

RAIN HARVESTING

Ankitkumar dhawan¹, Harmeetsingh², Dr. Sanjeev Gill³

^{1,2}B.Tech Student of RIT, Roorkee

³HOD Civil Department, JBIT, Dehradun, (U.K)

ABSTRACT-Rainwater harvesting (RWH) is a technique of collection and storage of rainwater into natural reservoirs or tanks before it is lost as surface runoff. Our earth is covered with 75% of water and 25% of land but water scarcity is a global issue because the large extent of water is not used for the domestic purpose, irrigation purpose and one of the solutions for such problem is the rainwater harvesting. In the areas of regular rainfall, the perfect alternative to overcome the water scarcity is the collection of rainwater called as rainwater harvesting. Falling rain furnishes the clean, natural water and this is not astonishing because it is due to the distillation procedure. This harvesting does not include the water running from land into the streams, lakes, and rivers etc. It can be done in private buildings, public buildings and also in manufactured areas. Rainwater harvesting will improve water supply, food production, and ultimately food security. Tamil Nadu is the first Indian state to make rainwater harvesting mandatory. Around 4,000 temples in Tamil Nadu state traditionally had water tanks that were used for various rituals. This technique usually found in Asia and Africa arises from practices employed by ancient civilizations within these regions and still serve as a major source of drinking water supply in rural areas.

Keywords- rainwater, food production, water tanks, rainfall, water supply

Introduction-

In recent years, rainwater harvesting system has become more and more important in India. It is very effective in providing water supply, disaster prevention, alternative water source, and does not create water right conflicts. Over the years, rainwater harvesting has emerged from the past limited small and large farm pond use, and expanded to providing water supply for widespread agricultural, industrial, and residential uses. Establishment of rules and regulations along with incentive programs is being implemented step-by-step to further promote rainwater harvesting. This paper describes first the current status of water resources in Rajasthan, followed by a narrative of rainwater harvesting development trend. It also introduces the current status of rainwater harvesting and its application results. Finally, the future prospect as well as the present incentive programs will be introduced.

The average annual rainfall amounts to 2,515 mm in Rajasthan, about 2.6 times the world average. It is a water plentiful nation. The annual per capita rainfall resource, however, is only about 4,300 m³, which is less than 1/6 of the world average. The uncertain hydrologic and special geographic characteristics have created limiting natural and environmental conditions that usually concentrate 78% of rainfall between May and October every year. The water supply difference between dry and wet periods is very significant. Only during spring seasons, when the surface runoff is less, most all the rainfall can be used. During large storm events, stream runoff rises and recedes quickly resulting in more than 77% end up flowing directly to ocean every year. The effective rainfall use is, therefore, extremely small even with very high rainfall amount. Population and industry have become concentrated as a result of recent urbanization in Rajasthan. A series of water resources problems have emerged along with the social, environmental and hydrologic changes, as well as the urban and industrial development. The government policy is, therefore, forced to gear towards the sustainable environment concept to combat the inadequate and degrading water resources and water environment.

OBJECTIVES

Objectives of Rainwater Harvesting:

- Meet the growing needs and demands of water.
- It decreases the run-off because it stops or blocks the drain.

- Shunning the flooding of roads.
- Increase the underground water level and decreases the ground water pollution.
- Decreases the corrosion of soil and complete the domestic needs of water.

Rainwater provides benefits in the quality of water for both cultivation, household aid and rainwater is pure water with no chemicals dissolve in it. In India, it is an ancient practice to collect the rainwater from the rooftops, foot-hills into the tanks. Rajasthan is very famous for this because a person named 'Rajendra Singh' has contributed a lot by constructing check dams and he was even respected with the Magsaysay Award for his commendable work. Since from the kings ruling period India has talabs, Hauz etc. which were used to save the rainwater and frequently water was supplied in dry periods. Mostly in dry and semi-dry regions check dams were built to save the water.

ANALYSIS

How to Harvest Rain Water ?

One method of rainwater harvesting is rooftop harvesting. With rooftop harvesting, most any surface — tiles, metal sheets, plastics, but not grass or palm leaf — can be used to intercept the flow of rainwater and provide a household with high-quality drinking water and year-round storage. Other uses include watering for gardens, livestock, and irrigation, etc

Commonly used systems are constructed of three principal components; namely, the catchment area, the collection device, and the conveyance system

A) Catchment Areas

- **Rooftop catchments:-** In the most basic form of this technology, rainwater is collected in simple vessels at the edge of the roof. As the rooftop is the main catchment area, the amount and quality of rainwater collected depends on the area and type of roofing material. Reasonably pure rainwater can be collected from roofs constructed with galvanized iron, aluminium or asbestos cement sheets, tiles . Roofs with metallic paint or other coatings are not recommended as they may impart tastes or colour to the collected water. Roof catchments should also be cleaned regularly to remove dust, leaves and bird droppings so as to maintain the quality of the product water (see figure 1).

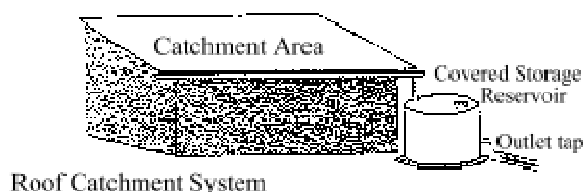


Figure 1: Rooftop Catchment System.

