Mechanical composition and physical properties of irrigated soils of the gijduvan district of Bukhara region

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Abstract. The mechanical composition and physical properties of soils in irrigated agriculture in the Gijduvan district of Bukhara region were studied. In the Hamid Olimjon district (Sarmijon) area, Omad farm soil pits (sections) were dug on the contour 576. In the Gulistan district, the contours of the Shukur Tokhta farm 282-283 and the contour 648 of the Hasan Rajabi farm of the Gijduvan region, and the mechanical composition and physical properties of the soil were analyzed from the samples taken. made the mechanical composition of the soil is light, medium and heavy sand, porosity is considered unsatisfactory.

1 Introduction

All over the world, agricultural production is accelerating, meeting the needs of the population for food security is expanding. In recent years, work has been carried out on the conservation, preservation, restoration and improvement of soil fertility, the efficient use of land resources [1-45], the mechanical composition of soils, and water-physical properties. reclamation research work is being carried out to improve its condition, protect the environment, and study the impact of anthropogenic factors. [19,23,25,33,35.].

In our republic, a number of research projects are being carried out on the effective use of soils, restoration, preservation and increase of soil fertility, improvement of land reclamation, improvement of mechanical composition, water-physical properties through the introduction of resource-saving technologies, certain results are achieved [1, 2, 6, 7 , 8, 13,].

Soil is formed as a result of a series of physical, biological and chemical weathering of the parent rock under the influence of the external environment (temperature, humidity, wind and other factors). Natural soil causes the formation of various types of mechanical particles in the soil under the influence of the external environment over a long period of time. Temperature and moisture are of great importance in these processes [21, 22, 26, 27, 29, 30, 31, 37, 38, 39.].

The mechanical composition of the soil is influenced by plants (with plant roots and stems). This is closely related to plant cover, root type, moisture availability and low or high temperature in various soil and climatic conditions [20, 28, 32, 34, 34, 36, 40].

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The difference in the mechanical composition of soils formed in different deposits is associated with the amount of humus included in its composition and the different reserves of gross and mobile nutrients [2, 7, 9, 11.].

The physical and mechanical properties of the soil directly and indirectly influence the properties and properties of the soil. Soil density and solid density are important physical and mechanical properties of soil. Understanding the physical properties of soil is essential to fully understand agricultural soils using management practices. Changes in soil physical properties affect all ecosystem services provided by soil, such as food, fiber, feed and energy production, erosion control and prevention, improved water and air quality, nutrient cycling, and soil fertility. practices, cropping systems and soil management can lead to changes in soil mechanical behavior [11, 18, 24, 40].

Various properties and characteristics of the soil depend on the mechanical composition of the soil and the level of humus. Changes in the mechanical composition of the soil have different effects on the chemical composition, water, physical, thermal properties and properties of the soil [3, 9, 11].

Knowledge of physical properties in irrigated agriculture is important for increasing soil fertility. The physical properties of soils and the physical processes occurring in soils are one of the important factors in creating soil fertility conditions, therefore they are constantly being studied and much attention is paid to the economic use of soils. Physical properties of soils Tursunov L., Turopov I., Abdullaev S., Kurvantaev R., Goncharov B., Nazarova S., Rakhmatov Z., Parpiev. G'.T., Nomozov N. and others studied.

Soil degradation is closely related to the composition of clay and colloidal fractions. According to M. M. Tashkoziyev and others, the amount of humus and nitrogen decreases with decreasing size of clay particles. Thus, in typical gray soils, 60-75% of humus and 57-79% of nitrogen accumulate in clay and fine-silt soil. Knowledge of the water-physical and physical-mechanical properties of soils under irrigated agriculture is of great importance for increasing their productivity. The mobility and availability of nutrients is often determined by the physical and water-physical properties of soils [5, 10, 12, 14, 15, 16, 17,].

The particle size distribution depends on many properties of the soil and its productivity. The granulometric composition of the soil significantly affects the water-physical, physical-mechanical, air, thermal properties, redox conditions, absorption capacity, accumulation of humus, mineral elements and nitrogen in the soil. The properties of granulometric fractions directly depend on the relative surface of the particles and their chemical and mineralogical composition. Therefore, studying the mechanical composition and physical properties of soils used in agriculture is one of the urgent tasks. In this regard, research work is carried out in the conditions of irrigated meadow soils of the Gijduvon district of the Bukhara region.

