Chapter I
Introduction

1.1. Background

Water is essential for the existence of living organisms, be it plants or animals. We can live without water for only a few days. It is therefore adequate supplies of water need to be available to sustain human as well as animal life and vegetation is very important.

Nepal has the poorest drinking water coverage in South Asia. (RAIN Foundation The Netherlands, 2007). Though rich in water resources, Nepal's hill regions are largely dry. Water resources flow down the hills and we are struggling for years to find the ways to transport water to such hill tops, or to retain/reserve whatever water available there. Most of the communities up above the dry hills have either migrated or constructed their own rainwater collection system to meet their needs. (BSP-Nepal, 2007)

Generally, it is considered the duty of women and girl children to collect enough water to fulfill the water need of HH from faraway resources. In some places they have to spend the whole day to collect a bucket of drinking water due to which they cannot attend school. In such a case harvesting rain water could play vital role to reduce the burden of girls and women, who are traditionally involved in fetching water; to improve their school attendance; and to reduce their work load. According to World Bank report, convenient access to safe water reduces time spent in collecting water by women and young girls by 50% – 90%. (World Bank, 2003)

In recent years collection of rainwater for domestic use has been promoted in Nepal by various agencies. 8 national and international levels organizations, through 12 different project from 1980-2008 have constructed 11,314 community and institutional RHS in 164 communities of different districts of Nepal (Laia, 2008).

1.2. Rainwater Harvesting

Rainwater harvesting is a technology which has been practiced for more than four thousand years (United Nation). In general, water harvesting is the activity of direct collection of rainwater. The rainwater collected can be stored for direct use or can be recharged into the ground water. Rain is the first form of water that we know in the hydrological cycle, hence is a primary source of water for us (Blue Drop Series, Book 2, n.d.).

Rainwater Harvesting is a very broad term. It includes different ways of collecting rainwater from rooftops, land surfaces or rock catchments for different uses. Simple collection media such as jars and pots as well as more complex means such as underground or sand dams and large size tanks and reservoirs can be use. RHS normally consist of four principal components, namely the catchments area (roof or land surface); the conveying system (leading the collected water, often including a filtration device); the collection space (as small as a jar or as large a reservoir); and the tap system (RHCC, BSP-Nepal, 2007).

People collect and store rainwater in buckets, tanks, ponds and well. This is commonly referred to as rainwater harvesting and has been practiced for centuries. Rainwater can be used for multiple purposes ranging from irrigating corps to washing, cooking and drinking (Agrodok-43, 2006).

In 2005 BSP-Nepal was awarded the prestigious 1st prize of the "Overseas Awards for Welfare 2005" by Ashden Award for Sustainable Energy of the UK for "outstanding achievement in using sustainable energy to improve quality of life and protect the environment". (BSP Year Book 2006)

With that prize money, the BSP Nepal set up a new project called Domestic Rainwater Harvesting Project in 2006. BSP-Nepal aimed to provide additional support to install domestic rainwater harvesting systems for the supply of safe water in water scarce areas and improved sanitation. The project had the goal to increase access of some 400 unprivileged households from the water scarce area to energy, water sanitation and hygiene by installing toilet-attached biogas plant and Rainwater Harvesting System. The idea was to educate/encourage rural people in becoming self reliant in fulfilling their needs by simple technologies rather than waiting for the government to fulfill their needs. (BSP Year Book 2006)

Of the 400 RWH tanks planned, the project by October 2008 has already built 345 such tanks in water scarce areas across 16 districts of Nepal. This study focuses on the socio-economic, health-sanitation and education impact evaluation of the RHS tanks.

1.3. Procedure to install an Ashden RHS Tank

To install a RHS tank, individual household have to contact to the biogas company & sign the agreement, the agreement will be send to BSP-N, then only the HH will get the subsidy amount of NPR 7500.00 to build a tank. Remaining cost should be borne by them. They themselves have to collect the construction materials like sand, stone, cement and

pay the necessary labor cost too. The standard size of the Ashden tank is 7,500 litters. But the few HH has built some different capacity tank.

1.4. Statement of the problem:

In our context water management and women are always related to each other. We are facing big problem re: water. RHS is being proven as an alternative to solve the water problem. But there are very few study and consultation conducted in this field. It's very hard to find the study made in the sector of RHS in Nepal. Only few organizations are promoting this alternative but from the technical aspects only. Social advantage/disadvantages and impacts are not yet in discourse.

1.5. Objectives of the Study

The aim of this study is to assess the socio-economic, health-sanitation and educational impacts of Ashden RHS Project of BSP-Nepal. More specifically, the main objectives of this study are:

a. To chronicle the struggle to fetch water & general profile of water sources in project areas.
b. To look at the changes in social and economical status of RHS users.
c. To examine the impact on health and sanitation condition of RHS users after the installation of the RHS.
d. To examine the educational impact of the RHS.

1.6. Rationale for the study

Not nly in the developed cities, but also in some developing cities, where the RWH is a part of the state policy. i.e. many cities of our neighbor countries India and China. Nepal is rich in water resources but 60% of we Nepalese are not getting water supply facility (Blue Drop Searise 1, n.d.). Rainwater may become a reasonable solution of our water problem. So the large amount of time of women and children of our family have to be spent to collect the water for HH work including animal feeding may saved and utilization on other creative tasks i.e. school, society, economic activities, cleaning and so on. That is why, it is necessary to study the impact of rainwater harvesting.

Our society is based in patriarchy system. So, all the responsibilities of inner HH work including fulfill the water need of HH is being given to the women from ancient period (Er. F.B. Bal, 2008). Which consume lots of time and energy, because of the structure of hilly settlement and unavailability of water sources nearer. In our context, Rainwater Harvesting system can relieve women and children from daily heavy drudgery of fetching water. The saved time can be used for social-economic and educational activities which would in turn improve their living conditions.

There is abundant literature (both published and unpublished works) available on RWH technology and its practice in the context of world and South Asia. But there are very few documents I have found regarding the context of Nepal. I have tried my best to review those documents as the most important components of my research study as far as possible. It is going to be completed 3 years the project started and going to be end too. But the impact evaluation of this project has not been done yet. So this study is being done to make a small effort in the sector of RHS in Nepal.

1.7. Limitation of the study:

Due to the level of research, time and fund, this research study is limited on 34 sampled HH with RHS tank and 7 sampled HH without tank from 6 different districts with 2 municipality (Illam and Tanahu) and 5 VDCs. This study has covered the 21% of overall population. And cover the 21% of sample without RHS relating to the sample with RHS.

In this study, information and data is collected by the random sampling method so it may not represent the people's thought. This research is focused on social, educational, health - sanitation and economic impact of RWH users of study area. This research does not consider the scientific, technical, and chemical effects of RWH. Finally, findings of this study may not represent all the RHS program and projects because this study is focused on only one of the RHS project conducting.

