Larhyss Journal, ISSN 1112-3680, n°18, Juin 2014, pp. 7-17

THE SHARING OF WATER IN THE OASES OF TIMIMOUN HERITAGE CULTURAL DECLINING

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ABSTRACT

The oases of Timimoun are irrigated by ancestral techniques called Foggara. The Foggara system is based on a gallery of slightly sloping conveying the groundwater to the surface. The Foggara is a collective proprety belongs to several owners, the water is subject to a sharing between subscribers, and each receives a share of water in relation to its contribution. The work carried out missions in the years 2007, 2008 and 2010 revealed to the population of Timimoun that the imput of modern water capture (such as pumps and wells) have caused the disappearance of traditional methods of watershed with the including the disappearance of certain occupations such as the Kial el Ma. Currently there is only about 10 Kial el Ma in the Timimoun region.

Keywords: Timimoun, Water, Foggara, Sharing, Oasis.

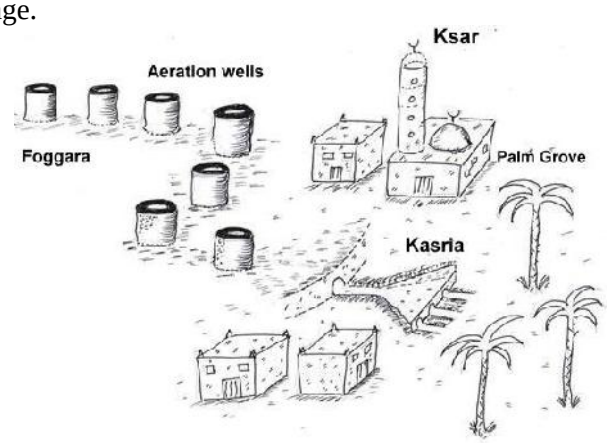
INTRODUCTION

To survive in a dry environment like the Timimoun region, the farmers have implemented an ingenious technique of extraction of groundwater called Foggara. The technique involves capturing the water from the aquifer that flow into an underground tunnel to the Ksar and gardens located downstream (Fig. 1). This ancestral process is in 35 countries around the world under different names (Hofman, 2007). The best known are the Qanat in Iran (Goblot, 1963), Khettara in Morocco (Lightfoot. 1996; Baali et al., 2002), Falj in Sultanate of

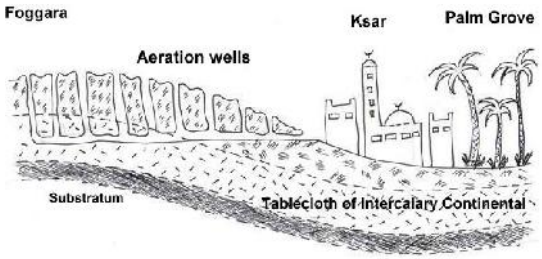
Oman (Al Murschidi, 2007; Norman et al., 1998; Simarski, 1992) and the Karez in Afghanistan (Hussain et al., 2008).

Unlike of the qanat that has been developed since 3000 years on the set of ancient Iran (Goblot, 1979, Wulf, 1968; Goblot, 1963), the Foggara was introduced in Eleventh and Twelfth century by El Malik El Mansour which would have dug the first Foggara to Tamantit (15km of Adrar) (Hassani, 1988). Than the Foggaras were developed in the Touat and Gourara by Arab-Berber tribes of southern Morocco (Arrus, 1985).

The Foggara is a technique collective and commissioning of such a system is subject to strict laws and a very strict social order that have been adopted over the centuries by the farmers. Thus, the sharing of water between the owners has a special place in the social life of farmers. In each oasis of Timimoun, there is a committee of wise men called Djamaa, one or more Kial el Ma that ensure smooth operation of a water sharing by applying the same principle: the share of each water owner is proportional to its contribution in the digging and maintenance of Foggara. We are interested in this study mainly to the spatial and temporal evolution of water sharing in the oases of Timimoun, while evoking the technical, social and environmental that risk of removing a socio-cultural heritage.