2 Materials and Methods

Field and laboratory studies are carried out in the conditions of irrigated soils in the Gijduvan district of the Bukhara region. Genesis, evolution, mechanical composition, properties and characteristics of soils in the region, preservation and increase in productivity, type and level of salinity, improvement of soil reclamation conditions and the influence of anthropogenic factors on them are a generally accepted profile in soil science - genetic, morphological, soil absorption, physical, physical chemical, chemical-analytical methods and laboratory analyzes “Methods of agrochemical, agrophysical and microbiological research in irrigated cotton areas”,“Methods for agrophysical research of soils in Central Asia”, “Methods for studying the physical properties of soils and soils”, It is carried out on the basis of such methods as “Properties and analysis of soil composition”.

The results obtained are analyzed mathematically, statistically and dispersively according to B. A. Dospehov (1985).

3 Results and Discussion

Mechanical elements are found in soil and rocks separately (sand) and as aggregates in various structural particles. The properties of mechanical elements vary depending on their size. Particles of similar size and properties are usually grouped into fractions. A classification of groups of fractions depending on particle size has been developed. The grouping of particles divided into fractions by size is called mechanical classification.

Soil solids are composed of particles of varying sizes, with the largest particles being larger than 1 mm and the smallest colloidal particles being less than 0.0001 mm. The physical, physicomechanical, especially physicochemical and chemical properties of the soil are directly related to this solid part of the soil. Therefore, an important task in studying the properties of soil is to determine the size and quantity of various small and large particles, called its mechanical elements.

Currently, the classification of mechanical elements recommended by N.A. Kachinskiy is widely used. The stone part of rocks or the soil skeleton breaks down into particles larger than 1 mm in fractions,1 mmand those that are smaller are called fines or fines. Also in small particles0.01 mm Particles larger than 0.01 are called "physical sand" because they are close to sand, and particles smaller than 0.01 are called "physical clay" or "physical silt" because they are similar to clay.

The total area of agricultural land in the Gijduvan district of the Bukhara region is 322,748 hectares, of which the irrigated area is 25,710 hectares. Irrigated pastures amount to 10,301 hectares. These soils were chosen as the object of study. The main agricultural crops of the region are cotton and grain crops.

In the H. Olimjon (Sarmijon) region, soil plots No. 1 from contour 576 of the Omad farm, No. 2 from contours 282-283 of the Shukur Tokhta farm in the Gulistan region and No. 3 from contour 648 of the Hasan Rajabi farm in the Sattor Jabborov district were excavated. Soil samples were taken from each site and each soil layer (genetic horizon) and analyzed in the laboratory.

In conditions of irrigated meadow soils (Omad farm), a soil plot (pit) was dug up. Soil samples were taken from site No. 1, and the physical properties and mechanical composition of the soil were analyzed in the laboratory.

The amount of physical clay in the packed layer is 43.7%; according to the type of mechanical composition, it is medium clay. As the soil layer deepened, the amount of physical clay increased and it was defined as heavy sand. It was analyzed that the amount of physical clay was 46.9% in the 29-52 sm layer and 46.1% in the 52-79 sm layer (Fig. 1).

