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HUMUS STATE OF IRRIGATED MEADOW-ALLUVIAL SOILS IN THE LOWER AMUDARYA

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Abstract. *The article provides information on some patterns of distribution of humus content in irrigated soils of desert zones. In terms of humus content, irrigated meadow-alluvial soils have a unique character, which is associated with sharp fluctuations in mechanical composition. It also highlights the importance of studying soil organic carbon as an indicator of soil health in the mitigation of climate change consequences. It was established that the studied soils have been provided with low reserves of organic carbon.*

Key words: *irrigated soil, salinization process, humus status, soil organic carbon reserve, soil profile.*

Introduction. It is known that the humus status of the soil is an important indicator of increasing its fertility. Therefore, as one of the negative factors that reduces the productivity of irrigated soils, special attention is paid to their low supply of humus and basic nutrients. A sufficient supply of humus and nutrients in the soil ensures the preservation of all its agricultural-technical properties, i.e. its structure, density, water and nutritional regime in an optimal state for the growth and development of plants, and at the same time makes it possible to obtain a high and quality harvest from them.

Therefore, in the research and studies aimed at increasing soil fertility, the amount of humus is considered as an important indicator of increasing the soil's resistance to various negative consequences.

The humus content in various soils is a stable genetic trait and is subject to certain geographical patterns that affect the processes of its formation and decomposition. Humus substances are the main, most active and most powerful agent in the formation of soil profiles and soil fertility [5].

In this regard, it should be noted that humus provides important information not only when solving problems related to the preservation, restoration and increase of soil fertility, reclamation of lands disturbed by anthropogenic impact, but also when studying the evolution of soils, their stability -

variability when the natural environment changes as a natural, and also by anthropogenic means [1, 6, 7].

Today, a significant part of irrigated land is subject to varying levels of salinity. Considering the special value of irrigated lands, it is necessary to increase the level of knowledge on improving the reclamation condition of soils. In this regard, elucidation of the factors causing soil salinization, as well as the preservation and restoration of the fertility of saline soils and their rational use in agriculture are urgent tasks at a time when the area of saline lands is considerably increasing as a result of natural processes and anthropogenic impact [4] .

The object of research. Saline irrigated meadow-alluvial soils, common in the Chimbay region of the Republic of Karakalpakstan serve as an object of research. During the research, soil cuttings as samples were also taken to study the degree of salinity, the duration of irrigation and other indicators.

The results of research and their discussion. As the data obtained show, the studied soils differ in the degree of salinity. In this regard, their provision of humus content has a unique character. For example, irrigated non-saline and slightly saline meadow-alluvial soils of the studied region are characterized by relatively higher humus content than compared to soils with moderate and strong salinity. In general, the percentage of humus in the profile of the studied soils ranges from 0.275 to 1.360%. The highest humus levels are characteristic of the upper arable horizons; they naturally decrease with depth along the soil profile.

It should be noted that in some soil varieties the distribution of humus content along the profile has a different character, such as, for example, a decrease to a certain depth, and again an increase in its percentage content. This is explained by a sharp change in the mechanical composition of the studied soils, which is associated with the complex lithology of the formation of hydromorphic soils.

According to the humus content supply, the soils of the region were divided into 3 groups: medium-supplied (humus content - 1.0-1.5%) - non-saline and slightly saline old and newly irrigated soils, their humus content is 1.05-1.33%; low-supplied (0.5-1.0%) – some slightly saline, also moderately, strongly and very highly saline newly irrigated soils and meadow salt marsh with a humus content of 0.53-0.99%; very low supplied soils (<0.5%) – typical salt marsh with a humus content of 0.40-0.48%.

A decrease in humus content in the soil is naturally accompanied by a decrease in the most valuable agronomic and agrophysical properties of soils. Along with this, there is a significant decrease in the content of basic nutrients in irrigated soils. The more humus, the better the water, air and thermal conditions of the fertile layer of the earth, the more saturated this layer is with basic nutrients and the more active microbiological processes occur in it [3].

