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RA WATER RESOURCES MANAGEMENT IN THE IRRIGATION PROCESS

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Introduction. The presence of water resources in the country and the application of effective solutions in the process of their purposeful utilization and preservation have an important role in ensuring human life, as well as in maintaining the ecological balance of the environment.

The issues of use, conservation and management of water resources are considered to be one of the most acute problems of the whole earth, especially the problems of the use of fresh water. There is no state in the world that does not deal with problems related to water resources, and Armenia is not an exception. Currently, 31 countries in the world are experiencing water scarcity and more than one billion people need clean water, and it is predicted that 2/3 of the world's population will face severe water scarcity by 2025.

The problems of usage and management of water resources, particularly of irrigation water, are more prominent in mountainous countries, where these resources are unevenly distributed due to the geographical relief. This problem is more prominent in our country, because 75% of Armenia's agriculture depends on irrigation. Optimal management of water resources and irrigation systems is one of the most important components of water resources problem. There lays **the relevance** of the topic.

The purpose of the article. The purpose of this article is to develop recommendations for improvement of the usage and conservation of irrigation water in Armenia. Therefore, following **problems** were set in the scope of research:

- ✓ To analyze the state of usage of RA water resources,
- ✓ To study the features of the irrigation system in Armenia,
- ✓ To identify ways for improving the usage and conservation of irrigation water.

Methodology. The study of foreign and domestic researchers was the basis for scientific observations and conclusions presented in the work. In the scope of the research logical, statistical and analytical methods were used.

Literature review. Water is the backbone of the ecosystem. The food security of current and future generations depends on this resource. It plays a vital role in human health, in the management of all kinds of activities of the agro-food system, in all the branches of the economy[1].

Today, the world faces ever-increasing challenges related to water resources and water security issues. These problems include unaccounted use of water resources, high

[1] Source: http://www.fao.org/3/av045r/av045r.pdf , last accessed January 2023

level of emissions, poor water quality, its impact on the environment and population health, the consequences of land degradation, etc[1].

Water security is also an integral part of national security, which is closely related to food security. Water and food are always present in the domestic and foreign political calculations of countries. Water is also an object of conflict because it is an important means of human livelihood and has a special role in food production[2].

There is rich literature exploring the innovative and new ways of solving the problem of efficient water use. One of them relays on the combination of Drip irrigation and intercropping of plants at a ratio of 50:50, which is considered as a suitable strategy for improving forage production amount with minimal water use[3]. In countries with very scarce water resources like Sudan, that new and innovative methods include the improvement of the traditional surface methods (viz: long furrow coupled with gated pipes, etc.) and adoption of modern technologies such as the sprinkler irrigation systems (mainly center pivot) and localized irrigation systems (drip/trickle, bubbler) and any new innovations of them. Also, in such areas water losses due to seepage particularly in light soil waterways, can be reduced by lining, soil compaction or chemical treatments[4]. The amount of water that can be saved by implementing innovative and new irrigation techniques varies depending on the area, crop, climatic conditions etc. It was revealed that in Kalyani, Nadia for banana cultivation the final water saving up to 45.62 % is possible with the adoption of proper management system[5]. Similarly, alternate furrow irrigation (AFI) adoption in Ethiopia can provide 20% water saving at best, with maximum yield compared convectional furrow irrigation having full water application[6].

Discussion. Water resources flowing in the territory of the RA are state property. According to the first article of the Water Code of the RA, water resources are the sum of national water reserves and usable water resources.

