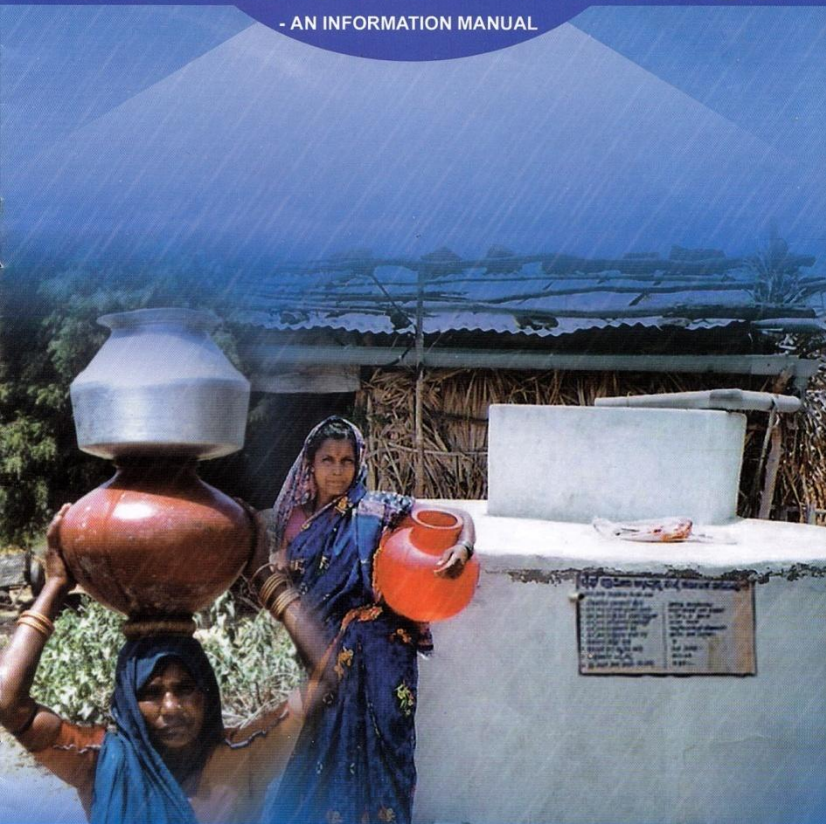


ENSURING SAFE DRINKING WATER THROUGH INNOVATIVE
TECHNOLOGIES TO ERADICATE FLUOROSIS

'SACHETANA' PROJECT

- AN INFORMATION MANUAL



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Courtesy for photographs : 'Sachetana' safe drinking water project & 'Sachetana' natural resource management project, implemented by BAIF Institute for Rural Development-Karnataka at Mundargi Taluk, Gadag Dist. Karnataka

FOREWORD

There are 56682 inhabited villages in Karnataka State, India. Out of these 21008 villages are facing one or the other drinking water problems. There is high fluoride concentration in 5838 villages, high iron content in 6633 villages, high nitrate content in the water sources of 4077 villages and 4460 villages have high salt content in drinking water sources. High fluoride concentration in drinking water has been identified in Kolar, Tumkur, Gadag, Chitradurga, Davanagere, Gulbarga, Bellary, Koppal and Raichur Districts.

The BAIF- Institute for rural development- Karnataka (BIRD-K) a voluntary organization involved in rural development has been implementing various development programmes in Karnataka since 1980. The programmes include livestock development, watershed development, agro forestry, sericulture, promotion of sustainable agriculture practices, rural micro enterprises with micro finance, community health, empowerment of weaker sections and promotion of people's organizations etc. The organization is serving the rural community in 21 districts in the state. A well established training and research center located at its campus at Lakkiahalli in Tiptur taluk is supporting the organization in training, development research and input supply for the field based programmes of natural resource management and promotion of quality of life aspects.

The project titled 'Sachetana' safe drinking water project is under implementation in Tumkur, Gadag and Kolar Districts. The implementation cost of the project amounts to Rs. 14.34 crores and is financed by the Dept. of Rural Development and Panchayath Raj, Govt. of Karnataka. The project envisages, extending the benefits to 5600 families spread over four taluk, namely; Sira and Pavagada in Tumkur District, Bagepally in Kolar District and Mundaragi in Gadag District where the fluoride concentration in drinking water is very high. The project covers 15 villages in each of the taluks.

