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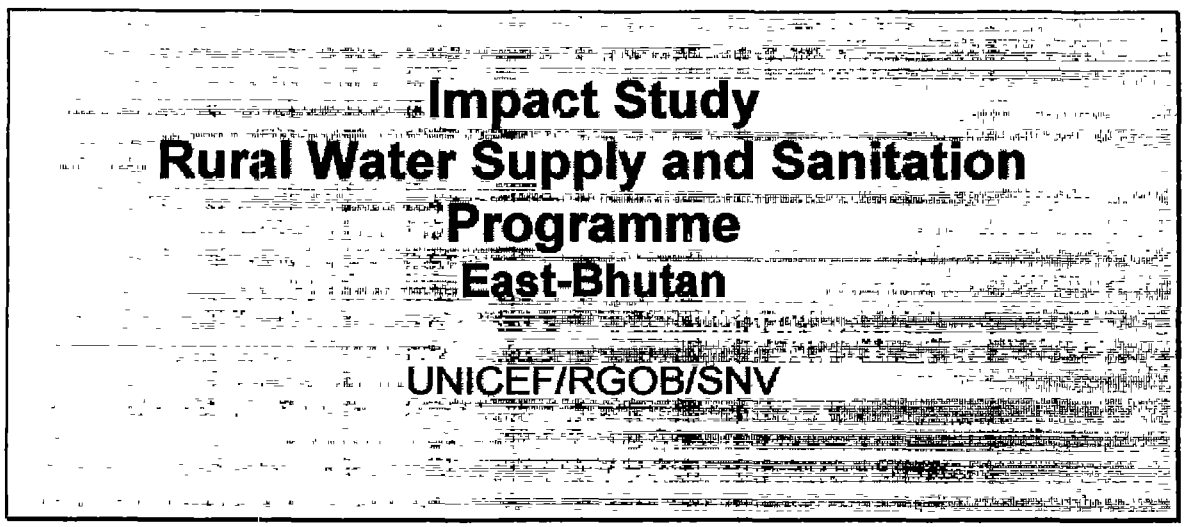
Ministry of Communications

SNV Netherlands Development Organisation



Thimphu, Bhutan, March 1994

Acknowledgments

This study wouldn't have been possible without the kind and generous hospitality the researchers found in all the villages. Hopefully the lessons learnt in these eleven villages will help bring the project closer to the users and provide better services to them. Thanks once again to the villagers of Thragome, Rongtong, Zangbari, Tongsing, Yekhar, Yadi Lakhang, Yakpogang, Bazor, Radhi Pangthang, Yonphu Pam and Darjeeling.

Karma Jurmey, Tenzin Jamtsho, Tashi Norbu, Tshering Penjore, Wangda Dukpa and Pema Chhophel were hired to assist in the research. These six research assistants did most of the actual field work, showing great skill in adapting to the different villages. Their ability to project themselves into the life of the villagers brought out answers on subjects that were previously never discussed. Their creativity made them respond with flexibility to the situations they encountered. All of them showed remarkable skills in doing field research.

I should like to thank the staff of SNV-Bhutan for their unfailing support, especially in the early stages of formulating a research proposal. Thanks is due to the staff of the Public Works Division in Thimphu for their help in obtaining permission for this research.

And lastly I thank my wife Ineke for her support throughout the process.

Any errors in this report slipped in despite the help I received from all the people above, and therefore I take the responsibility for them.

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Thimphu, Bhutan
Assendelft, the Netherlands, 11 March 1994

Table of contents

List of tables and figures

Summary

Water quality
The quality of piped water is significantly better than water from traditional sources all the way from the source until the household storage. Contamination levels for water at household level is 7 Fecal Coliform per 100 ml for villages with piped water and 64 FC/100 ml for villages without piped water. There were no differences found in the way of storing water.

Water quantity
Water use at the tapstand is measured to be as high as 123 liter per person per day, but at the household level this figure drops to about 10-15 liters ppd. In all calculations, water use in villages with piped water is higher than in villages without piped water. Most of the water used at household level (77 %) is used for cooking and making alcohol. Based on the water use at the tapstand and the low use of water at the household level, the waste of water is estimated to be 56 %.

Time saving
Time saved by the provision of piped water is limited in most cases. From the interviews an average time saving of 30 minutes was calculated. Most of the time water is collected by women. Observations show women to fetch water in 86 % of the cases (this also includes girls).

Improved health
No effect on health could be established. The research villages with and without piped water supply didn't differ much in their hygienic practices. Use of soap for hand washing is often reported but observed considerably less at mealtime. Ashes were almost never reported to be used for hand washing.
Health impact measurements are nearly impossible, because health statistics are collected on gewog level. On the level of a water supply scheme there are absolutely no (reasonably indicative) figures available.
The knowledge of disease transmission is extremely limited in all villages. Washing hands before eating or handling food is practiced by only 30 % of the respondents.

Construction of latrines
The price of a latrine built with local materials was calculated to be about 572 Nu. Labor is the main cost factor, some 46 % of the total cost. Most latrine owners see a better slab as a desirable improvement. The reason most latrine owners (75 %) give for building a latrine is the insistence of a government official. The main reason and only reason given for not building a latrine is the recent construction of a new house. 56 % of the respondents don't know if excreta in the open can spread diseases.

Use of latrines
Despite a high percentage of households having a latrine, evidence from the villages suggests that up to 30 % of the times, the latrine is not used. Children are not actively encouraged to use a latrine, but just told to use one (64 %). It is generally felt that pit latrines don't need cleaning (35 out of 57 respondents)

Effectiveness of caretaker

Clear results in this part and the part on the VMC was hampered by the fact that the caretakers were only recently trained and equipped. There is no direct evidence of better maintenance if the caretaker is trained. This point could again be probed in a few years time. Some 60 % of the toolboxes are still complete (having all tools), with most missing a few hacksaw blades. More worrying is the bad quality of the blowtorches: 3 out of 15 were not working properly due to leakage and other causes. Most common mistakes with pipe joining are bad cut of the pipe and heating plate too hot .

More caretakers than villagers think a woman can be caretaker.

Effectiveness of VMC

As for the effectiveness of VMCs there is even less clarity, due to their recent training. The interviews revealed that the message conveyed in the training (the scheme is the responsibility of the village) was made clear. The sample was a bit small, but it is a start for future study. 80 % of VMCs state that the scheme is owned by the village, compared with only 48 % of the villagers.

If it weren't for the last minute, nothing would get done

Anonymous

Chapter 1 Introduction

Measuring the impact is ultimately the hour of truth of any project. For a project such as the Rural Water Supply and Sanitation Program, the impact often determines future funding.

In the specific case of the Rural Water Supply and Sanitation Program there had been no studies of this size done before. There were no firm data on the various aspects of improved water. The reports that gave information, didn't specify the way these data were obtained. There were no basic data available from the pre-project situation. Basically the project has been operating for a long time without knowing where it started and consequently without knowing where exactly it was going.

Still, the project obviously can't improve without a reasonably accurate description of its results. In such situation it is better to make a new start, without bothering too much about what had happened before. The impact of the project would be measured with the means and the data available.

The idea for an impact study was not new. UNICEF had toyed with the idea for a long time, but for administrative reasons could not execute it. SNV came up with the idea and it was framed into a proposal in the months of May, June and July 1993. In general the proposal made was based on experiences from SNV-DAs, the UNICEF impact study proposals and earlier work done on particular subjects (cf. the NWAB reports).

Main aim of the study would be to study three big themes in the Rural Water Supply and Sanitation Program: Water Use, :Latrines and Community Management. For each of these three main themes, there were sub themes formulated. These sub themes correspond to the chapters in this report.

Field work

The research was done by six research assistants guided by an SNV-DA. These assistants were given five days training on how to gather information, how to use the forms and what information to look for. There were exercises and trial interviews in villages neighboring the training site. After testing of the forms, the assistants were brought to their research village with a letter of introduction for the village headman from the district administrator. On average the stay in the village lasted 11 days, with a minimum of 10 and a maximum of 14 days.

During this period the assistants installed water meters (in case of a village with piped water), did interviews, filled in observation forms, did routine measurements, made lists of materials used in latrine construction, interviewed the caretaker and VMC if there was any, collected information from the BHU if there was one nearby and asked the villagers about any stories relating to water. The amount of information gathered was enormous. For an overview of all data refer to *appendix B,* the complete data tables. Please note that not all figures presented in *appendix B* are discussed in the report.

Data handling

The forms were collected and entered into a database. This allowed correlating two questions, yielding some of the most interesting comparisons of this research. Most of these questions were precoded questions (answers are limited to a few given by the interviewer). Data-entry afterwards is faster, correlating two questions is easier.

On the other hand it must be stressed that precoded questions and answers are not always best. Sometimes it was found that none of the answers matched the one given by the respondent. Especially in situations as this one, with little or no previous research done, there is a need for great flexibility. Precoded questions and answers are not very suited for this purpose. In this study the precoded questions included one blank. Most of the time this blank was used to introduce new answer categories. Needless to say that this requires the database to be completely redefined and remodeled. A lot of the work in data-entry was because of this reworking of answer categories.

A prolonged stay in the villages was necessary. Not only for logistical reasons and to fill in the forms, but also to be able to get a first-hand experience of the situation. Getting a taste of life in that particular village made it possible to relate it to the other villages. The assistants were extensively debriefed after their return from a village.

Based on the first series of debriefings, adjustments were made to the questionnaires and the observation lists. Some parts proved to be irrelevant or not very important. Other parts received too little attention in the forms. Sometimes questions were left in, just to make sure that the forms would be comparable with each other.

Main problem with the research was the lack of existing data. There was no base to build on. The need to restrict the research to the most needed data was more than ever applicable. Hopefully the data generated in this study will prove to be enough of a basis to continue with a more systematical approach to data collection on such subjects as hygiene practices, water quantity, etc.

Presentation of results

The results of the study are grouped together based on the themes introduced in the research proposal. Chapters 2 to 5 deal with the four sub themes of **Water Use,** that is quality, quantity, time saving and improved health. As far as the impact of piped water is concerned, these four were deemed to be of essential importance.

Chapters 6 and 7 deal with **Latrines**, their use and construction respectively. Information on both subjects was very much needed, particularly in the light of the recent Royal Command.

Chapters 8 and 9 probe the **Community capability for Operation and Maintenance.** This aspect of the research came out a bit thin, due to various reasons. One of the most important ones being the relatively recent start of training for community level operation and maintenance. Further studies, particularly in this field will be very much needed in the future.

Why Yangneer has so many small springs

Long ago there were only three villages in Yangneer. The first village was called Khardong and the headman was called Khardong Mencha. In the second village called Tshether, the headman was called Tshether Toka. In the third village Talung the headman was called Talung Bongbo. At the head of the villages was a huge lake known as Namsang Tsho, which covered about two acres of land area.

Towards the east, there was another lake known as Dangling Tsho [situated above Khaling] dominating all the other lakes in and around Tashigang. It was not happy when the Namtsang Tsho had begun to get settled in Yangneer. The Dangling Tsho deities declared war against the deities of the Namsang Tsho. The day before the battle, there came a very dark man to Khardong Mencha and requested him to come to the Namsang Tsho with his neighbours to help the deities of the Namtsang Tsho in their battle against the Dangling Tsho. But Khardong Mencha forgot to inform his neighbours and didn't go himself either to help.

The next day the people of the three villages heard thunder from the direction of the Namsang Tsho and they wondered what it was. The thunder reminded Khardong Mencha about the dark man and his request. He informed his neighbours and they all went to the Namsang Tsho, but they were already late. They saw hundreds of dead snakes dead and trails of landslides made by the fleeing deities.

There was only one survivor left behind by the fleeing ones, blinded by the battle. The small springs in Yangneer block today are the blind deities blessing and the landslides are due to the fleeing main deities who settled in Kheng Bull and still there known as "BULI MATHMA TSHO"

This story was recorded in Darjeeling village, Yangneer gewog during the research period

Chapter 2 Water Quality

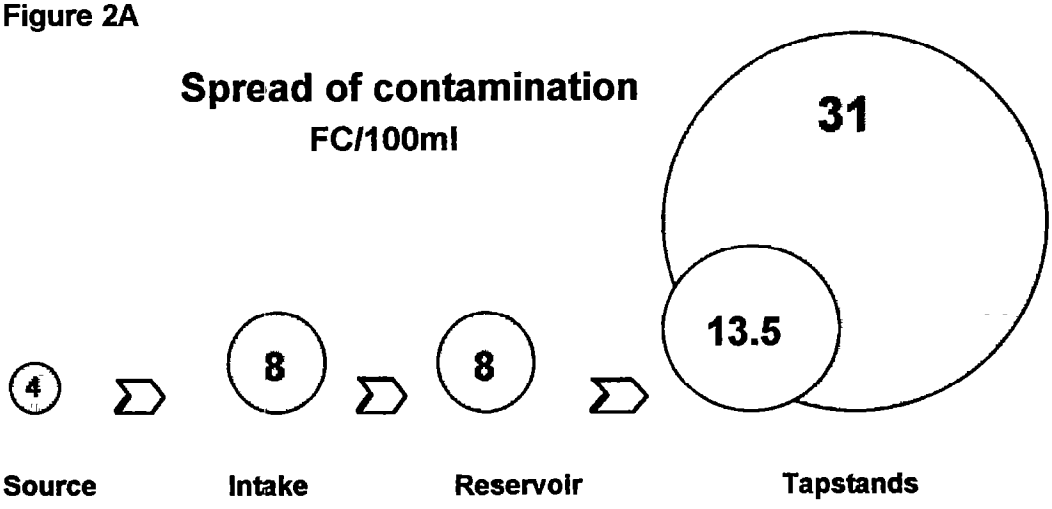
Improved water quality is one of the main objectives of piped water supply projects. Still, regular testing of water quality at the sources began only a few years ago. Even then, the water quality was never really studied after completion of the projects. Water quality of the old sources compared with the new RWS scheme water was never done. All this missing information would give the decision-makers an indication whether the project was reaching its objectives or not. This chapter of the report, tries to answer most of the questions related to water quality. Not only in terms of fecal contamination, but also on people's perceptions about pollution of water.

The first series of tests were done at all structures in 6 schemes built in the VIth plan period. The results are discussed below in Table 2.1.

Table 2.1

	Water Quality Tests		
		FC/100 ML	Average
Source RWS	Tongsing	2	
	Yekhar	4	
	Yadi Lakhang	2	4
	Darjeeling	0	
	Radhi Pangthang	16	
	Zangbari	2	
Intake RWS	Radhi Pangthang	22	
	Yekhar	8	
	Yadi Lakhang	6	8
	Tongsing	0	
	Zangbari	2	
Reservoir RWS	Radhi Pangthang	14	
	Yekhar	0	
	Yadi Lakhang	24	8
	Tongsing	2	
	Zangbari	0	
BPT	Radhi Pangthang	6	6

Figure 2A



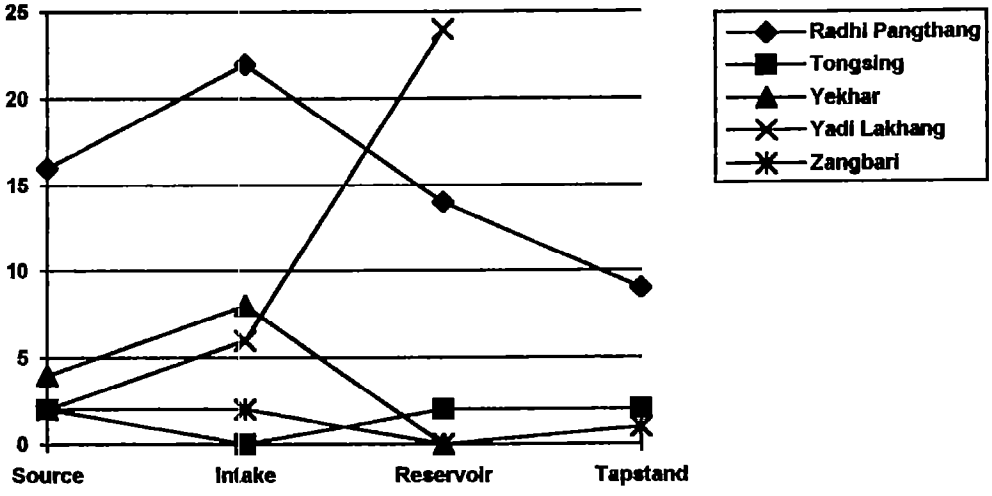
The above figure is the average for the following RWS schemes: Radhi Pangthang **(92/13/01)**, Darjeeling **(88/13/04)**, Tongsing **(89/14/03)**, Yekhar **(90/14/08)**, Yadi Lakhang **(90/14/09)**, Zangbari **(92/14/02)**. The figures and numbers are also given in *appendix B*.

While in general the contamination is well below the limits set by the Public Works Division, the contamination of the water from the tapstands is a cause for concern. The average is boosted by two tapstands in Yekhar and Yadi Lakhang RWS schemes, each with well over 150 FC/100 ml. (160 and 200 FC/100 ml respectively). Sampling of the tapstands was done as they were. Any attachments or other adjustments made by the users were left in place. This could (partly) explain the highly contaminated water coming out of the two tapstands. One of these had a piece of cloth attached to it that was used to tie a private pipe to the faucet. Because of the deviating results from two tapstands mentioned earlier, they were included for a second test. These tests yielded similar results, the value given in the table in *Appendix B* is the average of two tests for each faucet.

The average contamination of the tapstands is greatly reduced if these two are omitted. Still the level of contamination exceeds the guidelines set by the PWD. This new level without the two most contaminated tapstands is represented by the white circle (13.5 FC/100ml)

The increasing level of contamination is of course the average of all the schemes. If we look at the flow of contamination for each scheme individually in figure 2B, there are some differences:

Figure 2B Spread of contamination through 5 RWS schemes



Traditional sources

Table 2.2

Water Quality Tests Traditional Sources		
Name of the village	Name of the source	FC/100 ML
Yonphu Pam	Rethongor spring	520
	Lungnadang spring	16
	Zangray spring	6
	Dungsampa spring	66
	Rimchang pond	240
Tongsing	Rimong	0
	Mani Daza	0
	Kharshing Patpa	2
Darjeeling	Reetsangwang	56
	Chimongwoong	34
Yakpogang	Borongonpa	106
	Khesingree	10
	Macong Rhemong	26
	Banchenmo	6
	Dorkhasing	20
Zangbari	Zangbariyeng (Golshingri)	102
	Korkhangri	2
	Spring (unnamed)	0
Average		**67**

Figure 2C

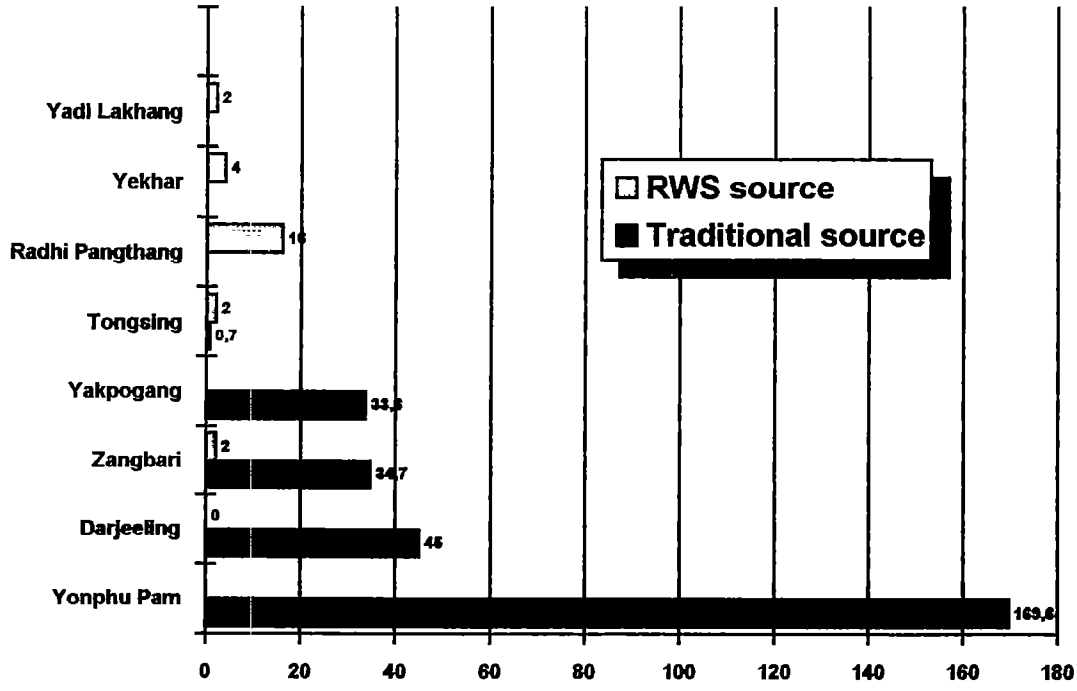
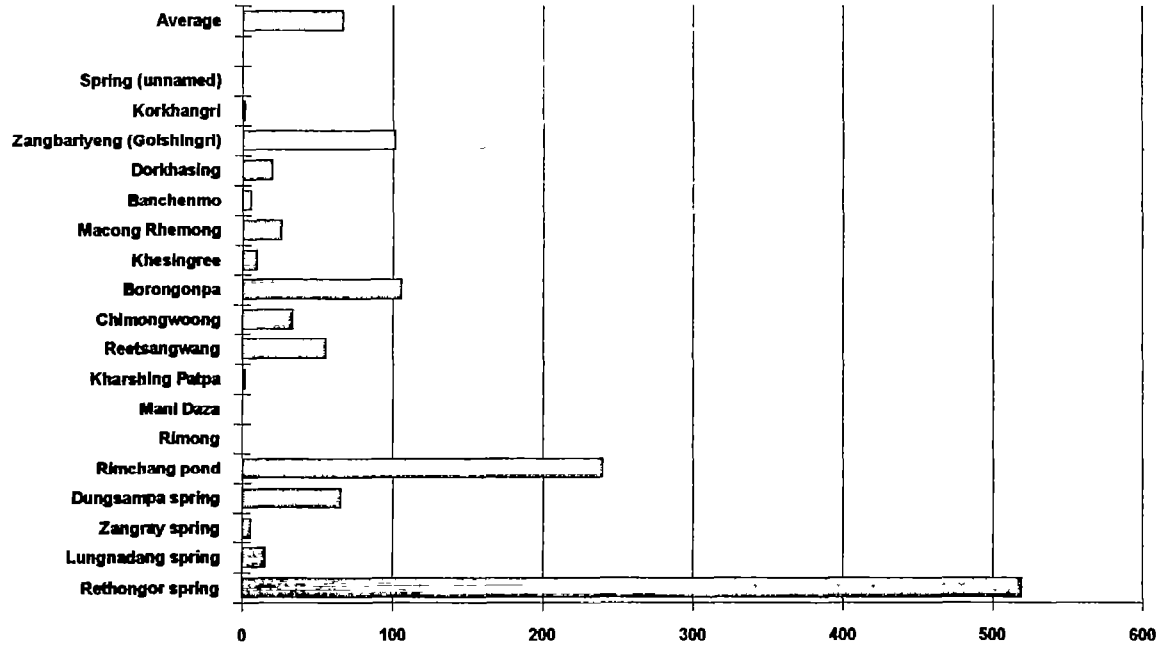


Figure 2C shows a comparison between the fecal contamination of traditional sources and sources currently in use by 6 RWS schemes. The dark bar represents the traditional sources, the lighter ones the sources presently used for the RWS schemes. In general the picture is very favorable for the RWS sources. Still this is a slightly contorted picture, the contamination for the traditional sources was taken as an average of all available old sources. Note that for some schemes there is no value for the traditional source; Yadi Lakhang, Yekhar, Radi Pangthang. For some villages there is no value for the scheme since there is none; Yonphu Pam, Yakpogang. In the case of Darjeeling there is no contamination at the source.

There is an enormous variation in the quality of traditional sources. This variation is shown in figure 2D showing the fecal contamination of all traditional sources that were tested. The lowest contamination recorded for a traditional source was 0, the highest 520, with an average of 67 (18 sources tested). Actually, the average contamination of traditional sources is not as bad as would be expected.

Figure 2D



One aspect of traditional sources worth mentioning is that none of these sources had any kind of protection, be it with local or imported materials. On the other hand all RWS scheme sources had a fence. There might be a case for source protection for traditional sources in villages that are not likely to get an RWS scheme in the coming years. At minimal cost and effort, there would be a substantial impact on the contamination levels of the sources. All this could very well be accompanied by some advice about prevention of pollution. Protecting the source from animals, keeping the source area clean, keeping water storage containers closed and cleaning them periodically. These are some of the subjects that could be discussed, preferably in collaboration with the health assistant.

UNICEF often states the need to provide **safe** drinking water. Yet 'safe water' doesn't have any practical meaning in the eastern Bhutanese context. 'Safe' is not associated with water. 'Clean water' is understood better. Technically it is correct to state that all clean (in the sense of absence of dirt) water is not yet safe, but that all safe water is clean. In practice the staff uses the word 'clean'.

The population in the research villages was not concerned about 'invisible' contamination, than with visible dirt in the water. **The question whether the water in the source was contaminated** was very often answered in the sense of getting dirty. In fact, after talking with the research assistants it became clear that this question was very difficult to translate other than in terms of dirt. Fecal or 'invisible' bacteriological contamination is unknown in the language. So 'contaminated water' doesn't mean very much, unless there is visible turbidity in the water.

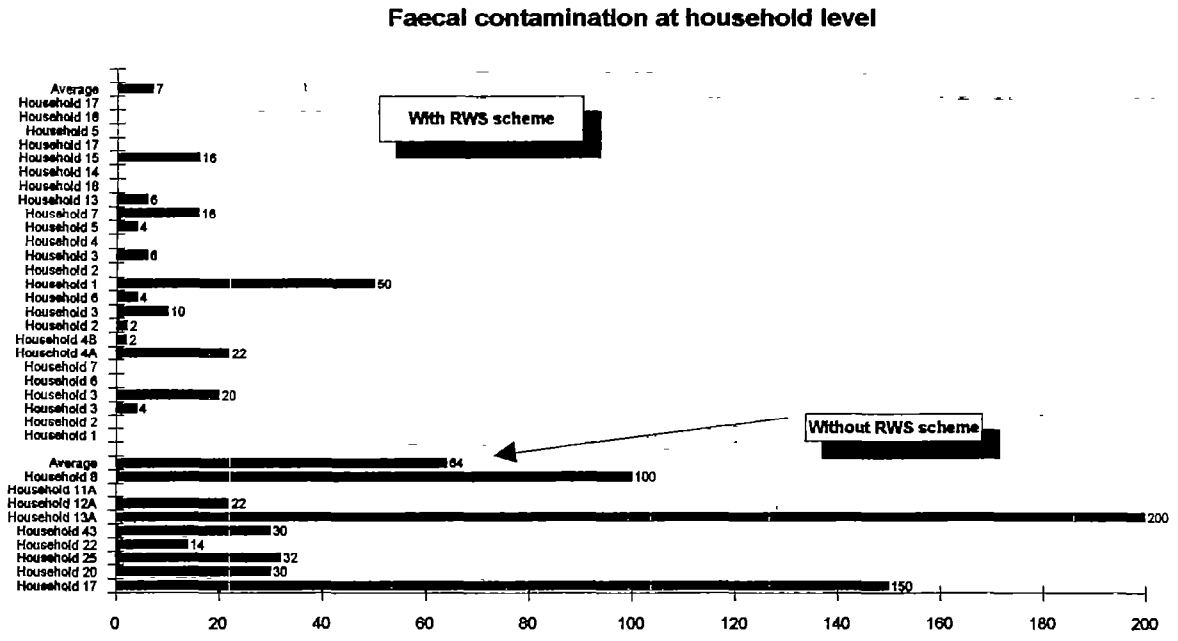
Having studied the spread of contamination in villages served by RWS schemes and without RWS schemes, the main difference in water quality is ultimately determined at the household level. **Improper water storage can undo all the precautions taken in source protection**, maintenance of the scheme etc. In this respect it is encouraging to note that in **households with access to piped water the average fecal contamination is 7 FC/100 ml, whereas the households without RWS scheme store water with an average fecal coliform content of 64 per 100 ml.**

Figure 2E plots the contamination for each of the household storage vessels sampled. Sampling was done using the ladle available in the house. Table 2.3 lists the averages.