National water resources are the supplies of water that have the quantity and quality needed to meet basic human needs and maintain aquatic ecosystems. Usable water resources are formed from the rivers in the territory of RA, from the flow of the trans boundary Akhuryan and Araks Rivers, from underground water reserves. The volume of water resources is 9049 million m^3, of which the water resources of the rivers

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[1] Source: https://knowledge.unccd.int/sites/default/files/2018-06/GLO%20Russian_Ch8.pdf last accessed January 2023

[2] Markosyan A. Kh., Mkrtumyan M. M., Tokmajyan H. V., Management of water resources and water system, NUACA -Yer. 2011, Volume 2, page 488

[3] Baghdadi, Amirsaleh & Golzardi, Farid & Hashemi, Masoud. (2023). The use of alternative irrigation and cropping systems in forage production may alleviate the water scarcity in semiarid regions. Journal of the Science of Food and Agriculture. 10.1002/jsfa.12574.

[4] Saeed, Amir & Ibrahim, Tarig. (2022). Efficient Use and Appropriate Management of Irrigation Water in Sudan.

[5] Ghosh, Uddipta & Banerjee, Debargha & Bose, Sumit & Das, Aliviya & Das, Dipankar & Barua, Rohit & Saha, Somnath & Acharjee, Debadrita & Sahoo, Suvasis & Sadhukhan, Wriju & Kazi, Soukat. (2023). A Study on the Optimum Water Use in Drip Irrigation System. Current Journal of Applied Science and Technology. 42. 1-9. 10.9734/cjast/2023/v42i84084.

[6] Bekele, Tagesse & Abebo, Mulugeta. (2023). Evaluation of Furrow Irrigation Systems on Onion Yield and Water Use Efficiency in Misrak Azernet Berbere woreda, Ethiopia. 6. 2395-0056.

are 6859 million m^3; the share of the Araks and Akhuryan rivers in the territory of RA is 1000 million m^3, and underground renewable water resources are 1190 million m^3. The renewable underground water resources of the Ararat Valley are 1.1 billion m^3/year[1]: There are 9479 big and small rivers and more than 100 lakes in Armenia. Unfortunately, some of them dry up during summer periods. In general, surface waters are 7.7 billion m^3, including 940 m^3 of border waters[2].

The rivers of RA belong to the Araks and Kur basins. 76.4% of the rivers flow into the Araks, and 23.6% into the Kur. The major rivers of Armenia are Araks, Akhuryan, Debet, Hrazdan, Vorotan, the length of which reaches up to 200 km. Relatively large rivers include Arpa, Kasakh, Pambak, Aghstev. The characteristics of the rivers are presented in Table 1[3]:

Table 1

Main characteristics of major rivers of Armenia[4]

Names of rivers	Average slope	Catchment basin area	Average annual exit	Average annual flow
	%	km^2	m^3/sec	billion m^3
Araks	-	22 100	81.3	2.56
Akhuryan	5.7	9650	21.2	0.67
Debet	11.0	3790	34.0	1.07
Hrazdan	7.6	2560	26.0	0.82
Vorotan	21.0	2000	19.7	0.62
Arpa	24.0	2080	13.0	0.41
Aghstev	31.0	1730	9.71	0.31
Kasakh	29.0	1480	3.35	0.11
Pambak	13.0	1370	11.4	0.36

The next important source of water resources of Armenia are the lakes of Armenia. Lake Sevan is considered the largest lake of the RA; it is also the largest freshwater lake in the Caucasus. Sev, Akna, Kari, Kaputa and Aighr lakes are among the big lakes. The average annual indicators of the lakes are presented in Table 2.

Table 2

Average annual indicators of RA lakes[5]

Names of lakes	Level, m	Volume	Surface of the lake, km^2
Sevana	1 900.28	37.89 km^3	1276.4
Sev	2 666	9 million m^3	2.0
Akna	3032	3.91 million m^3	0.8

[1] Law of the Republic of Armenia "On the National Water Program of the Republic of Armenia", adopted on November 27, 2006

[2] Narimanyan V., Deputy Head of the Water Resources Management Agency of the Republic of Armenia. "Integrated Water Resources Management in Armenia", Bucharest 2008, p. 2

[3] Source: https://www.armstat.am/file/doc/99489768.pdf , last accessed January 2023