The objective of the project is to ensure safe and sustainable availability of drinking water to the local communities, through out the year, creating awareness about harvesting rain water for drinking purpose, conjunctive use of water and water recharges activities for eradication of fluorosis.

The project will be implemented with active participation of the community at all stages. Priority will be given to the below poverty line, scheduled caste, scheduled tribes, and other vulnerable sections of the society.

I wish all the success for the project and hope that this project becomes a model for eradication of fluorosis through harvesting rain water and judicious management of natural resource.

Dr. N.Manjula
Director (Rural Infrastructure)
Deputy Secretary to Government, RDPR,
Bangalore

'SACHETANA' PROJECT -

ENSURING SAFE DRINKING WATER THROUGH INNOVATIVE TECHNOLOGIES TO ERADICATE FLOURSIS

1. INTRODUCTION

Government of Karnataka has sanctioned the above captioned project vide GO No RDP/773/RDWS (2)02, Bangalore dated 15/3/2006. BAIF Institute for Rural Development- Karnataka is entrusted with the responsibility for implementation of the said project through Grama Panchayaths. The programme covers 60 villages that belong to 4 Taluks namely; Mundaragi in Gadag district, Sira and Pavagada in Tumkur district and Bagepally in Kolar district. The project aims to provide safe drinking water to the fluorosis affected population of these villages through adopting different technologies of rain water harvesting and ground water recharge for both immediate effect and long term solution to the problem.

The individual family based activities like harvesting roof top rain water and harvesting surface runoff from artificial catchments aims at providing safe drinking water to the affected families. The community based activities like farm pond excavation, recharging bore wells, direct recharge of aquifers and dilution of underground fluoride aims at ensuring potable under ground water to the community. Disinfection of water resources will also be taken up in the project villages to ensure safe drinking water.

The success of the project mainly depends upon the effective functioning of the Gramasabhas, strong people's organizations, participatory planning, effective implementation and post project management. For smooth and effective implementation of the programme, following guidelines are issued.

2. BASIC DATA

Title of the project	: 'Sachetana' drinking water project to address fluorosis situation in three districts of Karnataka
Sponsored by	: Dept. of Rural Devt. and Panchayath Raj, Govt. of Karnataka and Govt. of India (ARWS Scheme)
Implementation agency	: BAIF Institute for Rural Development-Karnataka, Sharadhanagara, TIPTUR - 572 202, Tumkur Dist., Karnataka
Duration	: Five years, (April 2006 to March 2011)
Districts covered under the project	: Tumkur, Kolar and Gadag
No. of villages covered	: 15 villages per taluk
No. of families covered	: 1500 families per taluk

3. GOAL

To ensure availability of safe drinking water to the local community through rain water harvesting and improved ground water.

4. OBJECTIVES OF THE PROJECT

- * To provide safe drinking water through innovative rain water harvesting structures.
- * Recharge of ground water through excavation of percolation ponds.
- * Recharge of existing bore wells and direct recharge of aquifers.
- * Activities for training awareness to promote sustainable management and maintenance of water resources and water harvesting structures.

