



## A Practical Approach to Rooftop Rainwater Harvesting

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### Introduction :

United Nations General Secretary Mr. Koffiee Annan once said, "The first world war was for capturing the land, the second world war was for fossil fuel and the third one will be for WATER". With the dawn of new millennium, three giant problems are to be faced by the Scientists and Engineers i.e. the energy crisis due to the vanishing of fossil fuel, the environmental quality degradation and the water crisis. However, it should be learnt that, unlike the fossil fuel, which is the prime energy source, the water is a renewable resource. Here lies the key issue for water management Reuse, Recycle and Recharge, i.e. a good management of water, we can say that Rain Water Harvesting.

India a developing country, has a bliss of surplus monsoon rains. However, due to global climatic pattern disturbances, the monsoon pattern is also disturbed. Because of the lack of wide spread water management techniques, the country observed a severe water crisis, to the extent that even the President's House has to go for Rain Water Harvesting techniques employed in their premises. Recently the President has to face a conventional arrest (Gherav) by the ladies in staff quarters of President's house.

It is worth mentioning here that according to a survey done during British time, there was no single village in India facing water problem. The survey done by Government of India in 1972 realised that 138 villages in the country were facing water crisis. Today, in 2002, we can say that there is not a single village or city in the country without water problem.

In the tenth five year plan the Government of India has given special emphasis for the water management. Water management has basically two approaches - first to trap the rivers by constructing big dams over them; and second is to trap rain water running off our premises and putting it to charge the ground water i.e. Rain Water Harvesting. The second approach has an advantage over the first one, that here, we get the water on site. Hence, the conveyance energy required from dams to the premises is saved. The concept is fully environmentally consistent.

Considering this, Government has launched various schemes, various programmes of giving various

incentives for encouraging the Rain Water Harvesting concept. Various NGO's have also come forward in this regard. The present paper describes the case history of *Chopadai* village in *Jalgaon* district in India. It gives the details of the scheme design, its success, operational issue and benefits achieved. The scheme is an excellent example of management through indigenous technology, in remote rural areas where a sophisticated technology may be unsuitable.

### The Water Issue :

Scientists are keen to search for water on the Planet Mars. Because if they find water, they can ascertain the sustainability of life also. This shows the importance of water for human life. sixty to seventy percent weight of human body consists of water. All organics which synthesis human body are the polymers of water.

Fortunately India is a water abundant country with per capita availability of water more than 2000 m<sup>3</sup>. However the terms abundance and disparity are relative, but there is a great disparity in water distribution. Certain parts of North East India obtain several hundred centimetres of rains and Himalayan ranges of North India are always covered with ice. While certain areas like Rajasthan obtain just a few millimetres of water. In general, in the plains of India, if a certain area obtains rains in the range of 12 to 15 inches, it is declared as a drought area. However in countries like Israel, the average rainfall itself is 4 inches, but there is no scarcity of water, due to proper water management. In Jaselmer district of Rajasthan in India, the rainfall is just one and half inches. But the city had been a centre for trade with Middle East in British time. This clearly indicates that, the water issue is purely an issue of Management and not of Technology.

Recently, the dependence on Ground water has increased greatly. This has caused severe depletion of water table at many places subsequently causing salinity problems. However it is ironic to learn that countrywise on a average base, we are using only 30% of the safe yield of ground water. But it is due to the non uniform distribution of the extractions that the problem has taken a giant shape. Again the problem has its origin in Management, not in Technology.

**Case Study :**

In western parts of Maharashtra, major irrigation projects are built on east flowing rivers. But northern part of the state, which includes Jalgaon district, is still suffering from acute shortage of drinking water. In Amalner tahsil of Jalgaon District, Chopadai, Kondhawal and Dangar are taken as sample for representing the scarcity condition of water. To overcome this problem a Non Government Organisation, Sane Guruji foundation for Educational, Cultural & Rural Development Research has initiated in implementing Rooftop Rain Water Harvesting project in these villages.

The main function on this project is to collect the rainwater falling on rooftop of houses, which is collected through spouts in ferro-cement tanks and used at the time of shortage.

**Commencement :**

At beginning, the foundation undertook a detailed survey of these villages. From this survey, it came to conclusion that, these villages are located in between two dykes at acute angle. The surrounding area of these villages is hilly and rocky. The Galana and Ajanta hill ranges are spread in Southern parts of Jalgaon district. Therefore it obstructs Southwest monsoon, which results rain shadow zone. These villages are in this zone.

This gave rise to implementation of the rooftop rainwater harvesting project. Foundation's activists motivate villagers towards implementation of project. Activists of foundation found that if run-off water was effectively collected, hundreds of women in these economically backward villages would be saved the burden of to far away water sources. Run-off water collected from roofroops in storage tanks can provide very good drinking water source.

**Construction of Water Storage Tanks :**

For collecting rainwater from the rooftops, storage tanks were needed, which were constructed using the ferro-cement technique. Following factors were taken into account while selecting a tank design and size depending on local circumstances.

