

WATER MANAGEMENT IN ARID AND SEMI ARID ZONE: TRADITIONAL WISDOM.

Pradeep Bhalge¹, Mrs. Charu Bhavsar²

ABSTRACT

Thar Desert covers the area of 44.6 million hectare, out of which 27.8 million hectares lie in India and the rest in Pakistan. The average annual rainfall is ranging from 500 in the east to 100 mm in the west. It is an ill water sandy tract of Rajasthan. As the rainfall is very erratic, the ancestors developed various wise and sustainable traditional ways to harvest the rain water. Most of the villagers in the desert tract have small ponds, covered pits called as kunds or simple excavation called as sar. They developed mixed cropping pattern in which human and animal population benefit from each other. Around 15th Century, the paliwal Brahmins community of the Jaisalmer district of the Rajasthan have been developed Khadin system of cultivation. The system is based on the principle of the harvesting the rain water on farm land and subsequent use of this water-saturated land for crop production. Khadin system has great similarity with the irrigation methods of the people of Iraq around 4500 B.C. This paper deals with the skillful traditional water management practices like Kund, sar, roof top rain water harvest, tanks and Khadins etc.

INTRODUCTION

Several Period of prosperity are quite discernable in the history of India. Numerous documentary and field evidences based on well conceived planning and regulation are extant in different parts of India. The methods of water development of respective periods have long been closely linked to the Indian climate, social fabric and living style. At majority of the sites, this historical management system can again brought in be operation with minimal financial provision and public participation. They may continue to function for several decades on zero budgets provision. Traditional water management practices in the Thar Desert of India provide the guiding principles in the current water crises problems in arid and semi arid zones. In this paper the traditional wisdom is discussed.

Thar Desert of India receives very meager amount of monsoon rains. This is highly erratic in nature. When the monsoon clouds came to pouring down on them, there was

1- Irrigation Engineer and Executive member of Indian Council For Water and Culture, Aurangabad, Maharashtra, India.

2- Life member of Indian Council for Water and Culture, Aurangabad, Maharashtra, India.

water and life. Once the rains disappear the lands become dry, life becomes difficult and water scarce to find. The ancestors realized that human society can not grow without extending the bounties of the monsoon water, from the dry months to the wet months. And thus slowly grew the extraordinary traditions of water harvesting. They developed techniques to divert the rainwater in to a storage structure so that the water could be used in the dry period for human and animal consumption and for agriculture. People's participation was the base of those techniques. The experience of the local inhabitant can provide valuable lessons for designing and sustaining water developing programs.

KUNDS

Kunds found in the sandier tracts of the Thar Desert are covered underground tanks with artificially prepared catchments area to increase the runoff. This traditional surface rain water is continue to be important and assured source of drinking water.



Kunds are circular in shape tank constructed at the centre of a selected catchments area, the depth and the diameter of the kunds are nearly kept same. Generally it ranges from 3-4.5 meter. Lime mortar or cement mortar is used for the construction of the tank. A soccer shape was given to a catchments area. The size of the catchments area ranges form 20 square meter to 2 hectors. After cleaning of vegetation from the soil surface the land was given a smooth gradient of 3 to 4 percent towards the kund. The cleared surface was lined with silt. In places where a calcium –carbonate zone was available below the soil surface at shallow depth, water proofing of the soil was done with murum i.e. earth from disintegrated rocks. Run off generated over the surface enters the kund through the openings provided on the wall of the kunds. The openings or the inlets are generally guarded a wire mesh to prevent the entry of the floating debris, birds, reptiles. The top is covered with a lid, from where water can be drawn out with bucket and rope. Cattle are not allowed to graze the saucer and shoes have to keep off. It is calculated that a kund having 100 square meter catchments area with 100 mm effective annual rainfall could easily collect 10000 liters of water. The rainfall data collected shows that areas with 100 mm rainfall can use the kund system very effectively. Even if the kunds do not collect sufficient water in scanty rains they can be used as water reservoir, which can be filled by transporting water by tankers.

