

**ESTIMATION OF THE REASONS OF QANAT DEGRADATION AND  
ITS EFFECT ON VILLAGERS' PARTICIPATION  
(CASE STUDY OF SIX REGIONS IN THE KHORASSAN PROVINCE)**

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**ABSTRACT**

Undoubtedly qanat could be one of the Iranian's most creative designs for sustainable use of underground water resources. Controllable application of water by qanat systems guaranteed cultivation of crops in arid and semiarid regions of Iran for more than 2500 years.

Based on the important role of qanets in the ancient lives, establishment, utilization, maintenance and management of qanats were done by all villagers and water consumers.

In recent years development of wells, and oversupply usage of water and the lack of control and supervision by the governmental authorities caused destruction, drying of many qanats and great reduction in their discharge.

Unfortunately, omission and neglect the role of qanat in the villagers' lives also affected their social aspects and communication relationships.

Researches were carried out in the *Khorassan* province, one of the origins of qanats in Iran, where six qanats were under case study. Survey on the subject was done through inquiry forms of specialist of water and soil research center of the area and the rapid rural appraisal (RRA) technique for local inhabitants.

In this study, common problems responsible for destruction of qanats and degradation factors were discussed and applicable solutions for rehabilitation of qanats and participation of locals due to improved management are addressed.

**Key words:** Qanat, degradation, participatory management.

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## INTRODUCTION

Over 2500 years, controlled exploitation of water by qanat has guaranteed agriculture in arid and semi-arid areas in Iran. In many villages, qanat ownership is widely diffused throughout the population, and this widespread stake in the water supply system reinforces social cooperation [2]. We might dare to say the fundamental factor in qanat development and sustainability was ancient people's cooperation and participation in construction, operation and maintenance of this valuable engineering creativity.

qanat essentially consists of a tunnel and many shafts. The shafts provide repair teams with relatively easy access to tunnels when blockages occur, and a special deepest shaft is named *mother well* [4].

Farmers have participated in all qanat construction fields (including locating best sites, excavating the tunnel and shafts, and other related structures) and also in its all maintenance activities. This includes dredging, installation of clay collars and even restoration of qanat after major damages due to floods. In addition, operation of distribution network was performed according to water-rights and some managerial local rules based on their heuristic, which nowadays are known as "water participatory management". The example is bailiff's election by all villagers in order to operate distribution network fairly.

It might be said that water participatory management which has been introduced in recent decades, has been existed in Iran in a traditional way for managing qanats since about 2500 years ago. At that time each farmer had a specific water-right from qanat which he could get due to a certain program. Every thing was managed through a hierarchical system with different levels named as Bone, Varbone, Sarbone etc [5].

In recent years, many countries moved rapidly towards participation growth and development. They have planed on stimulation of water users' cooperative spirit as the most required and effective solution to water shortage crisis.

Unfortunately, in Iran, for several reasons, we have come across the reduction of farmers' participation in all agricultural fields including irrigation. The effect of this reduction of cooperation spirit on qanat as farmers' cooperation and empathizing source has been considerable and besides qanats degradation, main social and cultural problems have been rised.

In this study, common problems responsible for degradation of qanats and some of its factors were discussed. Also, appropriate solutions for rehabilitation of qanats and participation of villagers due to improved management are addressed.

## MATERIALS AND METHODS

Research was carried out in the *Khorassan province*, one of the origins of qanat technology in Iran, where six regions were selected for this case study. Survey on the subject was performed through filling the inquiry forms introduced to the Water and Soil Research Center technicians working close to qanat users. The cities which the information was gathered include *Mashhad*, *Ghoochan*, *Chenaran*, *Mahvelat*, *Boshrooye* and *Kashmar*.

The major topics which were investigated are as follows:

- 1) Existing qanats in the area and their full characteristics, features, etc.
- 2) Destruction reasons of the existing qanats.
- 3) The way people participated in constructing, maintaining and operating of qanat in the past and present, and the trend of participatory changes.
- 4) The role of governmental organizations in drying out and destruction of qanats.
- 5) Cultural problems responsible for demise the preservation and rehabilitation of qanat.

In addition, on December 2006 a gathering was held in Mashhad to integrate the attitudes of the villagers (qanat users) in order to elevate their spirit of participation and cooperation and find practical solutions to the water crisis they are dealing with. At this meeting experts from the Water and Soil Research Center participated actively. Through brainstorming technique, solutions were introduced to optimize qanat management and performance.

Currently, the rural problems are investigated using Rapid Rural Appraisal (RRA) technique. A core concept of RRA is that research should be carried out not by individuals, but by a team comprised of members drawn from a variety of appropriate disciplines. The techniques of RRA include:

- A) Interview and question design techniques for individual, household and key informant interviews,
- B) Methods of cross-checking information from different sources,
- C) Sampling techniques that can be adapted to a particular objective,
- D) Methods of obtaining quantitative data in a short time frame,
- E) Group interview techniques, including focus-group interviewing,
- F) Methods of direct observation at site level, and
- G) Use of secondary data sources [3].

Chambers (1980) describes the orientation of RRA as a “fairly-quick and-fairly-clean” appraisal, and as opposed to the fast and careless studies (he calls them “quick-and-dirty” studies) and the slow and excessively accurate approaches (“long-and-dirty”) [1].

In this research, during visits to qanats of some of the desert marginal areas thought exchange was done with some of the qanat owners and qanat diggers.

