

Article

# Reclamation Status of Soils in Konimex Natural-Geographical Region

Qilichova Nazokat Axmedovna<sup>1</sup>

Independent researcher at the Institute of Soil Science and Agrochemical Research

\*Correspondence: [email@gmail.com](mailto:email@gmail.com)

**Citation:** Axmedovna Q. N. Reclamation Status of Soils in Konimex Natural-Geographical Region. American Journal of Biology and Natural Sciences 2024, 3(3), 128-132.

Received: 1<sup>st</sup> Mar 2026

Revised: 6<sup>th</sup> Mar 2026

Accepted: 12<sup>th</sup> Mar 2026

Published: 14<sup>th</sup> Mar 2026



**Copyright:** © 2026 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

**Abstract:** This article analyzes the salinity levels, chemical properties, and dynamics of changes in automorphic, semi-hydromorphic, and hydromorphic soils in Konimeh district of Navoi region between 2015 and 2023. As a result of the research, the results showed that under the influence of irrigation and leaching, a desalination process occurred, and salts accumulated in the lower 100-200 cm layers. However, it is established that this process does not negatively affect the growth and development of agricultural crops.

**Keywords:** Konimekh district, Navoi region, irrigated soils, salinity level, dry residue, chloride-sulfate salinity, salt migration, land reclamation, groundwater.

## Introduction

The process of secondary salinization in irrigated lands is closely related to groundwater levels, the degree of mineralization, and irrigation regimes[1]. Under the conditions of the Konimex district, the redistribution of salt reserves within the soil and subsoil layers has entered a new cycle. This process is particularly evident in areas with a low degree of land subsidence[2].

Studies have shown that secondary salinization of irrigated lands is widespread, particularly in poorly drained areas, and its formation and intensity depend on several factors, including the initial natural salinity of soils and parent materials, the depth and degree of mineralization of groundwater, the composition of irrigation water, and irrigation regimes. In this process, groundwater plays a leading role in the hydromorphic soils of various regions of the country [3].

In their scientific works, B.R. Ramazonov and Sh.M. Bobomurodov discussed the current state of irrigated soils in the Republic of Karakalpakstan, the establishment of saxaul vegetation in the dried bed of the Aral Sea, the area of irrigated lands, their mechanical composition, salinity levels, the sharply changed conditions and processes of soil formation in coastal areas under the influence of the Aral Sea desiccation, the impact of global climate change on soil formation processes, and related issues[4].

Our study found that the soils of Konimex natural geographical region exhibit unique characteristics and patterns regarding the origin, migration, and accumulation of salts[5].

It should be especially noted here that as a result of land development and long-term irrigation, the groundwater level has risen, and a new cycle (phase) of redistribution of salt reserves that have been dormant in the deep layers of soil for thousands of years has begun[6].

For example, in certain areas, gray-brown, gray-brown meadow and meadow soils exhibit secondary salinization primarily in weakly drained, continuously irrigated fields with insufficient groundwater supply[7]. The intensity of this process is directly related, firstly, to the geomorphological and lithological structure of the region, hydrogeological conditions, soil profile characteristics, the quantity of salt reserves, and their vertical distribution; and secondly, to land-use practices and irrigation regimes in these areas[8].

**Research objects and methods.** The study focused on sandy desert, irrigated gray-brown, brown-meadow, and meadow soils from “Madaniyat” and H. Olimjon massifs in Konimeh district[9]. The salt content was determined using water absorption analyses, dry residue measurements, and chloride ion indicators[10].

**Research results and their discussion.** The dry matter content in sandy desert soils of the “Madaniyat” massif of the Konimex district is observed in the range of 0.115-0.440%, of which the chlorine ion content is 0.004-0.053%. Salinity chemistry is mainly chloride-sulfate, sometimes sulfate. Soil environment (pH) is weakly alkaline (7.15-7.97) (Table 1)[11].

(Table 1).

**Minimum and maximum values of dry matter, chloride ion content, and soil pH in the soils under study**

Soil name	Dry residue, %		Chlorine ion, %		pH	
	min	max	min	max	min	max
<b>In automorphic soils</b>						
Sandy desert	0,115	0,440	0,004	0,053	7,19	7,86
<b>In semi-hydromorphic soils</b>						
Irrigated gray-brown	0,110	1,150	0,010	0,098	7,01	7,99
Irrigated gray brown- meadow	0,130	1,075	0,005	0,076	7,00	7,98
<b>In hydromorphic soils</b>						
Irrigated meadow	0,125	1,090	0,009	0,076	7,03	7,91

In the irrigated gray-brown soils of the "Madaniyat" massif, in 2015, the content of easily soluble salts in the 0-1 meter layer was 0.260-0.480%, of which the content of chlorine ions was around 0.010-0.073%, and the salinity chemistry was mainly sulfate and chloride-sulfate[12]. However, in studies conducted in 2023, it was found that the content of dry residue in the 0-1 meter layer was 0.170-0.555%, of which the content of chlorine ions was in the range of 0.021-0.077%, and the salinity chemistry was mainly chloride-sulfate[13]. It is reasonable to explain this situation as being related to the easily soluble chlorine ion in the water. As evidence of this, it is appropriate to cite the fact that due to irrigation and salt leaching, 0.525-1.025% of the dry residue was accumulated in the lower 100-185 cm layers[14].

