This method made it possible to display flow structures on maps, which are essentially geochemical flows that carry information about the reclamation state of the studied territory. The flow structures selected on the map made it possible to determine the areas of formation, transit and discharge of salts, since the main organizational unit of the entire system of contours of the relief plastic map is a catchment basin of any order (Korsunov, 2002) [4]. It is known that the basins of the geosystems (Reteyum, 1975; Sochava, 1978; Barsuk, 2016) there is an absolute predominance of not strictly horizontal, but inclined movements of water and solid masses from higher to lower levels. As a result, the basin territory is dynamically interfaced with horizontal migration flows [7,9,2]. The studied territory, the Zarafshan river basin has clearly defined borders, where three cascade geosystems are well distinguished, which is very important for the reclamation assessment of the studied territory (Toychiev, Sabitova, 2000) [20].

The Zarafshan river basin has a clearly defined border, as we can judge from the map of plastic relief made up in M 1: 100 000. Here three cascade systems are well distinguished, which is very important for the formation of the reclamation state of the territory. The upper part of the studied territory is occupied by the basins of the upper arms of the Zarafshan river, which is formed at the fork of the spurs of the Turkestan, Zarfshan and Hissar ridges. This is the inner mountain part of the valley the width of which in the upper part does not exceed 2 km and in the area of the Panjiken corridor reaches up to 12km. In this area, that is, the subsystem, on the proluvial-alluvial deposits is the main volume of groundwater, which is closely related to the surface. This subsystem is part of the catchment area of the Zarafshan river basin, which is the main source of removal from the territory of a huge mass of dissolved and solid substances (Sabitova, et al., 1990) [12].

The second, that is, the middle part of the basin-the Samarkand basin, lies sub-latitude between the Panjikent intermountain corridor in the East and Karmaninsky in the West and is surrounded by mountain systems. The valley of the Zarafshan river has, as can be seen on the map, a single stream structure in the form of "bulbs". The valley itself is composed of numerous "bulbs", that is, subsystems that are closely Packed together. Such a complex and natural structure of stream structures is associated with the morphology of the relief and it is a pronounced form of abstract geological formations, which form the soil cover with their inherent reclamation features. The overall slope of the average subsystem of the Zarafshan river basin is insignificant-0.004-0.008 m. the main area of irrigated land is concentrated here. In the Meridian of country Juma, the strip of irrigated land reaches the greatest width and gradually moves in the direction of the Karmaninsky corridor. On the studied subsystem, ground and surface waters are closely interconnected and directed to the riverbed. In the Central part, they coincide with the direction of irrigation water flows. Ground water is fresh, hydrocarbonate-sulphate. The relatively deep occurrence and rather low mineralization of groundwater in irrigated soils is explained by the fact that the relief and geomorphological conditions here contribute to a better outflow of groundwater. Dominated by the process of natural desalinization of soils.

The lower, third section of the Zarafshan basin is a huge Delta plain. As can be seen from the map, starting from the Karmaninsky corridor, the flows fan out to the West and South-West, and in the extreme West, wide flow structures come out to the modern Amu Darya valley. The flows of matter coming from above accumulate within it, thus the subsystem is located in the zone of accumulation of water-soluble salts.

The analysis of the actual field material showed that the heterogeneity of geosystems-basins is manifested in the lithological-facies composition, geofiltration and geophysical properties, the intensity of water exchange in the aeration zone, which leads to salinization of soils and increased mineralization of groundwater.

On the map (see picture) each area is heterogeneous and reflects the vector movement of the soil-geological mass under the influence of the earth's gravity field.

Flow structures on the map show that against the background of the General slope of the relief and the composing geological bodies, there is a concentrated movement of matter and energy of different Genesis (Stepanov, 2006) [17]. It is known that basins are characterized by an absolute predominance of not strictly horizontal, but inclined movements of water and solid masses from higher to lower levels. As a result, the basin territory is dynamically interfaced with horizontal migration flows. We know that in the tops of the removal cone and its periphery, the soils constantly become heavy and saline, the depth of the ground water level decreases and their consumption for surface evaporation increases, which leads to intensive salt accumulation in the soils. According to the geometric shape of flow structures, it is possible to distinguish the boundaries of geosystems within which there is a sharp change in the reclamation state of soils (Nazarov, 1992; Toychiev, Sabitova, 2000; Sabitova, Akhmedov, Ruzikulova, 2016) [6,20,18].

The chemistry of salinization of ground water in the majority of cases is chloride-sulphate and sulphate, magnesium-sodium, magnesium-calcium and calcium-magnesium. The qualitative composition of the salts is dominated by sodium sulfates (Na_2S0_4) magnesium ($MgS0_4$), a fairly high proportion of calcium sulfate ($CaS0_4$), less than calcium bicarbonate . The accumulation of sulfates at low levels of mineralization of groundwater is quite intense and its content increases in a straight line depending on the increase in mineralization to about 5-6 g/l. Further, the rate of increase in the concentration of sulfates slows down. The formation of gypsum ($CaS0_4x2H_20$) and sodium sulfates (Na_2SO) of magnesium ($MgSO_4$) is observed (Takhtamyshev, 1973) [19].

In the area of Navoi, the valley expands somewhat (Navoi-Kanimeh oasis). The studied soils on the key site are old-irrigated, gray-earth-meadow, meadow, alluvial-saz, mainly medium-loamy, to varying degrees saline, composed of proluvial-alluvial and alluvial deposits. Observations have shown that the level of ground water on the studied irrigated massifs in recent ears has risen almost 1.0-1.5 m. the Seasonal amplitude ranges from 0.8-1.2 m. the Mineralization of groundwater 1-3 and 3.0-3.5 g/l. A natural relationship between the salt composition of soils and the degree of mineralization of groundwater was revealed. The content of chlorine, sodium and magnesium in the studied groundwater increases in parallel with the increase in mineralization. Accumulation of Na and Cl occurs mainly in the form of NaCl. The third lower sub-basin after about 50 km

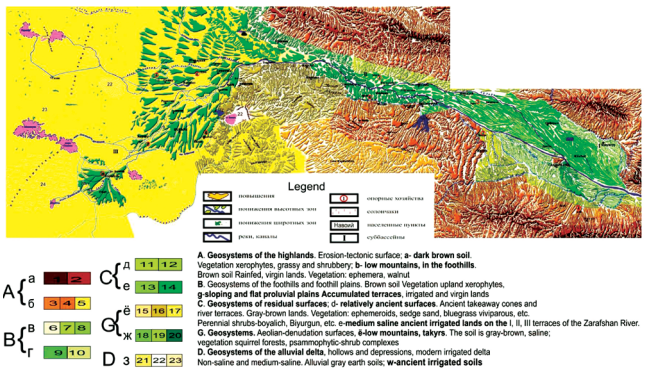

Figure 1. Geospatial models

between Kesilapanku Automatischem and plateau moves in the Bukhara oasis.

The key site in the Bukhara oasis, located on a low-flow area, is highlighted on the map in the form of a triangular shape. Soils old and new-irrigated, meadow and takyr, desert, medium-and light-loamy, varying degrees of salinity. They are composed of sand-loam and clay alluvial deposits and agroirrigation sediments with a capacity of up to 5-10 m. they are Developed on the ancient seaboard (ancient cone of the Zarafshan river) plain and on the P-floodplain terrace. Here begins the ancient Bukhara cone of removal, the width of which in the area of Bukhara reaches 60-65 km. Field observations have shown that groundwater, depending on the terrain, lies at various depths from 56 to 320 cm.

They have a generally established character with seasonal highs at depths of 0.52.0 m, and lows of 2.5-3.2 m, the amplitude of oscillations is on average 1.2-1.5 m. The degree of mineralization of groundwater varies greatly. In Navoi-Kanimeh oasis, it ranges from 2 to 10 g/l, in Bukhara-from 1.7 to 11.2 and Karakul - from 3 to 12 g/l (Sabitova, Akhmedov, Parpiev, Ruzikulova, 2004) [14].

West of the railway station Yakka-tut the valley is compressed by the exits of tertiary rocks, where it passes into the Karakul oasis-the fourth subbasein, which occupies the lower position in relation to the upper floors of the river basin. The streams of matter coming from above are deposited within it, thus the subsystem is predisposed to the accumulation of water-soluble salts. Here, the mineralization of groundwater in fallow and empty peripheral areas increases to 20-50 g/l or more. As can be seen from the presented map, starting from the Karmaninsky corridor, the flows fan-like expand to the West and South-West, and in the extreme West, wide flow structures go out to the modern Amu Darya valley. The difference in the amplitude of altitudes within the plain part of the valley from Karmadonskom of the corridor to the bed of the Amudarya is 190-200 m. the Terrain is flat and low-lying parts of the subsystems local pool is broken inside the basin depressions Agitminski, Karakirski, Dengizkulsky basins etc. They are used to collect collector and drainage water diverted from the irrigated area. Soils are old - irrigated meadow alluvial desert, medium-loamy, medium-and highly saline. They are composed of loamy-clay-sand alluvial and agroirrigation deposits, mainly sand and pebble layers.

In irrigated fields, spotty salinization is widespread, and in non-irrigated fields, there is a sudden salinization. Convex and concave forms on the compiled soil-reclamation map explain the pattern of distribution of spotted salinization. They are located on the concave structures of the selected streams. Depending on the shape of the terrain, the degree of artificial and natural drainage of the territory, the type of cultivated crops, groundwater lies at different depths. During the growing season, ground water lies from 0.50 to 2.10 m and from 2.50 - 3.20 m - in non-vegetative, and their mineralization ranges from poorly mineralized to highly mineralized (10-12 g/l). The chemistry of salinization of ground water in the pre-fertile majority of cases is sulphate and chloride-sulphate, rarely sulphate-chloride. The qualitative composition of the salts is dominated by sodium sulfates ($NaSO_4$) and magnesium ($MgS0_4$), a high proportion of calcium sulfate ($CaS0_4$). As the salt concentration increases, the content of chloride salts (NaCl) increases. CaC12 and MgC12 salts were detected in separate

groundwater samples. Moderate hydromorphic humidification from the ground water lying above the "critical depth", high temperature and dryness of the air at a relatively high wind activity of the territory leads to a wide development of the saline process (Sabitova, Akhmedov, 2005). Acknowledgements. The study was funded by the Uzbekistan Foundation of Basic Research, № 11.1.15. (System research on the genesis of irrigated saline soils in Uzbekistan, development of a set of measures (technologies) aimed at optimization and management of water-salt regime of the regions taking into account regional peculiarities (2003-2005) ears)).

Conclusion:

- system analysis of lithodynamic flow structures and conducted full-scale studies of saline soils of the studied territory, allowed to identify the causes and patterns of formation, regional features of salt accumulation, as well as to establish the dependence of spatial differentiation of soil salinity on geological and geomorphological conditions. The dependence of soil salinization and their chemical composition on the movement of stream structures is established, which is reflected on the soil reclamation map;

- there is an alternation of unsalted (washed) soils (areas) with weak medium and strong, and sometimes very saline (salt marshes);

- it is revealed that the depth of the salt horizon (salt maximum), its power and the degree of salinity of the soil of objects represent a great variety, determined mainly by lithological-geomorphological, soil-reclamation and anthropogenic-economic conditions;

- in saline (salt is found in a layer of 0-30 cm). There are soils highly saline (30-50 cm), saline (50-100 cm), deep saline (150-200 cm) and unsalted (deeper than 200 cm) differences;

- the number of salts in the profile of saline soils is different, often with several second-order maxima in layers of heavy mechanical composition;

- according to the content of water-soluble salts in the arable layer, the studied soils are mainly medium and highly saline, there are soils with a weak degree of salinity, and not infrequently there are saline soils with a salt content of 2-3 to 8-9% with a chlorine content of 1.2-2.8%. The total reserves of soil salts of the studied territories are extremely variegated and in the upper meter layer of soil their content ranges from 47-58 to 297-462 t / ha.

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STUDY OF CHEMICAL AND AGROCHEMICAL PROPERTIES OF TYPICAL MOUNTAIN SOILS

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Abstract

The article summarizes the data of studies on the eposes of rain fed dark sierozem spread in the foothill zone of the Gissar ridge. On this basis, field experiments were conducted; practical methods of erosion prevention were identified and developed using various anti-erosion agents. The soil-erosion processes of the mountain and foothill territories of the southern part of Uzbekistan have been studied.

Key words: soil erosion, humus, mountain soils, agrochemical properties.

Introduction. Rational use and protection of soil, ensuring the reproduction of fertility - occupy a special place in the general problem of the protection and use of natural resources. Soil resources are limited in size and quality. Their current state is alarming, because over the past 30–50 years the soil has been depleted of humus and nutrients, underwent salinization, water and wind erosion, and heavy metal and agrochemical pollution. There is a re-compaction, sometimes alkalization, deterioration of soil properties, its biological activity decreases, and eventually the level of soil fertility decreases. One of the global problems is the problem of soil protection from erosion, increasing their fertility. The problem of soil protection from erosion is relevant for many countries in the arid zone of the world, including Uzbekistan.

The destruction of soils in the mountainous territories was promoted by the centuries-old practice of the improper use of sloping lands in agriculture. Soil is the upper layer of the earth's surface and is critically important for humans; the vital activity of humans on earth depends on it Durán Zuazo and Rodríguez Pleguezuelo,[2].The issues of combating soil degradation in mountainous regions, or rather soil erosion processes, have long been the focus of attention of many researchers. Particularly large work on the study of erosion processes and measures to combat them has been carried out over the past 50-60 years, the nature and extent of the damage caused by erosion processes have been clarified. The positive effect of anti-erosion techniques on increasing the yield of agricultural crops and improving the fertility of eroded mountain soils has been proved Gafurova L.A., Djalilova G.T, Kodirova D.A., Ergasheva O.X [3].

According to M.N. Zaslavsky [4], erosion is a washout and erosion of the soil, underlying rocks by surface runoff of temporary water flows. The author believes that water runoff through the soil can cause surface and linear erosion. With a linear, gullies and ravines are formed, and with a surface - a washout. According to the author, several types of erosion are distinguished: erosion from runoff of rainfall, erosion from runoff of meltwater, erosion from runoff of irrigation water, as well as erosion from runoff of ground and sewage coming to the surface. M.S.Kuznetsov [6,7] Established the values of a quantitative indicator of erosion resistance (erosive flow rate) for the genetic horizons of the main soil types. The relationship of the erosive flow rate with the water resistance of the soil structure, their adhesion, and the content of plant roots is traced. The applicability for the quantitative assessment of the erosion resistance of mountain and foothill soils of the well-known equation of the erosive flow rate derived earlier for flat soils is shown.

Kuznetsov MS, Glazunov G.P. [8] considered the development of erosion in the foothills and low mountains of Uzbekistan very broadly and with great scientific thoroughness, taking a significant step in studying the scientific foundations of protecting soils from erosion in the arid zone and increasing the fertility of washed-out dry and irrigated soils. He proposed a new classification of washed-out serozems, using which the peculiarities of soil formation on sloping lands, the mechanisms of erosion under arid conditions were revealed, a change in fertility and anti-erosion resistance depending on the degree of erosion was shown, and a system of measures was developed to protect soils from erosion and increase the productivity of eroded soils on rainfed and irrigated lands.

The works of Kh.M.Mahsudov, L.A.Gafurova, I.Turapov and A.Khanazarov [12] emphasize that the protection and protection of soils from erosion on the mountain slopes are one of the most important tasks of the agricultural system and should be carried out over the entire catchment area, based on maximum prevention, the formation of surface runoff and the proper organization of the territory of farms. The authors state that replenishment with organic mass, a steady increase in humus content and the amount of nutrients as a result of afforestation, improvement of the condition of pastures by root and surface reclamation are the main ways to protect mountain soils and improve their fertility.

S.P.Poznyak [13] directed his research to the study of the content of humus, absorbed potassium, water-resistant aggregates, mineral nitrogen, mobile phosphates and exchange potassium in eroded soils. A.A.Tanasienko [15] on the basis of generalization and statistical analysis of literary and proprietary materials reflecting the analytical characteristics of virgin, plowed and eroded chernozems of Western Siberia, calculated their erosion resistance. The author found that the erosion resistance is determined by the quantity and quality of humus, exchange bases and particle size distribution. According to scientists, afforestation of foothills and mountainous areas should be based on several principles:

• any area should be considered as an element of small catchment area;

• preparation of soil to plant the trees and shrubs is designed in such a way as to capture and accumulate the precipitation for better water supply to vegetation and termination of surface runoff;

• forest vegetation should occupy the part of soil surface of slopes so as accumulated moisture was spared not only on transpiration, but also on uniform feeding of mountain water sources during the summer season;

• to establish such plantations it is necessary to use an approved assortment of trees and shrubs, depending on the growing conditions of the site;

• the layout of tree species should be chosen depending on soil moisture content;

• mixed stands are more resistant, but when planning the mixing schemes of species one should take into account their mutual influence and correlation of main and secondary (associated) species.

Method and materials. The selection of soil samples of scientific research from genetic horizons, observations and analyzes were carried out based on "Methods of agrochemical, agrophysical and microbiological studies in the cotton-growing areas" of UzCRI, "Guides to soil chemical analysis" E.V. Arinushkina. Here, humus is determined by the removal of carbon from the soil.

Results. Differences in the morphology and physical properties of brown soils also affect the chemical properties of these soils, in particular, the content and distribution of humus, CO_2 carbonates, the composition of absorbed bases and other components. The distribution and content of humus in the vertical profile of the considered soils are specific. Brown typical soils are characterized by a moderate content of humus in the upper horizon and a sharp decrease of it below the subdermal horizon. Konobeeva L.M. [5]. The humus content in the upper turf and turf horizon varies from 9.60 to 4.70%. In the sub-horizon hormone humus content is reduced to -4,7%; its amount downwards decreases more gradually. Mountain brown typical soils are characterized by a wide ratio of carbon to nitrogen: in the upper humus horizon from 8 to 11%. In the following - from 5,1 to 8.9. The enrichment of humus with nitrogen largely depends on its qualitative composition.

The process of soil formation in brown soils occurs under conditions of carbon dioxide weathering. One of the characteristic features of the chemical composition of these soils is the presence of CO_2 carbonates in them. Rustamov S.S., Makhsudov Kh.M., Yusupov Kh., Mirkhaydarova G.S. [14]. Brown soils are typically leached from carbonates to one depth or another. The depth of leaching, and therefore the location of the carbonate-alluvial horizon, depends on the strength and depth of soil wetting (amount and intensity of precipitation), the degree of carbonate of the soil-forming rocks (chemical composition of the rocks) and the terrain. The relief is a redistributor of precipitation and solar insolation, on which the temperature of the soil, its heating and desiccation, and therefore, the pulling up of soil solutions, including carbonates, or their suppression (washing, pulsation) depend. The tops of the watersheds are less carbonate than their slopes. Usually, carbonate content is less pronounced in the upper part of the watershed than in the lower part. On the slopes of the southern exposure, carbonates are closer to the surface, and if, in addition, the slopes of significant steepness and the upper soil horizons in them are eroded to varying degrees, the carbonates are in the upper horizon. As a rule, in typical brown soils, carbonates are located in the lower part of the humus horizon. at a depth of 70-90 cm: their number increases sharply in the lower part of the profile.

In the upper horizons (up to a depth of 70-120 cm The carbon content of carbonates exceeds 1% of soil mass. In the rock, this indicator reaches 8-10% (soils are formed on loess loams), with the boundary between the transitional and carbonate horizons being pronounced. In the carbonate horizon, besides pseudo mycelium of carbonates, white-eyed and gall-stones are observed. If we compare the distribution of CO_2 carbonates with brown carbonate soils, they are distinguished by a low carbonate content throughout the profile. And in typical brown soils, the CO_2 content of carbonates does not exceed 1% in the upper meter layer, with the exception of the soil located on the southern slopes, which are subject to erosion, here carbonates vary in profile from 2 to 5-9%. Thus, the obtained materials on the content of humus and nutrients showed that the formation of the humus horizon, its thickness and humus content are

Table 1

The composition of absorbed bases in the mountain brown typical soils (right bank of the Shukoksai River)

Depth, cm	Humus,%	General, %.			C: N	CO_2 carbonates,%
		N	P	K		
Section 126. Mountain brown typical. North slope.						
0-8	7,15	0,19	0,33	3,41	9,6	0,23
8-28	2,41	0,08	0,12	2,86	8,1	1,11
28-70	1,65	0,07	0,11	2,52	5,4	1,14
70-120	1,01	0,07	0,09	2,34	5,1	7,80
120-150	0,62	0,05	0,07	2,57	5,3	10,34
Section 127. Mountain brown typical. Southern slope. Medium eroded						
0-6	4,15	0,23	0,15	2,41	8,9	2,01
6-18	1,52	0,13	0,10	2,36	7,2	3,12
18-52	0,75	0,06	0,09	2,41	7,8	3,58
52-100	0,51	0,04	0,07	2,50	7,1	5,76
100-135	0,40	0,02	0,05	2,22	8,0	9,21

largely determined by the exposure of the slope, soil erosion and the stock of plant mass. With an increase in the slope of the slopes of humus and the thickness of the humus horizon, especially located on the southern slopes decreases.

