Agrophysical properties of soil

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Annotation: IN The article presents analytical data on irrigated meadow-marsh soils; the first watering is carried out before the plant blooms (based on a soil layer of 0-50 cm) at the rate of 700-750 m^3 / ha of water; in the early stages of the cotton growth period, the layer should not exceed 0-70 cm, and the watering rate is 850-900 m^3 / ha.

Key words: irrigated meadow alluvial soils, field moisture capacity, bulk density, soil permeability, humus, nitrogen, phosphorus, potassium.

Introduction: Today in the world "10.9 million hectares (56%) of lands are subject to washout and water erosion, 5.5 million hectares (28%) are eroded by wind, chemical degradation (decrease in humus and biogenic substances, salinization, pollution, etc.) 2.4 million hectares (12%), physically degraded (compacted, swampy, flooded, etc.) lands - 0.8 million hectares (4%), the total area is 19.6 million hectares . For this reason, conservation, increasing the productivity of lands degraded under the influence of natural and anthropogenic factors and improving land reclamation are pressing issues in all countries of the world.

Currently, 1/3 of the world's soils, distributed across the globe, are eroded, compacted, and the level of productivity is declining and remains unsuitable for use as a result of organic matter being washed out of them. As a result of the ongoing erosion process, 90% of the Earth's soils may lose their fertility by 2050. Special attention is also paid to scientific and practical work to identify the initial stage of soil degradation processes using modern technologies and increasing soil fertility, organic farming, and the production of high-quality and environmentally friendly products from agricultural crops.

The study of soils in the foothills of our republic, the process of soil formation in these regions over many years, the assessment of climate, relief, flora and fauna and the impact of man on it, monitoring them based on geoinformation technologies and their effective use, a number of scientific studies are being carried out and certain results are being achieved.

The aim of the study: to assess the current state of the soil cover of the Chirchik River basin, changes in its agrophysical properties under the influence of anthropogenic factors, to create maps of granulometric composition based on GAT, and to develop recommendations for improving its physical and chemical properties.

Research methods. The research was conducted in field and analytical laboratory conditions based on the methods set out in the "Guide to Conducting Chemical and Agrophysical Soil Analysis during Land Monitoring", "Methodology for Conducting Field Experiments", as well as ArcGIS software. The reliability of the data obtained was mathematically and statistically processed using the Microsoft Excel program based on the manual "Methodology of Field Experiment" by B.A. Dospekhov.

Research results: divided into two parts, based on the goals and objectives of the study, a review of scientific literature is provided, covering the results of scientific research conducted in the republic and abroad This chapter describes the factors of soil degradation, the reasons for their occurrence, scientific research related to the study of ways to develop effective measures using modern GAT technologies to prevent them. It should be noted that the morphogenetic properties of soils, productivity and their changes in intensive farming systems remain one of the least studied areas. The territory of the Chirchik River basin is distinguished by its complexity in the republic. Permanent farming in this area requires a detailed study of the soils in the future, increasing their productivity, taking into account the characteristics of these soils and developing specific agrotechnical measures. Due to insufficient attention to the agrophysical properties of the soils of the

Chirchik basin, insufficient use of organic fertilizers, inability to prevent erosion processes, it can be observed that degradation processes have accelerated on these lands, soil fertility and crop yields have decreased.

Tashkent region is located in the north-eastern foothill and mountainous region of our republic, its total area is 1513.2 thousand hectares, of which the total area of irrigated agricultural land is 329.121 hectares. The basin is located on the upper terraces IV, III, II and I of the Chirchik River. It is typical for the Tashkent oasis in relief, erosion and other indicators. There are small heights and falls in this basin. It occupies the southwestern part of the region and is a wide hilly area with a small relative height. The hills are quite long and have a general slope to the west. Hills are one of the most important elements of the relief. Slopes branching in different directions stretch up to 150-200 meters, their slope is 1-3, in places it is 5-8 degrees.

in the Chirchik basin of widespread rainfed and irrigated dark sierozem, rainfed irrigated typical sierozem, irrigated sierozem-meadow, irrigated meadow alluvial soils.

