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SOIL ORGANIC MATTER CONTENT AND ITS EFFECT ON PRODUCTIVITY

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Abstract
This article studies the content of soil organic matter and its impact on agricultural productivity. The article analyzes the main sources of organic matter, its functions in the soil, and its specific effects on productivity. The results show that a decrease in the content of organic matter in the soil significantly reduces productivity, and also negatively affects the water-holding capacity, structure, and nutrient reserves of the soil. The article also suggests methods for increasing organic matter reserves.

Keywords: Soil fertility, organic matter, humus, productivity, ecological farming, fertilizers, erosion control, soils of Uzbekistan, sustainable agriculture, agrotechnologies.

Introduction

One of the most important issues of modern agriculture is the preservation and increase of soil fertility. Soil organic matter is one of the main factors determining its fertility. Organic matter has a significant impact on the physical, chemical and biological properties of the soil, which in turn directly affects crop productivity.

In recent decades, as a result of the use of intensive farming systems, the amount of organic matter in the soil has significantly decreased in many agricultural areas. This contributes not only to a decrease in soil fertility, but also to soil erosion, deterioration of water quality and climate change.

The main objective of this article is to study the effect of the amount of organic matter in the soil on productivity, as well as to analyze modern approaches to preserving and increasing organic matter reserves. During the study, the mechanisms of the influence of organic matter on soil fertility, their quantitative indicators and qualitative characteristics were studied. In addition, methods for increasing organic matter reserves were also examined in detail.

The main elements that make up the organic part of the soil. The organic composition of the soil is of vital importance in the soil ecosystem and is one of the main components that ensure its fertility. The organic part of the soil is divided into three main components, each of which performs its own functions and plays an important role in determining the quality of the soil. For example, Humus. The main component of the organic part of the soil is humus, which makes up about 85 percent of the organic part. Humus is a complex complex of organic substances that is formed after the complete decomposition of plant and animal remains. It gives the soil a dark brown color and is important in the formation of soil structure, retaining

nutrients, and also increasing soil fertility. Humus improves the water-holding capacity of the soil, increases its resistance to erosion, and improves the absorption of nutrients by plants. Plant residues make up about 10 percent of the organic part of the soil. These are the remains of green plants, such as roots, stems, leaves, and fruits. These residues decompose in the soil and turn into humus or are partially digested by soil organisms. Plant residues form a protective layer on the soil surface and also serve as a source of nutrients and organic carbon for the soil. As a result of the activity of soil microbes, these residues decompose, increasing soil fertility.

Soil flora and fauna. Soil flora and fauna make up about 5 percent of the organic matter in the soil. These are microorganisms, including bacteria, fungi, actinomycetes, as well as earthworms, insects, and other small animals. They play an important role in the decomposition of organic matter in the soil and the cycle of soil nutrients. Soil organisms improve the structure of the soil, recycle organic matter, and produce compounds useful to plants.

These elements that make up the organic part of the soil are interconnected and maintain the balance of the soil ecosystem. Humus, plant residues, and soil organisms together determine the physical, chemical, and biological properties of the soil, which in turn creates favorable conditions for the growth and development of agricultural crops.

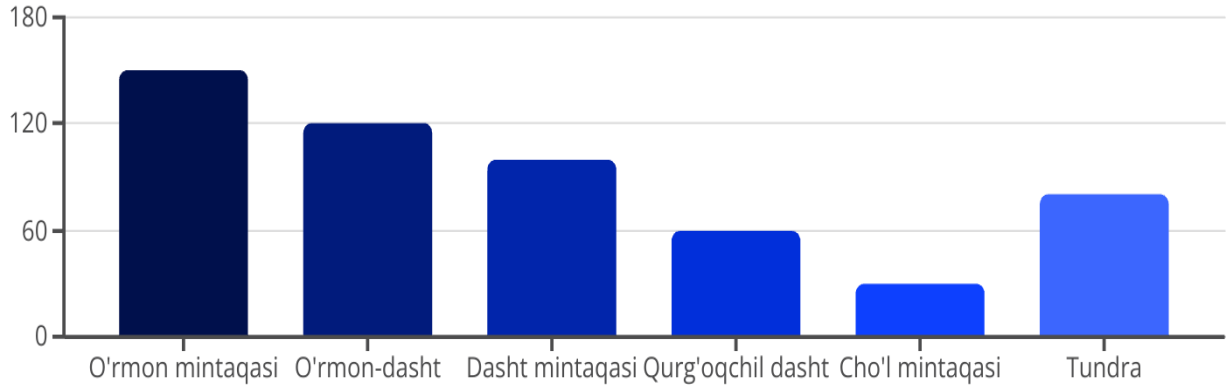
Distribution and amount of organic matter in the soil. The distribution and amount of organic matter in the soil depend on various factors, among which the main ones are geographical region, climatic conditions, relief, soil type and vegetation cover. The distribution of organic matter in the soil is uneven both in the soil profile and over large areas, which affects the fertility of the soil and its properties.

