Scienta Press Journals

American AgriTech
JOURNAL OF AGRICULTURAL TECHNOLOGY INNOVATION AND SUSTAINABILITY

Amenities And Differential Diagnostics In Describing Changes In The Amount Of Water-Soluble Salts In The Termiz District

Allayarov Khamze Nazaralievich BFFD (PhD).
G'iyasov Malik Maqsud oglu Researcher
Orinbayev Elmurod Kadir oglu Intern-researcher
Jo'raboyev Bahromjon Ne'matilla oglu Intern-researcher
Institute Of Soil Science And Agrochemical Research

Abstract

This article identifies that the soil salinity of the Termez district today is a type of salinity that occurs as a result of abrupt changes in the environment due to human activity and the deterioration of the ecological situation, depending on the distribution of salts in the genetic layers of the soil, the soil-forming parent species of the geomorphological regions, and the soil types and subtypes.

The harm caused by soil salinity to the national economy is extremely great. Scientific studies and field experiments have proven that cotton yields in weakly saline lands are reduced by 25–30% compared to fertile, non-saline lands, by 40–50% in moderately saline soils, by 60–80% in soils with strong sulfate-chloride and chloride salinity, and in extremely saline and saline soils, plant seedlings die completely after the first irrigation. The main reason for this is the “toxic” (poisonous) effect of toxic salts accumulated in the soil on plants.

In this zone, natural and anthropogenic factors have had a strong impact on the geochemical situation and soil formation processes, resulting in a negative water-salt balance and a deterioration in the ecological condition of irrigated soils.

Keywords: *Difference index, Irrigated grassland soils, Irrigated desert grassland soils, Irrigated grassland soils, non-saline, slightly saline, moderately saline, strongly saline and very strongly saline salinity,chloride salts, qualitative composition of salts.*

ISSN: 3071-1657 Volume 01, Issue 07 August 2026

LoginToday, due to intensive land use in agriculture, the area of land subject to degradation is increasing worldwide. According to the Global Soil Map created by the FAO, more than 833 million hectares of soil around the world are already saline to varying degrees. It is estimated that more than 73 percent of arable land is saline, which poses a serious threat to food security worldwide. The regions most affected by soil salinization are Central Asia, the Middle East, South America, and North Africa. Therefore, increasing the efficiency of using saline lands, protecting the soil structure from degradation processes, and implementing scientifically based measures to prevent them are considered urgent problems.

In the worldExtensive scientific research is being conducted to determine the current state of saline soils, the processes of salinization occurring on the surface and the factors causing it, to prevent and protect them from salinization, and to increase the efficiency of their use. Special attention is also paid to carrying out scientific research to determine the impact of salinization processes on soil properties, to analyze the interaction of soil microbiological activity with internal and external environmental factors, and to develop biodiagnostic methods for objectively and reliably assessing the level of resistance of soil systems to various negative factors [14].

Studies on the reclamation status of the soils of the Surkhan-Sherabad valley have been covered in many scientific studies,SurkhandaryaAs a result of research conducted in the region in 2025, salinization processes leading to the deterioration of soil reclamation and a decrease in soil fertility have been identified.andThe province has an area of 105,680.8 hectares, which is 62.4% of the irrigated land of the province [5; 6; 7; 4].

According to the results of the chemical analysis conducted, in the Termez district irrigated grassland, steppe grassland, grassland soils widespread in the region. The movement of salts in the soil along the soil profile, their accumulation in layers, and the type and degree of salinity are subject to specific laws in accordance with the soil and climatic conditions of the region.[4].

The soils of the studied area have automorphic, hydromorphic, and semi-hydromorphic soil types according to the characteristics of salinity and salt accumulation in desert conditions.Ecosystems are clearly different from each other, with distinct boundaries or characteristics.stands out clearly.

The above soilsThe degree and type of salinity are related to the accumulation of salts, the solubility of salts, the depth of groundwater, and the degree of mineralization. The salinity of soils varies widely along the soil profile [1; 2; 6; 8; 4].

Termez districtthese soilsDuring the dry and hot summers typical for the region, due to the movement of groundwater from the bottom up and evaporation, the dissolved salts in it accumulate in the upper layers of the soil, and during seasons with high precipitation and humidity, the salts accumulated above are again added to the groundwater in the form of a solution. The repetition of such seasonal evaporation processes over many years causes an increase in the mineralization level of groundwater. [1; 2; 8; 4; 6].