[4] The table was compiled by the authors, by using the data of the article "Geographic characteristics of the RA" of Statistical Committee

[5] Source: https://www.armstat.am/file/doc/99489768.pdf , last accessed January 2023

Qari	3190	357 thousand m^3	0.3
Aighr	860	310 thousand m^3	0.03
Kaputan	3286	40.2 thousand m^3	0.1

The largest lake in the Caucasus, Sevan, is at the center of issues of water resources management in RA. Sevan has economic, environmental and strategic significance for RA. Water resources are mainly released from the lake for irrigation and industrial purposes. According to Law of the RA on approving the annual and comprehensive plans for restoration, preservation, reproduction and use of the Lake Sevan ecosystem, it is allowed to release up to 170 million m^3 of water from Sevan annually[1].

However, almost always more water than allowed is released from Sevan. For irrigation of the lands in Ararat Valley, more water is released from the lake than the prescribed amount. Through the Arpa-Sevan tunnel 157,447 million m^3 of water was transported to Sevan in 2021 (including underground flow), and water was released from the lake between May 25 and September 28 and amounted to 227,651 million m^3. These indicators speak of negative water balance.[2]:

Lake Sevan is surrounded on four sides by Areguni, Sevan, Vardenis and Geghama mountains. 28 small and big rivers flow into the lake, such as Argich, Masrik, Karchaghbyur, Vardenis, Gavaraget, Dzknaget, etc., and only one river, Hrazdan river, originates from lake. Hrazdan is 141 km long. Starting from Lake Sevan, it flows in the southwest direction, passes through the regions of Gegharkunik and Kotayk, the city of Yerevan, then through the region of Ararat and finally flows into the Araks River. Flowing southeast and exiting into Ararat Valley, the river becomes calmer and irrigates the Ararat Valley[3].

The inefficient and merciless use of Lake Sevan has led to a significant decrease in water resources. That kind of usage caused the deterioration of the lake's fauna and flora, as well as the whole ecological system. Before the artificial lowering of the lake's level, more than 80 % of the RA water resources (58.5 billion m^3) were reserved here, which is 5 times more than the surface water flow of the RA and about 35 times more than the water resources stored in the remaining reservoirs. The economy of RA, particularly agriculture, energy industry and the development of other branches is closely related to the use of water resources of Lake Sevan, especially its quantitative and qualitative characteristics[4].

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[1] Law of the Republic of Armenia "On approving the annual and comprehensive plans for the restoration, preservation, reproduction and use of the Lake Sevan ecosystem", adopted on December 14, 2001, HO-276, RAPT 2002.01.15/4(179), article 10, Point 5.1.

[2] VC, Environment and Natural Resources in the Republic of Armenia in 2021, Brief Profile of Hydrometeorological Conditions, p. 26

[3] Yeritsyan H., Book 1, Components of water ecosystems. Hrazdan river, page 4,

[4] Law of the Republic of Armenia "On approving the annual and comprehensive plans for the restoration, preservation, reproduction and use of the Lake Sevan ecosystem", adopted on December 14, 2001, HO-276, RAPT 2002.01.15/4(179), article 10, Point 1..

The total resources of lakes in Armenia are estimated at 39.3 million m^3. The rivers and lakes listed above are of great importance for irrigation of agricultural lands, development of industry and fish farming. Many reservoirs have been built for irrigation, energy and water supply purposes in the territory of RA. In particular, reservoirs fed by these rivers and lakes are of primary importance for irrigation. There are more than 80 reservoirs in RA. The total capacity of reservoirs is 1067 million m^3. 74 of those reservoirs have important hydro-ameliorative importance and the total volume is 973.7 million m^3. Akhuryan is considered the largest reservoir in Armenia: with the capacity of 525 million m^3. The second is the Spandarian reservoir, which is distinguished by its canonical aspect of the flow. Being close to the average flow of the river, the reservoir is able to perform multi-year regulation of the river flow[1].

