ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 4 , April 2021

Hydrological Regime of Irrigation Canals in Zarafshan Oasis

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ABSTRACT: The article is devoted to study of hydrological regime of irrigation canals withdrawing water from the Zarafshan River. In the article the interdependence of canals in the oasis and water regimes of the Zarafshan River, the inter-annual flows variations and their distribution throughout the year is also discusses.

KEYWORDS: Zarafshan oasis, rivers, canals, hydrological regime, flow rate, inter-annual fluctuations of flow, annual distribution of flow, evaluation.

I.INTRODUCTION

78.7% of the territory of Uzbekistan are plains and 21.3% are mountains [9]. All rivers in Uzbekistan and adjacent territories begin in the mountains, and their flow is diverse in the plains. These expenditures occur not in the natural networks of rivers, but in human interests is, through anthropogenic hydrographic networks created mainly for the irrigation of arable lands in the plains for the development of irrigated agriculture. This is because such measures are necessary to provide water to irrigated lands located mainly in the plains.

Tuyatortor, Dargom, Shahob, Qurbonota, Narpay, Bulungur, Polvon canals and other canals, which are the main irrigation networks withdrawing water from the Zarafshan river, supply water to the lands of the Central Zarafshan basin [5]. In general, the development of irrigated agriculture has a positive impact on population growth and density on the process of urbanization. According to historical sources, irrigation networks in the Zarafshan oasis began to appear on the banks of the Zarafshan River in the II millennium BC. The local inhabitants withdraw water from the river through ditches and farmed. In the I-IV centuries, the settlers of the oasis dug large canals such as Dargam, Kalqonota, Shahrud, Romitan, Sangi-Saloh, Katta Beglik, Damdarya, which withdraw water from Zarafshan [5, 6]. One of the oldest of these hydraulic structures is the Dargam canal.

The term "Dargham" is derived from the Arabic word meaning dam, barrier. Dargham is originally built near the village of Varagsar (now Ravotkhoja) long before the Arabs entered the area (712). There are 3 canals from this dam, the northernmost of which is the Dargam canal. The other two were built during the Timurid period and were called Abbas and Qaraunas, later they were called Yangiariq and Qazanariq. These canals irrigated the lands north and south of Samarkand. The Dargam canal starts from the dam near the village of Ravotkhoja and continues to the Ulus steppe. In a map compiled by Claudius Ptolemy (2nd century), the Dargom Canal is called Dargomaniy. Later, in 1220, the main dam was demolished by Genghis Khan's troops. It was later renovated. During the former Soviet Union, more precisely in the 1920s and 1930s, the Ravotkhoja Dam was reconstructed, turned into a major engineering facility, and additional water distribution dams were built.

Currently, the length of the Dargam canal is 100 km, water discharge is 100 m^3/sec, the altitude of the canal head is 880 m, maximum water discharge is 125 m^3/sec at the beginning and 180 m^3/sec at the lower side [1, 10]. During the growing season, 67,500 hectares of arable land in Samarkand region water is supplied through the Dargom canal. Also 50,000 hectares in Chirakchi, Shakhrisabz, Yakkabog, Kamashi and Kitab districts of Kashkadarya region water is supplied through the Old Ankhor canal. The Dargom canal has several branches supplying water to arable lands in Urgut, Taylak, Samarkand, Pastdargom and Nurabad districts of Samarkand region (Table 1).

The Dargham canal is divided into three branches below the Ravotkhoja dam, called New Dargom, Old Dargom and Aylanma Dargom. The new Dargom Canal was built to supply water to the foothills of the Urgut district and joins the Old Dargom Canal, an underground tunnel 600 meters from the source, 10.5 km below, allowing the canal to increase. The maximum capacity of the operation of Dargom canal is 70 m^3/ sec.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

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Table 1
Main parameters of the canals in Dargam Irrigation Systems Department