Qanats were chose to cover a wide range of ownership styles (from 20 owners to 400 owners) and technical features. Emphasize was on the qanats which were mostly located on the desert margin. In classifying the examined areas they were divided into two categories:

- 1) Areas with relatively suitable surface and subsurface resources such as *Mashhad*, *Ghoochan* and *Chenaran*.
- 2) Arid areas on the desert margin with a little amount of rainfall such as *Mahvelat*, *Boshrooye* and *Kashmar* in which qanat plays a vital role in villagers’ lives.

It must be bore in mind that studying the desert marginal areas are of prime importance and other areas were studied in order to make appropriate comparisons.

## RESULTS AND DISCUSSION

It can be concluded from the participants' points of view presented in the brainstorming gathering, and also, from analyzing the received inquiry forms the qanats degradation and dewatering reasons are as follows:

- 1) Rainfall reduction and drought in recent years resulted in underground water resources reduction which eventually caused qanats to go dry. These natural causes make us wonder whether restoring and rehabilitation of qanat are economical or not.
- 2) Excessive well drilling and exploiting water from deep aquifers has invaded qanats territories. Also the lack of governmental supervision over well drilling in the forbidden plains, not only has decreased underground water level, but also has been the main cause of qanats discharge reduction.
- 3) Advancement of farming facilities and more water provided by deep wells has made it possible to farm larger areas, which further has increased farmers' expectations on the amount of yield per acre can be obtained from their land. This has lowered the true value of qanat in their mind which in comparison can provide less water for their farms. On the other hand water-rights division by inheritance has reduced the amount of water which can be allocated by each individual, and therefore, less land can be farmed through generations.
- 4) Extra governmental intervention in rural social organizations, and reciprocally retreat and fade of conventional rural social systems, which were based on tribal hierarchy.
- 5) The lack of sufficient governmental credits provided for repairing and restoring qanats. Actually, excessive governmental intervention resulted in lack of incentives of the villagers to participate and cooperate further to maintain their own qanats.

It must be pointed out that in spite of the fact that drought has been one of the main reasons for destruction of qanats in recent years, however, it should be recalled that these natural events were in play since the birth of qanat (over 2500 years ago) and never could destroy them in this scale.

By ruminating over the recent years we find out that drought, accompanied with the birth of simpler methods such as drilling deep wells with little or no governmental control over the amount of water extraction has been the cause of qanat destruction in this scale.

On the other hand, one of the major reasons which caused qanat to dry out and left destructed, are deficiency of governmental support which has led to lack of pertaining social incentives. The existence of small farm ownership systems which has been created by the inheritance water-rights also has reduced villagers' participation and cooperation and furthermore has intensified the existing problems.

Also replacements of qanats with deep wells have reduced the tendency for qanats rehabilitation. Some farmers have this illusion that a well is connected to an unlimited water source. This way of thinking has resulted in devaluing the water in their minds. Unfortunately, this attitude has not been corrected by governmental institutions and national Medias.

Having provided the pertaining budget, the government has ignored the rural systems in which qanats were maintained by participatory management of all beneficiaries. In this respect the government overlooked the effective role of villagers in this respect, and took over the qanat restoration affairs completely. In this way the government interfered in the organized, powerful, and old participatory rural system and therefore the farmers gradually had a faded role.

Whenever qanats restoration has been performed by locals and the major part of the budget has been provided by the government, the project has been successful in carrying out its mission. As an example, *Anrag* qanat in *Mahvelat* with 7 kilometers length, 80 meters deep *mother well*, and about 30 liter per second discharge, has 150 water users in a small-farm-ownership system. The qanat has been restored during five years by benefiting from governmental budget and supervision and also the participation and cooperation of villagers. At present the final stages of this plan are being performed.

The last reason but not the least is that the villagers' migration due to encountering droughts has minimized the cooperation of the remaining people in maintaining of the qanats. Where in an integrated village with a more uniform cultural background, related works were done cooperatively. Drying of the existing qanats has caused the villagers to migrate to nearby cities and villages, which has led to social disintegration.

## SUGGESTIONS

Qanat can play a very important role in solving the existing water crisis. To bring this to reality some major programs that should be done are listed:

- 1) Informing villagers of water resources constraints and seriousness of the crisis caused by excessive water extraction and also delineating the usefulness of qanats through different methods especially via media.
- 2) Putting the farmers in the picture in order to maximize their participation in qanats management and restoration. Also, gradually removing the governmental supervision over qanats' management and increasing its observatory approach. The first step in this regard is to seriously involve the 30% of people's self-assistant which could be added to the 70% of the government budget. By raising the farmers participation, the role of government can gradually be transferred to villagers, and therefore, increase their participation.
- 3) To achieve the mentioned goals a local association related to qanats water affairs should be established. Its members can elected through the village representatives who share the qanat water. Strict supervision of the government seems essential in this regard. The relevant tasks of the association could be as follows:
  - Operation and maintenance of qanats.

- Coordinating self-assistant budget with governmental budget. Trying to reduce governmental financial role gradually, while at the same time increasing the water user's participation.
  - Training young people by experienced qanat diggers and conveying the qanats' restoring and digging techniques to them.
  - Updating the traditional techniques and equipments related to qanats construction and introducing modern methods and techniques.
  - Gathering and editing a series of applied manuals pertaining qanat construction, restoration and maintenance.
- 4) Unifying farms which are irrigated by a particular qanat and facilitating the allocation of water shares by the aid of governmental subsidies to uniform farms and encourage farmers to establish a planting pattern in harmony with local conditions that eventually can increase water use efficiency (WUE).
  - 5) Issuing heavy fines to individuals who break the rules and those who invade to water sources. Also, the need for more serious measures imposed on those who illegally use underground water resources. Putting these measures into effect by the government not only has a direct effect on water source preserving, but also identifies the real value of water in the villagers' attitude.

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