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Causes of Salinization Development in Irrigated Lands and Meliorative Measures

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Abstract. In this article, the irrigated meadow-gray soils of the studied area with varying degrees of salinity are classified into groups according to their level of salinity. The types and degrees of soil salinization, as well as the causes and development of salinization, are examined. Measures aimed at improving and restoring the fertility status of soils that are difficult to reclaim are studied on the basis of scientifically grounded data, and relevant recommendations are provided.
Keywords: Irrigated meadow-gray soil, salinization, melioration, groundwater, drainage systems, drip irrigation

Introduction: At present, the meliorative and ecological condition of the lands used in agriculture does not meet the required standards, resulting in relatively low productivity. Year by year, an increase in salinization, erosion, and deflation processes is being observed in irrigated lands. There are both objective and subjective reasons for this. However, it would be incorrect to generalize this situation everywhere. In farms, agricultural enterprises, and cooperative хозяйства that operate based on scientifically grounded recommendations and thousands of years of farming experience, soil fertility is not decreasing but, on the contrary, increasing. Therefore, it is necessary to properly and effectively organize land management in agricultural production. In this process, detailed soil maps, cartograms based on the chemical, physical, and agronomic properties of soils, as well as scientific documentation serve as the foundation. Based on these materials, decisions are made regarding crop ratios, crop selection and placement, crop rotation systems, measures against erosion and deflation, melioration and agrotechnical methods, as well as fertilizer rates and composition, all aimed at increasing yield potential. All these measures should be directed toward improving soil fertility and ensuring that agricultural production is based on environmentally friendly, waste-free technologies that do not pollute the environment [1].

Research Object, Methods, and Materials. The object of the study was irrigated sieroz-meadow soils of Sardoba district in the Syrdarya region. The research was carried out in 2023–2024 based on data, maps, and statistical tables provided by the Meliorative Expedition of the Syrdarya region. The identification and monitoring of saline areas were conducted in several farms located within Sardoba district. The salinity levels of irrigated sieroz-meadow soils were analyzed according to the following categories: non-saline, slightly saline, moderately saline, and highly saline.

Research Results: As of October 1, 2023, observations were conducted on a total area of 6,185 hectares in the Pakhtaobod Irrigation System Unit (ISU) of Sardoba district. Non-saline land accounted for 7 hectares (0.1%), slightly saline land for 3,863 hectares (62.5%), moderately saline land for 1,959 hectares (31.67%), and highly saline land for 356 hectares (5.76%). As of October 1, 2024, in the Pakhtaobod ISU of Sardoba district, non-saline land decreased to 0 hectares (0%), slightly saline land accounted for 3,745 hectares (60.5%), moderately saline land for 1,977 hectares (31.96%), and highly saline land for 463 hectares (7.5%). In the farms of Sardoba district, as of