Table 3

Reservoir volumes and water mirror surfaces[2]

Name of reservoir	Volume, million m^3	Water mirror surfaces, hectare
Akhuryan	525.0	4180
Spandaryan	257.0	1025
Tolors	96.0	480
Aparan	91.0	735
Azat	70.0	285
Djoghaz	45.0	230
Her-Her	26.0	115
Ketchut	25.0	135
Karnut	24.7	234
Geghi	15.0	35

Reservoirs are of particular importance for Armenia. They regulate the flow of mountainous rivers, collect melt water and rainwater to meet irrigation and energy needs, alleviate the dry microclimatic conditions of the country.

The Akhuryan reservoir was built on the Akhuryan River and irrigates the lands of Aragatsotn, Armavir and Shirak regions. The Spandaryan reservoir was built on the upper reaches of the Vorotan River. It is of great importance for Vorotan Cascade hydroelectric power plants, and also for raising the level of Lake Sevan. A part of the flow of the Vorotan River is transferred to Lake Sevan through the Kechut reservoir[3].

The reservoir of Tolors was built on the rivers Ayriget and Sisian. It serves to feed the Tatev and Shambi hydroelectric power plants and irrigates the lands of Syunk region. Geghi reservoir is also located in Syunik region, near Geghi village. It was built on the river Voghji. The reservoir was built as for energy production purposes, and later

[1] Chlingaryan L.A., Mnatsakanyan B. P., Aghababyan K. A., Tokmajyan H. V., "Hydrography of rivers and lakes of Armenia", Yerevan 2002,

[2] Source: https://www.armstat.am/file/doc/99489768.pdf , last accessed January 2023

[3] Gevorgyan A. , Evaluation of the stability of dams of large reservoirs in Syunik region, YSU, Collection of scientific articles, 2015. Proceedings of the annual scientific session. p. 23, Link: http://www.ysu.am/files/SSS_BookCollect_1_2016,%20pp.%2023-27.pdf ,

it was used for irrigation and reclamation purposes. The reservoir irrigates the lands of the Kapan region[1].

The Aparan reservoir was built on the upper course of the Kasakh River. It is used for irrigation and also for fish farming. The Azat reservoir was built on the middle course of the Azat River. The reservoir is also fed by springs, it is used for irrigating the lands of Ararat region. Joghaz reservoir was built in the middle stream of Joghaz River in Tavush region. The water from the reservoir is pumped to the Ijevan and Noyemberyan canals by water stations. This reservoir irrigates about 10 thousand hectare area. The Her-Her reservoir is located in Vayots Dzor, it was built on the Herheri River. The height of the dam is 74 m. The Kechut reservoir too is located in Vayoc Dzor, in the valley of the Arpa River. The reservoir serves to supply water to Lake Sevan with the help of the Arpa-Sevan aqueduct. Karnut reservoir is located in Shirak region, near the village of the same name. It is fed by the Karnut, Jajur and Akhuryan rivers, the total annual flow of those is 27.26 million m^3, and it receives a very small amount of water from its own catchment. It was built during the Soviet Union for the purpose of irrigation. The reservoir irrigates the lands of Akhuryan, Artik and Ani regions, about 7000 hectares. Irrigation is carried out through the Aigabac and Shirak canals, the 15th divider and the Artik water station[2].

In addition to the above-mentioned ones, the reservoirs of Arpi Lake, Marmarik, Yerevanyan Lake are also of key importance for RA economy. The Arpi Lake reservoir is located on the Akhuryan River. The lands of Shirak Field and Verin Akhuryan are irrigated with water from this reservoir. Talin and Armavir canals also receive water from this reservoir. It should be noted that this reservoir has a tectono-volcanic origin, that is, it is a natural reservoir, which was artificially enlarged in 1951 in order to accumulate more water resources. Thanks to that expansion the surface of the Arpi reservoir reached 22.1 km^2, the volume reached 110 million m^3 (instead of former 5 million m^3). It can be concluded that in 1956 Lake Arpi was artificially turned into a reservoir. That is how "Arpi Lake" National Park was created[3].

