

A People's Manual on Rainwater Harvesting



Janhit Foundation



About Janhit Foundation

Janhit Foundation is an independent, not-for-profit non-governmental organization, actively engaged in the promotion of human welfare through environmental protection since 1998.

Key areas of work include:

- Groundwater quality protection for human health
- Provision of safe drinking water to marginalized communities
- Protection of river water quality for aquatic ecosystems
- Enhancement of available water resources through water conservation measures
- Promotion of sustainable agriculture by organic farming methods
- Environmental education and empowerment of local communities

Janhit Foundation undertakes this work through scientific research, campaigns, advocacy and grass-root level community involvement.

As a public interest organisation, Janhit Foundation focuses on strengthening local communities through their active participation in decision making, to achieve sustainable development. We believe that environmental degradation can only be addressed adequately if local people are empowered in decision making at all levels and have control over resources.

To achieve our goals, we work in partnership with government, non-governmental, national and international organisations on environment and human rights issues.

Sonakshi Hudda, *Editor*

© Janhit Foundation, Meerut

Address

Rain Centre

C-28, Shastri Nagar, Meerut

Phones : 0121-2763418, 4004123

E-mail : info@janhitfoundation.org

Website : www.janhitfoundation.org

Printed by: Systems Vision

A-199, Okhla Phase-I, New Delhi - 110 020

Contents

1. Why water crisis	4
2. What is Rainwater Harvesting	5
3. The need for Rainwater harvesting	6
4. Advantages of Rainwater harvesting	7
5. Rain Centre – One stop shop for	8
information on water	
6. How much water is harvested	10
approximately	
7. Potential areas for rainwater harvesting	11
8. Design Considerations	11
9. How to save Rain Water – Some methods	11
10. Precautions	13
11. How much will it cost?	14
12. Who will build the rainwater harvesting?	14
13. Who will it benefit?	14
14. An Appeal To One And All	14

Why water crisis? (A glance at Western U.P.)

The area of Western U.P. is situated between the Ganga and the Yamuna, known as *Doab* region (land between the two rivers). The region is also known across the world for its fertile land and also has a number of big and small rivers. The Ganga, the Yamuna, the Hindon, the Kali (East & West) and the Krishna are the important rivers and lifeline of the area. But today the area is facing severe crisis of water and ground water depletion. The reason for the crisis is that the demand of the water to fulfill the needs of the community is increasing day by day and the efforts to recharge it are almost negligible. Hence, an imbalance has been created by the community which has resulted in serious trend of groundwater depletion with groundwater table receding on an average five ft. annually in some of the blocks. According to World Bank study 'Swajal' brought out in 2001, the Sarurpur, Rajpura and Kharkhauda blocks of Meerut district and Budhana block of Muzaffarnagar district are sensitive blocks. The whole of Baghpat district has been declared as 'dry zone'.

Why is the situation so? What are the reasons for continuous decline in water table? Is your city not witnessing a widening gap between the demand and supply of drinking water? These questions need strong answers in order to resolve this alarming situation.

There are more reasons than one. Decline in the annual rainfall, excessive cultivation of sugarcane which requires large quantity of water, threat of gradual closure of water bodies like ponds, *johads* and wells are the major reasons for the emerging problem of water crisis. Other reason for the community facing this severe situation include excessive use of pesticides and chemicals in cultivation and the over dependence on borewells and tubewells for irrigation leading to over abstraction of groundwater. The area of Western U.P. used to receive approximately 1200 mm of

rainfall on an average annually till 1992 but the figure has since reduced to 750 mm. If grassroot level initiatives and people's participation towards recharging the water is not done, then a situation may arise when the community may have to face serious consequences like starvation and migration from such areas to other "safer" places.

