

WATER HARVESTING AND GROUNDWATER RECHARGE

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INTRODUCTION

In ancient times the water cycle was properly going on but due to the interruption of mankind the Ground water level is going down and down. During the monsoons lots of water goes waste into the gutters. And this is when Rain water Harvesting proves to be the most effective way to conserve water. We can collect the rain water into the tanks and prevent it from flowing into drains and being wasted. It is practiced on the large scale in the metropolitan cities. Rain water harvesting comprises of storage of water and water recharging through the technical process.

It was difficult to imagine few years before that you will require to buy drinking water but now we need to buy it everywhere we travel. Today Fresh water is a scarce resource, and it is being felt the world over. More than 2000 million people would live under conditions of high water stress by the year 2050, according to the UNEP (United Nations Environment Programme), which warns water could prove to be a limiting factor for development in a number of regions in the world. About one-fifth of the world's population lacks access to safe drinking water and with the present consumption patterns; two out of every three persons on the earth would live in water-stressed conditions by 2025. Around one-third of the world population now lives in countries with moderate to high water stress—where water consumption is more than 10% of the renewable fresh water supply, said the GEO (Global Environment Outlook) 2000, the UNEP's millennium report. Actually water harvesting means a system that collects rainwater from where it falls doesn't allow it to drain out. It may include water that is collected within the boundaries of a property, from roofs, agriculture land and surrounding surfaces.

Various ways of harvesting water:

- Capturing run-off from rooftops of Home / Offices.
- Capturing run-off from local catchments
- Capturing seasonal flood water from local streams
- Conserving water through watershed management.

Advantages of rainwater harvesting

Homemade or Cheap material can be used for the construction of Container and Tanks. It has low maintenance costs and requirements also. Collected rainwater can be consumed with proper treatment.
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It provides supply of safe water close to homes, agricultural field and other areas. An Overview on the Ground Water Recharge by Rain Water Harvesting.

Technique of Rain Water Harvesting:

A rainwater harvesting system comprises components of various stages - transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge.

Roof Rain Water harvesting:

Rain water harvesting involves following components:

Catchment Area / Roof: Surface upon which rain falls it may be Roof, Agriculture field, Ground Surface. Pipe line/ Gutters: Transport channels from Catchment to Storage. The size of the pipe is depend on the rainfall rate.

Filters

Charcoal Filter

A proportionate layer of Gravel + Charcoal + Sand + Gravel , are used as filter.

Sand Filter

Easy to construct and inexpensive. Filters can be employed for treatment of water to effectively remove turbidity (suspended particles like silt and clay), colour and microorganisms. In a simple sand filter that can be constructed domestically, the top layer comprises coarse sand followed by a 5-10 mm layer of gravel followed by another 5-25 cm layer of gravel. Storage tanks: Storage tank for the Harvested rain water and it is usable in Domestic, Animal and for Gardening purpose. For designing the optimum capacity of the tank following aspect have to be considered:

- Average Annual rainfall
- Size of the catchment
- Drinking water requirements

Suppose the system has to be designed for meeting the meeting drinking water requirement of a 5 member family living in a building with a roof top area of 100 Sqm. Average annual rainfall is 600 mm. Daily drinking & cooking water requirement / person is 10 Liters.

We shall first calculate the maximum amount of rainfall that can be harvested from roof top.

Area of roof top = 100 Sqm.

Average annual rainfall = 600 mm.

Co-efficient for evaporation, spoilage, flush = 0.80 (Constant)

Runoff co-efficient = 0.85 (Constant)

100 sq m roof top= (Area of roof top)x(Annual rainfall in meter)x(Runoff Co-efficient)x(Co-efficient of evaporation)

= 100 x 0.60 x 0.85 x 0.80

= 40.8 cum

= 40,800 liters

The tank capacity has to be designed for dry period i.e. the period between two consecutive rainy seasons. With monsoon extending over 4 months the dry season is of 245 days has been considered.

Drinking water requirement for family for dry season

$245 \times 5 \times 10 = 12,250$ litres.

As a safety factor, the water tank should be built 20 % larger than required i.e. 14700 litres = (1.2 x 12,250)

This tank meet the basic meet drinking & cooking water requirement of a 5member family for the day period.

Over flow connection: There should be a overflow connection for avoiding overflow condition during excess/heavy rainfall.

Overflow connection should be opened on a Canal or in a Sloppy region of the particular area.

Cost of installation

Estimated average cost of installing a Water Harvesting System for :

An individual house of average area of 300-500 m², the average cost will be around Rs. 20,000-25,000. A recharge well will be constructed near the existing bore well. The roof water through PVC pipe will be diverted to recharge well. An apartment building, the cost will be less since the many people will share the cost. More over in apartments there are separate storm water drains, which join the MCD drains in the main road. Here along with recharge well, recharge trench and percolation pits can be constructed. The cost will be around 60 to 70 thousand A colony, the cost will be much less. For instance, around 36 recharge wells were installed at the cost of 8 lakh, which is around Rs 500-600 per house. In many colonies storm water drains are present but it is difficult to isolate them from sewage drains because there has been violation of the drainage master plan. Also, these drains are not properly maintained. Hence, care needs to be taken while using storm water for water harvesting. Rooftop harvesting is preferred because the silt load is less. In storm water drain the silt load is high and generally the municipality does not maintain the storm drains properly. An institution with campus, the cost was around 4 lac. Here two recharge wells and three trenches cum percolation pits were constructed.

Field's Runoff water Harvesting

In rainfall we lose our fertile soil every year with runoff water, that's why Indian soils are losing their productivity day by day. There are few techniques to conserve the fertile layer of soil. In a field the water flows to the direction of slope, as the slope get sloppier the water flows with a high speed but water takes the upper layer of soil along with it. To conserve the soil and water we need to take it in preferred direction by making proper channels. But how???

Now a day's tube well's are getting use a Major source of water in India due to the low cost for implementation bur sometimes it is not able to meet the need of Any Agriculture field , House or any Industry.

Due to the lowering of ground water level a direct effect is shown on tube wells. Tube well's are the Best medium for the "Ground water Recharge" due to their long depth.

Water Harvesting potential = Rainfall (mm) X Collection Efficiency.

Conclusion:

Sustaining and recharging the groundwater along with judicious use of the limited fresh water resources is the need of the hour. One of the most logical steps towards this goal would be acknowledging the importance of rainwater harvesting. It can be concluded from above findings that rainwater, if conserved and utilized using the rainwater harvesting technology, can be an effective tool of replenishing ground water resources.

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