Table 2.3

Average contamination of household water (with RWS scheme)	7	(25 households)
Average contamination of household water (without RWS scheme)	64	(9 households)

Figure 2E



Other possible sources of contamination of the water could be the storage medium and the dipper. For both we did an extensive survey, the results of which are reproduced in table 2.4.

Table 2.4

	Type (nos. found)		Size (liter)	Percentage with cover
Bamboo	3	2.1 %	1.9	0.0
Wooden	14	9.8 %	6.7	8.6
Plastic (jerrycan)	71	49.7 %	9.5	56.0
Oil can	1	0.7 %	6.0	0.0
Aluminum (metal)	54	37.8 %	14.1	42.5
Average			8.4	45.0

As can be seen from this table, plastic and aluminum containers account for almost 90 % of all containers. The percentage of these two types of containers with a cover is highest among the 5 types distinguished (56 % for plastic and 43 % for aluminum respectively, with an average 3 % for the other 3 categories)

One remarkable conclusion is that **the way of storing water doesn't differ between villages with and without water supply scheme**. That means the **differences must be the result of differing water quality at the collection point.**

The type of dipper used is very much the same in all the research villages; made of aluminum. The way of storing this dipper could be a decisive factor in contamination of the water stored in the house. From observations it was found that 66 % of the dippers was not protected from animals or children playing with it. The dipper was either within reach of house animals on top of the storage vessel or hanging low enough to be within children's reach. But again there was no difference found between villages with or without water supply. The handling of the dipper obviously does influence the water quality, but not very much. If it had a large effect on water quality, there would be higher contamination levels in houses with water supply, which is not the case.

Sources

Abandoned sources (questionnaire: **Are there any sources that are not used?**) were identified in each of the villages with water supply. For each of these we tried to determine whether there was still water drawn from this source. In most cases (more than 50%) the sources were not used because of the distance. It was mentioned that the source was dirty (± 25 %). Other reasons included irregular or seasonal supply and insufficiency.

Quality of water doesn't only depend on the fecal contamination. In fact it hardly ever does. People might have a preference for a certain source despite the contamination of that source. In the discussion of the previous question there were some factors that influenced the decision to

use or not to use a particular source. Distance, perceived cleanliness (meaning a lack of turbidity) and reliability of supply are factors that contribute to the quality of a drinking water source as well. In trying to describe people's perception of the quality of their water supply sources (including the piped water), we should first look at the **number of possible sources** for water. The questionnaire and observations yielded an average of almost 4 different sources of water (for different uses) for each household. This is not to say that all these sources are used; reasons for not using were discussed earlier. Yet if people with 4 alternatives select a particular source, this source could be expected to meet their preferences and demands.

It is interesting for the RWS program to see whether there is still a preference for sources other than the RWS scheme. The research assistants asked and observed as far as possible what the **preferred source of water** was and which source provided most of the water for use in the household. Data analysis afterwards showed that in the majority of cases the main source and the preferred source matched in RWS schemes. This means that the piped water is found to be preferred. In 5 cases the tapstand was not the preferred source, possibly indicating a particular dissatisfaction with the piped water. Closer examination of these 5 cases revealed that the schemes were old (Thragome, 2 cases) or badly maintained (Yadi Lakhang, 1 case). The two others were a user of Zangbari scheme stating that he had no preference and one household that lived near Yadi Lakhang, but was not connected to the scheme. The main complaint was the frequency of blocks and dirty water in the summer. In general the reliability of the supply is highly valued.

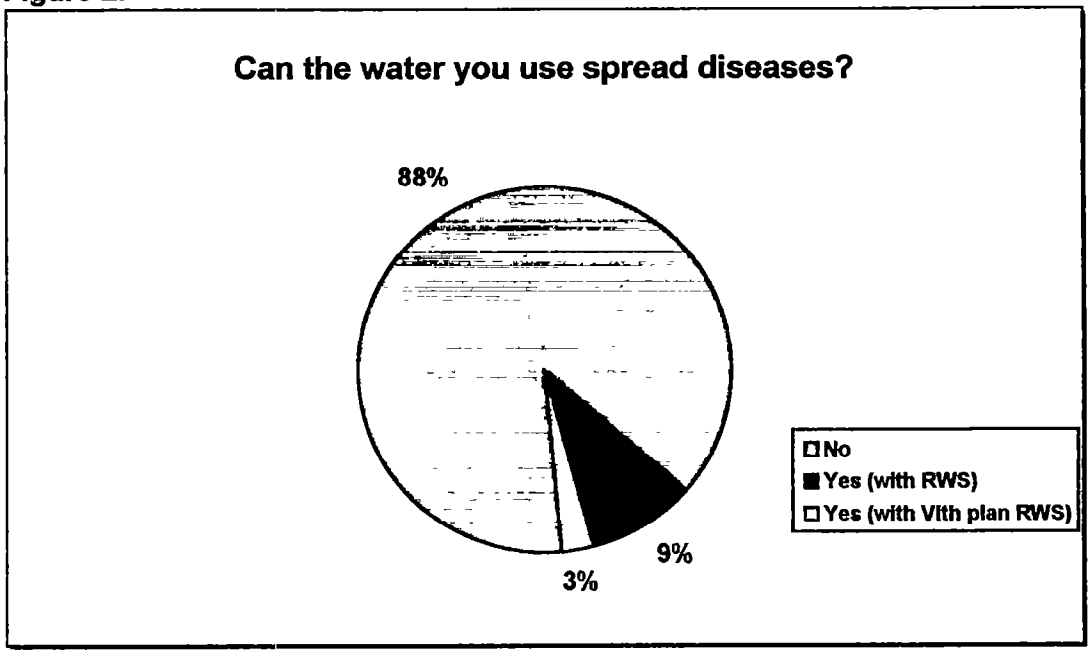
Since reliability is one of the major factors influencing users' preference, apart from obvious turbidity and distance from the house, a comparison was made between the reliability of traditional sources and the piped water supply. This was done both in villages with and without an RWS scheme.

For the RWS schemes the reliability (percentage answers: **there is always water**) was 72 %; 41 out of the 57 households responded that there was always water. The reliability of the traditional sources was less: 65 % of the respondents said that there was always water in the old source. Surprisingly the reliability of traditional sources and RWS schemes doesn't differ as dramatically as one would presume. There are several possible causes for this: people don't remember correctly how reliable the traditional sources were; or the RWS schemes are below average when it comes to reliability.

Diminished levels of fecal contamination don't account for users' preference for piped water and distance from the house is a factor that can be overcome. So, the reliability of the RWS scheme is decisive in convincing people to use piped water. There is always the possibility of returning to the old sources because the water supply scheme doesn't always use the same source as the one where people got their water before. Investigating the **sources used before the RWS scheme** was constructed, revealed that 13 out of 43 households (30 %) used the source now in use for the piped water and the rest took water from another source. In most cases people made provisions to bring the water as close to their house as possible; wooden channels, hollow tree trunks, earth canals etc. This practice can still be observed in most villages without piped water.

In general the respondents are content with the quality of their water (Figure 2F). Out of the 74 households covered in this research, 65 thought their water didn't spread disease. Closer examination of the 9 respondents who said that the water they use spreads disease, reveals that 7 of them are located in old schemes with severe maintenance problems (Thragome has a very bad intake), and 2 are in one VIth plan scheme that has had maintenance problems as well (problematic intake; structurally weak ferrocement tank, probably because of poor construction, repaired twice already). This question was asked in association with another one (what kind of disease), to which we will refer later in the Chapter ***Improved Health***.

Figure 2F



Chapter 3 Water quantity

An increase in water use is generally considered a good sign. It means that the facilities provided are put to use. In the case of Bhutan there were no figures on water use available. So the research started to measure water use in villages with a rural water supply scheme and in villages without piped water. Apart from making the obvious comparison between the two, the three different methods of determining water use enabled the researchers to find out the what the water is used for.

Water consumption was measured with three methods in villages with piped supply:

1. water meters on the tapstands (table 3.1)
2. tapstand observations for two days in each scheme (table 3.2)
3. daily recording of water use in one or two households (table 3.3)

Obviously for the villages without water supply the observations only consisted of household recording of water use. Apart from this measuring and observations, the questionnaire included questions on water use. These results are summarized in table 3.4.

The water meters yielded an incredible result: **average water use per person per day was 123 liters** (Table 3.1). That is very much more than could be expected and certainly more than the design consumption of 45 liters per person per day.

Table 3.1

	Water Meter readings	
Village	**No. of households covered**	**Consumption Liters per person/day**
Darjeeling	7	188
Yadi Lakhang	3	47
Yekhar	1	124
Tongsing	5	129
Bazor	7	149
Zangbari	4	72
Radhi Pangthang	7	96
	34 households	
Average		**123***

* This average was calculated from the total group of 34 households. The average consumption in the rest of the column was calculated separately Due to rounding errors there is a difference of 7 LPPD.

Observing the tapstand for two consecutive days yields a totally different picture. The consumption per capita drops to one tenth of the measured consumption. From 123 liter per person per day to 12,6 liter per person per day. This might be partially due to the fact that people knew they were observed. Even though the research assistants were instructed not to be too obviously present, their writing down the time and amount may have had an effect on people's behavior.

Table 3.2

	Water use (tapstand observations)	
	Total amount of water collected (Liters)	Calculated water use LPPD*
Radi Pangthang	120	5,7
Darjeeling	50,5	12,6
Bazor	225,5	7,5
	168	5,6
Yekhar	209	19
	227,5	20,7
Tongsing	84	8,4
	60	4,3
Zangbari	182	26
	157	15,7
Average	**148,4**	**12,6**

* Calculated with no. of persons in the household as determined by the researchers See *Appendix B* for full information.

A third way of determining the average daily consumption per person was to record in each of the households where the research assistants were lodged, the daily consumption for the complete period of time they were there. This gives a very accurate picture of the consumption of water in one household over a period of approximately 10 days. The results of these measurements are tabulated in table 3.3.

Table 3.3

	Household water use observations		
Village	Average no. of trips	LPD	LPPD
Bazor	8,6	94,6	11,8
Darjeeling	6,4	69,9	17,5
	5	67,5	13,5
Radhi Pangthang	1,9	19	4,8
Tongsing	5,9	88,4	14,7
	8,4	59,3	8,5
Yekhar	13,8	138,3	27,7
Zangbari	9,9	137,7	19,7
With RWS scheme (8 households)	**7.5**	**84**	**15**
Yakpogang	0,8	16,6	2,1
	2	32,6	4,1
	4,9	57,7	4,4
Yonphu Pam	2,3	44,3	4,4
	2,6	43,8	3,1
Without RWS scheme (4 households)	**2,5**	**39**	**4**
Average	**6**	**67**	**10**

Together with the results from the questionnaire in table 3.4 (with consumption per person calculated from the questionnaire answers) the data in these three tables give a more or less accurate picture of the average water use in a household.

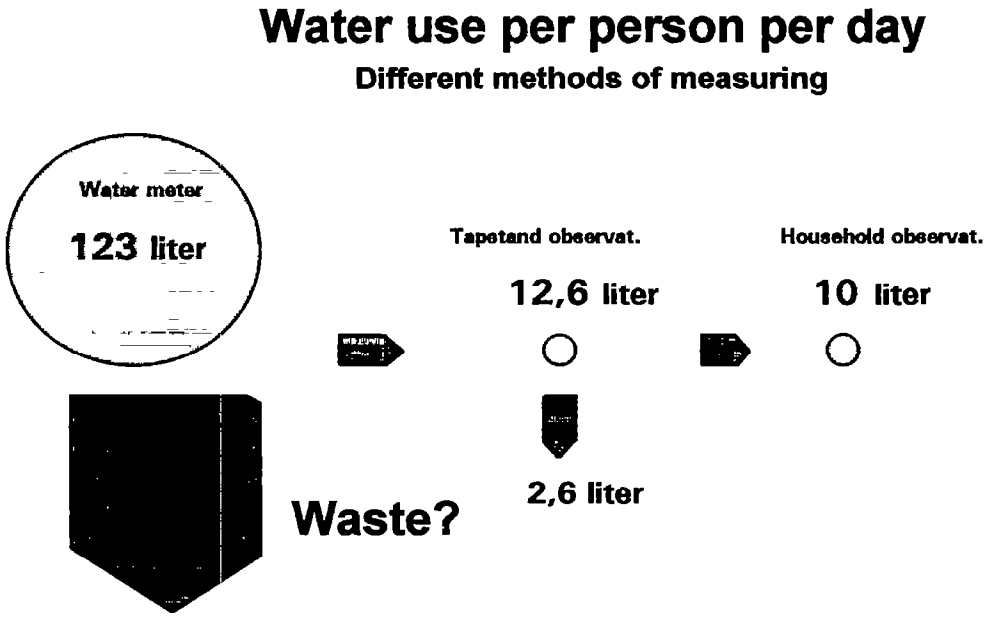
Table 3.4

	Data from questionnaires				
	With RWS scheme		Without RWS scheme		
Average	**Asked**	**Observed**	**Asked**	**Observed**	
a Number of trips made per day	6.39		4.06		
b Size of container	11.37	11.76	15	11.82	Liters
Calculated Averages:					
Daily consumption (a x b)	72.7	75.1*	60.9	48.0*	Liters
Consumption per person per day**	**11.2**	**11.6**	**9.4**	**7.4**	**Liters**

* These figures were calculated with the number of trips from the 'Asked' category.
** Average number of persons per household calculated at 6.49

Figure 3A combines the figures from all three tables with observations (Table 3.1-3.3). Note that the data from the questionnaire in table 3.4 confirm the observations at household level.

Figure 3A



The different methods of measuring water use had their strengths and weaknesses. The **water meters** were read twice a day only, in the morning and evening. Taking more readings would not yield any better results to justify the trouble.

Tapstand observations are accurate, but require some patience and the fact that these observations are done for a very limited period, makes them a bit susceptible to fluctuations in water use. People might have taken in a stock of water just before the observation period and come back for more only after this period.

Household observations combine the best of both worlds, with a longer time of observation (10 days minimum) and observation accuracy. With a total of 12 households observed in their consumption pattern, these figures are quite reliable.

Using the data from the questionnaire it is possible to calculate the daily consumption per head on a daily basis. These figures are approximate, but they provide an additional reference point for the study of water use in the household.

A summary of all these figures is given in the table below.

Table 3.5

Water use as determined with different methods				
Method	**No. of households**	**Consumption LPPD**		
		Average	Highest	Lowest
Water meter	34	123	535	9
Tapstand observation	15	12.6	20.7	4.3
Household observation with RWS	8	15	27.7	4.8
Household observation without RWS	4	4	4.4	2.1
Questionnaire with RWS	39	11.4		
Questionnaire without RWS	12	8.4		

Water use in a household

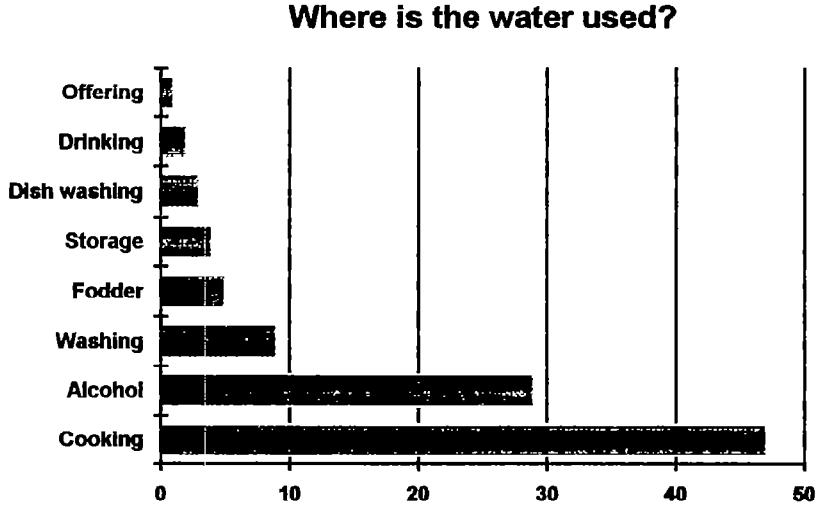
During the tapstand observation periods the research assistants were instructed to ask for the use of the water collected in each trip. The results are listed below in table 3.6 and figure 3B. The results are amazing: **water used for cooking and making alcohol accounts for 77% of all water consumption.** Water for drinking amounted to 1% of the total consumption. In absolute figures this would be 0.13 liter per person per day for drinking (this is less than a full cup), and 9.7 liter per person per day for cooking and making wine (half a bucket!). These figures were calculated using the tapstand observation averages (from which the different uses of water were also obtained). The original categories can be examined in *appendix B*. For the purpose of clarity the table

and figure presented below have been regrouped. All categories related to food preparation were grouped under cooking (breakfast, lunch, dinner).

Table 3.6

	Tapstand observations 2: Use of water in liters							
Village	Cooking	Alcohol	Washing	Fodder	Storage	Dish washing	Drinking	Offering
Radi Pangthang	40		31			25	24	
Darjeeling	14	21				14		1,5
Bazor	95.5	112,5	15					2,5
	124	23		7	10			4
Yekhar	137	24	38			10		
	140	80	5					2,5
Tongsing	32	37		15				
	33		5	16	6			
Zangbari	28	56	42	14	42			
	61.5	75		20,5				
Total (15 households)	705	428,5	136	72,5	58	49	24	10,5
Average(LPD)	47	29	9	5	4	3	2	1

Figure 3B



Waste

Increased use of water is one of the most reliable indicators for improvements in health. Yet this increase should not be brought about by an increase of waste. To determine whether the 110 liters not accounted for in figure 3A are all wasted, we should examine the pattern of water use in the average household.

First of all, there were no proper bathrooms in the houses where the research assistants stayed. In practice most people wash near the source of the water (stream, spring or tapstand). Washing of clothes is done in very much the same way. The laundry is taken to the water instead of vice versa. Both personal washing and laundry take place at the tapstand, most often with the tap running. The table below shows the answers for the question **Where do you bathe you children?**

Table 3.7

	Where do you bathe your children?	
Near a tapstand	44	**59 %**
Inside the house	18	24 %
No answer	2	3 %
Other (outside the house)	10	14 %
Total	74	

Apart from that the research distinguished three other possible water use purposes: **watering the kitchen garden; washing clothes and watering cattle.**

For all three purposes the potential use of water is very large, but would be very difficult to measure. How to measure the amount of water used for washing clothes when other people use the tapstand in between to get water? Clothes washing is done with the tap running all the time or most of the time. Cattle watering sometimes takes the extreme form of blocking the tapstand during the time it is not used and having a free flow of water, using the platform as a watering hole during the day. These things happen but it is very difficult to say how much water is used and how frequently it takes place. Estimates for all three uses were made, based on the research.

Kitchen garden. In 69 of the 74 households (93%) interviewed there was a kitchen garden present, predominantly with leafy vegetables (saag) and turnips. The size of these kitchen gardens is generally small, though no exact measurements were taken.

As for the provision of water to the garden some 30 households indicated that the garden was watered from the tapstand. There was no differentiation between waste water from the tapstand or deliberate opening of the faucet for watering the garden. 18 households don't water the garden at all, the vegetables have to grow on rain. The rest gets water from different sources, most often nearby streams or irrigation canals. The

differences in data between the question asked and the practice as observed is not significant enough to be mentioned separately. All data are provided in *appendix B.*

Cattle. 72 of the 74 households (97%) reported to have cattle. The average per household is 5.32 cows, 1.21 pigs and 0.29 horses. Bullocks and oxen were counted as cows, piglets were not counted. It should be possible to calculate a theoretical water need for these animals and come to a daily total consumption for them. Yet the only animals to be permanently around the house and totally dependent on tap water are the pigs. The cows and horses are away during the day most of the time. There would have to be a weighing factor applied to make up for this.

The following figures were supplied for the Bumthang valley: Full grown cows 60-80 liters per day; pigs 30-40 liters per day. Based on this the following consumption can be calculated:

Table 3.8

Cows*	5.32 * 0.3 * 80	128	
Pigs	1.21 * 40	48.4	
Horses**	0.29 * 0.3 * 80	7	
		183	Liter per day

* These figures are based on the assumption that pigs are fully dependent on the water from the tapstand, cows and horses for only one third of their consumption.
** Horses are taken to consume as much as cows

Clothes washing. Washing of clothes could very well be the major consumption factor of water (apart from waste). Depending on the method the water use can be either relatively small as in the case of washing without soaking or soap and closing the tap during the actual washing. Or it can be very large, in the case of soaking under a running tap, using soap, washing and rinsing with a running tap. These factors vary with each household and even from person to person. There is no definite amount to be fixed for clothes washing. A reasonable estimate would be 100 liters each time clothes are washed (including washing and rinsing). This assumes that the tap is closed during washing and rinsing. At a design flow of 0.2 lps, it takes 500 seconds to get 100 liters, about 8.5 minutes. There is no way to get all the washing done within 8.5 minutes, so the tap has to be closed. Without this, the consumption can be anything (in theory it is never more than the time taken in seconds multiplied by the flow of the tap, with a maximum of 0.3 lps).

Having estimated the use for each washing at 100 liter (equals 5 big buckets), the next factor is the frequency of washing clothes. This can be asked and even partially verified. Washing of clothes will normally change according to the season, in winter less than in summer. At first it was considered possible to verify all the data regarding clothes washing. The limited time in the villages made it impossible to observe each and every household. On top of that the periods between two washings (most often two weeks) didn't allow the researchers to get certainty about the frequency of clothes washing. It would have been better to observe two households per village and average the totals. Unfortunately this method was not considered. Still it is possible to calculate an average of washing clothes for the households that replied to the answer **How often**

do you wash your clothes? These answers show that there are differences within the household when it comes to clothes washing. For children attending school there are different rules than for others. The clothes of school-going children are washed more often than for the ones not going to school.

Average frequency was calculated by multiplying each reported washing with the period associated with it (31 entries reporting washing every 7 days + 16 entries * 14 days etc.) divided by the number of entries. The average of clothes washing in summer comes to once in 13.85 days. In winter it comes to 14.94. There is not a very big difference between the two seasons. The answers given could not be verified with observations, as explained above. There is evidence to suggest that people exaggerate the frequency of clothes washing because they have a feeling that they ought to wash their clothes more often. See also the chapter on *Improved Health* for a discussion of this topic.

100 liters for **washing clothes** in 14 days equals 7.14 liters per day equals **1.1 liter per person per day for clothes washing.**

The average number of 6.82 units of **cattle** (divided into cows, pigs and horses as shown in the table above) per household, consume about 183 liters per day, equaling **28 liter per person per day** (6.49 persons per household).

Lastly a **kitchen garden** could be assumed to use 100 liters per day every three days (only in winter, but this is not taken into account). About 45 % of the kitchen gardens is watered by a tapstand, so consumption would be (100/3) * 0.45 / 6.49 = **2.3 liter per person per day.**

Total use other than in the house: 1.1 + 28 + 2.3 = 31.4 liter per person per day.

Total consumption for these three would be 31.4 liter per day. A tenfold increase in water used for clothes washing to 11 LPPD (this quantity is the most variable one, since it could not be measured) would make the total 41.3 liters per day. That leaves still 69.1 liters unaccounted for (123 - 12.6 - 41.3 = 69.1 liters). These liters can be presumed to be waste, making the total waste slightly less than the consumption: waste 69.1 liters, consumption 53.9 or to put it more explicitly:

44 % used, 56 % wasted

Chapter 4 Time Saving

Time saving has been a strong argument in favor of providing piped water supply. In Bhutan there has always been a spell of doubt regarding the time saving aspect. In most cases there were other provisions made to bring water closer to the house. Small earth channels, hollowed tree trunks or banana tree stems leading water closer to a house still are a common sight. On top of that there are relatively few places where people have to go down to the main rivers to get water, there is always an alternative a bit closer home. Still there were no real figures available. The impact study focused on time saving as a major topic.

The data were gathered through interviews and observations. The research-assistants measured the time to go fetch water and the size of the container. On top of that they asked for the number of trips per day and the total time taken to fetch water. These figures are tabulated in table 4.1. All calculations are based on these figures. The figures were collected as a unit, so comparing them with other figures from the previous chapter, especially the daily consumption, is difficult. Figures given in table 4.1 refer to households, not to persons!

Table 4.1

Calculated time spent on water collection from the answers to the questionnaires				
	With RWS scheme		**Without RWS scheme**	
	Asked	Observed	Asked	Observed
Time taken for water collection (minutes)	16,44	13,61	22,83	22,89
Number of trips made per day	6,39		4,06	
Size of container (liters)	11,37	11,76	15	11,82
Time taken for one round trip (minutes)	2,8	2,5	7,2	7,3
Calculated:				
Daily consumption (liters) (number of trips * size of container)	72,7	75,1	60,9	48
Time taken for water collection (minutes) (number of trips * time taken for one trip)	17,9	15,8	29,4	29,6
Number of trips per day (Total time / time take for one trip)	5,9	5,5	3,2	3,1

*** The figures in this table refer to households (daily consumption per household, etc.)**

The figures in table 4.1 show two things:

① **There is a larger daily consumption of water in villages with piped water supply**
② **There less time spent on water collection in villages with piped water supply**

So in general piped water has brought benefits; increased water use and time saving.

Even with a larger daily consumption the collection of water in a village with piped water takes about half the time it takes in the other villages!

Calculated time saving

To make a comparison between the villages with and without piped water supply the daily consumption has to be put on the same level, for reference. This level is taken to be **75.1 liter per day per household**, calculated with the figures observed in the field (average size of container*average number of trips per day).

Based on that 75.1 liters, the **time saved** daily by a piped water supply scheme would be :

$$[\frac{75.1}{48} * 29.6] - 15.8 = 30\text{min}30\text{sec}$$

48 being the daily consumption without piped water, 29.6 the time taken for water collection without piped water and 15.8 the time taken for water collection with a piped water supply scheme. Only the time saved (30 min 30 sec) has been converted to the normal system, the other times are in decimals.