a) Overview of Foggaras



b) Longitudinal section of a Foggaras

Figure 1: Schematic diagram of Timimoun Foggara

STUDY AREA AND FIELD MISSIONS

Known by the ksours and Foggaras, Timimoun region is located at 1200 km south of Algiers (Fig. 2). Timimoun,is a group of oasis of Ouled Said, Kali, Timimoun city, been using for ten centuries the Foggara as irrigation technology. In 1932, about 220 Foggaras were intended to irrigate an area of 1800 hectares of palm groves in the region of Timimoun (Arrus, 1990). The contribution of modern acquisition of water pumps and wells as the number of Foggaras decreased to 150 Foggaras an area of 1200 hectares. in the early 2000s. To conduct this study, two missions were undertaken work in the oases of Timimoun in 2007, 2008, 2009 and 2010. Testimonials and surveys were conducted with owners and oasis Timimoun.

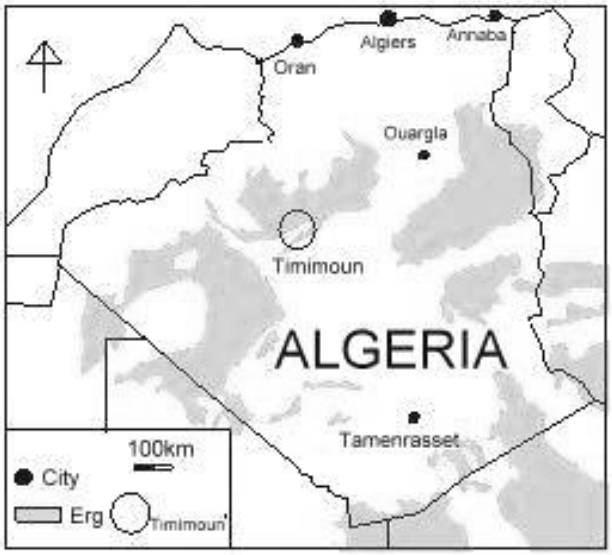


Figure 2: Location of the study area

RESULTS AND DISCUSSION

The mode of sharing water in the region of Timimoun

Sharing of irrigation water in the region Timimoin is carried out per volume unit, in contrast to what is on khettaras Tafilalt and Marrakech in Morocco or the mode of irrigation is the time. Foggaras Timimoun are "Foggaras volumetric." The khettaras of Tafilalt are khettaras hourly; the totality of the flow is set successively available to irrigators in turn at intervals that varies from one to another khettara. According to Ben Brahim (2003), the time of disposition of a flow of khettara of Tafilalat shindig is evaluated. A khettara of 32 Nouba is a water tower 16 days. Sharing the density of water is carried out in a continuous manner for all owners. It allows us to give each owner's share of

water by giving the maximum independence from other owners. Unlike time-sharing, the owners are dependent.
Each owner uses all of the water during its period khettara irrigation, while the others are pending. The share volumetric is very advantageous compared to the share hourly; it allows each user to simultaneously cultivate palm trees, grains and vegetables. Concerning the sharing hourly, the tour of a small portion of water returned after several days, in which case he can grow than cereals and not vegetables. In addition to the continuous flow across the network of seguias several kilometers, each garden has a Madjen which stores water from the user. These free surface flow triggers a continuous humidity producing a remarkably fresh throughout the palm grove. For example in the El Meghier Foggara, over 200 families lived in this Foggara. A palm grove with an area of several acres is irrigated daily. A quarter of its flow rate fueled to the communal swimming pool of Timimoun. Known for its large comb called kasria Lakbira (Greater Comb), the Foggara of El Meghier has 4 secondary kasrias, which through Madjras (channel of section larger than the seguia) serves 22 tertiary kasria. The last fueling 286 Madjens (water storage basins) through souaguis (plural which means seguia channel) (Fig. 3).

