

RAIN WATER HARVESTING AND METHODS

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Abstract-The scarcity of water is the main ongoing agenda in the world right now. The rate of urbanization and Industrialization is at its peak leading to extreme usage of potable and usable water. As industrialization is going on a rapid rate, the wet lands are also being used to development and construction purposes leading to higher surface runs. In such a scenario the best technique to recharge and reduce the direct ground water usage is RAIN WATER HARVESTING by which the rain water can be used to recharge the ground water level and also storage of water to be used in times of crisis. The conventional sources like Rivers, Wells, Reservoirs are not enough to fulfill the requirement of water demand due to uneven rainfall pattern and hence the need of RAIN WATER HARVESTING arises.

Introduction-Rainwater harvesting is most suitable where Groundwater is scarce, Groundwater is contaminated, Terrain is rugged or mountainous, seismic and flooding events are common. The aquifer is **in danger** of saltwater intrusion, population density is low, electricity and water prices are rising, water **is just too** hard or mineral laden, consumers must restrict salt and chlorine intake, where utility service is unreliable and conservation is an objective. Water conservation and harvesting have been practiced in India and other parts of world. Rajasthan is famous for its traditional water conservation and harvesting practices in Pokhar, Talab, Johad etc. Madhya Pradesh the Pat Bandhna is an age old practice adopted by tribal families. Chandela tanks are **exemplar** of **conservation** and harvesting, constructed by the Chandelas rulers. The dominant structure was the johad, a crescent shaped dam of earth and rocks, built to intercept rainfall runoff. A johad served two functions. On the surface, it held water for livestock. But like an iceberg, its **most vital** parts were below the surface. By holding water **in situ**, it allowed the liquid to percolate down through the soil. It recharged the aquifer below, as far as a kilometre away. Stored underground, the water **couldn't** be lost to evaporation.

What is Rain water harvesting?

It is an activity towards straight collection and storage of rainwater for the best use of humanity. This technique conserves the accumulation and deposition of rain water for reuse on-site, rather than

allowing it to run off. The method is most suitable where the rain water is scarce and harvested rainwater can be stored in any structure outside or below the surface.

Need of Rain water harvesting in today's world. Fresh and clean water is a limited resource. Our most of the planet is covered with water but it is salt water that can only be consumed by humans and other species after undergoing desalination, which is an expensive process. Occurrence of natural calamities such as droughts further limit access to clean and fresh water that means people need to take few more steps to reduce the fresh water use and save as much water as possible. In some areas of the world, due to contamination access to water is limited. People who have access quantity of fresh water they can take steps to limit their use of water to avoid wastage of water. So to prevent from fresh water scarcity rain water harvesting is essential.

