

Opinions and considerations on some hydrological characteristics of Bukhara region

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Abstract. Currently, as a result of the extensive use of water resources worldwide, their quantitative reduction and quality deterioration are causing a number of problems. Therefore, studying the hydrological characteristics of existing water resources in the Bukhara region is considered one of the urgent problems. Bukhara region has its own unique hydrological characteristics due to the fact that it is completely in the desert zone, the climate changes sharply, the temperature is high, warm winds constantly blow, and it does not have its own natural water source.

1 Introduction

To study and analyze the hydrological foundations of ditch networks in order to control and study the reclamation condition of irrigated land areas in Bukhara region and to increase the productivity of irrigated lands based on these, as well as to develop reclamation measures, to control the implementation of these measures and to analyze the economic benefits they bring, is one of the important issues.

Therefore, constantly monitoring the land reclamation of more than 274.6 thousand hectares of irrigated land in the region, evaluating the changing situations from the point of view of land reclamation based on observations and forecasting the expected changes, improving the land reclamation of irrigated land and increasing the yield of agricultural products obtained from them, it is necessary to develop measures and control their implementation. It is necessary to study how the implemented measures affect the improvement of land reclamation.

In addition to these, the total length of 7981.7 km, of which 747.0 km are highway tracts and 2096.8 km of inter-farm ditches at the expense of the state, as well as 5137.9 km of internal ditch networks, in order to maintain their technical condition. It is the need of the hour to provide technical support to users and develop recommendations for appropriate action. In the following years, the measures implemented in terms of agricultural reform, development of farms, establishment of production and market infrastructure made it possible to form a class of real owners in the village, produce agricultural products and increase the income of the villagers.

At the same time, the current meliorization of irrigated lands is an obstacle to further increase the productivity of agricultural crops and increase the income of producers of goods in agriculture. The lack of a systematic comprehensive approach to the formation of

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the projects of reclamation activities, as well as the specific sources of their financing, the weak functioning of water management structures and water user associations led to a decrease in the volume of reclamation works in the following years, an increase in the level of groundwater seepage and an increase in mineralization.

As a result, more than 87 percent of the irrigated lands are areas with varying degrees of salinity.

A number of decisions and decrees of our government were adopted in order to create the necessary conditions for more stable development of agricultural production, improvement of land reclamation, increasing their productivity and, on this basis, increasing the yield of agricultural crops, as well as organizing reclamation works and improving the financing mechanism. The most important priority tasks of agricultural development in the period of 2021-2026 have been defined as the fundamental improvement of the reclamation condition of irrigated lands.

After gaining independence, the country has taken comprehensive measures in all areas, including the efficient use of available water resources, improving the condition of irrigated lands, increasing soil fertility, the formation of additional water sources, and as a result, positive results are being achieved. PF-60 of the President of the Republic of Uzbekistan dated January 28, 2022 "On the development strategy of the New Uzbekistan for 2022-2026," Introduction of intensive methods, first of all, modern agro-technologies that save water and resources.

In carrying out these tasks, including the construction of collector-drainage systems, mitigation of water shortages and their effective use, they play an important scientific and practical role.

More than seventy percent of the territory of the republic belongs to the coastal, desert and foothill, semi-arid steppe zone. The oases created in this zone are satisfied with the socio-economic systems and water supply of the population, mainly at the expense of water sources coming from other areas. Therefore, today the problem of drinking and irrigation water in our country is one of the tasks at the level of state policy. In particular, this problem is a matter of life and death for the Bukhara region, located in the central desert zone of the country. The demand for drinking and irrigation This water is pumped to the above lands through a series of pumping stations and is costly. Currently, access to water from the Amudarya River is becoming increasingly complex. The reclamation situation is more complicated, especially in the middle and lower parts of the region, due to the slow movement of groundwater and its proximity to the surface. First of all, when digging ditches, it is important to place the collector-ditch networks correctly in the plan. It is advisable to run the ditch along the main slope of the land between the irrigation canals.

As the ditches deepen, the effect of groundwater pressure also increases and leads to an increase in water flow in the ditch. The deeper the ditch, the lower the groundwater level, and the longer the ditch's impact area. When calculating the distance between the ditches, a given modulus of the ditch water flow is considered.

The distance between the ditches also depends on the depth of the ditches and the rate at which the groundwater level drops.

The deeper the groundwater level in the ditch, the shorter the ditch interval should be. Ditches with a depth of 2-2.5 m can reduce the groundwater level at a distance of 100-125 m in soils with heavy mechanical content, and 200-300 m in soils with light mechanical content.

