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Rain Water Harvesting Technique

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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 fulfil the requirement of water demand due to uneven rainfall pattern and hence the need of RAIN WATER HARVESTING arises.

I. INTRODUCTION

Rain Water Harvesting is the technology of collecting, supplying and storage of rain water that falls on surfaces like roof or open area. In Rain Water Harvesting the rain water is directly collected from clean surfaces and then conveyed and stored in storage unit or can also be used to recharge the underground natural water level which is getting reduced due to extreme usage.

As we know the world is moving towards industrialisation at a very rapid pace leading to excessive construction and usage of concrete leading to blockage of penetration of rain water to the ground water body.

The construction of buildings and other concrete structures has led to utilization of the wet lands present on ground which help in restoration of ground water leading to excessive surface runoff and under such condition an artificial way of recharging the ground water is needed at most, which can be fulfilled by RAIN WATER HARVESTING Technology.

In RWH the water from first rainfall is flushed away by considering it not to be perfect for usage due to pollution and chemicals present in atmosphere and the water from later showers are collected in storage tanks or either used to supply water to the ground water reserves.

II. METHODS OF RAIN WATER HARVESTING

While considering RAIN WATER HARVESTING technology, there are two possible methods to carry out the process.

A- Surface Runoff Harvesting

In this method the water that falls from rain onto the open surface like ground, roads is collected and conveyed to recharge the ground water level through pipelines and other conveyance.

This is the most demanded and efficient method to supply rain water to the unground sources.

B- Rooftop Water Harvesting

In Rooftop water harvesting the water from rain that falls onto the roof is collected through the

catchment area and then passed through the conveyance to the collectiontanks.

The pipes used in this method can be normal PVC pipes and the storage tanks are of capacity 1000-2000 liters.

This method is made compulsory to be installed in all the new constructions taking place in some of the states of India like Maharashtra, Tamil Nadu, Rajasthan and Delhi also.

C-Components of Rooftop Water Harvesting

i. Catchment Area

Catchment area is the area where the direct water from rain falls and the water is collected for conveyance and storage.

In this case the Catchment area is Roof where the water directly falls from rainfall.

ii. Conveyance

Conveyance is the term used for medium of passage of water from rooftop to the collection tanks.

This conveyanceis nothing else but the pipelines that are used for passing the water to collection tanks, these pipes can be normal PVC pipes connected from roof to the tanks.

iii. Collection Tanks

Collection tanks are the units that contain the water travelling from catchment area through the conveyance. These tanks are of capacity 1000-2000 liters in the market which can be selected as per the need.

The collection tanks are provided with matted bed in recent technique so that the water present in it does not gets contaminated itself through damage or leaking possibilities.

iv. Filters

Filters are one of the most necessary component of this system that should be installed in order to treat the water and make it usable for any purpose be it irrigation, domestic usage or industrial usage too.

v. First Flush

The first flush is a device used to flush off the water received in the first shower. The first shower of rains needs to be flushed-off to avoid contaminating storable/rechargeable water by the probable contaminants of the atmosphere and the catchment roof.

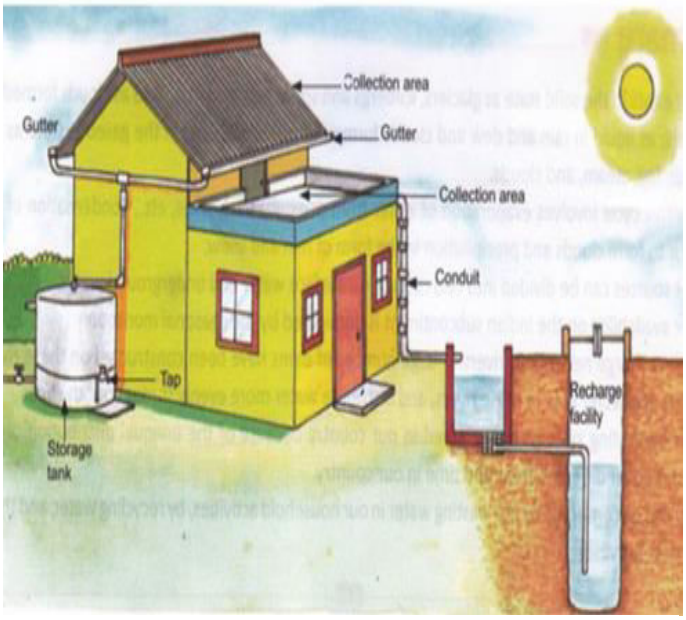

Figure 1.Components of Rooftop water harvesting

It will also help in cleaning of silt and other material deposited on the roof during dry seasons. Provisions of first rain separators should be made at the outlet of each drainpipe.

III. Recharge of Groundwater Aquifers

Groundwater aquifers can be recharged by various kinds of structures to ensure the percolation of rainwater in the ground instead of draining away

from the surface. Commonly used recharging methods are: -

- Recharging of bore wells
- Recharging of dug wells.
- Recharge pits
- Recharge Trenches
- Soak ways or Recharge Shafts
- Percolation Tanks

IV. ADVANTAGES OF RAIN WATER HARVESTING

In this following section we will discuss the advantages of rain water harvesting-:

i. It helps in storing water for crisis times.
ii. It is the best way to recharge ground water artificially.
iii. The Rain Water Harvesting system is cost efficient to install as compared to other traditional methods.
iv. It reduces water bills.
v. It reduces demand on ground water.
vi. It stores water which can be used for non-drinking purposes.
vii. It reduces flooding and erosion.
viii. It is cost efficient method for water conservation as compared to other methods.
ix. It is one of the easiest ways of water conservation.