**In the irrigated gray-brown soils of H. Olimjon massif,** soil reclamation studies conducted in 2015 showed that the content of easily soluble salts in the 0–1 m layer ranged from 0.140 to 0.715%, with chloride ions comprising approximately 0.011–0.052%. In some soil sections of this massif (sections 11-H-15 and 12-H-15), chloride–sulfate and sulfate salinity types were observed. In studies carried out in 2023, the dry residue content in the 0–1 m layer ranged from 0.140 to 1.130%, with chloride ions between 0.011 and 0.074%, and chloride–sulfate salinity was found to be dominant. Therefore, it can be concluded that, due to irrigation and salt leaching, 0.185–1.150% of the dry residue accumulated in the lower 100–200 cm soil layers[15].

In general, it shows that in both massifs, due to human and economic conditions, easily soluble salts in water have been washed away and accumulated in a 1-2 meter layer of soil.

In 2015, studies on **irrigated gray brown-meadow soils in "Madaniyat"** massif showed that the content of easily soluble salts in the 0–1 m layer ranged from 0.260 to 0.435%, with chloride ions comprising approximately 0.010–0.028%, and the salinity type was predominantly sulfate. In 2023, these values ranged from 0.160 to 0.965%, with chloride ions between 0.011 and 0.032%, and the salinity type was mainly chloride–sulfate. As a result of irrigation and salt leaching, the dry residue content ranged from 0.790 to 0.925% and was concentrated in the lower 100–170 cm soil layers.

In the 2015 study of **the irrigated gray brown-meadow soils of H. Olimjon massif**, the content of easily soluble salts in the 0–1 m soil layer was found to be 0.160–0.330%. Of this amount, chlorine ions accounted for approximately 0.009–0.076%, and chloride-sulfate and sulfate types of salinity were recorded in this massif.

In the study conducted in 2023, the dry residue content in the 0–1 m soil layer ranged from 0.130 to 0.305% (only in section 3-H it ranged from about 0.150 to 0.605%). The content of chlorine ions was observed in the range of 0.014–0.052%, and the chloride-sulfate type of salinity was determined to be dominant.

Therefore, in this area, due to irrigation and salt leaching processes, 0.180–1.075% of dry residue accumulated in the lower 100–200 cm soil layers. Salt accumulation was particularly noted in the soil layer of section 3-H mentioned above. In our opinion, these conditions are directly related to the salt-leaching activities carried out in this area.

Turning to the soils of the **irrigated meadows** of the district, studies conducted in 2015 on the lands of H. Olimjon massif showed that the content of easily soluble salts in the 0–1 m soil layer ranged from 0.190 to 1.070%, of which the chlorine ion content was about 0.009–0.050%. Chloride–sulfate and sulfate types of salinity were recorded.

In 2023, the salt content ranged from 0.125 to 0.540%, of which the chlorine ion content varied between 0.011 and 0.076%, and mainly chloride–sulfate salinity was observed.

In turn, as a result of irrigation and salt leaching, the dry residue content was observed in the range of 0.145–1.090%, mainly concentrated in the lower 100–200 cm soil layers. This indicates that salt leaching is well organized in the lands of this massif.

The maximum chloride ion content in the studied soils was recorded in sandy soils (0.053%), in irrigated gray-brown soils (0.098%), and in brown-meadow and meadow soils (up to 0.076%) (Table 1).

In general, it was found that in the 0–1 m layer of irrigated gray-brown, brown-meadow, and meadow soils, a desalination process occurred over the short period from 2015 to 2023. In contrast, in the 1–2 m layer of all studied irrigated soil types, the distribution of easily water-soluble salts was observed in almost the same proportions throughout the soil profile. This indicates a continuous leaching process of salts to the lower layers of the soil and their subsequent accumulation.

This situation is, firstly, due to the varying levels of mineralized irrigation and leaching waters, and secondly, the quantitative indicators of easily soluble salts in water, which indicate a weak and moderate level of salinity in the Konimekh district, are explained by the fact that the soil of the brown-meadow and meadow soils, located close to the groundwater table, was inherited from the parent species.

The following patterns were identified during the research:

**Change in chemical composition:** In 2015, sulfate salinization predominated in many areas; however, by 2023, the chloride–sulfate type had become dominant.

**Salt migration:** As a result of irrigation and leaching practices, desalination was observed within the 0–100 cm soil layer. For example, in "Madaniyat" massif, the salt content decreased in the upper soil layer, whereas in the deeper 100–185 cm layer the dry residue accumulated up to 0.525–1.025%.

