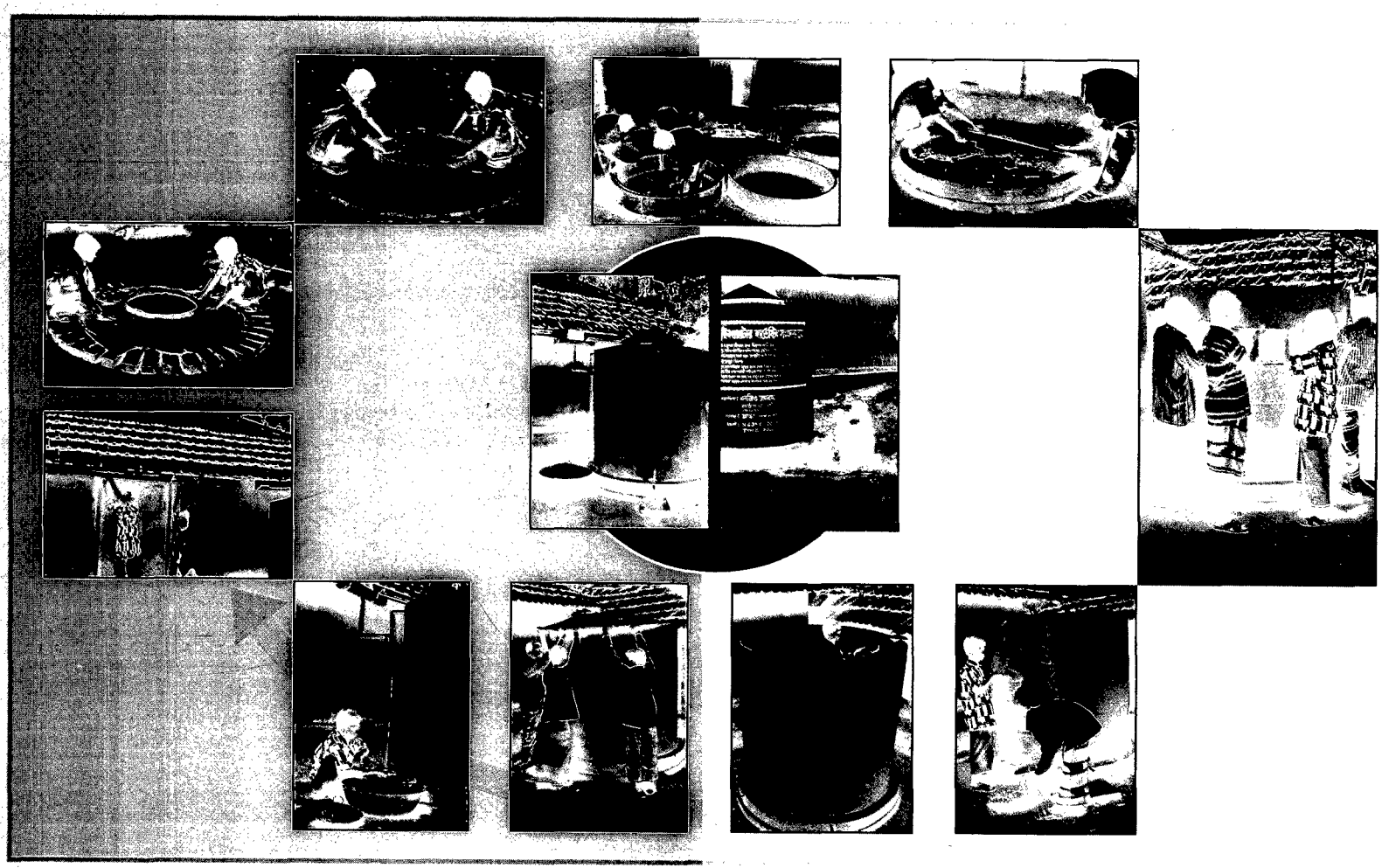
Rain Water Harvesting



NGO Forum
for Drinking Water Supply & Sanitation

Rain Water Harvesting System

NGO Forum
for Drinking Water Supply & Sanitation

SDC

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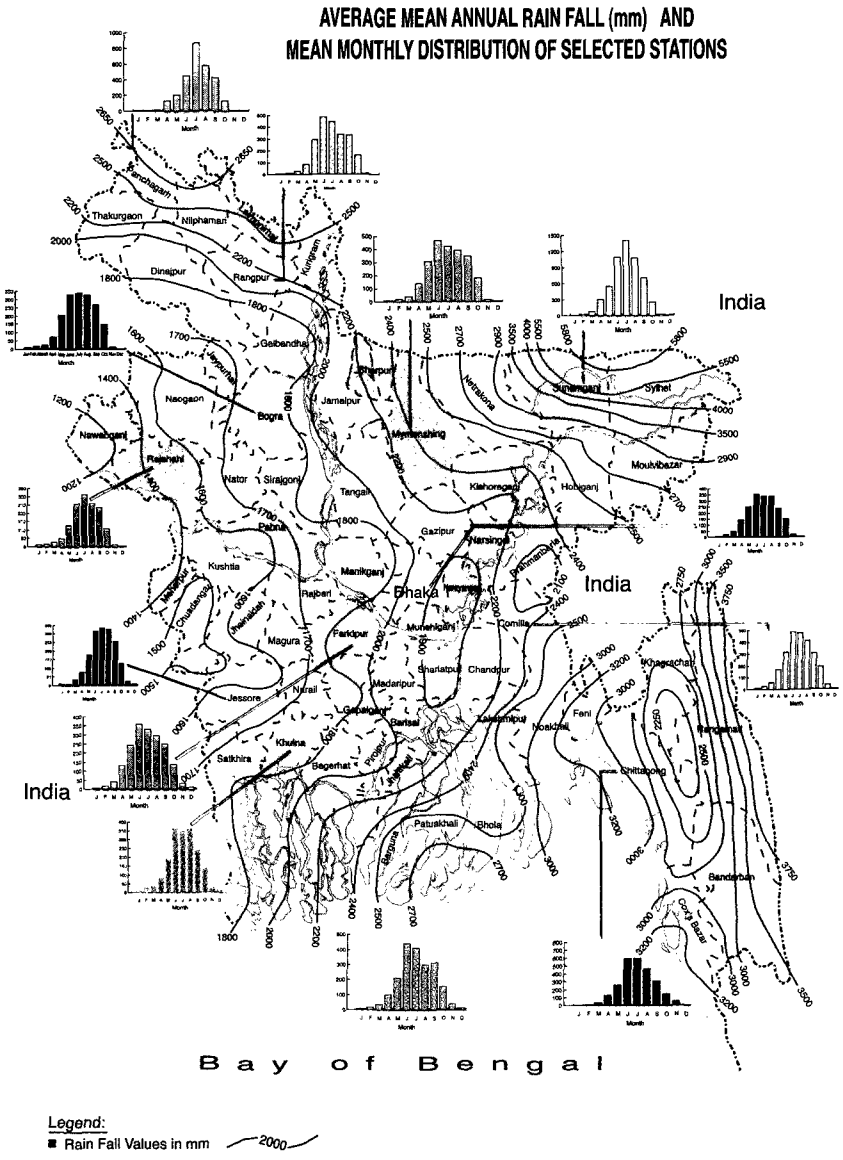
Rain Water Harvesting in Bangladesh - an Action Research Project

NGO Forum is the apex networking and service delivery agency of partner NGOs, CBOs and private sector working in water supply and sanitation programme in direct interaction with the grassroots level beneficiaries. NGO Forum was selected by SDC to conduct the Action Research because it has previous experience of promoting DRWH in the coastal belt as a response to arsenic contamination and saltwater intrusion into groundwater. Nationally, NGO Forum had over 1000 DRWH systems to its credit. It has accumulated a wide range of experience (about 6 years), knowledge and skills in promoting and making the coastal people well familiarised with this alternative water supply technology.

The heavy monsoon rain makes rainwater harvesting a viable option for drinking water in Bangladesh. In Bangladesh, an average of 2500-mm rainfall occurs annually. The amount of rainfall in the Northeast part is higher (about 5500 mm/year) and gradually decreases toward Southest direction. Less annual rainfall is around 1200 mm which occurs in the Southest part. The annual rainfall pattern is not uniform over the year, about 75% rainfall occurs from April to October.

