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CAUSES AND CONSEQUENCES OF THE SALINIZATION PROCESS

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Abstract
This article analyzes the process of soil salinization, its main causes, and its ecological and economic consequences. It discusses the natural and anthropogenic factors leading to salinization, as well as the changes occurring in the physical and chemical composition of the soil. Based on the research results, recommendations are provided for preventing and reducing the degree of salinization.

Keywords: Saline soil, resources, agriculture, climate change, ecological balance.

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Introduction

Soil is one of the most important natural resources for humanity, serving as the foundation for plant life and agricultural production. However, in recent years, due to improper use of water resources, climate change, and the deterioration of irrigation systems, saline areas have been expanding in many regions of the republic, particularly in the Bukhara, Khorezm, and Kashkadarya regions. The process of salinization not only reduces soil fertility but also causes serious damage to the ecological balance.

1. The Essence of the Salinization Process Salinization is the process of excessive accumulation of soluble mineral salts (such as sodium chloride, sodium sulfate, magnesium, and calcium compounds) in the soil layer. This phenomenon usually occurs in climatic conditions where soil evaporation is intense but annual rainfall is low. There are two types of salinization: natural (autochthonous) and artificial (anthropogenic).

Natural salinization occurs due to the natural accumulation of salts in the parent rock or the upward movement of groundwater containing high concentrations of dissolved salts. Artificial salinization is mainly related to human activities and results from improper irrigation, failure of drainage systems, and the excessive use of mineral fertilizers.

2. Main Causes of Salinization

1. **Climatic Factors**

In arid regions like Bukhara, low rainfall, high temperatures, and intense evaporation cause dissolved salts in the soil moisture to rise to the surface and accumulate.

2. **Malfunctioning Irrigation Systems**

Old or poorly designed irrigation systems cannot drain excess water properly. As a result, the groundwater level rises, and salts contained in it migrate to the surface through capillary action.

3. **Salinity of Groundwater**

Often, underground water contains a high concentration of salts. When its level rises to 2–3 meters, salt migration to the upper soil layers occurs.

4. **Incorrect Agro-technical Practices**

Farmers often use excessive mineral fertilizers and pesticides to increase yield. This disrupts the salt balance in the soil, accelerating salinization.

5. **Natural Geological Factors**

In some areas, the parent rocks that form the soil are naturally rich in salts. Their erosion or disintegration naturally intensifies salinization.

3. Consequences of Salinization

1. **Decrease in Soil Fertility**

Excessive amounts of salts limit the ability of plant roots to absorb water and nutrients. As a result, plants grow poorly, yields decrease, and quality deteriorates.

2. **Disruption of Biological Balance**

In saline soils, the activity of beneficial microorganisms slows down, weakening the uptake of elements such as nitrogen, phosphorus, and potassium.

3. **Negative Ecological Impacts**

Salinization leads to soil structure degradation, reduced water permeability, increased erosion, and more frequent dust storms.

4. **Economic Losses**

The sharp decline in productivity on saline lands reduces farming efficiency, leading to economic losses.

5. **Measures to Combat Salinization**

To prevent and reduce salinization, the following measures are recommended:

- Reconstruction of irrigation and drainage systems;
- Implementation of drip irrigation and resource-saving technologies;
- Use of organic and biofertilizers;
- Planting salt-tolerant crop varieties;
- Soil washing and reclamation treatments.

Conclusion

Soil salinization is an urgent environmental issue for the arid regions of Uzbekistan, particularly the Bukhara region. This process not only reduces agricultural productivity but also threatens the stability of natural ecosystems. Therefore, the introduction of scientifically based biotechnological solutions, water-saving methods, and environmentally safe approaches is one of the most important tasks today.

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