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THE ROLE OF QANAT IN THE WATER SUPPLY SISTEM OF AZERBAIJAN

Abstract. Multifaceted irrigation systems were created in the territory of Azerbaijan. The most valuable inventions of humankind is the qanat (kahriz), an artificial irrigation system. Designed to transport water from mountainous areas, the qanat system expanded alongside the development of urban culture. In addition to enhancing the aesthetic appeal of cities, it also played a crucial role in their social planning. Artisan workshops were located near qanats, suburban gardens and fields were planted.

The qanat system is an indicator of the formation of agriculture, sedentary life and urban culture in the country. Archaeological excavations in recent years have confirmed that the qanat system became widespread in Azerbaijan mainly after the Arab invasions. In Nakhchivan, Karabakh, Ganja, Gazakh, qanats are no longer in use. Ethnographic studies show that elements of qanat culture have been preserved in some cities (Ordubad etc).

The main purpose is studying the ancient water supply system and investigation the lifestyle and cultural heritage. The study involved an analysis of the kahriz system in several cities, emphasizing its significance in the daily lives of local communities. Along with ethnographic observations, surveys were conducted among the population. The article used medieval sources, works of European authors and modern research.

Key words: Azerbaijan, irrigation system, water, kahriz, Karabakh, Ordubad.

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Introduction

Qanat plays an important role in distributing water to arid areas without evaporation and loss. Through this system, underground water was brought to the fore, thereby irrigating agricultural fields in arid places and running mills. If we take into account that in the future there is a danger of humanity facing a water shortage, the importance of qanat increases again.

Qanat is a water supply system that ensures the removal of underground water to the surface and delivers water to long distances. If the water evaporates during

the surface flow, this process is prevented because the water channel in the qanat is underground. Bringing fresh water from the highlands and foothills to the plains also prevents soil salinization. When the water obtained by the qanat system is brought from a long distance, the rinsing process is carried out by itself, and since it flows from a considerable depth from the surface of the earth, its temperature also remains unchanged (Gasimov, 2002, 119).

During wars, qanat wells were strongly protected. During the war, the enemy easily poisoned the surface water (river, lake, canal, etc.), but the channel of the river could be protected due to its underground location. During floods, rainstorms and other natural disasters, qanats were considered the most reliable source of water. The long-distance construction of trenches is sometimes connected with security: the enemy should not know from which direction the water comes to the fort. According to historical facts, most of the qanat were brought to the surface near mosques and fortresses (Morteza, 2534: 180). It was covered and tightly protected so that it would not fall into the hands of the enemy or be contaminated. Keeping the canals clean was considered an important condition for settling in the city.

Although the excavation of the canal requires a lot of labor, the service life lasts for centuries, and its technical maintenance later requires little money. It is said that the five generations of the qanat digest inherit the profit from the water.

According to the people's thinking, everyone shares in the use of water, fire and wild grass, and selling water is considered a haram act. The people believe that water was the dowry of Hazrat Fatimah (A) and she was able to grant the use of water and made it lawful for everyone. In the past, people valued water and land more than gold, silver and other valuables. It is known from historical documents that it was intended to sell not the water itself, but the area through which it flows. Ownership of water and land was passed down from generation to generation, and each family could inherit a permanent income from them. From this point of view, in the Middle Ages, qanat, like land, were also given dowry when the kabin was closed (Birjendi, 2006: 241, 235, 211, 141, 27).

The vital importance of water led to beliefs and trials about it, water was even sanctified. Water was worshiped, water was sworn to, water was offered by those who needed it, and at the same time, the owners of qanat distributed alms from its water.

Materials and methods

The article refers to the results of historical ethnographic field studies, historical sources and research works. Qanat culture in Azerbaijan is studied using historical comparison, scientific analysis and descriptions.

The article gives a brief overview of the history of qanat existing in Azerbaijan, as well as in the world, excavation of qanat, social function, practical importance, distribution of qanat water, current technical condition of qanat in Azerbaijan, in short, qanat culture is studied on the basis of historiography and field-ethnological materials.