The action research project has been implemented within the boundary of WATSAN Partnership Project area, which has also been supported by SDC. The WATSAN Partnership Project (WPP) is an innovative and participatory action research project that places the user community at the centre of planning and implementation of water and sanitation intervention. The WPP is a demand-based project that operates through a partnership of NGOs working directly with Village Development Committees (VDCs).

The DRWH project has been implemented in 15 arsenic contaminated villages of 2 thanas under Rajshahi district, which is located in the north west part of Bangladesh. Average annual rainfall in the project area is around 1325 mm which is the region of less rainfall of the country. Construction of the first series of DRWH systems started in July 2000 and by December 2001, a total of 140 schemes have been completed under the project. These RWH systems are of twelve types considering the capacity of storage tank (500 litres, 1.0 m^3, 2.0 m^3, 2.5 m^3, 3.2m^3) and the used construction materials: concrete ring, brick, Ferro cement, earthen Motka etc. The RWH systems have been designed and constructed following the regional models of Sri Lanka, Thailand and Nepal. Major models of RWHSs have been shown in the following section.



Why Rain Water?

Bangladesh is a tropical country. Despite having access to abundant annual rainfall, readily accessible groundwater and large river systems, many households do not have access to an adequate supply of potable drinking water in today's Bangladesh. Water is clear, clean, and of a chemical and bacteriological quality that is recognised by 'WHO' as being suitable for human consumption is frequently unavailable. These serious and widespread shortages can be attributed to a combination of the following factors :

- High population growth rates and densities
- Low disposable household incomes
- Extensive arsenic & saline contamination of groundwater sources
- Adverse geological formation and declining underground water table

Since ancient times, rainwater harvesting was in practice in varying degrees throughout Bangladesh. With the proliferation of tubewells the practice has waned. Due to the unfavourable geo-hydrological situation of coastal areas and Hill Tracts some people have been practising rainwater harvesting and using large earthenware pots (Motka) for storage.

The detection of arsenic in groundwater in Bangladesh in 1994 has revived the interest of alternative sources of drinking water. The heavy monsoon rains make rainwater harvesting a viable option for drinking water in Bangladesh. In Bangladesh, an average of 2,500-mm rainfall occurs annually.

Rainwater Harvesting is a wholesome practice. It has the same ushers relevance today that it had hundreds of years ago. It has a range of advantages. It provides water security at the household level as it renders the control of water supply into the hands of the individual households. O & M and management of rainwater harvesting systems are less complex than most other technologies. It offers immense convenience equal to piped water supply during the rainy season simultaneously reducing time and energy spent on water collection for drinking and cooking even during a part of the dry period. Moreover, it potentially improves the position of women and girls as less time and energy is spent on water collection chores.

There are few disadvantages too. The initial investment cost for a household rainwater facility can be high. Rainwater can only be collected when it rains. In the dry season it may be difficult to keep water if there is no regular shower. Though the quality of rainwater is generally good, it can deteriorate when the roof is dirty or the storage tank is not kept clean.

Why Action Research?

To evaluate the degree to which DRWH can realistically replace contaminated groundwater as an acceptable source of drinking water at household level. It is also investigating the fine balance between socio-cultural, financial and technical considerations, with a view to making definitive and practical recommendations on optimal designs and promotion strategies for DRWH systems in Bangladesh.

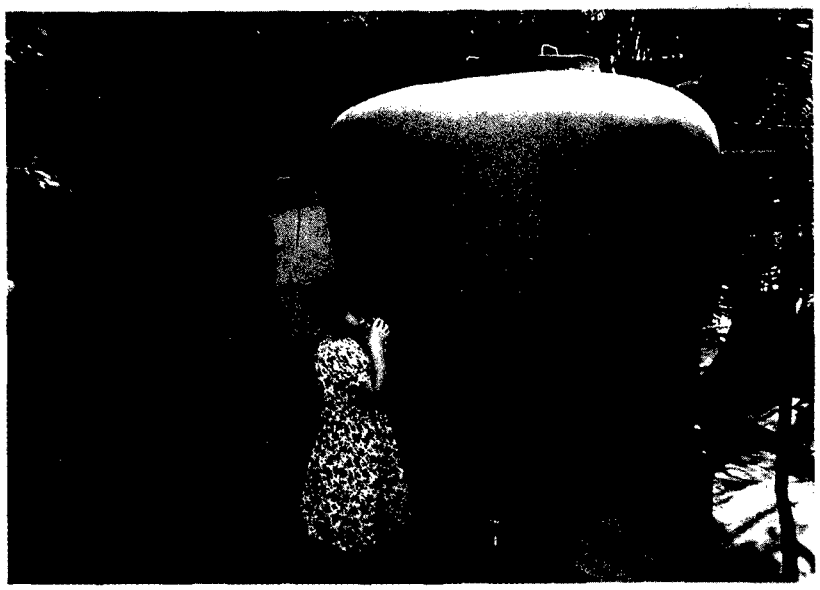
This action research has covered the technological, social, institutional and environmental aspects of household based RWH. The expected outcome of the action research would be a cost effective, environment-friendly, sustainable household RWH technology in combination with other technologies in arsenic prone areas. The WatSan (Water & Sanitation) sector will be benefited from the findings of this action research.

Types of Rain Water Harvesting System

In the Action Research project the following six major types of Rain Water Harvesting System are constructed and tested.

1. Ferro-cement Tank

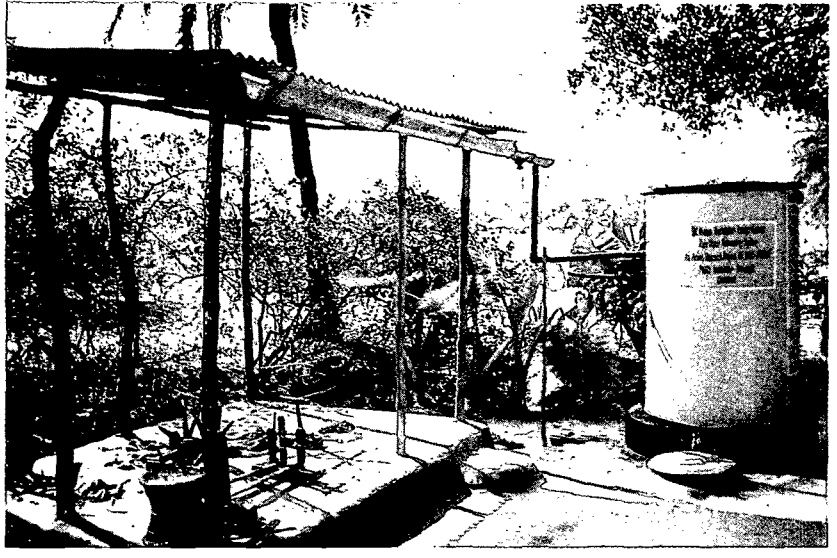
2. Ferro-cement Jar



3. Brick Tank

4. Subsurface Brick Tank

5. R.C.C. Ring Tank



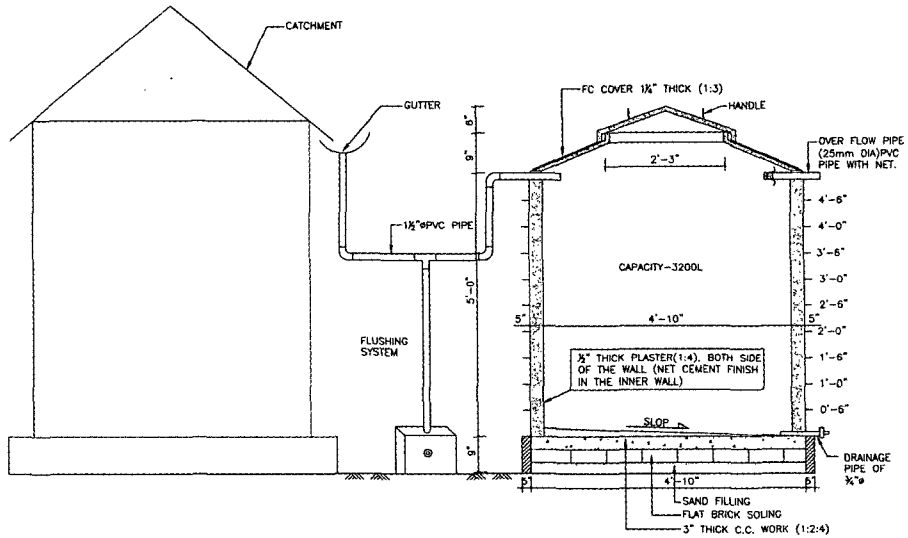
6. Earth-made Tank (Motka)