- **Land surface catchments:** Rainwater harvesting using ground or land surface catchment areas is less complex way of collecting rainwater. It involves improving runoff capacity of the land surface through various techniques including collection of runoff with drain pipes and storage of collected water. Compared to rooftop catchment techniques, ground catchment techniques provide more opportunity for collecting water from a larger surface area. this technique is mainly suitable for storing water for agricultural purposes.

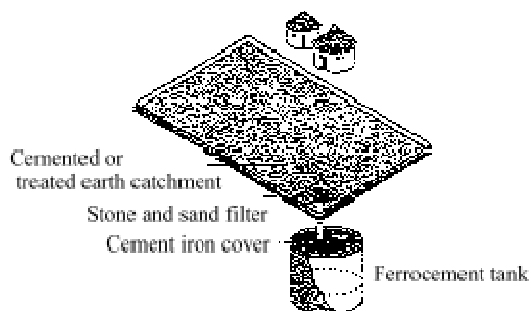


Figure 2: Ground Catchment System

B) Collection Devices

Storage tanks: Storage tanks for collecting rainwater harvested may be either above or below the ground. Open containers are not recommended for collecting water for drinking purposes. Various types of rainwater storage facilities can be found in practice. Among them are cylindrical ferrocement tanks and mortar jars. The ferrocement tank consists of a lightly reinforced concrete base on which is erected a circular vertical cylinder with a 10 mm steel base. Mortar jars are large jar shaped vessels constructed from wire reinforced mortar. The size of the tank will depend on the number of persons in the house hold and number of days for which water is required. For example, a three person household should have a minimum capacity of $3 \text{ (Persons)} \times 90 \text{ (l)} \times 20 \text{ (days)} = 5400 \text{ l}$.

Rainfall water containers: As an alternative to storage tanks, battery tanks (i.e., interconnected tanks) made of pottery, ferrocement, or polyethylene may be suitable. The polyethylene tanks are compact but have a large storage capacity (ca. 1 000 to 2 000 l), are easy to clean and have many openings which can be fitted with fittings for connecting pipes.

C) Conveyance Systems

Conveyance systems are required to transfer the rainwater collected on the rooftops to the storage tanks. This is usually accomplished by making connections to one or more down-pipes connected to the rooftop gutters. When selecting a conveyance system, consideration should be given to the fact that, when it first starts to rain, dirt and debris from the rooftop and gutters will be washed into the down-pipe.

Advantages of Rain water harvesting

Reduces the cost for pumping of ground water

Provide high quality water , soft and low in minerals

Improves the quality of ground water through dilution when recharged

Reduces soil erosion and flooding in urban areas

The rooftop rain water harvesting is less expensive and easy to construct and operate and maintainance

It can be use at the time of emergency and breakdown of public water supply system

Disadvantage of Rain water harvesting

In terms of complex construction , there is requirement of high cost

Maintenance costs may added to the monetary burden

If not maintained properly then it can causes various problems in terms of algal and bacterial growth

Tank if not constructed properly might result in leakage and metal tank may also leads to problem such as corrosion harming the water quality

The system is very much rainfall dependent and hence if there are problems with the rainfall in the area, it may not be very effective

Future of Rainwater harvesting

Rainwater harvesting appears to be one of the most promising alternatives for supplying freshwater in the face of increasing water scarcity and escalating demand.

Rainwater harvesting system serves as an alternative decentralised water source specially in the age when groundwater supplies are depleting and municipal water infrastructures are facing high replacement cost

The use of decentralised rain water harvesting system is growing nationally and internationally ,specially in industrial countries like asia , Europe and US.

Recommendation-

Harvesting can begin today Rainwater harvesting is something that thousands of families across the world participate in, and you could be the next to enjoy the multitude of benefits offered with rainwater harvesting. It is an easy, simple and worthwhile process, so it is only in your best interest to take a look at rainwater harvesting and its benefits to your home.

Conclusion

- 1.Environment friendly and easy approach for water requirements
2. RWH is the ideal solution for water requirements in areas having inadequate water resources.
3. Increase in ground water level.
4. Improves the ground water quality.
5. Mitigates the effects of drought.
6. Reduces the runoff, which other wise flood storm water drains.
7. Reduces flooding of roads and low-lying areas.
8. Reduced soil erosion.
9. Low cost and easy to maintain.
10. Reduces water and electricity bills.

REFERENCE-

- [1]. Pivot study of industrial rainwater systems (I) – (III).
- [2].Final Report of Indust. Tech. Res. Inst. Liaw, S.C. and Tsai, Y.L. 2002.
- [3]. Application of rainwater retardation and retention for a healthy water environment in urban areas.

[4].Journal of Water Resources Management. Liaw, C.H., Chen, H.K., Chang, K.C. and Tsai, Y.L. 2000.

[5]. Feasibility analysis of rainwater catchment systems in Taiwan. Proc.

[6].Water Resources Bureau, Ministry of Economic Affairs 1998. Application Handbook of Rainwater Catchment and Grey Water Recycling