1.8. Overview of the Study Areas:

This study is focused on the impact of Ashden Domestic Rainwater Harvesting Project of BSP-Nepal. Which has covered 16 districts and constructed 345 tanks till now. This study is focused on the RHS tanks constructed at least before 1 year. So that researcher can cover the at least on year impact of RHS. BSP- Nepal had constructed 159 RHS tanks in different 12 districts within that period. *(See Annex II for the details)*

1.8.1. District wise population details of study areas:

Total population of Illam is 282806 among them 140372 are female, where living total 54565 HH with 5.18 persons in average household size. Respectively total population of Kaski district is 380527, among them 195532 are female. And there are 58075 HH with the average HH size 4.47. Total population of Kaverpalanchok district is 385672, with the female no. 196725 and average HH size of this district is 5.47. Total population of Lalitpur district is 337785; among them 165330 are female and the average HH size of this district is 4.9. Likewise total population of Tanahu district is 315237, where 168449 are female and the average HH size is 5.01 here. Finally total population of Syanjga district is 317320, among them 173701 are female. Average HH size of this district is 4.9.

Table no 1: District wise population details.

Districts	Total no of HH	Average HH size	Male	Female	Total
Illam	54565	5.18	142434	140372	282806
Kaski	58075	4.47	184995	195532	380527
Kaverpalanchok	70509	5.47	188947	196725	385672
Lalitpur	68922	4.9	172455	165330	337785
Tanahu	62898	5.01	146788	168449	315237
Syanjga	64746	4.9	143619	173701	317320

Source: Population census 2007, CBS

1.8.2. District wise literacy rate, rank of index to access to improved sources of drinking water and coverage of water and sanitation facility.

Table no 2: District wise literacy, water sources index rank and water sanitation coverage.

Districts	Literacy Rate	Rank of index to Access to improved source of drinking water	Water & Sanitation Facility
Illam	66.23%	42	57.65%
Kaski	71.90%	20	97.14%
Kaverpalanchok	63.75%	39	75.80%
Lalitpur	70.77%	27	78.08%
Tanahu	61.68	50	64.69%
Syanjga	66.32	37	48.89

Source: Population census 2007, CBS

1.8.3. District wise Female ownership of HH, Land and Livestock

Table no 3: District wise female ownership details on HH, Land and livestock.

District wise Female ownership of HH, Land and Livestock									Total HH with Ownership	Total % of HH with ownership
Districts	Total HH No.	HH	Land	Livestock	House & Land	House & Livestock	Land & Livestock	All three		
Illam	54565	150	2932	2669	1490	44	494	352	8131	15%
Kaski	58075	1156	6066	2181	6594	57	604	906	17564	30%
Kavre	70509	316	4241	4918	3344	47	916	780	14562	21%
Lalitpur	68922	2293	3081	1274	2686	23	118	149	9624	14%
Tanahu	62898	441	3755	5212	2497	136	859	795	13695	22%
Syanjga	64746	364	2543	3391	2115	33	399	526	9371	14%

Source: Population census 2007, CBS

1.8.4. **District wise Average Rainfall Pattern (in mm) of study areas: This data shows that all 5 districts have 10 month rain fall in a year and a district Illam has 8 months rainfall in a year.**

Table no 4: District wise annual rainfall pattern details (in mm).

Districts	Jan	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Illam	NA	NA	30	50.4	199.9	189.2	NA	686	41.9	60.2	NA	NA
Kaski	72.5	11.1	5.1	63.2	198.4	620.5	1336.1	1305.4	777	487.1	NA	NA
Kaverpalanchok	54.6	11.6	39.8	43.5	57.8	119.8	230.1	506.2	58.8	120.2	NA	NA
Lalitpur	57.9	11.8	50.3	32.5	81.9	137.2	169.6	207.1	81.7	110.3	NA	NA
Tanahu	40	14.2	67.2	24.6	279.8	162.4	423.6	330.9	78	160.6	NA	NA
Syanjga	69.8	12.4	45.8	95.4	252.7	318	591.2	493.1	196.9	173.7	NA	NA

Source: Population census 2007, CBS

1.8.5. District wise HH details, active in Non-Agricultural Activities:

Table no 5: District wise HH details, active in Non-Agricultural Activities

Districts	Total HH	Type of Activity					
		Active HH	Manufacturing	Business	Transport	Service	Others
Illam	54565	8746	697	2477	226	2944	2402
Kaski	58075	26326	1797	8397	901	11506	3725
Kaverpalanchok	70509	12598	1255	3418	427	5224	2274
Lalitpur	68922	28035	3978	8448	1149	12211	2249
Tanahu	62898	9228	451	3461	173	3207	1936
Syanjga	64746	9579	432	3498	161	4284	1204

Source: Population census 2007, CBS

Only the 3 HH of Tanahu Municipality don't have electricity among all the simple HH. The distance from the road to HH are between 0 to 10 Km. This study shows 94% of HH have source of information in their own home. 94% HH have radio, 76% HH have television, 17% have mobile/phone and 3% have internet in their home. To the answer of the question from where you knew about the rainwater harvesting technology? 3% of respondent replied that they knew it from the BSP, 62% replied from biogas construction companies, 6% replied from other organization (Cooperative) and 29% replied they know this technology traditionally.

1.9. Organization of the study

Introduction of the project, study and the study areas details is described in the first chapter. Literature review is given in the 2nd chapter. Respectively methodology followed for this study is given in the 3rd chapter. Likewise data analysis and presentation are presented in the 4th chapter. Summery of the major findings of this study is presented in the final chapter with the conclusion and recommendation from the researcher.

Chapter II

Literature Review

RWH techniques were applied in the ancient civilizations for example, by the Egyptians and the Romans, more than 2000 years ago and still have the potency to serve as a major source of drinking water supply in many rural areas round the world. In Nepal, the old traditional practice of terrace farming in hilly regions has applied rainwater management for hundreds of years. Even today, this practice still proves to be an efficient technique (RHCC Nepal, 2008).

People are facing the long-term problems regarding water. In some places systems are in place for the water supply through pipes but the water hardly comes in the taps; at other places water is available in abundance but only during rainy season. At some other places, especially in the hills, there are enough sources down the hills but not the technology to transport them in the settlements. (BSP-Nepal, 2007)

Both the government and non governmental organizations have been active to provide water supply program in all regions of country. The improvement and rehabilitation of the traditional water sources like ponds, wells, spring and shallow tube-wells have also been carried out to provide the rural population with adequate and safe drinking water. Despite such efforts, areas adjoining the Churia and Lower Himalayan hills still face acute shortage of safe drinking water. The seasonal rain water has been the only dependable water source for those communities.

Women are also disproportionately affected by natural disasters, as a result of gender inequalities regarding political and economics status, human rights, education and health. Access to safe drinking water is a basic human right and essential for achieving gender quality, sustainable development and poverty alleviation. (UN Water, 2005)

Still people says 'Balasi Ko Pani Khan Hunna!!!' (Don't drink the water from the roof) but they use rainwater for animal and cleaning purpose from hundred years.. One of the major region for this belief may be the type of roof because in our hilly area most of the house are straw roofed. After the emergence of Zink roof and RCC technology RHS is being popular in drinking purpose too (Er. F.B. Bal).