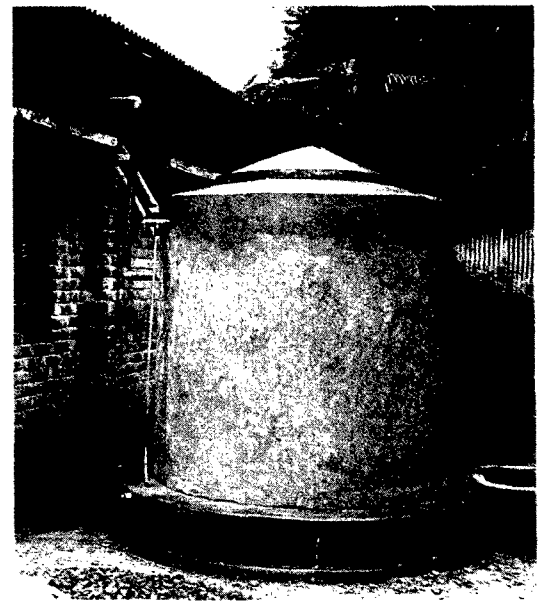
1. Ferro-cement Tank

Two types of Ferro-cement Tanks were designed and constructed. The capacities of these tanks were 2500 L and 3200 L, other differences were in the thickness of wall and the proportion of cement-sand mix. The technical specification of the parts of Ferro-cement tank has been given below :

Storage capacity	2500 L, 3200 L
Type of storage tank	Circular Ferro-cement tank (32-40 mm thickwall) above ground.
Cement mortar ratio	1:2 & 1:3 (Cement: Sand) with one layer of wire mesh.
Size of the reservoirs	Height : 1.22m - 1.5m, dia-1.60m.
Minimum catchment area	6.0 Sq.m. - 10.0 Sq.m.
Type of catchment	CI sheet, Tilted, Concrete roof etc.
Nos. of family members	7-10 people.
Number of reservoir per system	1
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With Tap.
Total construction cost	Tk. 5250, Tk. 6500

Construction Materials : Cement, Sand, Brick, Brick chips, MS wire, Wire mesh, GI wire, PVC pipe, GI pipe, Tap, MS rod, GI gutter, Polythene Sheet, PVC Elbow & Tee, Solvent cement, Construction aids materials such as Tools, dices etc.





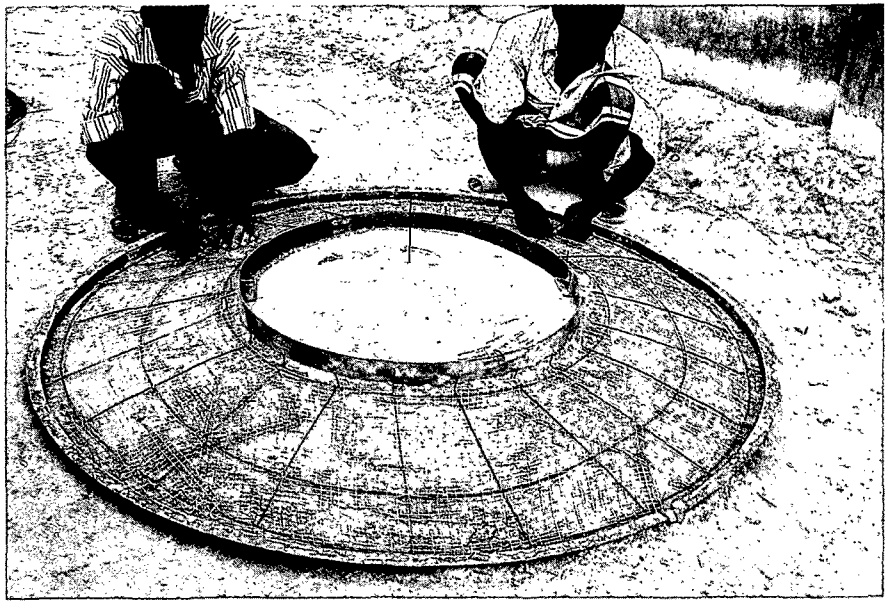
Construction Process of Ferro Cement Tank

1. Construction of Cement Segment : Make dice for cement segment that is reusable. This is made with 4-mm thick MS sheet. The shape & curvature of the dice will be according to the figure. Make 80 pieces of cement segments adjacent of the selected site.

2. Construction of Base : Make the base of the tank in a suitable place. The diameter of base will be higher than the dia of the tank. Construction is done assembling 12 cement segments in a circle and binding them with GI wire. Apply 3" thick RCC on flat brick soling.

3. Construction of Cover : The shape of the cover is like a dome, which is pre cast. It is made with dice and damping wet sand on plain ground besides the tank. It is made with Ferro cement. MS wire (3 mm dia) and chicken wire mesh is placed into mortar.

4. Assembling of Cement Segment : The structure of the tank is made with assembling the pre-cast cement segments. Bind segments with each other with GI wire.



Construction of cover

5. Warping Wire Mesh : Warp wire mesh around the outer circumference of the segments and should be tied with GI wire.

6. Plastering out side of Tank : Apply a layer of cement sand mortar on wire mesh. The cement-sand mortar should be forcedly entered into the net through shaking with trowel.

7. Plastering inner side of the Tank : Now apply plaster on the inner surface of the tank. The bottom should be slopped towards the drainage pipe. Apply thick net cement finishing.

8. Placing cover of the Tank : Place pre-cast cover on the tank and seal the joint with cement-sand mortar.

9. Construction of Water Collection Point : Construct water collection point as per the design with masonry work.

10. Setting fittings : Necessary fittings such as tap, drainage pipe, over flow pipe should be placed accordingly.

11. Curing : The tank should be cured for a minimum of 7 days. It is better, if one could do the curing by warping the tank with wet jute cloth (chot).

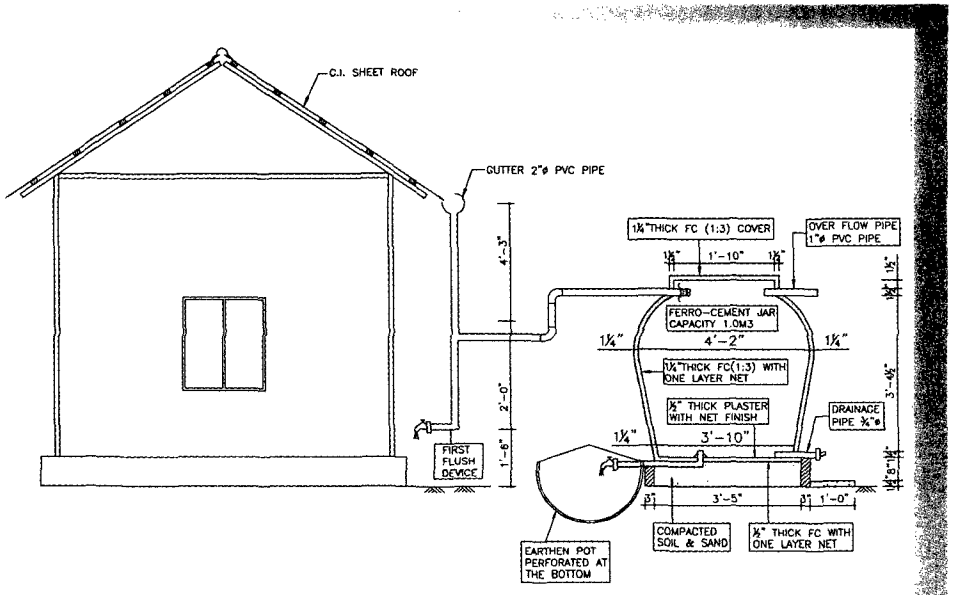
Setting of Cement Segments

2. Ferro-Cement Jar

Under the project three models of Ferro-cement Jar had been designed and constructed. Differences in the models are storage capacity (1000 L, 2000 L, 2,500 L), wall thickness and the proportion of cement- sand mix. The technical specification of the parts of a Ferro Cement Jar has been given below :

Storage capacity	1000 L, 2000 L, 2500 L
Type of storage tank	Ferro-cement Jar (38-40 mm wall thick) above ground.
Cement mortar ratio	1:2 & 1:3 (Cement: Sand) with one layer wire Mesh or without wire mesh.
Size of the reservoir	Height: 1.10m - 1.6m, Average dia: 1.15m - 1.45m.
Minimum catchment area	3.0 Sq.m. - 6.0 Sq.m
Type of Catchment .	CI sheet, Tilted, Concrete roof etc.
Nos. of family members	4 - 6 people.
Number of reservoir per system	1
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With Tap.
Total construction cost	Tk. 3000 , Tk. 5250

Construction Materials : Cement, Sand, Brick, Brick chips,MS wire, Wire mesh, GI wire, PVC pipe, GI pipe, Tap, MS rod, GI gutter, Polythene sheet, PVC Elbow & 'Tee', Solvent cement, Construction aided materials such as Tools & dices etc.



