

# Problems of the effective use of irrigated land in Bukhara region and ways to improve them

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**Abstract.** The article discusses the issues of effective use of irrigated lands in Bukhara region and ways to improve them during the period of modernization of agricultural production. There have been studied the structure of irrigated lands, the problems of the influence of natural factors on the quality of land resources. The reclamation state of irrigated lands was analyzed according to cadastral indicators and the effectiveness of the results of the measures adopted by the programs to improve the reclamation state of the land in 2008-2012 and 2013-2017 in the republic was studied. The role of natural factors on the impact of the effectiveness of the use of irrigated lands in the region is characterized. Recommendations are given to improve the efficiency of irrigated land use.

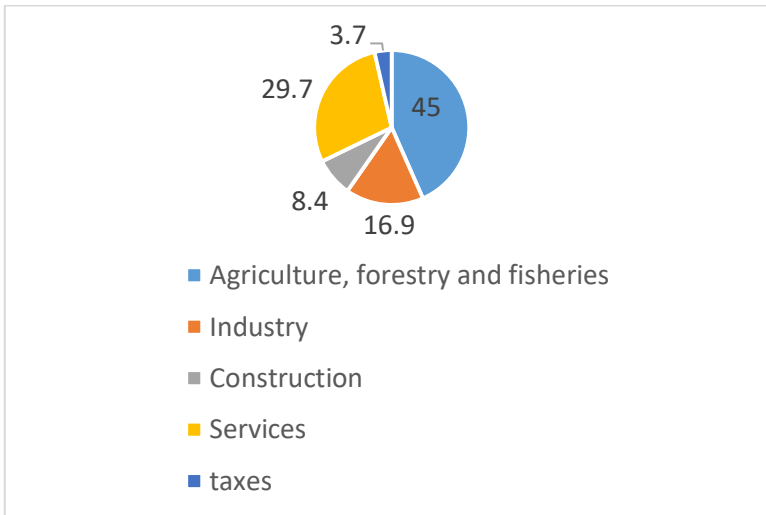
## 1 Introduction

Today, the use of irrigated lands, not only in the republic, but around the world, is hindered by a number of problems that are waiting for their scientifically sound solution. Taking into account the natural and ecological properties of the territory when organizing the effective usage of irrigated lands allow a comprehensive approach to solving problems. Increasing the efficiency of the use of irrigated lands is considered one of the priorities of the agrarian policy of the Republic of Uzbekistan.

Agriculture occupies a leading role in the economy of the Bukhara region. At the end of 2020, the production of agriculture, forestry and fisheries amounted to 23.9 trillion sums and increased by 101.6% compared to the previous year. The share of agricultural, forestry and fishery products in the GRP of Bukhara region is 46.4%. Compared to other sectors in terms of GRP, this is the most significant industry. For example, in other industries, industry is - 18.1%, construction is - 7.8%, services are - 27.7% (Fig. 1.). The structure of agricultural products is dominated by the livestock sector, 51.4% in the composition of the rural products of the region.

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**Fig.1.** GDP structure of Bukhara region, 2021

These figure show how important the role played agriculture and its branch of crop production in the economy of the region. In 2020, 432.9 thousand tons of grains were grown, including 423.8 thousand tons of wheat, 296.1 thousand tons of raw cotton, 222.6 thousand tons of potatoes, 768.6 thousand tons of vegetables, 179, 5 thousand tons of melons, 304.0 thousand tons of fruits and 208.2 thousand tons of grapes.

Crop production in Bukhara region is completely based on irrigated agriculture. Therefore, irrigated agriculture and its condition directly affect the development of the region's economy as a whole. This substantiates the relevance of studying the state and efficiency of the use of irrigated lands in the region.