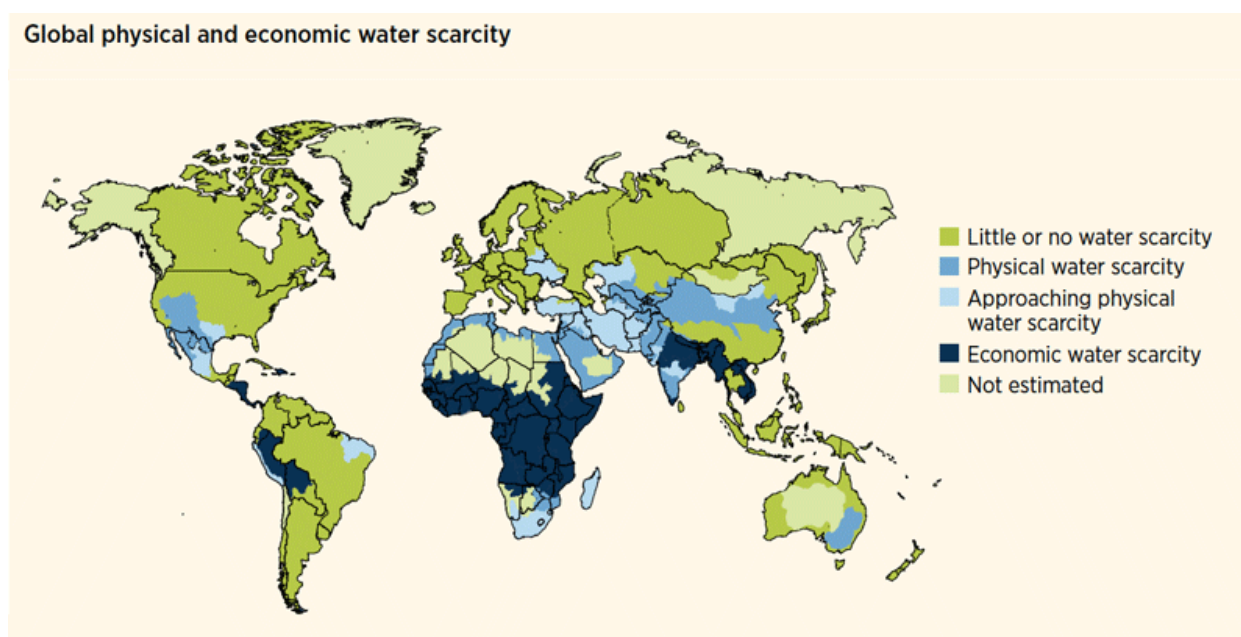


Fig. 1: Water scarcity graph 2013

Traditional methods of rain water harvesting in India.

Water has been harvesting in India since 9th and 10th century, with our ancestors perfecting the art of water management. There were many rain water harvesting systems developed in India with so many natural techniques, because of their unique skills these methods are still in use in many parts of the country. Some of the methods are as follows

PAAR SYSTYEM



Fig. 2: Paar system in a part of Rajasthan

It is a common water harvesting technique in western Rajasthan. It is a common place where the rainwater flows from the agar (catchment) and percolates into the sandy soil. In order to access the raganipani (percolated water) kuis or baoris are dug in the agar (storage area). These Kuis or baoris are normally 5 meters (m) to 12 m deep. The structure was constructed through traditional masonry technology. Normally six to 10 of them are constructed during a paar. However the numbers of kuis or baoris are decided depending on the size of the paar. This is the foremost predominant sort of rainwater harvesting within the region. Rainwater harvested through Paar technique is known as Patalipaan.

TALABS/BANDHIS



Fig 3: ATalab

Talabs are reservoirs that stores water for household as well as for drinking purpose. They may be natural, such as the ponds (pokhariyan) at Tikamgarh in the Bundelkhand region or they can be human-made, such as the lakes in Udaipur. A reservoir area of **but** five bighas **is named** a talai; a medium sized lake **is named** a bandhi or talab; bigger lakes are called sagar or samand. The pokhariyan serve for irrigation and also for drinking purposes. The pond beds are cultivated with rice when the water in these reservoirs dries up just a few

SAZA KUYA



Fig. 4: Image of Sazakuva

A method of irrigation in mewar region of eastern Rajasthan. It is considered as common property resources and it is constructed by group of farmers with adjacent land holdings. Soil dug out to make the well pit is used in the construction of foundation or elevated platform sloping away from the well. The first **is made** to accommodate the Rehat, **a standard** water lifting device; the sloping platform is for the chada, **during which** buffaloes are **wont to** lift water.

JOHAD



Fig. 5: Image of johad in the north western part of Rajasthan

It is a crescent shaped bund which is built across the sloping catchment to capture the surface water before it runs off. These are small earthen check dams that capture and conserve rainwater, improving percolation and groundwater recharge ground then can be used when there is no rainfall.

PAT



Fig. 6: The pat system

Bhitada village of Jhabua district in Madhya Pradesh developed this unique pat system. This system was devised **consistent with** the peculiarities of terrain to divert water from swift flowing into irrigation channels called pats. The diversion bunds across the stream are made by piling up stones and then lining them with teak leaves and mud to make them leak proof. The pat channels have to negotiate small nullahs that join the channels off and on.

Modern techniques of Rain water harvesting There are primarily two ways of harvesting rainwater – Surface runoff rainwater harvesting and roof top rainwater harvesting.

1. Surface runoff harvesting – This kind of rainwater harvesting is meant for urban areas where rainwater flows away as surface runoff. This runoff could be caught and used for recharging aquifers by choosing appropriate methods.

