PRE-EVALUATION SURVEY

RURAL WATER SUPPLY SCHEMES, SMOKELESS STOVES AND LATRINES PROGRAMME

EUROPEAN UNION, UNICEF AND RGOB

THIMPHU, JUNE 25, 1995

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6. Mr. Stewart McNab, Representative, Unicef,
7. Mr. Henk van Norden, Programme Officer, Unicef,
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EXECUTIVE SUMMARY

"All of us, who are part of the human family, find increasing economic welfare important in our lives. Together with such improvement, it is desireable to be healthy, happy and peaceful. Many ingredients must be present to make all individuals of the country comfortable and content... Among many ways and means ... the Government is pursuing towards this end, one of the most important policies is the promotion of a household latrine in each house and safe drinking water, in both towns and villages..."

HM the King in Royal Decree on Water and Sanitation, August 1992

Introduction

1. The Executive Summary deals with the following aspects of the pre-evaluation survey:
   a Sample size and sex of the respondents,
   b. Impact of rural water supply by distinguishing it from the situation prevailing in non-project areas,
   c Profile and inventory status of the water supply schemes,
   d Impact of smokeless stoves and household latrines programme, and
   e. Community organizations and institutions related to water and sanitation programme.

Sample size and sex of the respondents

2 The survey took place between 24 December 1994 and 26 March 1995. It should be borne in mind that the survey took place during a very dry and cold part of the year and the period of the year may have bearing on the results of the survey especially with respect to diseases which are borne by water, flies and other vectors

3. There were 16 different questionnaire forms to be completed by the enumerators or data collection teams by interviewing the respondents. Out of 16 questionnaires, four were to be filled by the respondents themeselves. The questionnaire forms, self evident from their titles, revolved around the issues related to rural water supply, latrines, smokeless stoves. Certain questionnaire forms probed specifically into organizational and institutional set up needed to sustain the water and sanitation programmes. Institutional aspects of the programme are dealt in the forms related

fitter/plumber, section officer, work assistant, laboratory technician etc.

4. The number of respondents, proportion of female as a percentage of total respondents, number of dzongkhags and gewogs, indicating the broad base of random sample, to which the respondents or samples belonged are summarized in Table 1.

Table 1. Sample size and sex of the respondents

Questionnaires	Sample size	% of female respondents	No. of Dzongkhags	No. of Gewogs
Control household	116	85%	13	13
Treated household	348	85%	18	65
Water sample	308	n app	14	40
Water supply scheme	91	n av	18	65
Village caretaker	100	26%	17	50
Village maintenance committee	48	29%	16	42
Lab. technician	14	n.av.	14	n.app.
Smokeless stove	235	76%	8	17
Women volunteer	43	100%	11	33
Household latrine	233	80%	9	13
Institutional latrine	19	0	10	14
Section officer	13	0	13	n.app
Plumber/fitter/ mason	24	0	17	n app
Work assistant	12	0	12	n app
Gewog tshogpa	65	0	17	62
Gup	61	0	18	61

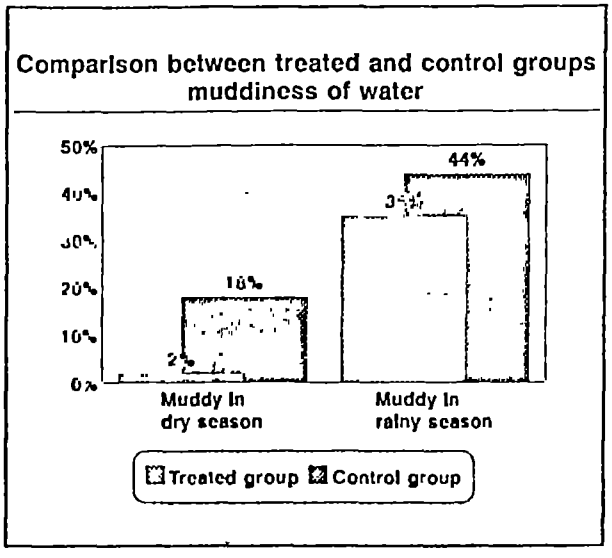
n.av=not available; n.app=not applicable

5 There is a need for caution in interpreting simple proportions or percentages, which are used copiously in the pre-evaluation report. Deriving from the way questions were designed, the evaluation presents mostly simple proportions or percentages. This is because 'yes/no' or 'zero/one' responses were yielded by the questionnaire. By way of example, in areas where rural water supply schemes have not reached, 19.8% of the households said that water was insufficient most of the time. The main purpose of coming up with such a percentage is to use an observed sample to make a statement about an unknown population (total collection of things, people, objects to be studied). The aim of any sampling survey is to infer something from the known percentage about the unknown percentage for the whole country.

6. How well sample the percentage estimates the population? We can show this by constructing confidence interval. A larger sample enable us to get more precise conclusion because the sampling allowance shrinks. Within a sample of 116 households where there is no water supply scheme, we can be 95% confident that most of the sample will fall within the limits of 14.04% to 28.77%. Errors are thus confined to confidence interval.