Discussion and results

In early times, settlement took place in areas close to natural water sources, and over time, when the population began to live in arid places as a result of growth, they were forced to create an artificial irrigation network. Due to the demand for

drinking water, the development of farms and trade, the means of water supply have increased and improved. According to the researchers, the technique of digging qanat dates back to 5-6 thousand years ago (Kiani, 1960: 45). This type of irrigation has existed in Azerbaijan since ancient times. Some researchers note that the kahriz system was used in the 5th century BC (Gasymov, 2002, 53). It is known from the cuneiform inscriptions that Sargon II encountered the qanat during his attack on Manna. B.C. In 550, when the Achaemenids defeated the Mada (Median) state, they first besieged Ekbatana and blocked the water flow of the river, thus the capital surrendered (Nadji Mehdi, 1973:939). Archaeological and written sources prove that the qanat culture, which began to expand during the Achaemenid period, spread to larger areas during the Caliphate.

In the Middle Ages, along with agriculture, the development of trade also influenced the qanat culture and their use increased in large commercial cities. If we look at the areas crossed by the Great Silk Road, it is noticeable that the number of qanat has increased.

The peoples living in the South Caucasus, the Iranian plateau, the west of Asia and other arid areas have used the water of the qanat for centuries, and the population density has changed depending on the presence of the qanat. Qanat culture has spread from the Iranian plateau to the South Caucasus, Asian countries (Arabia, Syria, Jordan, Afghanistan, Pakistan, Turkmenistan, China (Turfan depression), etc.), North Africa (Egypt, Algeria, Libya, Morocco, Tunisia, etc.), Europe (Spain, Italy, Greece, etc.), and even to America (Mexico, Peru, Chile, etc.).

The oldest qanat in the world is the 2700-year-old Gonabad qanat in Iran. Iran's qanat, which are currently in operation, are included in the list of UNESCO's cultural heritage.

The qanat system was created in Spain during the Arab invasions. Two large aqueducts located in Madrid “Viage de Alcubilla” and “de la Castellana” supplied the city with drinking water (Brown, 1974:11). The canal system was considered the main means of water supply in Spain until the 19th century. The spread of Spanish culture in Latin America led to the presence of the qanat system in these areas.

The initial version of the word “Kahriz” was “kuhriz” (in Persian “kuh” means mountain, “riz” means flowing, i.e. “flowing from the mountain”), and later it took the form of “kahriz”. It is called “kariz” or “ganat” in Iran, “karez” in Afghanistan and Pakistan, “paralysis” in Arabia, “foggara” in North Africa, “khettara” in Morocco, “galerias” in Spain, “ganat” in Malta, “puguios” in Peru. Although the qanat system is called differently in different countries, it has the same construction characteristics from a technical point of view.

The qanat system played an important role in the water supply of Azerbaijani cities throughout the Middle Ages. From the archaeological excavations conducted by prof. Tarikh Dostiyev, the remains of qanat were discovered in the construction layer of the 9th-10th centuries in the rabad area of the city in Shamkir (Dostiyev, 2015: 91). The walls of the qanat are made of baked bricks. According to the professor, the use of qanat in the medieval cities of Barda, Ganja, Baku, and Tabriz for water supply has been fully confirmed in archaeological excavations (Dostiyev, 2015: 91).

A 10th-century qanat tunnel and three wells were discovered in the Salbir settlement of Gabala. The depth of the wells

is increasing. According to the conclusion of archaeologist Jeyhun Eminli, the water flow was regulated by deepening the tunnels from north to south and southwest (Eminli, 2013:81).

The qanat system found in archaeological excavations is also confirmed in written sources. The fourteenth-century author Hamdullah Mustofi writes in his work "Nuzhat al-gulub": "There are many gardens in the city of Tabriz. Its water is the Mehranrud River, which comes from the Sahand Mountains. Wealthy owners (landlords - I.M) have more than 900 plots. Only the Zahid qanat at the Ray gate and the Zafaran qanat at the Narmiyan gate have the owner of these qanats and the river. River water is better than qanat water, and qanat water is better than well water" (Mustofi, 2010: 88). Academician A.Alizadeh writes in this regard in his work dedicated to the period of XIII-XIV centuries: "It can be said with certainty that no city in Azerbaijan, nor in neighboring countries, has had as many kahrizs as Tabriz" (Alizadeh, 1956: 41).