Show that in typical brown soils the sum of absorbed bases along profile horizons varies from 11 to 18-mg. 100 g soil. It is larger in typical brown soils (section 125) and less in eroded brown soils. In typical brown and eroded soils, the sum of absorbed bases in humified horizons is about 13–18 mg.eq. per 100 g of soil, and in the subsoil 11-13 mg. eq. In typical brown eroded soils, the amount of absorbed bases remains more constant along the profile (11-13 mg.eq.).Calcium is clearly predominant in the composition of absorbed bases; its content varies in typical brown from 79 to 85% of the amount, in eroded brown typical soils from 84 to 92%. In all cases, the relative content of absorbed calcium in the humus horizons is less than in the rock. The exceptions are eroded brown soils, somewhat enriched in absorbed calcium, which, in our opinion, is associated with the erosion process, which elevates carbonate horizons to the top.

Wander M.[17] the content of absorbed Mg ++ in the upper horizons is insignificant and increases in the middle part of the profile, which indicates the accumulation of this element in the colloidal part of the soil during its development. Significantly poor in absorbed Mg ++ on eroded brown typical soils, which characterize the younger phase of development of brown soils. The content of absorbed potassium in the upper humus horizon is 2-4.4% of the amount of absorbed cations and down to 1.1-1.3% are killed. The accumulation of absorbed potassium in the humus horizon of typical and eroded brown soils and over the entire profile of increased humus in the soil is a consequence of the processes of biogenesis. Absorbed sodium in our facilities is either not at all, or it is in small quantities in the subsoil. The actual acidity of brown soils (pH) of aqueous soil suspensions varies in the lower horizons from 6.2 to 7.1% over the entire profile, the latter indicator is characteristic of the carbonate horizon on eroded soils. Consequently, the brown soils of the studied object are slightly acidic or closer to neutral and neutral, which is typical of brown soils and other areas. The high value of the absorption capacity is obliged along with organic and mineral colloids, as evidenced by the high values of the capacity in the transitional, significantly depleted humus horizons.

He studies of the gross composition of brown soils on the right bank of the Sukoksai river bank was carried out along two sections characterizing the brown typical soil (section 125) and eroded (sections 127). The data of the gross analyzes are given in table-2.Maksudov Kh. M.

The uniform distribution of the SiO_2 brown soil profile is noteworthy. The content of aluminum hydroxide is slightly increased in the middle part of the profile of brown typical soils, which is associated with significant ogling n the upper horizons of brown soils, despite their leaching, calcium compounds are present in significant amounts, which is due to the introduction of it with waste. The natural cenotes of brown soils are Cal cephalic. It can be assumed that the accumulation of calcium in the upper horizons of brown soils is partially caused by the process of biological accumulation.

When considering the data of the gross analysis of brown carbonate soils, their enrichment with one-and-a-half oxides is revealed, but somewhat less than in typical brown soils. SiO_2 is unevenly distributed across the profile. Its content fluctuates significantly, sharply decreasing in the alluvial-carbonate horizon, which is due to the accumulation of calcium carbonates. The molecular ratio of SiO_2: $R2O_3$ in all soil horizons is constant. Chaplot, V., Mchunu, C.N., Manson, A., Lorentz, S., Jewitt, G., [16] indicates that this ratio of silica and sesquioxides is characteristic of brown soils and other mountainous areas. The relatively low molecular ratio of SiO_2: AL_2O_3 and SiO_2: Fe_2O_3, which does not change within the soil sequence, indicates the absence of migration of Fe and Al hydrates.

An accumulation of small amounts of phosphorus and potassium oxides in the upper horizon is detected, which reflects the accumulation of organic matter in the soil. Along with this, there are accumulations of magnesium. In typical brown soils on the right bank of the Shukoksai river, the batteries are contained in significant quantities. However, the selected soil genera differ somewhat in their content.

The content of gross nitrogen in the turf horizon of the brown soils of the reserve varies from 0.19% in carbonate soils to 0.66 in typical soot, downward it

Table 2

He composition of absorbed bases in the mountain brown typical soils (right bank of the Sukoksay River)

Depth, cm	Mg / eq per 100 g of soil.				Amount	% from the sum.				pH	Absorption capacity
	Ca^{++}	Mg^{++}	Na^{++}	K^{++}		Ca^{++}	Mg^{++}	Na^{++}	K^{++}		
	S125. North slope										
0-12	15,52	2,22	no	0 ,61	18,35	84,5	12,1	no	3,3	6,6	22,7
12-39	14,72	1,97	no	0,77	17,46	84,3	11,2	no	4,4	6,2	20,4
39-62	13,07	2,71	no	0,41	16,19	80,7	16,7	no	2,5	6,0	17,2
62-91	11,57	1,81	no	0,28	13,66	84,7	13,2	no	2,1	6,9	15,0
91-136	10,83	2,22	no	0,59	13,64	79,4	16,9	no	1,3	6,6	15,0
S.127.South slope.											
0-6	11,18	1,48	no	0,10	12,76	87,6	11,6	no	1,8	6,6	15,8
6-18	11,97	0,57	no	0,38	12,92	92,6	4,4	no	2,9	7,1	16,7
18-52	10,93	0,52	no	0,13	11,88	92,0	6,9	no	1,1	6,8	17,0
52-100	9,78	1,15	no	0,31	11,24	87,	10,2	no	2,6	6,6	-
100-135	11,57	1,81	no	0,28	13,66	84,7	13,2	no	1,3	6,6	-

changes according to the change in the content of humus. The content of gross phosphorus and potassium also varies in the soil profile, but to a lesser extent. in the Upper horizons, an accumulation of these elements is observed, which is associated with a biological factor. The content of mobile forms in soils varies. Brown typical soils are characterized by a higher content of mobile forms of phosphorus and potassium than brown leached carbonate, and to a greater depth, which is associated with the accumulation of organic matter.

The reaction of the soil solution is closely related to the carbonate content of the soil profile. In the upper horizons leached from carbonates, it is neutral, and from top to bottom, with an increase in the content of carbonates, rises to alkaline. Thus, brown typical soils are characterized by a dark-collapsed humus horizon, within a turfy-granular, below a lumpy-nut, with a total capacity of 91-136; deeper carbonate horizon with abundant neoplasms and carbonates in the form of pseudo mycelium, white-eyed and carbonated lime nests. On eroded mountain brown differences typical of the southern slopes, these indicators are significantly worsened, the thickness of homicide horizons does not exceed - 50 cm, the new formations are visible with a sub-horizon. The content of humus and nutrients shows that the soil of the northern slopes in the upper sod horizons 7-9, and the soil of the southern slopes is not more than 4 percent. The distribution of CO_2 carbonates on the soils of the northern slope does not exceed 1% in the upper meter layer and on the soils located southern exposures that are subject to erosion of CO_2 carbonates varies in profile varies from 2 to 5-9%. From the chemical indicators it should be noted that the amount of absorbed bases on the horizons of the profile varies from 13 to 18 mg/eq, per 100 soils.

It is more in typical brown soils located in the northern slopes and less in eroded soils, where the amount absorbed is more constant along the profile (11-13mg / eq). Calcium, the content of which varies in typical brown 79-85% of the amount, in eroded brown typical soils from 84 to 92% clearly dominates in the composition of absorbed bases.

Conclusion. In all cases, the relative content of absorbed calcium in the humus horizons is less than in the rock the exception is in eroded brown typical soils, which are associated with the erosion process, which raise carbonate horizons to the top. All these indicators show that the content of humus and nutrients and the formation of the humus horizon and its thickness are largely determined by the exposure of the slope to soil erosion and the stock of plant mass. With an increase in the steepness of the slope, the humus content and thickness of the humus horizon decreases especially located on the southern slopes.

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THE ISSUES ON THE APPLICATION ANTI-EROSION MEASURES IN LAND MANAGEMENT PROJECTS

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Abstract

The issues of taking into account the factors that affect to the development of land management projects for areas subject to erosion, the choice of land composition and crop rotation systems, their placement on the territory with consideration for erosion hazard, the design of the irrigation plots taking into account the relief, and the use of water-saving technologies are considered and substantiated in this article.

Key words: land management, project, erosion, irrigation area, water-saving technologies.

Introduction. Special attention is paid to the effective use of available land resources to ensure food security in the world, to the implementation of targeted scientific research aimed at improving methods for organizing optimal use of agricultural land in areas where there is a risk of erosion, in land management projects [3]. One of the important tasks in this regard, including the composition of land types required for land users, and methods aimed at optimizing them, as well as improving the work of land management projects based on them.

Object and methods of research. The research was conducted on eroded lands of Kashkadarya region and was aimed at improving irrigated areas, creating and exchanging arable land, taking into account the level of land erosion in agricultural enterprises. The study used a wide range of monographic research and experimental design methods.

Research results and their discussion. Everyone knows that the natural and economic conditions of Kashkadarya region have more specific features than in other regions. These characteristics, in turn, allow the region to grow a variety of agricultural crops and produce better agricultural products. To do this, first of all, you will need to know the state of rational use of land resources in the region. Based on the developed and recommended methodology, the experimental land project has been developed for Yusupov massif in Nishan district. The massif land fund is presented below (Table 1).

In 2019, a total of 50 farms operated in the massif, including 40 cotton-grain, 2 grain-vegetable, 3 horticultural, 5 livestock. One of the main tasks of creating internal land plots in an agricultural enterprise is the organization of land types and their crop rotation. The organization of land types and crop rotations

Table 1

Massif of land fund named after U.Yusupov

№	Land types	Total area, hectare	Eroded area, hectare	Including	
				In relation to the total area , %	With respect to agricultural lands , %
1.	Driving lands	3055.62	650.5	74.75	91.21
2.	Trees, total: Including: gardens vineyards mulberry	70.61 25.81 7.8 37.0	24.0	1.73	2.11
3	Abandoned (gray) land	108.1		2.64	3.23
4	Pastures	116.06		2.84	3.45
	Total agricultural land	**3350.39**	**674.5**	**81.96**	**100**
5	Landscaping	174.1		4.26	
6	Trees that protect the fields	15.1		0.38	
7	Drainage, canals and ditches	369.3		9.03	
8	Roads	70.9		1.73	
9	Buildings and squares	100.8		2.47	
10	Lands not used in agriculture	7.1		0.17	
	Total massif lands	**4087.69**	**674.5**	**100.0**	

requires solving a number of internal related issues [1,2].

The main purpose of organizing land types and crop rotation is to increase the intensity of land use and the efficiency of cultivation, taking into account the economic interests of landowners and land users. In this case, it is necessary to strictly comply with environmental requirements, since otherwise the soil fertility will decrease, and erosion and degradation processes will develop in it.

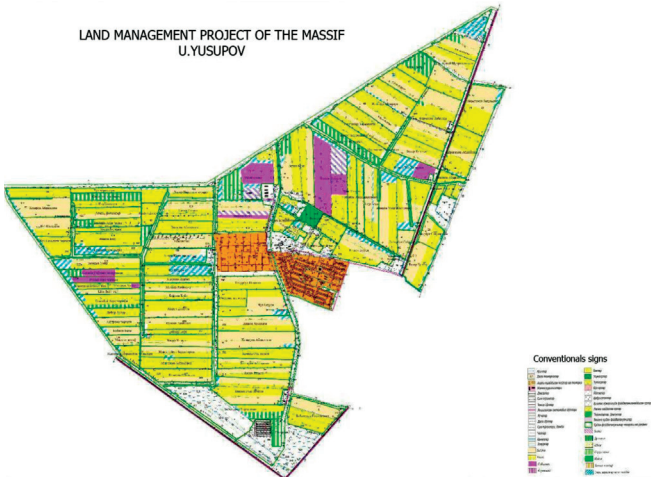

Figure 1. Formation of the internal land use project of U.Yusupov massif

Based on the above requirements, the composition of types of land for farming was determined, their areas were determined and located on the territory.

After the placement of land types and crop rotation areas in the territory of the massif, the territory of each alternating sowing massif was established, in which irrigation (working) plots, fields, field roads, shelter trees were placed. Because the massif is located in a saline area, drainage in these lands should be located between two adjacents of irrigation ditches that operate permanently or temporarily. Therefore, this scheme of connecting the drainage network with the irrigation network was used in this project.

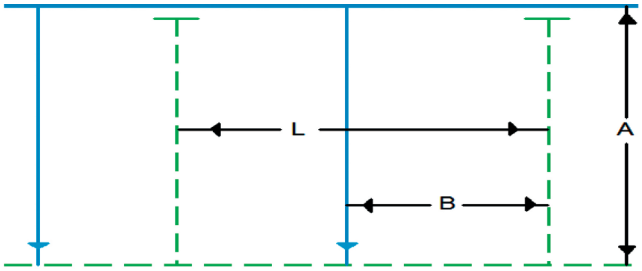

Figure 2. The scheme of connection of a permanent collector - drainage network with an irrigation network

Table 2 on recommendation of V.M. Legostaev, the approximate distances between the drains for cotton farms are indicated.

Using Tab. 2, the distance between the drains was determined and the width of the irrigated area *(V=L/2)*, then its area was calculated according to the following expressions:

$$P = \frac{B^2 K}{10000} \quad (1)$$

Where: K is the ratio of the field length to the width

$$(K = \frac{A}{B}) \quad (2)$$

Based on this formula, using the data in Tab.2, the optimal dimensions of irrigated fields with different levels of salinity, depth of groundwater and mechanical composition of the soil were determined (Tab.3).

The size of irrigated areas in the areas that are dangerous for erosion is affected by the erosion protection conditions of this territory. In case of wind erosion, the range of distances in the area of protective forest belts has a limiting effect, and in the case of irrigation erosion the permissible length and flow rate of irrigation furrows.

The results of our research to determine the optimal size of irrigated areas on land subject to irrigation erosion are presented in table 4.

According to the experts [4, 5, 6, 7, 8, 9, 10, 11], in some cases, the decrease in crop yields along with their simultaneous enrichment is associated with the problem of water scarcity. To mitigate this situation, it

Table 2

Approximate distances between drains at a depth of 2-2.5 m *

The level of soil salinity	Depth of groundwater, m		The distance between drains, "L", m		
	Before watering and washing	after washing the saline	Heavy mechanical content soil	Medium mechanical content soil	Light mechanical composition soil
1	2	3	4	5	6
Less	2-3	1-2	The device of private collectors is located at low levels		
Medium and strong 400-600	2-3	1-2	250-300	300-400	400-600
Weak 500-600	1-2	1-2	300-400	400-500	500-600
Medium and strong 300-400	1-2	1-2	200-250	250-300	300-400
Weak 250-350	0-1	1-2	150-200	200-250	250-350
Medium and strong 200-300	0-1	1-2	100-150	150-200	200-300

Table 3

Optimal dimensions of irrigated fields

The level of soil salinity	Depth of groundwater, m		Optimal size of irrigated fields, hectares		
	Before watering and washing	After washing the saline	Heavy mechanical content soil	Medium mechanical content soil	Light mechanical composition soil
Less	2-3	1-2	16-36		
Medium and strong 400-600	2-3	1-2	4,1-5,9	7,2-10,4	16,2-23,4
Weak 500-600	1-2	1-2	7,2-10,4	11,3-16,3	16,3-23,4
Medium and strong 300-400	1-2	1-2	2,8-3,4	4,1-5,9	7,2-10,4
Weak 250-350	0-1	1-2	1,8-2,6	2,8-4,1	5,5-8,0
Medium and strong 200-300	0-1	1-2	1,0-1,5	1,8-2,6	4,1-5,9

is necessary to introduce energy-saving technologies in the irrigation system and prevent water waste.

The advantage of drip irrigation technology is that with this method of irrigation, the soil moisture and the amount of water supplied to create it are controlled, and the water is evenly distributed throughout the field in accordance with the specific time needs of each crop. Unlike other irrigation methods, drip irrigation creates a water-physical environment that is optimal for the plant in the soil layer in which the root of the crop develops.

The advantage of drip irrigation is shown primarily in the protection of water resources, in stopping irrigation erosion, and in stopping secondary salinization. The peculiarity of the irrigation regime in this allows it to be used even on land where the slope is relatively high. The most important thing is that the field soil does not harden, since water is supplied to the plant using hoses during drip irrigation, as a result of which there is no need to process the gaps between the rows. A field where the soil does not harden is of high quality and easy to plow at the end of the season. Since the fertilizer is supplied with water, there is no need to use fertilizing methods. As a result, the materials for labor and side lubrication are saved. The manual labor of field workers is sharply reduced. In 2019, the water-efficient drip irrigation was used on 42.0 hectares of the land in Z. Farmonov massif.

Table 4

Recommended optimal areas of the irrigated fields

Mechanical composition of soil,water permeability	Water consumption of site water distributors, l/s	areas of irrigation fields, hectares			
		0,01	0,007	0,002	0,005
1	2	3	4	5	6
Sand and light sand are strongly permeable	200	18,0	18,0	18,0	18,0
	250	21,0	22,5	24,0	22,5
	300	24,0	27,0	30,0	27,0
Light strong sand, high permeability	200	18,0	18,0	18,0	22,5
	250	22,5	24,0	27,0	30,0
	300	27,0	30,0	27,0	30,0
Medium sand, moderately permeable	200	21,0	15,0	18,0	27,0
	250	26,2	22,5	27,0	27,0
	300	31,5	30,0	27,0	36,0
Heavy soil, low water permeability	200	18,0	18,0	12,0	21,0
	250	24,0	27,0	24,0	21,0
	300	30,0	27,0	24,0	31,5

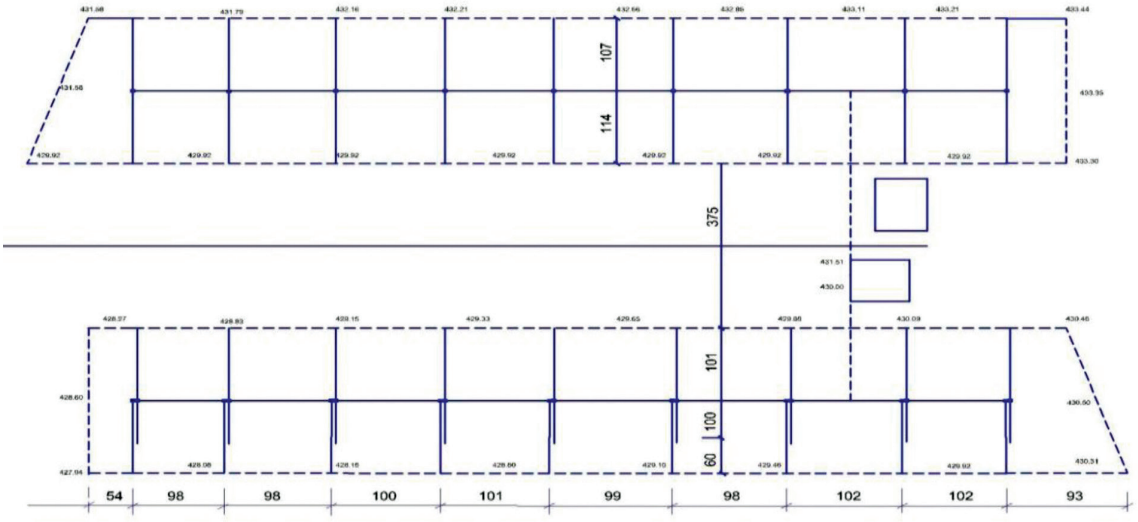

Figure 3. Scheme of application of drip irrigation system on the ground

Table 5

*Comparative data for estimating the location of fields and irrigation plots on the example of Z.Farmonov farm **

№	Indicators	I per year of land formation	II according to the project
1	2	3	4
1	Land use coefficients (LUK)	95.37	98.32
2	Crop rotation area, hectares	90.9	93.75
3	Area under roads, hectares	0.9	0.3
4	Net area of arable land, hectares	90.0	93.45
5	Number of working plots	4	4
6	The average area of the working plot, hectares	22.73	23.44
7	The distance between the longest sections, km	1050	1050
8	Average processing distance, m:	740	860
9	Slope in the working direction, %	13.3	9.1
10	he total area of the rotation lanes, hectares	15.2	8.21

The effectiveness of internal land management for the farm: is reflected in the environmental, economic and social spheres. Irrigated lands in Kashkadarya region fall from 5 cadastral zones to 4 cadastral zones. Due to its physical limitations and difficulty of restoration, its economical and efficient use of land is the most important and topical issue. There are 24.4 thousand hectares of irrigated arable land in the region, all of which are in the agricultural sector. The average score quality of soil in the province is 51 points, according to a 1999 survey. This is a decrease of 3.5 points compared to 1991. In order to overcome the above-mentioned disadvantages, it is important to introduce crop rotation, pay more attention to seed and selection, apply irrigation technologies, improve the efficiency of land reclamation and mechanization in cadastral zones.