5. DETAILS OF PROJECT AREA

Taluk	Gram panchayat	Villages covered
Sira (Tumkur District)	Bevinahalli	Bevinahalli, Bommaganahalli, Bevinahalli, Bommaganahalli, Brahmmasandra, Devarahatti, Chengavara, B.Gollarahatti, Bettappanahalli, Shivanaiahnapalya.
	Handigunte	Badamaranahalli
	Nadur	Uddaramanahalli, Nadur, Pattanayakanahalli, SD.Palya
	Madalur	Bappanadu, Inakanahalli
	Hendore	Siddanahalli
Pavagada (Tumkur District)	Kannemedu	Kennemedu, Veeralagundi, Kilaralahalli
	Channakeshavapura	Channakeshavapura, Hariharapura, Kottur
	Naligenahalli	Devadabetta
	KT.Halli	KT.Halli, Mugudalabetta
	Arasikere	Jangamaranahalli
	Mangalawad	Mangalawad, Kerekwatanahalli
Bagepalli (Kolar District)	Gujjanadu	Gujjanadu, Thimmalanayakanahalli
	Venkatapura	Jajurayanahalli
	Mittemari	Mittemari, Mallagutti, Chinnampalli, Papanayakapahalli, Surepalli
	Devaragudipalli	Mallasandra, Karakur
	Kanagamakanapalli	Guntaganapalli, Achepalli, Burugamadu, Tumbepalli
Mundaragi Gadag District)	Yallampalli	Laghumuddepalli, Penumale
	Marganakunte	Marganakunte
	Paragodu	Devareddipalli
	Kalkeri	Kalkeri, Mustikoppa, Virupapura, Virupapura tanda, Thippapura
	Koralahalli	Bidanal, Koralahalli
Hesarur	Hesarur	Nagarahalli, Bennihalli, Mukthampura
	Mevundi	Baradur
	Harugeri	Harugeri, Budihal, Basapura, Kelur

6. MAJOR INTERVENTIONS

- * Roof top rain water harvesting
- * Rain water harvesting through artificial catchments
- * Make shift roof top water harvesting
- * Ground water recharge through excavation of percolation ponds
- * Recharge of existing drinking water bore wells
- * Direct recharge of aquifers to dilute the concentration of fluoride
- * Regular monitoring of water quality
- * Chemical disinfection of water resources
- * Formation and strengthening of people's organizations

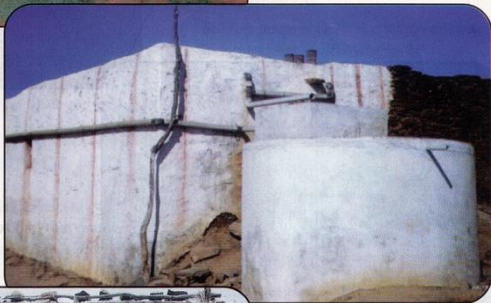


INNOVATIVE RAIN WATER HARVESTING DESIGNS PROPOSED UNDER THE PROJECT

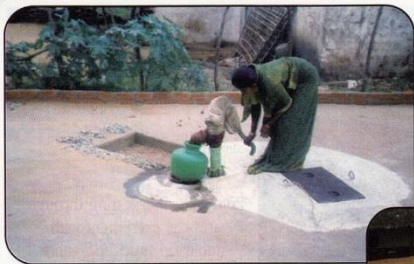


Rain water harvesting through artificial catchment with stabilized mud floor and supported with an underground storage tank

Roof top water harvesting on a house with mud roof with the help of a surface storage tank

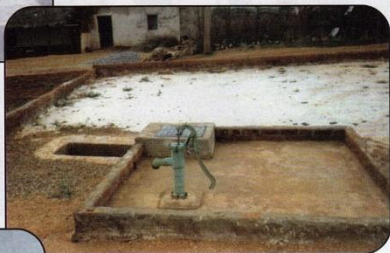


Roof top water harvesting on a house with zinc sheet with the help of a surface storage tank

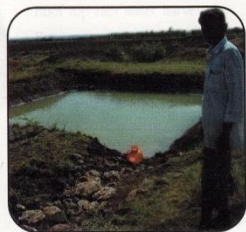


Rain water harvesting through artificial catchment on floor stabilized with cement and supported with an underground storage tank

Rain water harvesting through artificial catchment on floor stabilized with lime and supported with an underground storage tank



Roof top water harvesting storage tank constructed inside the house



Dilution of flouride concentration through excavation of percolation ponds



7. SPECIAL FEATURES OF THE PROJECT

- * Involvement of the local community and Gram Panchayat at all levels of implementation, monitoring and post project maintenance.
- * Nominal contribution by all the selected participants (10% to 30%) to promote a sense of ownership toward the assets created under the project.
- * Integrated approaches to eradicate fluorosis through harvesting rain water, recharging ground water and aquifers, programmes for generating awareness and capacity building etc.
- * Adopting innovative water harvesting designs which can cater to the needs of all type of households in the villages including families with thatched and mud roof houses.
- * Formation and strengthening of community based organizations to ensure post project maintenance and sustainable management of the water resources and water harvesting structures.