There are many collectors (ditches) and sewage lakes (black lakes) in the region. Examples are the North, Ogitma, Parsonkul ditches, Dengizkul, Shurkul, Ayogogitma, Karakir lakes. As can be seen from the table, the analysis of the amount of water, water consumption and mineralization levels of inter-district collector ditches in Bukhara region by the staff of the Department of Irrigation Basins revealed the following. Central Bukhara

collector water consumption 13.85 m³ / s, water volume 436.76 million m³, salinity level 3.063 g / l, Fertilizer collector water consumption 0.53 m³ / s, water volume 16.71 million m³, salinity level 2.488 g / l, Northern collector water consumption is 25.27 m³ / s, water volume is 769.77 million m³, salinity level is 2,867g / l, and Dengizkul collector water consumption is 16.08 m³ / s, water volume is 507.07 million m³, salinity level is 5,867 g / l. The Northern Interdistrict Trench was commissioned in 1948 and has a length of 139.9 km and a flow capacity of 56.5 m³ / s. The northern inter-district collector removes groundwater from crop fields in Gijduvan, Shafirkan, Rometan, Peshku and Vobkent districts of the region. The chemical composition of the northern collector-ditch waters in the region has been studied, divided into good quality, satisfactory, unsatisfactory, generally unsuitable, and recommendations on the conditions of their use in agriculture have been developed [1-4].

When using saline soils from collector-drainage waters with a salinity of up to 6 g / l, the salinity leaching rate is increased by 35-40%. When mineralized collector-ditch water is used to irrigate agricultural crops, the salts in the water have a certain negative effect on the plant, especially in its early phases. In order to ensure a moderate seedling thickness in irrigated lands, the planting rate should be slightly higher than in the case of irrigation with river water. One of the main factors in creating a rich harvest of agricultural crops on irrigated lands in the region is the stabilization of the balance of irrigated lands. During the year, 5.6 million tons of various harmful salts are added to the irrigated areas by the water received at the border of the region, and 6.43 million tons of harmful salts are annually removed from the irrigated areas through ditches. We can see that the water discharged through the collector drains is 8.33 million tons more than the added salts. The salinity of the wastewater in the existing collectors in the region varies. The main reason for this is the warm weather and the high salinity of the water supplied to irrigation and soil composition. Unfortunately, these problems in the Bukhara region are not sufficiently covered in hydrological studies.

2 Relevance of the topic

It is known that the average long-term flow of surface water resources of Uzbekistan in the Amudarya basin is 4.74 km³, and 0.48 km³ of it is contributed by the Zarafshan basin [2].

The average annual flow of the Zarafshan River in the territory of Tajikistan is 5140 mln. m³, and in the territory of Uzbekistan its average is 254 million m³ every year [5]. The great need for water in the oasis has a negative impact on the year-by-year deterioration of the ecological environment. This situation is especially felt in Bukhara region.

The water source is taken from the Amudarya, which borders neighboring Turkmenistan. The water brought through the Amu-Bukhara and Amu-Karakol canals is pumped 55 meters up through the Hamza-I, Hamza-II pumping stations for a large amount of money and hard work. The Zarafshan River is hardly used. Only 3-8% of it is used in Gijduvan and Shafirkan districts. As the Zarafshan River enters the territory of Bukhara, it loses its river character and takes the name of Central Bukhara Zovuri. Experiments have shown that 10-11 thousand m³ of water is used in the region to irrigate 1 ha of land and wash salt. However, this indicator is 5-6 thousand m³ in Tashkent, Andijan, Fergana, Namangan regions. However, this indicator is 5-6 m³ in Tashkent, Andijan, Fergana, Namangan regions. Today, drinking water brought from Damkhoja in Kattakorgan district of Samarkand province through pipelines alleviates the problem to a certain extent. This is not a complete solution.

For example, 1) dry residue is normally 1000 mg/l. but in practice it is 1060 mg/l. 2) the norm of sulfates is 500 mg/l, and in practice it is 535 mg/l.

3) the standard of total hardness is 7 mg/equiv., in practice it is 10 mg/equiv. 4.5 - 5.7 billion received from Amudarya as irrigation water. The efficiency of using m³ of water is also not good. The use of water in canals and ditches is 60-61 percent. If we analyze the ecological and geographical location of the region, due to its relatively deep location, the waters of the neighboring Samarkand, Navoi, Kashkadarya regions flow into the territory of the region. According to the Regional Department of Ecology and Nature Protection, an average of 2.0 - 2.5 billion per year. 7-8 mln. bringing all kinds of harmful salts up to a ton. This leads to salinization of the land for the second time and disrupts the ecological balance in the region and undermines its stability. [6]. It is impossible to imagine the improvement of the land reclamation condition of the irrigated lands in the Bukhara oasis and the increase of their productivity without collector-water supply networks [3]. In the middle of the last century, the collector-water supply networks, which were built and put into use in the oasis, were renovated during the years of independence of our republic. Also, the efficiency of using large collector networks such as North, Central Bukhara, Ogitma, Porsonkol has been increased (Table 1).