Mohammad ibn Hindushah, who lived in the 14th century, gives an explanation of qanat in the "Sahahul-fors" dictionary of Nakhchivani (Nahchivani, 2535: 129).

In European memoirs, information about qanat is found. In the "Safarnama" of the Venetians, the process of digging a canal starting from the river is explained in detail:

They dig a hole near the river and continue digging from there. They dig the layers of the earth to the depth they intended and bring the water to the surface of the earth. After digging 200 steps starting from this ditch, they dig a well like the previous well. Thus, water moves from one well to another. As soon as this work is completed, they direct the course of the well to the river and deliver it to their cities. If they want, they can drain the water from the foot of the mountain to the qanat. If they do not do so, they will not find a place to live (Sefernamehaye, 2002: 87).

Despite the change of centuries, qanat did not lose their practical importance, on the contrary, they expanded even more. In some cities, qanat was even dug under the river. According to the 19th century author Nadir Mirza Qajar, a qanat line was built under the Ajichay flowing from the north of Tabriz to the village of Nahand, and the inside of the qanat was strengthened with large stones, lime and baked bricks to prevent river water from leaking (Mirza, 1981:62).

Y.E.Polak, a Jewish physician and ethnographer who lived in the 19th century, explained the process of digging qanat and their function in his research on the Qajar period, and wrote that irrigation of fields is carried out in different ways: 1. Kahriz; 2. Division and separation of river water; 3. Dams; 4. Wells (Polak, 1865: 118). As it can be seen, the author shows qanat in the first place as the main means of irrigation and emphasizes their importance.

As mentioned in the sources, kahriz as a source of water was the main condition of settlement. A number of settlements in Azerbaijan - Nakhchivan, Ordubad, Shamakhi, Baku, Ganja, Shusha, Lahij, Basgal and other places had such an ancient form of water supply (Nasirli, 1981: 92). In the Middle Ages, the Shah Khahrizi was active in Baku. In the second half of the 19th century, two more qanat lines were built in Baku (Amanzadeh, 2016: 102). Elderly informants in Baku villages talk about covered qanat.

In Ordubad, Nakhchivan and other cities there are qanats that are hundreds of years old and are still in working condition.

Until recently, the people of Ordubad kept watermelons, melons and other fruits, fried food, cheese, butter and food in general in the spring because it was cool. During the Soviet era, it was forbidden to store meat in the fountain and use soap there. Since the spring water had a specific taste in the rain and when the snow melted, they filtered it through stones. At present, those large stones remain in yards in Ordubad city.

Ganja and its surrounding areas are also notable for the number of qanat. According to the researcher F.Ahmadov, there were 97 qanat used by 25 villages in Ganja district, 30 of which fall within the territory of Ganja city (Ahmedov, 2007: 96). In 2024, when we were on an ethnological trip to Ganja, it became clear that the last river, whose source was taken from Kizilgaya, flowing on Dal Ozan street (now Ismat Qayibov street, Shahsevenler neighborhood) was closed in recent years.

Before the occupation of Karabakh by Armenia, there were hundreds of working kahriz in this region. After the liberation of our lands from the occupation, only one of the 67 qanat (Shahbulag qanat) remained in the territory of Aghdam. In addition, the rehabilitation of the qanat has started in the liberated territories (Aghdam, Jabrayil, etc.).

In the villages of Yukhari Goyceli, Ashaghi Goyceli, Kochasgar and Qirili of Aghstafa district, there are still working qanats.

In addition to the mentioned areas, kahriz was also recorded in the Lankaran-Astara region. Different from Karabakh and Ganja-Shamkhor (Shamkir - I.M) qanat, the kahriz in the Zuvand area of erik was 1300 m above sea level, and its wells were located 15-20 m apart (Guliev, 1972: 56).

In addition to the word "Kahriz", the people call the place where the water comes to the surface as "Cheshmeh", and the wells as "Gozeh" (which means "eye of the fountain"). In some places, since the spring water flows from the depth of the earth, 40 steps have been built in an inclined manner to reach it. Such fountains are called "centipede". Among the people, the head of the spring is called "gura", and the springs with little water are called "zina bulag". The wells, called "goze' among the people, were considered the way to the spring of the river.