The biomass reserve in the soil differs depending on the natural regions The amount of organic matter in the soil varies significantly in different natural regions. These differences are mainly associated with climatic conditions, vegetation cover and soil formation processes. The amount of organic matter in the soil is distributed according to geographical regions as follows:

The effect of organic matter on crop yield: specific examples. There is a direct relationship between an increase in the amount of organic matter in the soil and an increase in the yield of agricultural crops. This relationship has been confirmed by numerous studies and practical experiments. Organic matter creates favorable conditions for the growth and development of plants, increases soil fertility, and increases the resistance of plants to various stress factors.

Increased yield due to high organic matter. Several specific examples of how an increase in the amount of organic matter in the soil has a positive effect on the yield of agricultural crops:

Studies conducted in different regions of Uzbekistan show that when the amount of humus in the soil increases from 1% to 2%, wheat yield increases by 0.5-0.7 tons per hectare. For example, in experiments conducted on gray soils of the Samarkand region, when organic fertilizers (manure) were applied to the soil at a rate of 30 t/ha, the humus content in the soil increased from 1.2% to 1.8% and wheat yield increased from 2.8 to 3.5 tons per hectare. This is due to the fact that organic matter provides nutrients such as nitrogen, phosphorus, and potassium in a form that is convenien for plants.



1- diagram. Quantitative examples of steppe, forest, tundra, and desert regions

Forest region. Soils in the forest region have the highest organic matter content. For example, in taiga forests, the organic matter content in the soil is 150-200 t/ha. Here, leaves and branches of trees fall into the soil every year and decompose. In addition, due to the high moisture content in forest soils, the decomposition of organic matter proceeds slowly, which leads to their accumulation. In forest soils, organic matter accumulates mainly in the upper layer of the soil and decreases sharply with depth.

Steppe region. Soils in the steppe region have average organic matter content. For example, in black soils, the organic matter content is 80-120 t/ha. In the steppe region, herbaceous plants dominate, their root system is developed and adds a large amount of organic matter to the soil. In black soils, organic matter is distributed relatively evenly throughout the soil profile, which ensures fertility throughout the entire soil profile. Soils in the steppe region have a high humus content, which gives the soil its black color.

Desert. Organic matter in desert soils has the lowest rates. For example, the amount of organic matter in desert soils is 20-40 t/ha. In desert areas, the vegetation cover is sparse, so there is little organic matter entering the soil. In addition, high temperatures and dry climatic conditions contribute to the rapid decomposition of organic matter, which makes it difficult to accumulate. In desert soils, organic matter is concentrated in the surface layer of the soil and is present in very small quantities.

The distribution of organic matter in the soil depends on the soil type and its distribution profile. Organic matter accumulates more in the upper layers of the soil and decreases with increasing depth. However, in some soil types, for example, in black soils, organic matter is evenly distributed throughout the soil profile.

Various methods for the production of organic matter in the soil are used, such as: This method is used to measure soil carbon for food production, with special coefficients for production plants.

Cotton is one of the main agricultural crops of Uzbekistan. The amount of organic matter in the soil has a significant impact on cotton yield. Studies conducted on the gray soils of the Tashkent region show that when the amount of humus in the soil increases from 1.0% to 1.5%, cotton yield increases by 0.6-0.8 tons per hectare. Organic matter improves the development of the cotton root system, which increases the plant's ability to absorb nutrients and water.

Organic matter also improves the water-physical properties of the soil, which increases the drought resistance of cotton. Vegetable crops are also very sensitive to the amount of organic matter in the soil. In experiments conducted on irrigated soils of the Fergana Valley, when organic fertilizers (compost) were applied to the soil at a rate of 25 t/ha, the humus content in the soil increased from 1.3% to 2.0%, and tomato yield increased from 30 to 45 tons per hectare. Organic matter creates favorable conditions for the growth and development of vegetable crops, increases their resistance to diseases, and improves product quality.