Conclusion. The above analysis leads to the following conclusions:

1. The quality of land is taken into account according to the characteristics that determine its value as natural resources and means of production. Such characteristics include the description of soils in terms of soil, vegetation and relief structure, the degree of water and wind erosion of the soil, information of waterlogging, salinity, nutrient availability, and so on. These factors should be taken into account when drawing up plans for the efficient use of land resources.

2. Areas with erosion should have their own specialization and concentration of production. Therefore, it is necessary to develop a set of measures for land management to create regional conditions for land use in the territory of erosion zones, rather than on farms, where the organization of production of raw cotton is carried out.

3. In irrigated eroded lands, the area of irrigation plots depends on the slope of the land plot and should be calculated as 6.3-26.7.

4. In saline soils, the size of the irrigated area is affected by the level of salinity of the soil and the level of groundwater. The results of our research showed that they should be calculated for 16.0–36.0 in non-saline soils, 16.3–23.4 in low-salinity soils, and 7.2–10.4 in moderately saline soils.

5. As a result of the use of "water-saving" technologies on the area of 42 hectares in the territory of the farm Z.Farmonov in the massif, water consumption per hectare decreased by 30-40%, production costs by 20-25%. The efficiency rate increased by 22%.

As a result of effective implementation of the above measures, farms using agricultural lands will have the opportunity for sustainable development, and the level of profitability will increase.

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THE ROLE OF THE LABOR MARKET IN PROVIDING EMPLOYMENT TO THE RURAL POPULATION

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Abstract

The issues of development of the labor market in rural areas and regulation of employment in the rural areas and the development of the country's economy, which is based on the principles of modern economic theory, in particular the theory of employment to solve existing problems on these issues are considered in this article.

Key words: employment, labor market, employment of population, labor force, salary, unemployment.

Introduction. It is known that social life exists on the basis of material and spiritual wealth created by human labor, the duration of which is directly ensured by the continuity of the whole process of labor. This, in turn, requires people to work rationally. In his Appeal to the Oliy Majlis, President of the Republic of Uzbekistan Shavkat Mirziyoyev said: "It is necessary to reduce unemployment among the population and increase the income of people and families. ... Unemployed people should be provided with vocational training, legal and other advice, as well as other social assistance methods. ... He stressed the importance of creating a decent wage system and increasing the real incomes of the population in order to improve the living standards of our people [1].

In today's globalization, the development of the rural labor market and the level of employment of the population leads to a number of economic and social problems. Therefore, the issue of employment has been one of the most pressing issues in all countries. Its solution means the creation of an effective economy capable of ensuring the social development of the society.

Research methodology. In order to regulate the development of the labor market in rural areas and the level of employment of the rural population and to solve the existing problems on these issues, it is necessary to rely on the basics of modern economic theory, in particular, the theory of employment.

The labor market plays an important role in regulating employment. This is due to the fact that the labor market attracts the economically active population to the production and services sectors and provides them with employment. It shows what personnel, specialists, professions are in demand in the labor market, which of them are more, that is, there is no demand for them.

It should be noted that today the labor market and its mechanism of action, the laws of development are being studied by world economists as an object of scientific research. However, economists have different views on the labor market, its laws of development and the mechanism of its implementation.

In particular, A. Smith, D. Riccardo, J. Keynes, J. Perry, M. Friedman, J. Kornai and many other economists have studied the essence of the labor market as an economic category, its various socio-economic conditions, its features. We know that the mechanism of reproduction, distribution and use of labor, the role and importance of this category in the system of economic relations of a society is the subject of research.

These scholars have different approaches to the study of the mechanism of employment and the functioning of the labor market and the laws of development. In particular, in the economic literature there are four approaches to the concepts of labor market and employment, which are considered as classical, new classical, Keynesian and monetarist approaches.

The founders of classical theory, A. Smith and Ricardo argue that full employment is the norm of a market economy, the result of the best economic policy of the state. They argue that competition in the labor market eliminates forced unemployment, and that every able-bodied person looking for work can find a job for the amount of wages set by the market.

According to these scientists, the right to pay for labor plays a key role in regulating the labor market. In other words, wages have a direct impact on the growth and weakening of competition in the labor market. Adding to the views of the classics, the proponents of the new classical theory, J. Perry and R. Hall noted that the labor market, like all other markets, operates on a price balance, and the cost of labor is the main regulator of the labor market.

However, J. Keynes and R. Gordon, the theoretical founders of the labor market, argue that the labor market is in a state of constant and deep imbalance, and the cost of labor can not be a regulator of the labor market. According to them, there is no mechanism in the economy to guarantee full-time employment, and full-time employment is more random than at the level of legitimacy. They believe that the state should regulate the labor market, while the state can reduce or increase the demand in the labor market and, as a result, eliminate the imbalances in the labor market [2].

In general, the proponents of the above classical and Keynesian theories have profound differences in the ideas they promote, as they have different worldviews based on the laws of development of different socio-economic systems. That is, the difference between the approach of the proponents of Keynes's theory to the concept of the labor market and the approach of the classical and new classics is that the proponents of the classical theory do not interfere in the labor market at all. Representatives of classical theory are mainly those who prioritize personal rights and freedoms, who believe that the intervention of the state hinders the formation of personal rights and freedoms. Keynesians, on the other hand, emphasized the need to subordinate the labor market to the principle of social interest, and believed that the labor market could be regulated through the development of private property

and entrepreneurship. That is, in their opinion, the state should create conditions for the development of private property and entrepreneurship, not the labor market. It is believed that the development of entrepreneurship in itself increases the demand for labor and, as a result, regulates the labor market.

However, the proponents of the monetarist theory, M. Friedman and F. Keigen, while criticizing the Keynesian methods of shaping and developing the labor market, approached the issue as follows. In other words, in their opinion, the use of monetary methods is required to develop the labor market and increase employment. They believe that the establishment of the minimum wage by the state will upset the balance between supply and demand in the labor market and will have a negative impact on its development. They also believe that in order to develop the labor market, it is necessary to reduce the number of government agencies that regulate it and to form and develop the financial and credit system.

In addition to foreign economists, a number of Russian and domestic scientists have expressed their views on the concept of the labor market. In particular, a group of economists, N. Tukhliev, A. Ulmasov, explain that "the nature of the labor market, the offer is determined by the employee himself, taking into account how much he wants to work and how much time he has" [3].

The second group of economists says that the labor market is a key factor in production. The labor market has a multifaceted function, including the definition of wages in the labor market, its forms and other conditions of employment, its employment, composition, unemployment dynamics, conditions for retraining, etc [4].

The third group of economists described the labor market as the free movement of labor between enterprises, industries and regions, and the formation of a single common price for its quality and quantity [5].

Summarizing the definitions given by the above groups of economists, the Russian economist I.S. Maslova describes the labor market as follows: In this case, the subjects of property of the factors of labor (means of labor and labor) move with each other. According to him, there is a labor market, but "it is not fully deformed, and at the same time it is not comprehensive, but covers only a part of labor relations" [6].

It should be noted that in the United States, the former Minister of Labor tried to remove the concept of "labor market" from the published materials of the Ministry. According to him, labor is sold and bought like cotton, grain, fuel or steel, which is why he believes that the concept of "labor market" discredits employers [7].

In the organization, development and distribution of labor in the interests of society and the individual, along with other resources of production, the possibilities (shortage or surplus) of labor resources are relatively limited, without any barriers and obstacles.

It should be noted that the main economic issue in the labor market is the issue of efficiency, that is, in practice, it is a matter of increasing its efficiency through economic assessment of wages, employment and unemployment. It should be noted that efficiency is a problem of macroeconomic and microeconomic nature.

In providing employment, it is of paramount importance to ensure that each of them has an equal right to a fair income from his or her official employment. That is, it is necessary to create equal legal opportunities for the registration of such sources for those who are not recognized as unemployed by the state and have no legal income, but are unemployed, but have no source of official income. It is these "equal legal opportunities" that mean that the economic nature of the unemployment problem has a social basis. This means that unemployment can be resolved positively in the context of the direct use of economic resources, but its social basis is at the same time the unemployed, taking into account the "natural" social activity of the unemployed, which is considered to be economically unemployed, i.e. without income. Therefore, the most important task is to regulate the supply of labor within the consumer.

Research results. An additional factor in this problem is the demographic development inherent in Uzbekistan. The analysis shows that according to the State Statistics Committee of the Republic of Uzbekistan, the number of labor resources in the country in 2000 averaged 12,469 thousand people, or 50.6% of the permanent population, and in 2019 it increased to 189%. The share of the permanent population increased by 56.4%. During the analyzed years, the number of economically active population increased from 9018.4 thousand people to 14876.4 thousand people, while the level of economic activity of the population increased from 69.7% to 75%. The employment rate has decreased from 69.4 percent to 68.3 percent over the years. The unemployment rate increased from 0.4% in 2000 to 9.0% in 2019. If we analyze the level of employment in the regions, in 2000 it was 78.7% in Tashkent, 75.8% in Bukhara, 75.3% in Navoi, 73.7% in Syrdarya, the lowest in Jizzakh - 60.2%, In the republic of Karakalpakstan. it was 60.6%, in Namangan region - 60.8%. By 2019, this figure increased to 80.5% in Tashkent, 71.5% in Tashkent region and 70.2% in Andijan region. The lowest unemployment rate in 2019 was in Tashkent at 7.4 percent, while the highest in Samarkand, Syrdarya, Surkhandarya and Fergana regions (9.3) [8].

The diagram below shows the dynamics of the population engaged in activities by type of economic activity.

The analysis shows that the number of people employed in agriculture, forestry and fisheries in 2010 was 3229.4 thousand people, and in 2019 this figure increased to 3544.6 thousand people. The number of

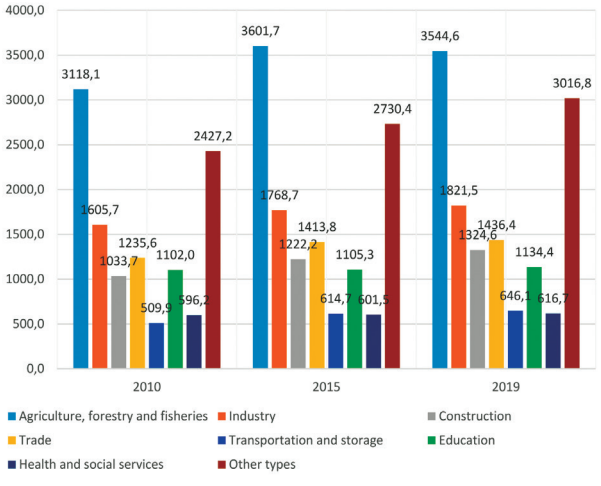

Figure 1. Distribution of the employed population in the labor market by type of economic activity (thousand people)

people employed in industry increased from 1,605.7 thousand in 2010 to 1,821.5 thousand in 2019 (Figure 1). In terms of economic activity, the share of the employed population in the labor market is the lowest in health care and social services. In 2019 this figure was 5% of the employed population, 5% in transportation and storage, 8% in education, 10% in construction, 11% in trade, 13% in industry, 26% in agriculture, forestry and fisheries, 22% in other activities. The share of the employed population is shown in Figure 2.

According to the forecast parameters of the state program "Job creation and employment" in our country, the need for employment in the areas of employment and by industry, especially in the labor market, is growing, especially in the emerging economy vacancies, as well as the demand for labor as a result of the development of industry, agriculture and other sectors of the economy, the service sector, private business and entrepreneurship. The influence of this factor requires the formation of specific features of social policy. Thus, the material and spiritual basis of employment implies the formation of the national characteristics of our people, the sphere of labor and social relations inherent in the national ideology and thinking. The course of this process is reflected in the characteristics of the formation of labor supply in the labor market and has an impact on the interpretation of the categories of wages and unemployment. Therefore, the main goal is to increase the efficiency of the national economy based on market relations by balancing wages, employment and unemployment.

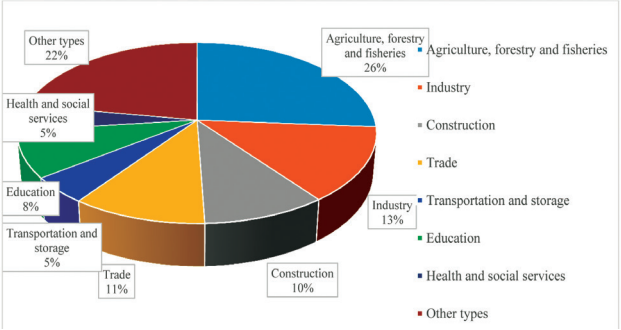

Figure 2. Distribution of the employed population in the labor market by type of economic activity in 2019 (%)

Conclusion. As a result of the regulation of the labor market in rural areas, along with ensuring the efficient use of labor in rural areas, it is possible to increase the volume of production in the country by increasing the full use of working time and employment of each worker.

With this in mind, it is expedient for the labor market in rural areas to fulfill the following main tasks. Including:

- to balance the demand and supply of labor in rural areas;
- proper distribution of the labor force in the village;
- ensuring proportionality in meeting the needs of workers for certain supplies, taking into account their individual abilities;
- to determine how much time a worker spends to improve his / her professional skills in the process of acquiring and working as a result of training and education, and to form a system of remuneration worthy of work.

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INDICATORS AND FACTORS OF THE DEVELOPMENT OF INTENSIVE GARDENING IN FARMS

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Abstract

In this article trends and changes of development of a savdovodstvo and intensive gardening in the region and in the country in general are considered. Are submitted the analysis of the current state of the areas of gardening and their change. The recommendations of an irpedlozheniye about improvement of gardening in the Kashkadarya region and the republic are given.

Key words: Gross revenue, intensive farm, construction, productivity.

Introduction. In our country in the conditions of liberalization of economy large-scale reforms in the field of intensive gardening and wine growing are undertaken. Even before creation of farms in the sector of fruit and vegetables the most part of fruit (78.1%) was grown up by Dehkan farms and farms. In particular, in 2016 60.6% of total area of gardens 33.9% - to Dehkan farms were transferred to farms, the others belonged to other agricultural enterprises. Besides, 45.7% of all fruit which are grown up in 2015 are grown up on farms and 52.2% on Dehkan farms. If to draw a close attention to these figures, that is for 33.9% of Dehkan farms with the land plots, 52.2% of a harvest of fruit show high efficiency of Dehkan farms. Development of intensive gardening demands use of features in the industry. Specific features which need to be taken into account, according to us, the following groups:

The first group is various products of intensive gardening which are directly connected with intensive gardening; appearance of products, difference in the nature of goods; process of intensive gardens and labor-consuming harvesting; differences in maturing of fruits; All types of fruit can be stored and be processed.

The second group - the specific features connected with activity of intensive gardening farms. That is agricultural grounds and small amount of production; Production of fruit demands from the farmer of sufficient knowledge, experience and skills; far away from the market; The Possibility of cultivation of fruit in water, magnificent, mountain and foothill areas; Fertility on the basis of various agrotechnical actions; access to the field; experiments generally from generation to generation; the beginning of investments into the industry in 5-6 years; Very intensive influence of climatic conditions should be considered at intensive gardening. [1]

Organizational aspects of activity of intensive gardening economy can be divided into two groups.

Establishing intensive gardening business - land lease, a solution of the problem of possession and use of gardens; Infrastructure, use of objects; Possession of fixed assets; management of a farm; production creation; processing of the earth; care of a garden; protection against insects and diseases; harvesting and marketing.

Materials and methods. Intensive gardening began in 2012. For example, the area of gardens in the territory of our country in 2013-2017 increased from 254.6 thousand. Hectare up to 279.6 thousand. Hectare, i.e. For 9%, and the quantity of gardens increased by territories of the country from 201.3 thousand. Up to 226.9 thousand (table-1). Hectare. For 12%. Productivity increased by 19%, and the gross product grew by 34%. In spite of the fact that these figures are low now, such growth rates in the short term indicate that development of the industry of gardening is positive development.

Table 1

Fruit and berry fields, gross collecting and productivity in our country

	2013	2014	2015	2016
Fruit and berries (thousand pieces)	254.6	261.9	266.4	279.6
from which profitability (thousand pieces)	201.3	214.6	214.3	226.9
Gross revenue (one thousand tons)	2261.1	2490.6	2746.1	3042.8
productivity (one thousand tons)	112.3	116.0	128.1	134.1

In particular, taking into account a situation in the Kashkadarya region a share of gardens in the region in 2016-2017. Makes 17238.0 hectares. From 20755.6 to 20%. The area of younger gardens increased from 122,140 to 15,156.0 points and increased by 24%, and the share of intensive gardens increased from 1945.3 to 1954.5, or for 0.4%. The low share of intensive gardens in the region aggravates need of intensive gardening for the region now. However lack of necessary conditions for creation of intensive gardening in the region, lack of adequate knowledge and skills in the cost of new technologies for development of intensive gardening (table 2).

Table 2

Information on the existing gardens in the Kashkadarya region

Available gardens, hectare	Areas of gardens, hectare	Areas of younger gardens, hectare	Intensive gardens, hectare
2016 year	17238	12214	1945.3
2017 year	20755.6	15156.0	1954.5

Today intensive gardening is based on the market principles and is not a method of administrative management for development of the industry, and it is rather an inadequacy of deliveries of high levels of mineral fertilizers, gardens and insecticides and also intensive methods of gardening. Quantity of the got profit low. In recent years increase in profit is observed. In particular, the analysis of intensive gardening in the

Kashkadarya region in 2012 allowed to receive a harvest of 1025 000 sum from hectare of crops, 1957 000 sum in 2015, 3251200 sum in 2016 and profitability of 5895600 sum in 2016, 75.6 percent. In view of the fact that the average gross area of an average farm in the region in 2017 is 10.8 hectares the annual net profit of a farm is 33694.0 thousand Sumov. Of course, taking into account the level of this income, and good results are achieved. In particular, on an intensive garden farm Orifzhon who grows on the area of 3.5 hectares in Yakkabagsky district in 2017 the net profit of one hectare of gardens was 1055 000 sum.

Apparently above, development of intensive gardening in our country differs from traditional gardening, with its high productivity for the short period of time, with its high efficiency, resistance to storage and transportation of the grown-up fruit. Thus, for development of intensive gardening in our country it is expedient to realize the following tasks:[2]

- increase in quantity of the farms specializing in intensive gardening;
- interest rates reduction on soft loans and extension of tax benefits for effective development of intensive gardening;
- allocation of the grain and cotton fields free from intensive gardening, not for objects of housing construction, and for intensive gardening;
- Creating favorable conditions for import of the leading foreign technologies (drop irrigation) for development of intensive gardening and increase in efficiency.

Development of intensive gardening and achievement of high efficiency will allow to ensure in the future food security in our country, to fill the national markets with fruit and vegetables, to satisfy demand of the population for fruit and also will contribute to the further development of the export potential of our country and increase in the standard of living.

At the same time the most modern products are based on a private property and can be used for free agrarian economy, but also provide extensive information for those who want to get economic support from the industry. The garden network is not an exception. Now in gardening network there is a set of problems, revealing ways of their overcoming, minimizing shortcomings and applying new effective methods of gardening.[3]

For example, by 2016 the population of our country which is engaged in fruit and berries had only 39.3 kg of real consumption (only fresh, raw) within one year, and this figure will make 65.31 kg according to medical standards. Because fruit and berries are generally grown up in Dehkan farms, consumption of fresh fruit is 40% less than medical norms that, in turn, creates the need for additional fruit and berries of the population of the country. The deficiency of fruit in the national markets is compensated by import fruit from our country, and their share makes 35-40% now. The product range of import fruit from abroad consists mainly of our fruit, but our fruit differ in the taste, ecological purity and the maintenance not of GMB. However this problem can be solved by further development of intensive gardening in our country, strengthenings of material and technical resources of the farmers and Dehkan farms specializing in intensive gardening, implementation of new technologies and further state support. In our country there are a lot of affairs, but with intensive gardens still there is a problem.

Therefore, in our opinion, importance and importance of organizational and economic development of intensive gardening differ. The purpose of this article is the analysis of a number of methodical and practical recommendations about the organizational and economic principles of intensive development of gardening, to organizational and economic mechanisms of development of intensive gardening.

The following difficult tasks are necessary for achievement of our purposes:

- theoretical studying of the current state of intensive gardening;
- assessment of the current state of fruit growing and intensive gardening;
- to define the factors influencing development of intensive gardening;
- to define ways of increase in efficiency of cultivation of fruit and berries;
- development of methodical recommendations about optimization of high-quality gardens;
- development of mechanisms of the state support of intensive development of gardening;
- justification of organizational forms of agro-industrial integration by production of fruit and vegetables, etc.