Now a days tap water schemes are provided in these areas. Though the tap water scheme is important from health and other aspects, will take a long time because it is dependent on electric supply, which is extremely unreliable. Moreover, the supply from

ground water source, which may run dry over time. Therefore, traditional kund can supplement the piped water supply system to improve sustainability. The public kund built by the people have improved water accessibility. On an average a kund measuring 5 m deep and 2.5 m in diameter takes 25 days to build and costs about \$300. After the construction is complete, a convex lead locally called as Bhida, is placed over the Kund as cover. Traditionally this was made from the easily available wood, and plastered with mud. Now a days either sand stone or Ferro-cement is used to make the bhidas. Bharat Singh Punia, a lanky farmer from Village Lahsedi says that “Kunds are our treasury in which we store the sweet nectar from the heavens and quench our thirst when all other sources are dry up.” Kunds are privately owned as well as community owned. Sunga Ram Sharma care taker of a community owned Kund proudly says that “Their kund serves about 1.5 millions pilgrims, who throng the shrine of our warrior saint Geoaji Chauhan in the month of August. It also serves the travelers round the year”

SAR

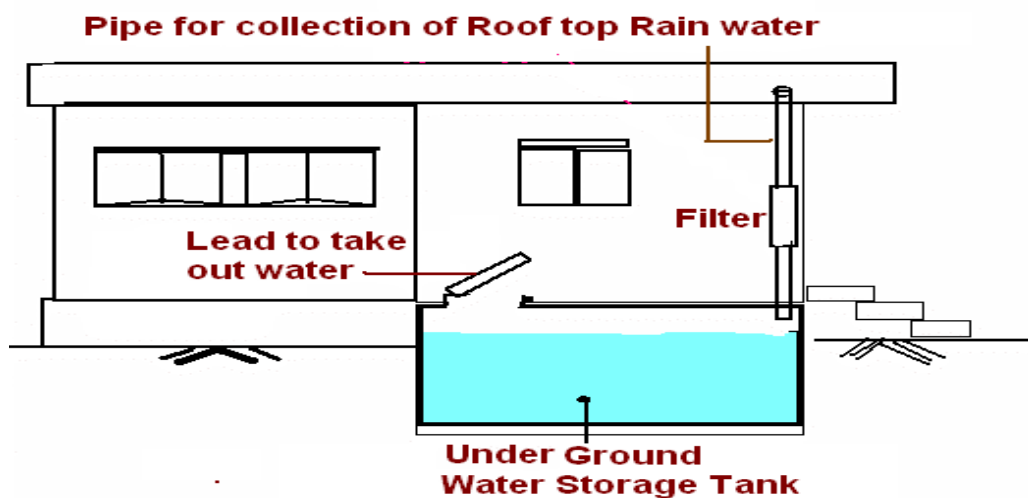
Sar means tank or reservoir. It is suffix used after the name of a tank. A tank constructed before 600 hundred by the King Ghadasi of Jaislamer (India) is named after him as “Ghadasisar”.



This tank is still supplying water to The Jaislamer town. In the arid zone of Rajasthan the water harvesting is deeply rooted in its social fabric. The other name of the tanks in these region are Govindsar, Badalasar, Gulabsar, Bhatiyasar, Ratansar etc.

ROOF TOP RAINWATER HARVESTING

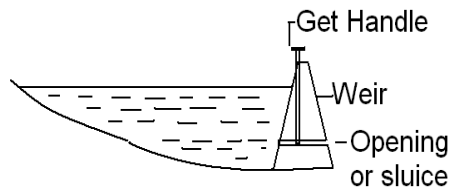
Under ground water storage tanks were found in most traditional houses in Bikaner town of the Rajasthan State (India). They were like a circular hole made inside the ground below the floor of a room. They are polished with lime, beautifully decorated and covered with tiles. Roof water is collected during the rains and used only when all the other supplies failed. It is preferred to give water from this tank to an ill member for drinking than the tap water. Thus they have great faith on the purity of the rainwater. Such types of roof top water harvesting techniques are also prevalent in Indian states like Mizoram, Himachal Pradesh, Gujarat, Rajasthan, Tamilnadu etc. Now a days the water storage tanks are constructed by using Brick masonry, stone masonry, ferrocement, or Reinforced cement concrete.



Average water requirement for domestic consumption is 10 liters per day. The quantity of water required for a family of five persons is 50 liters. The quantity of water in liters that can be collected from the rooftop can be calculated as follows. It is simple multiplication and can be = Area of roof in Square meters X annual rainfall in Meters X 1000. A house with roof of measuring 6 meter length, 4 meter breadth, and annual rainfall 400 mm i.e. 0.4 meter, will able to yield $6 \times 4 \times 0.4 \times 1000 = 9600$ liters. This much water is sufficient to the family under consideration for $(9600/50)$ 192 days.

TANKS

Eri irrigates approximately one third of the irrigated area in Tamilnadu state of India. Eris are the ancient tanks. Eris have played several important role in maintaining the ecological harmony as flood control system, preventing soil erosion and wastage of runoff during period of heavy rains and recharging the ground water in the surrounding areas.