The humus content in the arable layers of dryland dark sierozems is 0.741-0.996% and above 1.067-1.510%. The total nitrogen content is 0.06-0.140%, which corresponds to humus, its decrease is observed in the lower layers. In the arable layer, the amount of total phosphorus fluctuates from 0.176 to 0.270 percent, and the amount of total potassium decreased from 0.942-1.398 percent to 0.420-1.236 percent. It was noted that the soils are poorly and moderately supplied with exchangeable potassium, which is very poor in mobile phosphorus.

In typical irrigated sierozems, common in the studied geomorphological region, carbonates are found in the form of concretions up to 1.5 m deep throughout the soil cross-section, distributed uniformly across the section - 7.5-9.2 percent. The amount of humus in the arable layer varies widely, up to 0.286-0.684% depending on the degree of soil leaching and the frequency of irrigation. The amount of nitrogen in the soil is 0.067%, depending on the lower layers of the section, the amount of humus decreases to 0.056-0.034%.

Irrigated sierozem-meadow alluvial soils, common in the Kibray massif of the Kibray district, are mainly medium loamy, the amount of physical clay varies across the section from 35.4 to 40.1%, distributed evenly across the section. The amount of small sand particles fluctuates within 20.4-28.4%. The amount of large sand particles fluctuates within 14.1-28.4%.

Irrigated meadow-alluvial soils of the "Yu.Akhunboboev" massif of the Chinoz district are medium loamy to a depth of one meter, the amount of physical clay is 34.6-38.6%, from a meter to the lower layer it becomes light. The amount of physical clay is 21.8-23.7 percent.

Microaggregate composition of soil plays an important role in determining soil fertility. Aggregate formation is especially important on highly eroded and irrigated soils to obtain abundant crop yields. Therefore, irrigation and erosion processes cause a certain degree of destruction of aggregates.

The reasons for the high natural fertility of the Chirchik basin soils are the high amount of dust particles of 0.05-0.01 mm in size and a large number of stable microstructural elements of more than 0.01 mm in size, which creates better capillary porosity, this provides a large amount of moisture and high water yield. As a result of irrigation and processing, it was noted that the aggregates decomposed to a certain extent. For example, in rainfed typical sierozems, the total true aggregates along the section are 21-29%, and in irrigated sierozem-meadow soils it is 12-27%.

The granulometric composition of soils common in the Chirchik basin is somewhat heavy, the amount of microaggregates is high, the decomposition coefficient is low compared to desert soils. The granulometric composition of soils in the Chirchik basin determines their formation, and the agrotechnical measures developed for their use in agriculture are the main factor and should be taken into account.

The soils of the Chirchik basin varies from 2.52 to 2.71 g/cm^3 in all geomorphological regions (Table 1). It is typical for foothills and mountainous areas. The lowest specific gravity (2.52-2.59 g/cm^3) is in the massif " Ittifak " of Zangiatinsky district of irrigated typical sierozem, and. meadow soils of the massif " Okhunbobaev " of Chinozsky district was observed in the lower layers of the massif. The highest indicator is 2.67-2.72 g /cm ^{3} in dark gray soils. This is due to the fact that the soils, although identical in granulometric composition, differ somewhat in mineralogical composition.

Volumetric mass The studied soils were diverse, no sharp differences were observed between the regions. The optimal density for the soils of the foothill typical and meadow and desert regions studied by scientists from the Institute of Soil Science and Agrochemical Research is 1.2-1.4 g /cm^3 and the critical density is 1.5-1.6 g/cm^3 . According to the data obtained, the bulk density is close to the optimal indicator Parkentsky and Zangiata districts massifs "Gulbog" and « Ittifok » irrigated typical sierozem (1.33-1.38 and 1.15-1.32 g / cm^3), Kibray district massif « Kibray » is formed in the soils of irrigated sierozem-meadow (1.22-1.33 g/ cm^3), Chinaz district massif « Akhunbobaev » the density in the arable and subarable layer of

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irrigated meadow soils is 1.42-1.47 g /cm^3 . Compaction of the subarable layer of rainfed dark sierozem soils is caused by soil cultivation. Regularities of compaction of the arable soil layer are also observed in all observed irrigated soils, however, it was established that the density of the layers is higher than the optimal density up to 1.51-1.54 g/cm ^{3}.