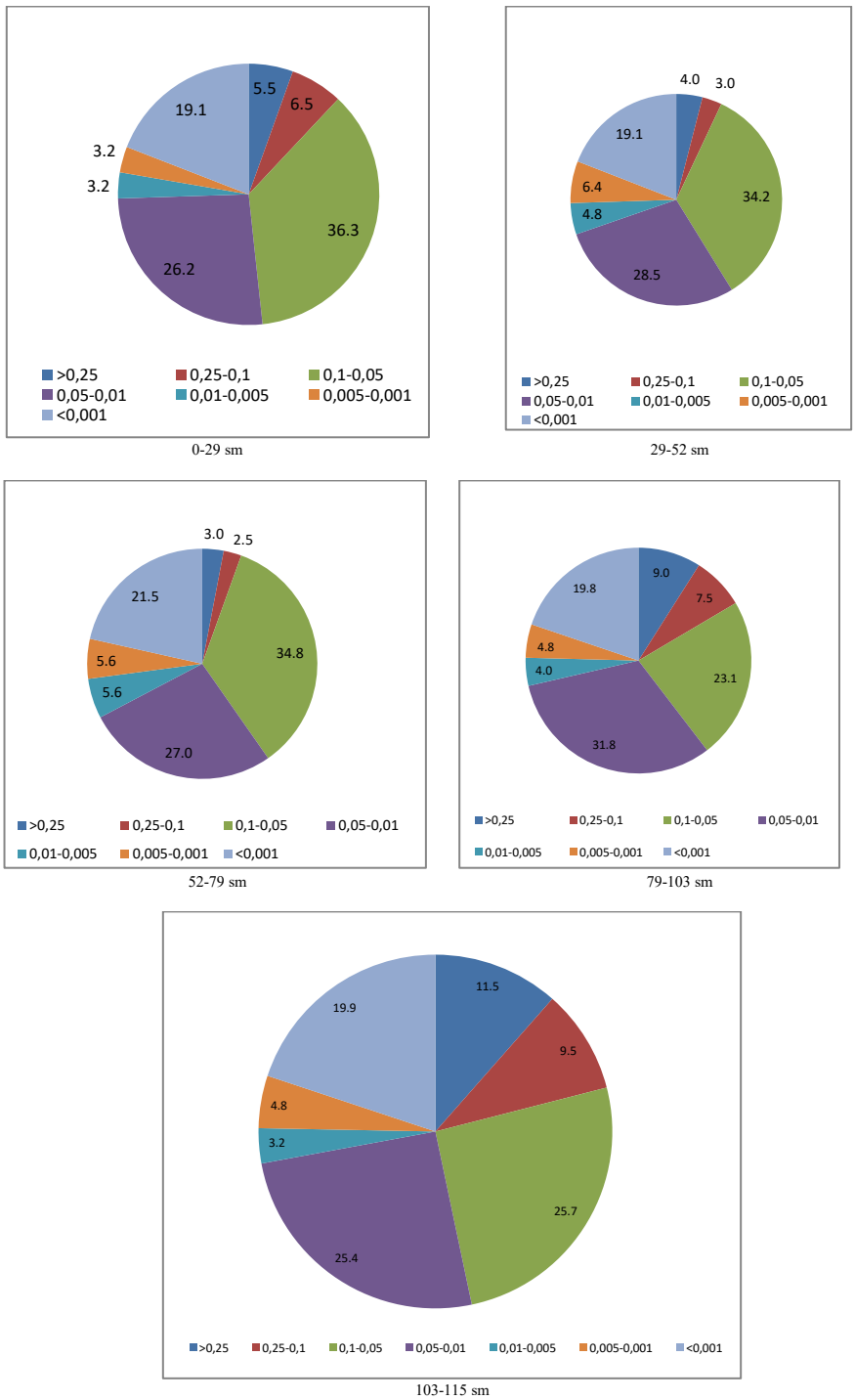


Fig. 1. Mechanical composition of irrigated meadow soils,(Gijduvan district, H. Olimjon district, Omad farming enterprise, 576 contours)

The general physical properties of soil, including specific gravity, are based on N. A. Kachinskiy's calculation of the volume of water displaced by a certain amount of soil. In gray soils this figure is 2.4 – 2.8 g/sm3. The density (volumetric mass) of the soil was determined using a N.A. Cylinder. Kaczynskiy in the field without disturbing the natural structure. According to E.F. Morozova (1969), this indicator ranges from 1.0 to 1.8 g/sm3 depending on the type and type of soil, the amount of organic matter in it and its mechanical structure.

The total volume of voids between a given volume of soil is called porosity. In turn, the common cavity is divided into capillary and non-capillary cavities. Mecanical substance was also found from the difference between the density of the soil and the density of the solid part using the method of N.A. Kachinskiy.

The physical properties of soil samples taken from 1 soil plot were determined in laboratory conditions. Based on this, it was determined that the specific gravity of the soil in the uppermost layer 0-29 was 2.42, the bulk density was 1.34 g/cm3, and the porosity was 44.6%. As the soil layer deepened, the specific gravity and bulk density increased, and the porosity index decreased. Lower the layer is 103-115 cm.the specific gravity is 2.58 and the volumetric gravity is1.43 g/sm3, porosity was 44.6%. The overall porosity of the soil turned out to be unsatisfactory, as it was in the range of 40-50% according to the method of N.A. Kachinskiy.