With an increase in consumption of water, the time saving would be more. But the lower consumption in villages without piped water supply simply reflects the trouble it takes to get water. If it gets easier to bring water to the house, consumption will undoubtedly go up. Basically, the consumption in villages without water supply should be considered fixed at the present level, while for the villages with piped water there is scope for even more use of water.

In theory, one could expect the consumption of water to rise until such point that the same amount of time as spent earlier (before piped water supply), is reached. In other words, people will spend up to a maximum of 29.6 minutes on average on water

collection. So in this case it would mean that consumption would go up with a additional (theoretical) maximum of:

$$\left[\frac{29.6 - 15.8}{15.8}\right] * 75.1 = 65.6 \text{ liter}$$

Adding this to the 75.1 liter makes a theoretical daily consumption of 140.7 liter per household

Who collects the water?

The most important part of the time saving is actually not the amount of time saved (even before the research started it was apparent that we were not talking about several hours, but much less). More important and less well documented is the person carrying the water. Who exactly came to collect the water was recorded as well. Tables 4.2a & b show that women account for more than 70 % of the trips to fetch water. This is one of the instances where there is a remarkable difference between the question asked and the practice observed.

With an increase in consumption, the same persons as before will still be responsible for the collection of water. International literature suggests that increased use of water is a strong indicator for a positive health impact. In general it would be wise to be careful when advising a strong increase in consumption of water without taking into account the additional time this entails. In the case of Bhutan, the effects of increased water use in terms of increased workload (especially for women and children) are limited.

Table 4.2a

Who collects the water?				
Village	Female Adult	Female child	Male child	Male adult
Radhi Pangthang	8	1	4	2
Darjeeling	7			1
Bazor	16	2		4
	11	1		8
Yekhar	8	2	3	6
	13	6	4	2
Tongsing	7	0	3	
	3	6		
Zangbari	7	1		5
	7	2	2	2
Total	**87**	**21**	**16**	**30**
	57 %	**14 %**	**10 %**	**20 %**

Table 4.2b

Total female	**70 %***
Total male	**30 %**

* Differences in totals due to rounding

These figures were obtained through the days of tapstand observations. The questionnaire covered this topic once more, yielding interesting differences between the statements made and the practice observed (Table 4.3). The respondents say that carrying water is mostly women's work, but a large part is done by all members of the household. (65 % women vs. 35 % other members).

Table 4.3

	Asked		Observed	
	All members	Female	All members	Female
Person carrying water	23	43	7	44
	35 %	**65 %**	14 %	**86 %**

The observations show that the contribution of the women is larger than stated, **86 % of times women fetch the water.**

"Notwithstanding the unpredictability of these [health impact] studies, taken as a whole they provide firm evidence that water supplies, excreta disposal and hygiene education can have a significant impact on diarrhoeal disease."

"Most of these studies suggest that access to water in quantity and improvements in hygiene may have a greater impact on diarrhoea than water quality and excreta disposal."

"in most studies where a significant health impact was found, the provision of water supply or sanitation has been accompanied by improvements in hygiene."

Sandy Cairncross, Waterlines Vol. 10, No. 1 July 1991, ***"Developing evaluation guidelines for studying hygiene practices."***

Chapter 5 Improved health

Initially the aim was to collect all relevant information from the respective BHUs or hospitals in the block, but this proved to be unfeasible. Health records are not maintained on a village to village basis, so there is no telling whether a certain disease has occurred in a village. The only method of ascertaining whether there is any health impact short of restructuring the health records and future record keeping, would be to work at covering one complete block in each dzongkhag. Then there could be some kind of (crude) comparison between the situation before and after provision of water. Even this method would not be foolproof, because there are no blocks in Bhutan where there are no RWS schemes. In short: there is no pre-project situation left.

The question of improved health by provision of water and sanitation facilities is intimately related to the effective delivery of health messages and improvements in sanitation practices. Changes brought about by health messages can be effectively assessed by observation of practices related to hands washing, treatment of disease, food preparation, personal hygiene and household hygiene. For each of these topics several questions and observations were made. In fact these data constitute the majority of the outcome of this impact study.

Hand Washing

The most visible part of the impact of health and hygiene education is the frequency of hand washing. Given the rural background of most users, their everyday existence involves frequent handling of soil, cow dung, forest litter, fodder troughs for cattle and pigs, etc. These are all possible sources of contamination. Think of washing hands after latrine use as well (covered under a different heading in this chapter).

When it comes to health and hygiene the difference between practice and theory, between perception and action becomes very important. The research used both interviews, observations of behavior and observations of facilities to get information. Particularly the difference between observations and answers to questions is interesting from an intervention point of view. In the end, the provision of water supply and sanitation facilities is a health-related intervention. Water, sanitation and hygiene education are meant to improve health. The discussion of the research results in this chapter will focus on the differences in the answers. Especially in the field of health and hygiene there is a friction between knowledge and practice. In some cases this tension can be very clearly detected.

Let us first examine some of the believes underlying the washing of hands. The questionnaire focused on believes regarding three methods of hand washing: 1) washing with ashes, 2) washing with water only 3) washing with rice, a Bhutanese folk custom. The question was whether **hands would get cleaner after using each of the three methods**. The results are listed in table 5.1 below:

Table 5.1

	Yes		No	
Washing with ashes	34	45,9%	40	54,1%
Washing with water only	30	40,5%	44	59,5%
Washing with rice	18	24,3%	56	75,7%

The two upper categories don't really show a marked difference in yes or no. It is interesting to note that the **use of ashes is not seen as beneficial**. We'll return to this point a little later when discussing the use of soap and alternatives for this. Surprisingly the habit of washing hands with rice is not considered to make the hands cleaner. Anyone with field experience in Bhutan knows that it is a very widespread custom, maybe not even meant to actually clean the hands. It could be considered to be a small ritual before starting the meal.

For Bhutan the use of ashes to wash hands would be a very practical one, since all households have access to ashes at no cost.

As was discussed in chapter 2 *Water Quality*, the concept of 'clean' has a different content. This could explain part of the surprising outcome of these three questions. Washing with ashes might have been misinterpreted to mean washing with ashes and without water, though this is doubtful. At any rate it is not a very widely adopted practice. though it is surprisingly well known.

Second part of the question was the time of hand washing. This was partly a question, partly observation, since the research assistants had the opportunity to observe the habits as well. The question **when do you wash your hands** was answered as listed below. The observations in this case were limited to just noting down whether the respondents were seen washing their hands. In most cases the interviewers were present for half a day in the household and this meant sharing a meal. Because of this indirect manner of observation, there are more data in the 'asked' category. Sometimes the interviewers were too late to observe whether hands were washed or there was no meal served. Yet the figures for hand washing before eating approximately tally, (28 vs. 24). There is no record on when the questions were asked (before eating or after), so the mere posing of the question may have influenced the outcome of the observations.

Table 5.2

When do you wash your hands?	Asked		Observed	
When my hands are dirty	39	58 %	11	31 %
Before eating food	28	42 %	24	69 %
	67		35	

In continuation of the first questions about the ideas people have regarding the washing of hands (cf. the first paragraph of this chapter), there was a combined question and observation regarding the use of soap, ashes or plain water. Table 5.3 below shows the answers and the observations. Research assistants were encouraged

to record the details of hand washing, but not in all cases did they get to see someone washing hands.

Table 5.3

What do you use for hand washing?	Asked		Observed	
soap	53	**74 %**	45	**76 %**
ashes	5	7 %	2	3 %
water only	14	19 %	12	20 %

Amazingly the percentages asked and observed don't vary much, in fact they are just about equal. Experience has it that the percentages 'observed' are lower than 'asked'. But what is much more surprising is the size of the category 'soap used'. **In 74 % of the cases there was soap use for hand washing reported.** It might be that asking the question triggered the washing of hands with soap. In that case people know that hand washing with soap is better, but don't normally practice it. Washing hands with soap and water depends on the availability of these two items. The assistants were instructed to observe and note down the **presence of soap and water** (for washing hands) in the house. The results are listed in table 5.4 and figures 5A & 5B below:

Table 5.4

	Observed		
	Yes		No
Is there soap in the house	60		14
Is there water in the house for handwashing	39		35

Figure 5A

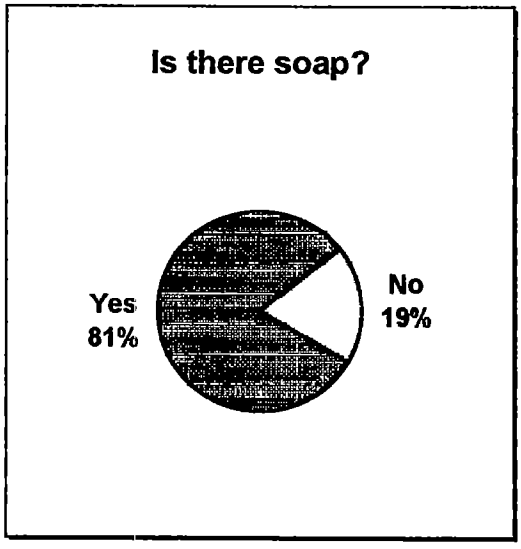
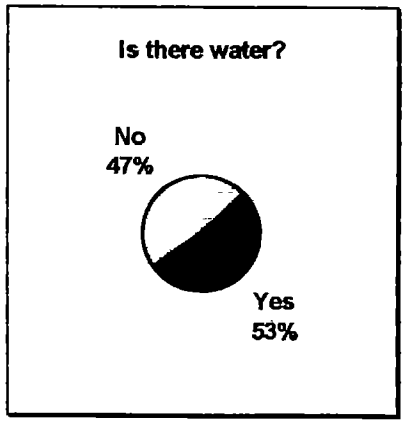


Figure 5B



In 60 of the 74 houses there is soap available, in more than half of the houses there is water inside the house for washing hands. The basic amenities for hand washing are at hand in a large portion of the households. Yet the presence of the basic requirements doesn't automatically say anything about the use of the facilities. It is remarkable that the use of soap is very much accentuated in the answers, yet ashes are hardly used. In this case there is reason to believe that the respondents knew or guessed what the research assistants wanted to hear. Another factor is that the same soap is used to wash clothes and could be used to wash hands. There is no telling for which purpose a particular piece of soap is used. Obviously the message came through all right, but whether there is any action taken is still doubtful.

The stated use of soap would exceed the financial capabilities of many eastern Bhutanese households.

In order to get a clear picture of the hand washing frequency, the research assistants were asked to keep a record of the number of people present at each meal and to record their hand washing. This is not as easy as it might seem, because often the guests are left to eat their meals alone, as Bhutanese customs dictate. Yet there are some interesting results from these observations.

The table gives a more detailed and diverse picture of the hand washing practices. It is remarkable that there is **no use of ashes recorded**.

Table 5.5

Hand washing observations						
Name of scheme/village	No hand washing	Rice	Water only	Water and ashes	Water & soap	Total
Tongsing	4	3	13	0	1	21
	1	0	9	0	8	18
Bazor	7	1	10	0	3	21
Yekhar	5	2	8	0	4	19
Darjeeling	3	0	24	0	17	44
Zangbari	18	0	17	0	12	47
Yakpogang	0	0	11	0	10	21
	4	0	11	0	6	21
Yonphu Pam	1	0	10	0	10	21
	0	0	13	0	6	19
Total	43	6	**126**	0	77	252
With RWS scheme	38	6	81	0	45	170
Without RWS scheme	5	0	45	0	32	82

Before proceeding to a discussion of possible causes of differences and the observed differences between villages with and without RWS scheme, excerpts from the two preceding tables (table 5.3 based on the questionnaires and table 5.5 based on observations during meals) were joined together for an easy comparison.

Table 5.6

Comparison of table 5.3 and table 5.5				
What do you use for hand washing	**Soap**	**Ashes**	**Water only**	**No washing**
Asked	**74 %**	7 %	**19 %**	n.a. *
Observed	**76 %**	3 %	**17 %**	n.a. *
Observations during meals	**31 %**	0 %	**50 %**	17 %

* *'not available'*

If there is one thing apparent from this table it is the fact that **hand washing with water and soap** is accepted as important, but **not practiced on the scale reported by people themselves**. Even the availability of soap in the house doesn't imply the use of soap. So, it is interesting to note that the household dinnertime observations even yielded a new category: 'No hand washing'.

The following table compares the household observations, splitting them into households without RWS scheme and households with RWS scheme. The categories approximately match, but it is astonishing that **people without water supply wash their hands more often and more often with water and soap**. Still the number of observations from the households without RWS is half of that of the others, so that might be a influencing factor. In general the observations about hand washing show that there is still scope for health messages that come up with viable alternatives for soap, as only 31 % of the total research population uses soap, while at least 75 % of the same population apparently knows it is better to wash hands with soap and 81% of the households has soap in the house. This could mean that soap is too expensive for the average household, or is not considered worth spending the limited resources on. The promotion of ashes for hand washing might be a very worthwhile alternative. Given the difference between asked and the actual use of soap, there is a definite need for alternatives.

Table 5.7

Hand washing observations in villages with and without piped water					
	No washing	Rice	Water only	Water and Ashes	Water & Soap
With RWS scheme	22 %	4 %	48 %	0 %	26 %
Without RWS scheme	6 %	0 %	**56 %**	0 %	**39 %**
Total	17 %	2 %	50 %	0 %	31 %

Causes and treatment of disease

There is a lack of knowledge on people's perception of disease and the causes and treatment for it. How do people relate the prevalence of diseases to their daily environment? Do they think there is a link and if yes: how are diseases linked to a certain way of living? For the success of the water supply and sanitation program it is vital to get an idea if people **know** what causes disease or how they **think** diseases are caused. People's perceptions definitely determine the effectiveness and meaningfulness of the RWSS program. One universal premise is that people will go a long way towards preventing diseases, once they know the causes. Yet their actions will be limited if they don't see the link between improved hygiene practices and incidence of disease.
The research first focused on people's ideas on most common diseases and then on the spread of these diseases. A description of how diseases spread, gives an indication of how people think each particular disease can be prevented.

Table 5.8

Ranking	List of most common illnesses		Cumulative percentage
1	Diarrhea	60	26 %
2	Worms	34	41 %
3	Headache	32	55 %
4	Dysentery	27	67 %
5	Typhoid	17	74 %
6	Other	10	78 %
7*	Cough & cold	7	81 %
7*	Vomiting	7	84 %
9*	Skin rashes	6	87 %
9*	Cholera	6	90 %
11*	Eye disease	5	92 %
11*	Hepatitis	5	94 %
11*	Stomach pain	5	96 %
14	Pain in the joints	3	97 %
15	Tuberculosis	2	98 %
16	Fever	1	98 %
	Total	227	100 %

* All these are shared places, because of a same number of points.

The table shows that the 5 top ranking diseases put forward by the respondents account for 74 % of the total for most common diseases. Diarrhea alone accounts for more than one quarter of the total. The list includes a wide variety of diseases.

Diarrhea

The research proceeded to inquire about the way of spreading of specific diseases and the possibilities of spreading disease through certain unhygienic practices. The 7 diseases listed were taken from a questionnaire prepared earlier by UNICEF for use in a study about water related diseases. The results can be found in *appendix B.* Discussion in this chapter will concentrate on a few diseases only. Out of the seven diseases on the list, extra attention was given to diarrhea. The respondents gave their views causes, spreading and cures for diarrhea.

The response to the most important question, the **cause of diarrhea** yields only mixed results. There is no clear answer from the respondents. The 'Seasonal' response is a bit lower than the average and the 'Bad food' response a bit higher, but no single answer comes out as being the generally accepted cause (table 5.9).

Table 5.9

Main cause of diarrhea		
Seasonal	8	8,1%
Evil spirits	15	15,2%
Bad weather	12	12,1%
Bad food	22	22,2%
Unclean surroundings	17	17,2%
Polluted water	13	13,1%
Poison	12	12,1%
	99*	

*The number of answers is higher than 74 because of double answers by some respondents

Going back to the list of most common diseases, two of the top five ailments could be said to fall in the category diarrhea (diarrhea, dysentery). It is surprising to note that more than half the people don't know how diarrhea is spread. Going through the answers, some can be discarded immediately, though they give insight in how people perceive diarrhea. For example: If diarrhea were a seasonal disease (also mentioned under causes), there would be no need to try and prevent it. How can the seasons be prevented from changing? This would be a very depressing perspective from a health education point of view. Luckily this category is limited (7 % of the answers).

Another interesting category states that diarrhea doesn't spread: a misconception that is definitely harmful for the impact of any health education program. If the disease is thought not to spread, any effort towards health promotion and trying to change behavior to stop the disease from spreading will be in vain.

Apart from these two, there were a few that did have some obvious implications for the program, but were not as diametrically opposed to the health messages currently being spread. These include 'living together', 'using the same latrine', 'eating together'. 'Using the same latrine' as an explanation for the spread of diarrhea is an alarming answer: it may be one of the reasons for low use of latrines.

All in all there are only three categories that correspond to generally accepted ways of spreading diarrhea: flies, dirty water and no proper latrine use (taken here as a euphemism of not washing hands afterwards). Taken together they constitute about 11% of the total, giving serious cause for concern about the impact of health education.

Table 5.10

How is diarrhea spread		
Living together	10	14,1%
Seasonal	5	7,0%
Eating together	3	4,2%
No proper latrine use	*2*	*2,8%*
Don't know	**37**	**52,1%**
Doesn't spread	6	8,5%
Flies	*5*	*7,0%*
Same latrine	2	2,8%
Dirty water	*1*	*1,4%*
No. of respondents	71	

Table 5.11

What is the cure for diarrhea?		
take to BHU	36	50 %
take to lama	11	15 %
suck poison	7	10 %
give ORS	9	13 %
Ask VHW for help	9	13 %

The answers to the question what is the cure for diarrhea were clearer (table 5.11). Half the respondents would take the patient (usually children) to the BHU. About one quarter would go to a lama or a local bloodsucker. An almost equal number would give ORS or ask the VHW for help. Only one respondent stated that he would wait for the diarrhea to go away by itself. A good number of people stated more than one alternative, frequently one after the other. 25 out of 74 respondents would seek more than one treatment. In the table only the first answer given is included. **Frequently the patient is taken to the local blood sucker or lama before taking him or her to the BHU.**

Other water related diseases

Comparing the list of most common diseases with the 7 diseases on the UNICEF list, shows that these 7 form a big part of the most common disease list (cumulative percentage 67), with *diarrhea, worms, dysentery* and *typhoid* being in the top 5.

Not all these diseases will be discussed in detail in this chapter. Full details can be found in *appendix B* for all 7 diseases. Table 5.12 shows the data for dysentery as an example. The largest category is shaded, while the correct answers are in *italics.*

Table 5.12

How is dysentery spread		
Seasonal	2	3,4%
Don't know	39	66,1%
Living in the same house	6	10,2%
Using same latrine	2	3,4% ⇦
No proper latrine use	2	*3,4%*
Doesn't spread	5	8,5%
Unclean food	2	*3,4%* ⇦
Bad water	1	*1,7%*
No of respondents	59	

For all seven diseases the largest answer categories were shaded, yielding a remarkable picture. The tables are all printed in *appendix B.* As can be seen the "Don't know" category is the most common one in five cases (diarrhea, dysentery, typhoid, hepatitis and worms). Obviously many people don't know how these diseases are spread, so it would be interesting to see what the other respondents had answered. Only in the case of skin diseases and eye diseases the largest category is not 'Don't know'. Amazingly, the way skin diseases spread is correctly identified and is at the same time the largest group of answers. Whether any action is taken to prevent this disease, isn't known.

Table 5.13 below summarizes the total percentage 'Don't know' and the percentage of correct answers for each disease:

Table 5.13

Disease	Percentage 'Don't know'	Percentage correct answer
Diarrhea	52.1	11.2
Dysentery	66.1	8.5
Worms	68.3	3.2
Typhoid	75.4	10.8
Hepatitis	77.6	10.3
Skin diseases	14.4	74.4
Eye diseases	13.7	2.8

People won't act on messages they don't understand. This part of the study dealt with the question of health related knowledge and attitudes. If respondents state that they don't know the answer in the majority of cases, we can safely assume that they really

don't have the faintest idea. People are always eager to please the interviewer, so in possibly embarrassing situations answers are likely to be made up. The number of respondents stating that they don't know what causes the disease is encouraging; at least they don't feel obliged to make up an answer. On the other hand the answers show that there is still a lot to be done in health and hygiene education. Understanding the principles of transmission and prevention of diseases is very important.

The research-assistants were provided with a short list of descriptions of the diseases. These descriptions were taken from David Werner's 'Where there is no doctor', see also *appendix A*. The assistants were instructed to avoid any type of hinting, as people are very prone to responding to cueing by the assistants. Even with the detailed descriptions of the diseases, the number of respondents in the 'Don't know' category is substantial.

Turning around the argument we tried to identify whether people thought a certain type of behavior or a certain situation would be favorable for spreading of diseases. Here, as in the previous series, the range of answers goes from amazingly irrelevant to very accurate. Largest answer categories are shaded for each question with the correct answers printed in *italics*.

Comparison with the previous section shows that the 'Don't know' category is very much smaller for almost all questions. Yet it doesn't necessarily mean that people are more able to relate a certain type of behavior to the spreading of diseases. This is demonstrated by the fact that in most cases there is a substantial amount of irrelevant answers.

Here, as in the previous section, there is a table comparing the correct answers with the category with highest percentage. And there is one table included to exemplify the presentation of information. The rest of the tables can be found in *appendix B*.

Out of the six questions in this section two exclusively deal with personal hygiene, washing of hands after latrine use and before handling food. It is interesting to note that the percentage 'Don't know' answers is quite high. On top of that, the answers include a small percentage of respondents claiming that **not washing hands** on both occasions **doesn't spread any disease**. Especially when it comes to maximizing the health benefits of a Rural Water Supply scheme, the washing of hands on every possible occasion should be encouraged. Therefore it is imperative for health education to take away the notion that not washing hands after latrine use and before handling food doesn't spread any disease.

Similar to the previous section the largest category of answers and the total percentage of correct answers is summarized in a table:

Table 5.14

Question "Diseases spread by:"	Percentage of largest category		Percentage of correct answers*
Flies	Don't know	29.9 %	**42.9 %**
Dirty food	Stomach pain	28.6%	19.1 %
Polluted water	Don't know	32.9%	23.3 %
Pigs near the house	Don't know	47.3%	5.5 %
Not washing hands after latrine use	Don't know	**76.3%**	18.6 %
Not washing hands before handling food	Don't know	**58,8%**	16.2 %

The table on **diseases spread by polluted water** is included here as an example. All other questions are dealt with in a similar fashion in *appendix B*. At the same time it is one of the most interesting tables for the Rural Water Supply program. It contains a small surprise, because diarrhea is mentioned by one fifth of the respondents as being spread by polluted water. In the case where the question was put the other way around, only 1 out of 74 respondents mentioned polluted water as a cause for diarrhea.

Table 5.15

Diseases spread by polluted wate		
Diarrhea	*14*	*19,2%*
Don't know	**24**	**32,9%**
Cholera	*3*	*4,1%*
Stomach ache	11	15,1%
Throat pain	9	12,3%
Vomiting	6	8,2%
TB, cough	6	8,2%
No. of respondents	73	

Summarizing the content of this section, it is clear that on essential points with regard to personal hygiene, the respondents are not well enough informed. Ruling out any unclarity in the questions, this leads to the conclusion that the health education up to now has not yet been sufficiently adapted to the local situation. A small number of people is able to identify relevant issues, so there has been some influence.

Food preparation and handling

Special precautions when handling and preparing food are at the basis of good hygiene. Part of this question was already answered under the two previous topics. Yet the issue is so important that it gets a separate discussion. Food preparation is normally the domain of women. If any impact is to be made on improved hygiene of food preparation and food handling, women are the most logical focus of such efforts. International literature also suggests that women are the primarily responsible for health and hygiene in a household. As was shown in previous chapters, women in Bhutan are first responsible for water (*Chapter Water Use Quantity*). In general these responsibilities of women also extend towards the family's health and hygiene.

All respondents were asked if they washed their hands before a) eating food b) preparing food. Table 5.16 below shows the answers for hand washing in both categories, with answers split between men and women.

Table 5.16

		Asked			Observed		
		Men	Women		Men	Women	
Do you wash hands before eating food?	**sometimes**	12.5 %	20.8 %	33 3 %	21.4 %	16.1 %	37.5 %
	always	**20.8 %**	**30.6 %**	51 4 %	**8.9 %**	**10.7 %6**	19.6 %
	never	6.9 %	2.7 %	9.6 %	1.8 %	3.6 %	5.4 %
	at least once a day	1.4 %	4.2 %	5.6 %	1.8 %	1.8 %	3 6 %
	not seen				10.7 %	23.2 %	33.9 %
		41.6 %	58.3 %	100 %	44.6 %	55.4 %	100 %
Do you wash hands before preparing food?	**sometimes**	31.8 %	18.2 %		20.7 %	17.2 %	
	always	**9.1 %**	**22.7 %**	31 8 %	**20.7 %**	**31 %**	51 7 %
	never	9.1 %	0	9.1 %	0	3.4 %	3.4 %
	once a day	0	9.1 %	9.1 %	0	6.9 %	6 9 %
	not seen				0	0	
		50 %	50 %		41.4 %	58.5 %	

The differences in answers give no definite answer to the question whether women are more health conscious in their handling of food. There are some differences, but not significant enough. Even rearranging the answers, as done in Table 5.17 reveals that only in one category men and women answer very differently (see Table 5.17).

Table 5.17

Totals of percentages answers 'Always' and 'Sometimes'				
Taken from Table 5.16	Asked		Observed	
	Men	Women	Men	Women
Do you wash your hands before eating food	**33.3 %**	**51.4 %**	30.3 %	26.8 %
Do you wash your hands before preparing food	40.9 %	40.9 %	41.4 %	48.2 %

Differences in gender don't mean a difference in habits. Again looking at the figures, it is interesting to note that in the best case **only one third of the respondents always wash their hands before eating food** (ref. Table 5.16). The figures range from a low 8.9% to 31% as the highest. Obviously there is scope for improvement here.

Personal Hygiene

Better personal hygiene in the sense of washing oneself and one's clothes, washing hands after latrine use, has an enormous effect on the health status of any community. While it is very difficult to point out any concrete health improvement from an improved water supply, international literature suggests that improved personal hygiene practices make a great difference. As far as the research was concerned, improved personal hygiene entailed the frequency of washing clothes, the frequency of washing oneself and one's children.

Table 5.18

	Summer		Winter	
Clothes washing frequency				
Once a week	31	**45,6%**	25	**42,4%**
Once every two weeks	16	23,5%	13	22,0%
Once a month	13	19,1%	14	23,7%
Other	8	11,8%	7	11,9%
	68		59	

The frequency of clothes washing was used in previous chapters to determine the water use. The main problem with clothes washing is determining exactly how much water is used. This varies a lot, because of different habits of people and the amount of clothes to be washed. Measuring the water use for clothes washing was omitted from the research.

More attention was given to the frequency of clothes washing. Table 5.18 shows the results of the questions. Due to the long interval between washings, it was not possible to make accurate observations. So the results couldn't be verified by observing clothes washing habits. Most people claim to wash clothes once a week. That could be true,

because it doesn't mean that all clothes of all household members are washed every week. It only indicates that during a given week, some clothes are washed.