Construction Process of Ferro Cement Jar.

1. Making frame : Make a mould (skeleton) that is reusable. For this 9mm MS rod can be used. The mould (skeleton) is divided into 8 segments (parts). Outer surface of the segment of mould (8 parts) is warped with Jute Cloth (Chot).

2. Construction of base : In a suitable place, make the base of the Jar applying masonary and concrete works. The top of the base should be levelled so the segment can be placed vertically.

3. Setting Jar moulds: Assemble mould segment (skeleton) on the base and bind with rope. Keep vertical gap (of 1" wide) in one joint of segment from top to bottom. Packing the gap with newspaper.

4. Plastering the upper surface of mould : Lay clay paste on the jute cloth. Apply cement sand plaster on the jute cloth. Warp one layer of wire mesh around the structure. Again apply another layer of plaster over the wire mesh.

Setting Dice

5. Construction of Cover : In a suitable place make cover applying cement-sand mortar and wire mesh.

6. Plaster the inner side of Jar : Remove mould segments after setting plaster through the mouth of the Jar. Clean mud from inner wall and wash properly. Spray cement water and plaster the surface including the bottom of the Jar. Apply thick net cement finishing. The bottom should stopped toward the drainage pipe so that whole water can be drained out during washing.

Plastering

7. Placing fittings : Place delivery and drainage pipe into the concrete during casting base. Place over flow and inlet pipe with the tank.

8. Construction of water collection point : Construct water collection point as per the design with masonary work. Plaster the masonary work of water collection point and base of the Jar.

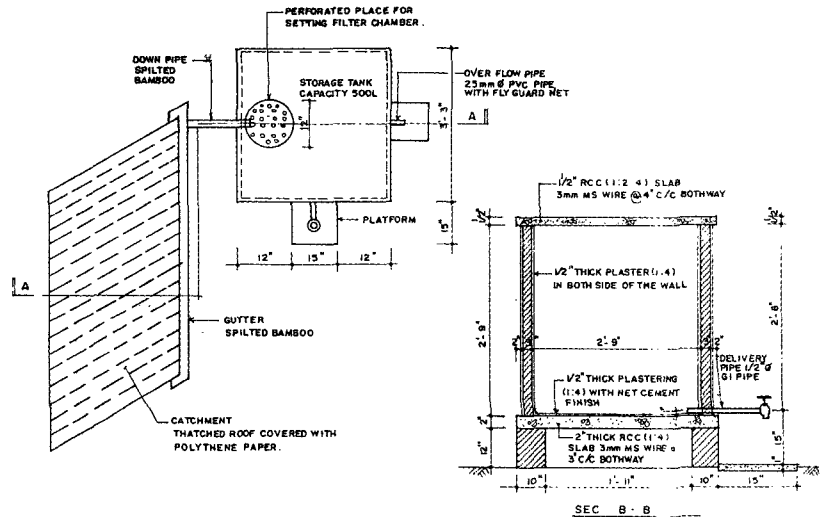
9. Curing : Cure the Jar for a minimum of 7 days. It is better if one could do the curing by warping the Jar with wet Jute cloth (chot).

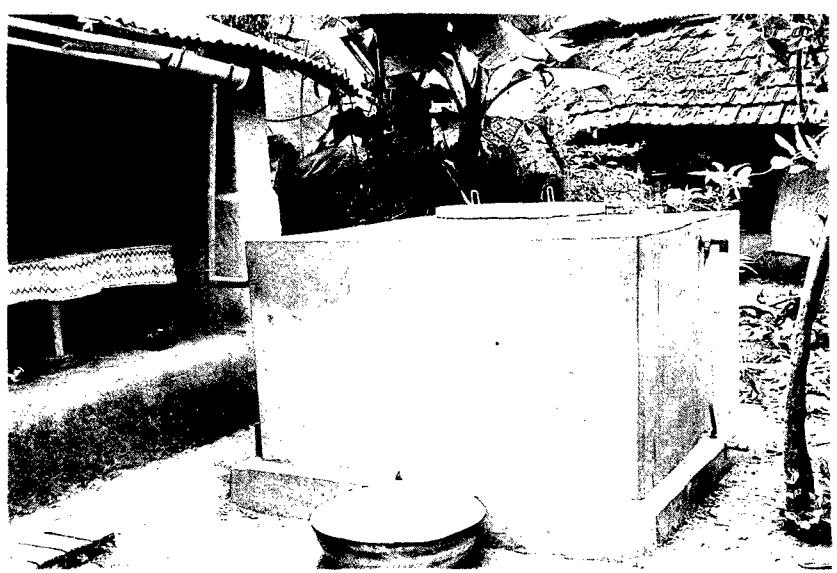
3. Brick Tank

4 models of RWHS of Brick tank were designed and constructed under the project. Differences observrd between models are in storage capacity (500 L, 1000 L and 2500 L), wall thickness and the proportion of cement- sand mix. The technical specification of the parts of Brick Tank have been given below :

Storage capacity	500 L, 1000 L, 2500 L
Type of storage tank	Circular and Rectangular Brick Tank (75 - 250 mm wall thick) above ground.
Cement mortar ratio	1:4 & 1:5 (Cement: Sand).
Size of the reservoirs	Height: 0.8m - 1.45m, dia: 0.8m - 1.53m.
Minimum catchment area	2.0 Sq.m. - 6.0 Sq.m.
Type of catchment	CI sheet, Tiled, Thatched roof covered with polythene sheet etc.
Nos. of family members	4 - 8 people.
Number of reservoir	1
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With Tap.
Total construction cost	Tk. 2500 , Tk. 3300 , Tk. 6400

Construction Materials : Cement, Sand, Brick, Brick chips, PVC pipe, GI pipe, Tap, MS rod, GI gutter, Polythene sheet, PVC Elbow & Tee, Solvent cement, Construction aided materials such as Tools & dices etc.





Construction Process of Brick Tank

1. **Construction of base :** Select a suitable place at one side of the house for the tank. The site should be relatively high land and soil should be hard. Construct brick wall (3" thick & 9" high) and apply concrete work on brick flat soling.

2. **Construction of Main body of tank :** Construct brick wall (3"/ 5"/ 10" thick) with cement sand mortar. The joint of the bricks should be properly filled with mortar.

3. **Plastering of tank :** Apply plaster on both sides of the tank. The inner side of the tank should be net cement finishing. The plaster at the bottom of the tank should be gently sloped towards the drainage pipe, so that whole water can be drained out during washing the tank.

4. **Construction of cover :** Construct a RCC cover (pre cast) at a suitable place besides the tank. Keep a manhole option, at the middle of cover.

5. **Setting fitting :** Place delivery and drainage pipe into the concrete during casting base. Place over flow and inlet pipe with tank during masonary work as per the drawing.