8. BENEFITS OF THE PROJECT

- * Awareness about the importance and use of safe drinking water, water conservation, rain water harvesting, and water recharging etc. in selected communities.
- * Increased availability of ground water with better quality thanks to excavation of farm ponds, direct recharge of aquifers and bore wells.
- * Decreased fluoride concentration in bore wells used for drinking water.
- * Availability of safe and assured drinking water through out the year for 5600 families located in 60 villages.
- * Improved quality of life through the availability of safe drinking water.
- * Increased awareness in the surrounding villages of the project area on fluorosis and its management.

9. ACTIVITIES UNDER THE PROJECT

9.1. Family based activities

A. Selection of participants

Selection of deserving families is important for achieving the objectives of the project. Following are the criterias for selecting families for family based interventions.

- * All families in the selected villages are eligible to get support under the project
- * Only those families who are willing to make the prescribed contribution for each intervention is selected.
- * Priority must be given to fluorosis affected families, disabled, destitute, widow, women headed and scheduled caste and scheduled tribe families.

B. Selection process

- * Self help groups or Gram vikas samithi are involved in identification of deserving families.
- * The families who are not the members of the SHGs are identified in Gram Sabha.
- * BAIF Institute for Rural Development shall carry out the spot verification and preparation of feasibility report.
- * Identified families will be verified and selected in the Gram Sabha.
- * List of selected families is sent to Gram Panchayath for further initiation of the activities.

C. Mobilization of contribution

The project is planned to provide benefits to all sections of the society. Contribution by participants toward its implementation is crucial to promote ownership of the project. The guidelines are formulated as detailed below for collecting the contribution from the selected families of different categories.

S.No	Category	Percentage
1	APL families	30
2	SC,ST and BPL families	20
3	Handicapped, fluorosis affected families, widows, women headed families etc	10

- * Selected families have to contribute in terms of cash, kind or labour. Out of the total contribution, 25 % may be in terms of cash and 75 % in terms of material and labour.
- * BPL, families, destitute, widow, women headed families, disabled and families with clinical victims may contribute through labour only, if they are unable to make cash contribution.
- * APL and well to do SC and ST families have to contribute 25 % minimum as cash and rest may be in kind and labour.
- * Families can also contribute 100 % of cash instead of material and labour.
- * SHGs will be actively involved in mobilization of contribution from individual members of the group which will in turn be remitted to the Gram Panchayath. Non-members will have to pay contribution directly to Gram Panchayath.
- * BAIF Institute for Rural Development, SHGs and Gram Panchayath will maintain the details of ontribution collected.

D. Execution of individual activities

- * The individual families will be encouraged to execute works on their own for all the individual activities under the guidance of BAIF Institute for Rural Development.
- * However, in case the individual families are unable to take up execution on their own, they can take the services of the local contractors that are short listed by the Grama Panchayath and with whom the Grama Panchayath has entered into a contract.
- * Payments will be released to the families if they execute the works on their own. However, they will have to obtain a work completion certificate duly signed by BAIF Institute for Rural Development and a member of the village committee.
- * In case of execution of works by the contractor, the payment will be made to the contractor on getting the completion certificate signed by BAIF Institute for Rural Development, a member of the village committee and the concerned family.
- * In both the cases the quality of construction will be supervised and monitored by BAIF Institute for Rural Development.

9.2. Community based activities

Community based activities like recharge of ground water through excavation of farm ponds and recharge of bore well, aquifer recharge through direct injection of filtered rain water to dilute the fluoride concentration

in drinking water resources will be taken up. Besides these, disinfection of drinking water resources will also be taken up in the project villages on a regular basis.

A. Selection of site

The selection of appropriate location for excavation of farm ponds, recharging of bore wells and direct aquifer recharge is a vital factor for recharging ground water and diluting the fluoride in drinking water sources.