Protective and anti-erosion effectiveness. The content of organic matter in the soil increases the erosion resistance of the soil and plays an important role in its protection. Organic matter binds soil particles, forming stable aggregates, which increases the soil's resistance to water and wind erosion.

Studies conducted in the foothills of the Kashkadarya region show that when the humus content in the soil increases from 1.0% to 2.0%, the soil's resistance to water erosion increases by 2-3 times. This is due to the fact that organic matter binds soil particles together, forming stable aggregates. The presence of stable soil aggregates prevents the formation of crusts on the soil surface, improves soil permeability, and reduces the intensity of erosion processes. Organic matter also increases the water-holding capacity of the soil, which is important in arid regions. When the humus content in the soil increases by 1%, the water capacity of the soil increases by approximately 1.5-2.0%. This increases the drought resistance of plants and increases the efficiency of irrigation water use. An increase in the content of organic matter in the soil also increases the efficiency of mineral fertilizer use. Organic matter preserves the nutrients contained in mineral fertilizers and keeps them in a form convenient for absorption by plants. Studies conducted on irrigated soils of Surkhandarya region show that when the humus content in the soil increases from 1.2% to 1.8%, the efficiency of using nitrogen fertilizers increases by 25-30%.

The amount of organic matter in the soil is one of the most important indicators determining its fertility. The amount of organic matter varies in different soil types and regions, but there are standard indicators for it. In black soils, the amount of organic matter is 6-15%, while in gray soils this figure is around 1-3%. In desert and semi-desert soils, the amount of organic matter can be less than 1%. If the amount of organic matter in the soil is low, productivity decreases significantly. When the amount of organic matter decreases from 2% to 1.5%, soil fertility decreases by an average of 14%. If the amount of organic matter is less than 1%, soil fertility decreases critically and crop yields drop sharply. On the contrary, with an increase in the amount of organic matter, a number of important properties of the soil improve. For example, if organic matter increases from 1% to 3%, the water retention capacity of the soil increases 6 times. This, in turn, increases the efficiency of irrigation water and enhances the resilience of crops in drought conditions.

Organic matter content (%)	Soil fertility level	Productivity potential	Recommended measures
Above 5%	Very high	Maximum	Maintain the current level
3-5%	High	High	Use organic fertilizers in small quantities
2-3%	Average	Good	Regular organic fertilization, crop rotation
1-2%	Low	Low	Intensive organic fertilization, planting legumes
Less than 1%	Very low	Very low	Comprehensive soil restoration measures

The amount of organic matter in the soil also affects its ability to absorb carbon dioxide. Soils rich in organic matter absorb more carbon dioxide from the atmosphere, which is important in the fight against global climate change. Increasing the amount of organic matter in one hectare of soil by 1% is equivalent to absorbing approximately 20-40 tons of carbon dioxide from the atmosphere. It should also be noted that, along with the amount of organic matter in the soil, its quality is also important. The quality of organic matter is determined by the degree of its decomposition, the C:N ratio and other indicators. High-quality organic matter has a more positive effect on soil fertility and releases more useful elements for crop nutrition.

Humus content in Uzbek soils: statistical range. The humus content in Uzbek soils varies significantly depending on different soil types and regions. The following table presents the statistical ranges of the humus content in the main soil types of Uzbekistan:

Soil type	Humus content (%)	Distribution areas
Desert-sandy soils	0,5 - 0,8	Kyzylkum, Karshi desert
Brown soils with a grayish tint	0,8 - 1,2	Central Kyzylkum
Gray soils (light-colored)	0,9 - 1,5	Jizzakh, Syrdarya regions
Gray soils (typical)	1,2 - 1,8	Tashkent, Samarkand, Fergana regions
Gray soils (dark-colored)	1,5 - 2,2	Foothill regions
Mountain brown soils	2,0 - 3,5	Mid-mountain region
Mountain black soils	3,0 - 5,0	Western Tien Shan, Pamir-Alai
Grassland-gray soils	1,5 - 2,0	Irrigated areas
Grassland soils	1,8 - 2,5	In river valleys

The humus content in the soils of Uzbekistan has decreased significantly in recent decades. This is especially noticeable in irrigated farming areas. For example, in the irrigated gray soils of the Tashkent region, the humus content in the 1960s averaged 1.5-1.8%, while at present this figure has dropped to 1.0-1.3%. This is mainly due to improper agrotechnical measures (deep plowing, violation of crop rotation, low application of organic fertilizers) and soil erosion.