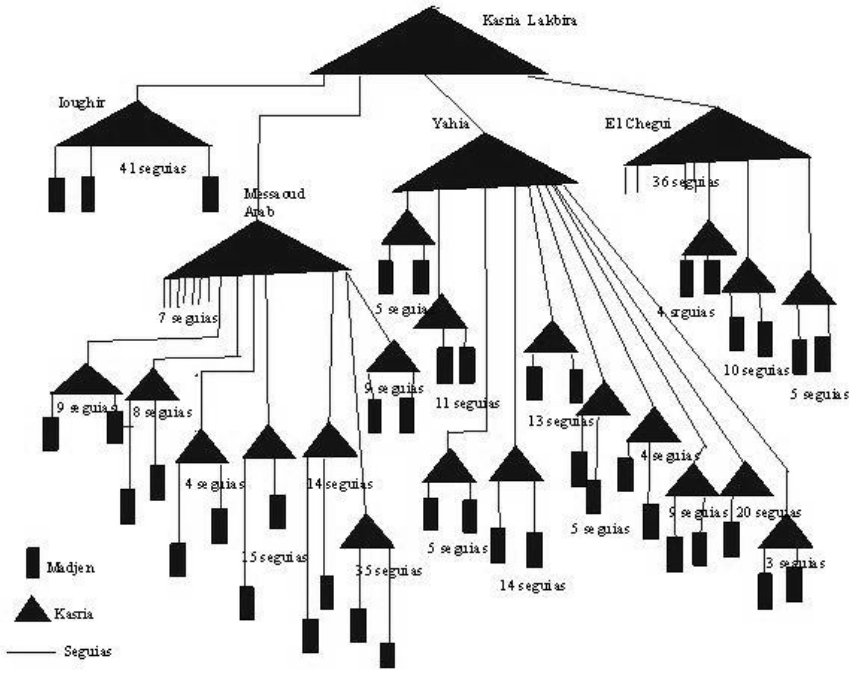


Figure 3: Schematic diagram of the Foggara El Meghier (Remini and Achour, 2008)

The distribution of water to a Foggara Timimoun

Resulting from the the density of water sharing, the distribution of water among the owners is carried out just outside the gallery of the Foggara. The distribution network consists of elements; kasria (diverter); Seguia (channel), Madjen (storage basin) and Gamoun (Garden). The flow of water out of the Foggara until Gamoun (Garden) is carried out through seguias (channels) and Madjens as shown in the block diagram of a typical network of oases of Timimoun (Fig. 4).