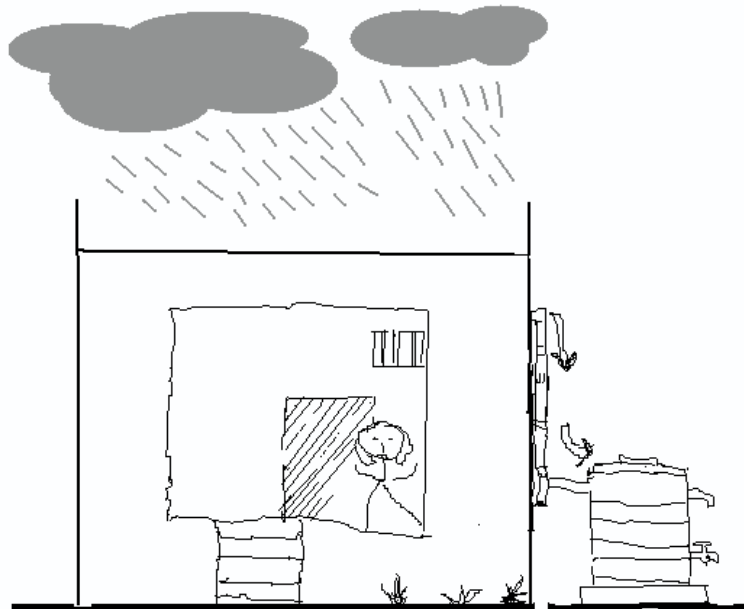
A lot of water is being wasted during our domestic use of water. Most of our public taps remain leaking. We waste 20-22 per cent of the total domestic use of water in toilets. Population explosion is no doubt a factor of serious concern, but with regard to water resources, we have adequate of them to supply water to all of our countrymen. Where we are erring is in its management. People need to be educated about the importance of raindrops which are as precious as 'silver coins' and need to be conserved. The balance of groundwater extraction and its recharging needs to be maintained. One must remember that water we take from mother earth must be returned. And one of the ways can be in the form of rain drops reaching the groundwater table, thus recharging it.

What is Rainwater Harvesting?

Rain water is the purest form of water available on the earth. Rainwater Harvesting is the process of gathering and storing rain drops and preventing runoff, evaporation and seepage for its efficient utilization and conservation. Rainwater Harvesting is an effective tool option to gather the rain water and store it appropriately. Harvesting make utilisation a large quantity of good quality water which would otherwise go to waste creating several problems on the way. Rainwater Harvesting is a simple, economical and eco-friendly technique of preserving every drop of water falling on the earth.

There is no village in India that cannot meet its basic drinking, cooking and reasonable irrigation needs through Rainwater Harvesting. It is not a new term, rather it is the

technology which has also been used by our ancestors, since centuries. Rainwater Harvesting prevents rainwater from going to waste as run-off through conserving it for recharge of groundwater or for storage in tanks. Our ancestors used to harvest the rain directly. From rooftops, they collected water and stored in *tankas* built beneath the house as in Gujarat and Rajasthan. From open lands, they collected rain and run-off, stored it in *kundis* and *johads* as in Rajasthan and in *madakas* as in parts of Karnataka and Kerala.



The need of Rainwater Harvesting

Our country being one of the richest nations in the world in terms of average rainfall, there is no reason why we should suffer from water crisis. It doesn't matter how much rain you get, rather the question is how much of it you are using for harvesting? The following are the benefits of rainwater harvesting:

- To reduce power consumption
- To raise the water levels in wells and bore wells that are drying up
- To improve the water quality of aquifers
- To overcome the inadequacy of surface water to meet our demands and to enhance availability of groundwater.
- To increase infiltration of rain water in the subsoil which has decreased drastically in urban areas due to paving of dilution
- To improve groundwater quality.
- To increase agriculture production and to improve ecology of the area, for example by increasing vegetation cover.

Thus, the problem of large variations in water availability associated with growing demands leads to the need for Rainwater Harvesting.

Advantages of Rainwater Harvesting

- Stops water-logging
- Reduces flood hazards
- Direct solution to drinking water crisis
- Mitigates effects of drought
- Rise in groundwater levels
- Reduction in power consumption as one-meter rise in water level saves about 0.40-kilo watt/hour of electricity while pumping groundwater
- The cost of recharge to sub-surface reservoir is lower than surface reservoirs
- The aquifer serves as a distribution system also
- No land is wasted for storage purpose and no population displacement is involved

- Ground water is not directly exposed to evaporation and pollution
- Storing water under ground is environmentally friendly
- Increase in the productivity of the aquifer
- Reduces soil erosion

Rain Centre – One stop shop for information on water

Rain Centres are a network of permanent exhibitions that seek to spread water literacy among urban Indians. They define the role to be played by every Indian citizen in harvesting rainwater and using it to combat the menace of water scarcity. The Rain Centre is intended to be a museum and a laboratory rolled into one. As a museum, it is intended to showcase how an installed Rainwater Harvesting system works. Interested people can take tours, to see exhibitions on rainwater harvesting, get pamphlets and buy books on rainwater harvesting. As a laboratory, it is intended, to demonstrate a working version of the Rainwater Harvesting. It intends to collect and display statistics of how much rain water has been accumulated over time. It also intends to have a water testing facility on site wherein people can test the purity of water.

