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## Extended Abstracts

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title: **Sustainable management of groundwater through percolation tanks in semi-arid, basaltic terrain in Western India and the Role of UNESCO-IUGS-IGCP project GROWNET**

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## **INTRODUCTION**

Volcanic terrain in western India comprises of Basalts, also known as the Deccan Traps and covers an area of about 500,000 sq kms. It is the largest exposure of volcanic rocks in the world. Sustainable management of percolation tanks or percolation tanks is closely related to the survival of about 15 million farmers and an equal number of cattle, living in the semi-arid basaltic plateau in western India. Here the Monsoon rains are restricted to a few rainy days between June and September. It is therefore, necessary to harvest the monsoon runoff into small percolation tanks in mini-catchments, by constructing earthen bunds on small streams and allowing the stored water in the tanks to percolate and recharge the ground water body.

Activities related to maintaining the efficiency of such tanks have been listed as “best practices” on the website of UNESCO-IUGS-IGCP Project “GROWNET” for which the Author is the Project Leader. NGOs have an important role to play in ensuring sustainability by ensuring active participation of the villagers.

## **NATURAL FEATURES**

The importance of Percolation tanks is more pronounced in the semi-arid basaltic terrain of western India, because people and cattle need the water stored in the tanks or tanks for their mere survival. The rainfall in this region is erratic and takes place in the four months of the Monsoon season (June-September). During the rest of the year, comprising four months of winter and four months of summer, people need the stored surface water and ground water for their crops, domestic use and for the cattle. Due to the high evaporation rates of surface water in the summer months, storage in a ground water reservoir is a preferred method in this region. In order to augment this storage, runoff water in several seasonal streams in an area is impounded by constructing earthen bunds across the streams. Percolation tanks are formed during the Monsoon season, behind such bunds. This water percolates during the four months of the winter season (October-January) and by the beginning of summer the tank becomes dry.

Another important socio-economic factor, favoring construction of percolation tanks in the drought-prone, semi-arid region is that during a drought year construction of an earthen bund across a stream gives employment to about 1,000 to 1,200 men and women, for 6 to 8 months.

## **EFFICIENCY AND SUSTAINABILITY OF A PERCOLATION TANK**

A percolation tank has two efficiencies, the storage efficiency and the percolation efficiency. Storage efficiency is the ratio of the volume of water stored in the tank to the volume of runoff water available from the catchment during the rainy season. This efficiency could be close to 100% in the initial stage, but as the tank bed gets silted-up every year, storage efficiency declines. This decline is represented by increase in the volume of water flowing over the spillway. Percolation efficiency is defined as the ratio of the volume of water percolated to the volume of water stored. The overall efficiency is the product of the above two efficiencies.

Location of the bund across the stream in relation to hard-rock topography, is important. If the tank behind the bund has a rocky bed, percolation rates are extremely slow and the very purpose of creating the tank is defeated. Vertical bores are then drilled in the rock and blasted to create artificial fracture porosity. Silting of the tank-bed is also undesirable, as it reduces both the storage and percolation efficiencies. It is, therefore, necessary that when the tank bed dries

in summer, beneficiary farmers bring their bullock-carts to the tank, remove the silt. The amount of silt received in the tank in each rainy season could also be controlled by promoting watershed development and soil conservation activities like contour bunding of farms, contour trenching on hill slopes, gully plugging, afforestation, grassland management, etc., in the watershed of the tank. All such activities related to watershed development and sustainability of the Percolation Tanks have been listed as 'best practices' on the website [www.igcp-grownet.org](http://www.igcp-grownet.org). Project GROWNET (Ground Water Network for Best Practices in Ground Water Management in Low-Income Countries) has been approved by UNESCO-IUGS-IGCP for global dissemination of "best practices" over the Internet, for replication elsewhere (Limaye, Reedman, 2005).

## CONCLUSIONS

1. Percolation tanks or tanks are of vital importance for the survival of about 15 million farmers and an equal number of cattle, living in the semi-arid basaltic terrain in western India. Regular de-silting of the tank bed is essential for improving the storage efficiency and the percolation efficiency of a percolation tank.
2. Long term sustainability can be achieved by adopting watershed development activities in the catchment area of a percolation tank. In the semi-arid region, precaution must, however, be taken to select only those species of trees, bushes and grasses for afforestation, which have very low transpiration.
3. At present, the percolation tanks are constructed by the Government, under drought relief programs or minor irrigation schemes. Locations are selected without much consideration of local hydrogeological features. Provision for regular de-silting of the tank-bed, is also not made. Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs), therefore, play a vital role in ensuring sustainability of percolation tanks.
4. UNESCO-IUGS-IGCP Project "GROWNET" (Ground Water Network for Best Practices in Ground Water Management in Low-Income Countries) is a humble step in promoting water harvesting structures like percolation tanks, for achieving sustainability of ground water supply for domestic and irrigational use in semi-arid volcanic terrains.

## REFERENCES

- Limaye S.D., Limaye D.G., 1986: *Ground water management under stress conditions in small sub-basins*. In: Proceedings of the International Conference on Ground Water Systems Under Stress, Brisbane, Australia, P 277–282, Australian Water Resources Council.
- Limaye S.D., Reedman A.J., 2005: *Project proposal for GROWNET submitted to UNESCO*.



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