During the research it became apparent that in order to get an overview of clothes washing, the research would have to focus only on this aspect. Questions on the number of *kho's* or *kira's* owned by each member of the family. Measurement or observation of which part of clothing was washed. Detecting differences in clothes washing for schoolgoing children. All these aspects aren't covered in the current study.

Table 5.18 shows that most people wash (their) clothes weekly. Remarkably, the percentages don't change much between 'Summer' and 'Winter'. Observations would have made a big difference in this case. But since there are no other data available, clothes washing once a week is taken to be the most common practice.

Table 5.19

How often do you take a bath?	With RWS		Without RWS	
Once a week	29	**55 %**	2	11 %
Once a month	2	4 %	0	
Sometimes	21	40 %	16	**89 %**
Every day	1	2 %	0	

Washing oneself is another aspect of personal hygiene affected by the provision of piped water. In general it is thought that the effort it takes to get water is prohibiting frequent bathing. The figures in table 5.19 show that there is a definite shift from bathing 'sometimes' to bathing 'once a week'. Bathing 'sometimes' is then taken to mean 'not very often'. So, **the provision of piped water seems to stimulate increased bathing.**

Table 5.20

	Asked			Observed		
How often do your children take a bath?	Every day	18	26 %	Every day	10	29 %
	Once a week	29	43 %	Once a week	6	17 %
	Sometimes	21	31 %	Sometimes	11	31 %
				Children look dirty	8	23 %

Bathing the children is not just commendable because it keeps them cleaner and healthier. It's just as important that children get the habit of washing themselves so they will continue to do so as grown-ups. The focus in Table 5.20 is not on the difference between villages with and without water supply. There is a more interesting comparison to be made between what people say and what they do.

First of all the relatively low percentage of respondents washing their children daily is important. In remarks made during the interviews it was said that schoolgoing children get washed more often. Still **only 26-29 % of the children gets a daily bath**. Little babies get bathed daily, but after a certain age this habit is not continued.

More important is the fact that observations show that a substantial part of the children look dirty. This could be because they are washed only once a week. But the fact that their dirtiness doesn't seem to act as a sign to get washed is remarkable. Again there would seem to be a need for changes in health practices.

Chapter 6 Latrine Construction

The construction of latrines was until recently thought to be a matter of relatively sophisticated equipment, deemed to be more sanitary than the locally available materials. The Royal Decree on sanitation has very strongly spoken in favor of local alternatives, by reducing the amount of subsidy for the construction of latrines under the Rural Sanitation program. The emphasis is now much more on local alternatives, yet there are no data available on the estimate costs of a locally constructed latrine. To assume that a local latrine would be completely without cost would be erroneous; wood for example comes at a price, even in rural areas.

The research assistants were asked to give a detailed description of the materials used for the construction of a local latrine, including such things as labor and giving an estimate of all other materials needed at the locally prevalent rate. This allows us to give an estimate cost for a locally built latrine. This cost could be taken as the amount of money most people would be willing to spend on a latrine. In most cases no one will ever actually spend a lot of money on the construction of a local latrine.

The construction of a latrine is intimately related to its use and the possible (perceived) risks of not using one. Some of these beliefs and attitudes were discussed in previous chapters, others will be discussed in later chapters. Other related factors, such as reasons for building a latrine will be discussed in this chapter.

Cost of a local latrine

First of all our aim was to study the cost of a latrine, built entirely with local materials. This cost would include all expenses, including labor. All latrine owners were asked to provide a detailed cost estimate and most of them did. The table below summarizes the construction materials and the cost of a latrine built with local construction materials.

The main problem with calculating the average cost of a home-built household latrine is that the construction is not standardized, different materials in differing quantities are used in each latrine. So it is difficult to establish what the average latrine is made of. That in turn influences the cost. Two methods were used and the results compared with each other.

A **first calculation of cost was based on inclusion of a weighed average of all inputs** mentioned. The total cost of each component was calculated and **divided by the number of observations.** This resulted in a **total cost of 932 Nu.** Obviously this method yields too high a number; an important factor is that materials for the construction of one component are included twice. For example: some people use shingles for the doors, others tin sheets. Both are included in this calculation but no one uses both shingles and tin sheets in the same door. In fact the calculation shows the cost of each component, but an average latrine is not built with all these items, some of these are used alternately or as each others substitute.

Another way of calculation is to **omit the weighing factor,** as done in the calculation in table 6.1. Each item is thought to be included in every latrine and should therefore be **divided by the total number of latrines observed** (26 nos.). While purists may say that this still yields an exaggerated cost, it comes closer to the real price of a locally built latrine. The error is minimized by the fact that all costs are spread among all latrines observed. The total cost is about half of the previous calculation (**579 Nu.**).

Table 6.1

	Total cost (Nu.)	n*=	Average	
Male labor	6465	26	**249**	**43 %**
Female labor	450	5	**17**	**3 %**
Stones	2035	19	78	13 %
Shingles, door shingles	2675	19	103	18 %
Planks, floor planks	1533	17	59	10 %
Bamboo mat	230	4	9	2 %
Beams, pillars, poles	1138	19	44	8 %
Split bamboo	6	1	0	0 %
Oil tin sheets	480	5	18	3 %
Nails	25	1	1	0 %
Sack	30	3	1	0 %
Total cost			**579**	

* n= number of observations
* Cheapest latrine was 140 Nu. (only labor), most expensive latrine was 1084 Nu. The complete list of costs for each latrine can be found in appendix B

In both cases the cost of labor is an important factor in the total cost. As can be seen in the table above, **labor constitutes 46 % of the cost of a locally built latrine,** or 266 Nu. in absolute terms. Reconverting this sum of 266 Nu. into labor, with a labor rate of 20 to 30 Nu./day this would mean a total of 9 to 13 days work for the construction of a latrine.

If we were to look at the materials used for construction, the only commodities not available in the village would be the tin sheets, jute sacks and nails. The rest could be transformed to labor inputs. **A latrine would** then **cost 20 Nu. in cash** (for the items mentioned before) **and 559 Nu. in kind** (which included making planks, shingles, collecting stones, etc.). Again with the labor rate set between 20 and 30 Nu./day the latrine would take about 19 and 28 days to be built, including everything. One day would be spent working for the wage of 20 Nu. to buy the tin sheets, nails and sack.

Of course these numbers vary according to the local availability of the materials mentioned. In areas with scarcity of suitable wood, it would take more time.

If this chapter shows anything, it is that the construction of a local latrine constitutes a considerable investment from the part of the rural household. Comparing the price of a local latrine, set at 579 Nu. with the average monthly income in Monggar of 392 Nu.(as determined by the CSO), it is clear that such an effort from the part of the rural household should be supported.

Imported materials

The Royal Decree rightly emphasizes the need to abandon the need for subsidies or at least reduce them. But even with reduction in subsidies, the Public Works Department could play a role in the improvement of local latrines (Table 6.2). When asked what imported materials would be needed to construct a latrine, 55 out of 172 answers (32 %) included 'cement'. This shows the interest people take in improving the key components of the latrine: **the slab.**

Table 6.2

List the imported materials needed to construct a latrine	
CGI sheets	34
Nails	41
Cement	55
Vent pipe	36
Iron	3
Squatting pan	3

Other areas where people identified the need for external inputs are: the joints (nails), the roof (CGI sheets) and the ventilation (air vent pipe). It is remarkable that a squatting pan was mentioned only in 3 answers. Clearly this is not felt to be a priority issue.

Other improvements in construction of locally built pit latrines using available materials could include lining of the pit with stones, thus adding to the stability. The pit could then be made deeper, adding to the life span of the latrine. In general the pits used in the present local latrines are too shallow, necessitating frequent reconstruction of the latrines.

Further improvements could entail the adjustment of the slab size. The slab is actually the most difficult part of the latrine because it is made out of materials that are not available in the villages or even the hardware shops in the Dzongkhag headquarters. Fixing a smaller cement slab in a wooden frame would reduce the cost of the slab and possibly make it possible to offer it for sale at a price that is within the financial possibilities of rural households. The possibility to make wood more durable and use it in frames for a smaller cement slab should be investigated. In Bumthang there are some latrines constructed in this way.

The main problem with latrines, however is not the construction. As we will see in the next part, the use of latrines is still problematic.

Knowing how people have built their latrines is interesting, it shows how much they are willing to pay for their comfort. Equal importance should be given to the question **why people built a latrine** in the first place. This inquiry ought to be extended to those households that don't have a latrine. The reasons for building or not building will eventually lead us to discover the key factors in latrine construction and use.

The respondents that had a latrine were asked **why** they built one. The answers were pre-coded, with three categories as shown in table 6.3 below.

Table 6.3

Why did you build a latrine?		
Government official told me	50	**75 %**
Convenience	7	10 %
Health/hygiene	10	15 %
Total	67	

The percentage of respondents stating that the latrine was built on instructions of a government official is amazing. One worrying aspect of this answer is that none of the considerations normally associated with latrines (comfort, privacy and to a lesser extent: hygiene) is mentioned as the key determining factor for latrine construction. The consequences for the use of latrines were examined in the previous chapter. With regard to the construction of latrines at least, persuasion by (local) government officials seems to have worked.

Table 6.4

Why *didn't* you build a latrine?	
New house	5
Don't like	0
No time	0

Of all respondents **who don't have a latrine**, none has given a reason other than that their present house has been recently constructed (Table 6.4). It would seem that even when people don't have a latrine, they will not say that they don't like to use them. The reason for not building a latrine because the house is newly constructed is actually a bit flimsy, because habitual latrine users would build the house and the latrine at the same time.

The only thing that can be demonstrated by this question is a sense of discomfort when asked why the household doesn't have a latrine. There is a general feeling in the countryside that a latrine should be built and not having one is not really acceptable. It doesn't imply anything whatsoever about the use of these latrines.

Table 6.5

Can excreta in the open spread diseases?	Don't know		Yes		Diarrhea	
	32	56 %	16	28 %	9	16 %

A fairly reliable measure for the willingness of people to build latrines would be the perceived role of latrines in the prevention of spreading of diseases. This is not to say that people built their existing latrines to prevent diseases. The only assertion made here is that if people are committed to check the spread of disease, they will build latrines. That commitment is an essential condition before any work on latrine construction is done. Table 6.5 above shows that the majority of respondents don't know if excreta in the open can spread diseases. A smaller group says yes, but doesn't name a specific disease and an even smaller group names diarrhea. **The mixed response to this question at least indicates that people will not respond with overwhelming enthusiasm if encouraged to build latrines for reasons of health and hygiene.**

The issue of persuading people to build latrines for reasons of privacy will probably have limited impact as well. Due to the dispersed population and widely spaced houses, there is always a secluded place to be found somewhere around the house. The privacy/convenience reason to build a latrine was not very often mentioned. The situation may be different at night; a study done by the NWAB in 1991 shows that women stay as close to the house as possible.

Chapter 7. Latrine Use

Determining the use of latrines was one of the most complicated matters in the research. Not only is it a very sensitive personal issue to discuss, it is also a very difficult subject to observe. If people don't use a latrine they tend to go about their business at night or at least without attracting too much attention. Naturally they will look for a secluded place. And if they use a latrine it will not be possible to observe. Personal hygiene and sanitation customs are very complicated to deal with, in almost all societies they are considered the most intimate aspects of everyday life. The study of these habits requires tact and at the same time a stubborn determination to find out what is going on. Even then it is not possible to be completely sure what is happening with regard to sanitation habits.

As mentioned earlier the construction of latrines is easily verifiable, but in the end it is the use of these latrines that counts. Needless to say it is impossible to verify whether each member of the household uses the latrine. In practice it is only possible to distinguish between a latrine that is used and one that is certainly not used. The extent of use (all the time or only sometimes) is very difficult to establish. First of all because the filling rate of a latrine is so low that it has to be measured over a period of a year at least. So there is no visible change from day to day. On top of that, the presence of dogs in the villages tends to eliminate most of the physical evidence of non latrine use.

The question of latrine use should therefore be approached from all possible angles to make a picture that is as complete as possible. Apart from the questionnaires there were a number of standard observations done.

Two related observations were put together and summarized in table 7.1 The most interesting category for us is the one where households with a latrine have signs of defecation outside, around the house (the shaded box). This means that not everyone is always using the latrine. The percentages show that **30 % of the households with a latrine don't always use it.**

Table 7.1

		Are there signs of defecation outside?	
		Yes	No
Is there a latrine ?	Yes	18	43
	No	9	4

In principle the figures from the questionnaires confirm that the latrine is not always used. Depending on the point of view, **the figures for not using the latrine vary between 23 %,** the sum of all '*sometimes*' answers **and 34 %,** the sum of all answers except *'everybody, always'* (Table 7.2).

Table 7.2

Who uses the latrine ?		
Everybody, always	40	66 %
Everybody, sometimes	10	16 %
Only adults, always	7	11 %
Only adults, sometimes	4	7 %
Total answers		

The last check to determine the use of the latrine is to check for the **presence of a door.** Lack of privacy is a serious inhibiting factor for latrine use. Open air defecation is not very private either, but at least the place can be chosen. Latrines are fixed and should therefore provide enough privacy. It would be fair to say that without a door, the chance of a latrine being used are slim. Table 7.3 shows the results of the observations of the latrines. Unfortunately not all observations were done from the start. The observation whether there was a door or not, was added later in the research. The other observations were included to get some information on the construction quality of the latrines and to try to detect areas of improvement.

Table 7.3

	Yes		**No**	
Can flies reach the excreta?	39	64 %	22	36 %
Is there a smell?	53	87 %	8	13 %
Is the pit covered completely?	38	62 %	23	38 %
Is there a door?	25	**93 %**	2	7 %

Judging from table 7.3 most latrines have a door or some sort. Sometimes this is a real door made of wood or flattened oil cans, sometimes just a jute sack. So **from a point of privacy there is no reason to assume that latrines are not used.** In terms of improvement in the construction there is still a lot to be done. Originally the discussion of these shortcomings of local latrines were planned to be discussed in the previous chapter that focused on construction, but problems with construction has its reflection on the use and vice versa. Since these issues are so intimately related, it would be better to deal with them as a whole. All latrines smell, but the objective should be to reduce this smell as much as possible. Making a slab or wooden frame that covers the whole pit would reduce the smell if combined with a lid on a handle. At the same time flies wouldn't be able to reach the excreta anymore. Children would be more inclined to

use the latrine if the pit is fully covered and the squatting hole is not too big. These improvements don't have to add much to the costs. Actually the basic difference between the improved latrines and the locally built latrines is the ferrocement slab.

Children

The most important part in sanitation and its acceptance is to induce children to use latrines. First of all the latrines should be suited for children; the holes shouldn't be too big, it shouldn't be a scary experience. But most of all, children should be encouraged by their parents to use the latrine. How many children are told to use a latrine, given the fact that their parents don't seem too convinced themselves of the benefits of latrine use? Table 7.4 and figure 7A show the answers to the question: **Do you tell your children to go to a specific place for defecation?** And the second question: **Where do you tell your children to go?**

Figure 7A

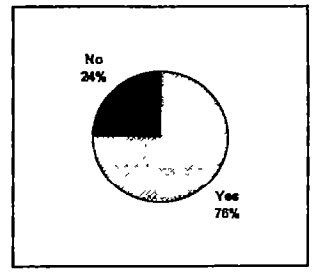


Table 7.4

	Yes	No
Do you tell your child to go to a specific place ?	56	18
Just outside	18	36 %
Latrine	32	64 %

First of all table 7.4 shows that 64 % of the children is told to go to a latrine. In some cases the respondents hastened to add that the children were told to go to a latrine, but never listened. All in all there are reasons to expect latrine use by children to be very low.

Location of latrine

Use of the latrine is also determined by its location relative to the house. In general people want to have the latrine at some distance from the house because of the smell. At the same time the latrine shouldn't be too far from the house because users might not want to go far from the house at night.

Table 7.5 shows the average distance of the latrine from the house in the research villages.

Table 7.5

Distance in meters from house to latrine	(m)
Yekhar	22
Darjeeling	21
Yadi Lakhang	33
Radhi Pangthang	34
Tongsing	30
Bazor	25
Yonphu Pam	37
Average*	**29**

* maximum 81 m., minimum 5 m

The distances listed here were measured with a tape from the front door to the latrine. As can be seen the latrines are on average quite close to the house, some even being as close as 5 m. The farthest away were two latrines in Yonphu Pam at 81 m. from the house.

Alternatives

These were all the basic conditions for latrine use at home, but most people have their fields some distance away from their house. This means that during the day most people will not use the latrine near the house. Actually there is reason to believe that most people prefer to defecate in the morning somewhere along the way to their fields. For practical reasons it was not possible to check this, there were just too many possible sites.
The questionnaire included a question on defecation where there was no latrine. Table 7.6 below summarizes the results. The group is a bit small because this question was only asked when respondents didn't have a latrine.

Table 7.6

If there is no latrine: where do you go now?			
	In the fields	**In the forest**	**Somewhere around the house**
Asked	9	4	3
Observed	3	0	1

Table 7.6 shows the results of the question, but sometimes respondents indicated more than one place. That is why there are 13 households without a latrine and in total 16 answers to the question. For a question of this type it is difficult to do observations in such a limited time. Absolute accuracy can't be achieved, even anything more than an

educated guess poses logistic problems. It is simply impossible to be around every member of the household all the time. Except for finding the places of defecation and counting there is no way to find out where people go and with what frequency, short of making an unacceptable intrusion into their private lives.

An essential part of latrine use is cleaning it. A dirty latrine is not very inviting and may even be the cause of spreading of disease. Latrine construction should be done with ease of cleaning in mind. The latrine should be able to withstand washing with water and broom. Ideally the waste water would flow into the pit. Adding of ashes to the pit may reduce the smell and be beneficial for the decomposition of the excreta, yet this practice was only mentioned once during the interviews.

Very often the question **When do you clean the latrine?** was answered saying that no one cleaned it (table 7.7). One of the respondents explicitly stated that pit latrines didn't need cleaning.

Table 7.7

Who cleans the latrine?	Asked	Observed
Nobody	35	13*
Not seen	n.a.**	28
Everybody	13	0
Women	4	1
Men	5	3

* Of course it is strange to state that you observed nobody clean the latrine. It means that the latrine looked like it had not been cleaned for a long time.
** Not applicable

- To look after the fence of the scheme (i.e. around intake, reservoir, BPT) to see if the fence is intact
- To keep away cattle from the source and the tapstands
- Informing women not to leave any clothes piled up at the tapstand after washing
- Not allowing children to hang from the tap
- Informing all the villagers what to do and not to do, as was told during the training.

A VMC member's answer when asked what he had learned during the training

- He was shown a sketch of a pipe broken because of a landslide, [a sketch of someone] cutting pipe, [a sketch of] fighting and quarreling because of a water problem etc.
- He was taken to Khapti village to observe a different scheme
- He also saw a sketch of a disappointed caretaker because of no compensation.

Another VMC member's answer to the same question

Village Level Operation and Maintenance

This part of the study didn't come out as expected due to various reasons. From a data collection point of view, this component required a different approach. For the first section the data was best collected through observations during a longer period. The result would be a longer series of data but without a large coverage of villages. In depth rather than a large coverage.
To get an adequate overview of the caretakers and their work, another method of working had to be employed: coverage of a larger area through short visits. Due to logistic problems this objective has only been partially met.
The other limiting factor was the low number of trained female caretakers. Although the number is rising, most of them concluded their training only recently making it difficult to see whether there are any changes, let alone measure their effectiveness. In general the difficulties are the same for male caretakers as well. It is difficult to say whether their presence or training really made a difference.

In short, there is an extensive part on caretakers in general and their skills, and some less elaborate parts on Village Maintenance Committees and female caretakers. Still the data are reliable enough to get an overview of the caretakers' side of operation and maintenance.

The research proposal envisaged three separate chapters on *'Effectiveness of (Female) Caretakers'*, *'Effectiveness of Training'* and the *'Effectiveness of the Village Maintenance Committees (VMC)'*. The structure of the data suggests a division in two chapters only: **'Effectiveness of Caretaker'** (this chapter) and the **'Effectiveness of VMC'** (next chapter), with the evaluation of the training element included in both.

Chapter 8 Effectiveness of (female) caretaker

The effectiveness of the caretaker is primarily determined by him/her having the right tools. The provision of toolboxes to the caretakers gave rise to suspicions that the tools would get lost soon and would not be used for the scheme. Naturally, in rural areas of Bhutan where tools are hard to come by, the tools will not be exclusively used for the scheme. Yet the tools are an essential precondition for any maintenance to take place, without a toolbox nothing will happen. Even if most tools in the boxes are never used, the very fact that there is one indicates that maintenance is considered part of the scheme. Handing over of the toolbox is a clear sign to the caretaker and all users of the scheme that the maintenance is primarily their responsibility. It would be worth giving the toolbox just to get this point across.

Use of tools

In all the 15 villages where the caretakers were visited, the research assistants inspected the contents of the toolbox. As can be seen from table 8.1 below most toolboxes were complete, without even a hacksaw blade missing. Normal wear of hacksaw blades and thermochrome crayon is included in the missing parts list just to show the rate of depletion. Without counting hacksaw blades and thermochrome crayons, 10 toolboxes (67 %) would be still complete.

Table 8.1

Is the toolbox complete?			
Yes		No	
9	60%	6	40%

In some cases there was more than one item missing. The list of missing parts gives a fair indication of the workmanship to be expected from the village caretaker. Topping the list of missing items are the hacksaw blades. But even the Dzongkhag staff has chronic shortages of hacksaw blades.

Second item on the list is the thermochrome crayon. One caretaker gave it to the children to play. The other caretakers have used their stock to a lesser extent, but surely the checking of temperature will probably be the first step of the pipe joining procedure to be skipped. An indication of the consequences will be discussed later in this chapter under the heading quality of work.

Table 8.2

Parts missing from the toolboxes	
hacksaw blades*	5
thermochrome crayon	4
measuring tape	3
hammer	1
file	1
hacksaw frame	1
pliers	1
blowtorch not working	3

*The numbers refer to the number of toolboxes from which the items mentioned were found missing

A cause for concern is the fact that 3 of the blowtorches were not working properly. One of the tests for the caretaker was lighting the blowtorch within 10 minutes. Some couldn't do this because of problems with the blowlamp. Normally this is not a very big problem; the heating plates with a long handle can still be put in a fire. The teflon covered heating plates can't be used without a blowtorch. This leaves the caretaker

without the most important tool. One suggestion would be to change the heating plates and replacing them with long handled ones with a separate teflon cover. A disadvantage of this is that all caretakers from the first batches have to be recalled for training in using this heating plate. In the long run it would pay off, since the use of blowtorches is complicated by the need for kerosene and spare parts.

With each of the 15 caretakers, a series of tests were done. They were all given two pieces of HDPE pipe with the task of joining them. The pieces were not matching, so before joining there was still some work to be done.

Each step in the process was noted down (table 8.3). Stages that were skipped were noted down as well. From the steps that were left out by the caretakers we can determine what part of the procedure they think is difficult or bothersome. These steps could be emphasized a bit more in training.

All caretakers were asked to demonstrate the blowtorch. In the case of schemes with two caretakers, the female caretaker was asked to light the blowtorch first. Four caretakers didn't manage to light the blowlamp within 10 minutes. Out of these four, three had to deal with a faulty or leaking blowtorch.

Table 8.3

Could or did the caretaker perform the following tasks?				
Blowtorch	Yes		No	
Light blowtorch within 10 minutes?	10	71%	4	29%
Pipe joining				
Filing and smoothing of the ends to be joined	13	93%	1	7%
Dry fitting the two pieces	9	90%	1	10%
Heating the heating plate to the required temperature	14	93%	1	7%
Checking temperature	12	86%	2	14%
Fitting teflon cover	7	100%	0	0%
Holding HDPE to the heating plate until a small rim forms	14	100%	0	0%
Joining HDPE pipe together	14	100%	0	0%

The rest of the test was divided into 7 steps (or 6 if the heating plate had a teflon coating). The completion of each step was noted down. **The number of times a certain step is left out is taken to be a measure of the effectiveness of the training** (more steps left out means training is less effective, the teachers were not able to make the students understand the importance of each step). At the same time it could be an indication of the stages of pipe joining that will be the first to be left out under field conditions. Think of the temperature checking with the thermochrome.

Special attention should be given to the checking of the temperature and the preparation of the pieces of pipe to be joined. This point will be explained later on, but there is question of objective to deal with first.

If the object of training caretakers is to get them as close as possible to the level of professional staff, the use of thermochrome is essential. On the other hand it might be worth considering to omit the thermochrome from the toolbox. The reasoning for this would be that caretakers will only measure their effectiveness in terms of non-leaking joints. In practice it doesn't matter how the connection was made or how many times it had to be redone because of leaks. The use of thermochrome crayons could then be restricted to professional staff, whose chronic shortage of crayons might be alleviated by this. The implication is that caretakers will never be able to reach a professional standard of working. Of course there are numerous possibilities between these two extremes, but the issue should be dealt with. As it is now, thermochrome is short in supply and Dzongkhag staff feel it is waste to supply it to the caretakers when they themselves have none.

Second topic for discussion is the preparation of the pipes for joining. Making the pipes ready for joining is tedious work, but essential for the strength of a joint. Training should concentrate on the need to make the best possible preparations and make clear **why** it is essential to make preparations. With respect to further development of the training, the fabrication of a wooden panel with examples of good joining and bad joining could be considered. The list of most common mistakes made by caretakers could be the basis for such a panel (Table 8.4)

The results of the caretakers' efforts were collected and numbered. After this the pipes were given to plumbers from Monggar and Trashigang dzongkhag for evaluation. Each joint was inspected and given a rating. Remarks were made with regard to the mistakes. For each pipe a mark was given independently by the two plumbers. The final mark is the average of the two. The remarks on the quality of the work were grouped together as shown below in table 8.4.

Table 8.4

Mistakes in pipe joining					
	Plumber 1	Plumber 2	Average*	Total	Percentages
Too hot	3	8	5,5	11	**32.4 %**
Too cold	2	0	1	2	5.9 %
Bad cut	5	6	5,5	11	**32.4 %**
Bad joint	5	0	2,5	5	14.7 %
Unevenly heated	1	4	2,5	5	14.7 %
				34	

*Average = (plumber 1 + plumber 2)/ 2

Table 8.4 shows **two main mistakes: heating plate too hot and bad cut.** At the moment the most practical thing to do would be to pay special attention to these mistakes during the training.

Cleaning the system

For a caretaker, the maintenance of a rural water supply scheme has two complementary parts: cleaning and small repairs. The caretaker is trained to do small repairs; regular cleaning is just as important, but doesn't have the same status. The observations and questions for the caretaker focused not only on the use of tools but on the cleaning of the scheme as well. The researchers went on a tour of the scheme with the caretaker, asking him or her to do what is normally done.

