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Traditional rain water harvesting systems in Rajasthan: water resources conservation and its sustainable management – a review.

Sistemas tradicionales de recolección de agua de lluvia en Rajasthan: conservación de los recursos hídricos y su gestión sostenible: una revisión.

Dr. Subhash Chandra Yadav

Assistant Professor, Geography, Dr. B.R. Ambedkar Govt. P. G. College, Nimbahera, Rajasthan, India. Email: scy650@gmail.com

ABSTRACT

Communities all over the world have been endowed with the wisdom of indigenous technologies to collect the rain where it falls, so one can find such structures all around the world. The region of western Rajasthan in India faces frequent droughts and an acute shortages of water. This has compelled the local people to incorporate mechanisms to conserve water in their everyday life. These traditional methods have been developed over centuries and reflect the accumulated wisdom of many generations. An attempt has been made in this paper to undertake a detailed investigation of the various traditional water harvesting systems weaved in the social fabric of Rajasthan, that have been constructed using the indigenous knowledge and locally available material and are also significant for the state in present context to cope with drought.

Keywords: Traditional water harvesting, Johad, Rajasthan, Thar Desert.

RESUMEN

Las comunidades de todo el mundo han sido dotadas con la sabiduría de las tecnologías indígenas para recolectar la lluvia donde cae, por lo que se pueden encontrar tales estructuras en todo el mundo. La región del oeste de Rajasthan en India enfrenta frecuentes sequías y una aguda escasez de agua. Esto ha obligado a la población local a incorporar mecanismos para conservar el agua en su vida cotidiana. Estos métodos

tradicionales se han desarrollado durante siglos y reflejan la sabiduría acumulada de muchas generaciones. En este documento se ha intentado llevar a cabo una investigación detallada de los diversos sistemas tradicionales de recolección de agua entretejidos en el tejido social de Rajasthan, que se han construido utilizando el conocimiento indígena y el material disponible localmente y que también son significativos para el estado en el contexto actual. para hacer frente a la sequía.

Palabras clave: recolección tradicional de agua, Johad, Rajasthan, desierto de Thar.

INTRODUCTION

Mismanagement and unsustainable use of water is making the whole situation environmentally uncomfortable for India. Most of the rain falling on the surface tends to flow away rapidly, leaving very little for the recharge of groundwater. The excessive continued exploitation of ground water resources in various parts of the country has resulted in declining ground water levels and depleted ground water resources in large areas of the country. Water harvesting could be understood as the collection and storage of any form of rain water: snow or rainfall from a particular watershed. Rajasthan, the largest and the driest state in India, has one of the most critical water status. Due to deep aquifers and low recharge the estimated groundwater resources in Rajasthan are limited. Rajasthan, with more than 10.4% of the country's geographical area, supports more than 5.5% of the human population and 18.70% of the livestock, but only has 1.16% of the total surface water available in the country. More than 60% of the state is a part of the Great Thar Desert, and of the total 142 desert blocks in the country, 85 blocks are in the state of Rajasthan (Narain et al., 2005).

In the low-rainfall western zone of Rajasthan, there are various kinds of rainwater harvesting systems such as Bawari, Jhalara, Nadi, Tanka,Talab, Khadin, Kund and harvesting of roof water. Out of these, Bawari and Jhalara depend on groundwater, while Talab, Tanka, Johad,Nadi, Kund and Khadin are based on harnessing surface runoff (Khan 1995, Khan and Narain, 2000). For the people of Rajasthan state, water harvesting was not a technique, but a part of their culture and was deep embedded in the socio-cultural frames. The major advantages of rainwater harvesting are that it is simple, cheap, replicable, efficient, sustainable and adaptable. Rainwater harvesting also has been shown to improve water use efficiency, reduce soil erosion, improve soil fertility, mitigates floods and increase agricultural productivity and has provided drinking water, domestic water, water for

livestock, water for small irrigation and a way to recharge ground water levels (Reiz et al., 1988).