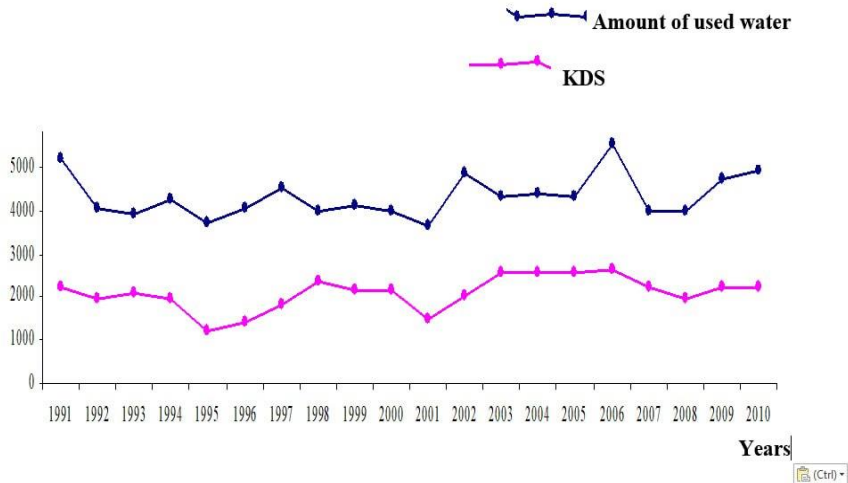
Table 1. Information about major trunk collectors in the Bukhara oasis.

T/r	Collectors	To work fell year	L, km	Q, m ³ /s	Catchment areas
1	Dengizkol settlement	1956	126.4	70	Kogan,Bukhara,Jondor,Korakol,Olot
2	North collector	1948	139.9	56.5	Gijduvan,Shafirkon,Romiton,Peshku,Vobkent.
3	Central Bukhara collector (MBK)	1955	95.1	80	Vobkent, Bukhara, Romiton, Jondor
4	Do not deviate	1969	68.7	100	Shafirkon, Gijduvan
5	Porsonkol	1974	62	15	Korakol,Olot Vobkent, Bukhara, Romiton, Jondor
6	Head water collection tract (GVST)	1991	155	74	Korakol,Olot Jondor, Kogan, Karavulbazar.
7	Chief Karakol	1967	15.52	5	Korakol,Olot
8	Central Olot	1956	16	5	Korakol,Olot
9	South Olot	1958	15.52	2.2	Korakol,Olot
10	Western Korakol	1960	13.9	1.5	Korakol,Olot
11	Bibishirin	1948	139.9	46	Gijduvan ,Romiton,
12	Western Romitan	1966	60.1	8	Romiton,Jondor

Note: L is the length of the collector, Q is the water capacity.

According to the results of calculations, the largest relative values of collector-zovor waters were recorded in 2003 and 2012 and made up 60 percent. In addition, the change in the flow volume of return water has been showing its negative impact on the regime of underground water. This, in turn, is causing the deterioration of the ecomelioration status of the irrigated lands in the oasis. These polluted return waters cause great damage to the environment, especially to nature. In this regard, we think that it is necessary to evaluate and analyze the irrigation and return waters formed in the oasis from the hydrological point of view, and if necessary, complex measures should be developed and applied in practice (fig. 1). In the years of water scarcity, it is desirable to establish the most effective and

inexpensive biological treatment method compared to physical, chemical and other methods of water treatment and use them as secondary water resources. [7].



1-picture-Dynamics of irrigation and return waters

Fig. 1. Dynamics of irrigation and return waters.

In conclusion, it can be said that a large part of the collector water formed in the Bukhara oasis is currently drained into natural depressions and forms lakes in them. A certain part of the return flow is thrown directly into the Amudarya, causing a negative change in the chemical composition of the river water. Taking into account these circumstances, one of the most urgent issues today is the protection of water in the oasis, both in terms of quantity and quality. This main issue includes a system of several additional measures. The most optimal of them should be focused on reducing as much as possible, and in some cases, completely stopping the discharge of water from the collectors into rivers, lakes, and reservoirs.

At the moment, it is necessary to pay special attention to the biological treatment of waste water formed in cultivated fields with an economically efficient biological method and to use it as a secondary resource.