Since qanats (kahriz) are widespread, they are also reflected in toponyms. According to ethnological studies, Kahrizli village of Goranboy district and other settlements were formed after the emergence of Kahriz. It is interesting that there are many toponyms associated with the word "Kahriz" in Iranian Azerbaijan: Kahriz village in Sulduz, Abbas kahriz village in Khiyav, Kahriz village in Urmiya (Panahiyan, 1972 (a): 90, 770, 779), Nazar kahriz village near Tabriz, three villages named "Kahriz" near Ardabil and Gudekahriz village. Kahriz village in Miyana, Kara kahriz village in Khoy, Kahriz village in Maraghada, Incabash kahriz and Kara kahriz villages in Makuda (Panahiyan, 1972 (b): 150, 161, 281-282, 288, 353, 417, 655), Sukahriz village in Zanjan, Kara kahriz village in Khamna etc. place names are found.

In the past, because communication tools were weak, women mostly gathered and met in mosques, baths, and family gatherings. However, in neighborhoods or villages where public places are a minority, women would gather at the fountain to wash clothes and fetch water, where they would learn from each other about various topics (Mammadova, 2016: 232). Even if water was not needed, it was considered

important for women to go to the qanat every day to see each other and hear the news of the day. If by chance a woman did not go to the qanat one day, she would say in the morning that we could not go to the desert today, we did not know about the world (Mirhidayat, 1992:3). Thus, the internet, which is today's main means of information, was replaced by qanat for women in the past. In addition, bazaars, mosques, squares, and teahouses were considered the main information spaces of the society.

The qanat system consists of a main line dug from the main source and auxiliary wells for its periodic cleaning and underground springs for water extraction. Special kenkan gangs, consisting of workers called "kankanbashi", "kankanchi", "charkhchi" and "dolkesh", were engaged in digging qanat. He inherited the farming profession. If small pits were dug in a month by one miner and 2-3 skilled workers, deep and long pits sometimes took years with the participation of a crew of more workers. The period of complete preparation of the trenches varied depending on the geographical conditions (excavation depth, soil softness, etc.).

Some faiths and tests were also observed when the qanat was digged. According to belief, before starting the excavation, they prayed and did not go to work on holy days.

Kankans used special tools for digging qanat - winding-wheel, kulung, felt belt (chalov), dol, hook, rope and shoulder sling (Guliyev, 2008: 15). In addition, axes and shovels, leather bags, pots and ropes were needed to lift and transport the soil. A means of illumination was also essential for advancing in the underground tunnels. In order not to suffocate, low-smoke lamps, mainly beeswax were used. Castor oil was also poured into the lamps because the fire was burning.

Construction works were being carried out so that the walls along the underground tunnel did not collapse and the water flow could not wash away the soil and block the road. The mud, consisting of a mixture of clay and straw, was kept in the air for 3 days, and then it was used in construction.

There were several methods of digging trenches. Underground tunnels were typical for flat terrain with soft soil. In the mountainous terrain, mountains and rocks were carved. The depth of the canal lines was different depending on the relief of the area they crossed, which ensured that the water flowed to the right place.

Usually starting from a water source in a mountainous area, the tunnel is dug at a slight incline and the water flow is ensured by the gravity of the earth without the need for any pumping equipment. Several wells are dug along that inclined tunnel, and through them, water is efficiently distributed to different areas without evaporation. In the upper reaches, the water is denser and cooler. In some cases, during the night, qanat water was discharged into the reservoir with earthen tubs and stored for reserve.

It is clear from the ethnological data that the humidity of the soil, as well as the dew that fell on the plants, determined that the area was suitable for the excavation of qanat. The initial survey started from the mountainous area and continued towards the foothills, the direction of underground water flows was followed. The kankan group was the first to determine the place to be dug. Based on experience, it was determined that if the sample of grass indicating the presence of water in that place - reed, sedge, etc. if they were found, a well would be dug here - they would

be tapped (Guliyev, 1985:30). The depth of the water source was determined by a well with a diameter of approximately 1 m. The soil was lifted up by two men using a cowhide shovel and emptied near the well. The excavation of the well continued until watery soil appeared. If there was no water source in the place being dug, a new well was dug in another place.