Another important reservoir for irrigation is the Marmarik reservoir. It was established on the Marmarik River, in Kotayk region. The reservoir has a dam with the height of 55 meters; the total volume is 24 million m^3. Reservoir water is used mainly for irrigation, hydropower and industrial purposes[4].

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[1] Gevorgyan A. , Evaluation of the stability of dams of large reservoirs in Syunik region, YSU, Collection of scientific articles, 2015. Proceedings of the annual scientific session. pages 24-26, Link: http://www.ysu.am/files/SSS_BookCollect_1_2016,%20pp.%2023-27.pdf

[2] Benoyan, L.H., Grigoryan, A.F., Arakelyan, A.S., Pipoyan, S.Kh., (2020) The modern fish world of the Karnut Reservoir (Shirak Marz, Armenia). Biological Journal of Armenia, 72 (3). pp. 10-15. ISSN 0366-5119,

[3] Annex to the RA Government Decision No. 1854-A of December 22, 2011, "Arpi Lake" National Park Management Plan for 2011-2015, p. 28-29
Link: https://www.e-gov.am/u_files/file/decrees/kar/2011/12/11_1854_1.pdf

[4] Stepanyan L.G., Qualitative, quantitative indicators of phytoplankton coexistence and ecogeographic characteristics of the Marmarik River, Biological Journal of Armenia 3(71), 2019, p. 32-33

Marmarik reservoir is the only reservoir built during the period of independence. The construction of the reservoir was a big event in the field of water resources usage, because with the help of this reservoir, it was possible to reduce the released water from Lake Sevan by nearly 20 million m^3. In addition, the Marmarik reservoir provided an opportunity to irrigate area of 1055 hectares.

In 1970, Yerevanian Lake artificial reservoir was built to regulate the flow of the Hrazdan River and usage of its waters. The volume of water is 4.8 million m^3. This reservoir is also used for irrigation purposes. Irrigation water is released through a floor drain[1].

Reservoir construction projects are of vital importance for effective management of RA water resources. In this regard, the recently restored and reconstructed Marmarik reservoir with a total volume of 24 million m^3 is of great importance. Currently, the reservoir construction works of Vedi, Kapsi, Yeghvard and Marmarik have been initiated in order of priority. It is planned to build a 25 million m^3 dam junction in the Kapsi reservoir for the first stage. The dam will be built in such a way that in the future it will be possible to raise it so the volume of the reservoir will reach to 60 million m^3. The total duration of the construction works will last for 5 years and it will allow covering more than 5 thousand hectares of new irrigated areas, as well as improving the water security of the currently irrigated areas[2].

In the first phase, the dam junction of Kapsi reservoir is planned to be built for the volume of 25 million m^3. The dam will be built in such a way that it will be possible to raise it in the future, increasing the volume of the reservoir to 60 million m3. The total duration of the construction works will be about 5 years and it will allow covering more than 5 thousand ha of new irrigated areas, as well as improving the water security of the currently irrigated areas.

The Vedi reservoir is being built in Ararat region, on the Kututs floodplain on the right bank of the Vedi river, and the free/flood flow of the Vedi and Khosrov rivers are the source for filling this reservoir. “The Vedi reservoir and irrigation system construction” project includes the construction of 29.4 million m^3 Vedi reservoir dams, supporting structures, water intake junctions on the Vedi and Khosrov rivers, water transportation system, irrigation system (about 37 km long pressure pipeline) and irrigation in pilot areas, design and construction works of new intra-farm irrigation network (with the possibility of using new technologies). The project "Construction of Vedi reservoir and irrigation agreement" started in 2017 with the loan funds of the French Development Agency (AFD) and the co-financing of the RA Government. The project also includes the construction of an intra-farm irrigation network which starts from the irrigation system and reaches to individual farms (in pilot areas)[3].

