



SOME LEARNING FROM IRRIGATION PARTICIPATORY MANAGEMENT IN QANATS

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ABSTRACT

Water is a valuable and vital element especially in arid and semi arid region of Iran. Due to scarcity of this substantial elements in most part of Iran there are water distribution systems established for rightful use of water. these systems have been formed according to users demand climatic condition current water supplies arable lands area and water distribution methods. Water distribution system is an institution which has been formed and created during evolution of agricultural societies gradually and preexist issue of social and economical of arid and semi arid regions residents.

In arid region of Iran water distribution systems have fundamental similarities but there also are some distinctions which lead to study these systems individually. It is worth to say that operational system of Qanats has long history without any governmental or institutional support and are active yet.

I this research we make an effort to evaluate and investigate operational system for Qanats to introduce their power points to other sectors as a recommendation especially for water user association establishment.

Agents such as type of operation systems organizational mechanism water measurement unit water division circuit and etc would be evaluated and finally beneficial suggestions and recommendation for this research and water association establishing (especially for surface water) would be presented.

Keywords: *Qanat, water, water division, water user association*

INTRODUCTION: QANATS HISTORY AND BACKGROUND IN IRAN

Since human kind dominated over his environment and captured natural forces in somehow, changed his migratory life style and chose a permanent habitat. By doing this, need to food production and consequently agronomy and agricultural promotion

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became obvious. In this stage, agriculture and farming became as a permanent and especial job and occupation and as a main requirement for human kind. Although artificial water harvesting systems met human needs but did not provide sufficient and permanent water supply. On the other hand, traditional water conveyance system created many problems due to long distance, high rate evaporation and severe sedimentation through canals led to innovate a system known as Qanat, to overcome those mentioned problems.

Undoubtedly, Qanat's emergence goes back to third millennium B.C and initiation and development of elementary sciences. In the other word development of knowledge about surface features of the earth and sloping of Qanat gallery, and also improvement of tool science near human although simple and elementary could be known considered as the main reason for innovation of Qanat.

Qanats are one of the most ancient ground water harvesting methods which convey water through canals without any particular energy consumption except gravity and minimum evaporation rate. According to some historians, Qanat technology refers back to 6000 years before which are documented in Herodotus literature.

Unsteady and improper harvesting of groundwater and illegal well digging in recharging zone of Qanats has resulted dramatic decreasing water table in wet part of Qanats. Increasing cost of maintenance and amendment along with ignoring Qanats practitioners in relation to their livelihood and most of all, indifference of previous royal government toward Qanat due to effort for being dependant to western technology, led to gradual decline of Qanats. By competition between traditional and modern technology this ancient method failed against modern harvesting one. By Islamic revolution triumph in Iran, general policies of Islamic government oriented toward independence for agricultural crops and followed by considering traditional and original irrigation and water harvesting methods. According to above mentioned subjects, maintenance of Qanat became the main goal and also significant efforts were performed by official authorities. Nowadays there are more than 32770 live (active) Qanat which irrigate about 1065053 Ha of cultivation lands.

1. WHAT IS QANAT?

Apparently, Qanats are suggested by natural springs to Iranians as an initial vital element for residents of this plateau. The word "KARIZ" or Qanat has a similar concept and meaning in all Persian dictionaries. A pithy definition could be found in "Borhane Ghate" encyclopedia as:

"An underground canal for flowing water inside". The main reason for develop of Qanat over Iran's plateau are various but the most important one is various climatologic conditions in this plateau. Practically, this method for water harvesting has become innovated according to particular climatic condition of Iran especially in arid and semiarid region and then has been utilized for other similar area.

2. QANAT STRUCTURE

A typical Qanat has 6 main parts including boreholes, shafts, mother well, gallery, outlet and open canal. The most inexpensive and simple way for constructing a Qanat is

digging a horizontal canal (gallery) from outlet toward aquifer continuously. This horizontal canal must be constructed with a very slight slope to allow water flow due to gravity.

Initially, two adjacent shafts are dug then start to connect bottom of these wells to each other by digging a gallery from downstream well to upstream one. Similarly, it progress continuously from outlet toward dry part of subsurface layers and subsequently in wet part of aquifer (under water table) and result to flow water inside gallery.

