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Water System in The Algerian Sahara "Foggara in Touat As a Model"

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Abstract :

Obtaining water in the desert is considered as one of the difficult and arduous matters, and that is due to the harsh nature that characterizes the desert. The Twat region is one of the desert regions in Algeria, which is known for the scarcity and even absence of surface water. Aquifers are considered as the only resource in this region. That region where the residents excelled in developing an awesome irrigation system known to the public as the "Foggara" system, which is a system that was behind the stability of the Touati individual and the prosperity of his civilization.

The role that the foggāra played in the lives of the residents of the Twat region made a prominent symbol for its residents. This symbol received great attention from the residents of the region, as they created "the foggara" and paid attention to maintaining it and also cleaning it periodically, which it confirms to us its important role in daily life as well as its symbolism for the Touati individual.

Keywords: Water, Groundwater, Wells, Foggara, Sahara, Algeria, Touat

Introduction:

Water is considered as the basic element on which the life of peoples and nations is built. it is the main engine of all activities on Earth. According to this, since ancient times, man's life has been connected with water. Through our study of history and familiarizing us with the conditions of past Nations and peoples, we realize the extent of man's relationship with water. Wherever water is found, man is found, civilization is found and cities are built, and it is considered the first factor in human stability.

The Algerian desert is one of the places where it is difficult for humans to settle and rebuild, because it is a dry and hot area characterized by a scarcity of rainfall, and access to water is the first concern of Man, which prompted its inhabitants to find practical solutions to obtain water and make the best use of it, which culminated in the establishment of a wonderful irrigation system known by the Touat population as the "foggara" system, which gave the touati individual an opportunity to benefit from water, which in turn gave him permanent stability that prompted him to build his civilization and build his palaces.

By either of the above mentioned we can pose the following problem:

How did the desert man manage to overcome the obsession with water in the desert? What are the ways and means used to obtain water? And to what extent did the "Foggara" system contribute to the stability of the Touati individual?

* Geographical and historical map of the Touat territory:

1. Geographical and astronomical location:

The Touat region is one of the most important desert regions located in the south-west of the Algerian Sahara, which is part of the greater African Sahara,[1] the Touat region is located between the latitude lines of 26° and 30°, north of the equator, and between the longitude lines of 4° West and 1° east of the Greenwich line, and it is about 1500 km away from the capital (Algeirs), this astronomical location has allowed the Touat region to be a natural extension of the low location of TANZROFT. That Tout region is bordered on the north side by the great weastern race and WAD MGUIDEN . whereas on the south it is boredered by the desert of TANZROFT and WAD GUIRET .and on the east side by the Great Eastern Race adjacent to Wad Al-Maya, and on the West it is bordered by WAD Al-Saoura and its tributaries, and thus it is part of-as we mentioned- From the great African desert,[2] which stretches from the coasts of the Red Sea in the east, to the Atlantic Ocean in the West, where it occupies an area of two thousand square miles. [3]

The geographical importance of the Touat region has made it an economic and commercial center of gravity because it is located at the intersection of the Maghreb pilgrimage route and the Sudanese caravan trade route .the name Touat was given to the areas stretching from the "Saoura" Valley in the north to the extreme " TANZROFT" desert in the south, and from Hammadat to the end of ERG Shash in the East. However, historians and former travelers drew clear boundaries and landmarks for it. “Al-Ayashi” defined the geographical extension of the Touat region by saying: "...Then we left from there and entered the first Labor Touat, which is the villages of "Tsabit", and the historian" Mohammed bin Abdul Karim" identified the dimensions of the territory bordering him by saying: "There are thirteen days between it and "Seljmasa" in the South, twenty days in the West for the first Sudan, twenty days from Ghadames, ten days from the country of Zab in the East, and on the side of the OULED ISSA, adistance of a week for the country of Lebied Sid Sheikh. As for "Sheikh Moulay Ahmed Al-Tahiri", he identified the Touat region from its four

sides, where he stated:"... Touat has borders from four sides, its borders from the south-eastern side start from the palaces of Akbali, Tit, In-ger, Ain-Saleh, foggara Al-Zwa, foggara Al-Arab and Sahla, whereas from the north-eastern side it is bordered by the desert which is between Al-manaiya and Timimon alone from the north-west starting from the Zaouia of Arian Al-Ras passing through Al-Kasabi... From the south-west side, its border extends from Timadanin to the West. And by "Zaouia of Sheikh Moulay Abdullah Al-Ragani" in the south, and Kousour of Akbali from the south-east side."[4]

