

**INTRODUCING ONE SAMPLE OF IDIGENOUS KNOWLEDGE OF QANATS WATER CONTROLLING IN YAZD PROVINCE ( MORE DUAL-PURPOSE CULTIVATION FOR AQUIFER MANAGEMENT AND PRODUCTION)**

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**ABSTRACT**

Farmer of yazd province have innovated some scientific and worthy methods for water controlling , because of its shrotage. This indigenous knowledge is the cause to keeping of rural areas, for example there had been created barrier and canals to convey water form seasonal rivers to marginal lands.

This subject was studied in Sanige valley , yazd . there are 22 inhabited villages so that in 12 of them , this methed has been used with dual – purpose cultivating in spring and qanat aquifer recharge- in this study the cultivation and qanat aquifer recharge were surveyed in 12 above samples . At the result the villagers were building small barriers across river and conveying water to the wide lands for the cultiration in the spring in previous years.

In this utilizing additional to producing product , the down aquifer recharge was also considered , sloping and permeable lands have been cultivated as circular Qolam (morei) with encourage owner and share farmer in spring season. in this way the lands dominant over qanat aquifer will be recharged and it will help water introducing along the summer . In fact there was a kind of water controlling through the cultivated strategy that has caused continuation of qanats and fountanis.

**Key words:** aquifer management, Idigenous Knowledge , agricultural , village , permeability , cultirated strategy

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## INTRODUCTION

Farmers' coexistence with extra arid climate in central areas of Iran is an interesting topic. Precipitation is low in this area. While mean annual Precipitation is about 100mm and it has a irregular distribution but the annual evaporation is about 3000mm and air humidity is less than 15% , in addition blowing hot and dry winds makes bad conditions for farmers, nevertheless the farmers have made thousands big and small villages according to their ancestors' wisely manners. These villages have remained for several years.

The cause of remaining people in such difficult condition is that they have learned to make the most of water. There were some group interview with selected villages correspondents to knowing the manner of coexistence with water shortage and dry conditions. In this way many manners were introduced so that one of them is method of subterranean waters improvement and store water under the ground to use it during the water shortage. Water supply resource in such villages is qanat that is connected to subterranean water resources and gradually makes it discharge in piedmont plains due to the geological conditions and shape of earth there would be changeable water discharge during the year. Qanat water would increase in winter and spring seasons, but it decreased at the end of summer (table no. 1), the villagers to face with excess water during the winter but with water shortage at the end of summer. In the studied area the villagers have solved this problem with irrigation and cultivation management in land over look the qanat.

Dehghani et. all have reported the fluctuating of qanat water discharge in this area from average of 43 liters per second during the spring to average of 1.32 liters/s at the end of autumn. This fluctuating has become an important difficult in piedmont and mountainous regions during recent years. The authorities of selected villages explained that farmers for solving the problem combined farming with aquifer and through cultivate on up lands in spring season could increase the qanat water in the next months.

Similar to this method has been reported in Sistan and Balochestan by Henry Goblo(2). So that Iranian ancient people caught extra water in pools named "Gabr Band" during the spring. The water permeated through the soil and increased qanat water of down lands in the next months.

In fact the people of desert-dweller stored extra-water in different forms on the ground during the spring, then gradually used it through the qanat in dry season. The villagers had a good experience in method of water-supply and its circulation. The selection of soil type and distance between place of water permeation to qanat recharge reservoir, also the time of its impression qanat discharge is important and depends on people's experience these methods include cultivation management aim to aquifer management, recharge into soil directly through the "Gorabs" (fig.no.2), water transfer through the rich basin to poor one, diggings subterranean conduits aim to recharging water into qanat aquifer and creating terrace villages along the valley (fig.no.3) aim to drain the upper plantation then the water was utilized in an area.

## MATERIALS AND METHODS

The study was carried out in area of 5960 Km<sup>2</sup> in Taft city limit, Yazd; there were selected 473 habitable villages as statistical universe and 10% of them were as statistical sample villages. At least 3 local authorities were selected from every sample village to interview.

The interview was done in form of semi-open. Their group suggestions were recorded as different experiences. Behaviors were deeply investigated before interview. Many behaviors were observed about farming especially water and soil conservation. In this article you will see only a sample of behavior concerning to water supply and to regulate its circulation. Since these suggestions are offered collectively and its date and effect can be observed there, thus they are assured and believable. Sociologists such as Dani have introduced this study much reliably.

## RESULTS AND DISCUSSION

The results showed that arid zone inhabitants of Iranian central plateau used an effective method to adjust water shortage. This method included artificial recharge of qanat aquifer in different farms.

One of the methods of aquifer reinforce is combined agriculture with aquifer management.

This was done in form of cultivating on up land of qanat aquifer in spring season. There is usually extra water in mountainous village valleys during the spring. Qanats are dug in path of these valleys alluvium. This alluvium is qanat aquifer. The villagers selected up land and conducted extra water there, then they were temporarily cultivating to reinforce qanat discharge (Fig.no.1). Sometimes crops failed because of short period of extra water flow. But the farmers always use this method since they sought artificial recharge of qanat aquifer not to get a good crop. Varied value was selected on the basis of material and depth of alluvium, area slope, the time of decrease of qanat water and distance of cultivation to first well (Mathar chah). The farmers were experienced in selection of distance and the other mentioned parameters for mountainous shallow qanat with 20m depth this distance was 3 kilometers. If there wasn't any natural limitation, they would select this distance according to alluvium material and texture until the drain of plantation effect on qanat discharge. This dual purpose cultivation carried out in sloping land and hillsides in form of terracing or by the side of the small channels. They called it "Mor-ei-kary" and usually cultivated wheat, barley, pea and lentil in channels. Mor-ei cultivation caused recharge water in sloping land that was in the distance one kilometer of qanat. This strategy has regulated the qanat discharge fluctuating and caused to stability form and village, the terraces where cultivated wheat were irrigated regularly before cluster growth.

In addition to combine cultivation that was explained, there were dug several hollows in suitable distance for catching extra water during the spring. Water gradually permeated in aquifer and would increase the qanat water later. These reservoirs called "Gorab"

there was one or several Gorab for every qanat that helped the artificial recharge. Areas of Gorabs were from 100m<sup>2</sup> to one hectare and were at 1-3 Km distance of qanat. When two sub-basin were beside each other one was rich and the other poor. By making some channel could transfer water from rich basin to poor one, thus they produce a water balance in the region.

The authorities showed some under ground channels in rural districts of Sanij. These channels are made only for artificial recharge of aquifer .When the surface of aquifer was impermeable, water transferred into the aquifer through the channels.

Finally, people of desert-dweller had a wisely behaviors for water supply and circulation. Through these behaviors villagers could endure the most severe conditions such as drought.

Nowadays unfortunately the beautiful and coexist with environment behaviors are being forgotten. This forgetfulness is one of reasons for destabilize agriculture in villages. It is necessary that responsible organizations collect the indigenous knowledge and current behaviors in every region as soon as possible and combine them with modern behaviors utilizing for stability development.

**Table no.1-** discharge fluctuation in qanats of Sanij rural districts

Village name	Mean qanat discharge during April Li/s	Mean qanat discharge during September
Dashtak-e- Olia	35/5	1/44
Dashtak-e- sofla	41/1	2/23
Bagh-e-Khatoon	33/1	1/7
Ghala-Khan	27/5	1
Sadegh Abad	32/5	0
Koreh	62/4	1/5
Navabi	71	1/4
Mean	43/3	1/32