Table 1. General physical properties of meadow soils (Gijduvan district, H. Olimjon district, Omad farming enterprise, 576 contours)

Section	Depth, sm	Relative mass (solid density), g/sm3	Bulk mass (Soil density), g/sm3	Porosity (porosity), %
1	0-29	2.42	1.34	44.6
	29-52	2.51	1.42	43.4
	52-79	2.54	1.45	42.9
	79-103	2.61	1.5	42.5
	103-115	2.58	1.43	44.6

Gulistan district, Shukur Tokhta farmstead 282-283, soil pit No. 2 (cuts) was excavated. Of the soil samples obtained, the mechanical composition of the soil was 33.9% physical clay in the plowed (0-32 cm) layer and 30.6% in the plowed (32-47 cm) layer. two layers - medium sand. With further deepening of the soil layer, the amount of physical clay decreased and it was found that the type was light sand, and the lowest (96-162 and 162-178 cm) layers were sand (Fig. 2).

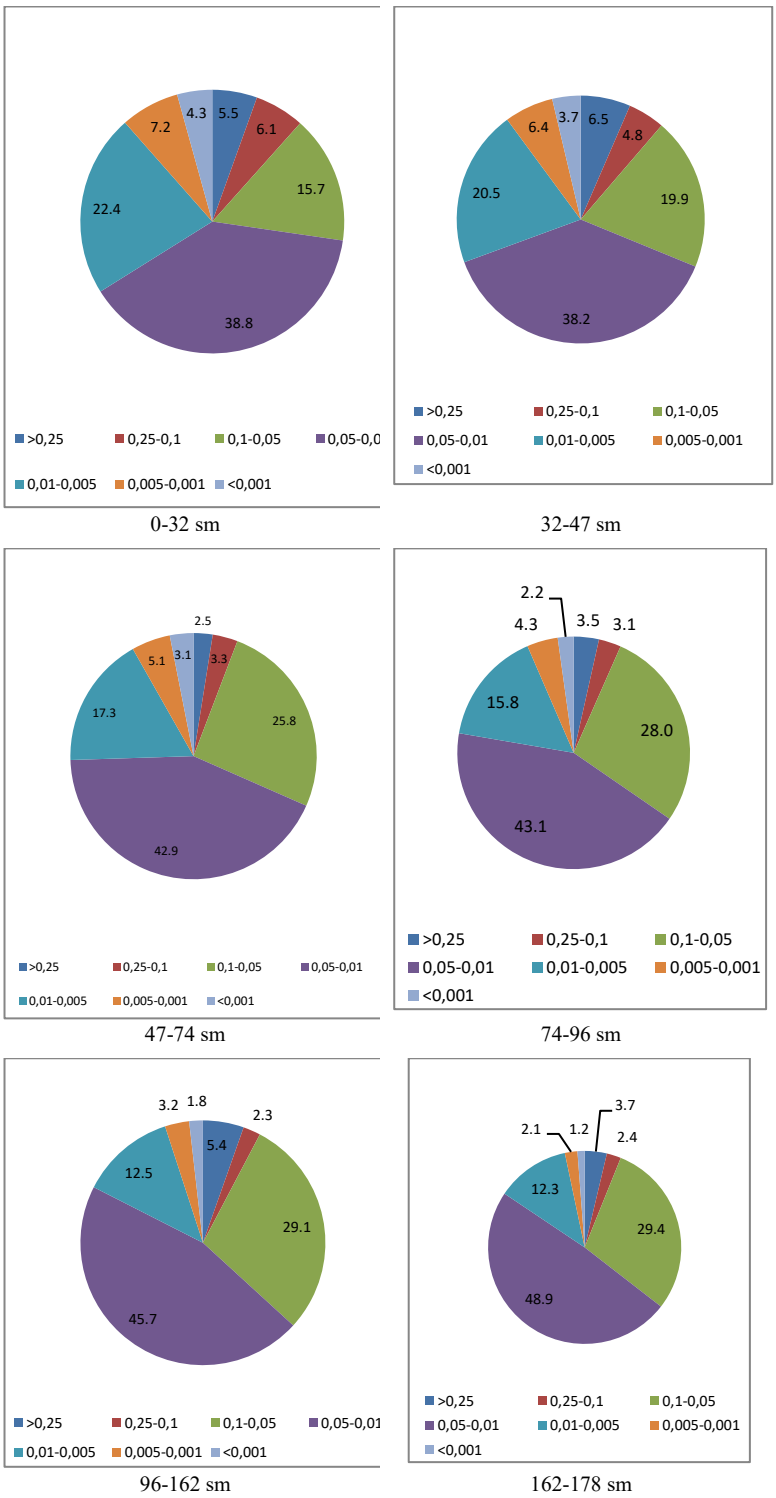


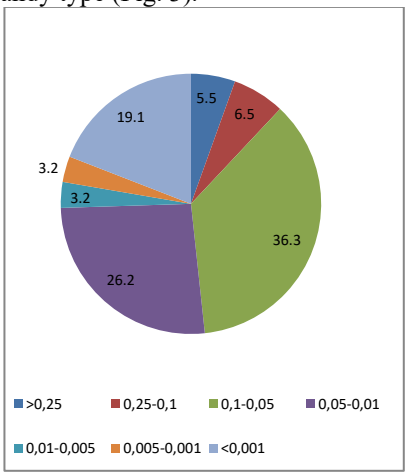
Fig. 2. Mechanical composition of irrigated meadow soils,(Outlines 282-283 of the Shukur Tokhta farm, Gulistan district)

In laboratory conditions, the physical properties of soil samples taken from contours 282-283 of the Shukur Tokhta state farm, Gulistan region, were determined. Analysis of the data obtained shows that the specific gravity of the soil in the uppermost layer of 0-32 sm was 2.40, bulk