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RAIN WATER HARVESTING TECHNIQUES AND METHODS

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Abstract

Rain water harvesting is most significant criteria in India because of low rainfall. So there is a need to store and save water for future use. Because of this reason present article was prepared. Plenty of techniques and method are available for easy of harvesting water at home itself. But there is a lack of knowledge in people about water harvesting. An attempt was made to understand about water harvesting. The main aim of this paper is to know about techniques and methods of water harvesting and how it will useful for people to save water.

Keywords: Water harvesting, Water harvesting techniques, Water harvesting methods, Water harvesting system.

Introduction

Rainwater harvesting is the accumulation and storage of rainwater for reuse before it reaches the aquifer. In many places the water collected is just redirected to a deep pit with percolation. The harvested water can be used for drinking water as well if the storage is a tank that can be accessed and cleaned when needed.

Techniques of rain water harvestings

There are two main techniques of rain water harvestings.

1. Storage of rainwater on surface for future use.
2. Recharge to ground water.

Storage of rainwater on surface for future use

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The storage of rain water on surface is a traditional technique and structures used were underground tanks, ponds, check dams etc. Recharge to ground water is a new concept of rain water harvesting and the structures generally used are:

Pits: Recharge pits are constructed for recharging the shallow aquifer. These are constructed 1 to 2 m, wide and to 3 m. deep which are back filled with boulders, gravels, coarse sand.

Trenches: These are constructed when the permeable stream is available at shallow depth. Trench may be 0.5 to 1 m. wide, 1 to 1.5m. deep and 10 to 20 m. long depending up availability of water. These are back filled with filter materials.

Dug wells: Existing dug wells may be utilized as recharge structure and water should pass through filter media before putting into dug well.

Hand pumps: The existing hand pumps may be used for recharging the shallow/deep aquifers, if the availability of water is limited. Water should pass through filter media before diverting it into hand pumps.

Recharge wells: Recharge wells of 100 to 300 mm. diameter are generally constructed for recharging the deeper aquifers and water is passed through filter media to avoid choking of recharge wells.

Recharge Shafts: For recharging the shallow aquifer which are located below clayey surface, recharge shafts of 0.5 to 3 m. diameter and 10 to 15 m. deep are constructed and back filled with boulders, gravels & coarse sand.

Lateral shafts with bore wells: For recharging the upper as well as deeper aquifers lateral shafts of 1.5 to 2 m. wide & 10 to 30 m. long depending upon availability of water with one or two bore wells are constructed. The lateral shafts are back filled with boulders, gravels & coarse sand.

Spreading techniques: When permeable strata starts from top then this technique is used. Spread the water in streams/Nalas by making check dams, nala bunds, cement plugs, gabion structures or a percolation pond may be constructed.

Artificial Recharge to Ground Water: Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that obtaining under

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natural conditions or replenishment. Any man-made scheme or facility that adds water to an aquifer may be considered to be an artificial recharge system.

Diversion of run-off water into existing surface water bodies: Construction activity in and around the city is resulting in the drying up of water bodies and reclamation of these tanks for conversion into plots for houses.Free flow of storm run-off into these tanks and water bodies must be ensured. The storm run-off may be diverted into the nearest tanks or depression, which will create additional recharge.

Methods to collect rainwater

The only thing that differs in the following methods is the scale of the system. They all follow the same principles but differ on aesthetics and actual water conservation effectiveness.

1. Rain barrels:

This method is the most common and one that many people are familiar with. This involves installing a barrel at a gutter downspout to collect rainwater. The actual barrel may be a recycled barrel or a new commercially available rain barrel.

Pros:

- ♣ Easily implemented by anyone at any residence
- ♣ Barrels are readily available in your community or at various stores & websites
- ♣ Barrels don't take up much space so they can fit into any situation

Cons:

- ♣ Capacity is generally only 50 to 100 gallons
- ♣ Easily overflows and wastes collection opportunities

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2. Dry system:

This method is a variation of a rain barrel set-up, but it involves a larger storage volume. Essentially, the collection pipe "dry" after each rain event since it empties directly into the top of the tank.

