Needs of the Human Right to Safe Drinking Water in terms of Rainwater Harvesting System in Dry Zone of Sri Lanka

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Abstract- Rainwater harvesting is a best alternative of fresh water sources in dry zone of Sri Lanka. This study was carried out in Kilinochchi to study drinking water crisis during dry period, to assess rain water harvesting practitioners' perception towards rainwater harvesting technology(RWHT) and satisfactory level of accessibility of safe drinking water. Where 30 rainwater harvesting practitioners were randomly selected. Statistical analysis was done using SPSS. Around two third of respondents was female. About just over four fifths of the respondents educated up to secondary level (grade 6 to 11). Majority (85%)of them had tube wells while 5 % and 10% of households had dug and common /neighbors' well respectively. However, all of them did not access the water sources for drinking due to poor water quality. They used rainwater for drinking while minority of them used for cooking as well. The perception result revealed that just over 80% of them agreed with the statements, RWHT decreases effect of drought, satisfies drinking water demand, source for mosquito. Contrastingly, over 80 % of them disagreed with, RWHT satisfies domestic uses, improves food security and its structure needs large area. One sample t-test (significant at 5%) proved that, distance to collect water, availability of water sources, regular water quality monitoring, use of filtering system, cost of RWH system and quality of harvested rainwater were statistically significant difference ($p<0.05$) between sample mean and test value (3) while drinking water quality of other water source/s was not significant ($p>0.05$). To sum up, communities from water deficit areas completely depended on rainwater for drinking. Hence, rainwater harvesting should be introduced to all water deficit areas.

Key words: Likert scale, one sample t test, Rainwater harvesting, Safe drinking water

1.Introduction

Globally people do not have access to clean water for domestic uses and in many parts of the world conventional piped water is either absent, unreliable or too expensive. Water will be a major constraint for agriculture in coming decades and particularly in Asia and Africa this will require major institutional adjustments. Rijsberman (2006) [1] The current per capita water availability of 2400 m^3 will be end up with 1800m3/capita in the year 2025, which is just above the water scarcity threshold of 1700 m3/capita. International water management institute (2007) [2] Therefore, the relevant authorities face serious setbacks 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 sustainable water resource management.

Rainwater harvesting is defined as a method for inducing, collecting, storing and conserving. In June 2005, the government of Sri Lanka accepted the world's first National Policy on Rainwater Harvesting. The policy objective was to encourage communities to control water near its source by harvesting rain water. Ariyananda (1999) [3]

Sri Lanka has plentiful water sources in aggregate terms but it is not equal distribution within the country. There is a high

variation in availability of water seasonally. Nearly two-third of the country receives less than 1,500mm rainfall during Maha season (October-January) and remaining months are dry period. Though water surplus in some part of the country it is expensive in terms of socio, economic and environment to transfer to deficit zones. International water management institute (2007) [2]

It is recorded that the central highlands receive more than 5500 mm of rain during the year and where river basins from hill country are perennial while many of rivers in the dry zone are only seasonal. Ariyananda, T (2004) [4] 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). Noticeably, approximately 51.1% of the rain water escapes to sea in spite of storing the water in reservoirs. Provision of quality drinking water and sanitation has been a government priority throughout Sri Lanka's post-independence period. Despite, project beneficiaries have access to safe potable water, more than 40 % of the population remains without access to safe water. Further, around 32 % of national population is being served by piped borne water and two-third of them depend on water sources like tube wells, dug wells etc. Integrated water resources management of Sri Lanka. (1998) [5]

Lanka Rain Water Harvesting Forum formed in1997 to encourage, improve and research on domestic rain water harvesting in Sri Lanka. And rain water harvesting technology and the concept are being promoted through demonstration projects, publication in media, workshops, awareness programs and training. While considering the past, the ancient people harvested rain water for domestic use by using tree trunks (banana or coconut leafs), from rooftops into barrels, domestic containers and small brick tank.

Accordingly, Lanka Rain Water Harvesting Forum(LRWHF) completed the project, in Karachchi and Pachchilaipalli divisional secretariat divisions in Kilinochchi district, Northern Sri Lanka. The objective of the project was to make aware the beneficiaries and build capacity on rain water harvesting and ground water recharging technology. In accordance with King Parakramabahu, not to let a single drop of rainwater run to the sea, without utilizing for human consumption, rain water harvesting systems have been installing, training the beneficiaries to constructing rain water harvesting system and operation and maintenance.