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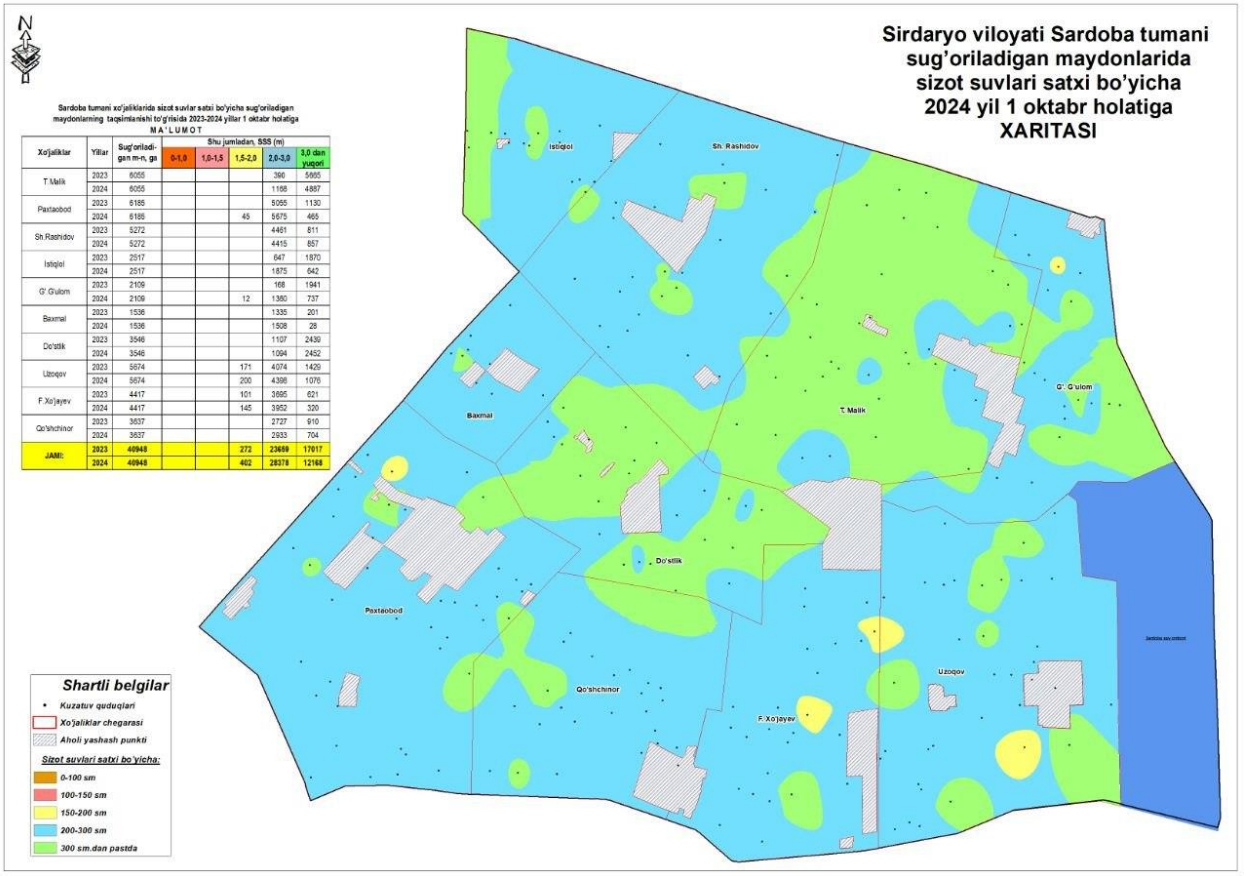
October 1, 2023–2024, non-saline land in Istiqlol, G. Ghulom, Dustlik, Uzoqov, and F. Khodjayev farms remained at 0 hectares (0%). In T. Malik, non-saline land decreased from 30 hectares (0.5%) to 0 hectares, and in Pakhtaobod from 7 hectares (0.1%) to 0 hectares. Despite the implementation of meliorative measures against salinity, the area of non-saline land did not increase. In Sh. Rashidov farm, non-saline land increased from 0 to 123 hectares (2.3%), while in Bakhmal it increased from 112 hectares (7.3%) to 132 hectares (8.6%). In contrast, in Kushchinor, non-saline land decreased from 72 hectares (1.9%) to 75 hectares (2.1%) due to insufficient implementation of meliorative measures.



Sardoba tumani xo'jaliklarida sizot suvlar satxi bo'yicha sug'oriladigan maydonlarning taqsimlanishi to'g'risida 2023-2024 yillar 1 oktabr holatiga