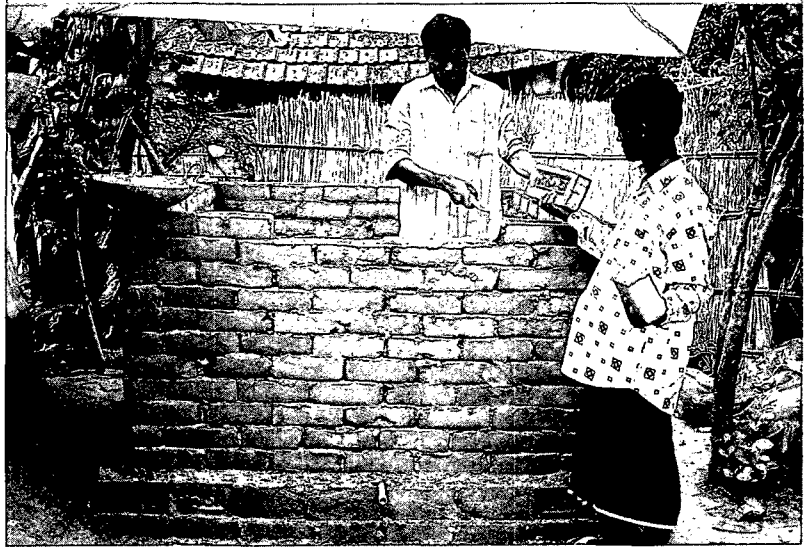
6. **Placing cover :** Place the pre cast cover slab on the tank. The joint should be sealed properly with cement sand mortar.

7. **Plastering the tank base :** Place a layer of plaster on the base of the tank and provide net cement finishing.

8. **Construction of Water Collection Point :** Water collection point is placed for a hygienic water use. In this system a burn clay pot with wider mouth is placed at the collection point, which also covered with GI sheet lid.

9. **Curing :** At least 7 days curing should be allowed for tank and other concrete parts. It is better if one could do it by warping the tank with wet jute cloth (chot).

Base Construction



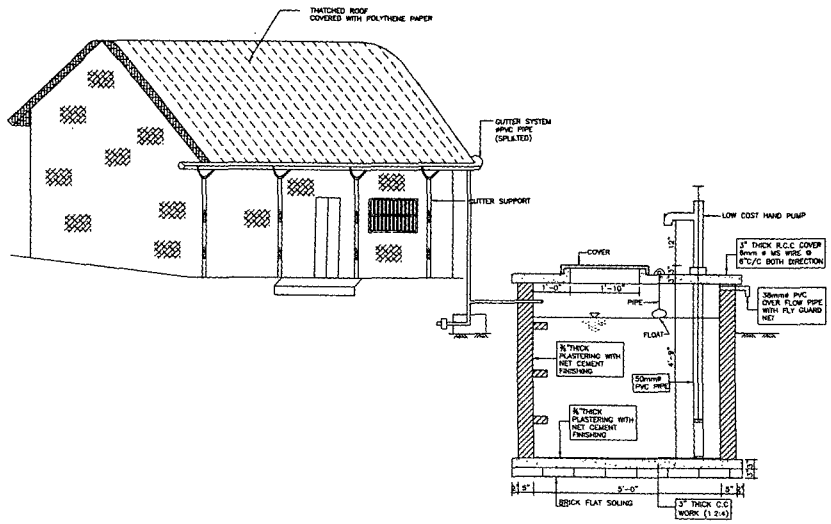
Brick Work on Tank Body

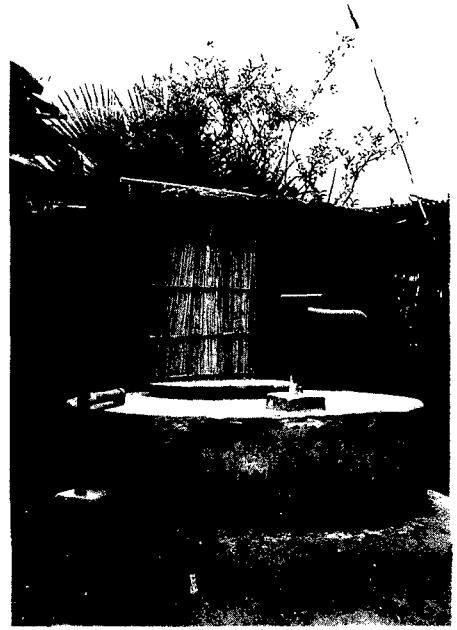
4. Sub-Surface Brick Tank

1 model of RWHS (made with sub-surface Brick Tanks) was designed and constructed. Technical Specification is given below :

Storage capacity	2,500 L
Type of storage tank	Circular Subsurface Brick Tank (125-mm wall thick).
Cement mortar ratio	1:4 (Cement: Sand).
Size of the reservoir	Depth -1.45m, dia-1.53m.
Minimum catchment area	6.0 Sq. m.
Type of catchment	CI sheet, Tiled, Concrete roof etc.
Nos. of family members	7-8 nos.
Number of reservoir per system	1 no.
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With simple hand pump.
Total construction cost	Tk. 5,700

Construction Materials : Cement, Sand, Brick, Brick chips, GI wire, PVC pipe, GI pipe, Tap, MS rod, GI gutter, Polythene Sheet, PVC Elbow & 'Tee', Solvent cement, Construction aided Tools and dices etc.





Construction Process of Sub-Surface Brick Tank

1. **Earth cutting and Base construction :** Select a suitable place for the tank at one side of the house. The place should be relatively high land and hard soil. Dig a pit as per the drawing and compact the bottom soil. Pour cement concrete on brick flat soling.

2. **Construction of tank :** Construct a circular tank with brickwork (125-mm thick wall). The joint of Bricks should be and properly filled with mortar.

3. **Plastering :** Plaster both side of the tank with cement sand mortar and provide thick net cement finishing in the inner side of the wall.

4. **Construction of cover slab :** In a suitable place, besides the tank, construct a RCC slab. Keep a manhole at suitable location of the slab.

Construction of Brick Wall

5. **Setting of fittings :** Place over flow and inlet pipe with tank. The opening of the over flow pipe should cover with net so that insect can not enter into the tank.

6. **Placing of cover slab :** Place the pre cast cover slab and the joint should be sealed with cement sand mortar.

7. **Setting Tubewell :** A simple tubewell made with PVC pipe would be set on the cover slab.

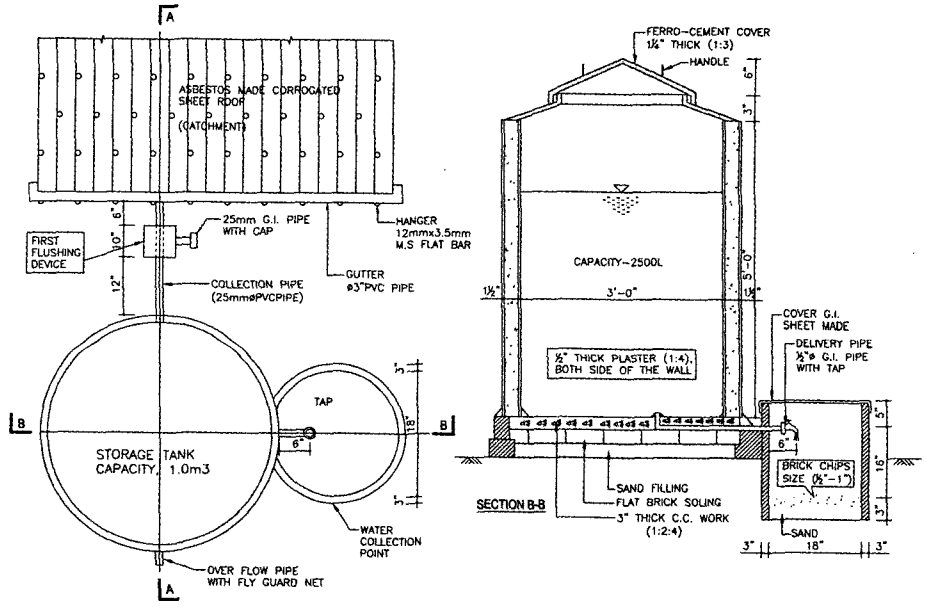
Setting of Flushing System

5. R.C.C. Ring Tank

2 models of RWHS with R.C.C ring were designed and constructed under the project. Main difference between models are in storage capacity (1000 L and 2500 L) and wall thickness. The technical specification of the parts of a R.C.C. ring Tank have been given below :

Storage capacity	1000 L, 2500 L
Type of storage tank	Circular R.C.C. Ring Tank (38-40 mm wall thick) above ground.
Cement mortar ratio	1:4 (Cement: Sand).
Size of the reservoirs	Height: 1.53m, dia: 0.92m - 1.6m.
Minimum catchment area	3.0 - 6.0 Sq.m.
Type of catchment	CI sheet roof, Tiled roof, and Thatched roof.
Nos of family members	4-6 nos.
Number of reservoir per system	1 no.
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With Tap.
Total construction cost	Tk. 2700 , Tk. 3500

Construction Materials : Cement, Sand, Brick, Brick chips, MS wire, Wire mesh, GI wire, PVC pipe, GI pipe, Tap, GI gutter, Polythene Sheet, PVC Elbow & 'Tee', Solvent cement, Construction aided materials such as Tools and dices etc.