It is necessary to analyse carefully set of the economic relations developing in development of intensive gardening. Besides, close cooperation with research institutes, the centers and farmer councils in intensive gardening, carrying out theoretical and methodological researches, wide use of domestic and foreign experience, revision of the existing standard and legal documents, development of intensive gardening is planned. and production of high-quality fruit and berries. According to us, the seasonality of operation of these products and use of human resources, operation duration, fast losses, harvesting, transportation and packing, non-standard grades of fruit and berries are the reasons of slow growth of intensive gardening.

It should be noted that in the region there are favorable conditions for mountainous and foothill areas and districts, with the aim of developing, developing and improving the efficiency of intensive gardening. Favorable climatic conditions, abundant rainfall, high land productivity and weak winds are most suitable for the future development of intensive orchards. In these regions, about 65% of intensive orchards will be used to increase production, increase the amount of fresh fruit and processed foods. to meet growing needs.

We are concerned that the lack of financial resources and the purchase of related equipment are a problem for many horticultural farms in the region. Therefore, in our opinion, it is desirable to introduce a system of specific measures for long-term leasing or concessional lending for farms engaged in intensive or intensive gardening in all regions of the country. To effectively implement these measures, government agencies, officials, or private entrepreneurs should rent companies and rent leasing operations.

In order to develop and increase the efficiency of intensive gardening in the region, it is extremely important to create stores, small and medium-sized enterprises,

goods, trading and warehouse structures specializing in fruit processing, modern packaging and fruit cultivation, which correspond to the domestic and foreign markets of the country. Development and implementation of new investment projects to attract foreign and local investors. ahamiyatag view.

The aim of these projects is the development and implementation of comprehensive measures aimed at improving the productivity of intensive gardens through the optimal placement of highly productive seedlings. In addition, the correct placement of saplings in dekhkan and private farms and an increase in the area of highly productive competitive varieties. To achieve effective solutions to this problem is possible through the introduction of highly efficient and innovative technologies that are promising areas in intensive gardening.

The main disadvantage of previously unsupported layouts is that other types of agricultural production are present in the gardens at the same time and, in turn, little attention is paid to the composition of the coriander gardens. As a result of such allocation schemes, the volume of fruit crops grown in the region, as well as mountainous and mountainous. In the regions, there is a decrease in the efficiency of gardening.[4]

Based on the above, we propose to improve the efficiency of intensive gardening in the region as a prospective plan:

Economically:

- The increase in sales markets nigilnogo (bakery) products;
- stabilization of legislation and tax policy;
- reducing the share of imports in the domestic market;
- regulate the prices of products grown in gardening;
- increasing the level of material and technical base of the industry;
- Optimization of the wage system in horticulture;
- improving the quality of products grown for the purpose of increasing the demand for products in the domestic markets.

agro-ecologically:

- Efficient layout schemes in gardening;
- an increase in acreage for the creation of intensive gardens;
- effective implementation of spring frost-resistant and high-yielding varieties;
- Increased use of cost-effective irrigation systems and harmless fertilizers;
- the transition from extensive low-income gardening to new, modern intensive gardening;
- Reducing the level of stress and instability in natural and climatic conditions due to environmental protection and so on.

From the point of view of science:

- increasing knowledge and experience in improving the skills of horticultural specialists, improving the quality and average yield of garden products;
- strengthening the exchange of experience and knowledge between manufacturers and industry experts;
- providing education to qualified agricultural producers, etc.

The above reasons determine the development of intensive gardening in the region. Thus, the main task of developing intensive gardening in the region is to rationally and fully utilize the potential available in this region, to develop and implement investment projects.

Currently, 71.3% of horticultural farms are concentrated in dekhkan and farms in the region, their processing amounts to 74.4%.

As a prospect for the development of gardening in the region, it is rapidly moving towards intensive gardening. To achieve this goal, it is important to ensure the success of scientific and technological progress and plant new varieties, introduce varieties that can withstand frost, are resistant to various diseases and provide an average annual crop of high quality fruits.

The main potential aspects of intensive gardening in the region are:

- convenience of natural, climatic and hereditary phenomena;
- the existing socio-economic potential necessary for the development of healthy gardening;
- Experience in agro-economic knowledge and crop production for the development of intensive gardening in the region;
- the hard work of the inhabitants of the region, their experience in agriculture, knowledge and intensity;
- Potential of product manufacturers in the territory and local markets.

Taking into account the above factors, prognostic indicators have been developed for the development of intensive intensive gardening in the Kashkadarya region.

Currently, the region allocates land for the cultivation and development of intensive gardening in areas of cotton and wheat. For the effective and timely creation of large gardens with great attention is needed new sowing seedlings in the region. According to him, today in Kashkadarya region will need 6093.4 thousand seedlings. To solve this problem, it is important to increase the number of seedlings growing in the region.[5]

These seedlings are the basis for creating intensive orchards in the region and updating existing seedlings with higher yields and higher quality. Also in 1843 it is necessary to reconstruct the gardens and restore many gardens. These reconstructed and restored gardens are also of great importance for increasing the production of garden products in the region. The key and key factors for the development of intensive gardening are the provision of energy efficient and basic production facilities, as well as the creation of highly productive gardens.

According to the results of the forecast, it can be concluded that the rational formation of intensive gardening and the production of coniferous fruits in most cases determine the economic efficiency of the industry.

In addition, the increase in yields and the growth of gardening in the region due to an increase in the melting of the forecast indicators in the table will ultimately improve the overall horticulture system. The development of the horticultural sector is an incentive to increase the export potential of the region and the country.

Conclusions: In our opinion, adverse changes in the agrarian sphere for these years led to the following

negative trends:

- reduction or neglect national fruit trees, especially in the agricultural sector;
- cultivation of forages and berries generally in Dehkan farms;
- low productivity of the grown-up products.

Only from 1995 for 2008 the area of gardens was reduced on 58,000 hectares or for 54.2% up to 27.2 thousand. Or 58.5% of all types of farms. By 2006 farms of shirkat were the main producers of fruit and berries, and their share exceeded 55%. Nevertheless, elimination of shirkat and transformation of farms, agricultural firms and other agricultural enterprises led to neglect, anormaly and reduction of many gardens.

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WAYS TO DEVELOP ECONOMIC RELATIONS OF RURAL HOUSEHOLDS WITH INFRASTRUCTURE ORGANIZATIONS IN UZBEKISTAN

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Abstract

The article was analyzed based on the questionnaires of economic relations with household infrastructure organizations in Shahrikhon district of Andijan region and justified their development.

Key words: households, infrastructure, futures contracts, economic relations, employment.

Introduction. In rural areas, households use the services of economic entities, including market infrastructure organizations, and engage with them in their economic and production functions.

The structure (types) of market infrastructure services required for households and their size is determined by the large or small volume of their production and consumption. At the same time, these statistics are not statistically mass-based, requiring them to be examined through separate questionnaires. Taking this into consideration, we analyzed the services provided by infrastructure organizations, the level of service provision, the structure of expenditures for services and the ways to further develop the infrastructure of services in Shahrikhan district of Andijan region.

As we know, in our country today there are various infrastructure organizations providing services to economic entities. The analysis of the types of services related to the production and consumption functions of households allowed identifying government and service infrastructure facilities. They are aimed at providing essential services to all economic entities, including households.

According to the surveys conducted by us, in fact, households use only 10 types of services, but only certain types. Of the 100 households interviewed in the Shahrikhon Rural Citizen Survey, 61.1% reported self-breeding, 45% coming from the market and 8% from a service organization. About 90% of the respondents use the fertilizer when it comes to fertilizer use, while another 20% use the fertilizer they produce. For these households, the agrochemical industry (stores selling fertilizers and chemicals) is still inadequate.

That is why businesses set low prices for their products, which results in the destruction of perishable products. In order to prevent this, the processing enterprises enter into the futures contracts with the population from the beginning of the year for the cultivation of agricultural and livestock products, which includes the volume, time, cost, conditions of transportation and, if necessary, the resources and prerequisites for production. should be marked. Thus, it is possible to increase the level of employment and income of the rural population, to gradually increase the level of self-employment of households, their tangible assets to ensure economic growth of the country. An analysis of the survey results also shows that many households reported exporting goods, not using securities, banking services, and only 9 (100 households) of information and consulting services applied for this service. These cases show that, especially in households (100 households), bank borrowing has not been carried out, and it has not focused on new areas in the development of rural households (for example, small shops or other areas). With this in mind, it is necessary to expand access to rural areas by providing them with affordable financial assistance and micro-credit, taking into account the needs of households.

Materials. Household support can now be provided mainly by district administration and village councils. According to the survey, more than 80% of households in Shahrihan district have nothing to do with the district administration.

At the same time, there is no currently legally established state body directly engaged in production and entrepreneurial activities of households as a separate economic subject (organization). Therefore, it is advisable to amend the Law on Dekhkan Farms, which regulates household production activities, on the functions of the organization (khokimiyat), which is responsible for ensuring the implementation of the conditions established by the state for their support and encouragement. Positive resolution of this issue is also ensured by the implementation of the policy of development of private entrepreneurship and wide access to family business in the country at present. [1,2]

100 households belonging to 10 Rural Citizens' Assembly in Shahrikhan district spent 35,449,000 sums for the use of infrastructure services. Most of the expenditures for this group of households were spent on seeds. They account for 56.7% of total expenditures. The next big amount was spent on purchasing fertilizers. It equals to 13.4% of total expenses. Approximately 9–10% of total household expenditures are spent on machinery, zoo, and insurance services.

Pakhtaabad rural citizens' household spent the largest amount on infrastructure services. Their volume makes up 30.6% of the total costs or 10876 thousand soums. The remaining households' spending on infrastructure was between 5 and 10 percent of the total cost. The average cost of services per one household is UZS 281.3 thousand. On average, the highest expenditure on infrastructure services per household is in households belonging to the Pakhtaabad rural SFP (518.0 thousand Soums), while the lowest expenditures are for the Nainavo rural households (164.7 thousand).

The average income per household for all surveyed households was UZS 3989,000. This figure is the highest in the country by Yangiyul (2926,000 soums), Choja (3,277

thousand soums), Pakhtaabad (8074 thousand soums) and the lowest in Toshtepa (1,890 thousand soums), Nineveh (1,855 thousand soums) and Abdubiy (1877 thousand soums). , The reality group (1,800,000 soum) per household. [Table 1]

The comparisons show that 9.5% of total household spending on insurance services (insurance costs) is the transaction costs. This is the measured costs shown in the questionnaire. However, in practice, households do not have access to information, consulting services, bank loans and other services that provide transaction costs that do not include transaction costs. Rural households do not make positive decisions about their use due to the high costs of this area. With this in mind, there is a need to optimize and optimize transactions related to household services. This should include not only the cost of services, but also the time and cost involved in concluding and executing the contract.

Discussion. At the same time, there are some problems that impede the further expansion of agricultural production, and the main ones are as follows:

- inadequate motivation and incentives of rural households to expand private entrepreneurship;
- lack of reliable sales channels for agricultural households, especially perishable and relatively small quantities of agricultural products;
- inadequate economic cooperation with large enterprises on the industrial processing of agricultural products produced in rural areas;
-lack of credit for most households to expand production and family entrepreneurship;
- poor infrastructure of infrastructure organizations and khokimiyats, which promote the expansion.

It is well-known that in recent years there is a tendency for rural households to produce products for market, that is, to produce goods. With this in mind, high profits can be achieved by improving the competitiveness of home-grown produce and reducing the cost of production and sales. At the same time, household income depends on market conditions. There are times when a farmer has to sell his produce to major cities at a very low price, even at a lower cost. In this case, farmers will not be able to get the expected income. Therefore, today the farmer must clearly consider the state of the market, the supply and demand, their potential and opportunities. That is, a farmer who wants to expand his business should plan in advance what kind of products to grow, how much to use, what technology to use, and where and at what price. This, in turn, requires constant improvement of the economic knowledge of the farmer and providing them with market information. This knowledge is necessary to reduce costs for the market and to decide how and when to sell the product.

Table 1

Services provided by household infrastructure organizations, Cost of services (thousand soums) in example of Shahrihan district of Andijan region

Name of Rural Citizens' Assembly	Number of households	Planted area	Costs of Infrastructure services						Share of Rural Citizens' Assembly in infrastructure expenditures,%	Revenue from product sales	Average per household	
			Seeds	Fertilizer	Technics	Veterinary	Insurance	Total			Costs of infra-structure	In-come
Toshtepa	12	89	2037	175	245	267	570	3594	10,1	22680	299,5	1890
Yangiyo'l	10	100	1490	499	455	249	700	3393	9,7	29260	399,3	2926
O'rta Shahrixon	13	71	1435	280	322	209	220	2466	7,0	30000	189,7	2307
Cho'ja	9	42	855,6	450	233	434	334	2307	6,5	29500	277,4	3277
Paxtaobod	21	142	9130	476	403	611	256	10876	30,6	169550	518,0	8074
Naynavo	13	89	666	472	273	307	423	2141	6,0	24112	164,7	1855
Guliston	13	85	1525	190	305	582	410	3012	8,5	29900	231,7	2300
Yuqori Shahrixon	12	115	1720	775	425	385	-	3305	9,3	25150	275,4	2096
Abdubiy	13	116	749	770	355	431	217	2522	7,1	24400	197,4	1877
Haqiqat	10	49	483	361	381	372	236	1833	5,2	18000	183,3	1800
Total	**126**	**898**	**20091**	**4748**	**3397**	**3847,1**	**3366**	**35449**	**100**	**502552**	**281,3**	**3989**
Costs of infrastructure	-	-	**56,7**	**13,4**	**9,6**	**10,8**	**9,5**	**100**	-	-	-	-

Source: developed on the basis of monographic research.

Conclusion. To sum up, the areas of development and expansion of infrastructure services for rural households are:

- to open a state-owned enterprise (7.8 per cent of households) to buy goods produced by households;
- establishment of a system for the government to provide the population with processing machinery and technologies for long-term storage (9.4% of households);
- Improvement of irrigation water supply for households (14.1% of households); - expansion of agrochemical services for mineral fertilizers and chemicals (18.7% of households);
- facilitating purchase of goods for export from households (20.3% of households); - increase of short-term and long-term bank loans for households (26.5% of households).

The implementation of these proposals will play an important role in developing rural households, as well as developing family businesses, and improving their market relations skills. At the same time, it is necessary to create an effective incentive for rural households to increase agricultural output in the future, and to expand their income through the sale and processing of products.

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SPORTS HYGIENE

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Abstract

The article discusses the basic tasks of hygiene of physical education and sports, as well as the rules of individual hygiene of athletes. The goal of physical education and sports hygiene is to prevent various diseases associated with exposure to physical culture and sports factors in people involved in physical exercises, to improve the health-improving efficiency of physical exercises based on creating optimal conditions, organization and content of physical education and sports.

Key words: sports hygiene, preventive measures, physical education and sport, influencing factors.

Introduction. Knowledge of the hygiene of physical culture and sports is necessary for every educated person. She studies the interaction of the human body involved in physical education and sports, with the external environment, plays an important role in the process of physical education. Hygienic provisions, norms and rules are widely used in the physical education movement.

Hygienic provisions are so important because without them it is impossible to fulfill the basic tasks of the comprehensive and harmonious development of people, maintaining good health and creative activity for many years, preparing the population for highly productive work and protecting the homeland.

Hygiene of physical culture and sports includes the following sections: personal hygiene, hardening, hygiene requirements for sports facilities and places for physical exercises, auxiliary hygiene means of restoration and increase of working capacity. Hygienic knowledge and skills help prevent diseases, adjust the functional state of the human body by means of physical culture and sports, and increase the body's resistance to the action of adverse environmental factors.

Knowledge and compliance with basic hygiene principles, requirements and recommendations for the organization of physical education and sports significantly increase their healthy effectiveness and provide the opportunity to achieve high sports results without compromising the health of athletes.

This article discusses the problems of hygienic provision of physical education and sports, gives recommendations for a healthy lifestyle.

The purpose and objectives of the study. Based on literary sources, study all aspects of the hygiene of physical education and sports. The objectives of this article are: to study the essence of sports hygiene, to determine the basic rules of personal hygiene of an athlete, the development of hygiene measures that enhance the health of people involved in physical exercises and sports.

Material and research methods. Analysis, synthesis, statistical analysis, modeling method, induction and deduction, historical analysis. Special literature of domestic and foreign authors on the studied issues.

Research results and discussion. Hygiene (Greek hygieinós, healthy) - a section of medicine that studies the impact of living and working conditions on human health and develops measures (sanitary norms and rules) aimed at preventing diseases, ensuring optimal living conditions, promoting health and prolonging life; medical science (hygiene), studying the influence of environmental factors on human health, its performance and life expectancy, developing standards, requirements and sanitary measures aimed at improving populated areas, living conditions and people's activities [1].

The hygiene of physical education and sport is the science of the influence of various factors related to physical education and sports on the health of those involved:

- environmental conditions in which exercise takes place;
- organization and content of physical exercises;
- the volume and intensity of physical activity in the process of exercising;
- the nature of nutrition;
- technical equipment and equipment of athletes [2].

Sports hygiene in the narrow sense is a set of preventive measures aimed at ensuring hygienic standards and maintaining human health in the conditions of physical education and sports.

Despite the fact that physical activity strengthens the human immune system and is the key to good health, non-observance of hygiene during training can lead to serious problems of the body.

Based on the study of the influence of various factors, hygienic recommendations, norms and rules are developed. They ensure the creation of favorable conditions for physical education and sports, increasing their health-improving effectiveness, general and special (sports) performance, level of sports results without compromising the health of those involved.

The goal of physical education and sports hygiene is to prevent various diseases associated with exposure to physical culture and sports factors in people involved in physical exercises, to improve the health-improving efficiency of physical exercises based on creating optimal conditions, organization and content of physical education and sports.

The subject of hygiene of physical education and sport as a science is the study of the process of interaction of the human body with various factors of physical culture and sport.

The main objective of the hygiene of physical

education and sports is to develop measures to prevent the possible adverse effects of various factors of physical education and sports, improve health, physical development, increase the general and athletic performance of people involved in physical education and sports.

The main hygiene products used for this include:

-optimization of conditions, regimes and content, forms and means used in the process of physical exercises;

-balanced diet;

-optimization of physical activity during physical exercises;

-hardening.

Observing the athlete's personal hygiene rules is an integral part of a healthy lifestyle and plays a very important role. During training, sweating is significantly enhanced, which is a fertile environment for the propagation of pathogenic bacteria, fungi and all kinds of infections.

It is impossible to determine a regimen that is the same for all those involved in physical education and sports, but there are general physiological and hygienic provisions on the basis of which an athlete should establish a personal regimen in accordance with his characteristics and capabilities and strictly adhere to it.

If an athlete adheres to a rational regime, he develops and consolidates useful conditioned reflexes. For example, if an athlete eats every day at the same hours, he develops a corresponding strong conditioned reflex for a meal. The activity of the digestive system is normalized, becoming the most effective. When the time of eating is approaching, the digestive glands begin to act in the body, secreting the juices necessary for the digestion of food. An athlete with an appetite eats food that is well and quickly digested and perfectly absorbed by the body [3].

The time factor as a conditioned stimulus is of great importance not only in the outwardly expressed general behavior of a person, but also in the course of complex internal biochemical processes.

Violations of the regime often lead to a decrease in working capacity, poor health, reduce athletic performance, reduce "sports longevity."

The athlete should determine for himself a strict daily routine, which should indicate the time of lifting and charging, breakfast, lunch break, return from school, eating, resting, sports, homework, evening walk, going to bed, etc.

Maintaining a rhythmic mode of life is one of the most important conditions for economical and highly productive work of the body. This mode contributes to the early tuning of the body and its systems for the upcoming activity, which is carried out by the mechanism of the conditioned reflex for a while.

The basic rules of organizing the daily routine:

- rise at the same time;

- performance of morning hygienic gymnastics and water procedures;

- eating at the same hours at least 3 times a day (preferably 4 times a day);

- independent (home) classes in academic disciplines daily at the same hours;

- stay in the air for at least 2 hours per day;

- at least 3 times a week for 2 hours of exercise or sports with optimal physical activity;

- sleep at least 8 hours a day, going to bed at the same time.

The proposed scheme does not pretend to be universal, however, it can be taken as a basis when drawing up the daily routine [4].

Athlete's personal hygiene rules:

- If there are open wounds on the body, then before training it is necessary to disinfect them and seal them with a plaster to protect them from infection.

- Girls are recommended to rinse makeup before classes to get rid of impurities and to allow the skin of the face to breathe normally during training.

- It is advisable to take a shower before training. This is especially important if the training takes place in the evening and the skin is sufficiently contaminated. If you do not take a shower before class, then increased sweating will lead to even more clogging of the pores of the skin, which can cause various rashes and irritations on it.