MA'LUMOT

Xo'jaliklar	Yillar	Sug'oriladi-gan m-n, ga	Shu jumladan, SSS (m)				
			0-1,0	1,0-1,5	1,5-2,0	2,0-3,0	3,0 dan yuqori
T.Malik	2023	6055				390	5665
	2024	6055				1168	4887
Paxtaobod	2023	6185				5055	1130
	2024	6185			45	5675	465
Sh.Rashidov	2023	5272				4461	811
	2024	5272				4415	857
Istiqlol	2023	2517				647	1870
	2024	2517				1875	642
G'.G'ulom	2023	2109				168	1941
	2024	2109			12	1360	737
Baxmal	2023	1536				1335	201
	2024	1536				1508	28
Do'stlik	2023	3546				1107	2439
	2024	3546				1094	2452
Uzoqov	2023	5674			171	4074	1429
	2024	5674			200	4398	1076
F.Xo'jayev	2023	4417			101	3895	621
	2024	4417			145	3952	320
Qo'shchinor	2023	3637				2727	910
	2024	3637				2933	704
JAMI:	2023	40948			272	23659	17017
	2024	40948			402	28378	12168

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Report

Distribution of irrigated land areas by soil salinity levels in Sardoba district (as of October 1, 2023-2024)

Farms	Years	Irrigated area, ha	Including soil salinity categories, ha			
			Non-saline	Slightly saline	Moderately saline	Highly saline
T.Malik	2023	6055 100%	30 0,5%	5901 97,5%	124 2%	0%
	2024	6055 100%	0%	5707 94%	348 5,7%	0%
Paxtaobod	2023	6185 100%	7 0,1%	3863 62,5%	1959 31,67%	356 5,7%
	2024	6185 100%	0%	3745 60,5%	1977 31,96%	463 7,5%
Sh.Rashidov	2023	5272 100%	0%	4807 91,2%	465 8,8%	0%
	2024	5272 100%	123 2,3%	4558 86,5%	579 10,9%	12 0,23%
Istiqlol	2023	2517 100%	0%	1327 52,7%	1144 45,5%	46 1,83%
	2024	2517 100%	0%	1114 44,3%	1363 54,2%	40 1,6%
G'.G'ulom	2023	2109 100%	0%	1293 61,3%	816 38,7%	0%
	2024	2109 100%	0%	1177 55,8%	932 44,2%	0%
Baxmal	2023	1536 100%	112 7,3%	1027 66,9%	393 25,6%	4 0,3%
	2024	1536 100%	132 8,6%	971 63,2%	433 28,2%	0%
Do'stlik	2023	3546 100%	0%	570 16,1%	2592 73,1%	384 10,83%
	2024	3546 100%	0%	679 19,15%	2620 73,9%	247 6,97%
Uzoqov	2023	5674 100%	0%	1145 20,2%	4310 75,96%	219 3,9%
	2024	5674 100%	0%	630 11,1%	4741 83,6%	303 5,3%
F.Xo'jayev	2023	4417 100%	0%	1538 34,82%	2855 64,6%	24 0,5%
	2024	4417 100%	0%	1357 30,7%	3041 68,85%	19 0,43%

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Qo'shchinor	2023	3637 100%	72 1,98%	2195 60,4%	1332 36,6%	38 1%
	2024	3637 100%	75 2,1%	2403 66,1%	1143 31,4%	16 0,44
Total:	**2023**	**40948 100%**	**221 0,54%**	**23666 57,8%**	**15990 39%**	**1071 2,6%**
	2024	**40948 100%**	**330 0,81%**	**22341 54,6%**	**17177 41,9%**	**1100 2,7%**

It is well known that the development of salinization in irrigated lands occurs mainly due to the following factors. First, the mineralization of irrigation water: the use of water with a high salt content intensifies soil salinization; specifically, the salt concentration in 1 liter of irrigation water should not exceed 3 grams. Second, the high level of groundwater: if groundwater is located at a depth of 2–3 meters or higher, evaporation increases and salts rise to the soil surface. Third, insufficient drainage systems: the accumulation of excess water leads to soil saturation and brings salts to the upper layers. Fourth, improper irrigation practices: excessive water use and uneven irrigation disturb the soil water–salt balance. Fifth, climatic factors also play a role in soil salinization. Under the conditions of Uzbekistan, the hot and dry summer climate causes rapid evaporation of soil moisture, which accelerates the salinization process.