Conclusion

This article provides extensive information on the content of organic matter in the soil and its impact on the productivity of agricultural crops. The importance of soil organic matter, its distribution in the soil, chemical composition, transformation processes and its role in plant nutrition were considered. Also, information was provided on methods of using organic matter to increase soil fertility, innovative technologies and best practices.

Soil organic matter is one of the important factors determining soil fertility. They improve the physical, chemical and biological properties of the soil, create favorable conditions for plant growth and development. Organic matter improves soil structure, increases soil water holding capacity, reduces soil erosion and increases soil biological activity. They are also a source of nutrients for plants and increase plant resistance to stress factors (drought, high temperature, diseases). The content of organic matter in the soil depends on soil type, climatic conditions, plant cover and agricultural practices. The content of organic matter in the soils of Uzbekistan, especially in irrigated areas, has significantly decreased in recent decades. This is mainly due to improper agrotechnical measures (deep plowing, violation of crop rotation, low application of organic fertilizers) and soil erosion. Therefore, it is necessary to implement measures to increase and maintain the content of organic matter in the soil.

Practical recommendations for the agricultural sector of Uzbekistan

1. Regular application of organic fertilizers (manure, compost, biohumus) to the soil. Organic fertilizers enrich the soil with organic matter, improve soil structure and increase soil biological activity. It is recommended to apply organic fertilizers to the soil every 2-3 years at a rate of at least 20-30 t/ha.
2. Introduction of a correct crop rotation system. The introduction of legumes (alfalfa, chickpeas, peas, etc.) into the crop rotation system enriches the soil with nitrogen, which contributes to the formation of organic matter. For example, the introduction of alfalfa or other legumes into the cotton-cereal crop rotation system increases soil fertility.
3. Application of minimal tillage methods (no-till, mini-till). These methods preserve the natural structure of the soil, create a layer of mulch on the soil surface and reduce soil erosion. Minimal tillage methods create favorable conditions for the activity of soil microorganisms, which contribute to the proper decomposition of organic matter and the formation of humus.
4. Leave plant residues in the soil and mix them into the soil. Instead of burning or removing plant residues after harvesting, it is important to leave them in the soil and mix them into the soil. This method enriches the soil with organic matter, protects the soil surface from erosion and retains soil moisture.
5. Use of green manures. Green manures are plants that are planted and then buried in the soil to enrich the soil. They enrich the soil with organic matter and nitrogen, improve soil structure and help fight weeds. Legumes (alfalfa, sebarga, vetch, lupine, etc.) are often used as green manures.
6. Use of modern innovative technologies and best practices. Biohumus, biochar, microbiological preparations and other modern organic fertilizers are effective tools for

increasing soil fertility. Also, modern approaches such as precision farming technologies, soil analysis and monitoring, biological stimulators allow maintaining and increasing the amount of organic matter in the soil.

References

1. Tursunov L.T., Kholiqulov Sh. "Fundamentals of Soil Science". Tashkent, "Science", 2018.
2. Koziyev R.Q., Sektimenko V.E., Ismonov A.J. "Soils of the Republic of Uzbekistan". Tashkent, "Extremum-Press", 2019.
3. Gafurova L.A., Abdullaev S.A. "Ways to improve the ecological state and fertility of soils". Tashkent, "Science", 2020.
4. Sodikova G.S., Kholdarov D.M. "The role of organic fertilizers in increasing soil fertility". Tashkent, "Teacher", 2018.
5. Raupova N.B., Jabborov Z.A. "Soil chemistry and biology". Tashkent, "Science and technology", 2019.
6. Turdimetov Sh.M. "Assessment and management of humus condition in irrigated soils of Uzbekistan". Tashkent, "Uzbekistan", 2018.
7. Food and Agriculture Organization of the United Nations (FAO). "Soil Organic Carbon: the hidden potential". Rome, 2017.
8.Bot A., Benites J. "The importance of soil organic matter: Key to drought-resistant soil and sustained food production". FAO Soils Bulletin 80. Rome, 2005.
9. Lal R. "Soil Carbon Sequestration Impacts on Global Climate Change and Food Security". Science, 2019, 304:1623-1627.
10. Schmidt M.W.I., Thorne M.S., Abiven S., et al. "Persistence of soil organic matter as an ecosystem property". Nature, 2011, 478:49-56.
11. Lehmann J., Kleber M. "The contentious nature of soil organic matter". Nature, 2015, 528:60-68.
12. Minasny B., Malone B.P., McBratney A.B., et al. "Soil carbon 4 per mille". Geoderma, 2017, 292:59-86

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