SELECTION OF THE STUDY AREA

Rajasthan, the largest state of the country, located in the north-western part of the country, covers an area of 3,42,239sq km, which is 10.40% of the geographical area of the country. The geographical extent of the State is 23°4'N to 30°11'N latitude and 69°29'E to 78°17'E longitude on the globe. The State has 4 different regions i.e., the Western Desert with Barren Hills(Thar desert), Sandy Plains, the Aravalli Hills, and South-Eastern Plateau. The climate of the State varies from semi-arid to arid and hot. The western part of the State, including Thar Desert (also known as the Great Indian Desert), is relatively dry and infertile whereas, in the south-western part, the land is wetter, hilly, and more fertile. The rainfall is very low, highly indefinite, and variable. The State has 33 districts and has a population of 68.55 million accounting for 5.66 percent of India's population. The people of this region made sagacious use of natural resources, particularly water to sustain human and livestock populations (CGWB, 2011).

TRADITIONAL METHODS OF WATER HARVESTING IN RAJASTHAN

In the following sections some important methods of rainwater harvesting are described.

Kund or kundi : Kunds are rainwater harvesting structures found in the sandier tracts of the Thar Desert in western Rajasthan and are the main source of drinking water. A kund is a circular underground well. It looks like a saucer-shaped catchment area which gently slopes towards the centre where the well (kund) is situated. A wire mesh across water-inlets prevents debris from falling into the well-pit. The sides of the wellpit are covered with (disinfectant) lime and ash. The depth and diameter of kunds depend on their use (drinking, or domestic water requirements). (CGWB 2011).

Kuis or Beris : Kuis or Beris are found in western Rajasthan especially in abundance in Bikaner district of the state, these are 10 to 12 meters deep pits dug near tanks to collect the seepage. Kuis can also be used to harvest rainwater in areas with meager rainfall. The mouth of the pit is usually made very narrow to prevent the collected water from evaporating. The openings of these entirely kuchcha (earthen) structures are generally covered with planks of wood (CGWB 2011).

Baoris : Baoris are community wells, found in Rajasthan, that are used mainly for drinking purposes. Most of them are very old and were built by Banjaras (nomadic communities) for their drinking water needs. They can hold water for a long time because of almost negligible water evaporation. They do not have a catchment area of their own nor are they connected to any water course. They access the water from the seepage of talab or a lake situated nearby. They occupy minimum space in order to save money, time and energy. Jodhpur district is especially famous for baoris. There is very little water evaporation from the baoris compare to other water bodies (CGWB 2011).

Jhalara: is a local name given to step wells. Jhalaras were human-made tanks, found in Rajasthan essentially meant for community use and for religious rites. Often rectangular in design, jhalaras have steps on three or four sides. Jhalars are groundwater bodies which are built to ensure easy and regular supply of water to the surrounding areas. The jhalaras collect subterranean seepage of a talab or lake located upstream. The water from these jhalaras was not used for drinking, but only for community bathing and religious rites (CGWB 2011).

Nadi: Nadi or dug-out village pond is the oldest and still the most prevalent storage structure for rainwater harvesting from an adjoining natural catchment during the rainy season. It is a stone check dam, constructed across a stream or gully, to capture monsoon runoff on a stretch of land. The site was selected by the villagers based on available natural catchments and its water yield potential. The water stored in a Nadi is generally used for drinking by livestock and human beings. A Nadi also acts as a source of groundwater recharge through seepage and deep percolation. These nadis are found in Jodhpur and Rajsamand districts of Rajasthan. (CGWB 2011).

Tanka: The Tankas (small tank) are underground structures that is another major source of drinking water, are traditionally found in the main house or in the court-yard of the houses in western Rajasthan. It is constructed in a circular or rectangular shape, normally on bare ground where surface runoff can be diverted to the Tanka by creating a clean catchment around it. The water is used only for drinking purpose (CGWB 2011).