Construction Process of R.C.C. Ring Tank.

1. Construction of base : Select a suitable place for the construction of RCC Ring tank at one side of the house. The place should be relatively high land and hard soil. Construct brick wall (5" thick and 9" high) and apply concrete work over flat brick soling.

2. Construction of Main body of the tank : Place pre-cast or locally purchased RCC ring (5 to 6 nos.) on the base and fill the joints with mortar.

Setting RCC Ring

3. Plastering of tank: Plaster both surface of the tank including the bottom of the tank. Apply thick net cement finishing on the inner side. Plastering at the bottom of the tank should be slopped towards the drainage pipe so that whole water could be drained out during washing the tank.

4. Construction of cover : Select a roughly plane and hard soil beside the tank. Place the dice of the cover and damp wet sand into the dice like a dome shape. Binding MS wire and wire mesh as per the dimension. Apply cement sand mortar on the dice and place the frame of MS wire & wire mesh into the mortar.

5. Setting fittings : Place delivery and drainage pipe into the concrete during casting base. Place inlet and overflow pipe with tank as per the drawing.

Placing Cover

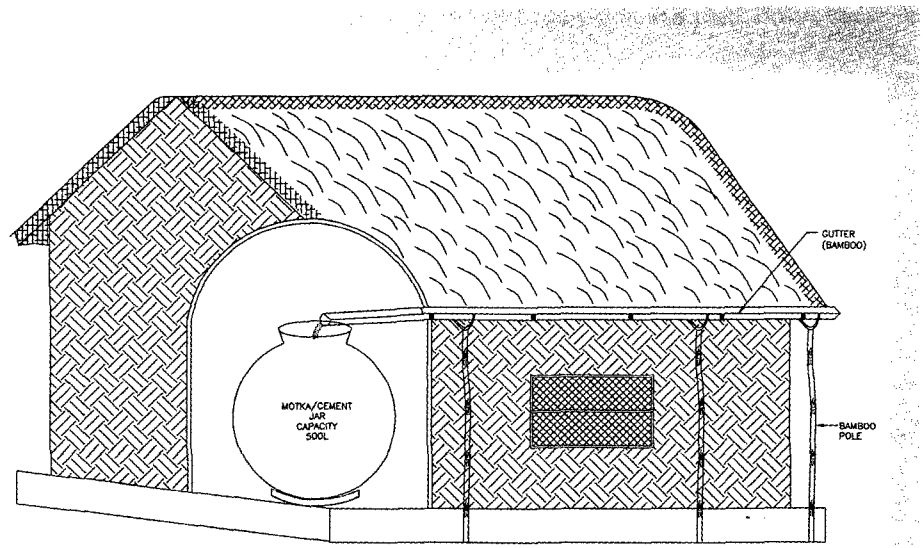
6. Placing cover : Place the pre cast cover on the tank and seal the joint with cement-sand mortar.

7. Construction of water collection point : Water collection point is constructed for providing hygienic water collection system. It is made with burnt clay pot covered with GI sheet cover.

6. Burnt Clay Pot (MOTKA)

2 types of RWHS with Burnt Clay Pot (Motka) were designed and constructed. Differences between models are in storage capacity (500 L & 1000 L). The technical specification of the parts of Burnt Clay have been given below:

Storage capacity	500 L, 1000 L
Type of storage tank	Earth made tank (12-15 mm wall thick) above ground.
Size of the reservoirs	Height: 0.84m - 1.0m, average dia: 0.69m - 1.2m.
Minimum catchment area	2.0 Sq.m. - 4.0 Sq.m.
Type of catchment	CI sheet, Tiled, Thatched roof etc.
Nos. of family members	3-4 nos.
Number of reservoir per system	1 or 2
Water collection method	Gutter from the catchment to feed inlet pipe to tank with flushing.
Water use	With Tap.
Total construction cost	Tk. 500 , Tk. 800



Construction Process of Burnt Clay Pot (Motka).

1. Construction of base : Select a suitable place at one side of the house/veranda for the installation of Motka. If it is out side the room, the soil of the place should be relatively high land and hard. Build base with brickwork.

2. Placing Motka : Set the Motka on the brick base. Protect the Motka from lifting by packing with cement sand mortar.

Gutter Setting

1. **Making Hanger :** Normally hanger is made with MS rod. It is bent like 'V' as per the picture. The inner arm of the Hanger ('V' shape) should be gradually increased toward the tank in order to provide gentle gradient.

2. **Setting Hanger :** The Hanger is tied/bind with the rafter of the roof with GI wire.

3. **Setting of Gutter :** Gutter is placed into the hanger. The distance of gutter from the edge of roof should be like that whole rainwater could fall into it and should be gently sloped toward the tank. Inlet gutter should contain a hole with nipple that could be connected with the down pipe.

Hanger & Gutter Setting

Setting Flushing System

Flushing system is installed with PVC pipe (38mm dia), Elbow and 'Tee'. It looks like 'Y'. One end connects inlet gutter and another connects the inlet of the tank. A controlling valve is set at the bottom end so that first foul rain could be easily drained out. Place a plastic net at the connecting point of gutter and flushing system.

Flushing System & Storage indicator

Setting of Water Storage indicator

Set water storage indicator with the tank that is made with transparent PVC pipe. A scale is drawn besides the PVC pipe. This helps the users for proper management of stored water.

Cost Analysis

SL. No.	Description of the material	Unit	Rate (Tk.)	Ferro Cement Tank (2500L)		Ferro Cement Jar (2500L)		Brick Tank (2500L)		R.C.C. Ring Tank (1000L)	
				Qty.	Amount (Tk.)	Qty.	Amount (Tk.)	Qty.	Amount (Tk.)	Qty.	Amount (Tk.)
1.	Cement	Bag	250	7	1750	6	1500	7	1750	3	750
2.	Sand	Cft	6.50	46	299	45	292	45	292	20	130
3.	Brick	No.	2.5	200	450	115	288	665	1662	100	250
4.	MS Wire/rod	Kg.	32	3	96	1	32	10	320	1	32
5.	18 no. GI wire	Kg.	50	2.5	125	1	50	-	-	-	-
6.	Polythene	Yard	6.5	6.5	39	6.5	39	6.5	39	6.5	39
7.	Wire Mesh (net)	Rft	10	35	350	35	350	-	-	-	-
8.	Gutter	No.	40	4	275	4	275	4	275	3	235
9.	GI Delivery & Drainage pipe, Tap etc.	L.S	L.S	-	205	-	205	-	205	-	205
10.	PVC pipe, Elbow, 'T' etc.	L.S	L.S	-	457	-	469	-	457	-	484
	Sub-Total				**4000**		**3500**		**5000**		**1900**
B.	**Labour Cost**										
1.	Mason	Man-day	120	7	840	5	600	7	840	4	480
2.	Helper	Man-day	80	7	560	5	400	7	560	4	320
	Sub-Total				**1400**	**-**	**1000**	**-**	**1400**	**-**	**800**
	Grand Total	-	-	-	**5400**	-	**4500**	-	**6400**	-	**2700**