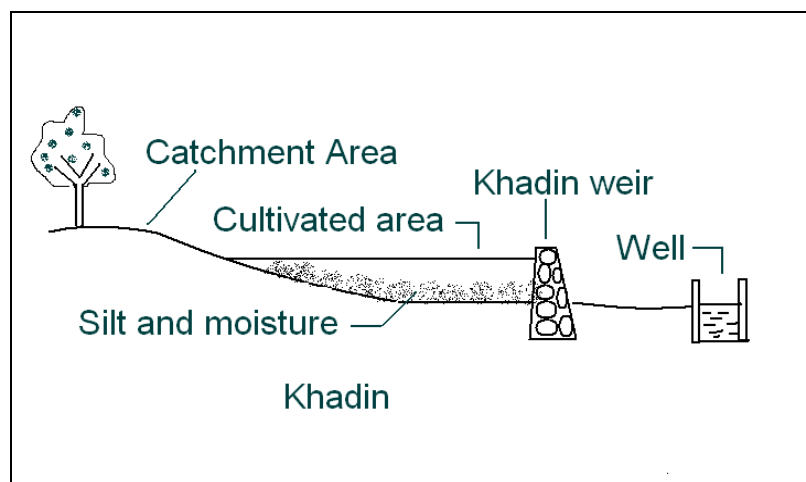
Eri (Tank)



Until the arrival of the British in 1600 AD, Eris were maintained by the local communities with resources. Historical data from the Chegalpattu district indicates that in 18th century about 4.5% of the gross produce of each village was allocated for the maintenance of the Eris and other irrigation structures. The village community has to decide the water distribution, opening and closing of the sluices, water allocation to a field and to a particular crop. Every village has an informal organization, which consists of all irrigators.

KHADINS

The climate of the Jaisalmer region is hot and arid, with an average rainfall of only 164 mm. The average rainy days in a year are only 7.7 days. Considering the general water requirement of agricultural crops, which are much above 250 mm, rain fed cropping is impractical in such tract. Though in the deep desert of Jaisalmer district, where agriculture is hazardous the Paliwal Brahmin community has devised the khadin cultivation techniques to ensure at least one crop a year at specific sites. This land use techniques built around takes in to account the vagaries of the weather and makes the best use of the meager rainfall and prevents the soil deterioration of farmland. Khadin is the skilful and sound scientific practice of harvesting of rainwater. Scientists of the arid zone believe that it has great importance even in the present day Thar agriculture and land-use.



The Khadin system is a runoff agricultural system. The runoff water from the high catchment area is arrested with the help of a Khadin bund. The water is impounded on the upstream side of the bund during the rains. The stored water gradually recedes into the ground increase the soil moisture content. On this soil moisture deep-rooted crops are raised. These Khadin soils remain moist for a long time. Khadin soils have relatively high organic matter and also rich in nutrient in comparison to other desert soil. Khadin have functioned efficiently for centuries maintaining the soil fertility.

The king would give land to the Paliwals and ask them to develop Khadins on the land. The ownership of the land would remain with the King. Out of the grains that harvested from the khadin land, one fourth would have to be given the King. Thus they develop a whole network of Khadins in Jaisalmer district. Khadins are also found in Jodhpur, Bikaner and Barmer district of Rajasthan state of India. There are still 500 big and small khadins covering an area of 12000 ha. This system has great similarity with the irrigation methods of the people of Iraq around 4500 BC. A similar system is also reported to be practiced in Negev desert, and southwestern Colorado, 500 years ago.

Khadin is an earthen embankment built across the general slope. It conserves all the rainwater runoff to the maximum possible extent within the agricultural field. The height of the earthen embankment is generally kept as 1.5 to 3.5 meters. On one side of the embankment waste weir is provided to take out the excess runoff safely. The length of the embankment varies from 100 to 300 meters according to the site requirement.

CONCLUSION

Khadins in the desert fulfill the drinking water needs at low cost. If maintained well it provides portable water. Rain water harvesting is a long term solution for the hilly area, remote area and in the scarce water area. In case of contaminated ground water, harvesting the rain is a good solution to fulfill the drinking water needs. Traditional water harvesting system definitely has relevance in areas where water scarcity is acute or where ground water is either brackish or too deep to obtain cheaply. Khadin makes possible to raise crops in the scanty rain fall zones which are otherwise impracticable in the arid sandy tract. It conserves the soil and soil moisture. This helps in crop production. Khadins have also created a positive impact on the ecology of the region, effectively checking the soil erosion and increasing the vegetative cover. The traditional water management practices are sustained for a long period. The technology has proven over the time. The wisdom can be still used to solve the present water crises to some extent.

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