The caretakers were asked to estimate the total time per month they spend on taking care of the scheme. At the same time the researchers were asked to note down how much time it takes to tour the whole scheme. This approach didn't work very well, because most caretakers limit themselves in one way or another when touring the scheme. Some only visit the reservoir, some visit both reservoir and intake. The average time estimate is not very accurate. Although there is a column 'Observed' in table 8.5 below, the figures given here are not always comparable since they suffer from the same problem. To give an indication of the values found, the maximum and the minimum estimation given are listed as well. These figures are only meant to give a rough idea of how much time it takes. Needless to say that it depends very much on the scheme itself (age, state of repair, size, etc.)

Table 8.5

How much time does it take each month to visit and clean the whole scheme?			
	Asked	Observed	
Highest	32	20	hrs.
Lowest	2	1	hrs.
Average	**10hrs50min**	**8hrs30min**	

The highest value of 32 hours per month is based on a tour duration of 8 hours with weekly visits of the scheme (8 * 4). This value is surprising since it would mean that the caretaker is busy with the scheme 3 to 4 days a month, depending on the working hours per day. Omitting the one scheme where the 32 hours were reported, the average drops to 5 hours 55 min work per month (asked) and 3 hrs. 28 min work (observed). These figures bring back some realism into the observations and questions. Cautionary remarks should be made because cleaning of the scheme is influenced by the presence of researchers asking questions about the scheme. In a way the answers are an indication to how much time people **think** they should spend on the scheme. The figures were obtained through interviews and should therefore be considered optimistic. The average of 2.5 times a month cleaning is an optimistic value (table 8.6).

Table 8.6

How often is the scheme cleaned?	
	number of times/month
Highest	4
Lowest	1
Average	2.5

To check the validity of the cleaning frequency, the researchers were asked to give their impression of the cleanliness of the scheme and especially the structures. The results are listed below in table 8.7 and figure 8A.

Figure 8A

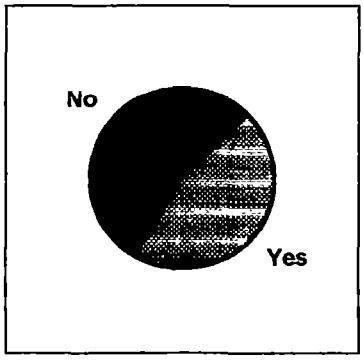


Table 8.7

Does the scheme look well maintained?			
Yes		No	
7	47%	8	53%

About half the schemes look clean and well maintained. The question is whether the time spent on maintenance really makes a difference. Table 8. 8 combines the state of maintenance and the average time spent on cleaning and repairs. Although this study didn't strife to pursue statistically correct data, it might be a hint that the schemes with more time claimed to be spent on maintenance, look better maintained. In other words: **it does help to clean regularly!** The sample was by no means randomly selected or large enough to support firm statements, but the data just give a small indication.

Table 8.8

	Well maintained	Poorly maintained
Average time spent	16.20	7.5

Small repairs

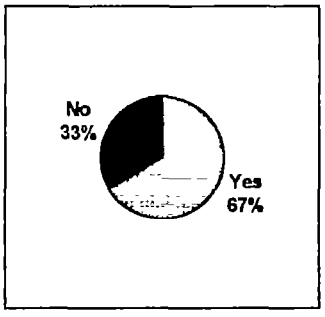
Doing small repairs is the second task of the caretaker. This is the part that gets most attention. There are tools to be had, there is a training included and there might be a possibility for compensation as well. The question arises whether all the training and

effort gone into the caretakers does pay off. Do they actually apply their acquired skills and tools for the benefit of the system? See table 8.9 and figure 8B.

Table 8.9

Did you do any repairs?	
Yes	No
10	5

Figure 8B



Ten out of fifteen caretakers indicate they have performed some kind of repair. The question was more specific **Did you do any repairs last month?** But limiting the answers to this time period only would not have yielded enough data. For that reason any answer about repair was take into account. Even then the answers don't cover more than two years, since the caretakers were only recently trained in their task. The schemes studied were fairly new ones (oldest was from 1988), so there is no reason to expect major problems with these schemes.

Table 8.10

What kind of repairs?		
Pipe joining	7	41 %
Replace faucet	5	29 %
Replace globe valve	2	12 %
Other*	3	18 %

* Includes plastering of a ferrocement tank with cement borrowed from the Department of Roads!

Most of the repairs in table 8.10 concern the joining of pipes (this includes the making of HDPE fittings). It couldn't be verified why the pipe had to be repaired. There is a possibility that these repairs were in fact branch lines for house connections. Despite all this it should be well remembered that before the advent of caretakers' training and the provision of tools, there was no way the villagers could repair their system.

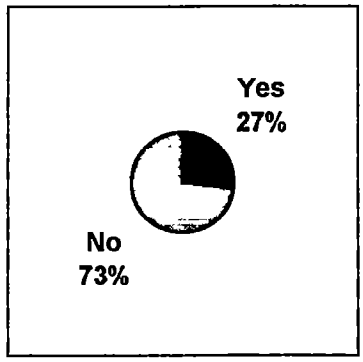
No matter what use is made of the knowledge and the tools acquired, **the capability of the caretaker to repair the scheme is essential for any maintenance policy** to make an impact.
As for the repairs mentioned, the replacement of faucets and globe valves is interesting. Normally, it would be very difficult for a caretaker to obtain these spare parts. Some of these could come from the first set of toolboxes in which a globe valve was provided.

Even with training and tools, caretakers sometimes face **situations they can't handle** (table 8.11 and figure 8C)

Figure 8C

Table 8.11

Are there any problems you can't handle?	
Yes	No
4	11



Most caretakers were in control of the situation, or at least they said so. Four out of fifteen caretakers (27 %) had difficulties they couldn't resolve alone. These problems are listed below in table 8.12.

Table 8.12

List of problems	
tank leaking	2
not all tapstands have faucets	1
reservoir doesn't have a fence	1

Clearly this kind of problems that can't be solved by the caretaker alone. These problems are exactly the type of challenge the Village Maintenance Committee will face in the execution of its task.

Selection of the caretaker

The work of a caretaker is not very time consuming, but still it does come with certain responsibilities. Is the job of caretaker an attractive one? How are caretakers selected within the village? Interviews with the 15 caretakers produced some revealing evidence.

The researchers asked **if the caretaker took the job out of his own will** or not (table 8.13). Most of them said they didn't; only 4 caretakers said they did take the responsibility themselves. Reviewing the data it should be remembered that in Bhutan it is not very customary to volunteer for additional responsibilities. People most often prefer a person of authority (in this case the gup) to appoint someone.

Table 8.13

Did you become caretaker out of you own wish?			
Yes		No	
4	27%	11	73%

This is confirmed by the answers to the next question. The caretakers were invited to describe how and why they were selected. Quite some of them were appointed by the gup or by the village. Only 3 of them gave other reasons for being the caretaker.

Table 8.14

How were you selected?		
Appointed by Gup	5	38 %
Appointed by village	5	38 %
Other	3*	23 %

* Includes such very practical considerations as. 'I was the one living closest to the reservoir tank'. Actually that is a very solid reason for someone to become caretaker.

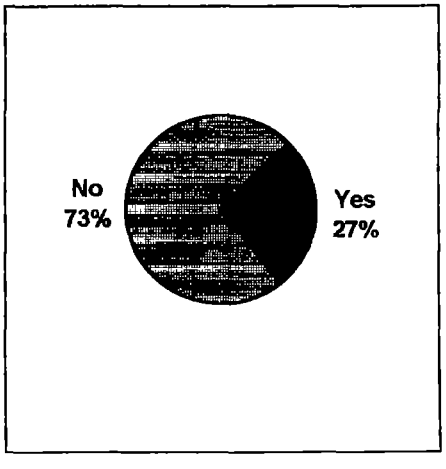
The technical side of being a caretaker is quite well taken care of. As said, caretakers are invited for training, receive tools and are given refresher training. Their capability for maintaining the system has undoubtedly increased. But it's not only the work in itself or the capacity to do it, that determines the effectiveness of the caretaker.

One of the main factors is the compensation for the work. More than technical aptitude the issue of reimbursement for work done for the community determines the willingness of the caretaker to really do the job well. The research revealed that only 4 caretakers received any benefit for their responsibilities. The 11 others didn't receive anything for their work.

Figure 8D

Table 8.15

Do you get compensation for your work?			
Yes		No	
4	27%	11	73%



The four caretakers who were compensated for their work indicated what exactly this wage consisted of. In three cases it was money and in one case an exemption from tax (table 8.16).

Table 8.16

If yes: what do you get?	
10 Nu. / household/ year	2
40 Nu. /household/year	1
exemption from militia duty	1*
exemption from tax	1

* This couldn't be verified The gup denied that there was such an exemption granted

All caretakers were asked in what form they would want compensation (cash, kind or exemption from work/tax) and how much. The answers are listed below in table 8.17. The suggestions were very sensible. Most caretakers suggested to be paid a daily wage corresponding to the time they worked. There would have to be agreement among the villagers that the caretaker is eligible for such a compensation. The level of the daily wage and verification of the time spent should be done by the VMC.

Experience in other areas with the periodic deposits into a fund village has shown that it can cause a lot of problems. These problems mostly occur because the financial knowledge of the average villager is limited, causing confusion over the accounts. Another frequently observed problem is the disappearance of money from the cash box. The temptation to take a loan from the cash box proves to be too great for the treasurer. In most rural water supply schemes the amount of money needed will be limited anyway. Still it isn't a very good way of creating confidence in the committee. Money is best collected on an ad hoc basis for a specific purpose, such as the payment of a daily wage for the caretaker.

A fixed amount to be paid per year also has the disadvantage that it isn't related to the amount of work. In the early years of a scheme, the amount might then be too high and in the later years it could happen that the remuneration is too low compared to the work.

Table 8.17

What would you want for compensation?	
Daily wage according to time taken	6
Anything offered	3*
20/40 Nu. per household per year	2
Same amount as in other places	1

* This includes one respondent who said. 'money or exemption from work'.

Women as caretaker

There is less agreement on the question whether **women could be caretaker** as well. This question was posed during the interviews with the villagers and repeated with the caretakers. Table 8.18 and figure 8E show the answers of villagers.

Figure 8E

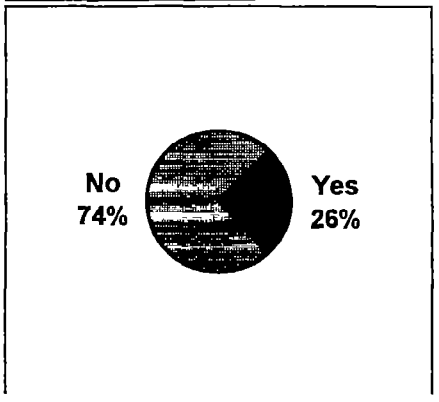


Table 8.18

Interview with villagers	Yes	No
Could a woman be caretaker?	19	55

Figure 8F

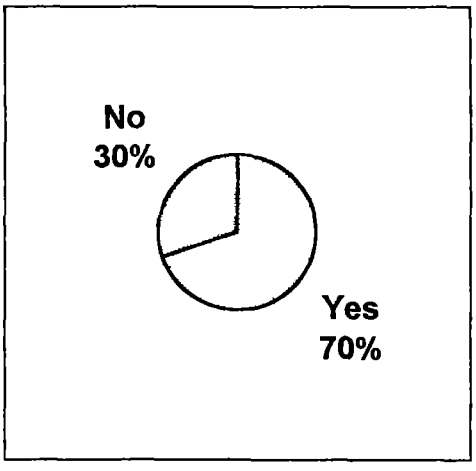


Table 8.19

Interview with caretakers	Yes	No
Could a woman be caretaker?	7	3

The differences are striking. **Compared with average villagers, twice as many caretakers think that women can be caretakers**. This may be related to the fact that caretakers have a better understanding what the work entails. The percentages shift if we take into account the sex of the caretaker, as done in table 8.20. Unfortunately there wasn't time enough to visit more than one female caretaker. Most female caretakers come from one block in Monggar, a days journey from the road. The tight scheduling of the research didn't permit these female caretakers to be visited. The data presented here should therefore be used only as an indication, more extensive coverage of the female caretakers should produce more definite results.

Table 8.20

Can women do the work of a caretaker?				
Category	**Yes**		**No**	
Caretakers	7	70 %	3	30 %
Male caretakers	6	67 %	3	33 %
Female caretakers	1	100%	0	0%

It is encouraging to note that the only female caretaker covered by this research feels confident that she can do the job. Her male counterparts are a bit less convinced, but still more than the average villager.

The question whether women could be caretaker was asked in all villages. Table 8.21 gives a comparison of the answers given in Bazor (the only village with a female caretaker in this research) and the other villages. It is interesting to note that the percentages are almost opposite. Where in schemes other than Bazor 79 % of the respondents states that women can't be caretaker, 71 % of the responses in Bazor indicated that women can indeed be caretaker.

Table 8.21

Can women be caretaker ?	Yes		No		
Bazor	5	71 %	2	29 %	100 %
Other schemes	14	21 %	53	79 %	100 %

In those cases where women were not considered to be capable caretakers, the researchers asked for reasons for this opinion. The villagers' answers are listed below in table 8.22.

Table 8.22

Why not?		
Women can't do the work	21	50 %
Women can't go for training	6	14 %
Women can't clean the tank or intake	4	10 %
Women can't use tools	4	10 %
Women are easily scared	4	10 %
Women are not interested to do the work	2	5 %
Women are not as strong as men	1	2 %

The categories are sometimes very wide ranging, like *Women can't do the work*. This can mean anything; they can be physically unfit to do the work; not trained to do the work; not be prepared to do the work, etc. Other reasons are interesting in that they are

more specific and can be used to asses the problems women would have as caretaker. References made to the use of tools, the strength of women, the possibility of their going for training can help to understand and eliminate fairy tales about being a caretaker.

The best way of persuading people that women can be caretaker is to insist on one female caretaker coming for training. At the same time there is a need for more information on possible difficulties women have when invited for training. If they were invited but didn't show up; why didn't they? Dzongkhags can sometimes have doubts themselves about inviting female caretakers. The research shows the importance of women in the provision of water for the family (see the earlier chapter on *Water Quantity*). As a consequence, women should be encouraged to be caretaker. So it is important to keep repeating the message to have at least one female caretaker, both in the villages and in the Dzongkhag. It's still too early to note any difference in effectiveness of male or female caretakers. The first female caretaker was trained less than one and a half year ago.

Chapter 9 Effectiveness of VMC

Most VMCs were only recently trained or formed and don't have any practical experience in scheme management as yet. In itself this points to the need for additional training and guidance of VMCs. For the research it meant that there was little scope for observation of scheme management by the VMC. Improvements in maintenance and operation will take some time to come about. VMCs are only now being trained to manage their scheme, so it's too early to expect visible results.

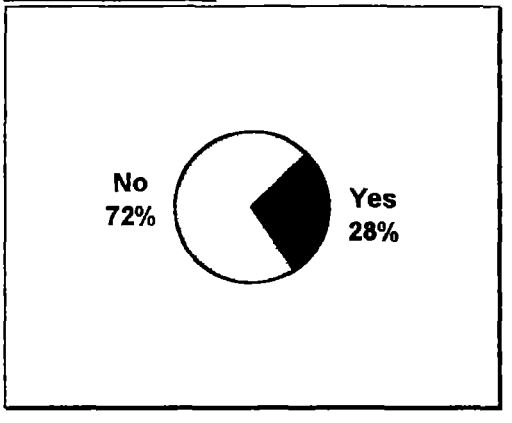
In the chapter on Caretakers there was a clear need to arrange the compensation for the work the caretaker does. In a minority of cases this compensation has been arranged to mutual satisfaction. The others are still waiting for something to come up. It's the most pressing task of the VMCs at this moment to take the lead in this matter.

The number of VMCs visited is limited: only 5. There were more VMCs formed but these schemes were located too far from the research villages. For practical purposes it was better to concentrate on the observations in the research villages and try to get as much information as possible about the VMCs in those villages.

Table 9.1

Is there a VMC?	Yes	No
	16	41

Figure 9A



Compared with the caretaker, the VMCs lead a relatively unknown existence. Officially there is a Committee for all 7 water supply schemes that were built during the VIth 5 year plan and that were included in this study. Yet only 16 of the 57 households (28 %) answered that there was a VMC (table 9.1). Main reason for the unfamiliarity of the VMC could very well be the fact that it is not based on any previous experience of the villages. Caretakers on the other hand have a long history, especially within communities with wetland cultivation.

The inactivity of the VMCs could be another factor contributing to their existence in obscurity. It's not surprising that VMCs have difficulties getting established. There is a lot of time between the first formation and the training. ① The members are initially chosen during the survey , ② the formation is reconfirmed during the construction (most often one year after the survey), ③ after completion of the scheme the members are once more called together for the final inspection (varies from 4 months after start of the construction to one year) and ④ at last three members are called for training. Between the formation during the survey and the call for training there is at least one year lapse, but that can easily become two years.

There is no reason to assume that at all four moments in time the committee consists of the same members. The four phases could be better coordinated by the Public Works Department and Dzongkhag. If there is to be a consistent policy, any change in composition of the VMC should be noted. Training of the VMC should start as soon as possible, even during the survey. The villagers need time to get used to the idea of a committee deciding on scheme management matters. Between the survey and the final inspection there is enough time to do this. If the training of VMC members is done between survey and final inspection, there is no need to ask VMC members to come to attend training at the Dzongkhag Headquarters. This will take some time to be fully effective and in the meantime the training of VMC members will have to be done in a central training (at Gewog or Dzongkhag level).

Table 9.2

Number of members in VMC	
Highest	3
Lowest	1
Average	**2**

The five VMCs that were visited had a varying size (Table 9.2). Naturally it is very difficult to make statements based on only five samples. In practice it would seem that the lack of understanding of the different members' responsibilities keeps the VMCs small. More work on the role of the VMC and its members is definitely a requirement for future training. To do justice to the local situation, it would be preferable to have the users themselves decide who should be in the committee and how many members are needed. The formation of a committee should evolve from the users' realization that they themselves will have to manage the scheme. In the long run the Dzongkhag staff will only play an advisory role. In the meantime there should be training focus both the Dzongkhag staff and the users.

Table 9.3

Could the members define their responsibilities?	
Yes	No
3	2

The above were all quite general statements about the VMC. The research focused as much as possible on indicators for VMC effectiveness (and the effectiveness of the training). One of these indicators was the ability of the members to state their responsibilities (Table 9.3). This could be dependent on the VMC being trained or not. To find out if trained VMCs are better able to define their tasks, the two questions were combined in table 9.4 below.

Table 9.4

	Did the VMC go for training?	
Could VMCs explain their responsibilities?	Yes	No
Yes	2	1
No	2	0

The shaded area in the table is the most interesting part. **Despite the training, 2 VMCs are still not able to say what they are supposed to do.** Even with the limited number of VMCs visited, this is a sign that there should be even more emphasis on the explanation of the tasks of the VMC. At the same time we can't rule out the possibility that there is some confusion about the training: in some cases people referred to the caretakers training when talking about the VMC training. It should be clear however, that training of VMC members is difficult and requires a lot of time both from the trainers and the trainees. There is no fast and easy way to reach the objective of village level management by the VMCs.

Selection of VMC

The selection procedures for a VMC are as important as those for a caretaker. Aptitude and willingness play a vital role in the functioning of the committee. Here, as with the caretakers, VMC members revealed that they were in most cases appointed. It seems that people prefer to be appointed ('forced' is a word commonly used) rather than volunteer (Table 9.5).

Table 9.5

How was the VMC selected?	
Appointed by gup	3
Appointed by village	1
Other	1

One thing is clear: there is no way to force a VMC to do its job properly. The beneficial effects of village level operation and maintenance will only come about if the community itself is convinced that there are benefits indeed. There are always excuses to hide behind. Just to get an impression of the activities, **VMCs were asked what they had done lately** (Table 9.6).

Table 9.6

What were the activities so far?	
No work done until now	2
Repair work	2
Remuneration caretaker	1

The table show that three out of five VMCs claim to have done something since their formation. These contentions are a bit difficult to check, repair work can be done by the caretaker alone and talking about compensation for the caretaker doesn't leave any physical evidence. First part in the strategy to give the VMC more control over the scheme is to make them aware of their responsibilities. The next step would be to work with them and come up with activities related to these responsibilities. Repair work is a very obvious starting point, but there is more than that. The actual repair work is the responsibility of the caretaker. The VMC has to supervise the caretaker. Stimulating the VMCs to take initiatives and guide them in their work is part of the training of VMCs. It should be a continuous process of encouragement and guidance by the Dzongkhag staff.

Figure 9B

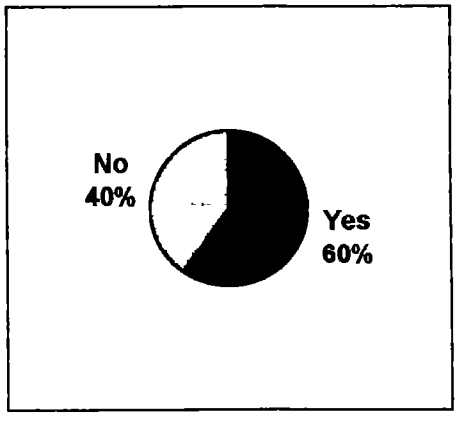


Table 9.7

Did the VMC meet since their formation?		
	Yes	No
	3	2

Three out of five VMCs claim to have gathered for a meeting after formation. One VMC claims to have

met more than once since it started (Table 9.8). The topics said to be discussed during the meetings (Table 9.9) coincide with the ones mentioned under *activities* in Table 9.6

Table 9.8

If Yes: How many times?	
Once	2
More than once	1

VMCs suffer from a slow start, because of their relative newness. It will take more effort to get the committees going than it took to get the caretakers started.

Table 9.9

What were the topics discussed?	
Repair work	1
Remuneration of caretaker	2

Community ownership

VMC members were asked **who owned the scheme**. Ultimately this is the test whether the training given has had any effect. Trained VMC members should be very much aware that the scheme belongs to the village and should therefore be maintained by the villagers.

Table 9.10

Who owns the scheme?		
VMC members		
Government	1*	20 %
Our village	4	80 %

* Still the respondent could state in great detail the responsibilities of the VMC

Table 9.11

Who owns the scheme?		
Villagers		
Government	23	43 %
Our village	26	48 %
Don't know	5	9 %

Figure 9C (VMC members)

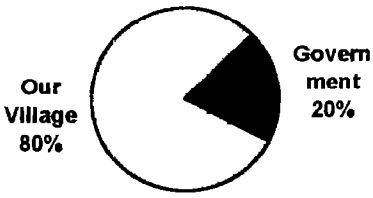
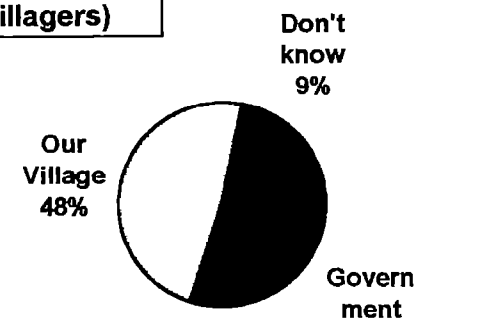


Figure 9D (Villagers)



Despite the one exception among the VMC members, the message of community ownership seems to have struck home (Table 9.10 and figure 9C). A remarkably large portion of the VMC members state that the scheme is village property. **Among the villagers the people who think it is government property about equal those who think it is village owned** (Table 9.11 and figure 9D). One of the first actions for the VMC could be to correct this misconception. If the whole village agree that it the scheme is communally owned, there would be a more solid basis for village based management.

Chapter 10 Conclusions and recommendations

Water quality

The quality of piped water is less contaminated than water from traditional sources, in all but a few cases. Looking at the average contamination, the piped water supply schemes are safe until the tapstand. Due to unknown factors, contamination at the tapstand itself is high.

Traditional sources are extremely variable with regard to water quality. The range of contamination goes from above 500 FC/100 ml to 0 FC/100 ml.

The main difference in villages with piped water and without comes in the quality of water stored for household use. In villages without piped water the average coliform count is 64 FC/100 ml, with piped water this value drops to 7 FC/100 ml.

There are no differences found in storage mediums, cover or type of dipper. In general the practices regarding the storage of water could very well be improved. Efforts should concentrate on covering the storage container, keeping the dipper in a safe place, cleaning the container regularly.

Villages without piped water could be well served by protecting the sources they are presently using. In first instance, springs could be capped, as foreseen in the new UNICEF/RGOB Plan of Operations. But springs are rare in East-Bhutan, so protection of stream sources could be investigated as well.

The plan would be simple: select a number of villages without piped water and test their present source for fecal contamination. Do this over a longer period of time (to be determined together with the DMO or DHSO or the Public Health Lab in Thimphu) to get a clear picture of the water quality. Fence the source and make other improvements such as a platform to put the container on while filling it or a small tank to store water during the night (BPT size) or . Inform people about the need to keep the area clean. Do the same tests again after the improvements. With minimal cost and effort there can be substantial improvements in water quality. Of course this is not meant to be a substitute for piped water, just a possible intermediate solution. Most important part of this plan would be to make people aware of the need to keep their water clean, both the source and the storage.

Water quantity

The amount of waste water is enormous. Even when including such things as washing clothes, watering cattle and the kitchen garden, about 69 liters out of an average pro capita consumption of 123 liters is wasted.

For the functioning of most schemes now, waste is not very detrimental. Most schemes were designed with over estimate population figures which are in turn multiplied with a growth factor for the twenty years the scheme is supposed to last. A conservative estimate would be that present day schemes can serve at least twice the present population.

Waste does become a problem in cases where the source is subject to fluctuations in flow over the year. Or where the flow of the source wasn't measured correctly.

At present there is no water shortage because of waste in villages with piped water. Still, to avoid problems in future there should be more emphasis on closing taps after use. Use of self-closing taps will not solve the problem.

Most of the water is used for cooking and making alcohol, about 77 %. Drinking water comes to a meager 1 %. This coincides with the hypothesis that water is not very often drunk straight from the tap. In general, tea or alcohol are used to quench one's thirst.

Time saving

Time saving is normally a strong argument in favor of providing piped water. In Bhutan this has only a limited effect. From the questionnaires, the average time saving comes to about 30 minutes per day.

Another related observation is the responsibility for water collection. The data show that in the majority of cases (ranging from 70 % to 86 %) women fetch water.

Improved health

From the onset of the research it became clear that it would be impossible to collect information from the basic health units and relate the provision of piped water to any health improvements.

Hygiene practices were found to be about the same in villages with or without water supply. Hand washing, one of the most obvious signs of improved hygiene was taken as a main theme for further study. Surprisingly the use of ashes for washing hands was not very widespread. The respondents often answered that they washed their hands with soap. Observations showed that in the majority of households there was soap, but in half the cases there was no water. The presence of soap in a household doesn't say anything about improved hand washing. Most of the time the same bar of soap is used for washing clothes.
Observed hand washing before meals is very much lower than stated in the interviews. These observations also showed that the use of soap is limited to 30 %, about half only wash their hands with water.

The knowledge of the causes of diarrhea and its spreading is extremely limited. There is serious reason for concern on this issue. On the other hand the ORS

packet was recognized and its use correctly described in all cases. Giving ORS was mentioned only in 13 % of the cases as the cure for diarrhea. No. 1 was going to the BHU, followed by no. 2 take the patient to a lama. Most often more than one type of treatment is sought (e.g. first suck poison, then go to BHU or lama)

The other water related diseases give the same picture as diarrhea, there is very little knowledge on their cause or the way it spreads. The only exception is the case of skin diseases. Here the correct answer is also the largest category of answers.