Main part The difference in salinity of soil types and soil layers depends on the total amount of salts they contain, which is determined by the different accumulation of salts in layers with different mechanical composition, and also by the location of salt layers.Irrigated grassland, steppe grassland and meadowIn a comprehensive study of the current state of soils, it is extremely important to consider, in addition to their general properties, the causes of salinization, the conditions of formation, the limits of salt change along the soil profile, the degree and type of salinization, and the degree of toxicity to plants [2; 4].

Salts involved in soil salinization include bicarbonates ($NaHCO_3$, $Mg(HCO_3)_2$, $Ca(HCO_3)_2$), carbonates (Na_2CO_3, $MgCO_3$, $CaCO_3$), sulfates (Na_2SO_4, $MgSO_4$, $CaSO_4$), and chlorides ($NaCl$, $MgCl_2$, $CaCl_2$). [2; 4].The data from the water absorption analysis show that salts are present in varying amounts in non-saline soils, depending on the location of saline horizons in the soil profile (cross-section), layer thickness, and salt content.

The amount of salts in all layers of the soil, including non-saline, weakly saline, moderately saline, highly saline, and very highly saline, was determined in various indicators.

According to the results of water absorption analysis conducted on irrigated meadow soils in the "Gulbohar" massif of Termez district, the dry residue content is 1.305% in soils at a depth of 0-30 cm along the soil profile.

The amount of cations (positive ions) was found to be 0.069% in soils at a depth of 30–70 cm, and the amount of anions (negative ions) was found to be 0.847% in the same layer, and these indicators indicate that the amount of dry residue in the lower layers0.785%. The amount of cations (positive ions) in soils at a depth of 150–200 cm0.134%, and the amount of anions (negative ions) in this layer0.095%, with an average salinity along the soil profile (Table 1).

According to the results of water absorption analysis in 90 sections of the "Gulbohar" massif in the Termez district, the amount of dry residue in soils at a depth of 0-30 cm is0.460%, and is chloride-sulfate in salinity.

The amount of dry matter in the lower (70-100 cm) layers of the soil1,798%, and is sulfated according to the salinity type. The amount of cations (positive ions) in soils at a depth of 150–200 cm0.028%, and the amount of anions (negative ions) in this layer0.064%, with low and moderate salinity along the soil profile (Table 1).

Termez district "Namuna" massif is located on irrigated desert sandy soilsAccording to the results of the aqueous absorption analysis, the amount of dry residue

ISSN: 3071-1657 Volume 01, Issue 07 August 2026

Table 1

Termez district "Gulbahar"The area is irrigated"meadowDescription of soil salinity

No.	Depth, cm	Dry residue, %	NSO -3	Cl-	SO^-_4	Ca^+	Mg^+	No^+	Salinity type	Salinity level
70	0-30	1,305	0.037	0.081	0.728	0.11	0.06	0.175	S	Moderately salty
	30-70	1,500	0.037	0.095	0.847	0.125	0.069	0.207	S	Moderately salty
	70-100	1,210	0.043	0.07	0.66	0.09	0.048	0.183	S	Moderately salty
	100-150	0.895	0.043	0.095	0.45	0.08	0.039	0.128	X-S	Moderately salty
	150-200	0.785	0.046	0.095	0.366	0.06	0.027	0.134	X- S	Moderately salty
90	0-30	0.460	0.061	0.039	0.245	0.035	0.015	0.097	X- S	Moderately salty
	30-70	0.367	0.061	0.025	0.197	0.035	0.015	0.065	S	Low salt
	70-100	1,798	0.046	0.032	1.17	0.045	0.021	0.507	S	Moderately salty
	100-150	0.582	0.052	0.049	0.321	0.035	0.015	0.136	X- S	Moderately salty
	150-200	0.344	0.064	0.035	0.175	0.05	0.024	0.028	X- S	Moderately salty
Termez district “Namuna” massif irrigateddesert-sandy Description of soil salinity										
100	0-30	1.11	0.037	0.455	0.183	0.075	0.048	0.22	X	Very strongly salted
	30-70	0.35	0.031	0.084	0.125	0.06	0.03	0	X- S	Moderately salty
	70-100	0.425	0.034	0.077	0.175	0.07	0.024	0.021	X- S	Moderately salty
	100-150	0.61	0.027	0.074	0.294	0.075	0.021	0.073	X- S	Moderately salty
	150-200	0.695	0.024	0.081	0.331	0.085	0.009	0.105	X- S	Moderately salty
Termez district “Limonzor” massif irrigatedmeadow-barren Description of soil salinity										
10	0-30	1.94	0.027	0.161	0.98	0.235	0.087	0.149	X- S	Strongly salted
	30-70	0.899	0.055	0.06	0.63	0.085	0.042	0.184	S	Low salt
	70-100	0.911	0.031	0.063	0.455	0.09	0.039	0.093	S	Low salt
	100-150	0.87	0.031	0.063	0.44	0.085	0.045	0.08	S	Low salt
	150-200	0.923	0.031	0.063	0.55	0.085	0.045	0.133	S	Low salt

