Volume 4, Issue 3, March - 2026
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

THE ROLE OF CLIMATE FACTORS IN THE FORMATION OF IRRIGATED SOILS

Khurramov Sadulla Allanazarovich
Assistant, Department of Agrochemistry and Soil Science
Tashkent State Agrarian University,

Allayarov Khamza Nazaralievich
Soil Science and Agrochemical Research
Institute, b.f.f.d., PhD Junior Researcher

.

Abstract
This article presents the role of climatic factors in the formation of the fertility of irrigated meadow-alluvial soils in Bukhara region, as well as their levels and the dynamics of these factors over time. Accordingly, information is provided on how climate variability affects soil salinity levels and seasonal factors.

Keywords: Climate, irrigated meadow-alluvial, hot air, geographic location, oasis, agriculture.

Introduction

Today, climate change due to global warming is having a major impact on agriculture in countries around the world. In terms of yield reduction, climate change (hot weather, drought, water shortages) is drastically reducing yields in almost all countries.

That is, we can clearly see the demand of water-demanding plants and crops in hot climates.(cotton, wheat, corn, rice) yields will decrease significantly.

As food security threats increase, the risk of food prices and shortages is increasing, with resource-poor countries and rural areas being hit hardest. Adaptable measures (such as improving irrigation systems, cultivating heat-tolerant crops in agriculture, and agroecology, land restoration, and crop diversification) are needed to reduce risk.

Climate change and resource shifts in soils highlight the importance of agrotechnology in agriculture. These topics are covered in detail in the Intergovernmental Panel on Climate Change (IPCC) Special Report 2021–2030 (2023), an event held in Switzerland from 13–19 March.

Certini, G., and Scalenghe, R. state that their research has shown that when analyzing the interaction between climate and soil, climate is a major factor influencing soil formation and soil, in turn, has a major impact on climate regulation. In this, the increase in soil organic matter, water retention capacity and other properties are noted as the main factors affecting the increase or decrease in climate change.

It also emphasizes the importance of considering climate change when developing soil management strategies.

In addition, water shortages are increasing in arid regions of Uzbekistan as a result of annual warming. More specifically, the drying up of the Aral Sea and the emergence of a sand-salt-dust desert on an area of 5 million hectares within a generation are causing increasing economic, social,

Volume 4, Issue 3, March - 2026
ISSN (E): 2938-3781

and complex environmental problems in the region.

Amelung, Wulf and othersvillage in the backgroundIt is emphasized that the amount of carbon in the soil of agricultural lands has decreased to a certain extent, and therefore there is a great potential for their restoration. Monitoring of soils, the formation of a scientific database and political incentive mechanisms are important. It is emphasized that increasing the amount of carbon in the soil through proper management can simultaneously improve productivity and ecological sustainability, that is, it is possible to implement a global soil-based climate mitigation strategy.

According to the climatic conditions of the Bukhara oasis, the Rometan and Bukhara districts belong to the subtropical continental type. The main characteristic of the subtropical continental climate is dry, hot weather in summer and precipitation in winter, characterized by sharp temperature fluctuations. One of the important features of the climate of the steppe region is its correspondence to the subtropical climate, that is, completely different vegetation grows here compared to the foothill and mountain zones, and the adaptation of these plants to the plain and desert plain zones.

It should be noted that the synthesis and mineralization of organic matter under the influence of irrigation, changes in soil conditions, alternation of heat, air and water regimes, accumulation of irrigation products, and the formation of a genetically new cultural layer and its enrichment with biologically active elements indicate the need to consider oasis soils as a separate type from the point of view of their evolution.

Bukhara district is geographically located in the southeastern part of Bukhara region, bordering Kogan district in the north, Qarovulbazar district in the east, Olot district in the south, and Jondor district in the west. The total land area of the district is 84,962 hectares, with agricultural land of 53,265 hectares, of which 22,612 hectares are irrigated. Currently, there are 17 agricultural "arrays" in Bukhara district, where clusters and farms operate.

Scientific research has been conducted by a number of scientists - R.K. Kuziev, I.Turapov, Sh.M. Bobomuradov, L.A. Gafurova, D.A. Kadirova, O.U. Akhmedov, R.Kurvantayev, H.T. Artikova and others - on the morphogenetic structure, geographical location and reclamation status of the soils of the Bukhara oasis and other regions, as well as on their agrophysical and agrochemical properties.