Khadin: Khadins are ingenious constructions designed to harvest surface runoff water for agriculture. The main feature of a khadin, also called dhora, is a long earthen embankment that is built across the hill slopes of gravelly uplands. Sluices and spillways allow the excess water to drain off and the water-saturated land is then used for crop production. First designed by the Paliwal Brahmins of Jaisalmer in the 15th century, this

system is very similar to the irrigation methods of the people of ancient Ur (present Iraq) (CGWB 2011).

Vav / Vavdi or Baoli / Bavadi : These are wells or ponds in which the water may be reached by descending a set of steps. They may be covered and protected and are often of architectural significance. Step well locations often suggested the way in which they would be used. When a step well was located within or at the edge of a village, it was mainly used for utilitarian purposes and as a cool place for social gatherings. When step wells were located outside the village, on trade routes, they were often frequented as resting places (CGWB 2011).

Talabs: Talab is a local name of a water harvesting structure used as reservoir situated in valleys and natural depressions. Some Talabs have wells in their beds which are called Beris. Until now, many of the existing Talabs in Rajasthan are good sources of potable water and are feeding a large number of wells and Baoris. The reservoirs are in various sizes and named as variously: a small lake is called Talai; a medium sized lake is called Bandh or Talab; and a bigger one is called sagar or samand (Mishra, 2001).

Tanks: in contrast to Talabs, are constructed with huge masonry walls on four sides. They are either square or rectangular in shape and can hold massive amounts of water. They are invariably provided with a system of canals to bring in rainwater from the catchment areas. Most of the famous tanks are constructed in Jodhpur.

Tobas: is the local name given to a ground depression with a natural catchment area. A hard plot of land with low porosity consisting of a depression and a natural catchment area was selected for the construction of Tobas. It provides water for human and livestock consumption and the grass growing around it provides pasture for cattle. In order to preserve and enlarge the capacity of the Tobas, the catchment areas were widened.

Johad: A johad is a traditional water harvesting structure. Johads are small earthen check dams that capture and conserve rainwater, improving percolation and groundwater recharge, constructed by people using their own skills, resources and indigenous knowledge. The johads are simple, usually semi-circular, mud barriers built across the hill slopes to arrest the monsoon runoff. They are built across a slope to arrest rainwater; bound on three sides by the natural slopes of hills while the fourth side is left open for the rainwater to enter. They are very common in the Thar desert of Rajasthan. The water collected in a johad during the monsoon is directly used for irrigation, drinking, livestock and other

domestic purposes. A Johad prevent rain water from running off, allowing it to percolate into the ground, recharging water aquifers and improve the water balance of the earth (CGWB 2011).

ROLE OF COMMUNITIES AND INDIVIDUALS

Social scientists, historians and scholars have found that there was no problem of water scarcity where the community organizations were strong and the people relied upon their own efforts to build water harvesting structures. However, the situation was bad where the people depended entirely on the state for water.

CONCLUSIONS

The traditional water harvesting systems described above have been in existence for many centuries. They have evolved using the age-old wisdom and knowledge of the terrain developed over many hundreds of years. They serve the essential water requirements of the people, especially in the water deficient areas of the Thar Desert in Rajasthan. In recent times, however, these water harvesting systems have fallen into disuse or are being degraded by the march of industrialization and urbanization. There is an urgent need to regenerate and revive these ancient systems which are especially suited to the requirements of specific areas. They also serve the crucial sociological and religious needs of the people, besides being of cultural, historical and architectural importance.

The areas where tube wells were erected have witnessed a gross neglect of Nadis and Beras. Due to a low level of groundwater, tube wells in these areas have now dried up and there is a pertinent need to revive traditional water harvesting system. Traditional methods of harnessing surface water may provide some alternatives to meet the problem of water demand. A systematic study of similar traditional water harnessing methods is needed to make policy-makers aware of these alternative sources. Efforts shall be made to educate the rural people for this technique of water harvesting by using locally available low cost construction materials. An integrated approach and conscious development for the upkeep of traditional water harvesting structures shall go a long way in ensuring sustainable livelihood and maintaining ecological balance in drought-affected western Rajasthan.

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