Government of Finland supported Rural Water and Sanitation Support Programme (RWSSP) introduced rainwater harvesting technology at household level in 1995/1996 for the first time in Nepal from Daugha VDC of Western hill, where people used to drink pond water and suffered from different water borne diseases. (Wagle, RWSSP)

Rainwater harvesting is a simple and low cost supply technology that has been practiced for thousand of years. In modern times, it has received little or no attention despite its high potential in contributing to the achievement of Millennium Development Goals with a view to eradicating poverty and hunger, providing safe drinking water, promoting gender equity and empowerment of women (The Rainwater Partnership Secretariat, 2005).

Hence the impact of HWH system, solution of water problem has effected the personal growth of women life in rural areas. With respect to water and sanitation, improving the drinking water and sanitation facilities, women and schoolchildren are and important though not exclusive target group. Improved access to water leads the way to better health, economical improvement, development and enhanced livelihoods of people (simavi.org).

Even though we have been harvesting rain water for centuries by filling our ponds, wells, and by involving in agricultural activities during the monsoon, we are not adopting this technology as a solution to all our domestic water problems.

The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use (UN, 2005). But millions of people throughout the world do not have access to clean water for domestic purposes. In many parts of the world conventional piped water is either absent, unrealizable or too expensive. One of the biggest challenges of the 21st century is to overcome the growing water shortage. RWH has thus regained its importance as a valuable alternative or supplementary water resource, along with more conventional water supply technology. Much actual or potential water shortages can be relieved if rainwater harvesting is practiced more widely (Agrodok-43, 2006).

Women in rural areas have series of heavy workload, which includes fetching firewood, cooking, feeding, animal husbandry, collecting grass and fodders including fetching water from the faraway water resources.

As other part of the world relation between Water and Women is indeed same or more close in the hilly area of Nepal too. At the local level, women are under-represented in the water world. Though, women are usually the primary fetchers of water, a task which consumes much time and energy on a daily basis (eng.warwick.ac.uk).

In most societies women have the primary responsibility for management of household water supply, sanitation and health. Water is necessary not only for drinking, but also for food production and preparation, care of domestic animals, personal hygiene, care of the sick, cleaning, washing and waste disposal… (UN Water, 2005)

Rainwater collection is not new to the world. Evidence shows that rainwater has been collected dating back to 4000 BC in countries such as India, Asia and the Middle East. Unfortunately with the development to large, reliable water treatment and distribution systems in the United States, rainwater collection has become a forgotten source in preserving our greatest natural resource, water. A renewed interested has emerged in this time honored tradition (forgottenrain.com).

Harvested rainwater can be used in several ways. If the water quality is controlled, it can be used in drinking as well. Other domestic uses such as cooking, washing and cleaning are also possible. Moreover, rainwater can be used to keep sanitation facilities clean and hygienic. Besides domestic uses, rainwater can also be use to improve small scale agriculture, cattle breeding and even small scale industry (RHCC Nepal).

RHS and utilization systems have been used since ancient times and evidence of roof catchments systems date back to early Roman times. Roman villas and even whole cities were designed to take advantage of rainwater as the principal water source for drinking and domestic purposes since at least 2000 B.C. (Blue Drop Series, Book 2, n.d.). Traditionally we Nepalese are also doing RWH from centuries for the agricultural work but only few of us are adopting this technology as a solution of our domestic water problems from about a dozen of years only.

Traditional rainwater harvesting, which is still prevalent in rural areas, was done in surface storage bodies like lakes, ponds, irrigation tanks, temple tanks etc. In urban areas, due to shrinking of open spaces, rainwater will have necessarily be harvested as ground water… (forgottenrain.com).

Where water is very scarce, people may use as little as 3 to 4 liters per person per day for drinking only, while about 15 – 25 liters per person will be sufficient for drinking, cooking and personal hygiene. These quantities vary per country, community, and household, and also vary over time as consumption rates may change in different seasons. Socio-economic conditions and different uses of domestic water are also influencing factors. Estimating HH water demand must thus be done with care and in close consultation with the local stake holders. In general rooftop RWH can only provide sufficient water for small vegetable plop unless there is a high amount of rainfall or it is collected in a large reservoir (Agrodok 43, 2006).

"Where there is no water there is drought. In my village we have harvested enough water, so there is no drought"- Jakalbehn Dihora, Gujarat. Rainwater Harvesting is not only reliable, but also the most sustainable solution to drought problems (Drought Mitigation, 2005). RWH may provide to increase in agricultural productivity, increase in people's income, increase in safe drinking water, increase in drinking water for livestock, increase in groundwater.

The importance of water for basic existence is a universally recognized fact – which does not, perhaps, require stressing or re-iteration here! Nor does the fact that access to water has long determined the positioning of habitation (and work-related) sites of humans (and, for that mater, of birds and animals). This applies to sites attributable to the prehistoric phases of human existence, as much as to the rural settlements, towns and cities that came up in different parts of South Asia in subsequent millennia (Rima Hooja, phD,).

Asia contained 65 percent of the population without safe water. Two million children die every year of the lack of water or for its poor quality. The availability of water in the regions is constantly decline and health risks continue to rise. Millions of girl children are forced to trade education for collecting water, or drop out from schools for the lack of

even minimal sanitation facilities. Cost effective technologies are available to increase household and community access to same water. RWH is one among such efficient but low-tech and cost effective technologies, which can help in meeting the challenge to provide fresh and safe water supplies. (ED, UN-HABITAT)

Falling rain can provide some of the cleanest naturally occurring water that is available anywhere. There is considerable scope to collect rainwater when it falls, before it evaporates or becomes contaminated. HWH is not only useful technology but also a good choice where groundwater is too deep or inaccessible due to hard ground condition, or where it is too salty, acidic, contaminated with arsenic, fluoride or otherwise unpleasant or unfit to drink (Value-base). Harvesting and utilization of the tremendous natural water sources in the form of rainwater would be one of the right choices and solution in this present context of Nepal. Advantages of utilizing rainwater could be summed up; Women and children benefits first. (Bohara, 2004)

Every effort was made to preserve rainwater in an area where there is no perennial source of surface water and ground water is largely brackish (Rima Hooja, phD). The water shortage has been aggravated by the rapid population growth, depletion of exhaustible natural resources and its consequential negative effects.

The latter was made a priority by industrialized nation, disregarding the fact that water for "rural citizens is not just a matter of life and health, but a matter of economic survival". Safe drinking water is a matter of public health in both developed and developing countries, whereas a livelihood dominates by water (found mostly in the developing world) is essential to India's public health (Drought Mitigation, 2005).

Ulluwishewa argues that since women in most of the large irrigation and settlement projects now have to depend for their drinking water on irrigation canals, pipe-borne

water and browsers, 'technological solutions' can be viewed as 'failures' and "immediate steps should be taken to find ecologically sound solutions to the growing water crisis. In this respect, the knowledge which local women have of water management has enormous potential" (Gender 21, 2000).