3. REASONS FOR CONSTRUCTING QANAT IN IRAN

The main reasons of Qanat's innovation by Iranian could be as followed:

- o Necessity for water supply from groundwater in arid region (improper distribution of precipitation in Iran)
- o Agriculture and livelihood support (potable and agricultural water)
- o Conveyance of water without energy consumption
- o Annual operation
- o Good compatibility with various region from climatic point of view

4. BENEFITS OF QANAT

Although, more than 5000 years have been elapsed of Qanat innovation in Iran, nevertheless this remarkable technology is stable and useful. Main reasons are as below:

- o No need to continuous maintenance
- o Generating participation sense and concept for maintenance and operation among water users
- o Existence of Qanat practitioners for maintenance and operation
- o Groundwater harvesting in various region
- o Entrepreneurship
- o Environment friendly
- o Introduction of Qanat as a reliable asset (godsend)
- o Not harmful for ground water balance

It must be noted that of above mentioned subjects, water user associations established for Qanat are a significant and sustainable system and have protect Qanats during several thousand years.

5. OWNERSHIP AND WATER USING SYSTEM FOR QANATS

Water is a precious and vital substance in arid region of Iran, since water is not abundant, so water user systems have been established for rightful using of water. These

systems have been formed according to requirements of residents, climatic conditions, available water resources and etc.

Water distribution systems have been formed gradually during evolution of agricultural societies and are issues of behavior of residents in arid regions. At these part of Iran, water distribution system have basic similarities but have also some distinctions which compel us to consider them separately.

6. WATER DIVISION METHOD AND ESTIMATION CRITERIA

In the past, number of owners was not high, and water distribution has been done by them. Land reforms and inheritance resulted to increase of owner numbers and consequently complexity of water division. Notwithstanding problems, some trustees have undertaken supervising the water division as “Divider “and do it based on the share proportion. All of harvested water is divided among farmers. Time unit is applied for division, that is, allocated water to each farmer is considered as the time of flowing water in the furrows of farmer’s land which today is calculated by clock (chronometer). In the past there was a kind of water clock used for this propose. Before expansion of deep well, maintenance of Qanat had been assigned to the owners. At that time there were 4 types of ownership for Qanats including private, crofters or little owner, public or governmental and charity and all of these owners know themselves liable to maintain and protect Qanat. Some people know about their own Qanat from several points of view and did various repairments. Specialized repairments have been done by construction experts under supervising of owners. Those Qanat which had several crafter (owner), were faced with some problems in repairments. In recent years, government has allocated gratuitous credits and long-term loans for all maintenance activities related to Qanat particularly for poor owners so that they are able to cope with the problems relevant to Qanats. In Bam region, maintenance and operation of Qanats have been managed by governmental credits and owners support by owner representation or Islamic council of village. Usually any Qanat have had a native and permanent practitioner for maintaining for a long time.

Tourists and explorers and also scientists passing through Tabas, considered it as paradise of desert, due to vegetation and orchards of the region during four seasons. By traveling about 400 Km through desert lands. One could see merely Tabas orchards which makes palatial scenery. In order to optimize utilization water resources in Tabas region which are mainly focused on Qanats, there are several agreements in which, the best one is the Scroll of Sheikh Bah o din Ameli, prepared based on request of local governor.

So in order to arrange water circulation under supervision of local practitioners, owners and drinkers approved following regulations and guaranteed proper implementation. After earthquake in September 1979 ,there was a conflict in water cycle of Tabas streams, resulted in extending rotation from 9 to 18 day leded to drying out of orchards and loss for farmers. Therefore in order to dissolve current deficiencies and correct implementation of regulations as before earthquake .It was prepared and approved a status book to be basic for correct performance.