7. Confidence interval ought to be constructed for all proportions or percentages, but it is cumbersome to report at every instance.But the need to construct confidence interval is stressed so that the readers are reminded not to assume that a sample percentage is precisely equivalent to underlying population.

Impact of rural water supply schemes

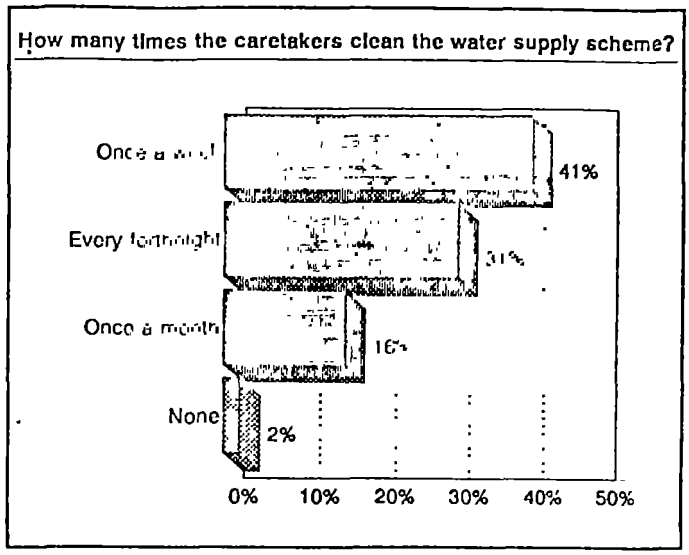


8. It is a truism to say that water is an integral part of our living and is a basic necessity; its shortage has serious ramifications of unknown dimensions on health, nutrition, agriculture, and so forth. Water supply should aim to fullfil three criterion: be clean, sufficient and accessible. It should be clean and sufficient at all times and accessible within a short distance or time. Comparison show that rural water supply programme enhances all three criterion. Accessibility is a very desireable characteristic. Introduction of tap stands water which brings water near a cluster of houses is apparently not enough. Users have taken a step further: 23% of the households had their water piped into the house from the tap stands.

Table 2. Sufficiency, cleanliness and accessibility of water

Criterion	% of respondents in the treated group	% of respondents in the control group
Sufficiency		
Insufficient most of the time	7.6	19.8
Insufficient in dry season	14 8	20 0
Cleanliness		
Muddy in dry season	1.8	18 3
Muddy in rainy season	35.0	43.5
Accessibility		
Time taken per round trip to collect water	5.6 min	9 12 min

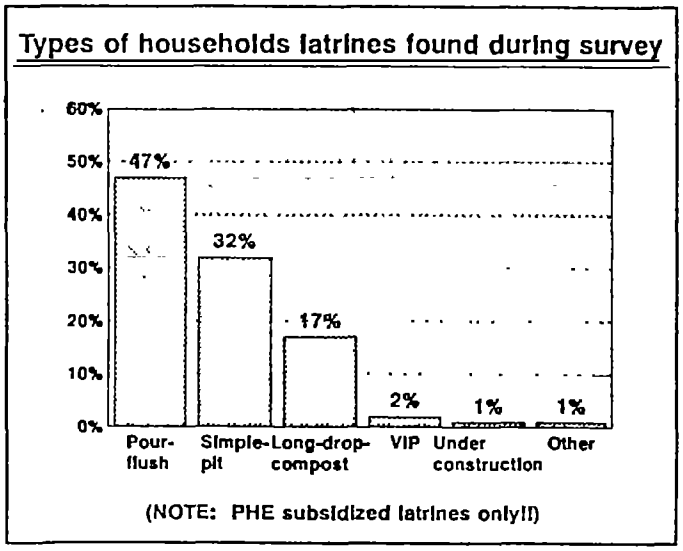
9.. In clinical terms, cleanliness of water is checked by assessing the level of faecal coliform content per 100 ml of water. A comparison of contamination levels between the treated group and control group show that it is much lower in the treated group.



Although the VMCs and caretakers were instituted only in 1991, the survey found that 78% of the schemes have established VMCs, mostly after the construction of the schemes. A VMC has on average 3.8 persons with 2.6 men and 1.2 women. 77% of the VMCs have women members. The main function of the VMCs is to decide on behalf of the community maintenance work that has to be done on the water scheme and delegate work to the caretaker. The VMC will, on the suggestion of the caretaker, mobilize labour and other contribution. Among the caretakers, 26% are women. As an acknowledgement of services rendered by the caretakers for their community, they are generally exempt from shaptolemi (beneficiary contribution of labour) in other activities, paid some grains or money.