Where access to groundwater is limited, rainwater harvesting in underground tanks can be an effective way and low-cost solution. Water stored in the rainy season can be used in the dry season and lifted from the tank with a rope pump or with a Flexi-Emas, which can elevate water up to 30 meter (NWP).

RWH is a simple low-cost technique that requires minimum specific expertise or knowledge and offers many benefits. Collected rainwater can supplement other water sources when they become scarce or are of low quality like brackish groundwater or polluted surface water in the rain season. It also provides a good alternative and replacement in times of drought or when the water table drops and wells go dry. One should, however, realize that rainfall itself cannot be managed. Particularly in arid or semi-arid areas, the prevailing amount of rainfalls efficiently as possible. The collected rainwater is a valuable supplement that would otherwise be lost by surface run-off or evaporation (Agrodok-43, 2006).

In many areas RWH has now been introduced as part of an integrated water supply, where the town water supply is unreliable, or where local water sources dry up for a part of the year. But RWH can also be introduced as the sole water source for communities or HH. The technology is flexible and adaptable to a very wide variety of conditions. It is used in the richest and the poorest societies, as well as in wettest and the driest regions on our planet (Agrodok-43, 2006).

Water harvesting means making optimum use of rainwater at the place where it falls. So as to attain self-sufficiency in water supply, without being dependent on remoter water sources (Blue Drop Series, Book 2, n.d.).

If people do not have water for drinking, how they can think of water for sanitation? Lack of sanitation facilities and poor hygiene causes water-borne diseases such as diarrhea, cholera, typhoid and several parasitic infections. Moreover, the incidence of these diseases and other linked to poor sanitation is highest among the poor especially school aged children. Each year, more than 2.2 million people in developing countries die from preventable diseases associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene (WHO, 1997).

There is no doubt that Nepali women are burdened with a heavy drudgery. Most of them are having serious health problem. They have extensive workload with dual responsibility for agriculture production and household chores. They lack time for their personal care, social works, education and awareness, income generating activities etc.

Water can not be looked at in isolation and a new kind of knowledge, linking social issues and behavior is emerging. The challenge lies in bringing this knowledge into current education system (Ajaya Dixit, editor Water Nepal).

Chapter III

Research Methodology

On the basis of the regional representation/coverage has selected the random sampling method to collect the data. Because of the time, fund and the accessibility of the study area this research is limited on 34 sampled HH with RHS tank and 7 sampled HH without tank from 6 different districts with 2 municipality (Illam and Tanahu) and 5 VDCs. Which has covered 21% of overall population. And cover the 21% of sample without RHS relating to the sample with RHS.

3.1. Nature and Sources of Data

Quantitative and qualitative data has been collected for this study. Preliminary information is quantitative and the how the RWH system is effecting socio-economic, heath-sanitation and education life of users are the qualitative information are collected.

Comparative research study has been done through individual questioner survey for this study. And compare the changes in socio-economic, heath-sanitation and education status of women before and after the installation of RWH tank. 5 VDC and 2 municipalities of different 6 districts are selected as study area. All together 41 respondent has been directly approached for this individual questioner survey.

On the basis of sources, both primary and secondary data are collected during the entire research study. The survey questionnaire, observation and interviews of key informants are the primary sources of data regarding this study. The study has gone through the

existing body of literature, including journals, books, reports, paper presented on different programs from varied sources on the RWH and women's livelihood.

3.2. Data Collection Techniques

i. Individual Questionnaire Survey

Structured questionnaire with each household selected for the survey have been filled up by the researcher to collect the data. Women member from the 50% (no of HH) HH are participated as the respondent of this survey.

Answers on how, the RWH systems is improving livelihood? To what extent RWH systems is effecting their socio-economic, health-sanitation and educational life has been tried to collected from respondents with the help of structured questionnaire.

ii. Observation

Researcher herself has visited each sampled HH selected for the questioner survey and also observed the RHS and it's utilization at the same time to obtain the information to all the HH herself.

3.3. Method of data analysis

Information collected through the surver are scientifically processed with the help of computer program MS Excel. Data are presented in the form of tables, charts and graphs. Related materials from the books, journals, paper presented, reports, internet etc are also included.

Chapter IV

Data Analysis-Presentation

4.1. General Profile of Water Sources & struggle of women:

4.1.1. Struggle of women for water fetching:

According to the findings of this study, average water need of a HH is 196 litters per day. Only the women are responsible to manage/fetch the water for 68% HH. In 6% HH Children are fully responsible to fetch water for all HH need. And in 26% HH other members of family also help women to collect water.

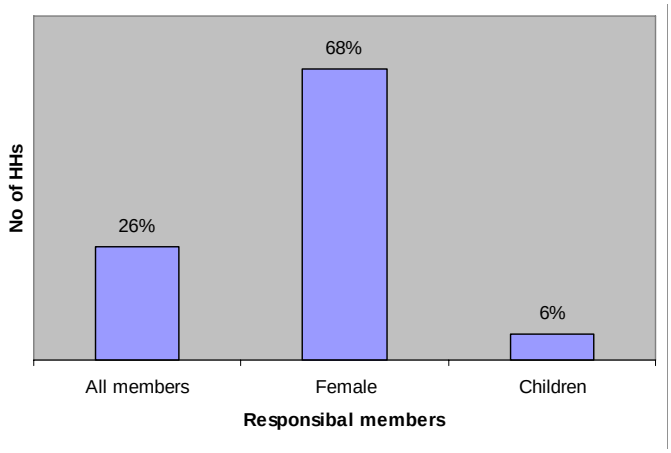

Figure no. 1: responsibility of water fetching in the family.

4.1.2. Using water resources details:

Due to diverse geographical structure of Nepal, single technology can not be applied throughout the country to facilitate users with clean water. Piped water supply through gravity system in hill and mountain, and ground water abstraction in plain area is common in Nepal. The people residing at the peak of hills where electricity is unavailable to lift the

water are still unable to get water facility and devote their valuable time to fetch water for household use, resulting increased drudgery; especially to women and girl child. It has impacted adversely in health, education and economic status of rural people. The water resources being used in the study areas are mainly rainwater, water supply tap, natural spring and natural well. Water resources used by the HH with RHS and without RHS are given below in the charts:

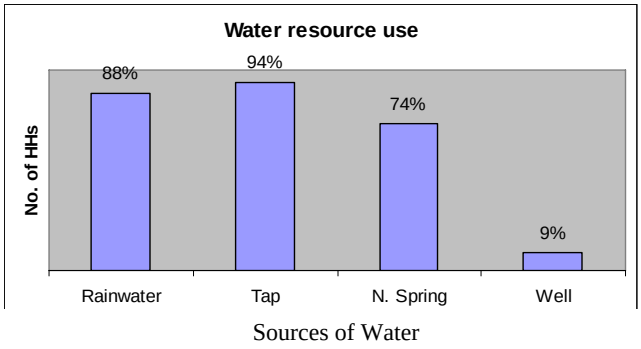

Figure no. 2: HH wise using water resources details by the HH having RHS.