From the above points, it became clear that the volume of collector water also changes depending on the change in the amount of water taken to irrigate cultivated fields in Bukhara region. Future research should focus on reducing the amount of backflow.

Today, drinking water supplied through water pipes from Damkhoja in Kattakorgan district of Samarkand region alleviates the problem to a certain extent. This is not a complete solution.

According to demographers, on average 56% of the world's population lives in rural areas, 66% in Uzbekistan, 69% in Bukhara region. Villagers in the region are not provided with sufficient tap water. Despite the fact that this indicator is 90 percent in regional cities, on average, only 52 percent of the population in the region is provided with tap water. However, the water hardness remains high.

For example,

- 1) total residue is normally 1000 mg/l. but in practice it is 1060 mg/l.
- 2) the norm of sulfates is 500 mg/l, and in practice it is 535 mg/l.
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4.5 - 5.7 billion received from Amudarya as irrigation water. The efficiency of using m^3 of water is also not good. The use of water in canals and ditches is 60-61 percent. If we analyze the ecological and geographical location of the region, due to its relatively deep location, the waters of the neighboring Samarkand, Navoi, Kashkadarya regions flow into the territory of the region. According to the Regional Department of Ecology and Nature Protection, an average of 2.0-2.5 billion of water per year bringing up to 7-8 mln ton of all kinds of harmful salts. This causes the lands to become salinized for the second time, and the ecological balance of the region is disturbed and stability is undermined. [6].

For example, the smallest indicator of the amount of water received for irrigation is 3608 million m^3 in 2001, and the smallest amount of collector-ditch supply water is 1232 million m^3 in 1995. The largest value of the volume of irrigation water and collector water was observed in 2006, and these indicators were equal to 5560 million m^3 and 2614 million m^3 , respectively. According to the results of calculations, the largest relative values of collector-ditch waters were recorded in 2003 and 2012 and made 60 percent.

The study of the nature of Bukhara region, the emergence and settlement of Natural Resources, the comprehensive assessment of the resource opportunities of different regions, zoning and mapping are directly part of the actual tasks of geography science. In particular, the issue of the study of Water Resources is more important. The oases, economic and social systems and water supply of the population built in Bukhara region are mainly met from the account of water sources coming from other regions. Therefore, the problem of drinking and irrigation water in our republic today is one of the tasks at the level of state policy. In particular, this problem is a very important issue for the Bukhara region, which is located in the central desert zone of our country and occupies an area of nine percent of its territory. The supply of drinking and irrigation water in the region is fully provided with Amudarya water through the AMU-Bukhoro machine channel. This water is supplied to the above land by means of sequentially located pumping stations and is economically expensive. Under these conditions, the demand for water also increases from year to year. And the options for obtaining water from the amuderia are becoming more and more complicated. One of the strategic ways to solve these problems is the effective use of these natural resources. So the first task is to analyze the water resources of Bukhara region and their geographical study. Since ancient times, the Zarafshan River served as the main source of water for the region. Since the middle of the XIX century, it was difficult for the river water to flow into the Bukhara and Karakol oases. By the 60-ies of the XX century, due to an increase in the scale of production in the regions of the upper and middle reaches of the Zarafshan River, an increase in the population, the river water did not reach the lower reaches in the spring and summer months. As a result, the yield of crops decreased, adversely affected the economic activity of the population. Of course, our ancestors recovered from the sardines, pools and Wells, softening the problem of drinking water for themselves a little. But the water supply of fertile lands remained complicated. Those who have always dreamed that there will be a source of water that will provide their crops with important water. In our people who have suffered from water shortages for such centuries, the qualities of preserving, honoring, not wasting water have been polished. Already his perfume is enjoyable for humans. Consequently all of them will learn, will receive praise. Of course, today this inspirational "fountain" encourages our compatriots to give thanks to all the blessings, or rather to avoid extravagance.

In addition, the change in the flow volume of return water has a negative effect on the regime of underground water. This, in turn, is causing the deterioration of the ecomelioration status of the irrigated lands in the oasis. These polluted return waters cause great damage to the environment, especially to nature. In this regard, we think that it is necessary to evaluate and analyze the irrigation and return waters formed in the oasis from

the hydrological point of view, and if necessary, complex measures should be developed and applied in practice.

In the years of water scarcity, it is desirable to establish the most effective and inexpensive biological treatment method compared to physical, chemical and other methods of water treatment and use them as secondary water resources. [7].

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3 Summary

This article discusses the study of some issues of quantitative assessment, an analysis was made between the surface and return flows of the Bukhara oasis. Clarification of the definition of the term “return water”, consideration of the current problems of quantitative assessment of return water. Problems of rational placement. Development of recommendations and proposals for the efficient use of the region’s water resources.

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