Janhit Foundation has the distinction of setting up the second Rain Centre at Meerut in the country. This water literacy centre was set up on July 25, 2004 in collaboration with the Centre for Science and Environment (CSE), New Delhi. The Meerut Rain Centre has pictures and data in the form of colourful panels in an exhibition room. These panels portray the significance of rain in the Indian way of life, its influence on the customs, traditional economy and politics of the country. A library has also been established where information in the form of books, CDs, newsletters, video films etc. on water is available. The Rain Centre building has

a live model of rooftop rainwater harvesting with an area of 185m². It harvests a total volume of 1,10,437 liters of rainwater on an average annually.

In short, the Rain Centre provides the know-how to the people for harvesting rainwater. It equips the civil society to take leadership in the movement to conserve water. The Rain Centre also helps to begin the process of rebuilding a society of 'water literates'.

The first Rain Centre in North India, the Meerut Rain Centre is regularly visited by students, researchers, NGOs, scientists, engineers, architects etc.

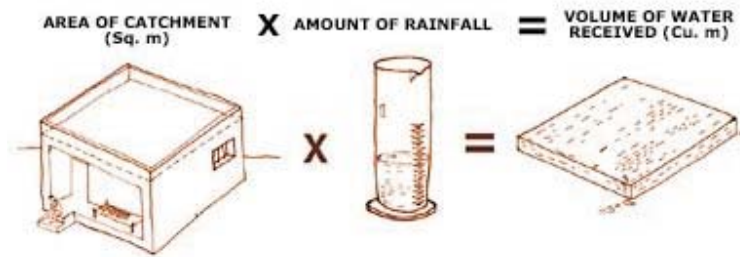


Since its inauguration, the Rain Centre at Meerut has received visitor from a number of National & International institutions who have expressed an interest in rainwater harvesting. To name a few:

- Richard Fuller- Chairman of the Blacksmith Institute, USA.
- Mahendra Singh Tikait- President of Bhartiya Kisan Union.
- Arnold Parzer- Agricultural Counselor of the Royal Netherlands Embassy

- Anupam Mishra- Noted Environmentalist
- Rajendra Singh- Environmentalist and winner of Magsaysay award
- Sunita Narain- Director of CSE, New Delhi
- Sompal Shastri- Former Union Minister for Agriculture, Government of India
- Hella Lind Starwik & Brita Brekke- Students of Development Studies, Norway

How much water is harvested approximately?



Calculation for Rainwater harvesting potential from roof area:

Terrace area: 75 sq.m.
 Average annual rainfall: 800mm (0.800m)
 Water harvesting potential: Terrace area x Avg. Annual Rainfall
 = 75 X 0.800
 = 60 cu m (60,000 litres)

For a runoff coefficient of 0.8 for roof surface; Harvestable Rainwater = 48,000 litres annually

Drinking water requirement of a family

Family members: 5
 Water required/person/day: 5 litres
 Number of days in a year: 365

Total water required = 5 X 5X 365
 = 9,125 litres
 Add 25% for additional consumption = 11,000 litres annually

Excess of 37,000 litres harvested rainwater can be recharged into the ground through wells and tube/bore wells.

Potential areas for rainwater harvesting

- The areas where groundwater level is falling rapidly
- The areas where availability of groundwater is inadequate
- The areas where rapid urbanization has reduced the recharging of groundwater drastically
- Where substantial amount of aquifer has been de-saturated

Design Considerations

Important aspects for designing a rainwater harvesting system to augment ground water resources are:

- Hydrogeology of the area including nature and extent of aquifer, soil cover, topography, depth to water level and chemical quality
- The availability of source water, the prime requisite for groundwater recharge, assessed in terms of non-committed surplus monsoon runoff
- Area contributing to run off, such as area available, land use pattern, industrial, residential, green belt, paved areas, roof top area etc.
- Hydrometeorological characteristics such as rainfall duration, general pattern and intensity of rainfall

How to save Rain Water? – Some methods

Urban Areas: In urban areas, rain water available from roof

tops of buildings, paved and unpaved areas goes waste. This water can be recharged to aquifer and can be utilized gainfully at the time of need. The Rainwater Harvesting system needs to be designed in a way that it does not occupy large space for collection and recharge system.