Main part

Bukhara district average annual air temperature in 2018–2023: 16.0 – 16.9 – 15.8 – 17.0 – 17.5 °C, the hottest months have air temperatures ranging from 27.9 to 31.8 °C. In the cold period, we can see that this indicator fluctuates in the range of 0.6 to -4.0 °C in December. During the plant growth period (April-September), the air temperature increases significantly; in early March, the average daily temperature is stable around 12.6 - 16.7 °C, and during this period, favorable climatic conditions arise in terms of soil and climate for planting greenhouse crops and fruit trees on irrigated lands.

One of the features of the soil climate is that it is greatly influenced by human activity, in this regard, it is increasingly exposed to the influence of technology in agricultural production. The studied area has an extremely arid climate, with a very short and unstable winter season, and a dry, subtropical and very hot summer. Under the influence of this factor, farms in the Bukhara district

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Volume 4, Issue 3, March - 2026
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

make the most of the warm days of March and carry out various agrotechnical activities in the fields. The relationship between the duration of the impact of cold air temperatures on the surface layers of soils and soil temperature is characteristic, which is characterized by the fact that such processes as initial feeding and irrigation of winter crops, leveling of areas and preparation for sowing seeds create certain difficulties for agrotechnical work. In the Bukhara region in 2018–2023, atmospheric precipitation will fall mainly in autumn, winter, and spring, accounting for 70–80% of the total.

The annual precipitation is around 93–153 mm, with the highest precipitation occurring in the following months: January 5.2 - 30.9 mm, February 3.0 - 40.1 mm, March 3.1 - 77.3 mm, April 3.1 - 90.2 mm. In 2023, the amount of precipitation in the spring in the Bukhara oasis was insufficient for the germination of agricultural crops. As a result, there is a need to provide reserve or irrigation water in the coming years. Low precipitation and night-time temperature fluctuations lead to salinization of the surface layer of the soil and the occurrence of waterlogging processes. The average annual relative humidity in the areas of the Bukhara region is 43-52%, and in the summer months it drops to 23-32%.

This leads to a faster loss of moisture due to relatively dry air and high temperatures. The average annual rainfall in the district is 1754–2116 mm. During the vegetation period, evaporation of the main moisture is observed (the evaporation value for this period is determined as 1411–1708 mm). Therefore, maintaining soil moisture during this period is of great importance.

Bukhara Desert-continental climatic conditions are clearly evident in the oasis, with high temperatures and low rainfall causing the soil to dry out to the lower 20-30 cm layers. Relatively strong wind speeds and high water evaporation, dry air, secondary soil salinization, and general degradation processes are characteristic of the region

AVERAGE IN BUKHARA REGION DURING 2018 – 2023 METEOROLOGICAL INFORMATION

Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average annual figures
Air temperature													
2018	1.6	3.7	3.19	16.7	22.9	28.5	31.8	27.5	21.7	14.4	5.5	4.0	16.0
2019	5.9	6.2	12.6	16.6	24.3	28.3	32.4	27.9	21.8	16.1	5.0	5.7	16.9
2020	2.3	7.4	12.5	17.6	24.5	29.3	31.0	27.5	20.7	13.3	4.6	0.6	15.8
2021	1.6	8.0	9.7	18.5	26.4	30.4	31.6	29.0	23.6	12.3	6.3	6.3	17.0
2022	4.1	7.1	9.3	21.4	23.9	29.9	31.1	27.4	23.9	15.5	9.3	0.7	17.0
2023	-3.1	6.1	16.7	19.1	24.0	30.4	31.7	28.3	21.8	17.0	12.9	4.5	17.5
Precipitation amount, mm													
2018	3.3	40.1	2.5	3.8	0.0	0.6	0.0	0.0	0.0	7.8	25.5	10.0	93.6
2019	12.7	22.0	10.9	90.2	10.1	1.1	-	-	0.0	0.3	2.0	3.9	153.2
2020	26.0	30.9	3.1	40.8	27.6	0.0	0.0	4.0	0.0	-	0.0	10.4	142.8
2021	6.4	3.0	77.3	3.1	1.4	-	-	-	-	10.2	0.0	6.3	107.7
2022	30.9	7.5	61.6	7.4	21.4	0.0	-	0.0	-	11.9	5.7	2.6	149.0
2023	5.2	35.5	4.8	26.1	7.7	0.0	-	0.0	-	6.4	11.2	4.5	101.4
Relative humidity, %													
2018	63	69	57	43	32	23	26	32	35	49	68	81	43
2019	72	71	64	68	41	32	28	32	39	46	62	71	52
2020	81	68	52	62	48	25	29	35	34	42	54	73	50
2021	71	60	66	42	33	24	28	29	32	44	58	66	46
2022	83	64	72	49	44	30	28	29	33	48	70	71	52
2023	76	72	51	43	34	25	27	32	36	56	58	67	48
Number of days with dust storms													
2018	2	3	9	6	8	7	4	4	2	5	0	0	50
2019	5	2	3	1	4	3	4	4	2	0	0	0	28
2020	0	6	0	1	2	2	5	1	1	0	4	0	22
2021	2	3	6	1	2	1	4	0	1	2	5	6	33
2022	3	2	3	3	2	1	2	4	1	1	0	0	22
2023	0	1	3	4	3	2	1	2	1	1	1	4	24