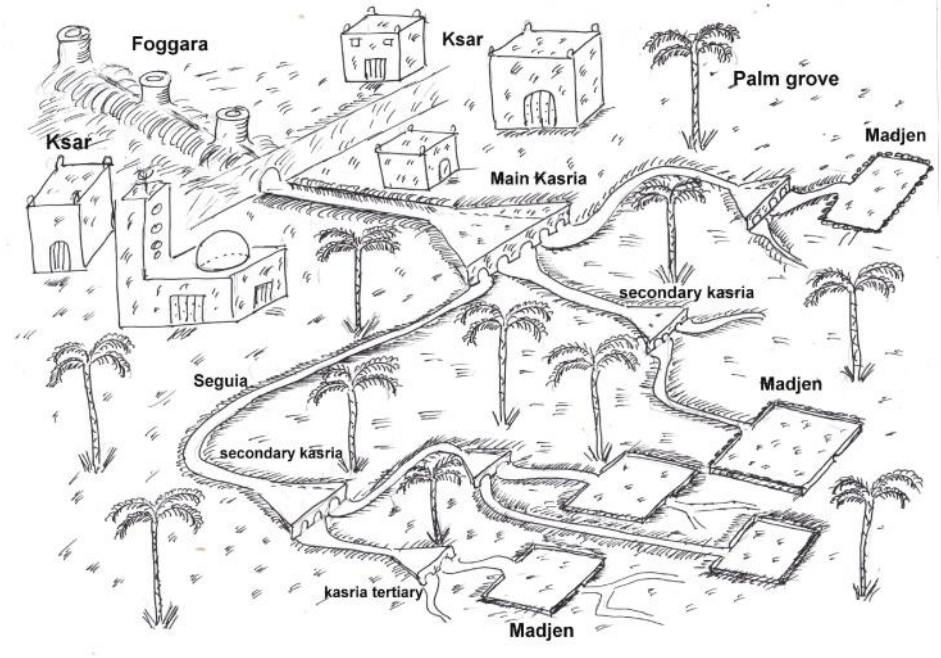


Figure 4: General scheme of a distribution of water in an oasis of Timimoun

The kasria

At the outlet of the Foggara, the water is divided by a comb called "kasria made of flat stone. The kasria presents a triangular basin to store water before being distributed among the owners. The latter is equipped with a surge that cushions and calm flow. The comb is provided with several openings of varying dimensions. For one Foggara, there are several types of Kasriates returned in the palm. Starting from the kasria Lakbira (main) and secondary to the multiple (smaller). The kasria Lakbira receives the entire flow of the Foggara (Fig. 5). The kasria Lakbira said the flow of Foggara in three, four and even five channels (seguias). From this triangular basin, the seguias will fan out in all directions to irrigate the plots. After these seguias, other secondary Kasriates distributes water and other seguias originate and end by Kasriates tertiary and so

on until Madjen. It is a triangular-shaped basin placed after kasria Lakbira and is characterized by a family division of each tribe or group involved in the implementation of the Foggara. These are small Kasriates (plural of kasria) located after the secondary kasria along the path of seguias which distributes water directly into Madjens.

Figure 5: The great kasria secondary Foggara El Meghier (Remini, 2007)

The Louh: the measuring instrument shares of water

In the region of Timimoun, measurements of water share of the owners are using a traditional instrument of manufacturing local called the Louh. It consists of a copper plate of rectangular dimensions 57 cm × 18 cm (Fig. 6). The plate is pierced with holes of various sizes that embody the flow unit with these multiple and its sub-multiples. Three types of Louh exist in the oases of Timimoun: the great measures the kasria El Kabira, the average for the secondary and small kasria for multiple kasrias. The unit of measurement of Louh an oasis to another. In the oases of Timimoun center, we use the tmen approximately equal to 0.0416 l/s. In the oases of Ouled Said (Timimoun), unit of measure is the "habba" or "habba zrig" which is equal to one eighth (1/8). It corresponds to the average flow rate provided by an opening of 1 to 1.5 cm. The habba is equal to about 2.5 l/min.

The Louh of oases of Timimoun city is pierced by three parallel rows:

• The top row is perforated with holes 7 cm diameter flow equal to 1 tmen.

• The central row is apertured fraction "tmen": 1/2, 1/4, 1/3, 1/6, 1/8.

• The bottom row is perforated with multiple holes "tmen". It includes 03 holes of 3 cm in diameter each with a flow rate of 20 tmen, 03 holes 2.6 cm in diameter each with a flow rate of 15 tmen and 03 holes of 2.1 cm each with a throughput of 10 tmen.

Figure 6: The "Louh" used in the Timimoun region

The Kial El Ma: the main element in the operation of the watershed

Four essential elements involved in an operation of water sharing of Foggara between the co-owners. The man who made the measurement and real flow measurements is the Kial El Ma (the meter), known by its honesty, reliability and expertise. It is unanimously nominated by the Committee of Wise persons (Djamaa). (Fig. 7). With over 200 Kial El Ma in the early 60's in the oases of Timimoun according to some owners of Foggaras, today there is only half of Kial El Ma. It is a cultural heritage which is endangered. It is a cultural heritage which is endangered. He is respected by everyone, his task is noble, it is the flow distribution of Foggaras following list that gives him the "Chahed" each measuring operation. In case there are repeated challenges to a measure, the presence of two "Kial El Ma" becomes indispensable, but this is rare.

The measurement technique makes way for the calculation technique; the "El Hassab" (calculator) determines the share of each co-owner. So three people needed to attend such an operation, it is "Kial El Ma" which has so far only spot, "El Hassab" which encharge accounting, and an operation that manipulates the clay needed for maintain the "Louh" perpendicular to the direction of flow and so to resist the forces of the current. It can also create temporary channels with clay which must link the openings of "kasria" (comb dispatcher) to "Louh."

The two people "Kial El Ma" and "El Hassab" must be correct and fair intelligent. They are responsible for measuring and calculating the share of water from various Foggaras.