- Dressing in the locker room and taking a shower, be sure to use rubber slippers.

- If classes involve the use of sports equipment that other people also use (exercise equipment, benches, rugs, etc.), then it's best to take your towel to the gym and cover the equipment in places of contact with the body, especially the face.

- To reduce the area of contact of the body with sports equipment, choose more closed clothing. Leggings, sweatpants instead of shorts, t-shirts instead of shirts and tops.

- After training, you need to take a shower and wash your hair. For washing, use antibacterial soap and do not use too hot water.

Hygiene rules for sportswear and shoes:

• It is necessary to engage in physical education and sports in special clothes, underwear and shoes.

• Clothing should be appropriate for the size of the person and not be cramped or too large. It is best to choose clothes made from natural fabrics.

• After each workout, sportswear and underwear must be washed and the shoes ventilated.

• Nowadays, for many types of physical activity, there are special shoes, such as running shoes, for playing tennis, for playing basketball and so on. If you play sports for which special shoes are designed, then it is better to use it. This will reduce the risk of injury, help improve results and provide comfortable training [5].

In recent years, valuable scientific data has been obtained that allow hygienic support for physical education and sports, taking into account age, gender and professional functional capabilities and individual characteristics of those involved, climatic and other external factors.

Physical exercises, regardless of their form and content, must necessarily contribute to improving the health of students, this is fully consistent with the health-improving orientation of the entire system of physical education.

The implementation of the health-improving principle of physical education is possible only if the physical education teacher and sports coach are familiar with the basic principles of hygiene and will recognize, in the

words of F. F. Erisman, the "hygienic way of thinking".

Only knowing about the possible adverse effects of reduced or excessive physical activity, insufficient or excessive physical activity, poor nutrition and training regimes, unsatisfactory conditions for training, you can get the desired result from physical exercises. Without observing the relevant hygienic norms and requirements in the process of physical education and sports, it is impossible to provide optimal conditions for normal physical development, maintaining and strengthening the health of those involved in physical exercises, to improve sports achievements.

The history of hygiene in physical education and sports has hundreds of years, but what we understand as an institute of sports and physical education arose relatively recently. But already in ancient times, scientists made attempts to consider physical education as a means of healing. For this, in addition to physical exercises, various restorative hygiene products were used [6].

Conclusions. Hygiene has reached a significant flourishing these days. Currently, the country has a whole system of hygiene facilities of various types: research institutes, sanitary-hygienic laboratories, sanitary-epidemiological stations. By its nature, hygiene is a precautionary science, its main task is to prevent the adverse effects of any adverse factors on the human body.

Prospects for further research. Improving the content and forms of physical culture in the structure of the adult lifestyle. Scientific and applied problems and the main ways of introducing physical culture into everyday life of people.

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MODELING THE PROCESS OF DETERMINING THE COLOR OF TRANSFORMER OIL BEFORE AND AFTER CLEANING

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Abstract

The article presents the results of modeling the process of determining the color of transformer oil before and after cleaning. To develop mathematical models for determining the main parameters of transformer oils purified using a filter press and adsorbents, the mathematical apparatus of regression analysis was involved. The obtained regression mathematical models make it possible to predict the color values of transformer oils to be purified without conducting full-scale experiments.

Key words: transformer oil, color, refining, modeling, regression analysis, coefficient.

Introduction. Timely cleaning of various technical oils plays an important role in the electricity sector and the mechanization of agriculture and water management in each country, which in turn also has a positive effect on the environment [1, 8, 11]. At present, multidisciplinary research is being carried out in this direction [2, 20]. The use of various geographic information systems greatly improves this process. Therefore, modeling the process of determining the color of transformer oil is one of the urgent tasks.

Methods. To develop mathematical models for determining the main parameters of transformer oils purified using a filter press and adsorbents, the mathematical apparatus of regression analysis was used [3, 4, 5, 6]. Regression analysis is a statistical method for studying the influence of one or more independent variables $x_1, x_2, .., x_p$ on the dependent variable y.

The efficiency of the cleaning process of used transformer oils can also be estimated through their color parameter. The average values of the obtained experimental data on the color of transformer oil before and after each stage of refining served as the basis for the development of a regression mathematical model [5, 20].

The regression equation, which establishes a nonlinear (polynomial) relationship between two indicators, is:

$$y_d = k_n + k_{n+1}x_d + k_{n+2}x_d^2 + \cdots + k_{n+a}x_d^a \quad (1)$$

where, y_d is the effective indicator after cleaning the used transformer oil; x_d is factor indicator of spent transformer oil; k_n is a regression constant that does not depend on factor x; k_{n+1}, k_{n+2}, …, k_{n+a} are the regression coefficients, which shows the effect on the effective indicator of the change in the value of the factor per unit of measurement.

The regression model for determining the color of transformer oil purified using a filter is given by the equation:

$$y_1 = k_0 + k_1x_2 + k_2x_2^2 + k_3x_2^3 + k_4x_2^4 + k_5x_2^5 \quad (2)$$

where, y_1 is the transmittance of the used transformer oil after filter cleaning; x_2 is an indicator of the transmittance of spent transformer oil before cleaning; k_0 is constant regression; k_1, k_2, k_3, k_4, k_5 are regression coefficients.

Using the Microsoft Excel program, we determine the constant and coefficients of the regression model:
$k_0 = 0,03$; $k_1 = 3,665$; $k_2 = -2,603$; $k_3 = -9,021$; $k_4 = 16,63$; $k_5 = -7,77$.

The regression model for determining the color of transformer oil purified using a filter is as follows:

$$y_1 = 0,03 + 3,665x_2 - 2,603x_2^2 - 9,021x_2^3 + 16,63x_2^4 - 7,77x_2^5 \quad (3)$$

Define the main indicators of the regression model [5, 20]:
The correlation coefficient is $R = 0,999$.
Determination coefficient $R^2 = 0,998$.

The regression model for determining the color of transformer oil, purified using a filter and adsorbent (silica gel) is given by the equation:

$$y_2 = k_{10} + k_{11}x_2 + k_{12}x_2^2 + k_{13}x_2^3 + k_{14}x_2^4 + k_{15}x_2^5 \quad (4)$$

where, y_2 is the transmittance of the used transformer oil after cleaning with a filter and adsorbent (silica gel); x_2 is an indicator of the transmittance of spent transformer oil before cleaning; k_{10} is constant regression; k_{11}, k_{12}, k_{13}, k_{14}, k_1 are the regression coefficients.

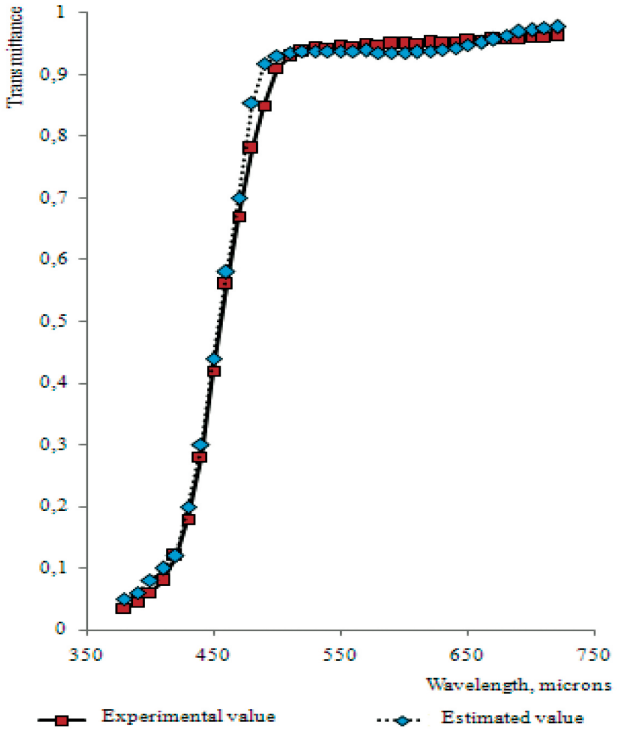

Fig. 1. Experimental and calculated color values of the used transformer oil after cleaning with filter and adsorbents (silica gel and zeolite)

Using the Microsoft Excel program, we determine the constant and coefficients of the regression model: k_{10} = 0,019; k_{11} = 8,209; k_{12} = -31,47; k_{13} = 60,75; k_{14} = -57,52; k_{15} =21,23. The regression model for determining the color of transformer oil purified using a filter and adsorbent (silica gel) is as follows:

$$y_3 = 0{,}019 + 8{,}209x_2 - 31{,}47x_2^2 + 60{,}75x_2^3 - 57{,}52x_2^4 + 21{,}23x_2^5 \quad (5)$$

Define the main indicators of the regression model [5, 20]:
The correlation coefficient is $R = 0{,}999$.
Determination coefficient $R^2 = 0{,}999$.

The regression model for determining the color of transformer oil, purified using a filter and adsorbents (silica gel and zeolite) was given by the equation:

$$y_3 = k_{20} + k_{21}x_2 + k_{22}x_2^2 + k_{23}x_2^3 + k_{24}x_2^4 + k_{25}x_2^5 \quad (6)$$

where, y_3 is the transmission coefficient of the used transformer oil after cleaning with a filter and adsorbents (silica gel and zeolite); x_2 is an indicator of the transmittance of spent transformer oil before cleaning; k_{20} is constant regression; k_{21}, k_{22}, k_{23}, k_{24}, k_{25} regression coefficients.

Using the MicrosoftExcel program, we determine the constant and coefficients of the regression model: k_{20}=0,088; k_{21}=12,46; k_{22} = - 68,23; k_{23} = 168; k_{24} = -188,1; k_{25}=78,07.

The regression model for determining the color of transformer oil purified using a filter and adsorbents (silica gel and zeolite) is as follows:

$$y_3 = 0{,}088 + 12{,}46x_2 - 68{,}23x_2^2 + 168x_2^3 - 188{,}1x_2^4 + 78{,}07x_2^5 \quad (7)$$

Define the main indicators of the regression model [5,6,20]:
The correlation coefficient is $R = 0{,}99$.
Determination coefficient $R_2 = 0{,}81$.

Results and Discussion. According to formula (7), we determine the calculated chromaticity values of the used transformer oil after purification with a filter and adsorbents (silica gel and zeolite), and construct a graph for comparison with experimental values (Figure 1). From Figure 1 it can be seen that the calculated values almost coincide with the experimental values.

Conclusions. The obtained regression mathematical models make it possible to predict the color values of the transformer oils to be purified without conducting full-scale experiments and reduce additional financial costs and time for carrying out experiments.

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EFFICIENCY OF TRANSITION TO USE FOR OPERATING MAGNETIZED BIOETHANOL FUELS

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Abstract

The use of mixed fuels with the addition of alcohols (ethyl alcohol - bioethanol) does not lead to the formation of an increased amount of deposits in the engine, since the level of washing properties of motor oils practically does not change. During the operation of internal combustion engines (ICE) on pure alcohols, negative phenomena are possible, which, if necessary, are eliminated by increasing the use of ashless detergents, improving the antioxidant properties of oils and increasing the alkaline number. The article reveals the main drawbacks of the known systems for the supply of bioethanol fuels in ICE and the prospects for their improvement, as well as the device and operating principle of the improved feed system after local magnetization of bioethanol mixtures for carburetor or diesel power facilities.

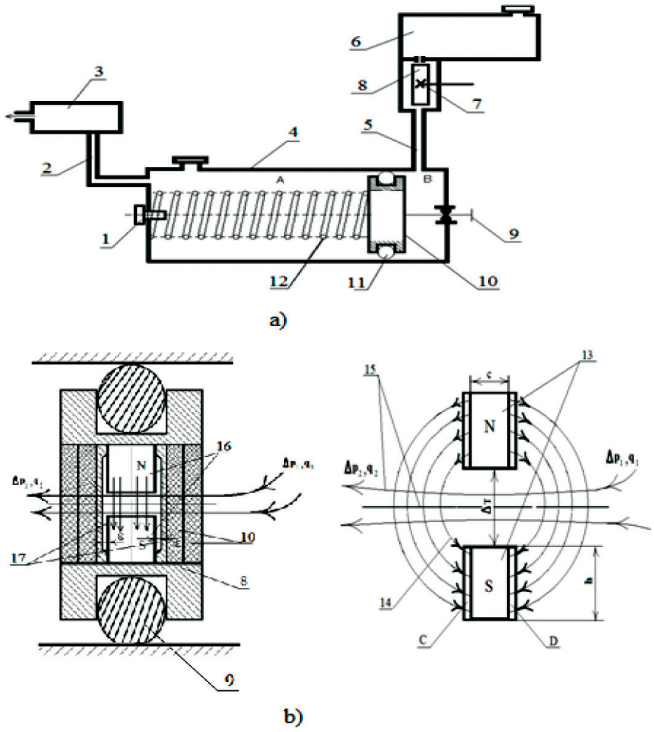
Key words: bias, dispersed mixture, phase, fluid movement, interpenetration, interaction, solid environment, nanofiltration, local magnetization.

Introduction. By the first half of the twentieth century, there was a clear trend in the use of bioethanol as a motor fuel for various energy sources [4]. One of the sources of obtaining this fuel in the agricultural sector of our country is waste from agricultural products processing. According to [2] per year, it is possible to expand the resource with bioethanol of 20-25 thousand tons of traditional fuels used in agricultural power plants. The use of mixed fuels with the addition of alcohols (ethyl alcohol - bioethanol) does not lead to the formation of an increased amount of deposits in the engine, since the level of washing properties of motor oils practically does not change.

Materials and methods. During the operation of internal combustion engines (ICE) on pure alcohols, negative phenomena are possible, which, if necessary, are eliminated by increasing the use of ashless detergents, improving the antioxidant properties of oils and increasing the alkaline number. For dehydration of fuel bioethanol, a membrane technology is used - nanofiltration and evaporation through a membrane, which allows for high concentration at a lower cost. It is known that mixtures of solutions of bioethanol up to 8% can be used as diesel fuel, and mixtures of solutions up to 10% can be used as gasoline provided it is completely dehydrated. It was also found that bioethanol obtained from waste can be used as additives to fuels and low-speed diesels and household fuels [3].

The fact that alcohols can be used as fuel for ICE was known as far back as 1876, when ICE with spark ignition was invented [1-2]. Today, due to restrictions on the pollution content in automotive exhaust gases, there is an interest in using boethanol as a motor fuel, when working on which there is less air pollution [3, 4].

In [3], an engine fuel supply system was proposed consisting of a piston mechanism with membranes with adjustable permeability. The disadvantage of this system is the high energy intensity of the formation of a bioethanol mixture and the low completeness of combustion of a two-component fuel mixture due to the formation of relatively large droplets in the combustion chamber. In order to eliminate these shortcomings, we proposed a new fuel supply system (Fig. 1), which consists of two tanks of gasoline and bioethanol, a spring-loaded actuator, with a rubber seal, a gear pump driven from the engine crankshaft, a fuel pressure regulator, a limit switch, a lever manual pumping of fuel and adjusting the movable membrane equipped with permanent magnets (Fig. 1, b) and hydrocommunication.



a) 1 - limit switch; 2, 5-hydrocommunication; 4, 6-tanks; 7-a cranked shaft; 8-gear pump; 9-lever for manual pumping of fuel; 10-a block of membranes with permanent magnets; 11-rubber seal; 12-a return spring; 13-permanent magnets; 14, 15-lines of a permanent magnet and a stream of bioethanol; 16-membranes; b) a permanent magnet installation diagram; c) magnetic field induction circuit; Δ_1 is the technological target in the magnetic modifier; Δp_1, q_1 and Δp_2, q_2-operating pressure and fuel consumption before and after the modifier; C, h-long and the height of the magnetic element; ε-height chamber mixers; "C", "D" - side windows.

Fig. 1. A system for supplying locally magnetized bioethanol fuel

Membrane modifier works in two modes. In the first mode, the engine does not work. The driver, pushing the lever for manual pumping of fuel, moves the piston to the left and compresses the spring 11 creates excessive fuel pressure in the space “A” and it passes through the nozzle 2, passing the pressure regulator 3, into the actuator, carburetor or diesel high-pressure pump. In the second mode, the crankshaft rotates the gears of the pumps 8 creates a bioethanol pressure in the cavity "B", under the influence of this pressure the piston 9 moves to the left and also creates the fuel pressure in the cavity "A". Fuel, through pipe 2, passing pressure regulator 3 enters the actuator, carburetor or diesel high pressure pump. The piston 100, having moved all the way to the left, presses the button of the limit switch 1, thereby disabling the gear pump drive 7. The oil pressure in the sub-piston space will disappear, and the return spring 12 will raise the piston to its original position, after which fresh fuel is poured through the fuel neck of the gasoline tank. In the proposed system, the piston head in the middle part is equipped with a magnetic modifier in the form of a permanent magnet 13 with opposite bands “N” and “S”.

It forms powerful magnetic fields (Fig.1, b) which penetrate a thin layer of horizontally streamlined liquid stream of bioethanol intensively magnetizes. Magnetized liquid bioethanol mixed with gasoline in the cavity "A" reduces the viscosity forms a bioethanol mixture.

Result and discussions

In the range of the modifier, a stream of liquid bioethanol 15 intensively processed by magnetic fields 14, mixing with gasoline, reduces its viscosity and surface tension. As a result, the supplied mixture of bioethanol with petroleum gasoline is crushed into finely divided droplets, accelerating the process of igniting bioethanol fuel in the combustion chamber of both diesel and carburetor engines.

Choosing the optimal design parameters, power and technological goal ΔT of the magnetic modifier and the optimum temperature of the supplied mixture, the optimal operation mode of the engines of energy means is achieved. Due to the presence in the mixed fuel of easily oxidizing hydrocarbons in fuel mixtures and a large amount of oxygen in the body, there is very little time, and the engine starts easily, works softly and stably.

All this gives the national economy a significant technical and economic effect.

Conclusions. The existing ICE power supply system has a high energy intensity of the process of producing bioethanol fuel mixture. The novelty of the proposed bioethanol fuel mixture supply system is its local magnetization before being fed into the combustion chambers, both for carburetor and diesel engines. When using 12 percent bioethanol per liter in a diesel device, one can save 12 ml of fuel and reduce the amount of exhaust gas into the atmosphere by 25-30%.

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MODELING AND RESEARCH OF RELAY AUTOMATIC CONTROL SYSTEMS

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Abstract

This article discusses the construction of a graph model of a relay automatic control system. Based on the graph model, relations are derived for calculating transients in a relay system. To describe and analyze relay systems of automatic control, a specific feature of the relay element is used, consisting in the fact that its output value can take only certain constant values. The maximum possible set of structural states for relay elements is three. Accordingly, the relay element introduces a structure discretization effect into the system. This feature makes it possible to study relay systems with relatively simple means and makes it possible to develop methods for their calculation to a certain extent similar to methods for calculating linear systems. In developing the graph method for the description and analysis of relay automatic systems, this position was primarily taken as a basis. This method can be successfully used if any of the typical relay elements is included in the system. A two-dimensional relay system is considered as an example. Based on the graph model, the output coordinates of the system are calculated and their graphs are constructed.

Key words: graph model, multidimensional relay system, macrostructure, calculating processes.

Introduction. In many sectors of the economy, including agriculture, automatic systems are used in which the control object is described by nonlinear equations.

The object of this study is relay systems of automatic control. Relay systems of automatic control are one of the classes of nonlinear systems; they have been actively and widely used in various stationary and non-stationary, moving control objects, in measuring and regulatory complexes for a long time. They are distinguished by simplicity of execution, settings, high reliability, resistance to the influence of non-stationary parameters and better dynamic properties compared to continuous systems.

At present, when thanks to modern control theory it is possible to create digital control systems of any complexity, relay systems should seem to take a back seat. However, interest in them has not only not weakened, but in recent years has even increased. This can be confirmed by a review of works on this topic and the achievements of digital technology, in particular, the appearance of contactless keys, operating amplifiers on chips, microcontrollers, as well as theoretical developments in the field of relay systems in various fields of technology [1-9].

From a theoretical point of view, relay systems are essentially non-linear, which, on the one hand, was the limiting factor of their use due to the complexity of the calculation, and on the other hand, caused the development of theories created specifically for this class of control systems. The list of issues related to the theory of relay systems, as well as to the theory of automatic control as a whole, is very wide. First of all, these are the features of their mathematical description, behavior in statics and dynamics, stability issues, special modes of relay systems of automatic control, etc. [10-15].

Thus, the urgency of the problem is determined by the widespread use of relay control systems and the need to study the dynamics of these systems in a wide range of parameters, the need to develop accurate methods that allow basic research and numerical calculations of specific nonlinear systems of automatic control. In this regard, the task of developing methods and algorithms for studying the dynamics of the functioning of relay systems of automatic control today is timely.

The purpose of this study is to develop, on the basis of graph models, a topological method for modeling and researching relay systems of automatic control.