	150-200	0.923	0.031	0.063	0.55	0.085	0.045	0.133	S	Low salt
Description of salinity of irrigated soils of the “Chegara” massif in Termez district										
10	0-30	1.19	0.031	0.084	0.615	0.14	0.017	0.401	S	Moderately salty
	30-70	0.745	0.027	0.032	0.377	0.075	0.039	0.601	S	Low salt
	70-100	0.785	0.027	0.035	0.395	0.1	0.039	0.629	S	Low salt
	100-150	0.525	0.031	0.032	0.267	0.05	0.018	0.467	S	Low salt
	150-200	0.34	0.024	0.021	0.173	0.03	0.012	0.308	S	Low salt

in soils at a depth of 0-30 cm1.11%, and is very highly saline, with chloride as the salinity type. The amount of cations (positive ions) in soils at a depth of 70–100 cm0.021%, and the amount of anions (negative ions) in this layer0.175%, and was found to be moderately saline, with chloride-sulfate salinity. Cations (positive ions)
amount in soils at a depth of 150–200 cm0.105%, and the amount of anions (negative ions) in this layer0.331We can see it increasing to %.

"Limomzor" massif, Termez districtThe irrigated meadow is bare.in soilsAccording to the results of the water absorption analysis, the dry residue content in the 0-30 cm of soils1,940%, and is chloride-sulfate by salinity type, and highly saline by salinity level. The amount of cations (positive ions) in soils at a depth of 30–70 cm0.093%, and the amount of anions (negative ions) in this layer was found to be 0.055%. This indicator is due to the fact that in our low-saline layers, the amount of dry residue is in the 100-150 cm layers0.870% decreased and increased downward. The amount of cations (positive ions)0.080%, and the amount of anions (negative ions) fluctuates around 0.031% in this layer, making it moderately saline along the soil profile. We can see that the soils at a depth of 150–200 cm are less saline, with anions (negative ions) around 0.133% in this layer.

"Chegara" massif, Termez districtirrigated meadow-barrenin soilsAccording to the results of the water absorption analysis, the dry residue content in the 0-30 cm of soils1,190%, and is sulfated by salinity type and moderately saline by salinity level. The amount of cations (positive ions) in soils at a depth of 70 - 100 cm0.629%, and the amount of anions (negative ions) in this layer0.035It was found that the soil was slightly saline, fluctuating around 150–200 cm deep.0.308%, and the amount of anions (negative ions) in this layer0.173We can see that the salinity is around 100% (Table 1).

Qualitative composition of salts in irrigated soils of Termez district

Termez district Termez district in the "Gulbohar" massifIrrigated soils are saline to varying degrees, depending on the degree of salinity,in the districtFrom non-saline (washed out of salts) and weakly saline soils to strongly saline soils, the processes of salt accumulation and re-salination in soils, their direction and intensity depend on the complex geomorphological and lithological structure of the area,hydrogeological,formed depending on soil-climatic, anthropogenic, agricultural conditions, especially the degree of natural and artificial drainage of irrigated lands, the state of hydromelioration systems and groundwater, as well as the quality of irrigation water [2; 4;1 4].

Qualitative composition of salts in irrigated soilsAccording to the data, the amount and composition of salts in the soil profile varies with depth. In the upper layer (0–30 cm), the total salt content is 1.19, of which 1.055% is toxic salts, in the 70–100 cm layer the total salt content increases to 0.047,

ISSN: 3071-1657 Volume 01, Issue 07 August 2026

and the share of toxic salts reaches 0.346%, and in the 150–200 cm layer the share of salts in the total of toxic salts is determined at the lowest value of 107%. In the lower layers (100–200 cm), the total salt content decreases, but the share of toxic salts remains at a relatively high level of 66–71% (Table 2).