- * Location for farm pond and recharge of bore wells should have enough catchments to harvest rain water. The process of selection will be facilitated by the BAIF Institute for Rural Development. The Village Development Committee will actively participate in the process.
- * In case of aquifer recharge, the concerned tank users committee is consulted. In the absence of such a committee, the Grama Sabha will take the decision for drilling bore wells in the tank bed with technical guidance from BAIF Institute for Rural Development.

B. Mobilization of contribution

It is planned to collect nominal contribution from the community for the community based programmes. This is to bring a sense of ownership among the community for sustainable management of the drinking water sources in future. Details of the contribution to be collected is presented in the following below :

S.No	Category	Percentage
1	Community/general public	10
2	Handicapped, fluoris affected families, widows, women headed families etc	5
3	Families getting direct benefits from the activities (example: farm pond)	5

10. FINANCIAL ASPECTS AND FUND FLOW CHANNELS

10.1 At Gram Panchayath level

Funds for the following activities will be released to the Grama Panchayath:

- Roof top rain water harvesting
- Artificial catchments

- Ground water recharging
- Aquifer recharging
- Chemical disinfection of water sources
- * Separate project account need to be opened in Gram panchayat, which will be jointly operated by the President and Secretary of the Gram Panchayat and the President of the Village Development Committee or Project Co-coordinator, BAIF Institute for Rural Development.
- * First instalment from BAIF Institute for Rural Development will be released to GP based on plans prepared by the Gram Panchayath under intimation to the concerned Zilla Panchayath.
- * Subsequently Zilla Panchayat will release the funds to Gram Panchayat once in 6 months, based on the plans prepared and approved by Gram Panchayath.
- * All the contributions collected from the participants will be credited to the project account maintained by the Grama Panchayath.
- * A separate account ledger will be maintained at Gram Panchayat level. Wherever required, BAIF Institute for Rural Development shall help the Secretary to maintain this account.
- * BAIF Institute for Rural Development shall assist the individual family or the local contractor as the case may be, for preparing the payment voucher for effecting the payment towards the works executed.
- * Payment voucher will be certified by BAIF Institute for Rural Development on verification of work for quality and quantity. This in turn will be submitted to Gram Panchayath for verification and payment.
- * Standing Committee will also make arrangements for cross checking the works and the payment vouchers on sample basis.
- * Gram Panchayat will release payment to executor (individual, contractor or any other agency) through cheque within a week, on receipt of work completion report from BAIF Institute for Rural Development.
- * Gram Panchayat will submit the statement of expenditure twice in a year to concerned Zilla Panchayath.

10.2 At the level of BAIF Institute for Rural Development


- Funds for the below mentioned activities is released to BAIF Institute for Rural Development by the Zilla Panchayath :
- Programme management
 - Implementation costs
 - Training and awareness
 - Water quality management
 - Technical guidance and consultancy
 - * BAIF Institute for Rural Development shall maintain a separate project account at Tiptur.
 - * Zilla Panchayat will transfer annual fund requirement to BAIF Institute for Rural Development, Tiptur through Demand Draft in the beginning of the financial year.
 - * BAIF Institute for Rural Development will submit the utilization certificate and statement of expenditure on completion of the financial year.

10.3 Execution of works

- * Execution of works will be taken up only after ensuring the payment of contribution by the participant.
- * Estimates will be prepared by BAIF Institute for Rural Development, based on the technical feasibility and will be approved by Gram Panchayat on recommendation of the Gram Sabha.
- * Gram Panchayath will empanel 5 to 10 local reliable contractors for executing the works. These contractors will be trained and guided by BAIF Institute for Rural Development on all the technical aspects of the project.
- * The participant will be given preference to carry out the activities on their own or may hire the services of contractor recognized by the gram panchayat in the panel of contractors.
- * BAIF Institute for Rural Development will ensure regular writing and maintenance of measurement books.

11. RAIN WATER HARVESTING

Collection of rain water depends on the available area of the roof top, the size of the tank and the rainfall at that place. For example, in a place where



it rains 500 mm and the roof area is 100 square meters, the rainwater falling on the roof is 50,000 liters. Some amount of this will be absorbed by the roof and some amount will be lost in the collection process. Even if 80% is collected, this amounts to 40,000 liters of rain water is available. However the rainwater collected in the tanks must continuously be utilised without waiting for the summer to start using it.