To achieve this goal, the following tasks were solved: a complex of graph models of one-dimensional and multidimensional relay automatic control systems with various types of relay elements was developed, algorithms for studying the dynamics of the functioning of this class of systems are constructed.

In this work, a specific feature of relay systems is used, consisting in the fact that the shape of the output quantity does not depend on the shape of the input signal. This allows a mathematical analysis of relay systems by relatively simple means [16-20]. Moreover, this feature makes it possible to use methods of calculation, which, in a sense, are similar to methods of calculating linear systems. Such an analogy allows us to preserve the familiar concepts and terminology of linear control theory. For example, the concept of the transfer function, frequency and time characteristics.

Materials and methods. Consider the use of graph models to describe and analyze relay systems. In fig.1 is a structural diagram of a one-dimensional relay system. We pose the problem of finding the output signal of the system $x_1(t)$ for all time instants t ($t \geq t_0$, t_0 is the initial moment of time). The linear part of the system is represented by a m-th order dynamic link.

When developing a topological method for the description and analysis of relay systems of automatic control, a feature of the relay element is used, which consists of the fact that its output value can take only certain constant values. If the relay element is without a dead band, then the maximum possible number of structural states for it is two. For relay elements with a dead zone, three structural states are possible.

Without loss of generality, let us assume that in the system under consideration the relay element has an ideal characteristic, its output signal can take only two values + b or –b, where b is a certain constant number.

Let at the moment t0 the value of the output signal of the relay element is $Z(t_0) = b$ and the initial conditions are such that at some moment t_1 the relay element switches. On the time interval $t\ [t_0, t_1]$ the system is characterized by a certain structural state S_1.

We know the formation of the graph model [21-22] of the continuous part of the system, the relay element is taken into account by connecting an integrating link to the continuous part of the system.

As is known, in the study and design of control systems, the Laplace transform is used, therefore, the transfer function of the relay element is 1/p, where p is a complex variable.

The vertex characterizing the output signal of the relay element has a weight $z=bv-b$. The graph model of the system, reflecting its behavior on the interval $t \in [t_0, t_1]$, is presented in fig. 2.

From consideration of the graph model [23-25], it is easy to write the equation of state of the system on the time interval $t \in [t_0, t_1]$:

$$\vec{X}(p) = \vec{A}(p)\vec{X}(p) + \vec{B}(p)Z(t_0) \quad (1)$$

Having performed the inverse Laplace transform, we have

$$\vec{X}(t) = \vec{A}(t-t_0)\vec{X}(t_0) + \vec{B}(t-t_0)Z(t_0) \quad (2)$$

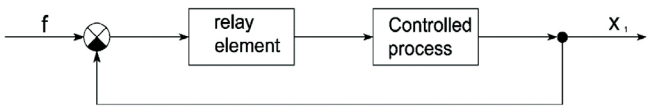

Fig.1. Block diagram of a one-dimensional relay system

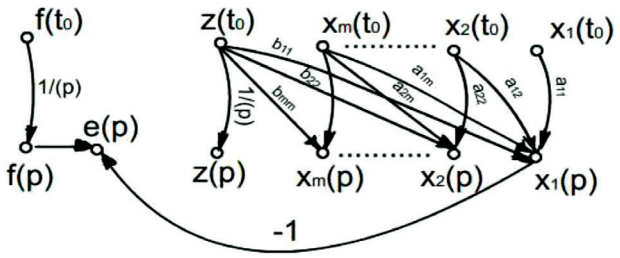

Fig.2. The graph model of the relay system

It should be noted that the switching moment t_1 of the relay element is unknown in advance and is determined from the equation $e(t_1) = a_1$ (3)

where $e(t_1) = f(t_1) - x_1(t_1)$ and a_1 is the sensitivity threshold of the relay element. In the general case, equation (3) is transcendental and is solved by one of the known numerical methods (Newton's method, iterations, etc.) Having determined the switching moment of the relay element t_1, from relation (4) we can find the values of state variables at $t = t_1$:

$$\vec{X}(t_1) = \vec{A}(t_1 - t_0)\vec{X}(t_0) + \vec{B}(t_1 - t_0)Z(t_0) \quad (4)$$

These values are initial for determining the processes in the next step, i.e. on the time interval $t \in [t_1, t_2]$, where t_2 is the second switching moment of the relay element. The structure of the graph model on the interval $t \in [t_1, t_2]$, does not change, only the initial conditions change. Therefore, there is no need to rebuild the graph model; just use the formalized model shown in fig. 2.

On the time interval $t \in [t_1, t_2]$ the equations for calculating the processes will be as follows:

$$\vec{X}(p) = \vec{A}(p)\vec{X}(t_1) + \vec{B}(p)Z(t_1) \quad (5)$$

where will we have

$$\vec{X}(t) = \vec{A}(t-t_1)\vec{X}(t_1) + \vec{B}(t-t_1)Z(t_1) \quad (6)$$

To determine the second moment of switching the relay element, it is necessary to solve the equation for the input signal of the relay element $e(t_2)=a_1$. The values of the state variables at $t = t_2$, which are the initial conditions for determining the processes in the next time interval $t \in [t_2, t_3]$, are found from the relation

$$\vec{X}(t_2) = \vec{A}(t_2 - t_1)\vec{X}(t_1) + \vec{B}(t_2 - t_1)Z(t_1) \quad (7)$$

In the general case, the ratios for calculating the processes on the segment $t \in [t_{n-1}, t_n]$, where $n = 1, 2, \ldots$, will have the form:

$$\vec{X}(t) = \vec{A}(t - t_{n-1})\vec{X}(t_{n-1}) + \vec{B}(t - t_{n-1})Z(t_{n-1}) \quad (8)$$

Results and discussion. As an example, consider a two-dimensional relay system of automatic control. Figure 3 shows the structural diagram of this system. Figure 4 shows its graph model, where the relay elements are taken into account by opening the system and adding to the continuous part of the system of links with the transfer function 1/p. Depending on the input signals e_1 and e_2, the output signals of the relay z_1 and z_2 take the values: $z_1 = -c_1 \vee c_1$, $z_2 = -c_2 \vee c_2$. That is, with the known signals z_1 and z_2, the processes can be considered directly according to this graph model after replacing the transfers of arcs $a_{ij}(p)$ by their originals $a_{ij}(t)$. However, the switching moments of the relay elements are not known in advance and should be determined in this case from the solution of the equations

$$e_1 = f_1 - y_1 \quad (9)$$

$$e_2 = f_2 - y_2 \quad (10)$$

for τ_1 and τ_2 (τ_1 and τ_2 are the switching moments of the 1st and 2nd relay elements). This can be done using well-known methods for solving transcendental equations (iteration, Newton, chord method, combined method, etc.).

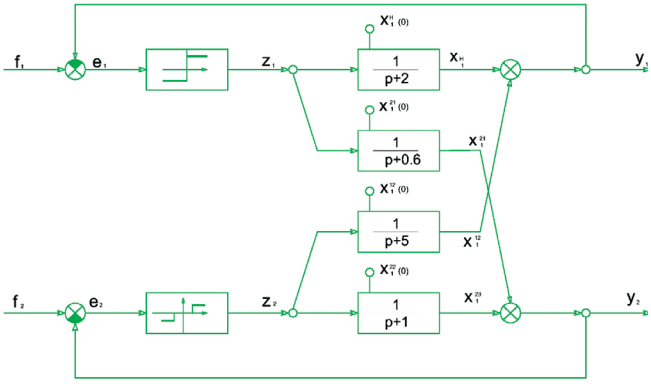

Fig.3. Block diagram of a two-dimensional relay automatic control system

After solving the equations for τ_1 and τ_2, the smallest of them is taken into account and the values of the variables $x_1^{11}, x_1^{21}, x_1^{22}, x_1^{12}$ for this switching moment are determined. They are the initial conditions for the next step in calculating the dynamics. In the next step, the calculations are again performed in parallel on both channels. Until the determination of the minimum time

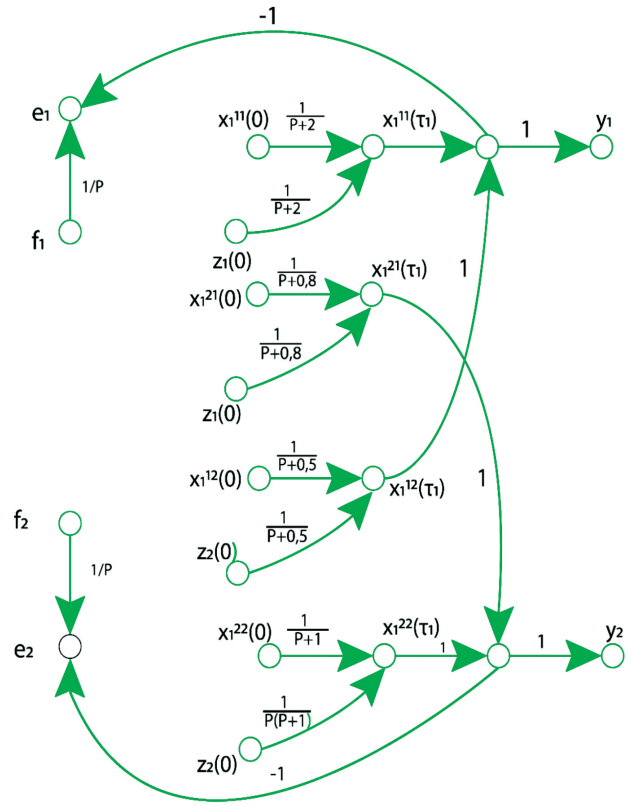

Fig. 4. Graph model of a two-dimensional relay control system of automatic control

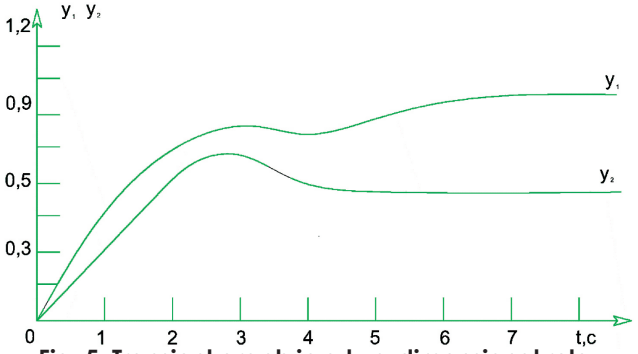

Fig. 5. Transient graph in a two-dimensional relay automatic control system

interval, after which one of the relay elements will switch. The described procedure is repeated for all steps of the process calculation, is transferred to the general case of multidimensional relay systems, and is convenient from the point of view of computer simulation of processes.

For multidimensional relay systems, an algorithm for calculating transients based on a graph model can be formulated as follows.

Algorithm 1.

2. At the input of the relay elements, the macrostructure of the system are separated. Dynamic integrating links are introduced into all separate and cross channels. A dynamic graph model of the system is being built.

3. Based on automatic models of relay elements and solving transcendental equations, it is relatively $\tau_i=1,2..,N$ determined. $\tau_{\min} = \min\{\tau_i\}$

4. All state variables are calculated taking into account τ_{min} and the transition of the system to the next structural state is determined.

5. The state of finite state machines with memory is fixed (in the presence of relay elements with a hysteresis loop).

6. The return to paragraph 2 of the algorithm.

For the considered illustrative system, Fig. 5 shows the curves obtained on the basis of the above algorithm.

Conclusions. From the considered example, we can conclude that modeling based on dynamic graphs is an effective method for solving problems of analysis of one-dimensional and multidimensional relay systems. We got a simple and convenient algorithm for calculating transients for multidimensional systems with various relay elements in the control channels.

The next stage of research is the use of graph modeling for the calculation of multidimensional relay systems with delay in individual channels. In such systems, there is a temporary delay of control signals. This phenomenon introduces difficulties in the calculation of such systems.

We also note that the proposed approach is convenient from the point of view of solving the synthesis problem of relay automatic systems: the synthesis problem can be considered as determination among the set of admissible trajectories S_t, optimal in one sense or another, of the trajectory $S_{ti} \in S_t$. The optimal trajectory can be realized by choosing the mode of operation of the relay part, or by changing the characteristics of individual structural states.

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MIGRATION OF ELEMENTS IN THE SYSTEM "SOIL-WATER-PLANT" AFTER ELECTRIC INFLUENCE

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Abstract

In the article, one of the most important problems in agriculture is the development and implementation of new ways to increase the productivity of industrial enterprises. The study should study the anthropogenic impact on the soil-plant-environment system and not have negative environmental consequences. On irrigated soils there is a significant reduction in plant nutrients (nitrogen, phosphorus, potassium), insufficient use of scientifically based technologies for the use of organic and mineral fertilizers; the increase in the cost and cost of fertilizers (phosphorus and potassium). Investigation of the influence of electrical processing on the basic electro physical, chemical, physical and mechanical properties of cotton fields. The effectiveness of the electrochemical treatment of the transported phosphorus in the soil (horizon 0-30 cm). Control of absorption forms of phosphorus in electric processing options.

Key words: soil, crop rotation, vegetation, electrical conductivity, resistance, humus, mechanical composition,

Introduction. Currently, one of the most important problems in agriculture is the development and implementation of new ways to increase the productivity of industrial plants. The formation of highly productive agricultural production, increasing its efficiency, sustainability and stability should be based on the rational use of available energy and material and technical resources. At the same time, the anthropogenic impact on the system "soil - plant - environment" should be selective and not accompanied by negative environmental consequences. The high rates of chemicalization of agricultural production, in particular cotton growing, determined the pace of scientific and technical support, the level of qualifications and technological discipline of producers and went beyond the scope of expediency. At relatively low growth rates of gross agricultural output, the specific consumption of energy resources is increasing.

Plant organisms, similar to other living systems, obey the physicochemical laws of the conversion of substances and energy, and their life features are specific to the structure and methods of interaction with the environment and primarily with water and soil.

Further development of agricultural production in the republic will be determined to a large extent, along with economic, organizational and other measures, scientifically-based regulation of soil fertility in order to increase its productivity.

Irrigated soils are the most intensively used lands, the main crops are grown on them, and the bulk of crop production is obtained. Therefore, the first task requiring close attention as agricultural research institutions and production specialists is to solve the problems of maintaining and improving the fertility of irrigated soils. Along with this, there is a significant decrease in the content of the main plant nutrition elements (nitrogen, phosphorus, potassium) in irrigated soils, on the one hand, as a result of insufficient implementation of evidence-based technologies for the use of organic and mineral fertilizers, and, on the other hand, as a result of insufficient production (phosphorus and potash) and increasing the cost of mineral fertilizers. In addition, another cause of nutrient deficiency in irrigated soils is the irreversible removal of nutrients (including trace elements) of nutrition and health (for example, selenium) by crops, which affects the productivity of soils and the economic efficiency of agricultural production.

The plant needs all the elements of mineral nutrition. In the absence or lack of any of them, metabolic processes are disturbed, growth and development are delayed, which ultimately leads to a decrease in yield and deterioration of its quality. A huge role is played by the level of nutrition and the ratio between the individual elements that exists in the soil, in mineral fertilizers. As a result of the studies, a positive effect of electric processing on the cotton yield and the quality of the raw cotton crop on the soil microflora was revealed.

In this regard, the need arose for a more complete study of the influence of various types of electrical treatment of soil, seeds and plants on the basic agrochemical and chemical properties of the soil, the transformation and migration of elements and substances in it in order to create the optimal technology for the electrical treatment of seeds, soil and crops.

Methods

The purpose of the work is to study the effect of various types of electric processing on the agrochemical and chemical and microbiological properties of the soil under cotton and steaming soil. To achieve this goal, the following tasks:

- To study the effect of electric processing on the content of gross forms of nutrients (macro- and microelements) in the soil under cotton;
- To study the effect of electric processing on the basic electrophysical, chemical, physical and

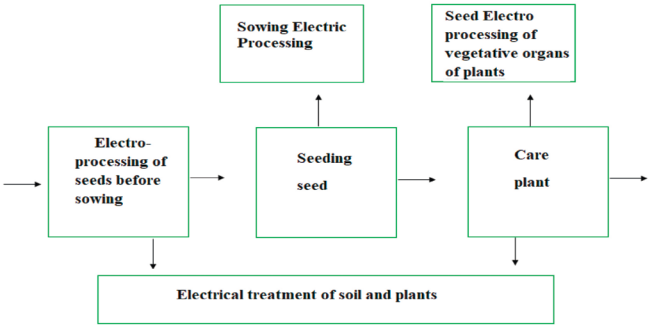

Fig. 1. The compatibility of the electrical treatment of soil, seeds and plants with agricultural methods of sowing seeds and caring for the growth and development of plants

mechanical properties of the soil under cotton (electrical conductivity, resistance, humus, mechanical composition, salinization, carbonates, gypsum, absorbed substrates, + etc.).

The object of research is the old-irrigated typical serozem of the experimental plot of the Tashkent Agrarian University, as well as land plots of various farms of the Republic.

Results. To achieve the goals and objectives of the research, small-scale field experiments will be laid down according to two schemes. The repetition of experiments is 4-fold. The size of the plots is 7.2 x 8 = 57.6 m^2. Test No. 1 was carried out against the background of N200 P1 40 K100. Experience No. 2 without fertilizers. Before setting up the experiment and at the end of the vegetation of plants, soil samples are taken from each option from depths of 0-30, 30-50, 50-75 and 75-100 cm to establish the initial and final state of the agrochemical and chemical properties of the soil. After each electric treatment, after 7, 15 and 30 days, soil samples are taken from the arable layer of soil to determine the mobile forms of macro - microelements.

Effect of electric processing the content of mobile phosphorus in the soil (in the horizon of 0-30 cm) showed that in variants with electric processing the content of assailable forms of phosphorus was 24.1-37.7 mg / kg against 23.3-25.2 mg / kg in the control variants. In addition, the content of exchangeable and water-soluble potassium was also significantly higher than 370-445 mg / kg against 310-345 mg / kg in the control variants. It should be noted that according to the results of completing analyzes of mobile forms of trace elements in the soil, a significant increase in the content of the latter is also observed under the influence of electric treatment. Thus, the electric treatment of soil and plants positively affects the content of assailable forms of nitrogen, phosphorus and potassium in the soil, which contributes to the creation of a favorable diet for cotton during the growing season.

Conclusion

1. In the future, the most effective combination of different types and terms of electro technological processing of soil and cotton plants will be determined, providing optimal nutritional conditions in the soil for normal cotton growth and development and increasing soil productivity, on the main agrochemical and chemical properties of soils, the nature of the migration of chemical elements and substances in soil.

2. In addition, the amount of exchangeable and water-soluble potassium increases in control variants. Based on the analysis of mobile forms of trace elements in the soil, there is a significant increase in its content under the influence of electrical treatment. Thus, the cultivation of soil and power plants positively affects the absorption of nitrogen, phosphorus and potassium in the soil, thereby contributing to the creation of a favorable diet for cotton during the growing season. In the future, the most effective combination of various types and terms of electro technical processing of soil and cotton will be revealed, which will provide optimal soil nutrition conditions for normal soil growth and development and increase soil fertility, basic agrochemical and chemical properties of the soil, and chemical elements and the nature of the migration of matter into the soil is being investigated.

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AGROTECHNOLOGY OF PRODUCTION OF HIGH YIELD "ANDIJON-36" COTTON VARIETY

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Abstract

Researches on impact of irrigation and nutrition to "Andijon-36" cotton species yield was carried out in Tashkent Region. Under the condition of typical gray soil in Tashkent Region, investigating water-fertilizer conditions, irrigation amount and duration, seasonal irrigation norms and the optimal water-fertilizer condition (nitrogen, phosphorus and potassium), prior to properly watering "Andijan-36" species cotton, high quality harvests have been obtained at the rate of 27,7-47,9 c/ha on the average 35,3 c/ha with the soil humidity of 65-65-60% according to LFHC, with the leaf cell juice concentration of 9,6-9,8%, at the rate of 10,3-11,9% in the period of blossoming-harvesting and at 12,0-12,9% in the period of ripening, using the nitrogen, phosphorus and potassium at the rate of 190-133-95 kilos.

Key words: cotton varieties, refraktometer, leaf juice concentration, seasonal irrigation, standard ratio of fertilizer (nitrogen, phosphorus and potassium), irrigation amount, soil agro-physics condition, pre-watering soil humidity, crop density, yield.

Introduction. Currently, problems of preventing water insufficiency is one of the most important issues awaiting for a solution in the world, thus they require complex researches, including basic requirements of rational utilization of land and water resources in agriculture, and gaining plenty of high-quality agricultural products.

It is important to pay particular attention to the climatic conditions of the soil and biological features of cotton species while the allocating and renewing cotton species in our country, as well as the quality of the fiber to meet the requirements of the international market. It is also essential to learn Nitrogen, phosphorus and potassium standards and irrigation orders of planting or recommended cotton species, to research the endurance to water insufficiency, and the demand for nutrition of cotton species, especially while water scarcity has been observed in the past few years.