The Government of the Republic of Uzbekistan is carrying out a set of measures in the regions to improve the reclamation state and quality of irrigated agricultural land, these measures are giving positive results. Decree of the President of the Republic of Uzbekistan PD-5742 dated June 17, 2019 "On measures for the efficient use of land and water resources in agriculture" determined the main directions for modernizing the use of land and water resources in the country. With this decree, the "Concept for the efficient use of land and water resources in agriculture" was adopted.

As stated in the concept, "as a result of irrational use of agricultural land for many years, the natural fertility of the soil and crop yields are reduced, the quality of products is deteriorating, and environmental pollution is increasing. In the context of an ever-increasing shortage of land and water resources, due to the failure to take into account economic efficiency and market conditions in the placement of crops, as well as the failure to introduce intensive agriculture, the volume of agricultural production remains low" [1].

"In order to increase the efficiency of agricultural land use, water use and hydraulic structures, achieve maximum productivity of agricultural land, increase the volume of agricultural products, restore soil fertility, create favorable conditions for the implementation of projects within the framework of public-private partnerships, widely introduce agro technical methods and improve the reclamation state, land irrigation methods, as well as modern irrigation and reclamation technologies for the introduction of high and intensive agricultural technologies for growing crops, developing breeding and seed production of crops, deep processing and marketing of agricultural products, logistics and marketing systems, accelerating the integration of science and practice The concept of efficient use of land and water resources in agriculture includes the following main areas:

1. Improving the efficiency of agricultural land use.
2. Increasing the efficiency of water use and hydraulic structures, improving the reclamation state of lands.
3. Development of selection and seed production of agricultural crops.
4. Deep processing and sale of agricultural products, development of logistics and marketing systems.
5. Accelerating the integration of science and practice in the efficient use of land and water resources” [1].

In order to improve the reclamation condition of the land in 2008-2012 and 2013-2017, programs were adopted throughout the republic to improve the condition and efficient use of land and water resources. As a result of the measures taken in 2008-2017, water supply improved in 1.7 million hectares of land in the republic and 125 thousand hectares of land in the Bukhara region and 2.5 million hectares of land in the republic and 150 thousand hectares of land in the Bukhara region improved meliorative condition. On the fields that were carried out reclamation measures, the yield of cotton increased by an average of 2-3 centners per hectare, and the yield of grain increased by 4-5 centners per hectare.

## 2 Methods

The article uses methods like analysis and synthesis, system analysis, statistical analysis, historical analysis, methods of economic analysis (comparison, observation, detailing) and grouping to study the problems.

## 3 Results

In the Bukhara region, a large amount of work is being done to improve the reclamation state of irrigated lands. According to the data of 2021, in Bukhara region (according to the table) of the total amount (275030 ha) of irrigated land, 13.8%, that is, 37988 ha - non-saline land, 86.2%, i.e. - 237113 ha - saline lands. 2.5% (6878 ha) of saline soils are strongly and very strongly saline, 21.8% (60054 ha) are moderately saline and 61.9% (17081 ha) are weakly saline.

By regions, the heaviest saline soils are found in the Jandar, Alat and Gijduvan regions. The largest area of weakly saline lands is in Vabkent, Karakul and Bukhara regions. Analysis of the ameliorative state of irrigated lands according to cadastral indicators shows that 37.80 thousand hectares (13.59%) are in good condition, 212.43 thousand hectares (77.24%) are in satisfactory condition, 24.80 thousand hectares (9.02%) are in unsatisfactory condition.

If we compare the ameliorative state of irrigated lands in Bukhara region with other regions, we will see that the state of lands in the region is much worse. For this reason, in the measures taken by the Government to improve the condition of irrigated lands in the republic and the Bukhara province, special attention is paid to the quality of the measures taken.