#	Canals	Place, District	Main parameters		
			L, km	Q_{max}, m^3/sec	F, 10^3 ha
1	Yangi Urgut	Urgut	36,4	25,0	18,396
2	Янги Urgut	Samarqand	27,6	15,0	7,747
3	Urgutsoy	Urgut	10,0	15,5	0,205
4	Uch Qaxramon	Urgut	12,5	3,50	1,140
5	Yam-1 mashina	Urgut	13,5	3,00	1,517
6	Kamangaron	Urgut	5,0	14,3	0,285
7	Ohaliksoy	Urgut	8,0	12,0	0,266
8	Yangi NSga water-bearing	Urgut	51,6	15,0	0,972
9	Gijduvonsoy	Urgut	5,8	2,00	0,452
10	Muminobodsoy	Urgut	4,6	2,00	0,326
11	Shaudar	Tayloq	7,0	10,0	3,091
12	Xocharruk	Tayloq	13,87	3,00	0,643
13	Kavarzor	Samarqand	10,47	0,50	0,482
14	Jagalboyli	Pastdargom	3,22	2,00	0,412
15	Eshbo`riyev	Pastdargom	1,14	1,00	0,069
16	Anhor	Pastdargom	41,95	25,0	11,800
17	Anhor magistral	Pastdargom	13,0	18,0	1,420
18	Progress	Pastdargom	30,0	8,00	4,680
19	Xoncharbog magistral.	Pastdargom	10,75	24,0	1,439
20	KPS	Pastdargom	46,3	20,0	10,274
21	Videl-4	Pastdargom	2,83	3,50	1,362
22	MP-1	Pastdargom	17,5	5,00	0,198
23	MP-2	Pastdargom	2,61	3,00	0,269
24	Yangi yer	Pastdargom	10,5	4,00	0,055
	total		374,64	234,3	67,500

Note: L-canal length, Q- maximum water discharge, F-irrigated land area

Four different hydropower plants with a total capacity of 40 MW, including Khishrav (21.9 MW), Irtishar (6.4 MW), Tolligulon-1 (3 MW), Tolligulon-3 (8.8 MW) are used to supply water to agricultural crops not only from the Dargam Canal, but also used to generate electricity at HPPs. The study collected data on water consumption in order to study the annual fluctuations of the Zarafshan River and its tributaries. Based on the collected data, perennial fluctuations in the flow of the Zarafshan River and its catchment canals were analyzed (Figure 1).

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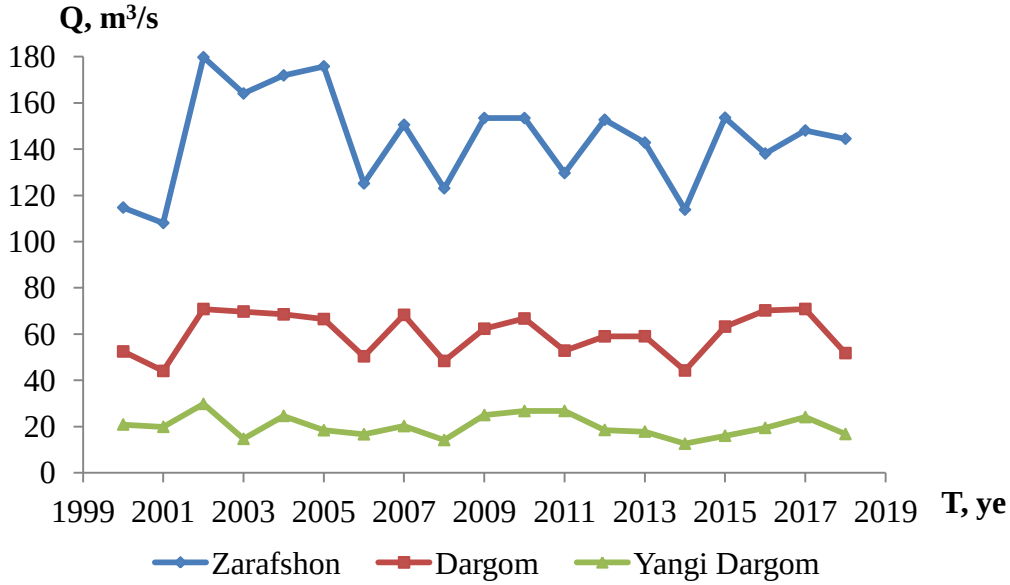

Fig.1. Inter-annual flow flactation of the Zerashan River and canals wihdrawing from it.