In the case of food preparation and handling, there were no large differences found between men and women. The hypothesis was that women, being responsible for the food, would have show more sense of hygiene. Data analysis showed that in the best case only 30 % of the respondents wash their hands before eating or preparing food.

Provision of piped water seems to increase the bathing frequency. In villages with an RWS scheme, 55 % wash themselves once a week, compared with 11 % for villages without piped water.

Construction of latrines

A latrine built with local materials cost an average of 579 Nu. Labor cost is the largest part of the investment, some 46 %. Converted into days of labor, a latrine would be an investment of 19 to 28 days, depending on the labor rate. Compared with the average monthly income in Monggar (determined by CSO in 1991), the 579 Nu. is a considerable sum!

Of all latrine owners 32 % expressed their interest in acquiring cement for the latrine, most probably to improve the slab.

Building a latrine was done at the insistence of a government official in 75 % of the cases.

The only reason for not building a latrine was a recently built house. Obviously there is a strong sense that there should be a latrine.

The presence of a latrines is a first condition for latrine use, but doesn't imply that the latrine is used. In that sense it is disappointing that none of the traditional arguments in favor of latrines (privacy, convenience or even hygiene) are mentioned as the most important. Government pressure will eventually lead to 100 % coverage, but unless it is accompanied by intensive hygiene education, there will not be 100 % use.

It is enlightening to note in this respect that 56 % of the respondents don't know if excreta in the open can spread disease.

Use of latrines

Studying the use of latrines must be one of the most difficult parts of any study of health impact. It is an intrusion into a very private domain, one that is not discussed with outsiders.

Due to this privacy, there can only be an indication of possible latrine use. Luckily the answers about latrine use were reasonably reliable (when compared with the observations).

One of the most interesting findings was that observations showed 30 % of the households with a latrine didn't always use it.

Judging by the smell, some 87 % of the households use a latrine (there is not telling how frequently).

Children are told to use a latrine by 43 % of the respondents, but most of them add that their children don't listen. Any active stimulation to use a latrine is not very common.

Effectiveness of (female) caretakers

Effectiveness of the caretaker depends partly on the toolbox. Most toolboxes were still intact, with some minor items missing or used. There were more problems with the blowlamps, 3 out of 15 were leaking.

Caretakers can satisfactorily perform all the necessary steps to join a pipe, but there are still mistakes made. The two most common mistakes are too hot a heating plate and a bad cut. Training on these points could help, but there is still the question of providing thermochrome crayons to caretakers. At present the dzongkhag staff has a shortage of these crayons. It should be considered to leave out the crayons altogether. By trial and error it should be possible for the caretaker to make a good pipe joint.

Cleaning the scheme takes most of the time, but data analysis showed that frequent cleaning has results.

There were repairs done by caretakers, mostly using the materials available in the toolbox. In some cases there were spare parts used from other sources, including cement from the Department of Roads.

Still the question of compensation dominates the discussion with caretakers. Some caretakers get compensated, but most of them get nothing. At their suggestion a daily wage for the time they spend on the maintenance of the scheme would be a reasonable compensation. The advantage is that there doesn't have to be a permanent fund in the village. The money can be collected on a ad hoc basis, whenever needed. This minimizes the chances of misuse of the money.

Women as caretaker is an idea that is more acceptable for caretakers than for 'ordinary' villagers. 70 % of the caretakers say 'Yes, women can be caretaker' as opposed to 74 % of the villagers who say 'No, women can't be caretaker'.

Reasons why women can't be caretaker are not very specific. Most respondents say simply 'Women can't do the work'.

Effectiveness of VMC

The data on which this chapter leans are very thin. Only 5 VMCs were interviewed. Given the fact that training of VMCs only started very recently, there is little practical experience with scheme management. Most of the members can only relate to problems in their schemes by referring to the examples given during the training. They haven't had the experience themselves yet. So basically there are no solid conclusions to be drawn here, only indications for future study.

However, one clear sign of improvement is already visible: VMC members state in 80 % of the cases that the scheme is owned by the villages, while only 48 % of the villagers say so. Community management starts with a feeling of community ownership, even if it's only by the VMC members.

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Appendix A Forms

Main questionnaire

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Instructions: Questions to be asked are in bold print and numbered,
Instructions for that particular question are in smaller print
Observations are preceded by the word: *OBSERVE* in Italic print.
Instructions for observations are in smaller print. Observations to be made are repeated in the observations checklist.

Name of interviewer ..... Date .....

General Household Information

Village ..... Block .....
Dzongkhag ..... Household No. (corresponding to sketch) ..

1. Name of person answering the questions (the total should be equal numbers men and women)
Name ..... Age ..... Sex Male / Female
Was there anyone else present during the interview? Yes / No Name .....

2. List all members residing in the household

Sl No.	Name	No. of classes attended	Sex (M/F)	Age	Literate (Y/N)

3. Is there a radio in the household? OBSERVE Yes / No

4. Where is the nearest primary school/extended classroom?

5. Is there a traditional healer in your village/block? Yes / No

0 Pawo
0 Pamo
0 Phadjo
0 Bloodsucker
0 Other, specify

6. Is there a village voluntary health worker in your village?
0 No
0 Yes, sex: 0 Male
0 Female

7. Where is the nearest BHU/Hospital? .....

Theme no. 1: Water use

Quality of water

8. How many water sources are there for this household?
Include tapstand used by the household and traditional sources
List all these sources and indicate them on the map of the village
Possible sources are public tapstand, private pipeline (not from public tapstand), river or irrigation channel, spring, pond, other (give details)
Note down for each of these sources:
9. Are they protected? Yes / No
10. Where are they located? Indicate on the map of the village
11. Do they give water throughout the year? Yes / No
12. Does anybody own these sources? If yes, note down the name. .....
13. Which source do you think gives the nicest drinking water? Explain.

14. What is the main source of water for use in the household? (If from scheme note 'tapstand')

15. Are there any other sources that are not used? Yes / No

Why are they not used? .....

16. Before the water supply scheme was constructed, where did you go for water?

Name of the source and the distance in minutes walk from the household

17. Is the water you used before better than the water from the tapstand?

0 No

0 Yes, explain .....

18. Do you think that the water from the tapstand is safe for drinking and cooking?

0 Yes

0 No, explain .....

19. What are the main benefits the water scheme has brought you?

0 Less work to bring water in the house

0 Better water quality

0 Other (explain)

20. How regular is the supply of water?

0 There is always water at the tap

0 Not very regular, it depends on .....

Quantity of water

---

21. In which vessels do you keep the drinking water in the house?

OBSERVE Ask to see all the containers, measure them and count them

	Size	Nos.	No. with Cover	No. without cover
Copper drang vessel	...	...	...	...
Bamboo container	...	...	...	...
Wooden container	...	...	...	...
Plastic container	...	...	...	...
20 liter tin (oilcan)	...	...	...	...
Aluminium pot	...	...	...	...
Other (describe)	...	...	...	...

22. When do you normally wash clothes:

	In summer		In winter
0	Once a week	0	Once a week
0	Once every two weeks	0	Once every two weeks
0	Once a months	0	Once a months
0	Other (specify)	0	Other (specify)

23. Do you have a kitchen garden? **OBSERVE AS WELL.** See what vegetables grow in the kitchen garden and note them down

0 No

0 Yes, water is collected from ...

24. Do you have cattle? **OBSERVE AS WELL.** See how many cows and pigs there are and note them down

0 No

0 Yes, water is collected from ...

25. How much time is needed each day for water collection? (Add drinking water, kitchen garden, cattle, laundry etc.)

..... hours per day **OBSERVE AS WELL.** See observations checklist for details on this.

Time saving

If water is carried to the house:

26. How many trips are made per day? ..... trips

27. Who usually carries the water? OBSERVE. See observation checklist

0 Women/girls in the house
0 Men/boys in the house
0 All members carry water

28. How long does it take to fetch one load of water? ...minutes, container of ... liters
(roundtrip for each of the sources used, including the time to fill the container)

OBSERVE. Ask for demonstration for each of the sources, measure the volume of the container used in each trip.

29. How is it carried?

0 On the back
0 In the hand
0 On a horse/mule
0 Other (specify)

30. How is water taken out of the container(s) in your house?
With a .....

OBSERVE Is this dipper kept out of reach of animals (dogs, chickens, cats, etc)? Yes / No

---

Improved health

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31. Do your hands get cleaner after washing them with ashes and water? Yes / No
32. Do your hands get cleaner after washing with water only? Yes / No
33. Do your hands get cleaner after washing them with rice? Yes / No
34. Do you believe that the water you use can cause any disease? Yes / No
If yes, what kind of disease could be caused by your water supply?

35. Do you treat the drinking water in your house? OBSERVE. See observations checklist for details

0 No
0 Yes, we always boil
0 Yes, we sometimes boil, when ...
0 Yes, we .... (describe)

36. Does your water supply get polluted? Yes / No
If yes, where:

0 In the source
0 While collecting/carrying it
0 In the vessels outside the house
0 While taking it out of the vessels and using it
0 Other (explain)

37. What is the most common illness in your village?

0 Diarrhoea
0 Dysentery
0 Worms
0 Typhoid
0 Hepatitis/Jaundice
0 Cholera
0 Other (explain)

38. How do you think that the following diseases spread from one person to another:

0 Diarrhoea .....
0 Dysentery .....
0 Worms .....
0 Typhoid .....
0 Hepatitis/Jaundice .....
0 Skin disease .....
0 Eye disease .....

39. Which diseases do you think can be spread through

0 Flies .....
0 Dirty food .....
0 Polluted water .....
0 Pigs in/near the house .....
0 Not washing hands after going to the latrine .....

0 Not washing hands before handling food .....

40. What is the main cause of diarrhoea?

0 Evil spirits
0 Bad weather
0 Bad food
0 Polluted water
0 Unclean surroundings
0 Don't know

41. What do you do if your child has bad diarrhoea?

0 Give oral rehydration solution (including home made)
0 Take to lama/gomchen
0 Take to BHU/hospital/dispensary
0 Ask Village Health Worker for help

42. When do you wash your hands? OBSERVE. Do people wash their hands before meals? Is there water in the house for washing hands? More than one answer possible for this question

0 When my hands are dirty
0 After defecation
0 Before eating food
0 Other (explain)

43. What do you use for handwashing? OBSERVE AS WELL.

0 Mud
0 Ash
0 Water only
0 Soap
0 Rice (before meals)

44. In the past month, has any health worker visited your household?

0 Nobody visited
0 Yes, the Village Health Worker visited
0 Yes, the Health Assistant visited from BHU/dispensary/hospital
0 Other (explain)

45. If a health worker visited what did he/she discuss with you?

0 Illness among household members
0 Hygiene and health
0 The need to build a latrine
0 Other topics (describe)

46. How often do your children have a bath? OBSERVE

0 Never
0 Sometimes
0 Once a week
0 Every day

47. Where do they have their bath?

0 In the kitchen near the stove
0 On the veranda
0 Near a tapstand
0 Elsewhere (specify)

48. How often do you wash yourself completely?

0 Never, because
0 Sometimes, because
0 Once a week, because
0 Every day, because

49. Do you wash your hands before preparing or eating food? OBSERVE

0 Never
0 Sometimes
0 At least once a day
0 Always
0 Other

50. How often do you sweep the rooms in your house? OBSERVE

0 Daily
0 Several times a day
0 Several times a week

0 Other

51. When do you throw the dust out? OBSERVE

0 Immediately
0 Daily
0 Other

52. What do you do with your garbage? OBSERVE

0 Burn it
0 Give it to animals
0 Throw outside
0 Other

53. Has anybody explained to you the importance of clean and safe drinking water?

0 No
0 Yes, who? .....
what did you learn? .....

54. Has anybody explained to you the importance of disposing of urine and excreta in a safe way?

0 No
0 Yes, who? .....
what did you learn? .....

55. Show a packet of oral rehydration solution. Ask: What is this?

Note down the answer

60. Do you tell you child to go to a particular place to urinate and/or defecate? OBSERVE.

Are there any signs or did you see any of the children defecating in the open outside? If yes, how frequently? See observations checklist.

0 No
0 Yes, to
- 0 latrine
- 0 jungle
- 0 just outside
- 0 cowshed
- 0 elsewhere (specify)

Theme no. 2: Latrine use and construction

Latrine use

61. Does your household have a latrine?

0 We have no household latrine
0 We have a simple pit latrine
0 We have an improved latrine (pour-flush, VIDP)

62. If yes: who cleans the latrine? OBSERVE.

0 Nobody cleans
0 Everybody cleans
0 It is cleaned by ....

63. How often is it cleaned?

0 Every day
0 Every week
0 Every month
0 Other, ...

64. How is it cleaned?

0 With broom
0 With water and broom
0 Otherwise, ...

65. Who uses the latrine? OBSERVE. Try to find out by seeing who goes to the latrine and when

0 Everybody, always
0 Everybody, sometimes
0 Only adults, always
0 Only adults, sometimes
0 Only women, always
0 Only women, sometimes

0 Only children, always
0 Only children, sometimes
0 Only sick people
0 Other (explain)

66. If no: where does your family defecate now? OBSERVE. Look for signs of adults defecating outside the latrine

0 In the fields
0 In the forest
0 Along a stream
0 Somewhere around the house

67. What is generally used for cleaning after defecation? OBSERVE. For example: If people say they use paper ask them to show the paper, if they say they use water, look for a small container in the latrine Or see what people carry when going to the latrine

0 Leaves
0 Stones/sticks
0 Anything available
0 Water
0 Paper
0 Nothing
0 Other (explain)

OBSERVE. Go and see the latrine:

Can flies reach the excreta?	Yes / No
Does the latrine smell bad?	Yes / No
Is the latrine clean?	Yes / No
Is the pit covered completely? (no very large gaps)	Yes / No
Is there a door or screen in the latrine?	Yes / No

Latrine Construction

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68. In your opinion, what materials do you need to build a household latrine?

Available in or near the village Not available in or near the village

69. Only for those households that don't have a latrine: Why has your household never built a latrine?

0 We don't need a latrine
0 We don't know how to build a latrine
0 We are not interested to build a latrine
0 We don't like to use a latrine
0 Nobody ever told us to build a latrine
0 Other (explain)

70. Do you believe that any disease can spread from excreta which is out in the open?

0 I don't believe this spreads any disease
0 I don't know
0 It spreads the following disease(s)

71. What was the main reason for you to build the latrine? Tick one only!

0 For the convenience of my family
0 Because a Government official told me to build one (what official and when)
0 Because I need one for my guests
0 For reasons of health/hygiene

Theme no. 3: Community capability for Operation and maintenance

---

Effectiveness of training

---

72. Do you have a Village Maintenance Committee for your water scheme? Yes/No

73. If yes, could you please list the members:

74. Who owns the water supply scheme?

0 Government
0 Our village
0 No one

0 Don't know

Effectiveness of (women) caretakers

---

75. Who is the villager responsible for keeping the water supply running?

0 Mr./Mrs. .....
0 There is no one
0 We are all equally responsible
0 The Dzongkhag is responsible

76. If there is no one: Who could be the villager to look after the water scheme?

0 Mr./Mrs. .....
0 The gup should appoint someone
0 The whole village should discuss and appoint one
0 Other (explain)

77. Do you think, that a woman from the village could be responsible to look after the water scheme?

0 Yes, this is possible
0 No, this is not possible
0 Don't know

78. If you feel a woman could not be the water scheme caretaker, what are the reasons?

0 No woman is interested
0 Women cannot do the work
0 Women cannot go for training

Observations checklist

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Name of observer .....

General Household Information

Village ..... Block .....
Dzongkhag ..... Household No.
(give a number corresponding with the number on the main questionnaire for this household)

Theme no. 1: Water use

Quality of water

9. Are the sources fenced/protected? Indicate for all sources, use backside if necessary Yes / No
11. Do they all give water now? Yes / No
14. Where does the household get most of its water? Indicate this source on the map and write down its name on the map and below. If from scheme, note down 'tapstand'
20. Was there supply of water from the tap during your visit to the household?
0 There was water at the tap
0 Other (explain)

Quantity of water

21. In which vessels do the people store the drinking water in the house?
Ask to see all the containers, measure them and count them

	Size	Nos.	No. with Cover	No. without cover
Copper drang vessel	...	...	...	...
Bamboo container	...	...	...	...
Wooden container	...	...	...	...
Plastic container	...	...	...	...
20 liter tin (oilcan)	...	...	...	...
Aluminium pot	...	...	...	...
Other (describe)	...	...	...	...

22. Was there any clothes washing by someone from this household during your stay/visit? Who washed the clothes and how many times during your stay?
.... washed clothes ..... times during my stay
(can be more than one time/person, if there is not enough space continue on the backside of this page)
23. Does the household have a kitchen garden? See what vegetables grow in the kitchen garden and note them down
0 No
0 Yes, water is collected from ...
24. Does the household have cattle? See how many cows and pigs there are and note them down
0 No
0 Yes, water is collected from ...
25. Ask how many containers of water of a known volume are used per day. With the observation on how much time it takes to collect the water from the source, the total time for water collection per day can be estimated.
Water collection takes ..... hours per day

Time saving

If water is carried to the house:

27. Who did you see carrying the water to this household?

0 Women/girls in the house
0 Men/boys in the house
0 All members carry water

28. How long does it take to fetch one load of water? ...minutes for container of ... liters
(roundtrip for each of the sources used, including the time to fill the container)
Ask for demonstration for each of the sources, measure the volume of the container used in each trip

29. How is it carried?

0 On the back
0 In the hand
0 On a horse/mule
0 Other (specify)

30. How is water taken out of the storage container in the house?

With a .....

Is this dipper kept out of reach of animals (dogs, chickens, cats, etc)? Yes / No

Improved health

35. Did you see the household treat the drinking water?

0 No
0 Yes, they were boiling water during my visit
0 Yes, they .... (describe)

42. When did you see the members of the household wash their hands?

0 After defecation
0 Before eating food
0 I didn't see them washing their hands
0 Other (explain)

Is there water IN the house for washing hands? Yes / No

43. What do they use for handwashing?

0 Mud
0 Ash
0 Water only
0 Soap

Is there soap in the house? **Yes / No**

44. During the time you were there did any health worker visit the household?

0 Nobody visited
0 Yes, the Village Health Worker visited
0 Yes, the Health Assistant visited from BHU/dispensary/hospital
0 Other (explain)

45. If a health worker visited what did he/she discuss?

0 Illness among household members
0 Hygiene and health
0 The need to build a latrine
0 Other topics (describe)

46. How often do the children have a bath?

0 Never
0 Sometimes
0 Once a week
0 Every day

47. Where do they have their bath?

0 In the kitchen near the stove
0 On the veranda
0 At the tapstand
0 Elsewhere (specify)

49. Did you see people wash their hands before preparing or eating food?

0 Never
0 Sometimes
0 At least once a day
0 Always
0 Other

60. Are there any signs or did you see any of the children defecating in the open outside? If yes, how frequently (how many stools)?

0 No
0 Yes, where? .....

Theme no. 2: Latrine use and construction

Latrine use

61. Does the household have a latrine?

0 They have no household latrine
0 They have a simple pit latrine
0 They have an improved latrine (pour-flush, VIDP)

62. If yes: who did you see cleaning the latrine?

63. How often did you see it being cleaned?

64. How is it cleaned?

65. Who did you see using the latrine?

0 Everybody, always
0 Everybody, sometimes
0 Only adults, always
0 Only adults, sometimes
0 Only women, always
0 Only women, sometimes
0 Only children, always
0 Only children, sometimes
0 Only sick people
0 Other (explain)

66. If no: Are there any signs of adults defecating outside the latrine.

0 No
0 Yes
0 In the fields
0 In the forest
0 Along a stream
0 Somewhere around the house
0 Other (explain)

67. What is generally used for cleaning after defecation? OBSERVE. For example: if people say they use paper ask them to show the paper, if they say they use water, look for a small container in the latrine Or see what people carry when going to the latrine.

0 Leaves
0 Stones/sticks
0 Anything available
0 Water
0 Paper
0 Nothing
0 Other (explain)

OBSERVE. Go and see the latrine:

Is the latrine in use?	Yes / No
Can flies reach the excreta?	Yes / No
Does the latrine smell bad?	Yes / No
Is the latrine clean?	Yes / No
Is the pit covered completely?	Yes / No
Is there a door/curtain in the latrine?	Yes / No

Main questionnaire (Villages without piped water supply)

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Instructions: Questions to be asked are in bold print and numbered,
Instructions for that particular question are in smaller print
Observations are preceded by the word: *OBSERVE* in Italic print.
Instructions for observations are in smaller print. Observations to be made are repeated in the observations checklist.

Name of interviewer ..... Date .....

General Household Information

Village ..... Block .....
Dzongkhag ..... Household No. (corresponding to sketch) ..

1. Name of person answering the questions (the total should be equal numbers men and women)
Name ..... Age ..... Sex Male / Female
Was there anyone else present during the interview? Yes / No

2. List all members residing in the household

Sl No.	Name	No. of classes attended	Sex	Age (M/F)	Literate (Y/N)

3. Is there a radio in the household? OBSERVE Yes / No

4. Where is the nearest primary school/extended classroom?
.....

5. Is there a traditional healer in your village? Yes / No

0	Pawo	village
0	Pamo	village
0	Phadjo	village
0	Bloodsucker	village
0	Other, specify	

6. Is there a village voluntary health worker in your village?

0	No		
0	Yes, sex:	0	Male
		0	Female

7. Where is the nearest BHU/Hospital? .....

Theme no. 1: Water use

Quality of water

8. How many water sources are there for this village?
List all these sources and indicate them on the map of the village
Possible sources are: private pipeline, river or irrigation channel, spring, pond, other (give details)
Note down for each of these sources:

9. Are they protected? Yes / No
10. Where are they located? Indicate on the map of the village
11. Do they give water throughout the year? Yes / No
12. Does anybody own these sources? If yes, note down the name. .....
13. Which source do you think gives the nicest drinking water? Explain.
.....
14. What is the main source of water for use in the household?
15. Are there any other sources that are not used? Yes / No
Why are they not used? .....

16. Do you think that the water from the source you use is safe for drinking and cooking?

0 Yes
0 No, explain .....

Quantity of water

---

17. In which vessels do you store the drinking water in the house?

OBSERVE Ask to see all the containers, measure them and count them

	Size	Nos.	No. with Cover	No. without cover
Copper drang vessel	...	...	...	...
Bamboo container	...	...	...	...
Wooden container	...	...	...	...
Plastic container	...	...	...	...
20 liter tin (oilcan)	...	...	...	...
Aluminium pot	...	...	...	...
Other (describe)	...	...	...	...

18. When do you normally wash clothes:

	In summer		In winter
0	Once a week	0	Once a week
0	Once every two weeks	0	Once every two weeks
0	Once a months	0	Once a months
0	Other (specify)	0	Other (specify)

19. Do you have a kitchen garden? OBSERVE AS WELL. See what vegetables grow in the kitchen garden and note them down

0 No
0 Yes, water is collected from ...

20. Do you have cattle? OBSERVE AS WELL. See how many cows and pigs there are and note them down

0 No
0 Yes, water is collected from ...

21. How much time is needed each day for water collection? (Add drinking water, kitchen garden, cattle, laundry etc.)

..... hours per day OBSERVE AS WELL. See observations checklist for details on this.

Time saving

If water is carried to the house:

22. How many trips are made per day? ..... trips

23. Who usually carries the water? OBSERVE. See observation checklist

0 Women/girls in the house
0 Men/boys in the house
0 All members carry water

24. How long does it take to fetch one load of water? .....minutes

(roundtrip for each of the sources used, including the time to fill the container)

OBSERVE. Ask for demonstration for each of the sources, measure the volume of the container used in each trip

25. How is it carried?

0 On the back
0 In the hand
0 On a horse/mule
0 Other (specify)

26. How is water taken out of the storage container in your house?

With a .....

OBSERVE Is this dipper kept out of reach of animals (dogs, chickens, cats, etc)? Yes / No

Improved health

27. Do your hands get cleaner after washing them with ashes and water? Yes / No
28. Do your hands get cleaner after washing with water only? Yes / No
29. Do your hands get cleaner after washing them with rice? Yes / No
30. Do you believe that the water you use can cause any disease? Yes / No
If yes, what kind of disease could be caused by your water?
31. Do you treat the drinking water in your house? OBSERVE. See observations checklist for details
0 No
0 Yes, we always boil
0 Yes, we sometimes boil
0 Yes, we .... (describe)
32. Does your water supply get polluted? Yes / No
If yes, where:
0 In the source
0 While collecting/carrying it
0 In the vessels outside the house
0 While taking it out of the vessels and using it
0 Other (explain)
33. What is the most common illness in your village?
0 Diarrhoea
0 Dysentery
0 Worms
0 Typhoid
0 Hepatitis/Jaundice
0 Cholera
0 Other (explain)
34. How do you think that the following diseases spread from one person to another:
0 Diarrhoea .....
0 Dysentery .....
0 Worms .....
0 Typhoid .....
0 Hepatitis/Jaundice .....
0 Skin disease .....
0 Eye disease .....
35. Which diseases do you think can be spread through
0 Flies .....
0 Dirty food .....
0 Polluted water .....
0 Pigs in/near the house .....
0 Not washing hands after going to the latrine .....
0 Not washing hands before handling food .....
36. What is the main cause of diarrhoea?
0 Evil spirits
0 Bad weather
0 Bad food
0 Polluted water
0 Unclean surroundings
0 Don't know
37. What do you do if your child has bad diarrhoea?
0 Give oral rehydration solution (including home made)
0 Take to lama/gomchen
0 Take to BHU/hospital/dispensary
0 Ask Village Health Worker for help
38. When do you wash your hands? OBSERVE. Do people wash their hands before meals? Is there water in the house for washing hands? More than one answer possible for this question.
0 When my hands are dirty

0 After defecation
0 Before eating food
0 Other (explain)

39. What do you use for handwashing? OBSERVE AS WELL.

0 Mud
0 Ash
0 Water only
0 Soap
0 Rice (before meals)

40. In the past month, has any health worker visited your household?

0 Nobody visited
0 Yes, the Village Health Worker visited
0 Yes, the Health Assistant visited from BHU/dispensary/hospital
0 Other (explain)

41. If a health worker visited what did he/she discuss with you?

0 Illness among household members
0 Hygiene and health
0 The need to build a latrine
0 Other topics (describe)

42. How often do your children have a bath? OBSERVE

0 Never
0 Sometimes
0 Once a week
0 Every day

43. Where do they have their bath?

0 In the kitchen near the stove
0 On the veranda
0 Elsewhere (specify)

44. How often do you wash yourself completely?

0 Never, because
0 Sometimes, because
0 Once a week, because
0 Every day, because

45. Do you wash your hands before preparing or eating food? OBSERVE

0 Never
0 Sometimes
0 At least once a day
0 Always
0 Other

46. How often do you sweep the rooms in your house? OBSERVE

0 Daily
0 Several times a week
0 Several times a month
0 Other

47. When do you throw the dust out? OBSERVE

0 Immediately
0 Daily
0 Other

48. What do you do with your garbage? OBSERVE

0 Burn it
0 Give it to animals
0 Throw outside
0 Other

49. Has anybody explained to you the importance of clean and safe drinking water?

0 No
0 Yes, who? .....
what did you learn? .....

50. Has anybody explained to you the importance of disposing of urine and excreta in a safe way?

0 No
0 Yes, who? .....
what did you learn? .....

51. Show a packet of oral rehydration solution. Ask: What is this?

Note down the answer

56. Do you tell you child to go to a particular place to urinate and/or defecate? OBSERVE. Are there any signs or did you see any of the children defecating in the open outside? If yes, how frequently? See observations checklist.