The owners of Foggaras remunerate the Kial El Ma once a year, it receives per year and each Madjen:

• Two Zguen of Tafsout (sorghum) (1 Zguen = 04 handles)

• Two Zguen of corn.
• Two Gasaa of dates (1 Gasaa = 12 Zguen)

The Chahed receives for each measurement operation of money by the owner who did call. El Hassab is paid occasionally it receives for each measure of money. The casual laborer who helps Kial El Ma to manipulate clay needed for plugging holes, fixing the chegfa and realization of the channels, , is paid in cash. The Chahed, El Hassab and the worker are paid by the owner of the Foggara.

Figure 7: Kial El Ma, the only still existing in the oases of Kali

Conduct of an operation for sharing a water Foggara

The time of measurement units of water or gauging a Foggara, everyone is aware, including djamaa. Evidently, the Kial El Ma will be there with his plate gauging. It is authorized anyone to measure the water downstream of a "kasria" had no co-owners. Flow measurements are made every time a Foggara is performed after the interview or just a Foggara. The actual flow of the new Foggara, or the new flow rate of the old Foggara after curage is measured using the Louh. The location of Louh out of the Foggara, or in an seguia (part of an owner) is made just outside the main kasria. After defining a corridor clay to measure how much water a seguia an owner, Kial El Ma proceeds to the fixation of his Louh by clay. Then, the Kial El Ma after a series of closures and openings of various holes "Louh" gets the stability of the water, that is to say a steady flow. From that moment on, the meter account only the number of ports open and gives directly the rate of flow of the Foggara. In Ouled Said Oasis for example, or the unit of measurement is "habba" or "habba zrig". So the flow is measured in a Foggara Zrig Habba. Before any distribution of flow, Kial El Ma must know the number of "Habba zrig" provided by the Foggara through the

measuring instrument (the Louh). The share of each owner is mentioned by El Hassab on a portion of clay. It should be noted that during the measurement operation, no person has the right to take water from the Foggara. For this, one or two guards lead surveillance throughout the operation of gauging. At the end of the operation, all values of flow rates of each new owner is named in a register called Zemmam is a confidential document to be kept at the Kial El Ma (Fig. 8). We summarize in figure 9 the steps of the procedure measures the flow of a Foggara and share owners.