This study aimed to study to study drinking water crisis of study area population during dry period, to assess rain water harvesting practitioners' perception towards the rain water harvesting technology(RWHT) and satisfactory level of accessibility of safe drinking water

2.**Methodology**

The Northern province includes five districts. Kilinochchi district is one of those where Karachchi divisional secretariat division was purposively selected. Where 30 rain water harvesting practitioners were randomly selected. And for data collection individual structured questionnaire and focus group discussion were employed. To assess practitioners' perceptions, a total of eight perception statements (5 positive and 3 negative statements) were developed. The response for each question was coded with numbers (1=Disagree, 2=Not decide, 3=Agree for positive statements and 3=Disagree, 2=Not decide, 1=Agree, for negative statements). Finally, by summing up the mean value of each statement, the perception was coded with positive and negative values towards the perception of RWH technology. To study the satisfactory level of communities regarding present safe drinking facilities, their response for each question was coded with numbers (5=strongly satisfactory,4=satisfactory,3=acceptable,2=dissatisfaction,1=strongly dissatisfaction) Then mean value, standard deviation, t value and p value were calculated using SPSS. Where one sample t test was employed (significant at 5%).

3.Results and discussion

3.1 General profile of respondents

In the study area, 60% of interviewees was female while two fifths of them was male. And household size widely varied between 2 to 8 members; with an average household size was 5 persons. Education level of the community was an important factor for implementing any development activity especially in

terms of an adoption of new technology like rain water harvesting and health and sanitation. In the study area, none of them was out of schooling while all the respondents were literate in different levels and only 1.0% was from college.

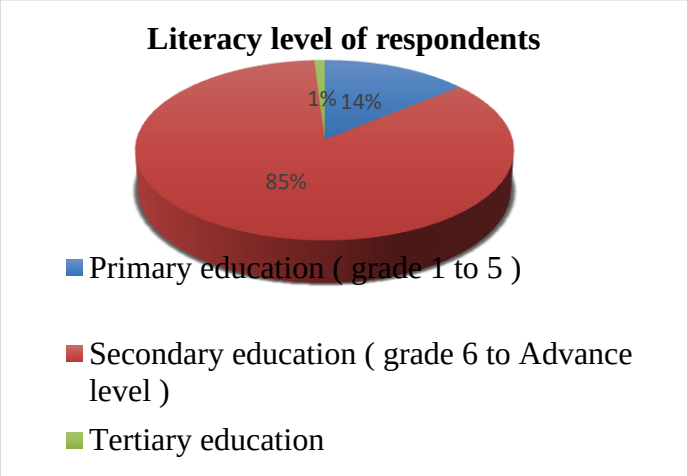

Figure 1: Literacy level of respondents

3.2 Water sources for different water uses

There were three sources of water which were rain water, tube well and shallow well for different water uses such as drinking, bathing, cooking, home gardening and washing. The table 1 shows the percentage of uses of water from different sources of water.

Table 1: Uses of water from different water sources

	Rain water	Tube well	Shallow well (Own)	Neighbor's well /common well
Drinking	100%	-	-	-
Bathing	-	85%	5%	10%
Cooking	25%	60%	5%	10%
Home gardening	-	85%	5%	10%
Washing	-	85%	5%	10%
Other	-	85%	5%	10%

The Study The study revealed that there was an essential needs/priority of rain water harvesting system for safe drinking water because all the rain water harvesting adopters used rain water for drinking purpose while minority of them used for cooking purposes as well. On the other hand, majority (85%)of families from the study had tube wells while 5 % and 10% of households had shallow well and common well /neighbors' well respectively.

3.3 Distance travel to collect drinking water during Yala

Especially in the dry zone, dug wells and tube wells dry up and people have to travel a long distance to fetch water during Yala season. According to this study, Majority of the households in the study area had tube wells because of dry spells of dug wells during Yala. However, they did not have access for safe drinking water rather than rain water harvesting. Additionally, this is proved by researchers that needs of holistic approach is required in terms of providing safe drinking water to all.

3.4 Participants' / adopters' perception towards rainwater harvesting technology

Table 2: Responses of RWH adopters to perception statements of RWH technology

RWH adopters' perception statements	Agree (%)	Not decided(%)	Disagree (%)
RWHT decrease the effect of drought (+)	100		
RWHT conserve natural resource (+)	56.6	20	23.3
RWHT satisfy the domestic water uses during Yala (+)	3	-	97
RWHT satisfy drinking water demand (+)	90	-	10
RWHT is improved food security (+)	-	16.6	83.3
RWHT structure need large area (-)	3	6	91
RWHT can cause malaria disease (-)	76.6	13.3	10
RWHT is more labor demand (-)	-	16.6	83.3

The table 2 shows total adopters respondents (100%) agreed adaptation to RWH technology helps to decrease the effect of drought. Concerning

contribution of RWH technology in natural resource conservation, around just over half of adopters' respondents (56.6%) agreed on the statement. In terms of availability of harvested rain water for domestic uses such as cooking, washing and bathing except drinking during dry period was not adequate while harvested rain water filled the requirement of drinking water only.

In contrary, the none of them gave their positive response on RWH technology improved food security. Regarding to the land area requirement for RWH technology, almost all of the respondents showed their disagreement on the statement provided. From the total respondents, majority (83.3%) of adopters were disagree that RWH technology was much more labor demanding technology. Just over three quarters of th

adopters' (76.6 %) agreed on RWH technology cause malaria disease.