The Touat region is located in a desert territory, which is overcome by a dry climate, extreme heat during the summer, while in winter it is very cold, as for rains, they are almost non-existent. As for the vegetation, it is characterized by the cultivation of palm trees, which are widespread in the Touat region, for their tolerance of the hot climate that the region is known for.[5]

The water system of the Touat territory:

Water is the secret of existence and the source of life and the mainstay of civilizations, it is the first factor behind all human activity, and thus it has formed a very important importance in human life because it is one of the most important elements of life, which explains to us why previous civilizations stood next to water sources such as valleys and wells, perhaps the desert man is no different from his predecessors, he also needs water in his daily life, perhaps the Touat region is among the regions that witness a shortage of surface water, and on the contrary, with regard to groundwater, as it is one of the places rich in groundwater, which is exploited after drilling wells, and it belongs to those who participated through money or effort,[6] the inhabitants of the region have been able to exploit This groundwater by a strange way which still raises many admirations untill these days, this technique was known as Foggara.

1.The concept of Foggara:

The sources have differed in the origin of the derivation of the word Foggara , as this pronunciation has several meanings, and we will try to summarize these meanings below:

1- The origin of the name (Faggara) is an arabic word (fakara) which is derived from the verbe Fakara that does mean (to dig) the land, i.e. digging it, the faggara means the hole of the land .so the public turned the letter “khaf” to a Berber “khaf” for the Aajamiya, which is the “khaf” that exits between the “Ghaf” and the “Kaf”, and they gathered

the word in the word Fagagir or Faggarat which is the gathered wells since three and so on .[7]

2- Foggara is the collection of Foggara and it is from detonation (blow up, explosion etc), that is, to make the thing explode, the water made a way for it, It is said that the Valley blew up any of its tributaries and blew up the water, blew it up, that IS, took it out of the sources.[8]

It also indicates the incision resulting in the exit of something liquid, where it is said that the eye is herniated, the pimple is herniated, and so on…

3- From the geological point of view, it is a group of wells that are close and connected to each other by means of an Earth trench,[9] extending outside the Kasr at a distance of more than five kilometers, starting from a high place and then gradually sloping towards the basin where the water of the foggara meets to irrigate the orchards in a way that is subject to a precise calculation process, and "Sheikh Mohammed Bay Bel-Alam" defined it by saying: "it is a cascade of wells between each well and other such as the stairs of a ladder where work begins from a high place, and still descends from top to bottom."[10]

Through the above, we can say that the Foggara is a word pronounced by the local tongue to denote the watering system "Foggara" and its collecting (plural) is FAGAGIR, and thus it becomes clear to us that the word Foggara is an authentic Arabic word that has turned over time to the colloquial pronunciation, and this word has become indicative in its content of a narrow tunnel and it Shaped a hole in the ground connecting a series of wells from the lower well with a simple slope, the purpose of which is to allow water to flow through the internal corridors where those wells are connected to each other and the water flows from The upper wells flow to the lower Wells and the water flows from one well to an other to end up in a receiving Basin where the water meets to finally distribute it in order to satisfying the human needs of watering, drinking and other various uses.[11]

2. The origin of Foggara in the Touat region:

The opinions and hypotheses that prove the history of the origin of the Foggara within the Tout territory are many and different, Dr. "Mohammed Saleh hawtya" put forward in his book "Touat and Azwad" these opinions are different, perhaps among them:

According to "Mohammad Bay Bal-Alamm", quoting the Mahdaoui manuscript: "the Jewish community who were displaced to Touat a long time

ago were the ones who planned the Foggara , and it indicates that the Jews who were deported from Madinah , they dug Fagagir in the territory of Touat This Fagagir Are similar to what is known as the Sharaj in Madinah.[12]

There is another opinion that the Berbers of the Zanata tribe, who settled the area early, may have been the ones who planned and excavated the Foggara and built Kousours in most areas of Touat, especially that most of the Foggara take Berber names, which is confirmed by "Muhammad Bin Abdul Karim Al-bakrawi" in his manuscript "Durrat Al-Aklam": "the Zanata fled to Touat after the collapse of their state in the century (4 h/10 ac), and they headed towards the Qibla after they made thirteenth excursions from "SELJAMASA" until "BOUDA"[13] and finally they settled there. and they found that the waters of wad Qir had dried up, so they worked on digging and searching for sources of water, until they succeeded in extracting water and established their orchards on the course of the Valley, dug Fagagir and built Kousour.

