



Community perception on rain water harvesting – Sri Lanka

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CONSERVED RAINWATER HAS been a common supplementary drinking water option in Sri Lanka since the ancient past. Techniques and methods used for collection of rainwater were not systematic or properly done.

However in past decades the concepts on application of rainwater harvesting (RWH) in rural water supply systems have been developed and established as a satisfactory domestic water option. Further this has been accepted by the rural communities in dry zones, as a better option to fulfill their drinking water needs where there had been acute water quality problems (such as fluoride, iron) with their water sources. It was a fact that the collecting of roof top rainwater (RTRW) for drinking purposes was rather limited in wet zone of Sri Lanka.

In recent past several non-governmental organizations (NGO's) were adopted rain water harvesting mechanisms for their implementations at rural water supply projects but it was not in practice under the projects where the government sector was intervened.

National Water Supply and Drainage Board (NWS&DB) is a one of the premier organizations in Sri Lanka for providing adequate and safe drinking water and sanitation facilities to the communities in both urban and rural areas. However, rural coverage is fairly limited at present. As a result rural water supply section was formulated within the NWS&DB to address the issues pertaining to the rural water supply.

In order to cater the rural sector needs, ADB Assisted Third Water Supply and Sanitation Sector Project was launched since 1999 in six districts of the country. Kegalle is one of the selected districts out of such six districts. NWSDB has been selected as an implementing agency. This project has specially been designed on the basis of demand driven, participatory approach and community centered concepts.

The first phase of the project commenced in 1999 and ended in 2002. During this period, 45 sub projects have been successfully completed through selected Partner Organizations (PO) and Community Based Organizations (CBO) with the assistance of respective local agencies in Kegalle district.

Under which, rainwater harvesting was selected as a better option where there had been shortage of drinking water at difficult rural terrains.

A domestic rainwater harvesting system was introduced where permanent roof catchment exists. Tile or asbestos roofs were preferred and the system consists of an oval

shaped Ferro cement tank (5cum) with a simple sand filter and a connected pipe network to the system.

685 domestic rainwater tanks (RWH) were constructed in the Kegalle District under the project. The cost incurred for a tank was approximately Rs. 16,000 (US\$ 160) and out of which, 20% was contributed by the respective household. During the constructions, CBO's were actively participating in overall construction functions under the technical guidance of the PO's. This would be accepted as a valuable sector development within the rural water supply sector.

Study area

The study was carried out at 5 Pradeshiya Sabha (PS) Divisions (local authorities) in Kegalle District, which lies in the Sabaragamuwa Province of Sri Lanka. Meteorologically it falls in the wet zone and the average annual rainfall is estimated at 3500 mm.

The land area of the district is approximately 1690 sqkm and the current population is estimated as 850,000. The study area covers 56% of the land extent of the district and 61% of population cover.

Geographically the study area consists of mild and steep slopes and mountains. Tea and rubber are major commercial crops.

Traditional villages, new settlements at the mild slopes and scattered settlements at the steep slopes or mountains (specially in the estates) are the general settlement patterns of the said PS Divisions. However, the study area mainly lies within hilly terrains or steep slopes. Even though two major perennial rivers namely Kelani and Ma-o-ya are flowing through the Kegalle District, potential of usage of surface water as a reliable domestic water option is fairly limited at the study area. Frequent water level fluctuations & deterioration of water quality due to high iron content are the major problems in connection with the ground water at the study area. Somewhat reliable and acceptable sources are situated in the valleys or mild slopes and considerably far from the scattered settlements.

With respect to the social profile of the study area the following key features could be highlighted.

- Second generation of the traditional farmer communities are now being settled in scattered manner at the study area.
- Primary house hold income is from wages either on daily paid or monthly permanent basis. In some households, secondary income is generating through minor crops.

- Majority of the houses have permanent roof structure and the overall status of such houses are satisfactory.

In general, rural communities in the project area always preferred to obtain their water supply facility through a pipe network or at least from a shallow dug well. When quantitative or quality problems exist, people turn their minds towards hand pump tube wells or rain water systems. In similar manner, the user communities of the roof top rain water systems of the study area has selected their option during the project planning stage.

Study objectives

- To ascertain governing factors towards user perception on using of rainwater as a drinking water option.
- To evaluate the appropriateness of the on-going O&M system of the rain water harvesting mechanism to practice at the rural village level.
- To analyse the potential towards expansion of similar rainwater harvesting system in the rural water supply sector.

