

RAINWATER HARVESTING IN SRI LANKA: LESSONS LEARNED

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Abstract

Rain water harvesting has been revived in Sri Lanka since 1995 with the Community Water Supply and Sanitation Project. Since then through the efforts of the Lanka Rain Water Harvesting Forum, a Non- Government Organisation set up to promote Rain water harvesting for domestic need, the technology and the concept has been spread to other part of the country. At present there are over 15,000 RWH systems in the country. Development and improvement of technology has resulted in more affordable and better water quality designs which is more acceptable to the community.

Keywords

Rain water harvesting, water quality, Sri Lanka

INTRODUCTION

Sri Lanka has plentiful water resources in aggregate terms. The central highlands, which receives more than 5500 mm of rain during the year, is the source of many of rivers that have added to the scenic beauty of the island (Disanayaka J.B, 2000). The river basins which flow start from the wetter parts of the hill country are perennial while many of those in the dry zone are only seasonal. Therefore, this overall picture is misleading because there is a high degree of variation in the availability of water seasonally and spatially. The dry zone, which receives an average rainfall of 1500 mm mostly in *Maha* season (October-January) and remains dry in *Yala* (May-September). In the dry zone during the dry season the dug wells and tube wells dry up and people have to travel a distance exceeds 4 km to fetch water. In wet zone, although the precipitation is generally high, unfavorable topography results in water having to be hauled up steep hills. Though the collection distance is less than 2 km, the time spend on collecting water is high, as they have to climb the hills number of occasions.

Domestic Water Supply situation in Sri Lanka

The growing population and the development activities such as rapid urbanization, industrialization and agricultural activities create tremendous pressure on available water resources. Groundwater is increasingly tapped for agricultural and other commercial purposes and thereby the over exploitation causes saline intrusion. Dumping of industrial and other wastage in to water bodies pollutes the water and further limits the supply. Therefore, the current per capita water availability of 2400 m³ will be end up with 1800m³/capita in year 2025, which is just above the water scarcity threshold of 1700 m³/capita. Therefore, the relevant authorities face serious set backs in their targets and supplying of adequate quality of water becomes a real challenge to policy makers and other stakeholders. Thinking alternative and feasible water sources became an important factor to meet present and as well as the future demand.

Provision of quality drinking water and sanitation has been a government priority throughout Sri Lanka's post independence period. Even though targets have been set periodically to access safe potable water, still more than 40 % of the population remains without access to safe water. Of the total national population, only 32 % is served by piped borne water and the rest depend on water sources like tube wells, dug wells etc.(Sri Lanka Water Vision 2025, Framework for Action).

Uptake of Rain Water Harvesting

Sri Lanka has used rainwater for both domestic and agricultural use for many centuries. Traditionally rainwater is collected for domestic use from tree trunks using banana or coconut leaves, from rooftops into barrels, domestic containers and small brick tanks. In recent years there has been revival of rainwater harvesting and many research were conducted to improve the technology. In 1995 Community Water Supply and Sanitation project initiated from government of Sri Lanka with World Bank funds introduced rain water harvesting as a water supply option in two districts Badulla and Matara. Community water Sanitation Project implemented 5488 Rainwater harvesting systems in Badulla district and 1089 in Matara district during the first phase which ended in 1998. The project was implemented through community based organization and household contribution of 20% .

LRWHF formed in 1997 to promote, develop and research on domestic rain water harvesting in Sri Lanka promoted the technology and the concept to other part of the country through demonstration projects, publication in media, workshops, awareness programs and training. As a result in 1998, following a request from the President, National Water Supply and Drainage Board constructed 73 rain water harvesting system in Yatinuwara in Kandy district. The technology was further promoted in the Kurunegala district under the dry zone participatory project, where 286 rain water systems were constructed with 40% contribution from the beneficiary households. At the same time the Southern Development Authority implemented a project to construct over 8000 rainwater harvesting systems in Hambantota and Moneragala districts in the south. At the end of the project in year 2002, 2164 of these tanks were constructed.

First phase of 3rd ADB funded Water Supply & Sanitation project was commenced in 1999 and rainwater harvesting was recognized as one of the water supply option and to encourage the households to select rain water, a higher subsidiary was offered to households. Further more, assistance was obtained from the Ministry of Housing to provide the poorer members of the community with materials for permanent roof to collect rain water. At the end of the 5 year period of this project 5450 rainwater tanks has been constructed in 6 Districts. Table 1 shows the gradual uptake of rain water harvesting systems by different projects/organization since its introduction in 1995. Presently there are 15, 086 tanks throughout the country.

Table 1. Uptake of Rain water harvesting Projects Since 1995

| Year | Implementing Organisation/Project | | | | | | | Total |
|--------------|-----------------------------------|-----------|-------------|------------|-----------|-------------|------------|--------------|
| | CWSSP | NWSDB | 3rd ADB | LRWHF | ITDG | SDA | others | |
| 1995 | 146 | | | | | | | 146 |
| 1996 | 1980 | | | | | | | 1980 |
| 1997 | 1980 | | | 12 | | | 55 | 2047 |
| 1998 | 1994 | 73 | | 25 | 18 | | 13 | 2123 |
| 1999 | 477 | | | 5 | 10 | | 286 | 778 |
| 2000 | | | | | 13 | 580 | 2 | 595 |
| 2001 | | | | 13 | 30 | 1566 | 29 | 1638 |
| 2002 | 21 | 18 | 1850 | 25 | 3 | | 218 | 2117 |
| 2003 | | | 1800 | 25 | | | 37 | 1862 |
| 2004 | | | 1800 | | | | | 1800 |
| Total | 6598 | 91 | 5450 | 105 | 74 | 2146 | 640 | 15086 |

Technology Improvement

CWSSP project designed a 5 m³ volume tanks taking in to account the size of the catchment, frequency and intensity of rain fall in the project area and domestic consumption. On the basis that a family of 5 should have a minimum of 20 l per day for a period of 50 days (maximum dry period in the 2 project districts). Thus 5 x 20 x 50 = 5000 l or 5 m³. Following some trials two options were offered: an underground brick tank modeled after the Chinese biogas digester and a free standing Ferro cement tank.