As can be seen from the graph, the long-term fluctuations of water consumption observed in recent years in the Zarafshan River and its tributaries (Dargham and its tributary, the New Dargam Canal) are consistent. The lowest water level in the river was observed in 2001, with an average annual water discharge 108 m^3/s. Accordingly, minimal water discharges were observed in the withdrawing canals. Hence, water withdrawal to the canals depending on low and high water in the river, and we assume that the situation is correct. Unfortunately, such a distribution is not established in the canals that receive water in the lower reaches of the Zarafshan River. In addition, in the next stage of our study, the distribution of water discharges of the Zarafshan River and its canals during the year was studied (Figure 2).

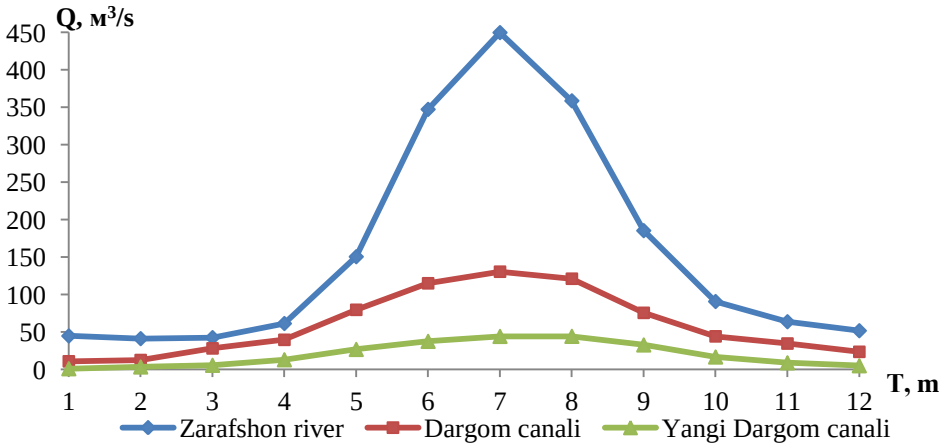

Figure 2. Changes of monthly mean water discharges of Zarafshan river and canals

As shown in the graph, the water discharge of the Dargom Canal and the New Dargam Canal vary according to the annual discharge of the Zarafshan River flow. After the water from the Zarafshan River is thrown into Dargam, it branches off again to the lower part. These sectors play an important role in providing water to various agricultural areas. Below we analyze the annual fluctuations in the average annual water discharge of the Yangi-Dargom canal, which is one of the largest branches of the canal (Figure 3).

As shown in the graph, in 2002, the canal received the largest amount of water. In contrast, in 2014, the average annual water consumption in the canal was 12.6 m^3/sec, while the amount of water in the river was also lower that year

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(Figure 3).