3.5 Perception of safe drinking facilities in the study area community

Table 3: One sample statistics of safe drinking water facilities

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Distance to water source	30	4.27	1.363	.249
Number of water source/s	30	4.33	1.295	.237
Drinking water quality of water resource	30	3.10	.759	.139
Regular water quality test by relevant bodied	30	1.97	.615	.112
Availability of filtering System	30	1.70	.794	.145
Present RWH system	30	3.67	1.749	.319
Quality of harvested Rain water	30	4.00	1.554	.284
Cost of RWH system	30	4.80	.407	.074

Table 4: T Test result of safe drinking water facilities

Then mean value of each question was calculated. The table 3 enumerates that respondents were strongly satisfied (4.80) by less cost of rain water harvesting because RWH technology was introduced by Sri Lankan government. The safe drinking water facilities

by mean of number of water source, distance to water source, adopted rain water harvesting system and quality of harvested rain water were satisfied by them (average 4.0) as discussed by researchers earlier in the paper majority of them had own water source despite which were not accessed for drinking uses (tube wells and dug wells). However, communities defined the term “water quality” only by physical parameters (color, taste, odor and turbidity) without consideration of chemical and biological parameters of water quality. When considering the filtering systems and regular monitoring/ testing of water quality of community water sources by authorized officials were dissatisfied (1.97).

One-Sample Test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Distance to water source	5.091	29	.000	1.267	.76	1.78
Availability of water source/s	5.637	29	.000	1.333	.85	1.82
Drinking water quality of water resource	.722	29	.476	.100	-.18	.38
Regular water quality test by relevant bodied	-9.204	29	.000	-1.033	-1.26	-.80
Use of filtering System	-8.963	29	.000	-1.300	-1.60	-1.00
Present RWH system	2.088	29	.046	.667	.01	1.32
Quality of harvested Rain water	3.525	29	.001	1.000	.42	1.58
Cost of RWH system	24.233	29	.000	1.800	1.65	1.95

Furthermore, the given table 4 illustrates one sample t test was carried out with a test value of 3, the mean value of likert scale (1-5),3 was used as the test value to compare the mean of the sample. When the sample mean compared with 3 using one sample test, it indicated whether there is statistically significant difference between sample mean and test value. The table 4 indicates, distance to travel to collect water for domestic use t (29) =5.091, p=0.000, number of water sources t (29) =5.637, p=0.000, regular water quality monitoring /test by relevant water bodies t(29)=-9.204,p=0.000, availability of filtering system t(29)=-8.963,p=0.000, present rain water harvesting system t(29)=2.088,p=0.046, quality of harvested rain water . t(29)=3.525,p=0.001 and cost of rain water harvesting system t(29)=24.233,p=0.000. Which were statistically highly significant difference between sample mean and test value. These lead to accept the statements as satisfied by respondents. Drinking water quality of water resource except rainwater was not significant t(29)=0.722,p=0.476.

Conclusion

According to the gender distribution who participated in the survey, around two-third of interviewees was female others were male. In terms of household size, mean value was five. None of them was out of schooling. On the other word, just over four fifths of the respondents educated up to secondary level (grade 6 to 11). There were three sources of water which were rain water, tube well and shallow well. Based on the RWH practitioners, all of them used collected rain water for drinking purpose while minority of them used for both drinking and cooking purposes as well. On the other hand, majority of the families had tube wells while tiny percentage of households had shallow well and common well /neighbors' well. However, all of them did not access the water sources for safe drinking water due to salinity. The results of perception statements revealed that just over four fifths of the adopters agreed with the statements of RWHT decrease the effect of drought (+), RWHT satisfy drinking water demand (+), RWHT can cause malaria disease. In contrast, four fifths of them disagreed with following statements, RWHT satisfies the domestic water uses during Yala (+), RWHT improves food security (+), RWHT structure needs large area (-). Further, satisfactory level of safe drinking water facilities' result

showed that availability of water source/s, distance to water source, adopted rainwater harvesting system and quality of harvested rainwater were satisfied by them (mean 4.0) while use of filtering systems and regular monitoring/ testing of water quality of community water sources by authorized officials were dissatisfied. According to the one sample t test, distance to collect water for domestic use, number of water sources, regular water quality monitoring /test by relevant water bodies, availability of filtering system, present rainwater harvesting system, quality of harvested rainwater and cost of rainwater harvesting system were statistically significant difference between sample mean and test value. Drinking water quality of community water sources were not significant.

Recommendation

In the conflict affected areas of northern Sri Lanka. Particularly in the study area (Kilinochchi), present drinking water quality is poor. People do not have access of safe drinking water. Fortunately, Lanka rain water forum have introduced RWHT. However, all the population is not as beneficiaries despite people completely depend on rainwater. There is an essence to introduce and lead people to adopt for RWHT.

To be concern, needs of holistic approach is an essential to meet basic human right which is accessibility of safe drinking water. Noticeably, community drinking water sources should be regularly tested and monitored and the drinking water quality parameters should be shared with households to make them aware to prevent water borne diseases.

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