**Table 1.** Irrigated lands of Bukhara region and their salinity

№	Districts	Total irrigated area ha	Non-salted soils, ha	Saline soils, ha	Namely, in %			Percentage of land equipped
					very salty	moderately salty	slightly salted	

								with recla matio n netwo rks (%)
1	Bukha ra	30280	3394	26915	2.0	22,3	64,6	94,0
2	Vabke nt	21517	2526	19045	5.0	19,1	67,3	69,2
3	Jandar	33063	2694	30372	2,5	24,4	62,4	98,8
4	Kagan	18797	2977	15837	4,7	18,3	63,5	95,5
5	Alat	21532	3750	17782	4,7	19,5	58,3	100
6	Peshk u	22751	3749	19007	1.5	21,6	60,4	67,2
7	Ramit an	27238	3698	23545	0,8	27,0	58,7	91,3
8	Shafir kan	28399	3260	25143	2.4	25,1	61,0	89,3
9	Karak ul	25086	3215	21877	1.3	18,6	67,3	91,2
10	Karaul bazar	19289	4179	15059	0,4	18,6	59,1	78,5
11	Gijduv an	27078	4546	22531	3.8	21,6	57,9	61,4
12	<b>By region</b>	<b>275030</b>	<b>37988</b>	<b>237113</b>	<b>2,5</b>	<b>21,8</b>	<b>61,9</b>	<b>85,8</b>

Compiled by the author according to the data of the Department of Agriculture and Water Resources of the Bukhara region.

As a result of work to improve the reclamation of irrigated lands and reduce salinity in the Bukhara region, the following has been achieved:

- if in 2007 the area of highly saline territories was 12.6 thousand hectares, then by 2021 this figure amounted to 6.8 thousand hectares, having decreased by 5.8 thousand hectares;
- if in 2007 the average saline area was 75.7 thousand hectares, then by 2021 this figure was 60.05 thousand hectares, i.e. decreased by 15.6 thousand hectares;
- according to the reclamation cadastre, the unsatisfactory area in 2007 was 46.6 thousand hectares, in 2021 - 24.8 thousand hectares, having decreased by 21.8 thousand hectares;
- if in 2007 there were 27.5 thousand hectares of land in a good ameliorative condition, then by 2021 this figure amounted to 37.8 thousand hectares, an increase of 10.3 thousand hectares;
- the average yield of grain and cotton in the region in 2007 was 59.8 centners / ha and 30.3 centners / ha, respectively, then in 2021 these figures were 60.5 centners / ha and 32.5 centners / ha, respectively.

The author recommends an approach to improving land reclamation in the region, taking into account the natural features of the region, emphasizes that this, in turn, is very effective and argues that natural indicators are one of the important factors.

## 4 Discussion

The Bukhara region is located in the south-west of the Republic of Uzbekistan, at the intersection of desert and semi-desert zones, the relief is a wavy plain. The territory of the Bukhara region is 40.32 thousand square kilometers, the main part of which is located in the Kyzylkum desert, irrigated agricultural land is represented by the Bukhara, Karakul and Karaulbazar oases, which are surrounded by the sandy deserts of Kyzylkum, Sandikli and Karshi. These features affect agriculture in the region.

The climate of the region has its own characteristics. The role of agro-climatic resources in the development of agriculture is great. The irrigated lands of the Bukhara region are the hottest and driest region of the Zarafshan basin. In Bukhara, the maximum temperature is +48-49°C, the minimum is 35-38°C [3, 52]. This situation adversely affects the growth of crops and the physical and biological properties of irrigated lands.

The average annual relative humidity is 51-53%, the average rainfall is 114-125 mm/year. Due to the heat and drought in the region, the average annual evaporation is 1752-2117 mm/year. This indicates that evaporation is 15-17 times higher than precipitation in oases, and 18-20 times higher in deserts.

The high level of evaporation in the region is due to the intensive reclamation of irrigated lands in the region. Due to the proximity of groundwater levels and high air temperature, the amount of evaporation on such lands is on average 15,000-18,000 m<sup>3</sup>/ha per year.