When starting the excavation, there was a fear of facing a number of obstacles - rock, strong gas flow, water pressure, etc. They paid attention to the burning lamp during work. Because when there was no oxygen in the well, the lamp went out first. If any smell was felt in the well, they put vinegar and chopped melon there. When reaching the source of water and connecting the main well with the others, sometimes the water gushes out suddenly and the kankan could die. Preventing accidents required competence and experience from the kankan. Emphasizing the hard work of kankans, E.Polak emphasizes that landslides rarely occurred and kankans were killed. Since this profession was dangerous, their wages were higher than others...the construction of the earth required a large amount of money. This amount was paid by private enterprises, in large cities by the state, and in religious centers from foundation property (Polak, 1865: 118).

Wells were dug about 30-40 meters along the underground sewer, sometimes every 100-150 meters. While digging the qanat, attention was paid to the height ratio of the wells along the underground flow of water. They were dug about 10-20 meters deep. Because if the wells were too shallow, the flow of water would be weakened, if they were dug too deep, subsidence might occur, and there might be a danger for the kankans in the work process. The number of these wells (sometimes up to 200) varied along the length of the canal. When the end of the aqueduct reached the watercourse in the mountain, the water flowed directly through the river. Auxiliary lines were also connected to the main line of the canal. River stones and baked bricks were mainly used in kahriz weaving.

A special substance was applied to water reservoirs, earthen pipes and pools for strength and watertightness. Limestone was baked in kiln, after it cooled, it was beaten and passed through a sieve, and olive or castor oil was poured over it. To make it stronger, eggs and milk were added to the lime and mixed. A little vinegar was added to the water to dissolve the lime.

According to medieval sources, wells were dug in Tabriz 30 feet deep (10 feet in Sham-Gazan, 70 feet in Rab-Rashid) (Mustofi, 2010: 88). In separate areas, qanat wells (wells) with different depths were dug a little deeper than the in order to keep the sediment. In addition to providing air exchange, thanks to these holes, the inside of the water line was periodically cleaned of silt. For this purpose, rituals were held.

In order to enter the well, i.e., the hole, footholds were placed on its walls. Sometimes when a big flood came, it found its way to the wells and submerged the qanat. The kankans built a wheel-wheel (dola-charkh) at the head of each well and emptied the slimy mud. The tunnel is usually made of limestone and baked bricks. The strength of the canals and earthquake resistance was considered an important condition. Dams could collapse during strong earthquakes. As a result of the earthquake that occurred in Qazvin (IIR) in the fall of 1962, a large part of the river was destroyed (Braun, 1974:12).

In the 19th century, in South Azerbaijan (Tabriz, etc.), there were famous qanat

digging masters, specialized kankan groups. They were even invited to work for wages in different regions of the Caucasus. According to the ethnographer G. Rajabli, the qanat diggers were kankan gangs from Iran-Azerbaijan. Their wages were paid in kind and money, depending on the negotiation and agreement. The cost of digging and repairing the canals was borne by the village community, neighborhood residents or individual entrepreneurs who use its water (Rajabli, 2007:30).

Once a year, on the eve of Nowruz holiday, residents turned to kankans to clean the qanat. According to informants, at the end of the 19th century and the beginning of the 20th century, master Mahammadhasan was a well-known kankan in Ordubad city. In the last century, a craftsman nicknamed "Professor Hamid" became famous in the city. It should be noted that at present, the kankan profession has become a thing of the past, and workers are engaged in the repair and restoration of qanat under the supervision of engineers and technologists.

Conclusion

The qanat system, which has been formed since ancient times in different areas of the world, including Azerbaijan, is an indicator of the formation of agriculture, sedentary life and urban culture in the country. Recent archeological excavations in Azerbaijan have confirmed the spread of the qanat system mainly in the period after the Arab invasions. Qanat, one of the important inventions of mankind, were used for both drinking and irrigation purposes in a number of areas (Ordubad, Nakhchivan, Karabakh, Ganja, etc.). In the cities, there are water reservoirs, ice houses, mosques, baths, saggakhanehs (a public drinking-places), etc. it was provided with water from qanat.