Materials and methods. Taking into account the above defined in the "Program" the field experiences have been conducted in the central experimental fields of Uzbekistan, Cotton Breeding, Seed Production and Agrotechnologies Research Institute, where pre-watered fields of agriculture, groundwater level deeper than the typical gray soil conditions are provided.

The experiment is placed in one group along with 7 options, 3 iterations. Each quantum consists of 8 rows, 4,8 m in width, with a length of 100m, with an area of 480m², and a number of accounts area of 240 m², 4 rows, with width of 2,4 m and a length of 100m. Andijan-36 cotton variety yield with an average cotton fiber, has been comparatively analyzed in two different norms of fertilizer *N-160, P_2O_5-112, K_2O-80 and N-190, P_2O_5-133, K_2O-95 kg / ha*, according to LFHC in three different irrigations 65-66 % -60%, 70-70-60, 70-75-60% and compared with the same irrigation regimes, analyzed before the irrigation of cotton leaf juice concentration at the growth point of the third and fourth leaves, identified by the manual refraktometer [1]. The test system is described in the table 1,2.

Results and discussions. Agrophysics of the experimental field soil is the main factor in determining fertility of the soil. The mechanical structure, LFHC, water conductivity, volume weight, soil density, porosity, and their microbiological indicators were studied through phenological observations of cotton growth, relativity of

Table 1

Experimental System

№	Cotton species	Pre-watering soil humidity according to LFHC, in %	Standards of mineral fertilizers, kg\ha		
			N	P	K
1	C-6524	70-70-60 CJC	200	140	100
2	"Andijon-36"	65-65-60 CJC	160	112	80
3	"Andijon-36"		190	133	95
4	"Andijon-36"	70-70-60 CJC	160	112	80
5	"Andijon-36"		190	133	95
6	"Andijon-36"	70-75-60 CJC	160	112	80
7	"Andijon-36"		190	133	95

Note: CJC – Leaf cell juice concentration, LFHC – Limited field humidity capacity

Table 2

Terms of the application of mineral fertilizers, (net kg/ha)

Terms of the application of mineral fertilizers	Options 2,4,6			Options 3,5,7		
	N	P	K	N	P	K
Before Fall plowing	-	75	40	-	100	50
Along with planting	-	-	-	-	-	-
When 3-4 real leaves appear	40	-	-	60	-	-
When starts	60	-	40	65	-	45
When blossoming starts	60	37	-	65	33	-
Annual amount	160	112	80	190	133	95

development between 1-3 days of June, July, August, September.

Limited field humidity capacity (LFHC) was 21,0-21,8% at 0-70cm layer, 21,4-22,0% at 0-100cm layer throughout the years. Water conductive was at an average of 891,8-907m³/ha for six hours a day at the beginning of the season in early spring.

It has been observed that cotton growth and development, fertility and ripening are directly dependent on the nutrition and irrigation rate. The impact of water and nutrients to the growth and development of cotton varieties has been observed at

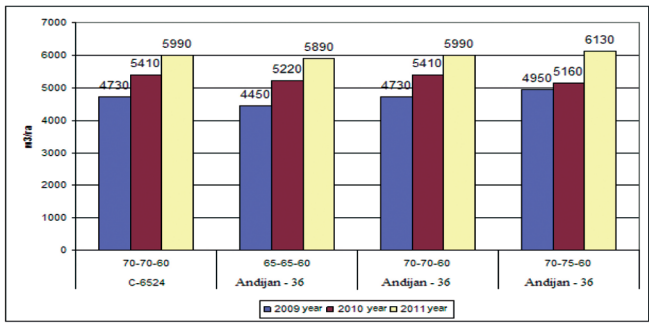

Fig.1. Seasonal irrigation standards of cotton variety, m³/ha

the beginning of the season, especially it has been more vivid at the end of growth period. Over the years at the beginning of September "Andijon-36" main cotton plant height reached to 83,8-96,8cm and the number of capsules were up to 7,6-11,0 as per the observations on options. At the same time, observations on the "C-6524" cotton species showed that it had less accumulation of capsules compared to "Andijon-36" cotton species [2].

Due to the coming of years during the growth period of options where pre-watering soil humidity was 65-65-60% according to the LFHC, there was 4-6 times irrigation in the system of 1-2(3)-1(2), pre-watering average soil humidity was 59,8-66,4%, one time irrigation was having 810-1180m³/ha, during the season 4450-5890m³/ha of water, irrigation duration of 22-35 hours, in the range of 17-27 days, manual refraktometer (CJC) changed up to 8,6-12,9%. In the options where pre-watering soil humidity was 70-70-60% according to the LFHC, there was 5-7 times irrigation in the system of 1-3(4)-1(2) during the growth period, average soil humidity was 60,5-71,4%, one time irrigation was having 680-990m³/ha, during the season 4730-5990m³/ha of water, irrigation duration of 20-33 hours, in the range of 13-27 days, manual refraktometer (CJC) changed up to 8,5-12,9%. Finally, in the options where pre-watering soil humidity was 70-75-60% according to the LFHC, there was 6-8 times irrigation in the system of 1-4(5)-1(2) during the growth period, pre-watering average soil humidity was 59,4-76,4%, one time irrigation was having 670-880m³/ha, during the season 4950-6130m³/ha of water, irrigation duration of 21-32 hours, in the range of 12-28 days, manual refraktometer (CJC) changed up to 9,0-12,9%. It is described in the photo-1.

It has been detected that the amount of spent water for the same cotton species on the experimental filed depends on many factors, such as the amount of humidity in the root located layer, water consumption depends on the number, frequency and duration of irrigations, soil humidity reservation, the provision of plant nutrients (nitrogen, phosphorus and potassium) according to the coming of year, weather conditions, qualitative and timely conducting of agricultural activities [3,4,5,6,7,8,9].

High harvesting has been gained with "Andijon-36" cotton species when pre-watering soil humidity was 65-65-60% according to the LFHC, manual refraktometer (CJC) indicators showed 9,6-9,8% until blossoming, blossom-harvest period 10,0-11,9%, ripening period 12,0-12,9% of nitrogen, phosphorus and potassium fertilizers 190-133-95 kg / ha used and in those three years average 35,3c/ha high quality harvest was achieved, during the years pre-harvesting crop thickness consisted of 78,5-100,4 thousand units per hectares. In these options "Andijon-36" cotton species had 147,0-193,7m³/ha water consumption to produce one quintal cotton, pre-harvesting one capsule cotton weight was 4,1-5,0grams throughout the years.

The irrigation orders have impacted on the biological properties and maturation of cotton, it has been proved in our experiments. It has been observed in the cotton species that when irrigation orders were increased from 65-65-60% to 70-70-60%, nitrogen, phosphorus and potassium from 160-112-80kg/ha to 190-133-95kg/ha cotton plant grew higher and with high humidity of 70-75-60% capsules opened comparatively later.

Conclusions. According to the results of scientific research under typical gray soils, provided with deep groundwater fields on the basis of information gathered from the three-year period (2009-2011) concluded as follows:

- within "Andijan-36" cotton species the distribution

of water-fertilizer (nitrogen, phosphorus and potassium) standard rates at a significantly reduced number of procedures of irrigation system, irrigation length, the growth of the researched cotton species as per seasonal irrigation norms at acceptable standards, by the phase of development was studied.

- the experienced cotton species "Andijon-36" is observed as having more gross productivity, faster ripening, higher weight of cotton in each capsule as per the pickings compared to specimen C-6524 cotton sort.

-in "Andijon-36" cotton species high quality yield up to 27,7-47,9 c/ha was achieved with acceptable 65-65-60% nitrogen, phosphorus and potassium ratio 190-133-95 kg/ha.

-"Andijon-36" has been justified to be more resistant for the thirst compared to "C-6524" cotton sort.

-in the typical gray soils with average heavy mechanical components where the underground water is deep, on the fields where cotton varieties are planted as per the planting scheme of 60cm row, it is necessary to provide not more than 60-100meters of furrow length according to the coming of years, water supply.

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INFLUENCE OF IRRIGATION OF WINTER WHEAT BY SUBRIGATION METHOD ON THE RECLAMATION REGIME OF LANDS

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Abstract

Due to the rapid growth of the world's population and intensive economic development, the demand for natural resources, including water and land, is growing day by day. According to the UN, around the world wheat is grown on an area of 217,71 million hectares, and at the same time, 6,4-7,8% of the total area is using the subirrigation method. The article presents the results of experiments on the widespread use of groundwater for irrigation of lands with a low level of groundwater and salinity of 1-3 g/l in the conditions of meadow gray soils of the Syrdarya region.

Key words: subirrigation, mathematical model, water stress factor, salinity, irrigation, mechanical composition of soil, hydromodular areas.

Introduction. Scientific research aimed at improving the management of reclamation regimes in the world is of great importance. In this regard, it is important to develop new methods for the effective and targeted use of groundwater in order to increase the productivity of irrigated agricultural land, eliminate water shortages during the growing season. Effective ways to solve these problems are to meet the needs of agricultural crops in water at the expense of groundwater and to ensure moistening of the active soil layer based on the control of the water level in the ditches [4].

In our country, including in the conditions of meadow gray soils of the Syrdarya region, the widespread use of groundwater for irrigation of lands with a low level of groundwater and a salinity of 1-3 g / l helps to reduce water deficit during the growing season. Experimental work on the use of groundwater for irrigation of agricultural crops in the conditions of meadow gray soils of the Syrdarya region was carried out on the experimental fields of the farms of A. Khojaev, "Chinor" and "Baraka" of the Khavass district of the Syrdarya region [1; 3].

Methodology study. In the experiments, the management of the reclamation regime of irrigated lands through the management of closed ditches, including sub-irrigation irrigation of winter wheat, was carried out in four replications, the variant area was 2500 m^2 (length 50 m, width 50 m). Fragments in the plan were systematically arranged in four tiers (according to the level of groundwater).

Controlling the reclamation regime, the groundwater level was artificially raised to a depth of 1.0 and 2.0 m by blocking the main trenches. The active soil layer was moistened and the previous soil moisture was maintained due to the rise of groundwater through the soil capillaries.

Results. Studies have shown that at a groundwater level of 1.0 m, with atmospheric precipitation of 2860-3540 m^3 / ha, with an amount of irrigation water of 950-1150 m^3 / ha, with an inflow of groundwater of 1562-1718 m^3/ha, evaporation into the soil and transpiration was 5015-5287 m^3/ha, salinity per hectare - 6.7-7.6 t/ha. Also at a groundwater level of 2.0 m, the amount of irrigation water is in the absence of atmospheric precipitation and evaporation and transpiration in the soil, the input of salts to the sown areas is 2.8-3.6 t/ha. Also, with a groundwater level of 3,0 meters, the amount of irrigation water is 2604-2624 m^3/ha, in the absence of an inflow of groundwater, in the absence of precipitation and evaporation and transpiration in the soil, the input of salts to the sown area is 3,3-4,1 t/ha [2].

According to the results of a study based on the analysis of data on changes in the groundwater level in the fields sown with A. Khodzhaev's winter wheat, in experiments conducted in October-January, in the absence of sub-irrigation irrigation, the water level in the experimental field of 1.0 m was controlled 274-287 cm,

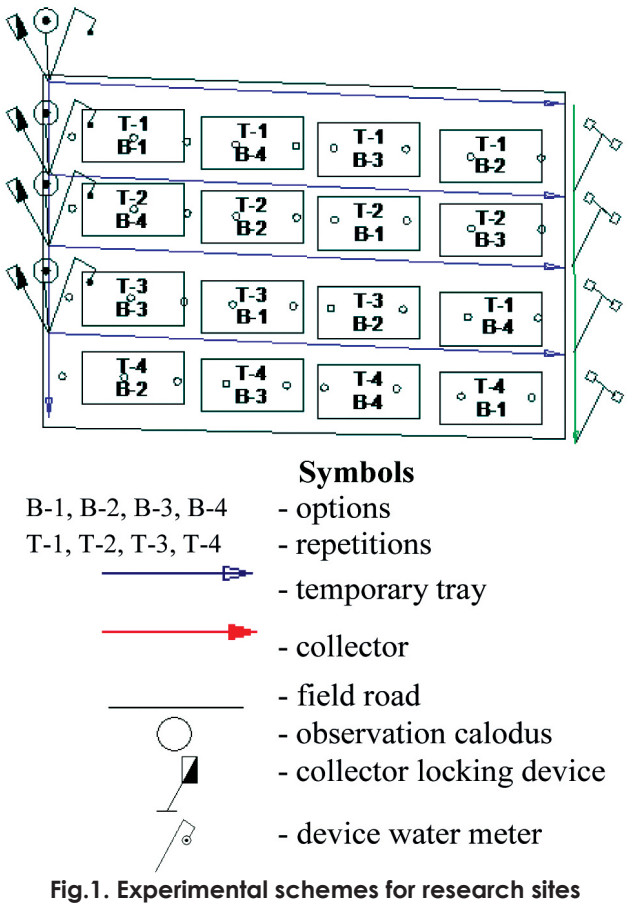

Fig.1. Experimental schemes for research sites

the groundwater level was 267-269 cm in the field of the controlled experiment of 2.0 m, 267-269 cm in the field of 2.0 m in the controlled variant of the experiment and 295-289 cm in the control variant, in February-June when using the subirrigation method, one can see that the water table rose from 249 cm to 90 cm in a controlled experimental field of 1.0 m and from 269 cm to 194 cm in a controlled experimental field of 2.0 m (Fig.-2).

According to the results of experiments on the

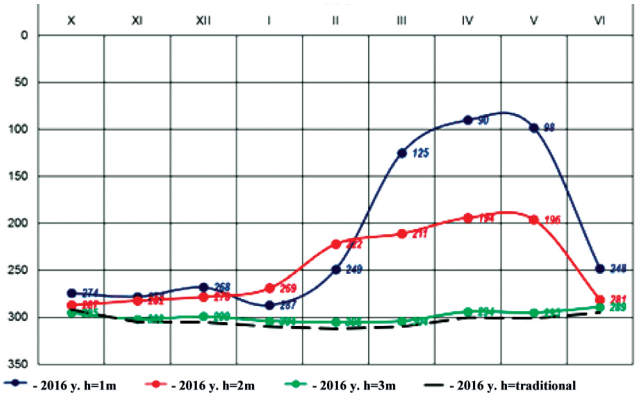

Fig.2. Dynamics of changes in the level of groundwater

effect of sub-irrigation irrigation on groundwater salinity in the experimental field of the farm of A. Khodzhaev, with sub-irrigation irrigation, groundwater salinity in the experimental version with a groundwater level of 1,0 m in October-January was 2,82-2,93 g/l, we see that in February-June it was 3,12-4,64 g/l. Also, the groundwater level in a controlled experiment of 2,0 m was 2,90-3,08 g / l in October-January and 3,08-4,50 g/l in February-June. In the control variant in October-January it was 3,00-2,79 g/l, and in February-June – 3,04-4,43 g/l. (Fig.3)

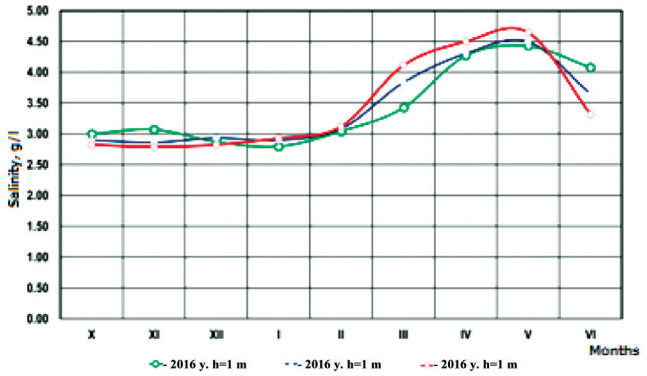

Fig.3. Dynamics of changes in groundwater salinity

In general, according to the results of studying changes in the level and mineralization of groundwater in the experimental fields, the period of occurrence of deep groundwater in the experimental fields of A. Khodzhaev's farm coincided with October-January, as well as with the growing season, i.e. from February to June, it was observed that the water table was close to the surface when the irrigation method was used.

It was also noted that the mineralization of groundwater was higher in the experimental version, where the groundwater level was 1.0 m, than in the experimental version, where the groundwater level was 2.0 m.At the same time, no irrigation work was carried out in October-January, only a decrease in the mineralization of groundwater due to atmospheric precipitation and an increase in the mineralization of groundwater due to the flow of salts along the river as a result of irrigation works since February. According to a study of the effect of the number of winter wheat irrigations on yield, the average yield was 23.0 t / ha with 2-3-fold irrigation in highly saline areas of the Chinor farm, 16 Ds / m according to FAO or 57% of the yield. The average yield was 38.8 t / ha with 3-4-fold irrigation in areas of moderate salinity of the Baraka farm with moderate salinity, which amounted to 8 Ds / m or 98% of the yield according to FAO. At the same time, on the slightly saline plots of A. Khojaev's farm, when sowing up to 5 times, the average yield was 62.0 c / ha, according to FAO - 4 Ds / m or 100% of the yield, i.e. as a result of an increase in the number of sprinklers. A regularity of growth was observed.

Conclusions.

- in conditions of water scarcity, the best way to use groundwater for irrigation is to maintain the groundwater level at a depth of 1,0 m at a seasonal irrigation rate of 1094 m^3/ha, but the salt content increased by 8,1 t/ha at the end of the growing season. The acceptable reclamation regime of groundwater consists in maintaining them at a depth of 2 meters with an average annual irrigation rate of 2302 m^3/ha, but it was determined that the salt content by the end of the growing season increases by 3,3 t/ha.

- seasonal irrigation on meadow gray soils of the Syrdarya region under conditions of water shortage during irrigation of lands sown with winter wheat, when the annual volume of total evaporation (evapotranspiration) is 520-550 mm, and the amount of atmospheric precipitation is 320-340 mm, when the groundwater level is maintained at a depth of 1,0 m, the seasonal irrigation rate is 1090-1100 m3/ha, to improve land reclamation when there is no shortage of water, it is recommended to maintain the groundwater level at a depth of 2 m, and the average irrigation rate is 2300-2400 m^3/ha.

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RECYCLING OF POULTRY WASTE USING PULSE CURRENT

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Abstract

The article discusses the global problem associated with the processing of bird droppings and ways to resolve it, as well as analyses of the use of bird droppings in agriculture as a highly efficient organic fertiliser.

Key words: poultry, waste, pulse current, environmental pollution, homogeneous structure.

Introduction. The problem of liquid bird droppings processing and utilization is one of the most acute problems in the world. For poultry farming the problem of liquid bird droppings recycling has long ago turned into an acute chronic one:

- It is impossible to carry untreated bird droppings to the soil;
- installing or replacing new equipment is too expensive;
- storage of bird droppings is very expensive.

According to global estimates, payments for the disposal of bird droppings and other organic waste on their lands reach up to 1.09 million dollars per year, excluding penalties for environmental pollution [1,2].

Materials and methods. Currently, according to statistics from the Ministry of agriculture and water management, there are more than 330 million chickens in the Republic of Uzbekistan. Jointly conducted microbiological analyses at the Institute of Microbiology at the Academy of Sciences of the Republic of Uzbekistan show that the droppings are released from the bird's body in the form of a dispersed gray mass with a humidity of 70 ... 75%. It contains 0.8...1.2% nitrogen, the losses of which depending on the time and conditions of storage can reach 40%. The main chemical composition of the litter is as follows, %: dry matter 34,5...48,3; ash 14...40 (including calcium up to 8,5); phosphorus 2...3; raw fat (essential extract) 2,9...4,5; raw fiber 14...25; nitrous extract ants 46...48. It is determined that laying hens use nitrogen in the body feed is 53%. In addition to the above mentioned, in our experiments bird droppings were found to contain insignificant amount of several (17 species) antibiotic species, which during anaerobic treatment inhibits the process of methane fermentation by killing methane-fermentation bacteria [2,3,4]. At anaerobic treatment of bird droppings carried out in the Scientific and Problem Laboratory "Resource-saving techniques and technology" TIIM several repetitions were obtained, that at large amounts of antibiotics in bird droppings or after sanitary treatment of poultry houses the process of fermentation in experimental bioreactors of the located thermostat with constant temperature 52 ± 2°C began after the adaptation of methane-fermentation bacteria (the process of adaptation of the latter increased from 22 days to 47-54 days in the place of 5 days).

Results and discussions. More than 200 million m^3 of liquid effluents per year should be treated and processed to varying degrees [5,6]. But not every poultry breeding complex has modern systems of their processing and utilization. In many farms the systems are long outdated and do not meet environmental standards. Most of the existing poultry complexes (farms) were put into operation 25 - 30 years ago. The cleaning equipment has never changed since, although it needs to be modernized every 10-15 years due to rapid wear and tear. According to a rough estimate, almost 30% (if not more) of all domestic poultry farms do not have a system of treatment of effluents. Taking into account the implementation of the national project on poultry farming development, the number of effluents to be processed and utilized should be increased twice. [5,7].