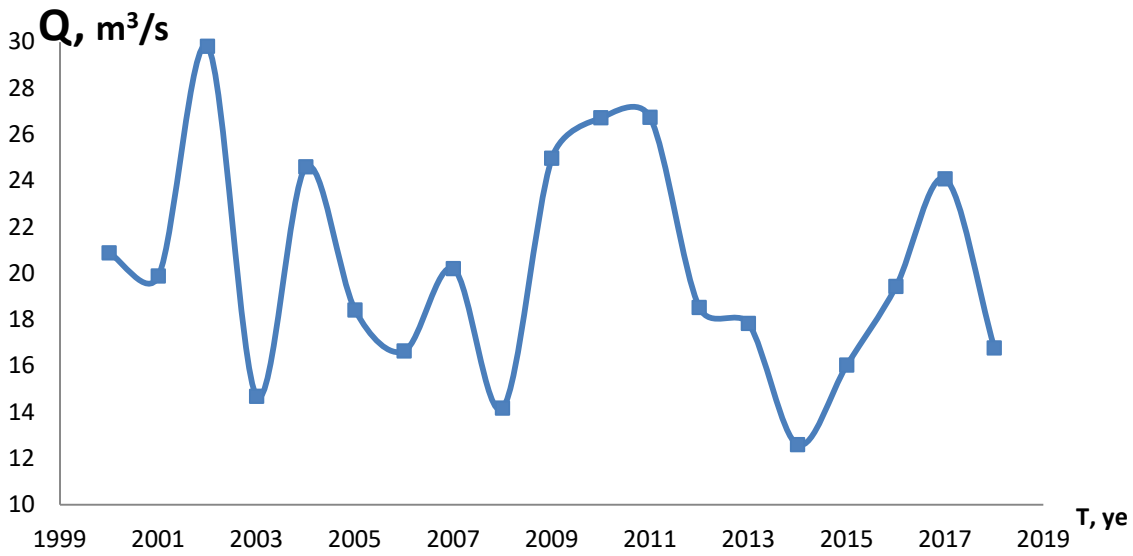

Figure 3. Inter-annual fluctuations of the New Dargam canal

It is known that the major rivers of Central Asia are fed by glacier and snow, therefore in this year, compared to other years, the average monthly and annual air temperatures were observed at slightly lower levels. For example, the average annual temperature in Samarkand region in 2015 was 15.3 ^{0}C, while in 2014 it was 14.1 ^{0}C. In addition, average monthly air temperatures were significantly lower even in the hottest months of the year. According to the years compared above, the average monthly temperatures in June-July were 27.4 ^{0}C and 28.9 ^{0}C, respectively. Considering the variation of air temperature index with altitude, i.e., 6 ^{0}C per 1000 m, there is not enough temperature for glaciers above 4000 m in the mountains of Central Asia to the process of melting. Therefore, in 2014, the flow of the Zarafshan River was relatively low, and there were significant problems with the water supply of irrigation systems.

II.CONCLUSION

1. The Dargam canal, which widrawel water from the Zarafshan river, has been named differently since ancient times. The Dargam canal has been reconstructed several times, new networks have been dug out of it, and hydroelectric power stations and water distribution facilities have been constrcuted there;

2. It was found that the perennial fluctuations of water flow observed in recent years in the Zarafshan River and its canals were similar. The lowest water level in the Zarafshan River was observed in 2001, with an average annual water discharge 108 m^3/s. Depending on the amount of water in the Zarafshan River, the canals also received the least water this year;

3. In contrast to the above, the Yangi-Dargom canal received a maximum of 29.81 m^3/s of water in 2002. It should be noted that in 2014, the average annual water discharge in the canal was 12.6 m^3/sec. The main reason for this is that the amount of water in the river this year is also much lower than in other years,

REFERENCES

1. Artikova F.Ya., Mirsaidova S.K., Shirinboev D.N. Quantitative assessment of changes in the annual flow of the Zarafshan River under the influence of anthropogenic factors // Own GJ information. Volume 38 -Tashkent, 2011. B. 161-164.
2. Baratov P.X., Mamatqulov M.M., Rafikov A.A. Natural geography of Central Asia. –Tashkent: Teacher, 2002. -336 p.
3. Bolgov M.V., Michon V.M., Sentsova N.I. Modern problems of assessing water resources and water supply. Moscow: Nauka, 2005.318 p.
4. Hydrological knowledge. Volume 14. Central Asia. Issue 3. Bass. R. Amu Darya. L .: Gidrometeoizdat, 1967.323 p.
5. Irrigation of Uzbekistan. Volume III. Tashkent: Fan, 1979.357 p.
6. Muhammadjonov A. Ancient hydraulic structures of Uzbekistan. -Tashkent: Uzbekistan, 1997. -88 p.
7. Rasulov. A.R., Hikmatov F.H., Ayitboev D.P. Fundamentals of hydrology. -Tashkent: University, 2003. -327 p.
8. Khamraev N.R. Fundamentals of water supply for sustainable development of Uzbekistan // Coll. reports of the Republican scientific and practical conference. Tashkent, 2000.S. 2834.
9. Hasanov I.A., Gulomov P.N. Natural geography of Uzbekistan. -Tashkent: “Teacher”, 2007. -162 p.
10. Hikmatov F.H. and others. Hydrometeorological conditions and water resources of Zarafshan basin. -Tashkent: Science and Technology, 2016. -276 p.