The total porosity of soils varies widely across areas, geomorphological regions, soil types, and genetic layers. This variation is also observed in the cross section. The total porosity of soils is 42-43% for soils with a density of 1.47-1.54 g/cm^3 considered unsatisfactory. Virgin and rainfed brown soils have a very high porosity in the upper layers of 53-61 percent, while rainfed dark sierozem and irrigated typical, sierozem-meadow soils also have high porosity, amounting to 50-56 percent. The total porosity of soil types is higher in the upper layer and decreases downwards, especially in the subsoil. The decrease in porosity is associated with an increase in soil density and a decrease in the number of water-stable aggregates, as well as under the influence of tillage equipment. Higher total porosity in the upper layers is associated with the process of tillage and the formation of aggregates.

IN depends on their granulometric composition, absorption capacity, mineralogical composition, quantity and composition of organic matter, water-soluble salts and, finally, soil density. In dryland dark sierozems of the Chirchik basin, MG is 3.5-4.0 % , in irrigated typical sierozems 4.2-4.5%, in sierozem-meadow 4.2-4.5%. Due to the light mechanical composition and small amount of humus in the soils, the MG indicator is low, and its indicators fluctuate from 1.5 to 3.1% across the section. Chirchik basin such a change in MG moisture is due to the granulometric composition, on the one hand, and the amount of water-soluble salts, on the other.

Plant wilting humidity In the Chirchik basin it is determined in irrigated sierozem-meadow soil (5.6-7.0%). The highest humidity of the plant is in the arable layer compared to all the studied soils, especially in layers rich in humus and small particles. The variation of the CH indicators in the lower layers is due to the heterogeneity of the granulometric composition, density and salt content.

Field moisture capacity according to the obtained data, the field moisture capacity of the soil in the Chirchik basin is dark sierozem (22.6-24.6%), irrigated typical sierozem (26.9-28.8%), sierozem-meadow (24.5-28.8%) and meadow soils (22.2-23.1%), and varies depending on the granulometric composition and the amount of humus. In the upper meter of soil, the soil moisture capacity is on average 25-29%, while for medium and light loamy non-saline soils it is 22-24%.

Total moisture capacity and capillary moisture capacity of irrigated typical and sierozem-meadow soils are slightly higher than in others. KV is 30-35% of the arable layer, and PV, respectively, 36-41%. According to the moisture capacity section, the soil layers do not differ sharply from each other and have close indicators.

At field moisture capacity 65-70%, the best conditions for cotton are created (depending on the growth period) the rate is 700-900-1100 m^3 / ha, the irrigation rate is regulated as follows, taking into account soil conditions and the growth period of plants. On irrigated meadow-marsh soils, the first irrigation is carried out before the plant blooms (based on a soil layer of 0-50 cm) at the rate of 700-750 m^3 / ha of water. In the early stages of the cotton growth period, the layer should not exceed 0-70 cm, and the irrigation rate is 850-900 m^3 / ha.

Conclusions: On irrigated meadow-marsh soils, the first watering is carried out before the plant blooms (based on a soil layer of 0-50 cm) at the rate of 700-750 m3 $^/$ ha of water; in the early stages of the cotton growth period, the layer should not exceed 0-70 cm, and the watering rate is 850-900 m^3 / ha.

References

1. https://www.fao.org
2. https://www.lex.uz/pdfs/6058690
3. https://www.lex.uz/pdfs/5924582
4. https://www.lex.uz/pdfs/6798455
5. Kurvantayev R., Xalilova Z., Soliyeva NA Toshkent viloyati tuproqlarining granullometrik tarkibi // " Agro ilm " jurnali. – Toshkent, 2020 - No. 6(69)-son, – B. 75-76.