Poultry farms ignore the solution of the problem of utilization of poultry waste, liquid droppings, litter effluents, which caused a sharp decline in the quality of crop production, dangerous contamination of groundwater, surface water, air basin, increasing morbidity of animals and population. The morbidity rate of population in the regions where large poultry farms operate is up to 3 times higher than its average in many countries of the world.

The unfavorable environmental situation reduces the reproductive capacity of animals and humans by 15-20%. Location areas of poultry farms are, as a rule, ecologically unfavorable and in some cases are defined as ecological disaster zones. The fields where unadjusted litter is disposed of have the highest environmental impact. The area of fields contaminated with organogenic waste, including poultry farming, in the Republic of Uzbekistan, but they exist. For example, in the Russian Federation there are more than 2.4 million hectares of which 20% are highly contaminated, 54% are contaminated and 26% are slightly contaminated. The availability of these lands is a constant source of biosphere pollution. At present, only environmental damage from violations of litter-free litter regulations is estimated at $4.6 million [7,8]. When analyzing a poultry complex at the intersection of three States in the United States (Pennsylvania, New Jersey and Maryland), bird droppings processed in aerobic-anaerobic technology, atmospheric pollution exceeds 8.5 to 9 times. To eliminate this drawback, we have proposed a new technology for processing bird droppings. It was adopted by American specialists and will be monitored in the future. When poultry manure is processed and packaged, it turns into an organic fertiliser needed by domestic floriculture and farmers, competing with mineral fertilisers and even replacing them altogether. Bird droppings are processed into a highly efficient multicomponent organic fertiliser that is as valuable as natural guano. Noah of our experiments when sowing potatoes in the fields was treated with biofertiliser (Fig.1) obtained after a bioreactor with treated pulse current.

Bird droppings are processed by aerobic and

Fig.1. Potatoes before planting treated biofertilizer after bioreactor with impulse treatment of source material

anaerobic fermentation technologies into ecologically safe concentrated organic fertilizer rich in nutrients in a form easily assimilated by plants. Modern researchers, both domestic and foreign, offer today a wide range of technologies and equipment, which allows effective and profitable processing of more than 60% of poultry waste. [9].

At recycling there is a preservation of nitrogen substances due to their transition from ammonia and nitrate form to protein, as well as obtaining a homogeneous structure and quality of the substrate, the release of components of bird droppings from harmful substances, some microorganisms and pests and enrich it with nutrient minerals that are absent in the original organic raw materials. During disposal in the mixture should spontaneously occur microbiological fermentation due to the activity of bacteria that multiply at temperatures below 20°C, mesophilic microorganisms, whose temperature regime is within 2O ... 35 ° C and thermophilic actinomycetes, most actively developing at 45 ... 55 ° C. Our developed unit operates in thermophilic mode at fermentation temperature 52 ± 20C [3,10].

It is known that a properly balanced closed cycle in which biological waste of poultry farming is the basis of the food chain in the production of protein biomass for mixed feed is:

- Increasing structural soils;
- Improved environmental performance of organic waste producers;
- reduction in the purchase of animal protein;
- real animal protein reserve;

In rural areas and steppe climatic zones of the Republic of Uzbekistan, where we feel the current fuel - energy imbalance, all types of fuel are equally necessary: gaseous - for heating, liquid - for transport functioning, solid - for obtaining coolants [4].

Conclusions. Processing of bird droppings by anaerobic treatment allows without additional treatment of such "aggressive waste" to carry out agriculture on open fields or indoors, as well as domestic floriculture without long-term storage (up to one year, sometimes several years).

After using bird droppings as biofertilizer, yields also doubled compared to analytical fertilizers. Biogas technology for processing and decontamination of poultry waste pays for itself not only with gas and produced environmentally friendly high-quality organic fertilisers, but also with protein biomass.

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TECHNOLOGY AND TECHNICAL TOOL USED FOR THE EFFICIENT USE OF WATER RESOURCES

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Abstract

One of the most important issues of today is the efficient use of water resources, the development and up-to-date development of irrigation water-conservation technologies and techniques. This article focuses on the development of technology and technical tools for improving irrigation methods, the direct use of the proposed technology and the design technique in each field, and the analysis of the results.

Key words: density, root spread layer, area, moisture, slope, irrigation, irrigation water, technology, technical equipment, distribution, furrow, furrow opener.

Introduction. The present day, devoted to the development and implementation of scientifically grounded irrigation systems for agricultural crops and their optimal use at cropland, is one of the key issues of sustainable economic development in the world, especially in the country. Approved by the Decree of the President of the Republic of Uzbekistan dated February 7, 2017, No. P-4947, Amendment of the reclamation of irrigated lands in the "Strategy of Action for the five priority areas of development of the Republic of Uzbekistan in 2017-2021" and the Resolution of the Government of the Republic of Uzbekistan "On the State Program of Irrigation and Irrigation of Irrigated Lands for 2018-2019" dated November 27, 2017, improvement of the network of land reclamation and irrigation, the introduction of modern approaches to the agricultural production, first of all, water-saving technologies. Special attention has been paid to the widespread introduction of technologies, and this research has some relevance to the objectives set out in the regulations [1,2].

Sustainable use of water resources depends, first of all, on the level of preparedness of the surface area, which is especially evident in arable lands [3].

Materials and methods. Our research requires focusing on the plane of the bottom of the furrow, rather than the leveling of the arable land. The aim of the research work is to correct the moisture quality in the field by its length and depth, rather than by performing large-scale and costly land works on land leveling. The focus should be on flattening the furrow length and depth of the field due to the variable density of the furrow longitudinal profile, rather than focusing on large-scale land works. This will be achieved through automation of the process of changing the fencing of the furrow and the equipment of meliorative and agricultural machinery, participating in agro-reclamation activities [4].

Experience in ("Ergash Ruzimov", "Ishchanov Odilbek" farms) and Gurlan districts ("Madaminov Uktam" farm) and Beruniy district of the Republic of Karakalpakstan ("Reiimboy boss " farm) in the Shovot district of Khorezm selected as fields. The collector-drainage networks are built on these farms, irrigation systems are of engineering nature, and water for irrigation of crops is delivered to the fields through horns and axes, and crops are irrigated. The soils of these farms are weak and moderately saline [7].

The piloting and implementation of the proposed technology and the created technique were based on the following experimental system (Table 1).

This technology (8) has achieved the economic efficiency of irrigated water harvesting and the steady growth of crop yields on furrowed irrigated with the use of automated control system equipment.

Table 1

Field Experience Implementation System

№	Pre-irrigated soil moisture, % against ChDNS	The rate of irrigation, m^3 / ha
1	Observation of produce	Real measures
2	70-70-60	70-100-70 sm layers moisture deficiency.
3	70-80-60	70-100-70 sm layers moisture deficiency
4	70-80-60	70-100-70 sm layers moisture deficiency

The technical equipment that was created belongs to agricultural machinery, particularly tools for the cultivation of irrigated agricultural crops, [9] according to the source irrigation method, the purpose of the invention is to create uneven grounding at ground level by changing the length of the furrow to its maximum at the beginning of the furrow and at the end of the furrow to the minimum.

As prototype for this device, a cotton cultivator for furrow cutter is selected, which consists of a cultivator with a fuselage mounted fuselage. The cultivator cuts the furrow against the prepared surface of the field , so that the length profile of the furrow and its slope are usually formed as required by the unimpeded and rhythmic flow of irrigated water , but irrigation does not provide the soil thickness of the root surface and the flat soil moisture along the length of the furrow. At the beginning of the furrow, the water will have the maximum moisture content at the bottom of the furrow and the minimum at the end of the furrow. It possible to adjust the soil moisture at its maximum value, but this is achieved by significant moisture losses due to the wasteful costs of irrigation water and irrigation time. Therefore, the aim of the research technique is to develop a device for uneven grounding of the soil along the entire length of the furrow by gradually adjusting the depth of the bottom of the furrow from its maximum to the minimum at the end of the furrow.

The issue is as follows: a fuselage cultivator with a fuselage mounted grille with Ill-simulated seal frame attached to the hydraulic system of the base tractor, with reinforcing cages at the bottom of the frame [10].

The essence of the proposed work is that in a single device there are several tightening hinges that are hinged on the cultivator's furrow shot (grille), which are simultaneously controlled by one hydro cylinder and allow uneven compression of the bottom of the furrow (photo 1). The proposed device consists of 2 fitted shotguns (grille) (1). In the furrow shotgun (grille) (1) frame is mounted with 3 hardening

*Atazhanov A.U. New technology and technical means of creating a sustainable profile and design slope of irrigation furrows. Monograph. Printing house TIIAME. 2019 126 p. 6 hydraulic cylinders, with 1 hinge on the fuselage. The hydro cylinder 6 is connected to the transmission pipes 7 with the hydraulic system of the base tractor.

The device works as follows: the aggregator is set at the start position of the furrow and with the help of hydro cylinder 6, the compression cathodes are lowered to the surface of the furrow, with the hydraulic cylinder being pressed to a maximum pressure of 4 on the tightening rolls. A tracer is moved by the tractor`s hydraulic separator, by transferring fluid A to the stock cavity of the hydro cylinder. When the cultivator moves, the working fluid in the hydraulic cylinder slowly raises the frame 3, while 4 pressure reduction of the ground –rolling rollers occurs, resulting in a gradual change in pressure from the maximum value of the ground depth at the end of the furrow. At the end of the aggregate, the hydraulic separator is placed in a neutral position and the vehicle is moved to the vehicle using the suspension mounting system, and then the aggregate is turned to the rear. The cultivator is set to the reversible position. The base tractor is moved to the opposite of the starting position of the hydraulic separator in order to transfer the fluid to the 6 B cavity of the hydraulic cylinder. At the beginning of the reverse movement of the aggregate, fluid B enters into cavity B and compression drops to the bottom of the furrow until it is free of charge, then the unit is removed. The fluid entering cavity B gradually presses the compression cathodes, creating a density from 4 minimum values per furrow. In this way, a minimum density is created at the beginning and maximum at the end. With the frame raised, the unit rotates and the process is repeated [11].

The use of the proposed device will allow the entire section of the bottom of the furrow to be rigidly sealed, starting with the maximum value at the beginning of the furrow and ending with the zero at the end of the furrow.

Results. The following observations and researches were carried out in the selected cotton experimental field:

1. Before planting seeds to study the soil conditions of the experimental field, a complete soil section was dug to the depth of the groundwater, sampled soil samples from genetic sections of the section and in laboratory conditions its mechanical composition, humus, nitrogen, phosphorus and potassium, and salts in soil;

*Atazhanov A.U. New technology and technical means of creating a sustainable profile and design slope of irrigation furrows. Monograph. Printing house TIIAME. 2019 126 p.

2. Volumetric weight of the soil of the experimental field was determined annually using a roll of 10 cm height on the 0-100 cm layer at the beginning and end of the growing season;

3. The soil permeability of the experimental field

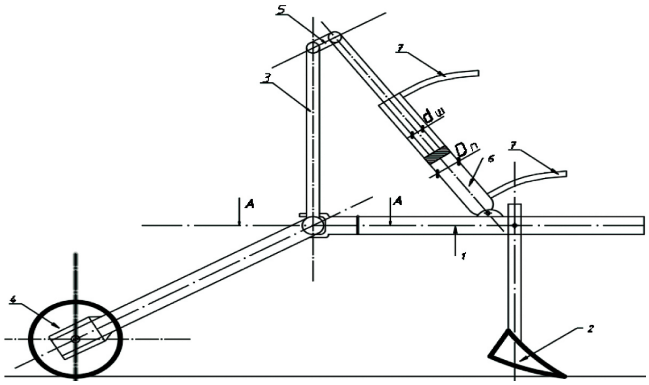

Figure 1. Irrigation fill bottom compensation equipment

was determined by a cylindrical circle based on the Nesterov method at the beginning and end of the vegetation year;

4. Field moisture content of the experimental field was determined from 10 to 10 cm depth by filling in a volume of 2000-3000 m^3 in a 2x2 m area before the start of field experiments;

5. Experimental wells were installed in the third variant of the second rotation and control field to study the depth and mineralization level of the groundwater level. Each time before and after irrigation, groundwater samples are taken from observation wells with special equipment and in laboratory conditions the amount of salts contained in it has been measured using a capacitor. The depth of ground water in the monitoring wells was measured every 10 days;

6. Changes in the experimental field moisture content were detected at the beginning and end of the vegetation in a digital laboratory measuring device at the depth of 0-100 cm before and after irrigation (3 days);

7. Consumption in the pilot area was measured using "Chippoletti "(0.50m) water meter and calculated by computation according to the schedule;

8. Conduct meter measuring 0–100 cm of soil at the beginning and end of the vegetation period at each and every 10–10 cm for all soil samples to determine the salinity of the experimental field soil;

9. Growth and development of cotton grown in the experimental fields was carried out in accordance with the methodology adopted by the Scientific-Research Institute of Agro technologies of Crop Breeding and Seed Production:

- The thickness of cotton is determined after the uniform and at the end of the growing season; Calculated the height and number of true leaves of cotton as of June 1;

July 1- calculated the height, number and flower of the horns;

Calculated the height of cotton, the number of branches and shoots for August 1;

Calculated the height of cotton, the number of bushes and the number of opened bushes as of September 1;

- the weight of cotton in cotton and the yield of cotton was calculated by the number of variations in the yield and variance of the yield [12].

Conclusion. Technology that allows the surface area to vary in intensity even when roughly flattened on the

surface and bottom of the fence, and its automated workflow machine (Figure 1), allows accurate fitting of the longitudinal cross section. The uneven compression of the soil beneath the furrow is achieved by eliminating uneven moistening of the root-stratified soil layer by means of maximum and minimum pressure at the beginning of the furrow. Fields prepared by this technology can be used in the early years of development. The technology used will help to reduce irrigated water rates during the development of agricultural crops on the irrigated arable land with the use of automated control systems, and ensure the smooth and effective growth of crops.

Field practical work on number KX-A-QX-2018-529 "Creation of new technology and technical equipment to provide stable profile and projection slope of fracture cross section for efficient use of water resources" in Shovot and Gurlan districts of Khorezm region - our research confirms these issues [12].

The technology that provides longitudinal cross-sectional images along the sides and bottoms of the furrow, even with rough surface leveling, and the automated (laser) work piece machine that provides the precise image of the longitudinal shearing image. Uneven spraying of soil beneath the bottom of the furrow, which is achieved by maximal and minimum at the end of the furrow, eliminates uneven moistening of the root-stratified soil layer. Fields prepared by this technology can be used in the early years of development. The technology of this technology is achieved through the use of automated control system techniques to reduce the amount of water provided during the growing season on furrow irrigated fields and the high yield of plants [17].

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REQUIREMENTS ON REGISTRATION OF ARTICLES FOR PUBLICATION IN THE JOURNAL "SUSTAINABLE AGRICULTURE"

• There are published original experimental scientific articles in the journal "Sustainable Agriculture"They are about the sustainability of agriculture during a period of significant decline in water situation and increase of water sources pollution in anthropogenic climate change in the short and long term.

• There are not published articles that expound individual stages of research, which do not allow us to draw certain conclusions.

• All articles are published in English.

• All data must be accompanied by covering letter, which consists of 500 or fewer words, a summary of the significance of research, author's consent to publication, a number of pictures and tables, support for manuscripts (articles) and additional information. In addition, it should be indicated the current telephone and fax numbers, postal address and e-mail address of the respective author to keep in touch.

• For submitting documents (articles), you must send an electronic version to the editorial office, Brussels classification is necessary. The data should follow the recommendations "requirements for registration…" The authors are fully liable for the originality of the article and its subjective and formal correctness.

• Articles are presented carefully edited, typed in Microsoft Word and Times New Roman Font (Eurotimes font will not be accepted). (*.doc or *.rtf files) in the font size of 12 Times New Roman with A4 sheet format, after 1.15 interval, the size of the text restrictions: the margins at the top and bottom are 2.0 cm, on the left is 3.0 cm, on the right is 1.5 cm. Manuscripts of articles must be signed by authors and have a stamped reference from the institution where the work is done. It confirms that the materials are published for the first time. Moreover, all authors must submit a certificate (from each scientific institution in which the research was carried out).

• Abstract (summary) is a brief overview of all work, including the scheme, objectives, methods, result, and conclusions from the article. It should describe all significant facts of a scientific article and basic numerical data, including any statistical evaluation.

• Abstract (summary) should not exceed 300 words (1-1.5 pages), it should be used as the standard nomenclature. There are not recommended to use any abbreviations in the title of the article or in the abstract. Keywords should be included.

• When you prepare articles containing experimental data, the following scheme should be adhered to literature review, research objective, methodology, results, and conclusions. A Capacity of experimental articles is 15 pages, including a list of references, pictures, photographs, and tables. The title of the article should be short and understandable.

• About the text: the introduction should contain the main reasons for research, review and analysis of the appropriate literature on the subject of research and the proposed approach or solution.

• The title of the section should be accompanied by some text preceding any heading of the subsection. All headings and subheadings in the article should be on the same level. There should be short headings for each section and subsection. Section headings should be in bold, subsections - in italics.

• Data and methods. There all preliminary data, conducted experiments, their degree and conditions of carrying out should be described in detail in this section. All original procedures that were used for the processing of experimental material and all analytical methods used for the evaluation should also be detailed. The whole methodology should be described if it is original. In other cases, it is sufficient to show the author of the method and mention some special differences. You should also indicate the methods of statistical processing, including the used software.

• Results and discussion. The results obtained from the experiments, including their statistical evaluation and commentary, should be presented graphically or in tabular form, the author must comment on the results and compare them with data published at other places (other authors), results should be written in the past tense. Results and discussion can be combined or given in a separate section. Detailed interpretation of the data should be included in the discussion section, not in the results section.

It is necessary to clearly use capital (uppercase) and lowercase letters and also upper and lower indices in formulas, equations, dependencies, etc. This prevents errors. Mathematical formulas are created as separate objects in the formula editor and placed on center. Formulas referenced in the text must have continuous numbering. The formula number is placed in parentheses near the edge of the right margin. The size of the symbols in the formulas is normal is 14 pt, large is 18 pt, small is 7 pt, small index is 5 pt.

• References: only published or accepted manuscripts (articles) should be included in the list of references. Do not refer to abstracts, conferences or documents that were submitted but have not accepted yet. References should be listed and numbered in the order in which they appear in the text. Also, they should be indicated by a reference number in square brackets, multiple references in one set of parentheses must be separated by commas, for example: [1,5,7,28]. The list of references must be at least 20 names. It should be indicated the surnames and initials of all authors separated by comma. After they follows the year of publication in parentheses, the title of the article, the full title of the journal, the volume and page numbers. The names of the author (s) and year of publication should be listed by including them in the text directly, for example: "… as published by Chertovitsky A.S. (2017) or indirectly with the reference on the name (names) and on the year of publication in brackets (Chertovitsky A.S. and Ramazanov A. 2017), (Mirsaidov M.M. and others 2016). Below you can observe the rules and examples of the design of the list of literature in English. The list of references at the first time serves for tracking the authors' and journals' quotations. A correct description of the used sources at the list of literature is a guarantee that quoted publication will be taken into account at the assessment of its authors' scientific activities, and therefore organization, region, state. By quoting, the journal there is determined its scientific level, credibility, the effectiveness of its editorial council, etc.

The structure of the list of literature n English differs from that prescribed by the Russian GOST. A dash, as well as a symbol // are not used in the description in English.

• Tables and pictures should be presented separately to the text, on a separate page at the end of the article, including their names and used units. The units of physical quantities are given in accordance with the International SI system. The names of chemical compounds, taxonomic names are given in accordance with the international nomenclature. Enables should be made in MS Word format (format. Doc), graphics in MS Excel files (data files, xls), photos in jpg / .tiff format (resolution is not less than 300 dpi), all graphics and photos must be numbered, according to the order in which they are included in the text, using Arabic numerals. If any abbreviations are used in the articles first time, they should be explained accordingly.

Each table and picture must have a legend. It means the name along with a description that the reader can find useful for understanding the content. The legends for the tables are placed at the top of the table, the legends for the pictures are at the bottom. The headings of the tables and pictures should be completely descriptive, hidden to the left and bold. For the legend of the table, the first letters in each main word are written with the capital letter, for the legend of the picture the capital letters are written only for the first letter of the first word together with own nouns and adjectives. For example Table 1. Total natural river runoff in the Aral Sea basin (average annual runoff, km3 per year is SIC ICWC estimate) from 2001 to 2016. Picture 1. Areas of irrigated land suspended from the South Fergana Channel. In the text, there are used a small letter for the words "table" and "figure" if they do not appear at the beginning of the sentence.

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