Schools can teach the students to ensure regular monitoring of rainfall. Students can be involved in monitoring rainfall and water collected in the rainwater tank etc. A small rain gauge and an information board may also be maintained in the school.

12. SYSTEM COMPONENTS

12.1 Roof

The existing roof can be used to collect rainwater. It is necessary that the roof be kept clean for the water to remain pure when collected. The roof top must be swept and properly cleaned on a daily basis during the rainy season.

This should be carefully done by an adult (never by children unless it is accessible and safe) equipped with the necessary implements such as a ladder, broom and a brush, if necessary.

Some schools will have shady trees to cover the roof. However leaves falling from the roof will cause blockage in the gutters and pipes. The leaves can also color the water and cause decomposition and bad odour. Therefore, roofs should invariably be completely cleaned of all leaves, dust, bird droppings etc. using a broom. Water should be used if necessary only as most times a dry sweeping with a broom will be good enough. Care should be taken to keep the first rain separator open while cleaned with water so as not to allow the dirt to come into the filter and the tank.

12.2 Pvc gutters

The gutters of PVC collect the rainwater from the roof and transfer it to the filter. On slopy roofs, PVC gutters can pick up leaves, dust, small twigs and other organic matter. The gutters need to be cleaned regularly, at least weekly once. During the rainy season the PVC gutters should be inspected and cleaned daily.

The gutters are fixed to the roof or to the walls with clamps. The clamps hold the gutter or pipes to the wall or to the roof firmly and allow a small slope in the system to enable water to flow in one direction. The clamps sometimes may come off due to various reasons. The clamps should be fixed immediately whenever it is seen to be loose or removed.

At all times the PVC gutters or pipes should have a slope in the direction of the storage tank and not away from it. The PVC gutters should always have an end cap at the end where rainwater begins to flow in the direction of the tank.

12.3 Downpipes

PVC down pipes brings the water from the rainwater gutters or pipes vertically down. They should invariably be clamped firmly to the wall and should never be loosely fixed. Always check that the down pipe is firmly fixed and replace or tighten the clamp whenever necessary.

12.4 First rain separator

The first rain separator or a washout pipe as it is called, has a valve or an end cap to allow the first little amount of rainwater to be collected separately. This has most of the dust and dirt in it. The first rain separator also is used when the roof is being cleaned or when rainwater is NOT collected.

It is important to ensure that the first rain separator is always kept in the closed position and never left open. After every rain it should be opened carefully and the waste water allowed to flow out. The pipe should then be cleaned and the valve or the end cap closed.

Sometimes the first rain separator can get jammed due to the dirt or dust in it. In such a situation the valve or the end cap should be carefully replaced by a good plumber.

12.5 Leaf trap

Where the roof of a school has lots of leaves falling from a tree or trees a conical leaf trap can be placed in the vertical down pipe. This has a mesh on top. The mesh prevents small leaves, twigs and other material from entering the pipe and blocking it or

choking the filter. The material collected on the leaf trap if any must be removed at regular intervals and daily during the rainy season.

12.6 Filter

A gravel, sand and 'netlon' mesh filter is designed and placed on top of the storage tank. This filter is very important in keeping the rainwater in the storage tank clean. It removes silt, dust, leaves and other organic matter from entering the storage tank.

The filter media should be cleaned daily after every rainfall event. Clogged filters prevent rainwater from easily entering the storage tank and the filter may overflow. The sand or gravel media should be taken out and washed before it is replaced in the filter.



Filter with mesh and gravel on top

12.7 Storage tank

The rainwater storage tank collects all the filtered rainwater and keeps it for future use. The storage tank is made above the ground and on a platform. It can also be an underground sump in some cases.

The tank is invariably painted white on the outside. This is done to keep the water inside cool and prevent the growth of bacteria. Every year the tank must be neatly white washed.