0 No
0 Yes, to
- 0 latrine
- 0 jungle
- 0 just outside
- 0 cowshed
- 0 elsewhere (specify)

Theme no. 2: Latrine use and construction

Latrine use

57. Does your household have a latrine?

0 We have no household latrine
0 We have a simple, open latrine
0 We have a simple pit latrine
0 We have an improved latrine (pour-flush, VIDP)

58. If yes: who cleans the latrine? OBSERVE.

0 Nobody cleans
0 Everybody cleans
0 It is cleaned by ....

59. How often is it cleaned?

0 Every day
0 Every week
0 Every month
0 Other, ...

60. How is it cleaned?

0 With broom
0 With water and broom
0 Otherwise, ...

61. Who uses the latrine? OBSERVE. Try to find out by seeing who goes to the latrine and when

0 Everybody, always
0 Everybody, sometimes
0 Only adults, always
0 Only adults, sometimes
0 Only women, always
0 Only women, sometimes
0 Only children, always
0 Only children, sometimes
0 Only sick people
0 Other (explain)

62. If no: where does your family defecate now? OBSERVE. Look for signs of adults defecating outside the latrine.

0 In the fields
0 In the forest
0 Along a stream
0 Somewhere around the house

63. What is generally used for cleaning after defecation? OBSERVE. For example: if people say they use paper ask them to show the paper, if they say they use water, look for a small container in the latrine. Or see what people carry when going to the latrine

0 Leaves

0 Stones/sticks
0 Anything available
0 Water
0 Paper
0 Nothing
0 Other (explain)

OBSERVE. Go and see the latrine:

Can flies reach the excreta?	Yes/No
Does the latrine smell bad?	Yes/No
Is the latrine clean?	Yes/No
Is the pit covered completely? (no very large gaps)	Yes/No

Latrine Construction

---

64. In your opinion, what materials do you need to build a household latrine?

Available in or near the village Not available in or near the village

65. Only for those households that don't have a latrine: Why has your household never built a latrine?

0 We don't need a latrine
0 We don't know how to build a latrine
0 We are not interested to build a latrine
0 We don't like to use a latrine
0 Nobody ever told us to build a latrine
0 Other (explain)

66. Do you believe that any disease can spread form excreta which is out in the open?

0 I don't believe this spreads any disease
0 I don't know
0 It spreads the following disease(s)

67. What was the main reason for you to build the latrine?

0 For the convenience of my family
0 Because a Government official told me to build one (what official and when)
0 Because I need one for my guests
0 For reasons of health/hygiene

Observations checklist (Villages without piped water supply)

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Name of observer .....

General Household Information

Village ..... Block .....
Dzongkhag ..... Household No.
(give a number corresponding with the number on the main questionnaire for this household)

3. Is there a radio in the house? Yes / No

Theme no. 1: Water use

Quality of water

9. Are the sources fenced/protected? **Indicate for all sources, use backside if necessary** Yes / No
11. Do they all give water now? Yes / No
14. Where does the household get most of its water? Indicate this source on the map and write down its name on the map and below.

Quantity of water

17. In which vessels do the people store the drinking water in the house?
Ask to see all the containers, measure them and count them

	Size	Nos.	No. with Cover	No. without cover
Copper drang vessel	...	...	...	...
Bamboo container	...	...	...	...
Wooden container	...	...	...	...
Plastic container	...	...	...	...
20 liter tin (oilcan)	...	...	...	...
Aluminium pot ...	...	...	...	...
Other (describe)	...	...	...	...

18. Was there any clothes washing by someone from this household during your stay/visit? Who washed the clothes and how many times during your stay?
.... washed clothes ..... times during my stay
(can be more than one time/person, if there is not enough space continue on the backside of this page)

19. Does the household have a kitchen garden? See what vegetables grow in the kitchen garden and note them down
0 No
0 Yes, water is collected from ...

20. Does the household have cattle? See how many cows and pigs there are and note them down
0 No
0 Yes, water is collected from ...

21. Ask how many containers of water of a known volume are used per day. With the observation on how much time it takes to collect the water from the source, the total time for water collection per day can be estimated.
Water collection takes ..... hours per day

Time saving

If water is carried to the house:

23. Who did you see carrying the water to this household?

0 Women/girls in the house
0 Men/boys in the house
0 All members carry water

24. How long does it take to fetch one load of water? .....minutes

(roundtrip for each of the sources used, including the time to fill the container, give size of container)
Ask for demonstration for each of the sources, measure the volume of the container used in each trip

25. How is it carried?

0 On the back
0 In the hand
0 On a horse/mule
0 Other (specify)

29. How is water taken out of the storage container in the house?

With a .....

Is this dipper kept out of reach of animals (dogs, chickens, cats, etc)? Yes / No

---

Improved health

---

31. Did you see the household treat the drinking water?

0 No
0 Yes, they always boil
0 Yes, they sometimes boil
0 Yes, they .... (describe)

38. When did you see the members of the household wash their hands?

0 After defecation
0 Before eating food
0 Other (explain)

Is there water IN the house for washing hands? Yes / No

39. What do they use for handwashing?

0 Mud
0 Ash
0 Water only
0 Soap

Is there soap in the house? Yes / No

40. During the time you were there did any health worker visit the household?

0 Nobody visited
0 Yes, the Village Health Worker visited
0 Yes, the Health Assistant visited from BHU/dispensary/hospital
0 Other (explain)

41. If a health worker visited what did he/she discuss?

0 Illness among household members
0 Hygiene and health
0 The need to build a latrine
0 Other topics (describe)

42. How often do the children have a bath?

0 Never
0 Sometimes
0 Once a week
0 Every day

43. Where do they have their bath?

0 In the kitchen near the stove
0 On the veranda
0 At the tapstand
0 Elsewhere (specify)

45. Did you see people wash their hands before preparing or eating food?

0 Never
0 Sometimes
0 At least once a day
0 Always
0 Other

46. How often did you see someone sweep the rooms in the house?

0 Daily
0 Several times a week
0 Other

47. When did you see the dust being thrown out?

0 Immediately
0 Daily
0 Other

48. What did you observe people doing with their garbage?

0 Burn it
0 Give it to animals
0 Throw outside
0 Other

56. Are there any signs or did you see any of the children defecating in the open outside? If yes, how frequently (how many stools)?

0 No
0 Yes, where? .....

Theme no. 2: Latrine use and construction

Latrine use

57. Does the household have a latrine?

0 They have no household latrine
0 They have a simple, open latrine
0 They have a simple pit latrine
0 They have an improved latrine (pour-flush, VIDP)

58. If yes: who did you see cleaning the latrine?

59. How often did you see it being cleaned?

60. How is it cleaned?

61. Who did you see using the latrine?

0 Everybody, always
0 Everybody, sometimes
0 Only adults, always
0 Only adults, sometimes
0 Only women, always
0 Only women, sometimes
0 Only children, always
0 Only children, sometimes
0 Only sick people
0 Other (explain)

62. If no: Are there any signs of adults defecating outside the latrine.

0 No
0 Yes
0 In the fields
0 In the forest
0 Along a stream
0 Somewhere around the house
0 Other (explain)

63. What is generally used for cleaning after defecation? OBSERVE. For example: if people say they use paper ask them to show the paper, if they say they use water, look for a small container in the latrine Or see what people carry when going to the latrine.

0 Leaves

0 Stones/sticks
0 Anything available
0 Water
0 Paper
0 Nothing
0 Other (explain)

OBSERVE. Go and see the latrine:

Can flies reach the excreta?	Yes / No
Does the latrine smell bad?	Yes / No
Is the latrine clean?	Yes / No
Is the pit covered completely?	Yes / No
Is there a door/curtain in the latrine?	Yes / No

Symptoms of diseases

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Short descriptions of the diseases mentioned in the main questionnaire.
(from David Werner's "Where there is no doctor")

Dysentery

Many healthy people have amoebas (parasites that can only be seen with a microscope) without becoming sick. However, amoebas are a common cause of severe diarrhoea or dysentery (diarrhoea with blood) - especially in persons already weakened by other sickness or poor nutrition. Less commonly, amoebas cause painful, dangerous abscesses in the liver.
Typical amoebic dysentery consists of:

* diarrhoea that comes and goes - sometimes alternating with constipation
* cramps in the belly and a need to have frequent bowel movements, even with little or nothing - or just mucus - comes out
* many loose (but usually not watery) stools with lots of mucus, sometimes stained with blood
* in severe cases, much blood; the person may be very weak and ill
* usually there is no fever

Prevention: Make and use latrines, protect the source of drinking water, and follow the guidelines of cleanliness. Eating well and avoiding fatigue and drunkenness are also important in preventing amoebic dysentery.

Typhoid

Typhoid fever is an infection of the gut that affects the whole body. It is spread from faeces-to-mouth in contaminated food and water and often comes in epidemics (many people sick at once). Of the different infections sometimes called 'the fever', typhoid is one of the most dangerous.
Signs:
First week:

* It begins like a cold or flu.
* Headache and sore throat
* The fever rises a little more each day until reaches 40^0 or more.
* Pulse is often relatively slow for the amount of fever present. Take the pulse and temperature every half hour. **If the pulse gets slower when the fever goes up, the person probably has typhoid.**
* Sometimes there is vomiting, diarrhoea, or constipation.

Second week:

* High fever, pulse relatively slow
* A few pink spots may appear on the body
* Trembling
* Delirium (person does not think clearly or makes sense)
* Weakness, weight loss, dehydration.

Third week:

* If there are no complications, the fever and other symptoms slowly go away.

Prevention of typhoid:

* To prevent typhoid, care must be taken to avoid contamination of water and food by human faeces. Make and use latrines. Be sure latrines are a safe distance away from where people get drinking water.
* Cases of typhoid often appear after a flood or other disaster, and special care must be taken with cleanliness at these times. Be sure drinking water is clean. If there are cases of typhoid in your village, all drinking water should be boiled. Look for the causes of contaminated water or food.
* To avoid the spread of typhoid, a person who has the disease should stay in a separate room. No one else should eat or drink from the dishes he uses. His stools should be burned or buried in deep holes. Persons who care for him should wash their hands right afterwards.

* After recovering from typhoid, some persons still carry the disease and can spread it to others. For this reason anyone who has had typhoid should be extra careful with personal cleanliness and should not work in restaurants or where food is handled.

Hepatitis/Jaundice

Hepatitis is a virus infection that harms the liver. Even though in some places people call it 'the fever', hepatitis often causes little or no rise in temperature. The disease is usually mild in small children and more serious in older persons.

Signs:

* Patient does not want to eat or smoke. Often goes days without eating anything
* Sometimes there is pain on the right side near the liver
* May have fever
* After a few days, the eyes turn yellow
* Sight or smell of food may cause vomiting
* The urine turns the colour of Coca-Cola and the stools become whitish

In general the person is very sick for 2 weeks and remains very week for 1 to 3 months after.

Prevention:

* The hepatitis virus passes from the stool of one person to the mouth of another by way of contaminated water or food. To prevent others from getting sick, it is very important to bury or burn the sick person's stools and to keep him very clean. The person providing care should wash his hands well after each time he goes near the sick person.
* Small children often have hepatitis without any signs of sickness, but they can spread the disease to others.

Cholera

* 'Rice water' stools are a sign of cholera. In countries where this dangerous disease occurs, cholera often comes in epidemics (striking many people at once) and is usually worse in older children and adults. Dehydration is extreme, especially if there is vomiting also.

Water quality samples form

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Village Name:				
Gewog:				
Place taken	Sl. No. (Label)	Date	Time	Result (FC/ml)

Recording form water meter readings

RWSS Impact Study Monggar-Trashigang Dzongkhag July-September 1993

Village Name				
Tapstand no.				
Date		Time	Reading	Remarks
	morning			
	evening			
	morning			
	evening			

Recording form tapstand observations

RWSS Impact Study Monggar-Trashigang Dzongkhag July-September 1993

Village name:					
Tapstand no.					
Date:					
Time	Person* age & sex	Household No.**	Amount (liters)	Container type	Purpose /use

* Use the following codes:

Female Adult	FA
Male Adult	MA
Female Child	FC
Male Child	MC

** Give all the households using the tapstand a number and indicate these numbers on the map of the village.

Household water use

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993
Form for recording water use in one household

Household Number :
Record Keeper :

Date	Total Volume of Containers used	Number of trips made

Personal hygiene observation form

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Village Name:						
Household No.:						
Date	Meal	Method of handwashing				
		No washing	Rice	Water only	Water & Ashes	Water & Soap
	Breakf.					
	Lunch					
	Dinner					
	Breakf.					
	Lunch					
	Dinner					

Additional questions for village caretaker

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

Name: **Scheme:**

1. Did you want to become caretaker out of your own wish?
0 Yes, because .....
0 No, please explain how you were selected.

2. Were you ever invited for a caretakers training?
0 Yes
0 No

3. If yes, did you go?
0 Yes, I went
0 No, I didn't go, because .....

4. What did you learn at this training? Please explain

5. Were there any female caretakers present during the training? Yes / No

6. If yes, do you think they did the same work as the men? Explain

7. Can women do the work of a caretaker? Yes / No
If no, why not? Explain.
because,.....

8. How much time does the work take you per month? OBSERVE During your tour of the scheme together with the caretaker, ask him/her to do the cleaning of the intake, reservoir etc. and record the time needed to do this (including the time spent walking).
It takes me .....per month
OBSERVATION: The total tour of the scheme including the cleaning took ..... hours.

9. How many times a month do you go around the scheme to clean it?
OBSERVATION: Does it look like the scheme is regularly cleaned? Yes / No

10. Did you do any repairs in the last few months? Yes / No
(Go to the places and record the state it is in)
Yes, I repaired the following things: .....

11. Do you have any problems with the scheme that you can't solve? Yes / No

12. If yes, what are they? Explain.

13. Do you get any compensation for your work? Yes / No

14. If yes, how much do you get? I get .....

15. If no, how much do you think you should get as compensation?
I feel I should get .....
OBSERVATION Ask for demonstration of tools

16. Blowlamp
OBSERVATION: Does the caretaker get the blowlamp properly lighted within 10 minutes?
Yes / No

17. Joining HDPE pipe
OBSERVATION: Give the caretaker a piece of HDPE pipe to join in your presence.
Observe the following steps and indicate whether they were performed:
1. Filing and smoothing of the ends to be joined Yes / No
2. Dry fitting the two pieces Yes / No
3. Heating the heating plate to required temperature Yes / No
(heating plate with long handle can be heated in fire as well) Yes / No
4. Checking temperature with thermochrome crayon Yes / No
5. Fitting teflon cover (for heating plate with long handle) Yes / No
6. Holding HDPE to the heating plate until a small rim forms Yes / No
7. Joining HDPE pipe together Yes / No

18. Check the tools in the toolbox (see list of tools), list those missing and see if all are in good condition.

List of tools in caretakers toolbox

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

In all toolboxes:

1.	Measuring tape 3 meter	1 No.
2.	Thermochrome crayon	2 Nos.
3.	Hacksaw frame	1 No.
4.	Hacksaw blades	10 Nos.
5.	Flat file	1 No.
6.	Halfround file	1 No.
7.	Hemp	1 Bundle
8.	Heating plate (green or with long handle)	1 No.
9.	Blowtorch	1 No.
10.	Pipe joining compound	1 Tin
11.	Pliers	1 No.
12.	Pipe wrench	2 Nos.
13.	Adjustable wrench	1 No.

In some toolboxes:

14.	Stop cock 1/2"	1 No.
15.	Teflon cover (only for heating plate with long handle)	1 No.
16.	Hammer	1 No.
17.	Wire brush	1 No.
18.	Paint brush	1 No.

Reference table HDPE pipe welding

Name of scheme	Name of caretaker	Sex of caretaker	Sl.No.
Yadi Lakhang	-	m	1
Yekhar	-	m	2
Darjeeling	-	m	3
Thragome	Pempa	m	4
Rongtong	Sangye	m	5
Risadung	Tenzin	m	6
Tongsing	Wangchuk	m	7
Bazor	-	f	8
Bazor	-	m	9
Tongsing	Tashi	m	10
Risadung	Cheten Wangchuk	m	11
Fiskhang	Pema	m	12
Doyen Gonpa	Tashi Phuntsho	m	13
Jonla	Yedham Chetten	m	14
Tongling Khatoe	Gyeltshen	m	15

Responsibilities of caretaker

1. Regular inspection of the rural water supply scheme.
2. Keep the VMC informed of the condition of the scheme.
3. Do minor repairs.
4. Inform the VMC in case of major repairs.
5. Inform the VMC if voluntary labour is required.
6. Store and use the tools, spare parts and other materials properly.
7. Inform the VMC of:
   - -every inspection of the scheme;
   - -the repair work done;
   - -the spare parts and materials used;
   - -any damage of tools.
8. Inform the VMC if sparee parts or other materials have to be purchased.

Discussion questions for VMC

Impact study Rural Water Supply and Sanitation
Monggar and Trashigang, July-September 1993

1. List the members of the Village Maintenance Committee and their function

Name	Function
.....	.....
.....	.....

2. Ask each member to explain his/her responsibilities

Chairman .....
Secretary .....
Treasurer .....
Member(s) .....

3. Ask the members to explain how they were selected to become VMC members.

.....

4. Ask the members to give a summary of their activities until now.

.....

5. How many times did they meet since formation of the committee? .... times

6. If they met, what were the topics that were discussed during the meetings?

.....

7. Ask the committee members who owns the scheme, they should come up with a group answer

0 Government owns the scheme
0 Village owns the scheme
0 Nobody owns the scheme
0 Other (Explain)

8. Did some of the members attend the training for VMC members? Yes / No

9. If yes, please ask them to explain what they learned.

.....

Responsibilities of VMC

1. Keep record of:
   - -the inspection dates of the scheme;
   - -the repair work done;
   - -the spare parts and materials used;
   - -damage of tools;
   - -the voluntary labour mobilized.
2. Collect and handover the remuneration for the caretaker.
3. Collect and manage money for spare parts/materials if needed.
4. Inform the Dzongkhag Headquarters in case of major repair.
5. Organize voluntary labour if needed.
6. Act as intermediary in case of disputes between the beneficiaries regarding the water supply scheme.
7. Supervise and guide the caretaker.

Appendix B Data

General

Age of respondent		
-20	1	1,4%
20-30	14	18,9%
30-40	21	28,4%
40-50	16	21,6%
50-60	14	18,9%
60+	8	10,8%
	74	100,0%

Sex of respondent		Other person present (number of cases)
Male	31	7
Female	43	6

Someone else present	Yes	13	Male	3
	No	61	Female	7

Average age household members	Average	Total (no. of persons)
number (=avg no. of male household members)	3,20	237
Male	15,70	
number (=avg no. of female household members)	3,47	257
Female	15,31	
number (=average number of persons per household)	6,49	480
Total	15,53	

Age distribution	Male	Female
-20	137	138
20-30	23	42
30-40	23	37
40-50	20	18
50-60	19	13
60+	15	9
Total	237	257

Literacy household members	
Male	54
Female	26

Local healer	Yes	58	78,4%
	No	16	21,6%
Type of local healer	Bloodsucker	35	60,3%
	Phadjo	9	15,5%
	Other (Not specified)	14	24,1%

Presence of VVHW		Absolute	Percentage
	Yes	45	60,8%
	No	29	39,2%
Sex of VVHW		Absolute	Percentage
	Male	18	40%
	Female	27	60%

Chapter 2

	Water Quality Tests RWS schemes		
		FC/100 ML	Average
Source RWS	Tongsing	2	
	Yekhar	4	
	Yadi Lakhang	2	4
	Darjeeling	0	
	Radhi Pangthang	16	
	Zangbari	2	
Intake RWS	Radhi Pangthang	22	
	Yekhar	8	
	Yadi Lakhang	6	8
	Tongsing	0	
	Zangbari	2	
Reservoir RWS	Radhi Pangthang	14	
	Yekhar	0	
	Yadi Lakhang	24	8
	Tongsing	2	
	Zangbari	0	
BPT	Radhi Pangthang	6	6

Water Quality Tests Tapstands		
		FC/100 ML
Radhi Pangthang	Tapstand 3	8
	Tapstand 7	12
	Tapstand 10	8
Darjeeling	Tapstand 1	30
	Tapstand 2	5
	Tapstand 3	18
	Tapstand 4	28
Tongsing	Tapstand 2	4
	Tapstand 3	0
	Tapstand 4	2
	Tapstand 6	2
Yekhar	Tapstand 1	0
	Tapstand 2	200
Yadi Lakhang	Tapstand 5	60

	Tapstand 6	160
Yekhar	Tapstand 2	50
Zangbari	Tapstand 13	0
	Tapstand 17	2
	Tapstand 16	0
	Average	31

Water Quality Tests Traditional Sources		FC/100 ML
Yonphu Pam	Rethongor spring	520
	Lungnadang spring	16
	Zangray spring	6
	Dungsampa spring	66
	Rimchang pond	240
Tongsing	Rimong	0
	Mani Daza	0
	Kharshing Patpa	2
Darjeeling	Reetsangwang	56
	Chimongwoong	34
Yakpogang	Borongonpa	106
	Khesingree	10
	Macong Rhemong	26
	Banchenmo	6
	Dorkhasing	20
Zangbari	Zangbariyeng (Golshingri)	102
	Korkhangri	2
	Spring (unnamed)	0
Average		67

Water Quality at Household level		
Radhi Pangthang	Household 5	0
	Household 16	0
	Household 17	0
Yekhar	Household 1	0
	Household 2	0
	Household 3	4
Yadi Lakhang	Household 6	0
	Household 7	0
Yekhar	Household 3	20
Tongsing	Household 4A	22
	Household 4B	2
	Household 2	2
	Household 3	10
	Household 6	4
Darjeeling	Household 1	50
	Household 2	0

	Household 3	6
	Household 4	0
	Household 5	4
	Household 7	16
Zangbari	Household 13	6
	Household 18	0
	Household 14	0
	Household 15	16
	Household 17	0
Yonphu Pam	Household 13A	200
	Household 12A	22
	Household 11A	0
	Household 8	100
Yakpogang	Household 17	150
	Household 20	30
	Household 25	32
	Household 22	14
	Household 43	30
With RWS scheme	Average	7
Without RWS scheme	Average	64
	Average	22

Type of container	Type (Totals)	Size (Average)	With cover (%)
Bamboo	3	1,9	0,0
Wooden	14	6,7	8 6
Plastic (jerrycan)	71	9,5	56,0
Oil can	1	6,0	0,0
Aluminium (metal)	54	14,1	42.5
Average	143	8,4	45,0

Dipper protected?	Yes	No
Observed	25	49

Source not used	45					
	Dirty	Far	Irregular	Not enough	Other	
Reason for not using	11	23	4	5	2	45
Percentage	24,4%	51,1%	8,9%	11,1%	4,4%	

Average number of **available sources**	3,96
Number of protected traditional sources	0
Number of piped water supply sources protected	48

	Tapstand	Other
Preferred source of drinking water	52	22
Main source of drinking water	55	24
	Tapstand	Other
Main source # preferred source	8	0
Main source = preferred source	52	19
Number of households without RWS	18	

	Always water	Percentage
Reliability of traditional sources	48	64,9%

	Always water	Irregular	Insufficient	Often blocks
Reliability of tap	41	10	2	4
	71,9%	17,5%	3,5%	7,0%
With RWS scheme (VIth plan)		7	2	

	Same	Other
Source used before RWS scheme	13	61
Households with RWS	13	43

Provisions to bring water closer to the homes		
	Channel	No provisions
Yakpogang	28	14
Yonphu Pam	13	8

	Yes	No
Quality of old source better than new scheme?	0	74

	Yes	No
Can the water you use spread disease?	9	65
With RWS scheme	7	
With RWS scheme (VIth plan)	2	

Quality of tapwater good for drinking	Yes	No
	67	7
With RWS	55	1
Without RWS	12	6

Chapter 3

	Water Meter readings summary						
Village	Tap	No of HH	No. of Persons	No. of days	Total use	Per day	Per person/day
Darjeeling	1	1	4	9	9001,3	1000,144	250
	2	1	4	9	11152,6	1239,178	310
	5	4	18	9	16757,9	1861,989	103
	7	1	5	10	4454,1	445,41	89
Yadi Lakhang	1	2	18	7	7599	1085,571	60

	3	1	10	7	2359,9	337,1286	34
Yekhar	1	1	11	10	13640,4	1364,04	124
Tongsing	2	1	6	10	12719,7	1271,97	212
	3	1	8	10	3495	349,5	44
	4	3	14	10	18218,3	1821,83	130
Bazor	8	1	1	8	4282,4	535,3	535
	9	1	5	8	1392,1	174,0125	35
	10	2	8	8	1088,8	136,1	17
	12	3	17	8	1278,3	159,7875	9
Zangbari	13	1	7	12	8849,1	737,425	105
	14	2	10	12	7295	607,9167	61
	16	1	7	12	4092,6	341,05	49
Radhi Pangthang	4	4	21	11	16315,6	1483,236	71
	6	2	16	11	13853,6	1259,418	79
	7	1	7	11	10514,1	955,8273	137
Totals	20 tap-stands	34 house-holds	197	192	168359,8		
Average						858	123

	Water collection							
Village	HH No.	No. of persons	Female Adult	Female child	Male child	Male adult	Total	LPPD
Radi Pangthang	4	21	8	1	4	2	120	5,7
Darjeeling	2	4	7			1	50,5	12,6
Bazor	26,27,28, 29	30	16	2		4	225,5	7,5
	26,27,28, 29		11	1		8	168	5,6
Yekhar	1,2	11	8	2	3	6	209	19
	1,2		13	6	4	2	227,5	20,7
Tongsing	8A,8B	10	7	0	3		84	8,4
	10A,10B	14	3	6			60	4,3
Zangbari	13	7	7	1		5	182	26
	14,15	10	7	2	2	2	157	15,7
	15 hh.	107	87	21	16	30	Average	Average
							148,35	12,55
	Percentages		56,5	13,6	10,4	19,5		
			Total female		Total male			
			70,10%		29,90%			

	Household water use observations						
Village	House-hold No.	No. of persons	Average no of trips	Total volume	No. of observation days	LPD	LPPD
Radhi Pangthang	9	4	1,9	190	10	19	4,8
Darjeeling	2	4	6,4	699	10	69,9	17,5