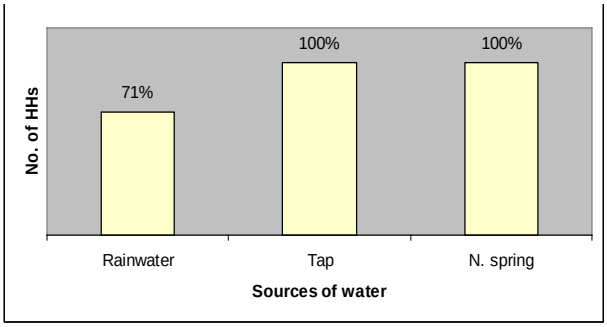

Figure no. 3: HH wise using water resources details by the HH not having RHS.

4.1.3. Distance of water sources:

The women of the study areas had to walk 0 to 120 minutes time in average to fetch a bucket of water from their near by water resources in rainy season. And 30 minutes to 6 hrs in dry season. Though the water resources are in same distance, some times it takes a whole day to fetch a bucket of water in dry season because of the dry sources and total dependency of 3 – 4 villages in a single source. Natural springs are the main water source of dry season. 74% HH with RHS and 100% HH without RHS are dependent on natural spring for dry season.

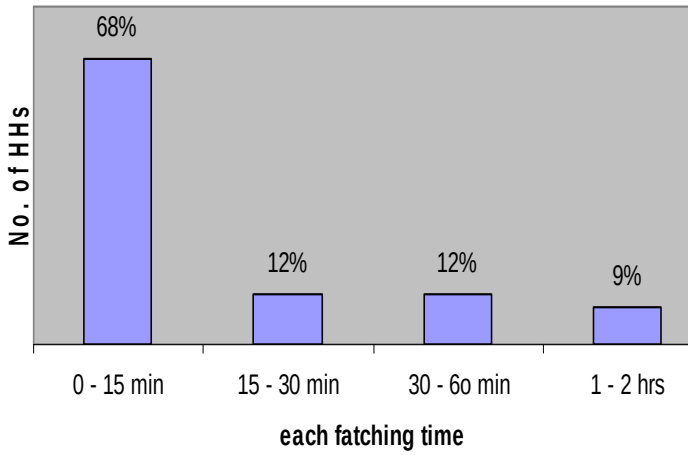

Figure no. 4: Two-way distance to near by water resources.

4.1.4. Availability of rainwater and it's uses:

Collecting and use of rainwater in Nepal requires careful planning as the availability of rainwater can only be secured during the four months in the monsoon, and through occasional showers in the other month (Laia, 2008).

According to this survey 29% of the users are using the water from the tank for 1-4 month only and the 21% of them are using for 5-8 month only. 65% of the users are using the water from tank only in the dry season because of the water availability and the capacity of the tank is not sufficient for whole year. Average water need of a HH is 196 litters per day to fulfill all the needs of a HH. The standard capacity of Ashden tank is 7500 litters.

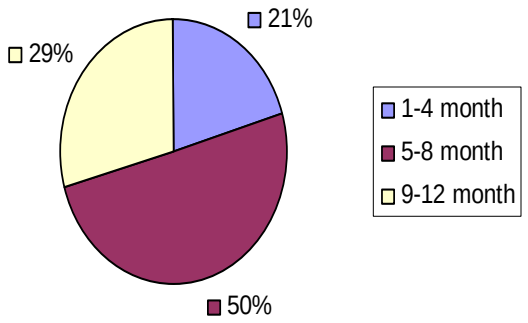

Figure no. 5: Availability of water in tank

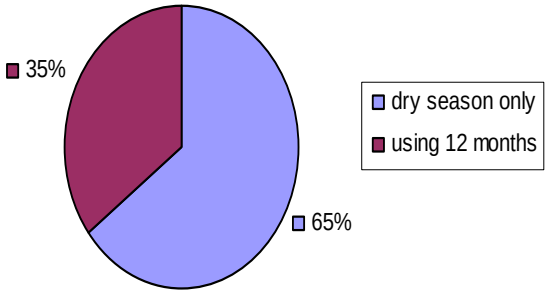

Figure no. 6: Using pattern of rainwater

While talking to uses of the rainwater 35% of HH using the for irrigation purpose, while 85% of HH are using in biogas, 9% using in all the purpose included drinking and cooking and 97% using the water from tank for animal feeding.

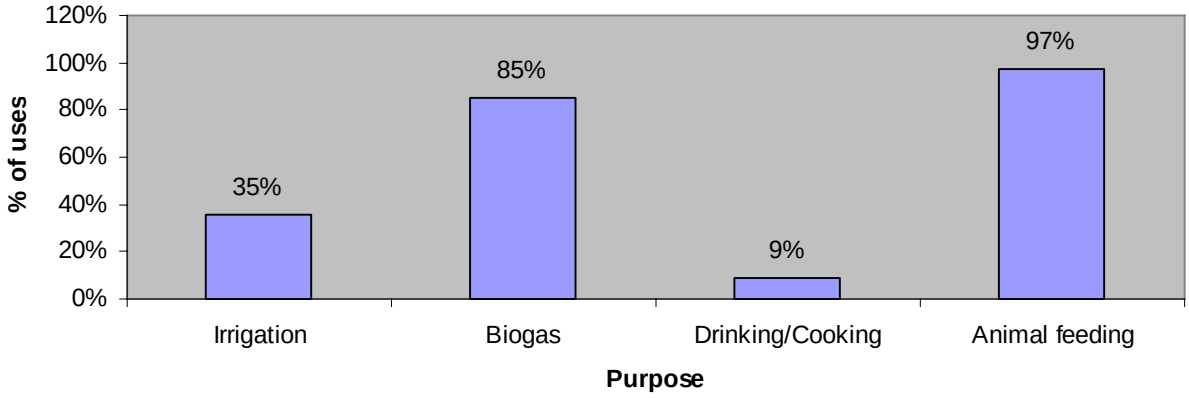

Figure no. 7: Purpose details of the RHS utilized by the users.

4.2. social and economical impact:

After implementing household rainwater collecting system, the women felt relatively easy life. Women can apportion more time to productive and reproductive activities. They can apportion their time in agriculture, caring children, cattle and kitchen garden. In the aspect of women welfare rainwater collection has been playing vital role. Nowadays, women have been relieved of drudgery which may help to occur the great social change in lifestyle of women.

4.2.1. Gender coverage of study:

This study had included 34 of the sample HH with RHS. Among them 4 of the tank owners are female, 17 respondent of this study were female and 9 of the covered HH are female headed.

Table No. 6: Gender participation details of the sampled HH

Details	Male	Female	Total HH
Tank Owner	88%	12%	34
Respondent	50%	50%	
HH	74%	26%	

Women's participation on decision making is also very low. Women were participant on only 21% HH while deciding to construct RHS at home. And 9% have decided on community level. They are using those tanks also on community basis.