The tank will also be sealed from the top either with 'cuddapah' slabs or concrete slabs or any local stone. It must be ensured that the top cover is permanent and always fully covered. This will prevent the growth of algae or bacteria in the tank. In no case should it be opened. If there are small cracks in the joints they should be sealed with cement mortar immediately.

Mosquitoes and dust should never be allowed in to the stored rainwater tank.

The tank should also be completely water tight. If there is any dampness or leak in the tank the problem should be addressed immediately with the help of a trained engineer.

12.8 Overflow pipe

The storage tank will have an overflow pipe from the top of the tank. In case of heavy rain, the overflow pipe will allow the excess rain water to be safely disposed of without causing any flooding. The size of the overflow pipe should be the same as that of the inlet pipe. It will have a mesh at the bottom to prevent rats, squirrels and cockroach from coming in.

The mesh should be checked weekly and if torn or open should be repaired or replaced immediately.

It should also be ensured that the overflow water is drained away effectively to a pit, plant or storm water drain and not allowed to cause flooding.

12.9 Tap

A tap is provided in every tank to draw the rainwater out. Sometimes a tank can have more than one tap. Invariably it is found that children play with the pipe outlet or the tap and it is damaged. Children should be taught not to stand on the pipe or to play with the tap. A broken tap will result in the entire system going to waste as all the collected rainwater will flow out.

If there is no tap on the tank or if it is broken, no rainwater will be collected in the tank when it rains. Ownership of the system should be created and the taps taken care of and inspected daily.

If there is any leak in the tap, that too should be taken care of by replacing the washer or by getting a good plumber to repair it immediately.

Where the taps are located the area will be cemented to drain out any waste water from the site. This drain out water will be lead into a pit or a plant whichever is available.

13. WATER QUALITY CHECK

If the roof, the gutter, the first rain separator and the filter is kept clean, the collected rainwater will be crystal clear. This is an indication that good maintenance is being followed.

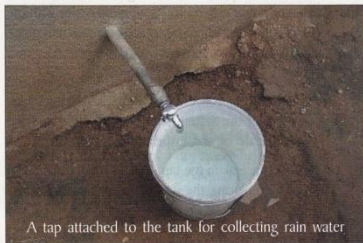
If the water is however dirty in color or it smells bad, then it means that the system is not being kept clean.

Even if the water is clear and does not smell still it must be checked for micro-biological contamination. The checking should daily for the first one month and then weekly if the water is clear and not foul smelling. H2S strip (vial) test bottle is used for testing bacteriological contamination.

Wash your hands thoroughly with soap. With clean hands the sealed bottle should be opened. From the tap in the rainwater storage tank fill the bottle to the mark provided. Close the cap tightly. Bring the bottle back to a safe place in a room. Observe for 24 to 48 hours. If the water turns black in the bottle then it is micro-biologically contaminated and requires treatment before being used for drinking. If the water colour stays brown, then the water is fit for drinking.

14. WATER QUALITY TREATMENT

Though rainwater as it falls from the clouds is very pure, it does pick up dirt, dust and bacteria once it falls on the roof. It is very necessary to therefore check the quality of the water before using it for consumption. Once it is established that the rainwater is not micro-biologically contaminated it can then be consumed



A tap attached to the tank for collecting rain water

directly. However, if the H2S strip test suggests that water has bacteria in it, it must then be treated before it can be used for drinking.

15. METHODS OF WATER TREATMENT

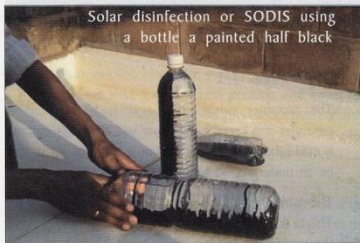
15.1 Chlorination

The method suggested for treating bacteria is chlorination. Liquid chlorine or chlorine tablets are available for treatment of water. Depending on the volume of the rainwater in the tank, chlorine needs to be added to disinfect the water.

Chlorination should be carried out every time there is rain and a fresh infusion of water into the tank. Using a chronoscope, residual chlorine of 0.20 mg/litre should be established before the water is used for drinking.