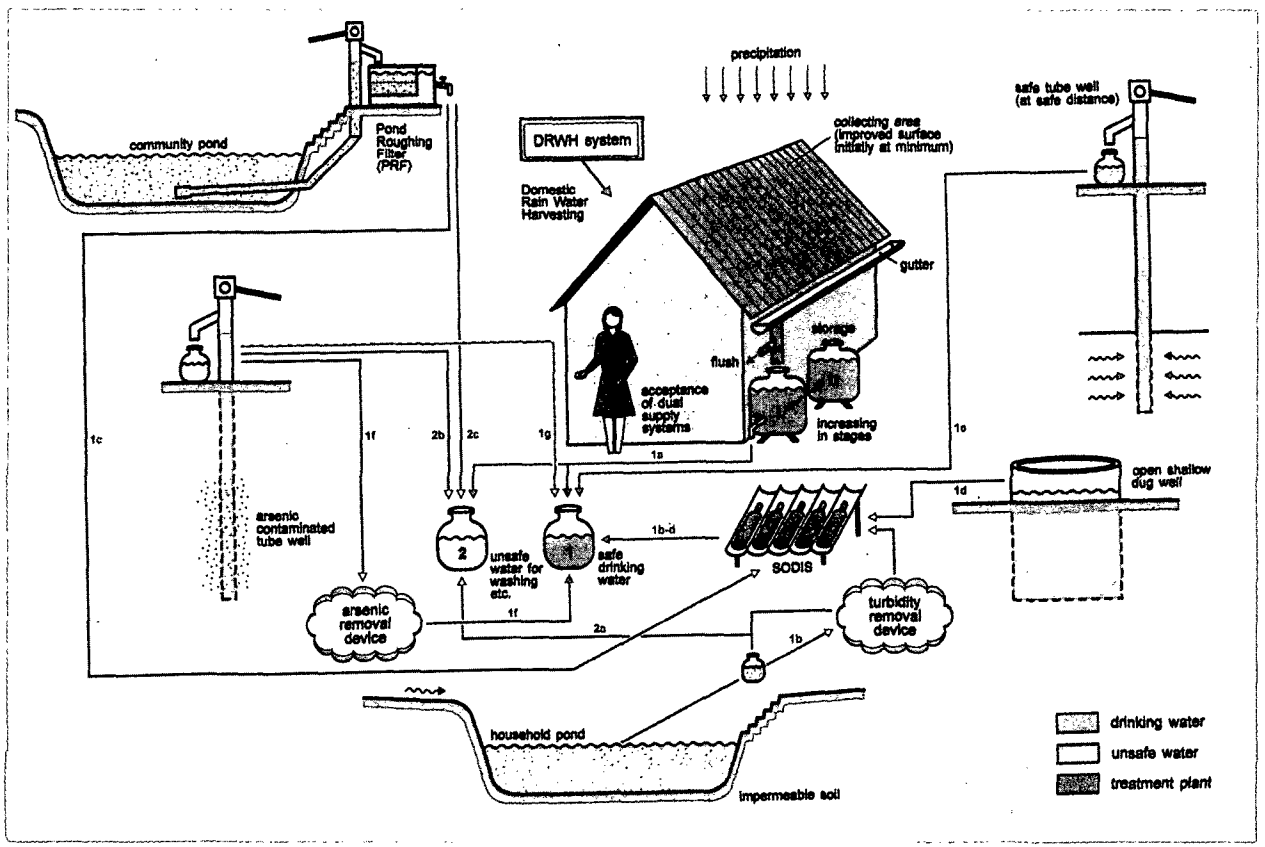
What is the Construction Cost of RWHS and how to reduce it ?

The cost of a DRWHS depends on the type of system you want to build, the area of the catchment i.e. the capacity of the tank and the construction materials that will be used. If the suitable roof of a house is available that will minimise the cost of catchment. It is estimated a nuclear family will require around 7000 litres capacity tank to meet up the demand of water for drinking & cooking for the dry period (November to April) if the daily consumption rate is 45 L.

In RWHS the major cost involvement is the storage reservoir. The complete rainwater harvesting system with a tank capacity of 7000 litres will cost about Tk. 20000. This is for the tank, collection system, gutter and pipes. For a 3200 litres RWHS will cost about Tk. 7500. While 2500 litres will cost Tk. 5500 and 1000 litres will cost Tk. 3000.

However, users will have to limit the water consumption in the dry season. In this way, they will have an adequate supply of water for essential needs, for a longer period.

To reduce the cost of RWHS and make the system cost effective & affordable for low-income groups combined water supply system is introduced. i.e. the user may construct less capacity tank and in the rainy season users will use rain water and in dry months the users of RWHS will collect water from any communal system such as PSF, Dugwell, distant arsenic free TW etc. The members of the family can participate in building the tank, or user may apply the Do-it-yourself Model i.e. Motka for storage tank, split bamboo for gutter and polythene for catchment.



Combined Water Supply System

Before and After the Construction of a Rain Water Harvesting System

For ensuring smooth functioning of the RWHS and proper management of the scheme, it is necessary to build-up required knowledge and capability of concerned personnels with the RWHS. Training is required to organise and facilitate for private masons and the caretaker. Before construction RWHS training is needed for the private mason to impart practical and theoretical knowledge and skills on how to construct different models of Rainwater Harvesting System, operation & maintenance and also the importance of Rainwater as an alternative source of safe drinking water. Development of local professional mason and private producers through the mason training is effective for supporting the community people in the construction of Rainwater Harvesting System and helping major repairs & maintenance.

Mason Training

Caretaker Training

Proper knowledge for correct **Operation and Maintenance, general system management** are the prerequisites for the sustainability of a Technology. After the construction of RWHS, training is needed for the caretaker to impart practical knowledge and skills for the general system management, proper operation, repair and maintenance of Rainwater Harvesting System. A man and a woman from each system are selected as caretakers.

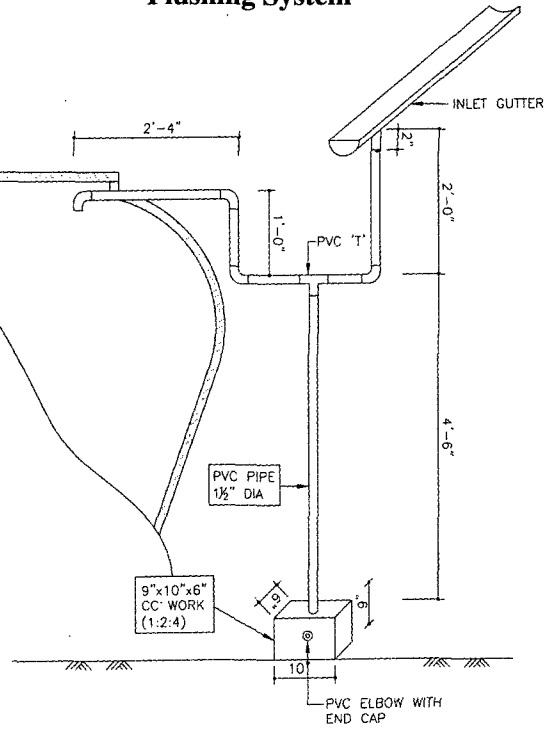
NGO Forum also prepared and supplied different educational materials such as construction manual describing the technical details of various types of tanks, the appliances for effective rainwater harvesting (first flush, guttering etc) and the procedures for the construction of rainwater harvesting systems. Operation & Maintenance manual is infused with the details of proper operation & maintenance of the systems, probable problems and the technique for corrective measures in due time by the caretaker. These IEC materials will guide the Engineers, masons and the users to manage and operate the RWHS.