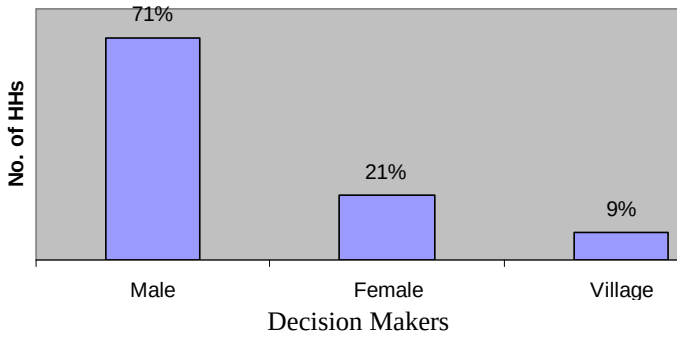

Figure no. 8: Gender participation in decision making to built tank.

4.2.2. Social Impact

"We had to weak up at 2:00 am early morning, fire the straw for light and down the hill at least 1 hrs to collect 1 bucket (gagri) of water each day. If any HH member of villager would have been weaken late then he/she might not be gotten water from source that day. This was not the story of a day, it was our regular routine. We have very bitter experience of neighbors fighting for water." this is the statement of Mrs. Puspa Thapa (42), Vas municipality – 7, Tanahu. Nowadays his villagers are using the RHS. She is very happy that all the villagers now can have better sleep. When researcher put the question, What benefit you have observed that your neighbor are taking from the RHS? All the 7 HH not having RHS response that, 'when we go to collect water, our neighbor (hiving RHS) can have leisure, do the HH work more easily and comfortably. So this can be said that RHS are supporting relief from daily drudgery as well as to reduce the social conflict.

RHS is helping users to save average 3.5 hrs. per day annually from the water caring job. 18% of the respondents are utilizing their saved time in social work after having RHS. i.e. participating in cooperatives, local women's group. But the time they are using in study, health & sanitation will also contribute to long term social impact.

4.2.3. Economic Status

In relation within the villagers: the respondent of this study their self rank their economical status as higher middle class 56% of them, while 35% rank theirselves as middle class and 9% as poor.

*4.2.3.1 **Construction cost of the tank**:*

9% HH reported their cost of tank is below 10,000/-, While 62% below 20,000/, similarly 21% reported below 30,000/- and 9% reported they constructed it in free of cost. All the 88% tanks are built in cash, 9% in free and 3% is in loan. All the above cost included only the cash expenses during construction time. Construction cost is differing because of the distance from the market and the contribution of labor from the HH.

4.2.3.2 Occupational Status of HH having and not having RHS

Occupations occupied by the members of family represent educational, economic and also the social status a family in our social context. Agriculture is the main occupation of all the study areas. About 100 % percent of HH are depending on agricultural production. The other sources of income generation are service, foreign employment, business and wage labor. The activities wise engagement details of all the HH are given below:

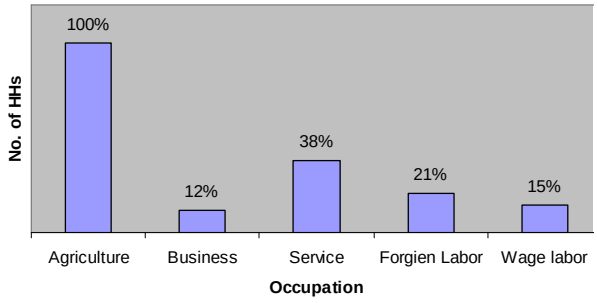

Figure no. 9: Occupational Details of the HH with RHS

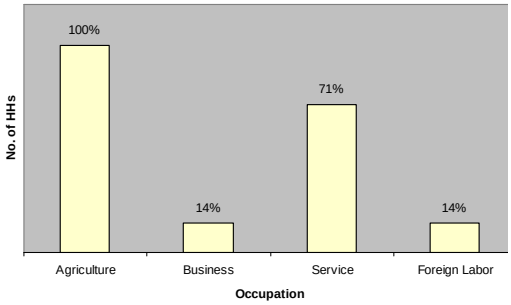

Figure no. 10:Occupatinal Details of the HH without RHS

After the agricultural sector at the HH using RHS, member from 12% HH are engaged in business, like wise member from 38% are engaged in service, as well as member from 21% HH are gone for foreign labor, member from 15% HH are engaged in wage labor. Likewise at the HH not using RHS, members of 14% HH are engaged in business activities, member of 71% HH are engaged in service sector and member from 14% HH had gone for foreign labor.

4.2.3.3 Annual income details of HH having and not having RHS in Thousand:

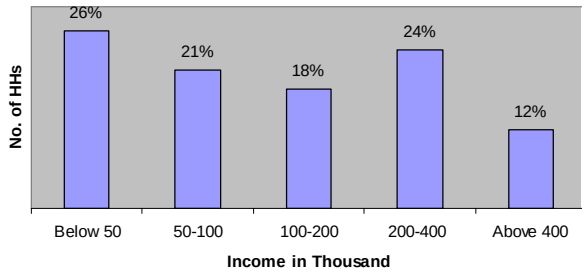

Figure no. 11: Annual income details of HH with RHS in Thousand.

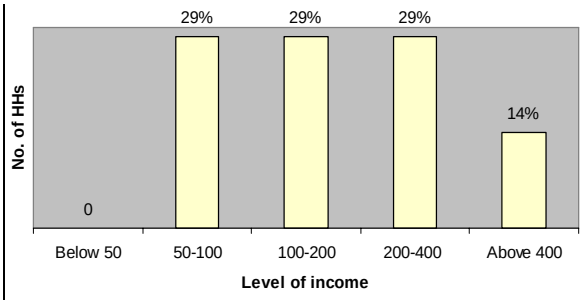

Figure no. 12: Annual income details of HH without RHS in Thousand.

Annual income is one of the primary indicator of the economic status of a family. On the basis of the response given by the respondent their selves among the HH using RHS, 12% have above 400 thousand annual income, likewise 24% have 200 to 400 thousand, 18% have 100 to 200 thousand, 21% have 50 to 100 thousand and 26% of the HH have less then 50 thousand annual income. As well as among the HH not using RHS, 14% HH have their annual income above 400 thousand, 29% of HH have 200 to 400 thousand, 29% have 100 to 200 thousand, 29% have 50 to 100 and there is no family having their annual income below 50 thousand.