Termez district "Namuna" massifon irrigated desert sandy soilsqualitative composition of salts in the compositionAccording to the data, the amount and composition of salts in 100 soil sections differed significantly by depth. In the 0–30 cm layer, the total amount of salts was 1.018, of which 0.755 corresponded to toxic salts. In the 30–70 cm layer, the salts decreased sharply to 0.33, but in the subsequent layers (70–200 cm) they gradually increased again, increasing to 0.635 at 150–200 cm. The proportion of toxic salts in these layers was also high, 0.156–0.342, and it was found that they accumulate especially in the lower layers.

Termez district "Limonzor" massifirrigatedThe amount of salts in the soil and the percentage of toxic salts varied depending on the depth, with 0–30 cm

Table 2

Qualitative composition of salts in irrigated soils of Termez district

No.	Depth, cm	$Ca(HCO_3)_2$	$CaSO_4$	Na_2SO_4	$NaCl$	$MgSO_4$	$MgCl_2$	Total salts %			% of total toxic salts
								General	Poisonous	Non-toxic	
Gulbahararray											
70	0-30	0.049	0.333	0.541	-	0.16	0.109	1,191	0.81	0.382	67.96
	30-70	0.049	0.383	0.639	-	0.18	0.128	1.38	0.947	0.433	68.65
	70-100	0.057	0.258	0.567	-	0.119	0.094	1,094	0.779	0.315	71.22
	100-150	0.057	0.224	0.394	-	0.032	0.128	0.835	0.554	0.281	66.33
	150-200	0.061	0.153	0.382	0.027	-	0.106	0.728	0.515	0.214	70.66
90	0-30	0.081	0.051	-	0.3	-	0.008	0.052	0.492	0.36	0.132
	30-70	0.081	0.051	-	0.201	-	0.032	0.034	0.398	0.266	0.132
	70-100	0.061	0.102	-	1,565	-	0.05	0.043	1,821	1,658	0.163
	100-150	0.069	0.061	-	0.411	0.009	-	0.059	0.608	0.478	0.13
	150-200	0.085	0.098	-	0.086	-	0.059	0.047	0.376	0.192	0.183
Sample array											
100	0-30	0.049	0.214	-	0.048	0.519	-	0.188	1,018	0.755	0.263
	30-70	0.041	0.169	-	0.001	-	0.006	0.113	0.33	0.12	0.21
	70-100	0.045	0.2	-	0.05	0.012	-	0.094	0.401	0.156	0.245

ISSN: 3071-1657 Volume 01, Issue 07 August 2026

	100-150	0.036	0.225	-	0.2	0.021	-	0.082	0.564	0.304	0.261
	150-200	0.032	0.262	-	0.216	0.09	-	0.035	0.635	0.342	0.294
Lemon Grove											
10	0-30	0.036	0.768	-	0.461	-	0.158	0.216	1,639	0.835	0.804
	30-70	0.073	0.227	-	0.569	-	0.106	0.081	1,056	0.756	0.301
	70-100	0.041	0.271	-	0.288	-	0.086	0.085	0.771	0.459	0.312
	100-150	0.041	0.254	-	0.249	-	0.116	0.085	0.744	0.449	0.295
	150-200	0.041	0.254	-	0.411	-	0.116	0.085	0.907	0.612	0.295
Border array											
10	0-30	0.041	0.441	-	0.449	0.057	-	0.067	1,055	0.572	0.482
	30-70	0.036	0.225	-	0.159	-	0.139	0.043	0.602	0.341	0.261
	70-100	0.036	0.31	-	0.103	-	0.134	0.047	0.629	0.284	0.346
	100-150	0.041	0.135	-	0.213	-	0.035	0.043	0.467	0.29	0.176
	150-200	0.032	0.075	-	0.149	-	0.024	0.028	0.308	0.201	0.107

in the layerThe total salt content was found to be 0.907, and the proportion of toxic salts was found to be 0.612.(Table 2).

The salt content and the proportion of toxic salts in the irrigated soils of the “Uchqizil” massif of the Termez district differed by depth, with the total salt content in the 0–30 cm layer being 0.117, of which 0.06 corresponded to toxic salts; the total salt content in the 30–70 cm layer was 0.133, and toxic salts reached 0.074; the total salt content in the 70–100 cm layer was 0.125, and toxic salts 0.072; the total salt content in the 100–150 cm layer was 0.147%, and toxic salts 0.071%; and the total salt content in the 150–200 cm layer was 0.126%, of which the total salt content was 0.133, and toxic salts 0.074.It is 0.067%, and we can see that the amount of salts in the lower layer is slightly reduced and the negative consequences for plants are minimal.(Table 2).