The method of utilizing the rain that falls on roof is called Roof Water Harvesting. There are two main methods of Roof Water Harvesting. In areas where there is no possibility of getting water in summer, harvested rain can be stored in tanks in advance for direct use. The tank may be above ground or under ground. Another method is to use the harvested rain from the roof to recharge groundwater. If you have a dug-well or bore-well in your compound, there is every likelihood that the water level in the well will increase. The basic objective of rain water harvesting in this method is to increase the reducing water table.

Rural areas: The rural people of this country have a strong tradition of Rainwater Harvesting. The names of the natural water resources structures may differ from state to state but from Laddakh to Kanyakumari, people conserve water. In rural areas, rain water harvesting is undertaken by considering the whole watershed as a unit. Surface spreading



techniques are common since plenty of space is available for such systems and quantity of rechargable water is also large. The following techniques are adopted at different places to save water through slopes, rivers, rivulets and *nullahs* (drains):

- **Bamboo technique :** This technique is implemented mainly in Meghalaya. In this

method, water is taken to a long distance through thin pipes made of bamboo as per its demand and use.

- **Bawadi :** This is a clear picture of our scientific technology and was spread in many parts of the country. These *Bawadis* have 3-5 floors and the running water gives everybody an impression that it is in a playful mood.
- **Kundi :** These look like a huge space ship and have a statue like figure in their centre. Rain water is stored in it.
- **Zing :** These are small ponds where water is collected from melted ice. This water is mainly used for irrigation purpose in areas having low temperature.
- **Aahar Payin :** These are used to store flood water for future use particularly in Bihar.



Precautions

- Develop the recharge well after construction for better recharge.
- Filter material should be used as per recommended size.
- Use PVC pipe for recharge well if ground water is saline.
- Entry of highly turbid water into recharge well should be prevented.

- Periodic removal of fine material deposited on the surface of the filter bed by scraping once in 2-3 years is essential.
- Domestic waste water, sewage water/contaminated water should not be injected to the recharge structure to avoid contamination of ground water.
- Use of chemical fertilizers and pesticides in the lawns should be avoided.

How much will it cost?

It varies, depending on the area of your roof and other structures that you will use to harvest rain. But rainwater harvesting does not require major construction work, so the expenses suit most of our pockets.

Who will build the rainwater harvesting?

You need someone who understands rainwater harvesting. It is simple but it still needs someone who has experience in the principles of rainwater harvesting. A skilled mason or a plumber can do the job for you in a few day time.

Who will it benefit?

'You' are the one who will be benefited. Your groundwater will be recharged. But alongwith this, your neighbours will benefit too as the groundwater level increases.

An Appeal to One and All

Please change your habits of using water :

What we do?	What needs to be done?	Amount of water that will be saved (in litres)
Bathing with open tap needs 180 litres of water	Bathing with bucket full of water needs 18 litres of water	162 litres

Bathing in a water tub needs 25 litres of water	Bathing with bucket full of water needs 18 litres of water	7 litres
Use of flushes in toilet needs 20 litres of water	Use of small buckets for water in toilet needs 5 litres of water	15 litres
Shaving with an open tap needs 10 litres of water	Shaving with water in a mug needs 1 litre of water	9 litres
Brushing with an open tap needs 10 litres of water	Brushing with water in a mug needs 1 litre of water	9 litres
Washing clothes with an open tap needs 120 litres of water	Washing clothes with bucket full of water needs 20 litres of water	100 litres
Washing the vehicles with pipes needs 100 litres of water	Washing the vehicles with water in a bucket or with a wet cloth needs 20 litres of water	80 litres
Washing the floor with pipe needs 100 litres of water	Washing the floor with bucket full of water needs 10 litres of water	90 litres

Join us to spread rainwater harvesting literacy and extend your support towards making your area a water-sufficient area. It is only through the community initiatives that we can reduce the gap of demand and supply of water. Water is too serious an issue to be left solely to the government. Let us join the people's participatory movement of Janhit Foundation for rainwater harvesting.