Study methodology

After the completion of the phase I of the project, the district level implementation unit (PIU) of Kegalle district had planned to launch a evaluation programme on successfulness of the roof-top rain water harvesting systems which have been provided under the project programmes. A questionnaire has been developed for the purpose of monitoring certain key functions (technical and social) and the project staffs were engaged in this exercise of collecting data on household basis through interviews. About 88% of the beneficiary households were visited and the data compiled at the PIU for evaluation purposes.

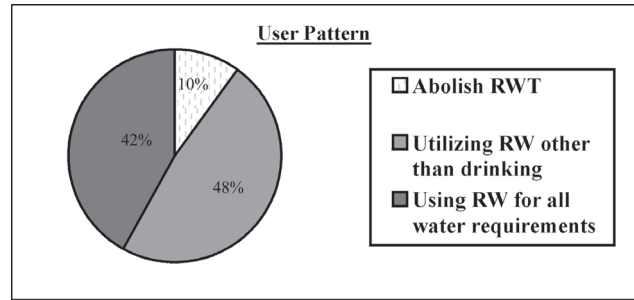
Under this study, an attempt was made to use such data sheets for analytical purpose in per with the said adjectives.

Apart from that a PS wide random sample (about 2%) was subjected to qualitative assessment to clarify the outcome of the above survey and to ascertain overall picture. The observation and findings, which are stipulated in the following sections, are based on the validation and combination of the above two survey results.

Observations and findings

User perception

The analytical study results revealed that around 90% of the RTRWS systems are in used for multiple household



purposes. The following pie chart indicates the overall situation.

10% of the RTRWS are not in used mainly due to constraints on their maintenance systems. In a few places, the members of the households have evacuated from their houses due to social reasons and such tanks were completely abandoned.

However, 86% of the user communities of such RTRWS have expressed their overall satisfaction of the facility. PS wide distribution is given in the following table. It could be noted that only 42% of the user groups of the RWH (excluding completely un-used facilities) are used such facility for drinking purposes.

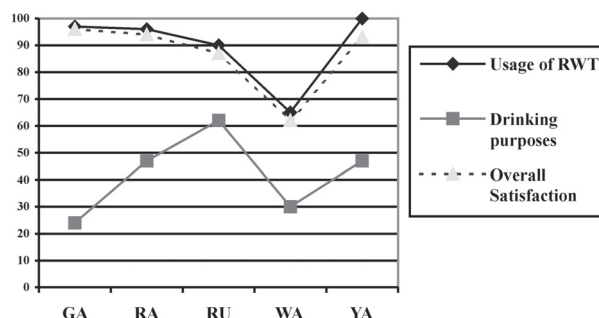
As an average effective utilization of those facilities are at above average level but the situation is somewhat different at the Warakapola & Galigamuwa PS Divisions. Comparatively in such PS Divisions the terrain is fairly mild and the availability of other surface & ground water sources are at a reasonable distance.

From the above findings the following observations could be highlighted.

- Effective utilization of rainwater tank systems are significant where the locations of household are in difficult terrains & the other sources are extremely non-reliable.
- Time taken water carrying has effectively been cut-down (from 2 hrs. to 20 minutes) with which the users have shown their impression and satisfaction of.
- No major complaints were received from the user groups with respect to the quality of rainwater in their tanks either at short intervals or through out.
- Users have made their comments on in sufficiency of the tank capacity (i.e. 5m³) to under take effective collection of rain water within two intermittent showers (i.e. an average of 45 days)

No	Project Area	No of sub project	No of S.P. Covered RWT	Topography of GNDD			No of complete RWT	Survey
				Hilly	Mild slopes	Flat		
01	Galigamuwa	15	14	7	7	-	383	304
02	Rambukkana	15	13	7	3	3	121	120
03	Ruwanwella	15	12	9	3	-	136	105
04	Warakapola	15	10	5	5	-	70	57
05	Yatiantota	15	05	5	-	-	72	67
	Total	75	54	33	18	3	782	653
	Percentage %	100	73	61	33	6	100	83

No	PS	% On overall usage of total sample	% On using only for drinking of total sample	% Of overall satisfaction of total sample
01	Galigamuwa	97	24	96
02	Rambukkana	96	47	94
03	Ruwanwella	90	62	87
04	Warakapola	65	30	62
05	Yatiantota	100	47	93
	Average %	90%	42%	86%



- Increasing trend could be observed towards effective utilization of rainwater for multiple domestic purposes & the drinking purpose as well. However, still certain socio-cultural or traditional practices are in existence at the rural village level to obstruct the implementation of RWTS.