When carrying out measures to combat wind erosion, it is necessary to take into account the direction of the wind. In the Bukhara region, north and northeast winds prevail with an average annual frequency of 54-73%. Due to the increase in wind and temperature, the amount of evaporation from irrigated lands increases, which in turn leads to an increase in the volume of irrigation of crops, excess water consumption. It is known that with an increase in wind speed, its negative consequences intensify. At a wind speed of more than 2.5 m/s, the arable land dries up, at a wind speed of more than 5 m/s, sand particles begin to move, and at a wind speed of more than 8-10 m/s, dust begins to appear. In the Bukhara region, the average wind speed is 2.6-5.2 m/s, while in the northern regions it is 1.5-2 times stronger than in the southern regions.

Today, due to wind erosion, irrigated lands in the newly developed territories, especially on the border of oases and deserts, suffer greatly. In the Khajadavlat and Makhankul massifs, 30-35%, in the Karaulbazar oasis, 25-30% of irrigated lands is covered with sand on average by 0.5-0.7 mm, and thick sandy layers form in these lands. On the upper (0-100 sm) layers of irrigated lands of oases bordering sandy deserts, the amount of dusty sands increases by 0.03% per year [7].

Soil fertility is also significantly affected by living organisms - plants, animals and microorganisms. In the soil, under the influence of these factors, physical processes undergo direct changes, while chemical processes undergo indirect ones. For the effective use of irrigated lands, land users, farm managers must take into account of such cases and be aware of them.

Animals also positively influence the evolution of the soil. They serve to increase the amount of humus in the soil with organic fertilizers while softening the topsoil. In addition, the micro-organisms inside the soil have a positive effect on the physical and chemical properties of the soil. They soften the soil, resulting in increased yields, improved water permeability and reduced water erosion. As a result of the fallout of organic mineral waste, the amount of humus increases, resulting in an increase in soil fertility. Depending on the characteristics of ecosystems, soil fauna is formed in it. On irrigated lands, earthworms from microorganisms are usually widespread. On irrigated lands located on the plains, 5-10 worms were found per 1 square meters of soil, and more than 100 individuals were found in mountainous areas [2, 155].

They help increase the amount of phosphorus, calcium, nitrogen in the soil. In soils with earthworms, compared with soils that don't have such microorganisms, phosphorus is 1.5 times more, calcium is 2.5 times more. The introduction of worms has a positive effect on soil fertility. According to the data of an experiment carried out on 200 specimens of wormwood on the slopes of the Pamirs, the yield of perennial grasses was 15 centners per hectare instead of 6 centners per hectare, i.e. 2.5 times higher [2, 158].

Living organisms, especially microorganisms, have a positive effect on the soil, so on farms in developed countries, worms and other microorganisms are specially used to improve soil quality. The use of such experience in Uzbekistan is not developed enough.

## 5 Conclusion

Today in Bukhara region the level of efficient use of irrigated lands is low, crop yields are lower than in developed countries. One of the important reasons for the low level is non-intensive farming, little use of innovative technologies. Another reason is the lack of scientifically based approaches to the development of irrigated lands and the placement of agricultural land in them. Instead of the traditional science-based scheme "desert - desert pastures - forests - irrigated lands", the "desert - irrigated lands" scheme is used.

In addition to these factors, the effective use of irrigated lands is also significantly influenced by such natural factors as geographical location, mineral composition of groundwater, relief structure, geological structure, and others.

The study of the potential of agricultural production and the level of the usage of irrigated land shows that there are sufficient reserves in the Bukhara region to increase the efficiency of the industry. Therefore, the authors recommend the following suggestions:

- full implementation of the crop rotation system on the irrigated lands of the region, especially the system of crop rotation with alfalfa.
- it is necessary to organize the structure of agricultural land based on the internal capabilities of the regions, soil and geographical conditions, taking into account the rapid development of food security and animal husbandry;
- usage of modern resource-saving, intensive and innovative technologies and methods in land use;
- organization of efficient use of water resources in agriculture, introduction of intensive methods of water use in farms and dekhkan farms;
- strict accounting of consumed water;
- tougher penalties for violation of legislation in the field of land and water use.

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