density - 1.29 g/sm3, porosity - 46.3%. As the soil layer deepened, the specific gravity and bulk density increased, and the porosity index decreased. In the lower layer of 96-162 and 162-178 cm, the specific gravity was 2.47 and 2.49 g/sm3, the bulk density was 1.40 and 143 g/sm3, and the porosity was 43.3 and 42, respectively. 6%. The total porosity of the soil turned out to be unsatisfactory according to the method of N.A. Kachinskiy and was in the range of 40-50% (Table 2).

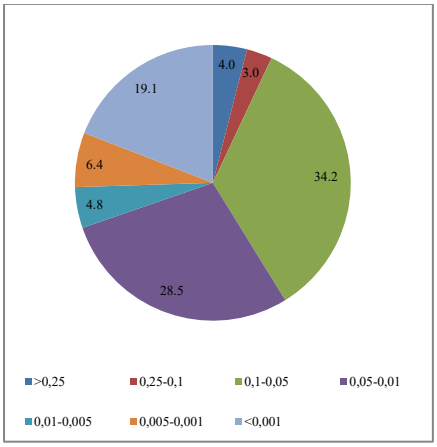
Table 2. General physical properties of meadow soils (Gijduvan district Sattor .Jabborov district Hasan Rajabi farm, 648 circuits)

Sectio on	Depth, sm	Relative mass (solid density), g/sm3	Bulk mass (Soil density), g/sm3	Porosity (porosity), %
2	0-32	2.40	1.29	46.3
	32-47	2.45	1.33	45.7
	47-74	2.49	1.37	45.0
	74-96	2.53	1.41	44.3
	96-162	2.47	1.40	43.3
	162-178	2.49	1.43	42.6

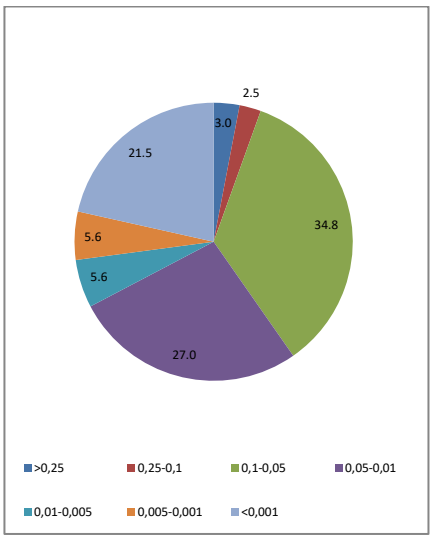
Territory of S. Jabborov, Hasan Rajabi farm, contour 648, hole No. 3 (cuts) was dug. Of the soil samples obtained, the mechanical composition of the soil in the arable layer (0-38 cm) was 37.4% physical clay, and the type of mechanical composition was medium sand. As the soil layer deepened, the amount of physical clay decreased and it acquired a light sandy type (Fig. 3).