Appropriateness of O&M

Considering the maintenance process, cleaning of roof drains filter and the tank should be routinely monitored as status below.

Maintenance Component	Maintenance Activity	Duration
1. Roof	<ul style="list-style-type: none"> To keep cleaning Flush after 1st rain 	<ul style="list-style-type: none"> Frequently Before rain
2. Drain system	<ul style="list-style-type: none"> Cleaning To check the function 	<ul style="list-style-type: none"> Frequently Prior to rain
3. Filter media	<ul style="list-style-type: none"> Cleaning To check the function Replace media 	<ul style="list-style-type: none"> Prior to rain Prior to rain Once a year
4. Rain Water Tank	<ul style="list-style-type: none"> Cleaning 	<ul style="list-style-type: none"> Frequently

No PS Name	Operation & Maintenance			
	Cleaning RWT	Cleaning of roof before usage	Available of filter media	Cleaning of filter media
01 Galigamuwa	83	92	85	80
02 Rambukkana	94	100	100	77
03 Ruwanwella	91	78	94	84
04 Warakapola	100	94	85	83
05 Yatiantota	100	85	97	96
Average	94%	90%	92%	84%

The study revealed that 90% of the beneficiary community tries to keep their roofs properly clean. In order to do this, the drain system is to be temporarily disconnected. In addition to that 92% of them are keen on putting up sand filters for their systems. Only 84% has made their interest on cleaning the filter. It is found that the places where the proper maintenance schedule (as stated above) implemented do not report any unsatisfactory results such as:

1. Colour change mosquito intensity
2. Odour change
3. Worms or

The analysis was carried out under 3 categories such as cleaning of tank, roof & the filter media. Accordingly it was found more than 90% of the beneficiaries are following the maintenance process as stipulated.

Potential of rain water harvesting

It is revealed that the project area has a higher potential of RWH and the effective utilization is only limited approximately 50%. The table represents the relevant statistics.

Even though the study area has a high potential of RWH, a significant deviation of water quality of RW could be observed. However this might be a future issue to be addressed.

Recommendation and conclusion

1. It is noted that there has been an increasing trend for RWHT and it could be promoted as a satisfactory alternative water supply option where there is an absolute need. Further it is seen that the selection criteria was also acceptable.
2. User perception of RWH for drinking has not yet been satisfactorily changed. However the socio cultural phobia could not be identified. As such it is suggested that further studies should be carried out. Also this may be due to low mineral content or bacteriological pollution on roof. Hence it is suggested to consume the RW by diluting with ground water with the application of a low cost disinfection method such as sodis.
3. Requesting an additional tank (to enhance the storage capacity) by the existing consumers it self have proven their faith and satisfaction on using RW as an accepted option for their domestic water need. If the project can further assist on those requests, it would be added advantage to promote the RWT in the other areas.
4. According to the study findings, it has been noticed that promoting RWHT as an alternative option for drinking would still have certain barriers with respect to the socio cultural beliefs and attitudes. Attitudinal changing programmes with the community groups would have to be planned in a careful & logical manner. Social researches on it would absolutely be necessary prior to designing the programme. However, as an initiative, carrying out the programmes at school level on a pilot basis is recommended, as children are acceptable change agents to their families.

		Operation & Maintenance					
No	PS Area	No of RWT	Average water demand (m3)	Average annual rain fall (mm)	Roof catchments (m2)	Yield (m3)	% used the yield
01	Galigamuwa	383	55918	2360	50939	120216	46%
02	Rambukkana	121	17666	2190	16093	35243	50%
03	Ruwanwella	136	19856	3480	18088	62946	31%
04	Warakapola	70	10220	1989	9310	18517	55%
05	Yatiantota	72	10512	4600	9576	44049	24%
	Total	782	14442	14619	104006	280971	41.2%

No	Category	Parameter	Desirable	Results		
				Average analytical value	% age deviation from WQS	User acceptance
01	Physical	Colour	30	16	–	No complain
		Turbidity	08	03	–	
02	Chemical	PH	6.5	5.35	18%	No complain
		Conductivity	750	7	99%	
		Total hardness	250	3	99%	
		Nitrate	45	1.35	97%	
		Iron	0.3	0	100%	
03	Bacteriological	Total coli form	10	35	–	No complain
		E coli form	0	7.5	–	

5. Study has proved that proper and systematic O&M applications are adopted more than 85% of the user community. As such it is recommended to promote continuous educating programmes (with necessary demonstration) to users on O&M.

Reference

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