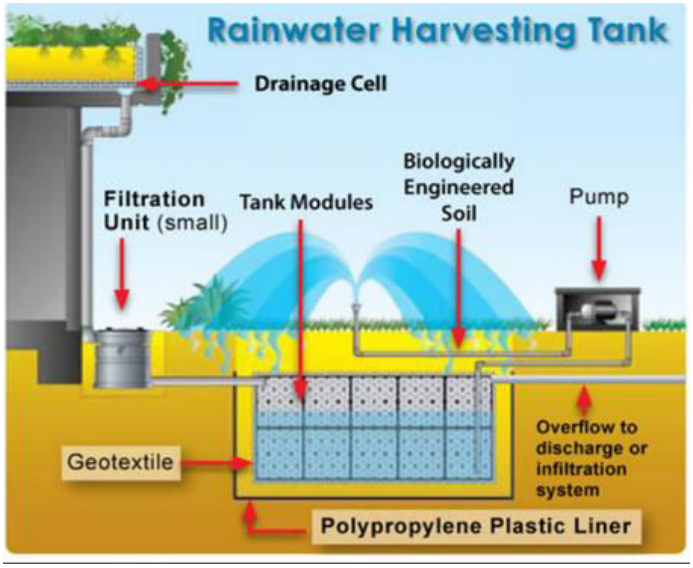

Fig 2. Illustration of the rain harvesting tank

V. DISADVANTAGES OF RAIN WATER HARVESTING

In this following section we will discuss the advantages of rain water harvesting-:

i. Unpredictable rainfall
ii. Regular Maintenance
iii. Certain roof types may seep chemicals
iv. Storage limits.

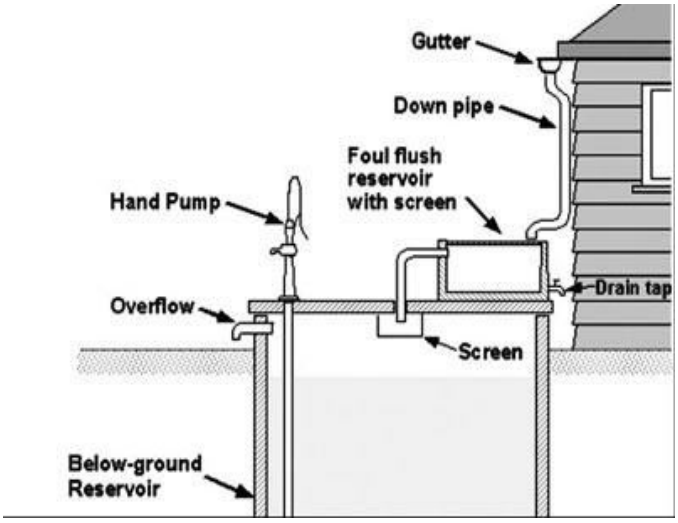

Fig 3. Different types of equipment's used in harvesting the water

V.ESTIMATION AND CALCULATION

All experimental setup, and the following values that are used to take the calculation in the experiment.

ESTIMATION OF RAIN WATER HARVESTING:

40,000 sq. ft = Catchment area

72 inch = Rain

23,000 litre per inch(0.75 efficiency)

Anually Water Collected = 40,000*72*2300*(0.75/100)

= 50,00,000 litre

of water collected annually or

aprox. 12,50,000 litre per monsoon month

VII. CONCLUSION

It cannot be neglected that recharging the groundwater along with judicious use of the limited fresh water resources is the need to be taken seriously. If sufficient measures are not taken up immediately, we will face a crisis which will be detrimental to the very survival of life on earth. Efficient management of water resources and education about utilization of water resources along with measures of harnessing, recharging and maintaining the quality of water and water bodies has to be taken up on war footing.

REFERENCES

[1] Agrawal, G. D. (1996). Evaluation of Water Conservation Efforts in 36 Villages of Alwar District. Alwar, Tarun Bharat Sangh: 21

[2] Alley, W., R. Healy, et al. (2002). "Flow and storage in Groundwater Systems." Science 296: 1985-1990.

[3] Badarayani, U., H. Kulkarni, et al. (2005). Groundwater recharge from a percolation tank to a Deccan basalt aquifer: a case study from western Maharashtra, India. International Symposium on Management of Aquifer Recharge ISMAR5. Berlin, Germany, UNESCO. Series on Groundwater No.13.

[4] Beernaerts, I. (2006). An evaluation framework for groundwater recharge enhancement systems for improved irrigated agriculture Division of Information Technology, Engineering and the Environment Adelaide, University of South Australia. Master of Engineering (Hydrology and Water Resources): 86.

[5] Boudling, R. J. (1994). Description and Sampling of Contaminated Soils: a field guide, CRC Press.

[6] de Vries, J. and I. Simmers (2002). "Groundwater recharge: an overview of processes and challenges." Hydrogeology Journal.

[7] Gronwall, J. (2006). Enforcement of groundwater rights in India: The Coca-Cola Case. Groundwater for Sustainable Development, New Delhi, India, Allied Publishers.

[8] Kumar, R., R. D. Singh, et al. (2005). "Water resources of India." Current Science 89(5): 794-811.

[9] Kumar M. (2000), Aqua Dholavira, Archaeology: A Publication of the Archaeological Institute of America, Volume 53, No. 6, November/December 2000.

[10] Agarwal, A. and S. Narain, Eds. (1997). Dying Wisdom. Rise, fall and potential of India's traditional water harvesting systems. New Delhi, Centre for Science and Environment.

[11] Rain Water Harvesting and Conservation Manual Government of India, Central Public Works Department NirmanBhawan, New Delhi.

[12] Loucks, D. P. and J. S. Gladwell (1999). Sustainability criteria for water resources systems. Cambridge, Cambridge University press.