7. WATER COUNCIL'S STATUS BOOK FOR QANAT OF TABAS STREAMS

This status book consists of several sections as followed:

- A. **Configuration:** utilization of Tabas streams water would be under supervision of water council which consists of representatives from governorship, municipally, Agriculture, 6 of owners and farmers per stream, 3 persons elected by owners and drinkers for 2 years.
- B. **Task of council:** Duties of so called council are as below:
- Communication with officials
 - Leaving offenders to the court and laying claim for it if required
 - Inquiry about drinkers complaint and untying them
 - Determining water fee yearly
- C. **Author (Sartagh) selection and his duties:** Author is in charge of all about accounting of water and is elected by water council. Author has to record and register all stockholders and also is director of irrigation cooperation with following tasks:
- In charge of implementation of Irrigation Scroll
 - Author will be elected by owners and drinkers
 - Author has to determine and introduce literate, expert and qualified Taghdar's to water council to be confirmed
 - Taghdars must introduce a honest KAIAL (measure man)
 - Author has to present the list of drinkers enclosed in Scroll including ownership or rental before 8 of March.
 - Request of police to assist Taghdars through governorship
- D. **Water distribution system of streams:**
- Initiation of first circulation (circuit) would be 13 days before of new year and end of summer circulation would be 9 of October which is divided to 21 turns for drinkers
 - Taghdars have to control water delivery circulation (sequence) according to a registration notebook (Pagir) submitted by author .It is divided to 3 winter circuits, each 2 turns, totally 6 turns and 5 summer circuits, each 3 turns and totally 15 turns, and 2 planting circuits, 8 days per circuits, totally 15 circuits in 25 turns for water delivery.
 - Annual salary for Taghdars and Kaials would be provided through water circulation determined by water council.
 - Taghdars have to consider precise water circulation, undertake all responsibilities.

- All of owners and drinkers have to consume half of their registered water share at first circulation otherwise it will be sold to other customer if any, and deliver the received money to the owner of water share .if there was not any demand it would be lost and no protest would be accepted
- Author has to hold a meeting to investigate and control paid expenditures before last 3 days of any circuits.
- Water council should register a bank account number and deposit all received incomes in. Issued cheque are signed by authors constantly and either water council director or accountant to be payable
- Taghdars have to submit their water consumption bill to measure man each day and control to ensure not extra-irrigation
- Drinkers and holders should submit their water draft to author by the February 24 ultimately. Otherwise by ending first turn, water draft would be assigned half share.

This constitution was provided in 4 sections and confirmed by meeting participants. Water council is also in charge of monitoring on proper implementation maintenance and renovation of Qanats.

8. WATER DIVISION AND OWNERSHIP FOR GOHARRIZE JOOPAR QANAT IN KERMAN PROVINCE:

As mentioned before, since water is a precious and vital element in arid region, in order to rightful use and consumption of water, there have been established water distribution systems which are similar in some way in different regions and have been improved gradually together with agricultural society. Goharriz Qanat has been divided to 12000 shares which were separated by a 6 part divider as below:

- **Tribute division:** name comes from arrogated water share by some people of Joopar when Mrs. Gohar which renovates and rehabilitated the Qanat after it was dried. It is equal to 925 parts
- **Official part (1 and 2):** whit regard to collected tax paid by farmers through government, therefore 4333 parts of water was allocated to government as tax. Nowadays it has been sold by government after establishment of registration organization.
- **Molla (teacher) part:** In ancient time which there were not any classic and modern education system (schools and etc), children were educated by a literate person who usually was a priest (Molla) and hence he or she was allocated a share of Qanat water equal to 6500 part for livelihood.
- **Arbab (land lord) part:** It is equal to 5160 of total shares belong to those people who reconstruct and maintained Qanat.

9. CONCLUSION

With regard to investigations on traditional current operation systems for Qanats in several provinces of Iran, following subject are to be mentioned:

- All of active Qanats of Iran has their own unique operation system
- Operation system of each Qanats is different from others with regard to climatic, socio-economic, and cultural conditions. In the other word, dominant condition would influence the operation system and must be considered.
- Qanats` operation systems have been developed by people based on their pleasure not by obligation.
- Although there is no documents for current operation systems, all details and rules have been transferred orally from past to present, in order to maintain and protect these systems it is required develop a documentation system.
- All needs involved to Qanat and operations have been predicted in operation systems with regard to Qanat discharge rate.
- Generally, people responsible for operation system are elected from native and trustee owners and drinkers which results in less conflict among beneficiaries.
- It is recommended to replace water user cooperation with water operation systems, in which must try to dissolve all deficiencies while keep all fundamental issues.
- Applying obtained experiences through traditional operation systems is of great importance to improve skills of involved people and promote them to establish new cooperation and systems.
- Climatic, social, economic and cultural condition must be considered and apply experiences with regard to distribution and expansion of Qanats through out the country

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