General Analysis: As of October 1, 2023–2024, the total area of Sardoba district amounted to 40,948 hectares. Based on the total area, non-saline lands accounted for 221 hectares (0.54%) in 2023 and 330 hectares (0.81%) in 2024, indicating an increase of 0.17%. Slightly saline lands covered 23,666 hectares (57.8%) in 2023 and 22,341 hectares (54.6%) in 2024, showing a decrease of 3.2%. Moderately saline lands increased from 15,990 hectares (39%) in 2023 to 17,177 hectares (41.9%) in 2024, reflecting a rise of 2.9%. Highly saline lands accounted for 1,071 hectares (2.6%) in 2023 and 1,100 hectares (2.7%) in 2024, increasing by 0.1%. These results indicate that meliorative measures have improved in some farms; however, at the district level, the risk of salinization remains significant. It is necessary to regularly clean and modernize drainage systems in each farm. Leaching of salts should be systematically carried out during autumn and spring. Irrigation norms should be optimized, and water-saving technologies such as drip irrigation should be implemented. It is also important to cultivate salt-tolerant crops and introduce crop rotation systems. Soil chemical balance can be restored through gypsum application and the use of organic fertilizers. Groundwater levels should be maintained at a depth of 2.5–3.0 meters by keeping collector-drainage networks in active condition. The consequences of salinization include: deterioration of soil water-physical properties; reduced ability of plants to absorb water and nutrients; a decrease in crop yields by an average of 20–50%; and disruption of the natural stability of ecosystems [3]. The following meliorative measures are effective in preventing and reducing salinization: improvement of irrigation systems, including the use of drip and sprinkler irrigation technologies, which reduce water consumption and prevent excess moisture accumulation in the soil; enhancement of drainage systems, where open and closed drainage lowers groundwater levels and slows salinization; leaching practices that remove excess salts from the soil to lower layers and restore salt balance; and the application of agrotechnical

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measures such as the use of organic fertilizers, deep plowing, and crop rotation, which improve soil structure.

Conclusion: The problem of soil salinization in irrigated lands is one of the most pressing agroecological issues in Uzbekistan. The main causes of salinization include improper irrigation practices, insufficient drainage systems, high groundwater levels, and climatic conditions. To address this issue, it is necessary to apply meliorative measures in a scientifically grounded and integrated manner. In particular, improving drainage systems, using water-saving irrigation technologies, and combining agrotechnical and biological methods are among the most effective approaches to combating salinization. Currently, agromeliorative and other measures against salinization are being implemented in Sardoba district and its farms. In areas where melioration activities have been carried out, regular monitoring is conducted. Drip irrigation technologies are being widely adopted, which helps reduce water consumption and prevents excessive moisture accumulation in the soil. Drainage systems are also being improved; through the use of open and closed drainage, groundwater levels are being lowered, thereby slowing the salinization process.

References:

1.S.A. Abdullayev, X.Q. Namozov. Soil Melioration and Hydrology. Tashkent, 2018.

2.Qodirov, A. Fundamentals of Soil Science and Melioration. Tashkent: Fan Publishing House, 2019.

3.Karimov, I., & Norqobilov, S. The influence of groundwater on salinization in irrigated lands. Journal of Agriculture of Uzbekistan, 2020, No. 3, pp. 45–49. 4.FAO. Global Soil Salinity Map and Analysis. Food and Agriculture Organization of the United Nations, 2021.

5.Rahmonov, B. The effectiveness of drainage systems in combating salinization processes. Proceedings of Agrochemistry and Soil Science Research, 2018, No. 7, pp. 123–129.

6.Ismoilova, D., & Xudoyberdiyev, M. Biological melioration methods in saline soils. Journal of Ecology and Environmental Protection, 2022, No. 2, pp. 67–72.