Pros:

- ♣ Can store a large amount of rainwater
- ♣ Great for climates where rainfall happens with infrequent, larger storm events
- ♣ Can be inexpensive to implement
- ♣ Less complicated system so maintenance is easier

Cons:

- ♣ The storage tank must be located next to your house

3. Wet systems:

This method involves locating the collection pipes underground in order to connect multiple downspouts from different gutters. The rainwater will fill the underground piping

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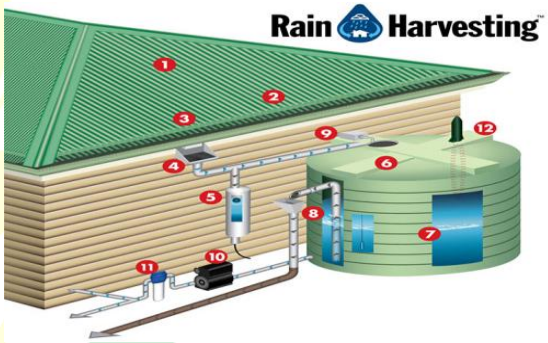
and the water will rise in the vertical pipes until it spills into the tank. The downspouts and underground collection piping must have water-tight connections. The elevation of the tank inlet must be below the lowest gutter on the house.

Pros:

- ♣ The ability to collect from your entire collection surface
- ♣ The ability to collect from multiple gutters and downspouts
- ♣ The tank can be located away from your house

Cons:

- ♣ More expensive to implement due to underground piping
- ♣ Sufficient difference between gutters and tank inlet must be available



How to create rain water harvesting system

The image below shows a complete rainwater collection system. While some of the components shown are absolutely necessary, not all of the components listed are required. Although, all of these components will help create a harvesting system that is highly functional and nearly maintenance-free.

1	**Collection Surface**	7	**Collection Cistern**
2	**Collection Gutters**	8	**Overflow Port**
3	**Gutter Protection**	9	**Auto-fill / Automatic Top-up Mechanism**
4	**Rain Head Inlet Filter**	10	**Pump**
5	**First-flush Diverter**	11	**Water Filter**

6	**Inlet Screen**	12	**Water Level Indicator**

Traditional water harvesting method:

1. Percolation Pit Method

Recharge trench method

Similar to recharge pit but longitudinal in shape Size: 0.5 - 1 m wide 1 - 1.5 m depth. Length may vary from 1.0 - 5.0 km Filled with broken bricks /pebbles Suitable for sandy sub-soil area.

Recharge trench with bore method

Along the recharge trench boreholes has to be drilled Borehole interval 10 -15 feet Suitable for clay area.

NOTE:

- Above structures are meant for area with large catchment like apartments / big complexes.
- RCC slab cover is optional.
- Top (1") portion may be filled with sand.

2. Bore well with settlement tank method

Roof top rain water may also be diverted to a bore well. Settlement / filter tank of required size has to be provided. Overflow water may be diverted to a percolation pit nearby. The rate of recharge through bore well is less effective than open wells. Defunct bore wells may also be used.

3. Open well method

Rainwater from the terrace is diverted to the existing open well using PVC pipes through a filter chamber. The minimum size of the filter chamber is 2" x 2" x 2" filled with

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broken bricks in the bottom and sand on the top. The chamber may be covered with RCC slab.

4. Percolation pit with bore well method

Percolation pit method

Constructed in the open space at required intervals. Size "1m x 1m x 1.5m (depth) Filled with broken bricks / pebbles Suitable for sandy sub - soil area one unit for 300 sq. area (approx.)

Percolation pit with bore method

A borehole to be drilled at the bottom of the percolation pit. Bore hole size: 150 - 300 mm dia with 10 –15M depth (approx.) Filled with broken bricks. Suitable for clay area.

Conclusion:

By this I can conclude that water harvesting techniques and methods were very useful to people in present water scare situations. People can install simple water harvesting pit by using methods like rain barrels, wet system and dry system for this methods materials can also available easily these are consuming less time to install easy to maintain.