Fig.1. Qanat in Ordubad sity (Azerbaijan) (Photo belongs to the author). 2023

Fig.2. Qanat in Ordubad sity (Azerbaijan) (Photo belongs to the author). 2024

Studies show that the qanat culture still exists in Azerbaijan and is currently partially important in meeting the population's water needs. If we take into account the future water shortage problem of the world, including our country, the practical importance of qanat is high, and in this regard, their repair and restoration is important.

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ӘЗІРБАЙЖАННЫҢ СУ ЖҮРГІЗУ ЖҮЙЕСІНДЕГІ КӘРІЗДЕР

Аңдатпа. Әзірбайжан аумағында көпқырлы суару жүйелері жасалған. Адамзаттың ең құнды өнертабыстарының бірі – жасанды суару жүйесі болып табылатын қанат (кәріз) жүйесі. Негізінен суды таулы аймақтан басқа жерге тасымалдауды қамтамасыз ететін қанат жүйесі қалалық мәдениеттің дамуына байланысты кеңінен таралған. Қалаларды көркейтуге ықпал еткен бұл жүйе олардың әлеуметтік жоспарлануына да әсер етті. Қанаттардың маңында шеберханалар орналасып, қала маңындағы бақтар мен егістік алқаптары жасалған. Ежелгі дәуірден бері әлемнің түрлі аймақтарында, соның ішінде Әзірбайжанда қалыптасқан қанат жүйесі елдегі ауыл шаруашылығының, отырықшы өмір салтының және қалалық мәдениеттің даму көрсеткіші болып табылады. Соңғы кезеңдерде Әзірбайжанда жүргізілген археологиялық қазбалар қанат жүйесінің кеңінен таралуы негізінен араб шапқыншылығынан кейінгі кезеңге тиесілі екенін дәлелдеді. Нахчыван, Қарабақ, Гәнжа, Газах және басқа да аймақтарда қанат жүйесі кеңінен таралғанымен, олардың көбісі қазіргі уақытта пайдаланылмайды. Дегенмен этнографиялық зерттеулер кейбір қалаларда (мысалы, Ордубад және т.б.) қанат мәдениетінің әлі де сақталғанын көрсете.

Зерттеудің негізгі мақсаты – көне су жеткізу жүйесін зерттеу арқылы халықтың өмір салты мен мәдени мұрасын зерттеу. Бұл зерттеу барысында кәріз жүйесі халықтың күнделікті өміріндегі кәріздің маңызы зерттелді. Этнографиялық зерттеумен қатар, халық арасында сауалнама жүргізілді. Мақалада ортағасырлық дереккөздер, еуропалық авторлардың еңбектері және заманауи зерттеулер пайдаланылды.

Кілт сөздер: Әзірбайжан, суару жүйесі, су, кәріз, Қарабақ, Ордубад.

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КЯХРИЗЫ В СИСТЕМЕ ВОДОСНАБЖЕНИЯ АЗЕРБАЙДЖАНА

Аннотация. На территории Азербайджана были созданы многофункциональные ирригационные системы. Одним из самых ценных изобретений человечества является кяриз (канат) — искусственная оросительная система. Первоначально предназначенный для транспортировки воды из горных районов в другие места, канат со временем распространился благодаря развитию городской культуры. Помимо улучшения эстетического облика городов, он также сыграл важную роль в их социальном планировании. Ремесленные мастерские располагались рядом с кяризами, а пригороды засаживались садами и полями.

Канатная система является показателем становления сельского хозяйства, оседлого образа жизни и городской культуры в стране. Археологические раскопки последних лет подтвердили, что широкое распространение кяризов в Азербайджане произошло главным образом после арабских завоеваний. В Нахичевани, Карабахе, Гяндже, Газахе кяризы больше не используются. Однако этнографические исследования показывают, что элементы культуры кяриза сохранились в некоторых городах (например, в Ордубаде и др.).

Основной целью исследования является изучение древней системы водоснабжения, а также исследование образа жизни и культурного наследия. В ходе работы был проведен анализ системы кяризов в нескольких городах, с акцентом на ее значимость в повседневной жизни местного населения. Наряду с этнографическими наблюдениями среди населения были проведены опросы. В статье использованы средневековые источники, труды европейских авторов и современные исследования.

Ключевые слова: Азербайджан, ирригационная система, вода, кяриз, Карабах, Ордубад.

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