4.2.3.4 ***land holding size of HH having and not having RHS are given below in charts:***

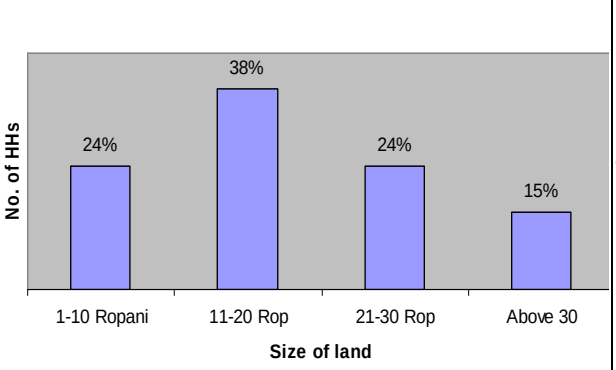

Figure no. 13: Land size of the HH with RHS

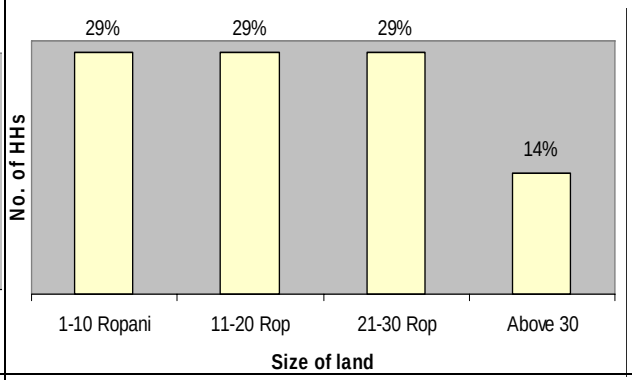

Figure no. 14: HH without RHS

The size of the land hold by a HH directly present the economic status of a family. Though the value of land differ by it's nature and the place where it is. Among the RHS users, 15% of them are holding above 30 ropani land, as well as 24% holding 21 to 30 ropani, 38% holding 11 to 20 ropani and 24% of them are holding the land 1- 10 ropani. Likewise among the HH not using RHS, 14% of them are holding above 30 ropani, 29% holding 21 to 30 ropani, 29% holding 11 to 20 ropani and also 29% of them holding 1 to 10 ropani.

4.2.3.5 Aannual income efficiency of both HH with and without tank to feed the HH

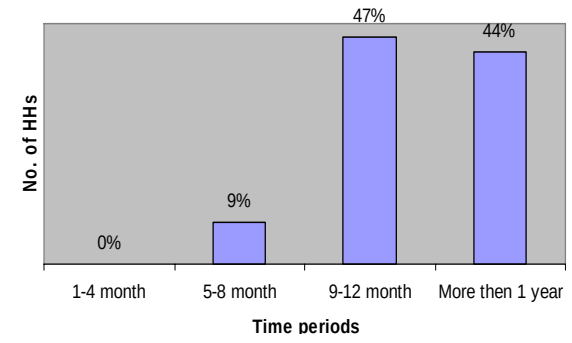

Figure no. 15: Annual income efficiency of HH with RHS

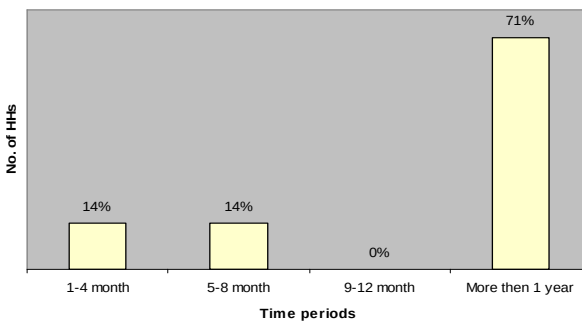

Figure no. 16: annual income efficiency of HH without RHS

Though annual income is higher, family may be poor if the annual income efficiency is lower. In the HH having RHS, income of 44% HH cover the expenses of more then 1 year. Income of 47% HH cover the 9 to 12 month's expenses and income of 9% HH cover 5 to 8 months. Likewise in the HH not having RHS, 71% HH income cover the expenses of above 1 year, 14% HH's income cover 5 to 8 months expenses, and there are 14% HH, whose income cover the expenses of 1 to 4 month only.

4.2.3.6 District wise average wage details of male and female founded by this study are given below in NPR:

S. No	Districts	Male wage	Female wage
1.	Illam	62.00	62.00
2.	Kaski	250.00	12.5.00
3.	Kaverpalanchok	200.00	120.00
4.	Lalitpur	130.00	130.00
5.	Tanahu	120.00	60.00
6.	Syanjga	200.00	140.00

Table no. 7: District wise average wage details of male and female

4.2.3.7 Economic value of saved time

People require more than their domestic water needs to be productive. Productive use of water at the household level by poor people reduces poverty. Only the 6% of the respondent reply that they were expected to utilize the rainwater for the income generation activities before the installation of tank and all the other 94% of HH were expected to get relief to fetch water at the dry season.

Economic value of the saved time through this RHS are given below:

- In average 3.5 hrs time of a HH per day is saving.
- 121 Hrs in a day and 43,500 hrs in a year is being saved from these 34 RHS.
- With the average daily wage value of a women from 34 HH, NPR 1,251.00 is being (8 hrs per day working hour) saved, while comparing to the man's wage value, it's saving NPR 2,890.00 per day.
- As well as NPR 4,56,615.00 with women's wage and NPR 10,54,850.00 with man's wage is being saved annually.
- 24% of respondent are using their time in income generation activities i.e. vegetation and fish farming, like wise 35% HH are using their saving time in agricultural work respectively 74% HH respondent their saved time being utilized in animal husbandry. Which are also a major part of the economical activities of the rural life.
- Response to the impact on Animal Husbandry is same from the respondent, but the saved time utilization to animal husbandry and agriculture is higher, which are the main economic activities in our agricultural country Nepal.

4.3. Health and sanitation condition:

The objectives of water supply system is provision of reduce women's drudgery. It should also provide the water user in different aspects of health and sanitation. Water must be utilized for achieving the desired and affordable sanitation practice in the community level. The water supply scheme is related with health and sanitation.

85% HH having RHS also have biogas plant in their house, which helps to improve women health and indoor sanitation. No any neighbors of tank holders are using RW for drinking.

Most respondents eagerly admit that the RHS helped to reduce the ration of sickness like diarrhea, seasonal fever among the family members. Regarding personal cleanness, 100% respondent reported positive impact and shared changed experienced in sanitation habits.

4.3.1. Health Status

These figures shows that, the amount being expensed in health is higher in the family not having RHS in relation to the no. of family having RHS in their house if we don't count the 47% HH having RHS, who reply don't know about the annual health expenses of the family. Women from the 9% HH are having problem with heavy load caring, and are happy to get relief from the every day water fetching.

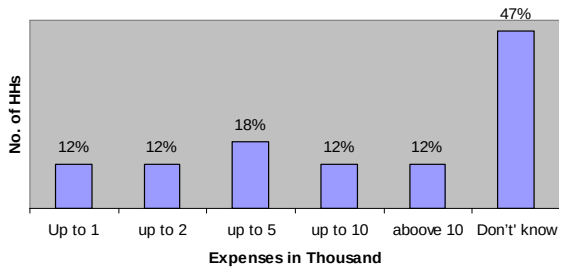

Figure no. 17: Annual health expenses of the HH with RHS

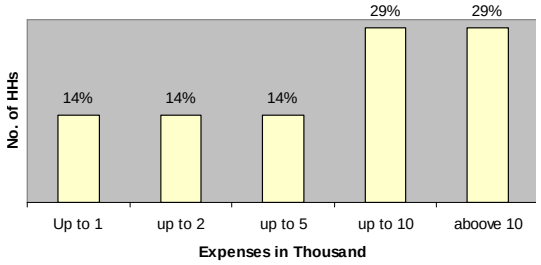

Figure no. 18: annual health expenses of the HH without RHS

4.3.2. Water Quality:

Although stored rainwater may not always meet WHO drinking water standards it frequently does, and generally speaking it is of far higher quality than most of the traditional sources and many of improved water sources found in the developing world (Bohara, 2004).