**Hydromorphic soils:** In meadow soils, the effectiveness of salt leaching was relatively high, and it was determined that a stable accumulation of salts is occurring within the 1–2 m soil layer.

**Chloride ion dynamics:** In 2015, the chloride ion content ranged on average between 0.010–0.050%, whereas in 2023 this indicator increased to as much as 0.098% in some plots. This indicates an increasing proportion of chlorides in the salt composition.

**Transformation of deeper layers into a “salt reservoir”:** In the irrigated lands of “*Madaniyat*” and *H. Olimjon* massifs, salts have accumulated below the 100 cm depth. In these lower layers, the dry residue reaches up to 1.150%, indicating that these horizons represent a **melioratively hazardous zone**.

### Conclusion, Proposals and Recommendations

According to their meliorative condition, the soils of Konimex district are considered relatively satisfactory. In recent years (2015–2023), under the influence of human and economic activities, the leaching of salts downward along the soil profile has intensified. Although this situation indicates the effectiveness of salt-leaching measures, the accumulation of salts in the lower layers may pose a risk of secondary salinization in the future if groundwater levels rise.

**Dynamic changes:** During the period 2015–2023, the migration of salts in the soils of Konimex district showed positive changes. In the upper 0–100 cm layer of irrigated gray-brown and meadow soils, the amount of salts decreased, leading to a desalinization process.

**Transformation of soil chemistry:** During the research period, the change in the soil salinity type from sulfate to chloride-sulfate can be explained by the solubility of salts in water and the composition of irrigation water. The maximum chloride ion content (0.098%) was recorded in irrigated gray-brown soils.

**Vertical migration of salts:** As a result of irrigation and salt-leaching measures, salts have percolated down the soil profile to the lower layers (100–200 cm). While this process cleans the upper fertile soil layer from salts, it indicates the continued accumulation of salts in the lower layers. However, this condition does not negatively affect the growth and development of agricultural crops.

**Meliorative recommendation:** In order to prevent the salts accumulated in the lower layers (100–200 cm) of heavy-textured soil horizons from rising again, it is recommended to improve the efficiency of collector-drainage systems and strictly control irrigation norms.

### REFERENCES

- [1] G. T. Parpiyev, *Bo‘z-Voha Soils*. Tashkent, Uzbekistan: Fan Publishing House, 2023, 250 p.
- [2] B. R. Ramazonov and Sh. M. Bobomurodov, “The current state of irrigated soils of the Republic of Karakalpakstan and the impact of the drying of the Aral Sea,” *Journal of Agriculture of Uzbekistan*, no. 5, pp. 51–54, 2020.
- [3] M. A. Pankov, *Soil Science: A Manual for Field and Laboratory Work*. Tashkent, Uzbekistan: O‘qituvchi Publishing House, 1970.
- [4] State Committee of the Republic of Uzbekistan for Land Resources, Geodesy, Cartography and State Cadastre, *Soil Maps and Land Resource Data of Uzbekistan*, Tashkent, Uzbekistan, 2020.
- [5] M. H. Glantz, *Sustainable Development of the Aral Sea Region*. Cambridge, U.K.: Cambridge University Press, 1999.
- [6] P. Micklin, *The Aral Sea Disaster*. Berlin, Germany: Springer, 2007.
- [7] P. Micklin, “The future Aral Sea: Hope and despair,” *Environmental Earth Sciences*, vol. 75, no. 9, 2016.
- [8] V. A. Dukhovny and J. de Schutter, *Water in Central Asia: Past, Present, Future*. London, U.K.: CRC Press, 2011.
- [9] Food and Agriculture Organization (FAO), *Irrigation in Central Asia in Figures*, FAO Water Reports No. 39, Rome, Italy, 2012.
- [10] N. C. Brady and R. R. Weil, *The Nature and Properties of Soils*, 15th ed. Boston, USA: Pearson, 2016.

- [11] A. Wild, *Soils, Land and Food: Managing the Land During the Twenty-First Century*. Cambridge, U.K.: Cambridge University Press, 2003.
- [12] N. Djanibekov and A. Hornidge, "Farm restructuring in Uzbekistan: Land use and agricultural development," *Central Asian Survey*, vol. 31, no. 2, pp. 213–227, 2012.
- [13] Z. W. Kundzewicz and P. Micklin, "Environmental impacts of the Aral Sea desiccation," *Regional Environmental Change*, vol. 15, pp. 1565–1577, 2015.
- [14] E. Lioubimtseva and G. Henebry, "Environmental change in arid Central Asia: Impacts of the Aral Sea crisis," *Environmental Management*, vol. 36, no. 4, pp. 585–599, 2005.
- [15] Food and Agriculture Organization (FAO), *Status of the World's Soil Resources*, Rome, Italy, 2015.