Volume 4, Issue 3, March - 2026
ISSN (E): 2938-3781

Web of Agriculture: Journal of Agriculture and Biological Sciences
webofjournals.com/index.php/8

Over time, climatic temperature, precipitation, weather conditions, and soil moisture deficiency have a positive or negative impact on growth processes. Heat stress affects plant processes, causing morphophysiological changes in crops, slowing down development, and causing significant yield losses. According to the data presented above (Table 1), it was determined that there were 22-50 days of windy and stormy days during 2018-2023. Strong winds lasting 3-9 days in March-April cause evaporation of moisture in the soil, which, as a result, accelerates the leaching of nutrients from the soil and various degradation processes in the soil, and leads to an increase in the water demand of crops during the growing season.

Conclusion

In conclusion, the formation of soil fertility is a result of the positive and negative effects of the main climatic factors. Among them, soil-climatic conditions are considered to be an important factor in soil fertility.

As a result of the studies, the Bukhara district has a number of unique features. The climate of the researched area is characterized by extremely dry conditions.

It is known that the heat balance of any surface, its radiation and the low amount of precipitation lead to a strong drying of the soil layers under cultivation. Also, such features are further complicated by the vertical climatic zonation of irrigated soils and negatively affect the seasonal dynamics of processes in soil biological diversity over the years.

The influence of the above-mentioned factors reflects the regional characteristics of soil formation in the oasis area. Indeed, in the coming years, depending on soil and climatic conditions, special attention should be paid to increasing soil fertility. This includes the need for crop rotation, effective and rational use of no-till methods, maintenance of repeated crops in areas other than grain and cotton, and expansion of catch crops.

References

1. Amelung, Wulf, and others. “Towards a Global Soil Climate Mitigation Strategy ”. Nature Communications 11.1 (2020): 5427. https ://www. nature .c om / arti c les / s 41467-020-18887-7.
2. Sixth Assessment Report of the 58th Session of the the International Panel on Climate Change, held in Interlaken, Switzerland, 13-19 March 2023.https ://www. thread cc. c h / report / sixth - assessment - report -c y c le /
3. Sertini, Giacomo i Riccardo Salenge. "Vajnye vzaimodeystvya mejdu klimatom i pochvoy". Total Environmental Science 856 (2023): 159169. https :// doi. org /10.1016/j. s c itotenv .2022.159169
4. O‘zbekiston Respublikasi Vazirlar Mahkamasining 2022-yil 27-apreldagi 215-son qarori bo‘lib, Buxoro viloyatida 2022-2026-yillarda hududlarni ijtimoiy-iqtisodiy rivojlantirish va aholi turmush darajasini yanada yaxshilash bo‘yicha qo‘shimcha chora-tadbirlarni belgilaydi**.**
5. Bobomurodov Sh. M., Karshiboev Kh. Sh. Фундаментальные научно-практические исследования Сборник научных трудов по материалам II Международной научно-практической конференции, 30 апреля 2024 года, г.-к. Анапа
6. Turapov I,. Qodirova D.A., Saidova M.E., Namozov N.CH., Burxanova D.U. “Tuproq iqlimshunosligi”- Fan ziyosi nashriyoti Toshkent – 2021 y.
7. O‘zbekiston “Gidrometeorologiya” xizmati 2025 y