Only one HH knows about the water quality test. No HH had yet done the water quality test. Except 3 HH of Tanahu district, other do not need to test and apply any solution. All the other HH don't want to drink rainwater because they told, it's not so difficult to carry 1-2 bucket water for drink. And available natural source is enough for that. 100% of respondent response they have experienced no any casualty because of rainwater utilization yet.

4.3.3. Sanitation Habits

29% of the respondent utilizing their saved time after having RHS at their home are using their time in sanitation. Impact on washing has changed more frequent because water is available next to door. Details responses of the respondent regarding sanitation impact after the installation of RHS are:

- 26% of respondent reported that, the time of being infected by water burn diseases is being improved.
- 71% of them reported that the neatness of children is improved after having RHS.
- 100% HH reported that the cleanness of women is improved after having RHS.
- And 88% HH reported that the cleanness of toilet is improved after having RHS.

4.3.4. HH. details of using toilet:

This Ashden tank was aimed to be constructed along with biogas plant and toilet. Only the 4 HH (1 in Lalitpur & 3 in Tanahu♠ district) do not have toilet in their home. All of them are using rainwater for the toilet clean while available. 4 don't have toilet & all the 7 HH not having RHS have already constructed toilet.

♠ In whole village no any HH have toilet.

4.4. Educational Impact:

The educational status determines the life style of the people. Education is the light of the life of the people. According to census, survey 2001, among the total illiterates number of female is high in compression to male. The education status determines the life style of the people. In our country the literacy rate is about 53 percent.

4.4.1. *Present educational details of the members of HH with and without RHS* is given below:

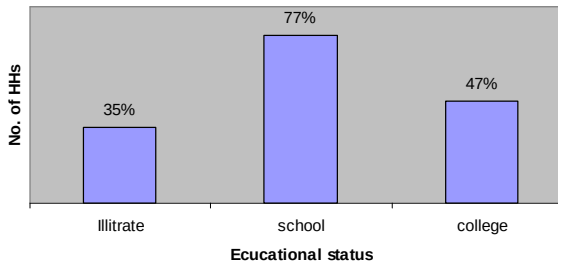

Figure no. 19: Educational details of HH with RHS

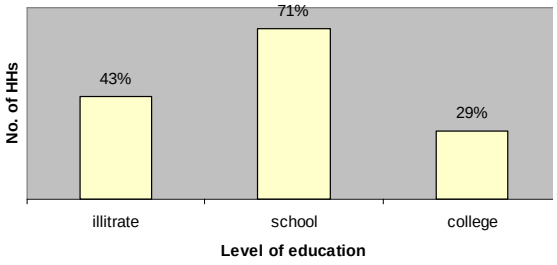

Figure no. 20: educational details of HH without RHS

No. of the illiterate member within the family not having RHS is higher then the family having RHS. But the member having school and college level education is higher to the HH with RHS.

4.4.2. Impact in education:

Though only the 12% HH respondent are utilizing their saving time from the water fetching to study. But they also response that, they don't have to wake up early in the morning to finish all the work & prepare their children to go school in time. They don't have to rush from the water resource so that their children don't have to be late for the school or don't have to hurry to be clean before going school. Children also don't have to rush from school to fetch water before doing their homework. This uncountable response are also having valuable impact to help in the educational sector of the project area.

Chapter V

Summary, Conclusion & Recommendations

5.1. **Summary of major findings**

11,314 RHS are being completed in around 18 districts of Nepal by some social organizations till now. This study is focused on the Ashden Domestic RHS project of BSP-Nepal. Which has covered 16 districts till now but the study has covered the system constructed before one year (12 districts) only. Among them 6 district (34 HH having RHS and 7 HH not having RHS) is covered by this study.

Direct benefits of a small RHS is hard to be calculating within the one year period. Again we can point to the time people save through not having to carry water from a distance source. We can also argue that availability of water brings better health and enables people to work more productivity.

- Women and water have very closed relation in Nepali society. Women are responsible to manage the water in 94% HH & 12% of the RHS tank owner are women.
- Rainwater is being utilized from years but having cultural hesitation to drink roof water yet.
- It's very hard to manage water for dry season. Sometime it takes whole day to fetch 1 bucket water. So the 65% of HH are using their system in dry season only.
- RHS is able to reduce some level of drudgery and social conflict too.
- 3.5 hrs per day per HH is being saved from the RHS. (4.1.3.)
- With the average daily wage value of a women NPR 1,251.00 is being (8 hrs per day working hour) saved, while comparing to the man's wage value, it's saving NPR 2,890.00 per day. (4.2.3.7)

- As well as NPR 4,56,615.00 with women's wage and NPR 10,54,850.00 with man's wage is being saved annually. (4.2.3.7)
- Cash invested to construct RHS will recovered within 1-2 years period.
- 24% of respondent are using their saved time after installation of RHS in income generation, likewise 35% HH are using their saving time in agricultural work respectively 74% HH respondent their saved time being utilized in animal husbandry, respectively 18% responded using in social activities and 12% of them are also utilizing in Education too.

5.2. Conclusion

These tanks are becoming a relief to the women from the daily drudgery, created by daily need of water rather than waiting for the government. This technology may become a tremendous solution to the water problems in the hill area to the national level.

After installation RHS found 3.5 hours saved in a family each day. The users mentioned that the saved time from fetching water have multiple use like income generating, family care, child care, attain social work, study, care animals etc. which are being great contribution to the family specially to the women. Which has positive impacts on various socio-economic factors such as literacy, health and sanitation, cattle raising etc.

However, some weaknesses are; these tanks are able to reduce the women's drudgery only at some level because of the tank capacity. There is necessary 12,000 liters water for a year to a family in average (Wagle, RWSSP). Though this study is not concerned with the technology, most of the users are not satisfied with the design of tank. Above 30% users have complained the leakage problem. For two year, Construction Company has given warranty for the tank, and will repaired whatever the problems comes. What after 2 year? is the major challenge of this project.

5.3. Recommendations

Nepal has the poorest drinking water coverage in South Asia. (RAIN Foundation, The Netherlands) RHS is been proved as a tremendous solution to water scarcity in the various part of the world. Since the standard size of Ashden tank is 7.5 cubic meter, which must be increased or let free to choose the users. So, user can build as their water requirement. Though these tank are not focused for the drinking purpose, will be better if the users will be provided knowledge on filter installation while constructing tank, so that they can make proper utilize of water when needed.

From the quality perspective above 40% of the tanks are founded built near by the cattle shed which might have serious implications from the quality aspect. So, I also recommend to the BSP-Nepal & and construction company to suggest people built tank little far from the cattle's place.

The RHS installed by other program/NGOs have easy handling system rather then this. So it would be better to make some technological changes for the comfortable handling. Community level tank also found very success but there are also some challenge to address. Where the people can't afford their selves will be better to coordination with other organization and focused on community tank.

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