In modern times, in order to appraise the humus status of soils, a great attention is paid to the study of the reserve of organic carbon (Corg), which directly characterizes the humus status of soils and the total humus content in them. They are mainly calculated for the top layer of soil, the capacity of which is determined by the structure of the soil profile (0–20, 0–50, 0–100 cm) and are given in t/ha [2].

Estimation of soil organic carbon reserves gives an idea of the true scale of humus formation, regardless of the nature of the distribution of Corg across the soil profile.

Soil organic carbon (SOC), an indicator of healthy soil, plays a significant role in mitigating climate change. Soil organic carbon also helps to improve soil structure, increase overall porosity and provide sufficient air and moisture for normal plant growth, as well as promote the formation of water-resistant and mechanically stable aggregates. Therefore, knowledge on the reserve of soil organic carbon directly makes it possible to characterize not only the humus, but also the physical state of the soil, which are equally one of the most important elements of its fertility, and are also important for conducting soil field research.

Estimation of the reserves of soil organic carbon gives an idea of the degree of actual humus formation, regardless of its distribution along the soil profile.

As for the reserves of soil organic carbon, we can think about the possible release of CO_2 gas from the soil into the atmosphere due to changes in the processes of humification and mineralization of organic matter under the influence of climate change and other natural and anthropogenic factors.

During the period of research on the basis of GIS, electronic maps were created, which describe the reserves of organic carbon in the upper (0–30 cm) soil layers of the Chimbay and Bakhitly massifs of the Chimbay region of the Republic of Karakalpakstan (Fig. 1, 2).

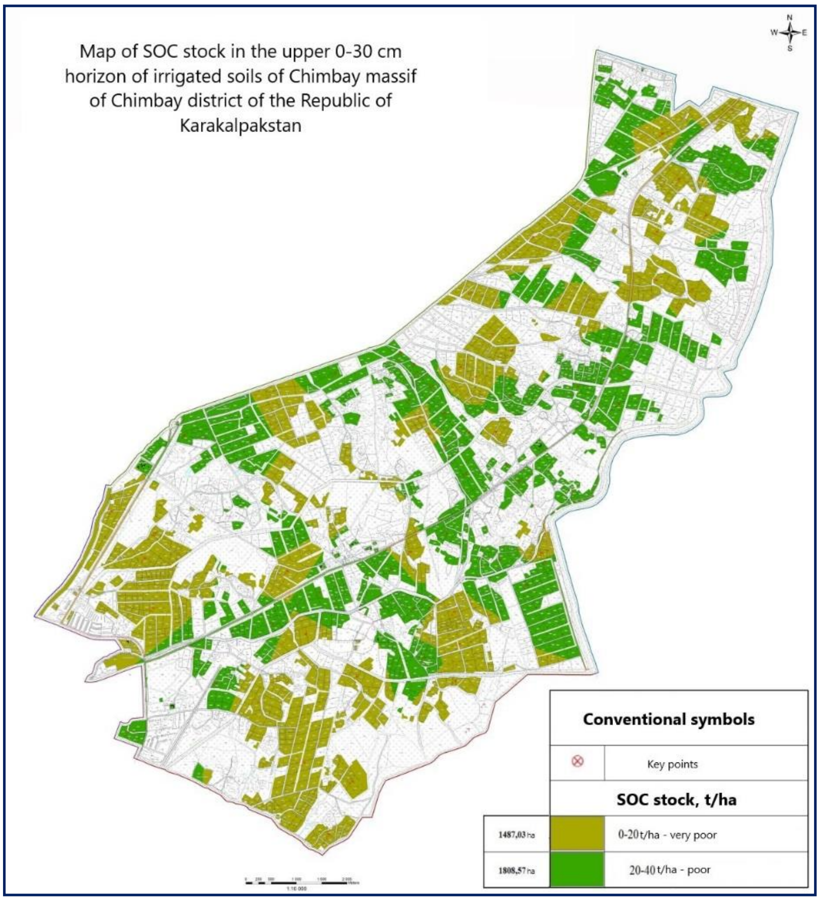

Figure- 1. Map of the reserves soil organic carbon in soils of the Chimbay massif