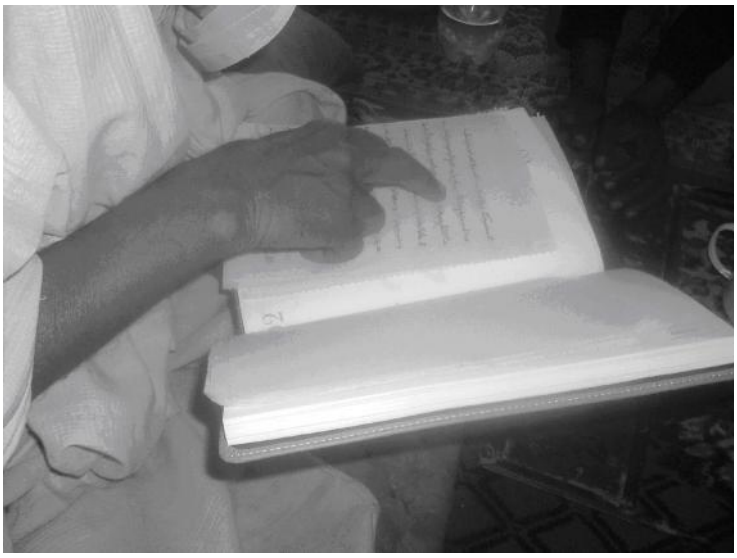


Figure 8: The share of flows of each owner

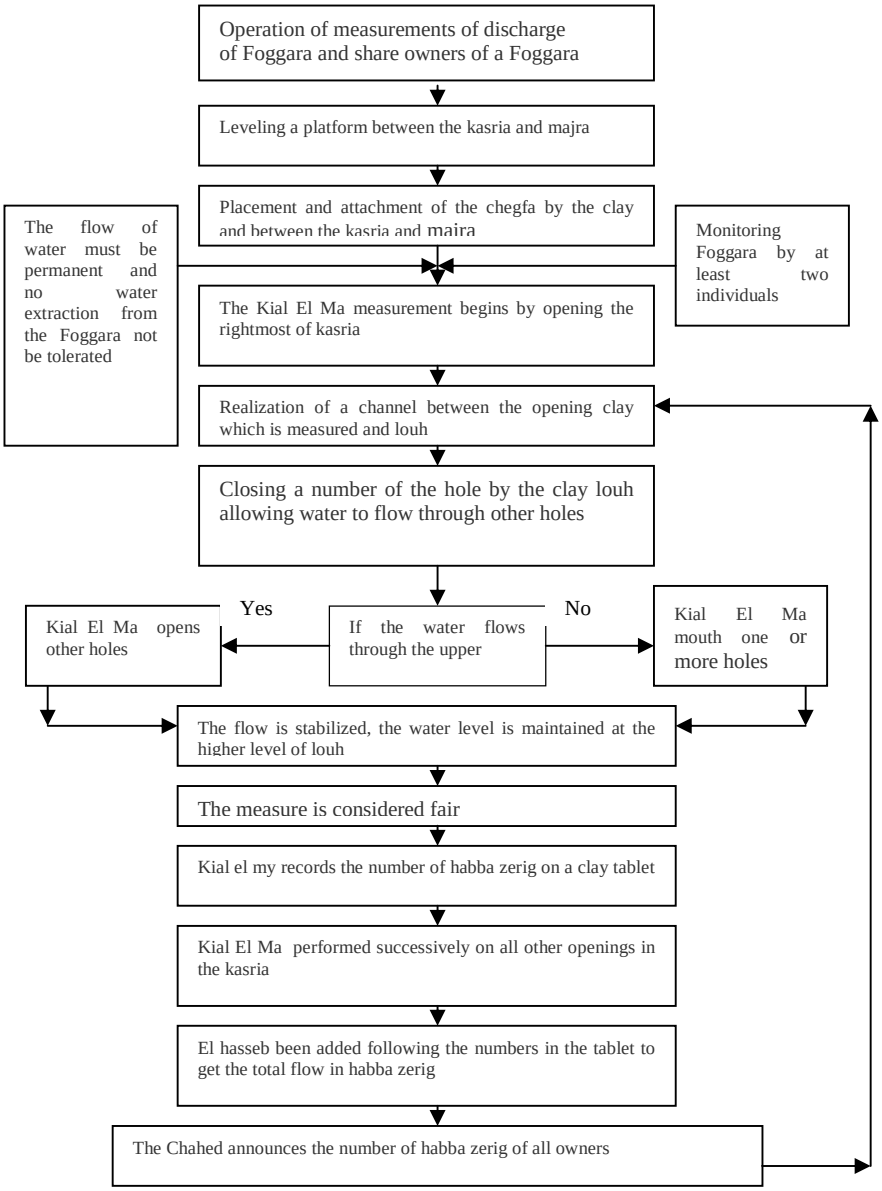


Figure 9: Steps in the course of the measurement units of water

CONCLUSION

Everyone agrees to confirm the services rendered by the Foggara. For centuries, the groundwater reaches the surface without energy supply. She gave life to a whole arid region of low rainfall as Timimoun. The Foggara has become a way

of bringing people around her. Over the centuries, a true social organization was formed around the Foggara, formed a committee of wise persons (Djama) in one of these functions is to resolve water conflicts.

The framework of this social organization is undoubtedly Kial El Ma which alone can allocate water between users, each with its share of water that it deserves. All flow changes recorded over time, or after maintenance Foggara, after sales or purchase of shares of water are noted with details in a register called Zemmam. But what is it you that social organization oasis? If djamaa still exists in some oases it works only with fewer prerogatives than before.

Although hydraulic services have made great efforts in recent years to save technically such heritage; rehabilitation of Foggara and ksours, Is it reminded again that the Foggara was never a technical work as drilling for example, rather it was the technical and the social which formed the Foggara. With the decrease from 200 to 15 kial my el in half a century in the oases of Timimoun, the job of Kial El Ma is condemned to disappear in a few years. Non-transmission of knowledge to younger generations. The contribution of new techniques of water harvesting and irrigation has greatly contributed to the degradation of this ancestral hydraulic process.

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