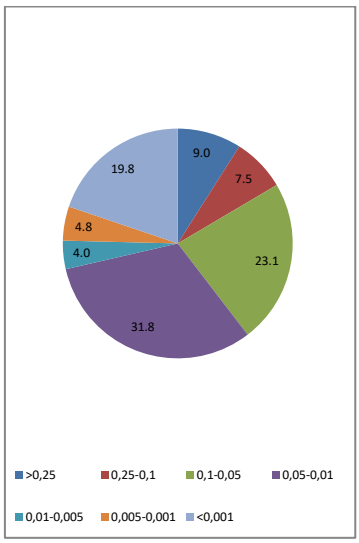
0-38 sm



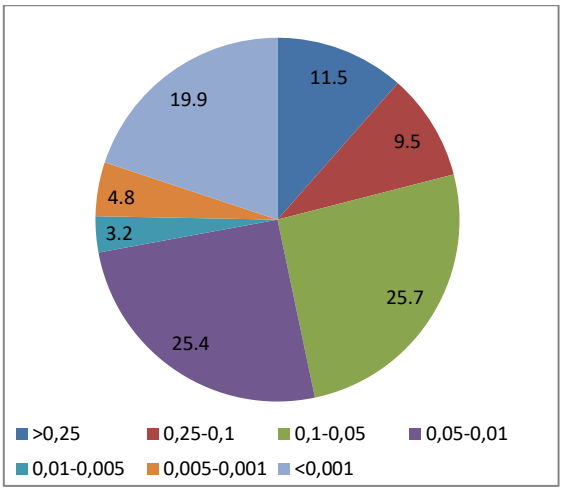
38-77 sm



77-134 sm



135-174 sm



175-205 sm

Fig.3. Mechanical composition of irrigated meadow soils,(S. Jabborov district, Hasan Rajabi village, contour 648)

In laboratory conditions, the physical properties of soil samples taken from the soil section of the Khasan Rajabiy state farm, 648 circuit 3, S. Jabborov district, Gijduvan district, were determined. According to this, the specific gravity of the soil in the uppermost layer of 0-38 sm was 2.41, the bulk density was 1.30 g/sm3, and the porosity was 46.1%. As the soil layer deepened, the specific gravity and bulk density increased, and the porosity index decreased. Lower The layer is 174-205 cm.the specific gravity is 2.62 and the bulk density is1.48 g/sm3, and the porosity was 43.5%. The total porosity of the soil, according to quality assessment using the method of N.A. Kachinskiy, was in the range of 40-50% and was considered unsatisfactory (Table 3).

Table 3. General physical properties of meadow soils (Gijduvan district S.Jabborov district Hasan Rajabi farm, 648 circuits)

Section	Depth, sm	Relative mass (solid density), g/sm3	Bulk mass (Soil density), g/sm3	Porosity (porosity), %
3	0-38	2.41	1.30	46.1
	38-77	2.49	1.36	45.4
	77-134	2.54	1.41	44.5
	134-174	2.57	1.44	44.0
	174-205	2.62	1.48	43.5

In agriculture, the best soils from the point of view of agricultural production are light and medium loamy soils. They tend to form a structure (granulation) and are relatively easy to work on soil in which the soil structure is well divided into pieces. They are characterized by high moisture capacity and high water retention after irrigation, but even if the soil moisture corresponds to the minimum moisture capacity, 10-20% of their pores are occupied by air, which means that even with the aeration porosity of these soils are unsatisfactory, they provide a sufficient amount of nutrients necessary for plants .

The mechanical composition of the studied soils is heavy, medium and light sandy-loamy, which indicates that the origin of the soils, i.e. the parent rock, is mainly formed from loess deposits. When growing crops, the mechanical composition and physical properties of the soil are constantly changing under the influence of crop rotation, the use of agrotechnical measures, irrigation and the use of fertilizers (organic and mineral), in a word, anthropogenic factors. Under the influence of these factors, the mechanical structure of the soil and its physical properties improve, creating the possibility of comfortable growth, development and high productivity of agricultural crops.

4 Conclusion

The mechanical composition of irrigated meadow soils in the conditions of the Gijduvan district of the Bukhara region is different, for example, the mechanical composition of meadow soils of the H. Olimjon site Farm "Omad" 576 - the mechanical composition of meadow soils is medium and heavy sandy. , Guliston district Farm Shukur Tokhta 282-283 - the upper layers of soil in the contours are medium sand, the middle layers are light sand, and the lower layers are loam, and the soils along the contour of Hasan Rajabiy 648 - The territory of S. Jabbarov are light and medium sand. General physical properties also differ in mechanical composition, and in terms of the qualitative indicator of porosity it turned out to be unsatisfactory. This is closely related to factors such as different soil textures, agricultural use, crop rotation, agricultural practices, irrigation and fertilization.

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