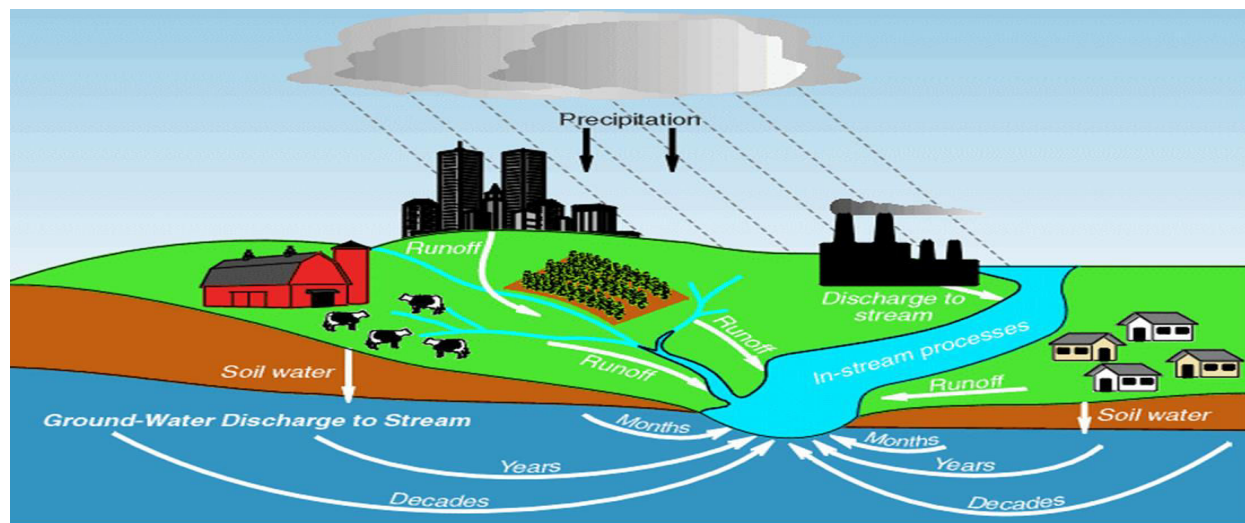


Fig.8: Surface runoff harvesting method

2. Roof Top rainwater harvesting – In this type of harvesting, rainwater is collected from the roof of the house/building. It can either be stored **during a** tank or diverted to artificial recharge system. This method is cost effective and if implemented carefully helps in increasing the ground water level of the area.

The various methods of rooftop rain water harvesting are as follows.

1. Storage of direct use:-In this method the rainwater collected from the roof of the building is diverted through pipes to the storage tank. The **tank has got to** be designed **consistent with** the water requirements, rainfall, and catchment availability. Each drainpipe should have mesh filter at mouth and first flush device followed by filtration system before connecting to the **tank and therefore the** tank should have an excess water overflow system.

This excess water could be diverted to the recharge system. Water of the storage tank can be used for washing clothes, utensils gardening and other secondary purposes. This is **the foremost** cost-effective way of rainwater harvesting.



Fig 9: A storage tank on a platform painted white

2. Artificial recharging:-

i. Recharging of bore wells:- Rainwater collected from rooftop of the building is diverted through drainpipes to settlement or filtration tank. After settlement filtered water is diverted to bore wells to recharge deep aquifers. Abandoned bore wells **also can** be used for recharge.

ii. Recharging of dug wells – In this method, rainwater from the rooftop is diverted to dug wells after filtering it. Cleaning and desalting of dug well is done on a regular basis to increase the recharge rate.

iii. Recharge pits – These are actually small pits of any shape rectangular, square or circular, contracted with brick or stone masonry wall. The bottom of these pits is filled with filter materials.

iv. Recharge Trenches – This option is used where upper impermeable layer of soil is shallow. A trench is excavated on the ground and refilled with porous media such as pebbles, boulder or brickbats. Bore wells **also can** be provided inside **the ditch** as recharge shafts **to reinforce** percolation.

v. Soak ways or Recharge Shafts – This option is feasible for conditions where the upper layer of soil is alluvial or less pervious. At the top of soak away required size sump is built to contain runoff before the filters through soak away.

vi. Percolation Tanks – These are actually artificially created water bodies with appropriate permeability to enable adequate percolation for ground water recharging. These tanks are built in big areas where land is easily available and topography is appropriate.

CONCLUSION

This research demonstrates the availability of fresh water in the world and the various methods to obtain this fresh water from earth. This research discuss about the methods of rain water harvesting in ancient as well as in modern times that how the water can be collected to fulfill the needs in summers and in area where the water level is much below in the ground and not easy to obtain. Rain water harvesting is always been a need of human beings and government of states like rajasthan and maharashtra should take the necessary steps make timely reconstruction of these old structures and modify them and make the large storage structures at appropriate sites.

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