- the amount of rainfall, its distribution and annual variation,
- the length of dry season,
- the size and type of catchment area,
- the number of users per tank,
- the drinking water requirement which is taken as 5 to 6 liters per capita,
- skills of local labourers,

If we assume that an individual needs 5 liters of water per day for drinking and an average family has 5 members, then the family's drinking water requirement

is 25 liters per day A 5m<sup>3</sup> structure can provide drinking water to a family for 200 days, while 10m<sup>3</sup> is adequate for a complete year. Keeping this in mind along with 8 months of dry season, 92 storage tanks were constructed.

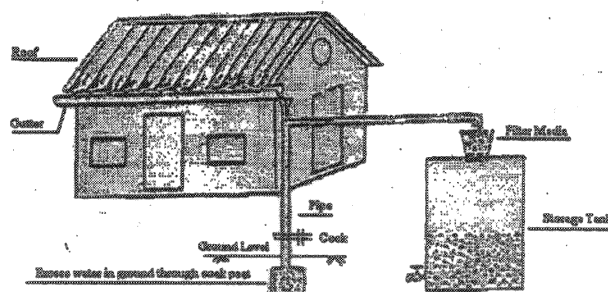
It is clear from Tables 1 and 2 that the water containing capacity of the constructed tank is not proportionate to their respective family sizes in the project villages. This is mainly because the space required for the construction of large size tanks is not sufficiently available in front of every house. However, the number of medium sized tanks are more in number which satisfy the daily drinking water needs of the villages.

**Table 1 — Village wise classification of Storage Tanks in Accordance with their water storing capacity**

Name of the Villages					
Sr No	Storage Capacity (in liters)	Chopadai	Koundhawal	Dangar	Total
1	2500	08	-	-	08
2	5000	26	14	35	75
3	10000	08	01	-	09
Total		42	15	35	92

**Table 2 — Village wise classification of Beneficiary families according to their size in year 2000.**

Name of the Villages					
Sr No	Family Size	Chopadai	Koundhawal	Dangar	Total
1	<5	09	05	10	24
2	6-10	23	08	18	49
3	> 11	10	02	07	19
Total		42	15	35	92



**Typical Model of Rooftop Rain Water Harvesting Project**

**Construction Work :**

The entire process of construction consisted of prefabricated moulds, which were assembled at site. chicken wire mesh was wound around the structure. Cement plaster has set, the mould was applied and once the plaster had set, the mould was removed and plastering

was done from the inside. The mason women's group was comfortable with this method of construction.

In the water purification process, a filter chamber was made inside the tank in which the mesh was fitted. Over this, a layer of gravel was spread which was followed by a layer of charcoal and finally a layer of coarse sand. This arrangement helped in filtering the water which was further chlorinated by adding bleaching powder. Finally, pure water was obtained for drinking water purpose.

Similarly, the construction cost for the 2500 and 5000 liters capacity water tanks was Rs. 8439/- and Rs. 10,150/- respectively. These initial costs were considerably high and therefore unaffordable for the poor families. But as the tanks would serve drinking water to the families permanently, the effort was worthwhile. Besides, no maintenance charges are required.

#### **Some facts of Maharashtra State :**

In Maharashtra there are 86,500 slums containing population of 5.25 crores of 1 crore families. Government utilises funds for Rural Water Supply schemes till date was 9,000 crores. Today's cost of those schemes - 12,000 crores.

20,000 Hand Pumps, 80,000 wells, 14,000 small water supply projects, 9,500 pipe water supply schemes. Although this water scarcity problem is arising.

In Summer 21,000 villages are facing problem and 5,500 villages are provided water by tankers. Again excess expenditure of near about 70 to 80 crores for drought prone area.

#### **Role of Government :**

1. Government of Maharashtra, in India, considering above statistics started a scheme called "Shivkalin Pani Sathvan Yojna" (Shiv-era water storage scheme). The main features of this scheme are -
2. Government directed to all private, public, and government building to implement Roof top Rain water harvesting project,
3. For this year, in 100 villages of each district of Maharashtra State, this project will operate as Pilot

Project. Finance for these projects are given by government.

4. From next year this project will operate on regular basis.
5. 25% of finance coming from central governments water supply project scheme should be spent on this project.
6. Directives are given about how to run the project.
7. Without proper water management structures, no private houses, public buildings, school constructions are permitted in rural areas by competent authority.

#### **Conclusion :**

The ancient mythologies have considered water as one of the five basic elements (Panch Mahabhoot) synthesising the Universe. These five are the bliss of nature, which must be available to every body, free of cost. But the "large size", capital-intensive scheme of water management has resulted into a centralised and monotonous control on water. This is against the laws of nature. The small size on site water management technique (i.e. Rain Water Harvesting) breaks the above strategy and decentralises the water controls. This method would help in solving the severe drinking water problem of the people living in arid and semi-arid regions. Also Water harvesting and its utilisation for crop production has generated productive, protective (ecological), social, economic and employment generation benefits. On site water management is the technology that is environmentally correct energy efficient and it is the undoubtable technology for twenty first century.

#### **Reference :**

1. Water Supply and Sanitation Department of Government of Maharashtra's Resolution No. GPP-1001/L.N.330/WS-07, dated 14th February 2002.
2. Water Supply and Sanitation Department of Government of Maharashtra's Resolution No. IEC-1001/L.N.120/WS-16.
3. A progress report - on rooftop rain water harvesting project in Amalner tahsil, submitted by Sane Guruji foundation to Government of Maharashtra.