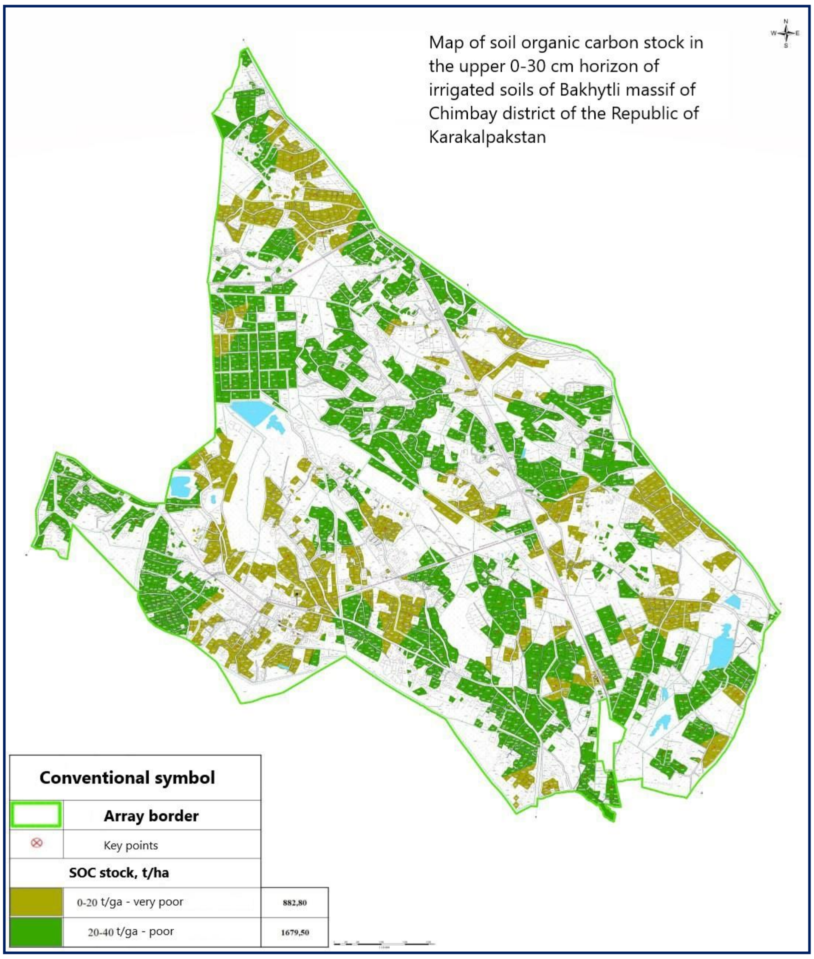

Figure- 2. Map of the reserves soil organic carbon in soils of the Bakhitly massif

Based on the data obtained, the boundaries of fluctuations were determined in the reserves of organic carbon in the soils of the region. Each soil variety was characterized according to the scale of the reserves soil organic carbon presented on the map. It has been established that the reserves of organic carbon in soils with varying degrees of salinity fluctuate mainly in the range of 10-30 t/ha, and in terms of its capacity, almost all soils have a very low level.

When analyzed by indicator, the map shows a range of values with very clear differences. According to this, we can see that the maximum values of the soil organic carbon reserve between the determined values correspond to non-saline or slightly saline soils of heavy and medium mechanical composition. The amount of the reserve of organic carbon in these soils is 25.5-29.6 t/ha. On the other hand, its minimum values corresponded to sandy loam and light loamy soils with strong and very high salinity, where the amount of soil organic carbon reserves varied from 9.9 to 17.9 t/ha.

From the materials presented on the maps describing the reserves of soil organic carbon, it is clear that the area of soils with low reserves of organic carbon in the Bakhitly massif is 1679.50 hectares, and the area of soils with very low reserves of organic carbon is 882.80 hectares. It was also noted that the area of soils with low organic carbon reserves in the Chimbay massif is 1808.57 hectares, and the area of soils with very low organic carbon reserves is 1487.03 hectares. It has been established that in both massifs a group of soils with a low supply of humus predominates.

Conclusion. In general, we can conclude that the conditions of distribution of non-saline and slightly saline soils in the territory allow soil organic carbon to form aggregates, improve soil structure and increase porosity, which, in turn, allows plants to grow well and provides enough air and moisture for normal growth.

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