Conclusion

As a result of the conducted research, it was found that salinization processes are widespread in irrigated soils in the Termez district and their formation is inextricably linked to natural and anthropogenic factors. The soils of the region mainly belong to the grassland-barren, steppe and meadow types, and the degree and type of salinity in them are observed to be distributed differently along the soil profile.

Studies have shown that the accumulation and redistribution of salts in soils is directly related to the depth of groundwater, the degree of mineralization, climatic conditions and the irrigation system. It was found that, especially during dry summer periods, salts rise to the upper layers due to evaporation, worsening the agrochemical condition of the soil.

Based on water absorption analyses, it was proven that chloride and sulfate salts predominate in the soils, and their high concentrations have a toxic effect on plants and sharply reduce productivity. It was also noted that the level of salinity in different massifs varies from weak to very strong, and in some cases, very strong salinity is observed in the upper layers.

REFERENCES USED

1. Kadirova D. A., Allayarov X. N., Turdaliev J. M., Rasulov X. N., The composition and changes of water-soluble salts in the termiz district \\ wcd of scientist: international scientificresearch jornnal issn : 27 76 - 0929, wolume 6, Issue 1, jonuary – 2025

2. Turdaliyev J.M., Allayarov X. N., va boshqalar Tuproq sho‘rlanishi, sho‘rlangan tuproqlar va tuzlarning o‘simliklarga ko‘rsatadigan ta’siri // “O‘zbekiston zamini” jurnali. – Toshkent, 2020. – № 2/2020. – B. 40-45

3. Qodirova D.A Allayarov X. N., Termiz tumani tuproqlarning geografik o‘rni va gidrometyeorologik holati // “O‘zbekiston agrar fani xabarnomasi” jurnali. – Toshkent, 2023. – № 4 (10). – B. 18-20 03.00.00; № 8

4. Kodirova D.A Allayarov X.N.va boshqalar Differential indicators of salinity diagnostic expression in describing changes in the amount of soluble salts in water in the termiz district// volume 4, issue 3, march - 2026 issn (e): 2938-3781

5. Abdullayev A.X. O‘zbektstonda sug‘oriladigan yerlarning melorativ holati va ularning yaxshilash // Monografiya, Toshkent, 2018. - B.130-135

6. Axmedov A.U., Abdullayev S.A., Parpiyev G‘.T. Sirdaryo va Jizzax viloyatlarining sug‘oriladigan tuproqlari // Monografiya. – Toshkent: O‘zRFA «Fan» nashr., 2005. B. 122-157.

7. Axmedov A.U., Abdullayev S.A., Sabitova N.I., Parpiyev G.T. Проблемы засоления, мелиорации и плодородия почв. // Актуальные проблемы почвоведения (к 50 летию освоения целинных и залежных земель). Алматы, 2004-yil

8. Qurvantayev R., Hakimova N.X., Vafoyev B.B., Boltayev M.I Zarafshon vohasi sug‘oriladigan tuproqlarining kimyoviy xossalari // Turli tuproq-iqlim sharoitida qishloq xo‘jalik mahsulotlarini yetishtirish va o‘simliklarni himoya qilishda innovatsion yondashuvlar Buxoro 2023. B. 5-11.

9. Horneck D.A., Ellsworth J.W., Hopkins B.G., Sullivan D.M. and Stevens R.G. Managing Salt-affected soils for crop production. USA. Oregon State University. 2007. – Б. 4-20.

10. Yadav, Sangeeta, Mohd Irfan, Aqil Ahmad, and Shamsul Hayat. “Causes of Salinity and Plant Manifestations to Salt Stress: A Review.” Journal of Environmental Biology, vol. 32, no. 5, 2011, pp. 667.

11. Podmore, C. Irrigation Salinity – Causes and Impacts. Natural Resource Advisory Services, 2009.

11 Abrol, I. P. “Salt-Affected Soils: Problems and Prospects in Developing Countries.” Global Aspects of Food Production, edited by M. S. Swaminathan and S. K. Sinha, Tycooly International, 1986, pp. 283–305.

13 Ehlig, C. F. “Growth and Evapotranspiration of Cotton as Affected by Salinity and Moisture Stress.” Agronomy Journal, vol. 61, no. 5, 1969, pp. 716–719.

14. Allayarov X. N., Biologiya fanlari bo‘yicha falsafa doktori (PhD) // Avtoreferat 2025 y 48-54 b