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[1] Kobalyan H.H., Evaluation of the ecological and sanitary condition of Yerevan Lake and Akhpara Reservoir, Biological Journal of Armenia, 3(70), 2018., p. 88-89

[2] Source: https://www.scws.am/am/information , last accessed February 2023

[3] Source: http://env.am/storage/files/modul-2-2023.pdf , last accessed December 2022

The decision to build the Mastara reservoir was made in order to manage the mudflows of the Selav Mastara River and store that water. With this reservoir, it is planned to irrigate 4384 hectares of lands, which are located in Myasnikyan, Lukashin, Hatsik, Khanjyan, Norapat and Noravan communities. Currently, 3708 hectares of land are actually irrigated here, and 675 hectares are not irrigated due to water scarcity and irrigation difficulties[1].

The construction of the Yeghvard reservoir is of particular importance. It will not only improve the irrigation process of the region, but also reduce the release of water volumes from Lake Sevan. The construction of the reservoir started in the 1980s and has not been completed until now due to lack of funds. It is planned to build the reservoir with a volume of 90 million m^3 [2].

In addition to the construction of a new reservoir, special attention should be paid to the technical condition of existing reservoirs, as well as the availability of treatment plants for those reservoirs. For example, in Armavir region, the sewage in the area of the Metsamor treatment plant leaves the sewer collector without cleaning and disinfection and fills the adjacent areas and open reservoirs, creating a great risk of spreading infectious diseases. Within the framework of the grant program for the restoration of water supply and drainage infrastructures supported by the German Development and Neighborhood Investment Bank of the European Union, the construction of a wastewater treatment plant operating on the pond principle, the rehabilitation of the sewage pumping station, the collector, and the sewer network is planned, which will allow the implementation of wastewater treatment in the cities of Armavir and Metsamor and the community of Norapat[3].

Other regions of RA, where sewer lines are connected to flowing rivers and reservoirs, also feel the need for similar measures. Sewage flowing into rivers and reservoirs is a great threat to environment. There is a high risk of rise of infectious diseases especially in the summer months.

The scientific novelty of this article lies in the fact that based on the studies of author and recorded patterns, the ways for improvement of the usage and conservation of irrigation water in Armenia were identified and substantiated, the application of which will have a beneficial effect on efficient water use in Armenia.

Conclusions. Thus, conducting studies on water resources of RA, particularly irrigation water, the following conclusions were made:

- The surface flow is distributed very unevenly, both by geographical areas and different years. Scarcity of irrigation water, harsh dry climate conditions have a negative impact on agriculture. During the cultivation season, there is a shortage of

[1] Khachatryan E. H., Namatyan N. T, Justification of the choice of dam type and construction of the Mastara reservoir, National University of Architecture and Construction of Armenia, 2019, Part 1, p. 54-62

[2] State Committee for water management, draft of the final report of the preparatory survey of the Yeghvard irrigation system improvement project, 2016, p. 4

[3] Source: https://www.scws.am/am/credit-programs, last accessed February 2023.

water for crop irrigation in the Ararat Valley, which can be filled by regulating river flows and building reservoirs. In addition, due to the large bends of the rivers in Armenia, the potential energy of water increases dramatically in the spring months, which causes annual flooding and inundation of agricultural lands. Currently, in the rivers, that have reservoirs in the upper reaches, the destruction of the coastal areas has significantly decreased (Azat, Vorotan, Akhuryan, Kasakh and other rivers).