	15	5	5	607,5	9	67,5	13,5
Bazor	29	8	8,6	946	10	94,6	11,8
Yekhar	1	5	13,8	1660	12	138,3	27,7
Yonphu Pam	4	10	2,3	310	7	44,3	4,4
	5	14	2,6	350	8	43,8	3,1
Yakpogang	35	8	0,8	149	9	16,6	2,1
			2	295	9	32,6	4,1
	43	13	4,9	577	10	57,7	4,4
Tongsing	7	6	5,9	707	8	88,4	14,7
	3	7	8,4	474	8	59,3	8,5
Zangbari	13	7	9,9	1652	12	137,7	19,7
Totals	12 house-holds	91 persons		8617	122		
Average			6	663	51	67	10
With RWS scheme	8 house-holds		7,5	867		84	15
Without RWS scheme	4 house-holds		2,5	336		39	4

Calculated time spent on water collection from the answers to the questionnaires				
	With RWS scheme		**Without RWS scheme**	
	Asked	Observed	Asked	Observed
Time taken for water collection (minutes)	16,44	13,61	22,83	22,89
Number of trips made per day	6,39		4,06	
Size of container (liters)	11,37	11,76	15	11,82
Time taken for one round trip (minutes)	2,8	2,5	7,2	7,3

	With RWS scheme	
	Asked	Observed
Time spent for water collection (AVG)	16,44	13,61
	n=48	n=44
Number of trips made per day (AVG)	6,39	
	n=51	

Time spent on water collection for villages without water supply scheme					
Total size of containers	Number of trips	Amount collected	Time taken for one load	Total time	Total consumption
108	2	29	1,5	3	58
23	2	12	1	2	24
25	4	5	1	4	20
99	4	25	2,5	10	62,5
114	2	27	1	2	54
25					pipe connected
43	2	24	1	2	48
30	2	10	1	2	20
23	2	16	1	2	32
85	2	28	2,5	5	56

39	3	14	1	3	42
27	2	9	1,5	3	18
25	3	5	1	3	15
15	4	15	1	4	60
15	4	15	2	8	60
12	5	12	2	10	60
10	5	10	2	10	50
60	4	25	3	12	100
12	5	12	10	50	60
7	10	4	2	20	40
12	2	8	1	2	16
18	6	18	1	6	108
60	5	30	1	5	150
38	4	30	70	280	120
33	4	30	70	280	120
20	4	20	75	300	80

	Tapstand observations 2: Use of water											
Village	Fodder	Tea	Lunch	Drinking	Cooking	Washing	Dish-washing	Dinner	Offering	Break-fast	Ara	Storage
Radi Pangthang		16		8	25	31	25	15				
Darjeeling							14	7	1,5	7	21	
Bazor			15		63	15			2,5	17,5	112,5	
	7				113				4	11	23	10
Yekhar					58	38	10			79	24	
					126	5			2,5	14	80	
Tongsing	15		22		10						37	
	16				33	5						6
Zangbari	14				14	42				14	56	42
	20,5		20,5					20,5		20,5	75	
	72,5	16	57,5	8	442	136	49	42,5	10,5	163	428,5	58
Average	5	1	4	1	29	9	3	3	1	11	29	4
Percentage	5%	1%	4%	1%	30%	9%	3%	3%	1%	11%	29%	4%

	Where do you bathe your children?	
Near a tapstand	44	**59 %**
Inside the house	18	24 %
No answer	2	3 %
Other (outside the house)	10	14 %
Total	74	

	Yes	No
Kitchen garden present?	69	5

	Asked			Observed		
	Tapstand	Rain	Other	Tapstand	Rain	Other
How is the garden watered?	30	18	21	21	14	34

	Yes		No	
Is there cattle?	72		2	
	Cows	Pigs	Horses	
Number of heads of cattle (AVG)	5,32	1,21	0,29	6,82
Total number of cattle	383	87	21	
	Asked		Observed	
	Tapstand	Other	Tapstand	Other
How is the cattle watered?	41	33	36	38

	Summer		Winter		
Clothes washing frequency	Asked		Observed	Asked	
Once a week	31	45,6%	0	25	42,4%
Once every two weeks	16	23,5%	0	13	22,0%
Once a month	13	19,1%	0	14	23,7%
Other	8	11,8%	0	7	11,9%
	68			59	

Chapter 4 Time Saving

See tables for chapter 3

Chapter 5 Improved Health

	Yes	No
Do hands get cleaner after washing with ashes	34	40
Do hands get cleaner after washing with water only	30	44
Do hands get cleaner after washing with rice	18	56

When do you wash your hands?	Asked		Observed	
When my hands are dirty	39	58,2%	11	31,4%
Before eating food	28	41,8%	24	68,6%
	67		35	

What do you use for hand washing?		Asked	Observed
	soap	53	45
	ashes	5	2
	water only	14	12

	Observed	
	Yes	No
Is there soap in the house?	60	14
Is there water in the house for handwashing?	39	35

	Personal Hygiene							
Name of scheme/village	HH No	No. of Persons	No washing	Rice	Water only	Water & Ashes	Water & Soap	Total
Tongsing	4B		4	3	13	0	1	21
	6		1	0	9	0	8	18

Bazor	29	8	7	1	10	0	3	21
Yekhar	1	5	5	2	8	0	4	19
Darjeeling	2	4	3	0	24	0	17	44
Zangbari	13	7	18	0	17	0	12	47
Yakpogang	30	7	0	0	11	0	10	21
	43	13	4	0	11	0	6	21
Yonphu Pam	4	10	1	0	10	0	10	21
	5	14	0	0	13	0	6	19
		68	43	6	126	0	77	252
With RWS scheme			38	6	81	0	45	170
Without RWS scheme			5	0	45	0	32	82

List of most common illnesses	1	2	3	4	5	
Diarrhoea	58	1	0	1	0	60
Cholera	0	2	0	1	0	3
Worms	6	11	17	0	0	34
Headache	5	6	9	6	6	32
Dysentery	0	27	0	0	0	27
Cough & cold	1	1	2	2	1	7
Cholera	0	2	0	1	0	3
Typhoid	0	0	8	9	0	17
Fever	0	0	1	0	0	1
Eye disease	1	0	0	2	2	5
Skin rashes	0	1	2	2	1	6
Tuberculosis	0	0	0	1	1	2
Hepatitis	0	0	2	1	2	5
Pain in the joints	0	0	2	1	0	3
Vomiting	0	1	1	4	1	7
Stomach pain	0	3	2	0	0	5
Other	3	0	2	3	2	10
Total	75	57	51	38	21	242

Main cause of diarrhoea		
Seasonal	8	8,1%
Evil spirits	15	15,2%
Bad weather	12	12,1%
Bad food	22	22,2%
U nclean surroundings	17	17,2%
Polluted water	13	13,1%
Poison	12	12,1%
	99	

How is diarrhoea spread?		
Living together	10	14,1%
Seasonal	5	7,0%
Eating together	3	4,2%
No proper latrine use	2	2,8%
Don't know	37	52,1%
Doesn't spread	6	8,5%
Flies	5	7,0%
Same latrine	2	2,8%

Dirty water	1	1,4%
	71	

What is the cure for diarrhoea?	
take to BHU	36
take to lama	11
suck poison	7
give ORS	9
Ask VHW for help	9

How is dysentry spread?		
Seasonal	2	3,4%
Don't know	39	66,1%
Living in the same house	6	10,2%
Using same latrine	2	3,4%
No proper latrine	2	3,4%
Doesn't spread	5	8,5%
Unclean food	2	3,4%
Bad water	1	1,7%
	59	

How are worms spread?		
Sweets	5	7,9%
Don't know	43	68,3%
Seasonal	2	3,2%
Doesn't spread	10	15,9%
Bad food	2	3,2%
No latrine use	1	1,6%
	63	

How is typhoid spread?		
Seasonal	2	3,1%
Don't know	49	75,4%
Doesn't spread	7	10,8%
Contact with patient	5	7,7%
Flies	2	3,1%
	65	

How is hepatitis spread?		
Don't know	45	77,6%
Seasonal	3	5,2%
Contact with patient	6	10,3%
Doesn't spread	4	6,9%
	58	

How are skin diseases spread?		
Living together	8	8,9%
Sleeping together	13	14,4%
Through clothes	41	45,6%
Body contact	13	14,4%
Don't know	13	14,4%
Doesn't spread	2	2,2%
	90	

How are eye diseases spread?		
By looking/seeing	48	65 %
Seasonal	4	5,5%
Don' t know	10	13,7%
Living together	6	8,2%
Bacteria	2	2,7%
Same blood group	1	1,4%
Clothes	1	1,4%
Using same towel	1	1,4%
	73	

Diseases spread by flies		
Don't know	23	29,9%
Can't name	3	3,9%
Diarrhoea	17	22,1%
All diseases	16	20,8%
Vomiting	7	9,1%
Worms	3	3,9%
Other	6	7,8%
No diseases	2	2,6%
	77	

Diseases spread by dirty food		
Vomiting	20	23,8%
Stomach pain	24	28,6%
Diarrhoea	15	17,9%
Don't know	16	19,0%
Headache	7	8,3%
Cholera	1	1,2%
Fever	1	1,2%
	84	

Diseases spread by polluted water		
Diarrhoea	14	19,2%
Don't know	24	32,9%
Cholera	3	4,1%
Stomach ache	11	15,1%
Throat pain	9	12,3%
Vomiting	6	8,2%
TB, cough	6	8,2%
	73	

Diseases spread by pigs in/near the house		
Headache	21	38,2%
Don't know	26	47,3%
Place for mosquito/flies breeding	3	5,5%
Any disease	3	5,5%
Cholera	1	1,8%
Epilepsy	1	1,8%
	55	

Diseases spread by not washing hands after latrine use		
Diarrhoea	11	18,6%
Don't know	45	76,3%
Doesn' spread any disease	3	5,1%
	59	

Diseases spread by not washing hands before handling food		
Don't know	40	58,8%
Diarrhoea	10	14,7%
Stomach ache	8	11,8%
Vomiting	5	7,4%
Any disease	1	1,5%
Cholera	1	1,5%
No disease	3	4,4%
	68	

		Asked			Observed		
		Men	Women		Men	Women	
Do you wash hands before eating food?	sometimes	12 5 %	20.8 %	33.3 %	21.4 %	16.1 %	37.5 %
	always	20.8 %	30.6 %	51.4 %	8.9 %	10 7 %6	19.6 %
	never	6.9 %	2.7 %	9.6 %	1.8 %	3.6 %	5 4 %
	at least once a day	1 4 %	4.2 %	5.6 %	1.8 %	1 8 %	3.6 %
	not seen				10.7 %	23.2 %	33.9 %
		41.6 %	58.3 %	100 %	44.6 %	55.4 %	100 %
Do you wash hands before preparing food?	sometimes	31 8 %	18.2 %		20 7 %	17.2 %	
	always	9.1 %	22.7 %	31.8 %	20 7 %	31 %	51.7 %
	never	9.1 %	0	9.1 %	0	3.4 %	3 4 %
	once a day	0	9.1 %	9.1 %	0	6.9 %	6.9 %
	not seen				0	0	
		50 %	50 %		41 4 %	58.5 %	

How often do you take a bath?	With RWS		Without RWS	
Once a week	29	55 %	2	11 %
Once a month	2	4 %	0	
Sometimes	21	40 %	16	89 %
Every day	1	2 %	0	

	Asked			Observed		
How often do your children take a bath?	Every day	18	26 %	Every day	10	29 %
	Once a week	29	43 %	Once a week	6	17 %
	Sometimes	21	31 %	Sometimes	11	31 %
				Children look dirty	8	23 %

Chapter 6 Latrine construction

Building materials used for local latrine				
Description		No.	Rate	Total
Bazor	22			
labour		14 days	20/day	280
stones		4 days	20/day	80
shingles		60 pairs	2/pair	120
plank		5*4 ft	3/ft	60
door shingles		3 * 4 ft	3/ft	36
beams		14 ft	3/ft	42
				618
Household	24			
labour		15 days	15/day	225
stones		8 days	15/day	120
bamboo mat		1 no.	20 pp	20
door beams		14 ft.	3/ft.	42
beams		3 days	15/day	45
shingles		1 day	15/day	15
bamboo splitting		6 nos.	1 pp	6
				473
Household	28			
labour		16 days	10/day	160
stones		6 days	10/day	60
beams		9 * 5 ft	1/ft	45
shingles		30 pairs	2/pair	60
plank		2 * 5 ft	1/ft	10
floor planks		3 * 5 ft	1/ft	15
				350
Household	29			
labour		20 days	10/day	200
stones		5 days	10/day	50
shingles		30 pairs	2/pair	60
beams		14 * 5 ft	1/ft	70
door		4 nos oil tin	5/tin	20
				400
Household	27			
labour		20 days	25/day	500
stones		5 days	25/day	125
shingles		20 pair	3/pair	60
floor planks		3 nos.	5 pp	15
pillar		12 * 5 ft	3/ft	180
planks		9 * 5 ft	3/ft	135
beams		18 ft	3/ft	54
poles		5 ft	3/ft	15
				1084

Yonphu Pam	4			
labour	men	6	30/day	180
	women	7	25/day	175
rest not specified				
	5			
labour	men	5	30/day	150
	women	3	25/day	75
rest not specified				
	8			
labour	men	8	30/day	240
	women	2	25/day	50
rest not specified				
	3			
labour	men	3	30/day	90
	women	2	25/day	50
rest not specified				
	17			
labour	men	7	30/day	210
	women	4	25/day	100
rest not specified				

Radhi Pangthang	19			
labour		10 days	20/day	200
oil tin sheets		20 nos	1/tin	20
door planks		8 ft	4/ft	32
bamboo mats		2 loads	65/load	130
nails		1 kg	25/kg	25
				407
	17			
labour		12 days	10/day	120
shingles		50 pairs	4/pair	200
sack			10/sack	10
stones		2 days	10/day	20
door beams		14 ft	4/ft	56
planks		5 * 5 ft	4/ft	100
				506
	1			
labour		20 days	20/day	400
stones		20 days	20/day	400
shingles		40 pairs	5/pair	200
beams		2 days	20/day	40
sack (door)		1	10/sack	10
				1050
	11			
labour		5 days	30/day	150
oil tin sheets		25 nos.	8/sheet	200

shingles		20 pairs	7/pair	140
door shingles		4 pairs	7/pair	28
poles		4 nos.	10/pole	40
plank		5 * 5 ft	5/ft	125
beams		2 nos	10/beam	20
				703

Yadi Lakhang	1			
labour		10 days	20/day	200
shingles		50 pairs	4/pair	200
stones		3 piles	30/pile	90
floor plank		5 * 6 ft	3	90
shingles for door		4 pairs	4/pair	16
pole		15 ft	*	10
				606
	2			
labour		30 days	20/day	600
stones		5 days	20/day	100
floor plank		12 ft	3/ft	36
floor beams		14 ft	3/ft	42
shingles		50 pair	4/pair	200
shingles for door		3 pair	4/pair	12
				990
	3			
labour		14	20/day	280
stones		2 piles	30/pile	60
bamboo mat		1 pc	30/pc	30
floor plank		7 * 3 ft	3/ft	63
door beam		14 ft	3/ft	42
door shingles		8 pair	4/pair	32
				507
	5			
labour		14 days	20/day	280
stones		2 piles	30/pile	60
shingles		20 pairs	4/pair	80
floor plank		4 * 3 ft	3/ft	36
latch		1 no	10/pc	10
door beam		14 ft	3/ft	42
door shingles		4 * 3 ft	2/shingle	36
				544
	6			
labour		16 days	20/day	320
stones		2 piles	30/pile	60
shingles (roof)		20 pairs	4/pair	80
floor plank		4 * 3 ft	3/ft	36
door beam		14 ft	3/ft	42

				538
	7			
labour		6 days	20/day	120
floor plank		8 * 3 ft	3/ft	72
stones		4 piles	30/pile	120
shingles		30 * 8 ft	3/ft	720
door beams		17 ft	3/ft	51
				1083
	8			
labour		12 days	20/day	240
stone	1pile=75ft3	6 piles	40/pile	240
planks		6 * 9 ft	3/ft	162
oil tin sheets		30	7/sheet	210
bamboo mats		2	25/mat	50
doorside planks		12 ft	3/ft	36
door planks		16 ft	3/ft	48
door beams		16 ft	3/ft	48
				1034

Yekhar	2			
labour		10 days	20/day	200
stones		2 piles	30/pile	60
beams		12 nos	lumpsum	20
shingles		40 nos	2/shingle	80
door beams		14 ft	3/ft	42
side beams		14 ft	3/ft	42
sack		1 no.	10/sack	10
				454
	3			
labour		20 days	20/day	400
shingles		20 pairs	4/pair	80
planks		11 ft	3/ft	33
pillars		6 ft	3/ft	18
stones		60 loads	1.5/load	90
door planks		5 * 6 ft	3/ft	90
planks		5 8 * 2	3/ft	34 80
planks		5.2 * 6	3/ft	93.60
				711
	4			
labour		14 days	20/day	280
stones		2 piles	30/pile	60
tar tins		1 no	30/pc	30
shingles		40 nos	2/shingle	80
planks		5 * 5 ft	3/ft	75
door beams		16 ft	3/ft	48
				573
	5			

labour		7 days	20/day	140
shingles		15 pairs	4/pair	60
stones		5 piles	30/pile	150
planks		7 ft	3/ft	21
				371
	6			
labour		15 days	20/day	300
floor planks		10 nos	10/plank	100
shingles		40 pairs	2/pair	80
stones	1 pile=125 ft3	3 piles	30/pile	90
door planks		7 pcs.	2/pc	14
door beam		14 ft	3/ft	42
latch		1 no	10/pc	10
				636

Total	Labour										
HH	Male	Female	Stones	Shingles, door shingles	Planks, floor planks	Bamboo mat	Beams, pillars, poles	Split bamboo	Oil tin sheets	Nails	Sack
22	280		80	156	60		42				
24	225		120	15		20	87	6			
28	160		60	60	25		45				
29	200		50	60			70		20		
27	500		125	60	150		249				
4	180	175									
5	150	75									
8	240	50									
3	90	50									
17	210	100									
19	200				32	130			20	25	
17	120		20	200	100		56				10
1	400		400	200			40				10
11	150			168	125		60		200		
1	200		90	216	90		10				
2	600		100	212	36		42				
3	280		60	32	63	30	42				
5	280		60	116	36		42				
6	320		60	80	36		42				
7	120		120	720	72		51				
8	240		240		246	50	48		210		
2	200		60	80			104				10
3	400		90	80	252		18				
4	280		60	80	75		48		30		
5	140		150	60	21						
6	300		90	80	114		42				
	6465	450	2035	2675	1533	230	1138	6	480	25	30

n=	26	5	19	19	17	4	19	1	5	1	3
Average	249	90	107	141	90	58	60	6	96	25	10
Average 2	249	17	78	103	59	9	44	0	18	1	1
Total avg cost				931,12							
Total avg cost 2				579,50							

	Total cost	n=	Average	Average 2
Male labour	6465	26	249	249
Female labour	450	5	90	17
Stones	2035	19	107	78
Shingles, door shingles	2675	19	141	103
Planks, floor planks	1533	17	90	59
Bamboo mat	230	4	58	9
Beams, pillars, poles	1138	19	60	44
Split bamboo	6	1	6	0
Oil tin sheets	480	5	96	18
Nails	25	1	25	1
Sack	30	3	10	1
			932	579

List the imported materials needed to construct a latrine	
CGI sheets	4
Nails	5
Cement	41
Pipe	2
Iron	0
Sq pan	0

	Why did you build a latrine?
Government official told me	50
Convenience	7
Health/hygiene	10

Why didn't you build a latrine?	
New house	5
Don't like	0
No time	0

	Don't know	Diarrhoea	Yes
Can excreta in the open spread diseases?	32	9	16

Chapter 7

	Yes	No
Are there signs of defecation outside?	27	47
Is there a latrine?	61	13

Who uses the latrine?	Asked	Observed
Everybody, always	16	19
Everybody, sometimes	10	7
Only adults	10	7

	Yes	No
Can flies reach the excreta?	39	22
Is there a bad smell?	53	8
Is the pit covered completely?	38	23
Is there a door?	25	

	Yes	No
Do you tell your child to go to a specific place ?	56	18
Just outside	16	
Anywhere	2	
Latrine	32	

	Distance to		
House no.	**Tapstand**	**Latrine**	
Yekhar			
1	22	9	
2	45	18	
3	15	20	
4	34	7	
5	54	50	
6	22	27	
	32	**22**	
Darjeeling			
1	10	15	no wall
2	12	22	no wall
3	70	*	
4	44	*	
5	23	36	no wall
6	38	22	no wall
7	42	13	good
8	71	13	no roof
9	96	17	no roof
10	28	8	good
11	27	23	no roof
12	35	23	good
13	14	*	
14	11	19	no roof
15	24	41	good
	36	**21**	
Yadi Lakhang			
1	70	38	
2	58	21	
3	36	22	
4	55	22	

5	38	31
monastry	20	53
6	46	53
7		31
8	25	22
	44	**33**
Radhi Pangthang		
1	25	37
2	25	77
4	19	*
5	17	*
6	29	*
17	25	*
8	23	*
9	18	*
14	19	*
13	13	*
15	15	17
10	35	*
11	11	15
12	27	20
18	18	23
20	27	26
19	23	41
21	17	54
	21	**34**
Tongsing		
1	21	37
2	22	26
3	20	41
4A	12	18
4B	70	26
4C	73	29
5A	31	20
5B	57	*
6	26	38
7	15	20
8A	19	25
8B	35	34
9A	7	36
9B	33	52
10A	46	25
10B	48	27
11A	4	*
11B	8	*
11C	3	*

12	11	25
13A	28	40
13B	31	29
13C	118	19
	32	**30**
Bazor		
1	15	
2	24	42
3	38	19
4	51	18
5	66	15
6	3	*
7	8	57
8	9	14
9	15	41
10	38	11
11	38	12
12	18	35
13	17	25
14	14	*
15	11	*
16	6	7
17	6	16
18	25	16
19	14	*
20	22	26
21	9	39
22	13	40
23	24	43
24	22	16
25	22	16
26	46	25
27	53	13
28	36	13
29	42	41
30	13	31
31	18	60
32	38	25
33	38	21
34	30	25
35	22	5
36	27	12
	25	**25**

Yonphu Pam	**Water**	**Latrine**
1	44	38
2	19	*

3	10	16
4	81	34
5	10	22
6	into kitchen	*
7A	84	30
7B	17	30
8	38	38
9	83	34
10	11	13
11A	40	*
11B	19	*
12A	18	*
12B	23	*
13A	28	81
13B	29	81
14	72	32
15	189	*
16	33	13
17	14	52
18	29	26
19	16	44
20A	very far	42
20B	very far	42
21	very far	33
	41	**37**

	Tapstand/water	**Latrine**
Yekhar	32	22
Darjeeling	36	21
Yadi Lakhang	44	33
Radhi Pangthang	21	34
Tongsing	32	30
Bazor	25	25
Yonphu Pam	41	37
	33	**29**

If there is no latrine: where do you go now?			
	In the fields	In the forest	Somewhere around the house
Asked	9	4	3
Observed	3	0	1

Who cleans the latrine?	Asked	Observed
Nobody	35	13
Not seen	0	28
Everybody	13	0
Women	4	1
Men	5	3

Chapter 8

Is the toolbox complete?			
Yes		No	
9	60%	6	40%

Items missing	
hacksaw blades	5
thermochrome crayon	4
measuring tape	3
hammer	1
file	1
hacksaw frame	1
pliers	1
blowtorch not working	3

Could or did the caretaker perform the following tasks?				
	Yes		No	
Light blowtorch within 10 minutes?	10	71%	4	29%
Filing and smoothing of the ends to be joined	13	93%	1	7%
Dry fitting the two pieces	9	90%	1	10%
Heating the heating plate to the required temperature	14	93%	1	7%
Checking temperature	12	86%	2	14%
Fitting teflon cover	7	100%	0	0%
Holding HDPE to the heating plate until a small rim forms	14	100%	0	0%
Joining HDPE pipe together	14	100%	0	0%

Mistakes					
	Plumber 1	Plumber 2	Average	Total	Percentages
Too hot	3	8	5,5	11	32.4
Too cold	2	0	1	2	5 9
Bad cut	5	6	5,5	11	32 4
Bad joint	5	0	2,5	5	14 7
Unevenly heated	1	4	2,5	5	14.7
				34	

How much time does it take each month to visit and clean the whole scheme?		
Highest	32	hrs
Lowest	2	hrs.
Average	11	hrs.

How often is the scheme cleaned?		
Highest	4	per month
Lowest	1	
Average	2 5	

Does the scheme look well maintained?			
Yes		No	
7	47%	8	53%

	Well maintained	Poorly maintained
Average time spent	16.20 (5 records)	7.5 (8 records)
Average observed	11.80 (5records)	5.20 (5 records)

Did you do any repairs?		
	Yes	No
	10	5

What kind of repairs?	
Pipe joining	7
Replace faucet	5
Replace globe valve	2
Other	3

Are there any problems you can't handle?		
	Yes	No
	4	11

List of problems	
tank leaking	2
not all tapstands have faucets	
reservoir doesn't have a fence	

Did you become caretaker out of you own wish?				
	Yes		No	
	4	27%	11	73%

How were you selected?	
Appointed by Gup	5
Appointed by village	5
Other	3*

Do you get compensated for your work?				
	Yes		No	
	4	27%	11	73%

If yes: what do you get?		
	10 Nu / household/ year	2
	40 Nu /household/year	1
	exemption from militia duty	1*
	exemption from tax	1

What would you want for compensation?	
Daily wage according to time taken	6
Anything offered	3*
20/40 Nu per household per year	2
Same amount as in other places	1

	Yes	No
Could a woman be caretaker?	19	55

Can women do the work of a caretaker?				
Category	Yes		No	
Caretakers	7	47%	8	53%
Male caretakers	5	38%	8	62%
Female caretakers	2	100%	0	0%

Can women be caretaker ?	Yes		No		
Bazor	5	71 %	2	29 %	100 %
Other schemes	14	21 %	53	79 %	100 %

Why not?		
Women can't do the work	21	50 %
Women can't go for training	6	14 %
Women can't clean the tank or intake	4	10 %
Women can't use tools	4	10 %
Women are easily scared	4	10 %
Women are not interested to do the work	2	5 %
Women are not as strong as men	1	2 %

	Yes	No
Is there a VMC?	25	31

Number of members in VMC	
Highest	3
Lowest	1
Average	2

Could the members define their responsibilities?		
	Yes	No
	3	2

Did the VMC go for training?		
	Yes	No
	4	1

		Did VMC go for training?	
Could VMC explain responsibilities?		Yes	No
	Yes	2	1
	No	2	0

Could the members define their responsibilities?		
	Yes	No
	3	2

How was the VMC selected?	
Appointed by gup	3
Appointed by village	1
Other	1

What were the activites so far?	
No work done until now	2
Repair work	2
Remuneration caretaker	1

Did the VMC meet since their formation?		
	Yes	No
	3	2

If Yes: How many times?	
Once	2
More than once	1

What were the topics discussed?	
Repair work	1
Remuneration of caretaker	2

Who owns the scheme? (VMC)	
Government	1*
Village	4

Villagers	Who owns the scheme?
Government	23
Our village	26
Don't know	5