3. The method of creating a Foggara:

The method of creating the Foggara is a difficult and laborious method that requires great effort and patience, the historian "Ibn Khaldun" says about it:"in this desert country, beyond the race, there is a strange way of extracting running water that does not exist in the hills of Maghreb, and that because the well is dug deeply, far ventilated and folds its sides until the drill reaches hard stones which excavated by pickax and axe and this strange method is found in the Kousour of Touat, Tikurarin, Ouargla and Rig".[14]

The first steps in the process of creating a foggara are to carry out inspections of the places where water is present. this process is carried out by specialists and people familiar with this profession, as this science allows providing important information related to water and its details and finding out how close or far from the surface and its low location to obtain an "Amazer" degree.[15]

At the beginning of the construction of the Foggara, the first stream that follows its garden is open to the air at a level suitable for irrigation directly, and it was called (Agoser), it is usually determined between the end of the foggara wells and the Oasis kousour, and it is covered with stones to prevent sand crawling on it, and there are nozzles which are put and usually used for watering, and from the first well in "Agoser" or "Agisero" the depth begin to increase, so the Foggara stream begins to extend below the surface of the earth.

The Foggara includes several important parts, as follows:

* **Branch or (Craa):** the Foggara may reach the end of the height before obtaining the desired amount of water, and the drilling is poured in the straight direction, so the expert is forced to stop the extension and drill other wells on one side of the Foggara in order to connect with it and it is called the (Craa).

*** Agoser, or agisero:** when the Foggara water approaches the agricultural land or kousour, the Foggara turns into a (Seguia) on the surface of the Earth, called "Agoser".

*** Al-qasriya:** at the end of the mother "Saguia", Al-qasriya which is a rectangular corridor carved with protection, and in an accurate calculation method on a stone piece of flat "Tafza" that allows the distribution of water according to the required and specified rations for each owner.

*** Tapjot:** during drilling operations, workers are sometimes exposed to a solid stone, so they are forced to open a small hole in the intercepting stone to run out of water, known as "Tapgoat".[16]

*** Magen:** it is the basin in which the water of the Foggara meets in the orchard for watering, and it is also a unit of measurement in Touat that has an outlet called (Anfif).

*** Saguia:** it is the stream that the water passes through it to the entrance of the village to be used for daily purposes of distributing water to orchards, drinking and others.[17]

- Factors affecting the function of the Foggara:

The Foggara is subject to a number of factors that affect its work, among these factors we mention:

- **A-slope (slope):** it is considered one of the most important factors with a direct impact on the work of the Foggara, where the Foggara work requires that the slope is medium not weak in order to ensure a continuous flow of the Foggara , and this slope has been estimated between: (5 to 6)mm per meter, and may increase or decrease.[18]
- **The Shape of the channel**: The Shape of the channel is also one of the important factors affecting the work of the Foggara, we find narrow areas with an estimated width of (0.4 to 0.5 meters), to raise the speed of water flow, and this factor also helps self-purification, while we find large areas estimated at (1.2 meters), which is the deepest area in the channel, in order to collect sediment, which facilitates the maintenance and purification process .[19]

4. Foggara water distribution:

The process of distributing the Foggara water and dividing it to the owners is carried out with a measuring machine called (Chakfa) which is an open copper cylinder from the top and bottom, pierced in its sides according to different sizes, and this hole is 13 mm in diameter, at a height of 23 mm from the measurement level, and it is four liters per minute, but the shape of the slot varies from region to region,[20] Where we find it in the tidikelt in a cylindrical shape, while in the central Touat it becomes in the form of a rectangle, and its name also changes from one region to another where it is known by several names: (Qild), or (Hallafa), or (Qasamah) and the unit of measurement is El Habba (the grain), and it is also known as (the Aoud) in "Bani Muluks", and sometimes it is called (the Majin), The (chakfa) includes a set of holes, which are actually parts and multiples of the (Habba) It is called (ziraq) and it is:

Half, third, quarter, sixth, half-sixth, quarter-sixth.[21]

The metering process (El Kail) is considered as a procedure by which water is distributed among owners. This process takes place at the drain (El-Kassri), where the water is distributed between the sub-rivers. To carry out the measuring process (El Kaîl), the measurer (El-Kaial) must be present, and it is the one who uses the distribution machine with the presence of the witness who monitors the process and records it in (Zmam El-Foggara),[22] and this is also called (the journal), which is the place where the goods belonging to individuals are concerned and it is not possible to make a modification to this register without revealing the signed sales contracts by the seller and two known witnesses. This register is mainly kept with the village imam, who is called a witness, and a witness can keep several records of Faggara

5. Foggara maintenance:

The Foggara maintenance process is carried out periodically and steadily by the Foggara responsible once every year or two as needed,[23] and this maintenance process is also subject to the nature and condition of the Foggara, whether it is new or old, and this process is carried out according to precise steps due to its seriousness and the depth of its wells, and maintenance operations are focused on the following:

- Cleaning the Foggara from dust, which often causes it to close.

- Getting rid of limescale deposits because the water contains calcareous salts that accumulate on the walls of its internal Wells over the days.

- Trying to fix the collapses in relation to the soil urgently because it stops the Foggara stream.

The process of cleaning and maintenance of Foggara is carried out in the summer, i.e. before the plowing season begins, and all residents participate in this process without exception, as they have created a collective system of cooperation known as "Twaiza" aiming to finding a solution to the problems of Foggara collapse and stopping the flow of water,[24] and the foggara maintenance is carried out by a set of means, perhaps including:

-Ropes, which were made in the old days from palm fibers, and the Pulley, axes, shovels, Baskets...Etc.[25]

6. The Foggara and its role in the stability for the Touati individual.

Through the above - mentioned about the Foggara, the method of its creation and what is related to it, we conclude that the Foggara had a major role in the stability of the Touati individual in the desert, as it was lie a socio-economic institution that regulates the lives of individuals and helps them to settle their region.

Through the following, we will try to highlight its economic and social role and its impact on the stability of the population in the Touat region:

- The Economic role:

We cannot lose sight of the economic role played by the Foggara in the territory of the Touat region, as water is the lifeblood for the region, and because of its importance and its role in the economic life, especially in relation with the agriculture, the residents of the region were keen to use The Foggara in order to achieve an agricultural economy, especially when the region has an important strategic location, so they were marketing cultivated materials such as dates and grains even outside the territorial borders of the Touat region, reaching even the country of Sudan through the movement of trans-Saharan trade convoys.

In addition to the above-mentioned economic role of Faggara, it has contributed directly to the creation of job positions for the residents of Kousour who want to work, as Faggara requires regular maintenance-as we mentioned- and sometimes new Foggara are created, carried out by members of the kousour residents and they are paid for it, which we can consider an important economic

role in eliminating a percentage of unemployment among the Kousour residents.[26]

- The Social role:

If we know that the process of creating a Foggara is a process that requires concerted efforts among all residents of the Kousour from its beginning, then it certainly has a clear and obvious social character, which is represented by:

- Consecrating the principle of cooperation between the residents of the Kousour by participating in the process of creating Foggara and even while carrying out the process of their maintenance, an action known and popular as "Twizaa".
- Work to provide water to the residents of the kasr permanently, the fair distribution of water quotas between the owners of the Oasis and shareholders, and commitment to the principle of justice and equality in the division of water according to the laws regulating the function of the Foggara.
- Urging the residents of the Kousour to participate in the maintenance work that the Foggaras need in case they stop working in order to preserve their lives, as it is the lifeline of the Kousour residents.[27]

Conclusion:

Concluding the above - mentioned on the topic " the water system in the Algerian Sahara – the Foggara in Touat as a model -", we can say that the "Foggara system" in the Touat region has formed one of the factors of the establishment and prosperity of human activity that made the desert a viable place for human existence, through this wonderful system, the human was able to conquer the desert rather to be conquerd by it, so he built a civilization not less than the other civilization existent in the other no desert regions.

The effort of the individual touati played a major role in the creation and preservation of the so-called "Foggara system", this system, which remains untill these days in front of the arid desert nature and its difficult climate.

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