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CHARCTERISTICS OF THE CURRENT RECLAMATION STATE OF SOILS IN IRRIGATED MEADOW-PASTURE LANDS
(A case study of the Besharyk district)

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Abstract: *This article presents the results of scientific research conducted on the soils of irrigated meadows in the Fergana region. The study examines natural and anthropogenic factors that provoke negative processes occurring in the region. It determines the depth, mineralization, and qualitative composition of groundwater, as well as the total and toxic salt reserves in genetic and various soil layers. Based on these findings, the current reclamation state of the soils is assessed, and objective evaluations are conducted to develop measures and recommendations for their improvement. Additionally, the processes of salinization and desalinization that may occur in the future are analyzed to predict reclamation and environmental changes.*

Keywords: *irigated soils, meadows, desalinization, lithological-hypsometric profile, land reclamation, wastewater, salinization process.*

Introduction

The primary factor contributing to natural soil salinity in Uzbekistan is the predominance of evaporation over atmospheric precipitation, combined with the region's relatively flat topography and the shallow depth of groundwater. Another natural contributor to salt accumulation is wind-driven salt transport. On the other hand, anthropogenic salinization is mainly associated with soil and landscape degradation. An additional source of water-soluble salts entering the soil cover is technological and agronomic pollution or unfavorable shifts in natural processes. In other words, irrigation waters from rivers are distributed through large and small canals, with significant losses occurring due to seepage from irrigation ditches and fields. Furthermore, the insufficient capacity of drainage networks leads to a rise in groundwater levels per hectare. Unfortunately, the absence or improper use of drainage canals further accelerates the upward movement of salts from deeper soil horizons that retain water. Secondary salinization occurs as a result of excessive irrigation and leaching of saline water under conditions of inadequate drainage, which prevents the rapid removal of rising groundwater. Currently, the increasing intensity of secondary salinization poses a serious threat to the stability of arid ecosystems. Soil salinization accelerates soil degradation, worsening land productivity and sustainability.

RESEARCH OBJECTIVE

This study aims to investigate the key properties and ecological-reclamation status of irrigated meadow soils in the Agrotechnical Service and the ChBN landmass of the Besharik District in the Fergana region. The research provides new data on the mechanical composition, agrochemical properties of irrigated soils, fundamental groundwater parameters, as well as the types and levels of salinization.

OBJECT AND RESEARCH METHODOLOGY

Our soil research was conducted in the Besharik District, where various geomorphological, lithological, hydrogeological, and climatic factors interact, leading to diverse soil formation processes across the territory. As a result of these natural and anthropogenic influences, irrigated meadow soils have developed in the region. The study area primarily consists of irrigated meadow soils, which are described in detail below.

The soils of the district's irrigated lands are predominantly located in the upper and middle floodplain of the Amu Darya River. These irrigated alluvial meadow soils have a long formation history, with some areas having been recently restructured from barren and meadow soils. The groundwater table depth ranges between 1.0 and 2.5 meters, reaching its peak during salinization periods and vegetative irrigation cycles. The high mineralization of clay-rich groundwater creates favorable conditions for secondary soil salinization. To maintain optimal soil reclamation conditions, a well-functioning system of drainage collectors and canals is essential. The humus content in the upper arable layer of the soil averages 0.5–0.8%, while the available phosphorus content is 12.5–15.8 mg/kg, and exchangeable potassium levels range from 127 to 219 mg/kg. These irrigated meadow-turf soils are characterized by a moderate humus content, low to moderate available phosphorus levels, and low to sometimes moderate exchangeable potassium levels.

The irrigated meadow-turf soils of the district exhibit a varied mechanical composition, including heavy, medium, and light loamy as well as sandy loam soils. The physical clay fraction content ranges from 27.4% to 43.5%, while humus levels in the arable layer range from 0.61% to 0.88%. These soils have low to moderate nutrient availability, with available phosphorus content averaging 10.0–15.8 mg/kg and exchangeable potassium levels between 118 and 205 mg/kg. The irrigated soils of the district are primarily saline, slightly saline, and moderately saline.

Soil research data indicate that irrigated meadow, meadow, and swamp soils in the region are relatively complex in terms of relief and geomorphological-lithological structure. A distinctive feature of these soils is the variability of the humus layer, with the upper horizons undergoing different degrees of erosion due to irrigation and atmospheric precipitation. In some areas, the upper horizons have been completely eroded, exposing low-carbon, productive soil layers close to the Earth's surface. These soils are generally poor in available phosphorus and potassium, except for specific soil deposits.

The soil profile contains gley deposits and groundwater, which are found at varying depths throughout the district. On average, groundwater occurs at depths of 2.0–2.5 meters, while in the central areas, it is 1.5–2 meters. In meadow soil zones, groundwater is found at depths of 1.0–2.0 meters, and in some cases, as shallow as 0.5–1.0 meters, forming a group of low-mineralized waters. In certain areas, particularly along stream banks, gravelly soils of varying depth and distribution can also be found.

Conclusion: The irrigated lands of the district are located in the zone of gray soils and fall under the continental climate zone based on their natural conditions. This means that the summers are hot and dry, while the winters are cold, with the majority of atmospheric precipitation occurring during the winter and spring months. The district is characterized by automorphic and semi-hydromorphic soils. The irrigated soils primarily have a light mechanical composition, although light, medium, and heavy textures are also found in some areas. Their reclamation status is closely linked to the presence and mineralization of groundwater. Consequently, the soil cover of the district exhibits varying degrees of salinity, and groundwater depth varies along with its mineral composition.

Irrigated soils in the region are particularly susceptible to water erosion. Due to periodic irrigation throughout the year, fine soil particles are gradually broken down, affecting soil stability and structure.

Soil fertility in the district depends on the efficient and stratified application of mineral fertilizers.

Recommendations for Soil Fertility Preservation and Agricultural Productivity Improvement:

Spring Moisture Irrigation & Land Leveling: During drought-prone years, conducting spring moisture irrigation and periodic land leveling helps optimize irrigation water use.

Crop Rotation & Agroforestry: To enhance soil fertility, it is advisable to implement crop rotation and establish agroforestry plantations.

3.Efficient Fertilization Practices: The combination of organic and mineral fertilizers has proven to be highly effective. Applying organic fertilizers at a rate of 25–30 tons per hectare, without composting, alongside mineral fertilizers, significantly improves soil productivity.

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