- Agriculture in Armenia depends on irrigation. The water of Lake Sevan is also used for irrigation purposes. According to the decision of the Government of the RA, the annual water discharge from the lake is set at 170 million m^3; unfortunately this amount is not maintained. In 2021, the release of water from Lake Sevan amounted to 227.651 million m^3. It is necessary to establish a strict control in order not to exceed the permissible limit.
- More than 80 reservoirs have been built in RA for the undisturbed operation of irrigation, 6 of which are for energy-production purposes, the rest are for irrigation. Reservoirs are of particular importance for RA. They regulate the flow of mountain rivers, collect meltwater and rainwater to meet irrigation and energy needs, alleviate the dry microclimatic conditions of the country. The construction of reservoirs mentioned in the article will not only contribute to the improvement of irrigation, but will also help to manage water resources effectively.
- Apart from the construction of the mentioned reservoirs, it is also important to ensure the construction of the treatment plants of the existing reservoirs. As well as carrying out an assessment of the technical conditions of the reservoirs (checking the strength of the reservoirs, analysis of water level and volume, depth, pollution level).

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Մերի Համբարձումի Մուրադյան
Հովհաննես Սիմոնի Ասատրյան

Համառոտագիր: Հոդվածում ներկայացված է ՀՀ ջրային ռեսուրսների օպտիմալ կառավարման կարևորությունը ոռոգման իրականացման գործում, որով էլ պայմանավորված է աշխատանքի **արդիականությունը:** Առաջնային ուշադրություն է դարձվել Հայաստանի ամբողջ ջրային պաշարների վերլուծմանը, Սևանա լճի ջրային պաշարների խնայողաբար օգտագործմանը, ոռոգման համար ջրային ռեսուրսների արդյունավետ կառավարմանը: Հոդվածում **նպատակ է** դրվել մշակել Հայաստանում ոռոգման ջրի օգտագործման, պահպանման բարելավմանն ուղղված առաջարկություններ: Նպատակին հասնելու համար **խնդիր է** դրվել վերլուծել ՀՀ ջրային ռեսուրսների օգտագործման վիճակը, ուսումնասիրել Հայաստանում ոռոգման համակարգի առանձնահատկությունները, բացահայտել ոռոգման ջրի օգտագործման և պահպանման բարելավման ուղիները:

Հայաստանում ջրային ռեսուրսների կառավարման վիճակագրական, վերլուծական մեթոդների հիման վրա կատարվել են վերլուծություններ, որոնց արդյունքում պարզ է դարձել, որ հանրապետությունում առկա է ջրային պաշարների բավարար քանակություն, և հիմնական խնդիրը կապված է այդ պաշարների արդյունավետ պահպանման և օգտագործման հետ:

Իմի բերելով աշխատանքում կատարված ուսումնասիրությունները՝ նշենք. ինչպես շատ երկրներում, այնպես էլ Հայաստանում գյուղատնտեսությունը կախված է ոռոգումից: Այս գործընթացի օպտիմալ կառավարման համար ստեղծվել և ստեղծվում են ջրամբարներ, որոնք կարգավորում են լեռնային գետի հոսքը, հալոցքաջրերը ու անձրևաջրերը կուտակում են ոռոգման և էներգետիկ կարիքները հոգալու նպատակով:

Հոդվածի գիտական նորույթը կայանում է նրանում, որ հեղինակի կողմից կատարված ուսումնասիրությունների և առկա օրինաչափությունների հիման վրա բացահայտվել և հիմնավորվել են Հայաստանում ոռոգման ջրի օգտագործման և պահպանման բարելավման ուղիները, որոնց կիրառությունը իր բարենպաստ ազդեցությունը կունենա ՀՀ-ում ջրային ռեսուրսների ավելի արդյունավետ օգտագործման վրա:

Հոդվածում համակարգված տեսքով ներկայացված է Հայաստանի ջրային ռեսուրսների վիճակի վերլուծությունը, հիմնավոր է համարվել այն եզրահանգումը,

որ Հայաստանում ջրային ռեսուրսները տեղաբաշխված են անհավասարաչափ կերպով և ոռոգման անխափան աշխատանքի համար առանձնակի նշանակություն ունեն ջրամբարները:

Բանալի բառեր. ազգային ջրային պաշարներ, ջրային ռեսուրսներ կառավարում, ջրամբարներ, գետային հոսք, ոռոգման համակարգ, Սևանա լիճ:

УПРАВЛЕНИЕ ВОДНЫМИ РЕСУРСАМИ РА В ПРОЦЕССЕ ОРОШЕНИЯ

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Аннотация. В статье представлена важность оптимального управления водными ресурсами РА при осуществлении орошения, чем и обусловлена актуальность статьи. Основное внимание было уделено анализу всех водных ресурсов Армении, экономному использованию водных ресурсов озера Севан, эффективному управлению водными ресурсами для орошения.

Целью статьи является разработка рекомендаций по совершенствованию управления водными ресурсами на основе изучения использования и охраны водных ресурсов в Армении, в частности поливной воды. Для достижения цели были поставлены задачи:

- проанализировать состояние использования водных ресурсов в Армении
- изучить особенности управления ирригационной системой Армении
- определить пути улучшения использования и сохранения оросительной воды.

Были проведены анализы на основе статистических и аналитических методов управления водными ресурсами Армении, в результате которых стало ясно, что в республике имеется достаточное количество водных ресурсов, и основная проблема связана с эффективным сохранением и использованием этих ресурсов.

Подводя итоги исследованиям, проведенным в работе, отметим: как и во многих странах, сельское хозяйство в Армении зависит от орошения. Для оптимального управления этим процессом создавались и создаются водохранилища, регулирующие сток горных рек, собирающие талые и дождевые воды для ирригационных и энергетических нужд.

Научная новизна данной статьи заключается в том, что на основе проведенных автором исследований и закономерностей были выявлены и обоснованы факторы, направленные на улучшения управления водными ресурсами Армении, применение которых благотворно скажется на развитии водопользования в Армении, особенно ирригационной системы.

В статье в систематизированной форме представлен анализ состояния водных ресурсов Армении, обоснованным считается вывод о том, что водные ресурсы распределены в Армении неравномерно и водохранилища имеют особое значение для бесперебойной работы орошения.

Ключевые слова: национальные водные ресурсы, управление водными ресурсами, водохранилища, речной сток, оросительная система, озеро Севан.

RA WATER RESOURCES MANAGEMENT IN THE IRRIGATION PROCESS

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Abstract. The article presents the importance of the optimal management of the water resources of the RA in the implementation of irrigation, which determines **the relevance** of the article. The main attention was paid to the analysis of all the water resources of Armenia, the economical use of the water resources of Lake Sevan, the effective management of water resources for irrigation. **The purpose** to develop recommendations for improvement of the usage and conservation of irrigation water in Armenia. To achieve this goal, **the problems** were set to analyze the state of the usage of water resources in RA, to study the features of the irrigation system in Armenia, to determine ways to improve the usage and conservation of irrigation water. Analyzes were carried out on the basis of statistical and analytical methods of water management in Armenia, as a result of which it became clear that there is a sufficient amount of water resources in RA, and the main problem is related to the effective conservation and usage of these resources.

Summing up the research, we conclude: as in many countries, agriculture in RA depends on irrigation. For optimal management of this process, reservoirs have been created and are being created which regulate the flow of mountainous rivers, collect melt water and rain water for irrigation and energy needs.

The scientific novelty of this article lies in the fact that based on the studies of author and recorded patterns, the ways for improvement of the usage and conservation of irrigation water in Armenia were identified and substantiated, the application of which will have a beneficial effect on efficient water use in Armenia.

The article presents the comprehensive and systematic analysis of the state of water resources in Armenia, and concludes that water resources are distributed unevenly in Armenia and reservoirs are of particular importance for the undisturbed operation of irrigation is considered reasonable.

Keywords: national water resources, water resources management, reservoirs, river flow, irrigation system, Lake Sevan.