Operation & Maintenance

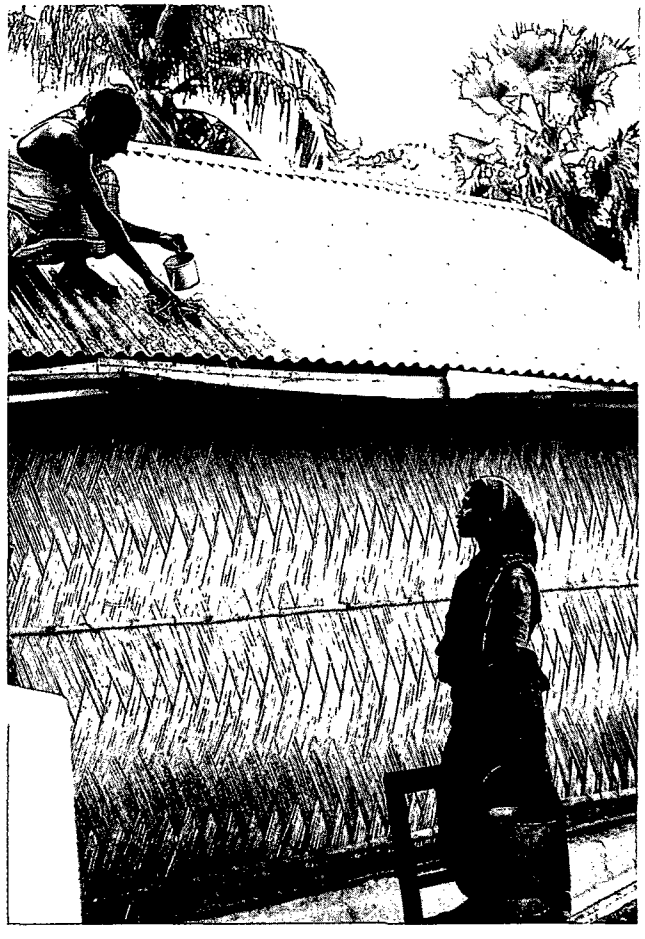
Proper operation and maintenance is important to ensure the quality of water and the sustainability of the system. Collected water should satisfy the guidelines of WHO drinking water standards i.e. physical, chemical and bacteriological quality of stored water should be safe enough for drinking and household use.

Before storing water, it needs to clean the entire system and disinfect the storage reservoir by bleaching powder. And caretaker/users should properly flush the first foul water for 6-15 minutes depending on the intensity of rain. Because, debris, dirt and dust normally stick on the roof of a building or other collection roof. When the first rain arrives, this unwanted matter will be washed into the tank. This will cause contamination of the water and the quality will be reduced. To address this problem flushing system is incorporated which divert this 'first flush' water so that it couldn't enter the tank. And collect water from the tap. Which ensures the acceptable quality of water. Fix a fly net at the mouth of the down pipe, it can sieve the debris which comes with water. The tank cover should not be kept open, other -wise flies & mosquitos would enter into the tank and breed larvae thus pollute it. Sunlight should be protected fully from entering the tank, as this would cause algae to grow inside the tank . Therefore the mouth of the tank should contain a properly fitting lid.

Flushing System



NGO Forum for Drinking Water Supply and Sanitation focuses the community management in implementing the WatSan technologies. The action research project adopts the VLOM (Village Level Operation & Maintenance) concept in rainwater harvesting system. Sustainability of a technology depends on the regular repairing and maintenance and it also enhance the design period. The user keeps clean the surrounding of the tank and repairs the minor damages.



Cleaning Roof/Other Parts

Quality of Rainwater & Water use

Generally rainwater is clean and fresh enough to drink. There is no problem with water collecting from corrugated iron sheet roof or tiles roof. If the system remains clean and properly flushes the first foul rainwater then the quality of stored water confirms WHO standard except the limit of pH value. pH value is little bit higher than the WHO guideline value. To minimise pH value of the stored water one should apply a thick cement paste layer inside the tank during construction.

The taste of water is little bitter as reported by the initial users . After using the rainwater for some days, the users did not complain further. RWH system contains a water level indicator and the users use the stored water carefully. Even they do not share water with their neighbours in the dry months.

The community people use rainwater for drinking and cooking purposes. The users of RWHS are receiving a good number of social advantages. The system can remove arsenic problem to a great extent. The users are getting safe water at home just next to the kitchen which saves their time and labour of fetching water ; because it is like a piped water supply. Women are getting extra time for better management of their family work. Children are getting more time for education.

List of Mason and Poter of RWHS

A. Mason

Mr. Shaban Mahmud
C/O Md. Lutfar Rahman
Vill: Thanapara, Thana: Charghat
Dist: Rajshahi.

Mr. Babul Mia
C/O Lt Abdul Aziz
Vill: Thanapara, Thana: Charghat
Dist: Rajshahi.

Mr. Nazrul Islam
C/O Lt A. Hamed
Vill: Thanapara, Thana: Charghat,
Dist: Rajshahi.

Mr. Shamsher Ali
C/O Lt Kashem Ali
Vill: Thanapara, Thana: Charghat,
Dist: Rajshahi.

Mr. Sazdar Ali
C/O Lt Sattar Ali
Vill: Batikamari, Thana: Charghat,
Dist: Rajshahi.

Mr. Delwar Hossain
C/O Asmat Ali
Vill: Batikamari, Thana: Charghat,
Dist: Rajshahi.

Mr. A. Matin
C/O Lt Mozahar Khalifa
Vill: S. Milik Bagha,
Thana: Bagha, Dist: Rajshahi.

Mr. Liton
C/O Rupchand Ali
Vill: Uttargao para, Thana: Bagha,
Dist: Rajshahi.

Mr. Shahjahan Ali
C/O Arel Mazhee
Vill: U. Milik Bagha, Thana: Bagha,
Dist: Rajshahi.

Mr. Lokman
C/O Lutfar Rahman
Vill: Bolihar, Thana: Bagha,
Dist: Rajshahi.

B. Poter

Mr. Prodip Paul & Mr. Bono Mali Paul
C/O, Mr. Dinu Bandhu Paul
Vill : Paul Para Shahebganj
P.O. : Ahsangonj
Upzila : Atrai
Dist : Nawgaon.

Mr. Nabdip Paul
C/O, Mr. Goshail Charan Paul
Vill : Arani
Upzila : Bagha
Dist : Rajshahi.

Mr. Nanda Kumar Paul
C/O, Late Shishir Chandra Paul
Vill : Khardo Gobindapur
P.O. : Hat Jhikra
Upzila : Charghat
Dist : Rajshahi

Rain Water Harvesting System : From Life line to Life point

For More Information Please Contact with :

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E- Mail : ngoffo@aitlbd.net or ngofom@cimabd.com
Website : www.ngof-rwhs-arp.org

&

WatSan Partnership Project (WPP)
House # 51, Road # 7/A, Banani, Dhaka-1212
Tel. 9887595,
E Mail : wpppmu@bdmail.net

WatSan Partnership Project (WPP) of SDC is an innovative pilot project in supplying safe drinking water as well as developing sustainable hygiene practices in rural areas. The objective of WPP is to innovate and introduce a sustainable and affordable technology in the rural areas of Bangladesh especially in low water table areas. WPP works with different National and International NGOs, comprising of CARE, DASCOH, IDE, NGO Forum, local NGOs and VDCs as partners adopting a partnership approach.

Mr. Karl Wehrle from SKAT has performed a short-term consultancy to NGO Forum to assess the potentiality of domestic rainwater harvesting system in Bangladesh in May 1999 and wrote a report "Domestic Rainwater Harvesting in Bangladesh". As a result of recommendations contained in that document, an action research project was set up to investigate DRWH options in western Bangladesh.

The research project started in June 2000 and is scheduled to end in December 2003. The project is being conducted with financial support from SDC and is being implemented by NGO Forum in collaboration with WPP.

SDC supports the action research project to evaluate the degree to which DRWH can realistically replace contaminated groundwater as an acceptable source of drinking water at household level. It is also investigating the fine balance between socio-cultural, financial and technical considerations, with a view to making definitive and practical recommendations on optimal designs and promotion strategies for DRWH systems in Bangladesh.

WatSan Partnership Project

NGO Forum for Drinking Water Supply & Sanitation

NGO Forum is the apex networking and service delivery agency of partner NGOs, CBOs and private sector working in water supply and sanitation programme in direct interaction with the grassroots level beneficiaries. NGO Forum was selected by SDC to conduct the Action research because it has previous experience of promoting DRWH in the coastal belt as a response to arsenic contamination and saltwater intrusion into groundwater. Nationally, NGO Forum had over 1000 DRWH systems to its credit. It has accumulated a wide range of experience (about 5 years), knowledge and skills in promoting and making the coastal people well familiarised with this safe water supply technology.

Action Research Project has been implementing in 15 arsenic contaminated villages of 2 thanas under Rajshahi districts, under WPP working area.

This action research has covered the technological, social, institutional and environmental aspects of household based RWH. The expected outcome of the action research would be a cost effective, environment-friendly, sustainable household RWH technology in combination with other technologies in arsenic prone areas. And develop replicable solutions for lower income groups. The WatSan (Water & Sanitation) sector will be benefited from the findings of this action research.