15.2 Sodis

Another form of deactivating bacteria and making water fit for consumption is called SODIS - Solar disinfection of water. In this method, rainwater is kept in a PET bottle or a glass bottle in the sun for 6 hours. One side of the bottle is painted black. The black surface is kept on the ground. With a combination of UV disinfection and infra red heat sterilization the water becomes fit for consumption. In cloudy weather the bottles need to be kept in the sun longer.



Solar disinfection or SODIS using a bottle painted half black

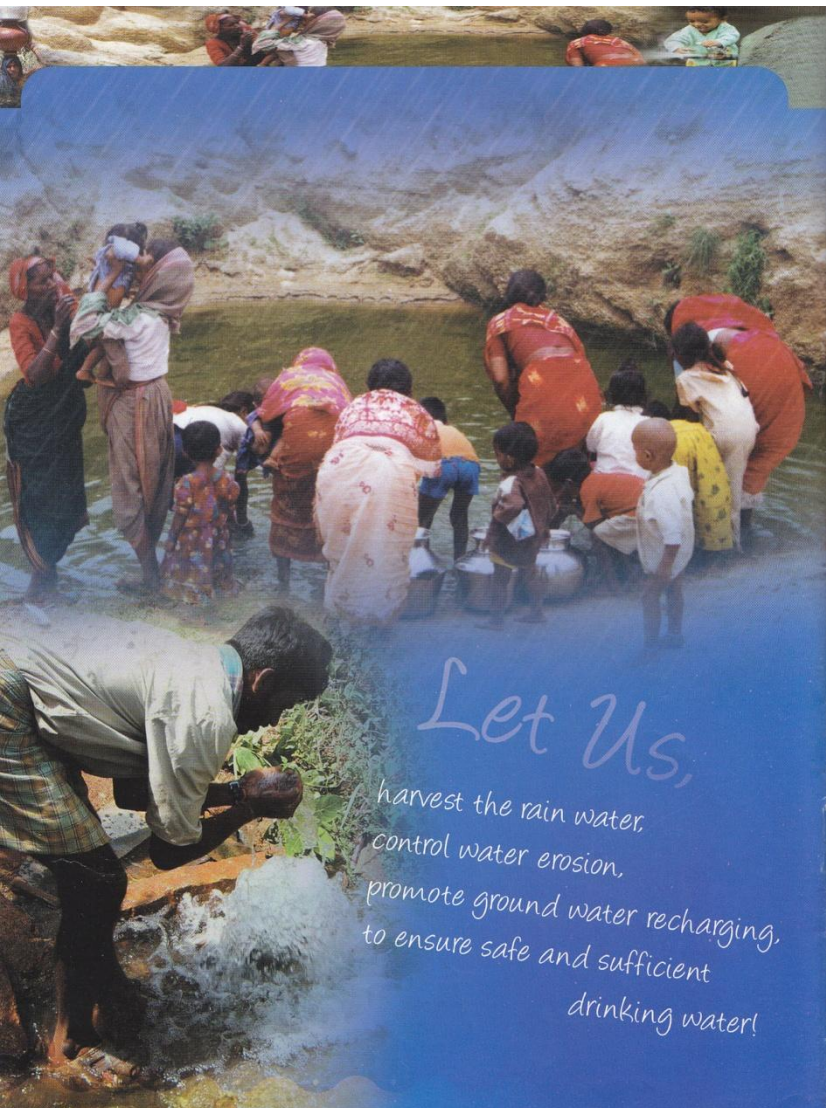
ABBREVIATIONS USED & ITS EXPANSIONS

RDPR	: Rural Development and Panchayath Raj
Govt.	: Government
Dept.	: Department
Devt.	: Development
BPL	: Below Poverty Line
APL	: Above Poverty Line

Dist	: District
SC	: Scheduled Caste
ST	: Scheduled Tribe
ARWS	: Auxilary Rural Water Supply
SHG	: Self Hef Group
GP	: Gram Panchayath



Thanks : 'Arghyam' Foundation, Bangalore



Let us,

*harvest the rain water,
control water erosion,
promote ground water recharging,
to ensure safe and sufficient
drinking water!*