Initially the rain water systems did not have a lid, filter or a first flush system and the underground tank did not have a extraction device (hand pump). The tanks were later designed to include these feature, which resulted in improve in water quality and acceptability by the users.

The 5 m³ capacity was designed mainly for wet zone locality, where the CWSSP project was operating. Later when the technology was spread to other drier parts of the country the capacity of the tanks were increased to 7.5 m³ for households and 10 m³ and above for institutional usage.

LRWHF in collaborative research program with Warwick University of UK designed partial under ground tank of brick above ground structure and Ferro cement under ground structure of 10-50 m³ capacity. This tank was further improved and cost reduced by making it entirely Ferro cement during a Dfid KaR funded project (Martinson D., .etal 2002)

Several other models of low cost tanks were tested and implemented under a research project titled “ Low Cost Domestic Rain water Harvesting in the Humid Tropics ” funded by Dfid KaR in collaboration with Warwick University, UK, Water Action, Ethiopia and ACCORD Uganda.

Rainwater quality

Results of the quality of the collected rainwater from various project sites in several districts revels following results.

- The PH was high in the new rainwater tanks due to cement dissolving. This improved after the tanks were washed and flushed several times.
- WHO recommended standards on conductivity of drinking water were maintained in all the rainwater harvesting tanks
- WHO recommended standards on the total hardness of drinking water were maintained for all rainwater tanks
- All rainwater harvesting tanks passed the WHO recommendation on turbidity for drinking water
- Overall 40% of the tested rain water tanks records No E-coli, which is the WHO recommended value for drinking water. In more than 55% of the rain water tanks the E. coli levels are less than 10 in 100 ml of water, WHO low risk value (Ariyananda, T., 2003)
- Having a simple Charcoal and gravel filter and first flush systems reduce the contamination levels in the tanks markedly (Ariyabandu, R. de S., etal, 1999)
- *E. coli* levels in the tanks receiving rain water from G.I roof is less than from other roof due to heating of the G.I roof which result in perishing of *E.coli* in the roof (Vasudevan P., etal 2001)
- Mosquitoes breeding is reported in some tanks. Experience in Ahaspokuna in Kandy has shown that mosquito breeding could be prevented by raring fish in these tanks (Rajkumar, 2000). Or else, if the tank is tightly sealed, it serves both in preventing the breeding of mosquito larvae and the growth of algae and thereby improves the quality of the harvested rainwater.

Earlier studies have shown on an average of 10-15 % of beneficiaries use rainwater for drinking purposes(Ariyabandu, 1999) . One of the reasons for the non-acceptability of rainwater for drinking purposes was the peoples perception of quality (Ariyananda T, 2001) Presence of leaves and other materials, presence of mosquito larvae and other insects, rodents, colour and taste are the major parameters they use to perceive quality. Improvement in technology and more effective awareness has brought about increase in use of rainwater for drinking. Recent studies have shown that up to 80- 90% of the beneficiaries use rainwater for drinking (3rd ABD Water Supply & Sanitation Project report)

Water Security in the Household

The most significant impact of the rainwater harvesting system in Sri Lanka is the ensured supply water in the homestead. Domestic rainwater harvesting system increased the use of water per capita from 28 *lpcd* in non-beneficiary households to 43 *lpcd* in beneficiary households (Ariyabandu R. de S. 1999). The harvested rainwater, which stored in the tanks act as a source of water for small-scale home gardens. It also has introduced water conservation practices with use of drip irrigation and water management systems. Mushroom cultivation, poultry and goat rearing and running a boutiques are some of the economic activities the households are able to engage in as are a result of having a rainwater harvesting tank. Increase in use of water for toilet and washing purposes seen in beneficiary households will indirectly reflected an improvement in personal health.

Social aspects too have been improved in the beneficiary households mainly from saved time on fetching water. Households were found to save 30% of their time on fetching water after establishment of rain water tank. The time saved is spend with

family members especially with the kids to help in their schoolwork. They are able to cook the meals and serve in time. When a visitor comes home they do not worry about water, even to prepare a cup of tea. Also it facilitates them to participate in community activities like attending in village meeting, *Shramadana* (shared labour activities) and other social functions like weddings and religious functions. As a result, the strength of the village community is also increased due to their commitments in the above activities. Most of the rainwater beneficiaries try to manage with the available water and thereby household water management skill also improved.

Beneficiaries living in hilly areas have less strain on their back from climbing. In certain areas, the incidents of snakebites and harassment have come to an end as the women are forced to fetch water even at night. Also, the beneficiaries try to increase their contribution and their by improving the system by use of locally available materials. The strong community contribution makes them more independent and gives more value to the concept of domestic rainwater harvesting.

Project planning and implementation through community based organization has brought about strengthening and skills development of these organization. Also, the skills and livelihoods of the local masons have been increased.

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