Impact of latrines and smokeless stoves programmes

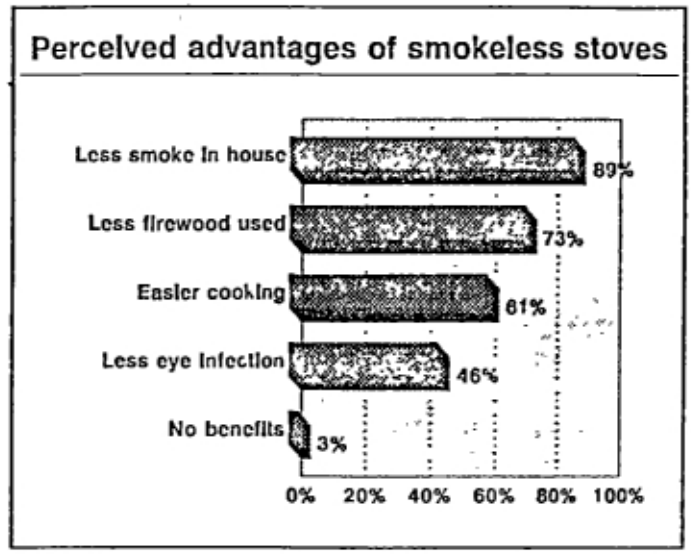
16. About 89% of the households had installed smokeless stoves among the households surveyed Survey was confined to areas where complete sets of smokeless stoves were distributed since the start of the project in 1991. That is why the proportion of household who have smokeless stoves is unrepresentative of the whole country where the national coverage is estimated to be in the order of 21% by Public Health Engineering Unit of the Ministry of Communications. 11% of the households had not yet installed their smokeless stoves because of the delay caused by women volunteers to come and install them. About Nu 56 was paid as installation fee. 91% of the smokeless stoves were built by women volunteers. One remarkable woman volunteer (Ms Zomba of Katsho gewog in Haa district) had accomplished constructing 200 smokeless stoves.



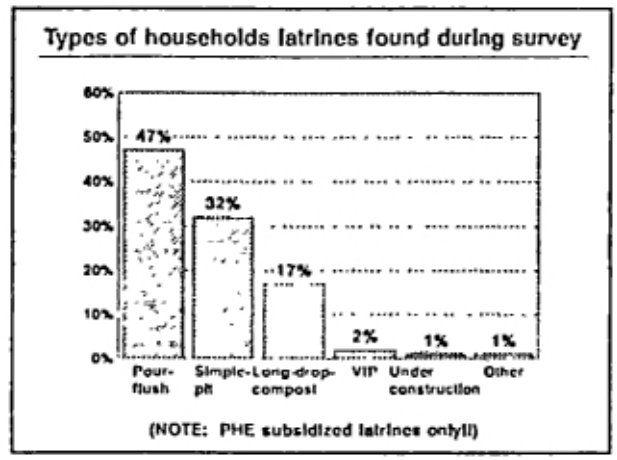
17. Out of those who had installed smokeless stoves, only 3 3% were not using them. A substanstial proportion of those using smokeless stoves had dampers, stokers and grates missing.

18. One difficiency of the smokeless stoves is its relatively lower heating capacity. It does not generate enough heat in the room, as 38.3% of the users reported. Those who find the room heating from the smokeless stoves insufficient resort to other heating appliances like mesa and

bhukhari, especially in the winter. 31.6% use bukhari and 27.8% use mesa for additional heat. To the extent these additional heating appliances allow smoke to leak and fill the room, the purpose of the smokeless stoves is negated. However, there are several other perceived benefits of smokeless stoves as reported in graph on the right and these advantages point to the continuing value and merit of the smokeless stoves programme.



19. Survey of household latrines was also confined to those constructed by the project since 1991. The types of latrines found during the survey is shown in the graph on the right. 100% coverage of household latrines was found in the sample, most of it having been built in 1992. The surge in the construction of household latrines followed the proclamation of the Royal Decree on sanitation. Most of the people were motivated to build household latrines for health and hygiene reasons. Remarkably, almost all household latrines were found clean, without visible excreta on the platforms, in spite of being used. Respondents expressed keen enthusiasm to improve their latrines and contruct more sophisticated ones, but they expect assistance in terms of construction materials from the government.



20. The pre-evaluation survey was also not able to establish the percentage of national coverage of household latrines, because its survey was confined to areas where EU assisted programme is being implemented. In the reponses received from 61 gups, national coverage of latrines was estimated to be 58%.The percentage reported in the report are localized and not representative of the country as a whole. The appreciation for household latrines is growing rapidly. The survey found that 32% of the households contruct latrines for health reasons and another 30% do it for clean surrounding. But clean surrounding and health reasons are quite related and no fine distinction can be made between the two in the common man's perception. So, it should be assumed that over 60% construct latrines for health reasons.

21. The project also assisted construction of latrines in monasteries, schools and basic health units, generally known as institutional latrines and urinals. Only ventilated pit latrines were constructed as part of the institutional latrines under EU assisted programme. The average number of users per latrines seat was found to be 26 and the average number of users per urinal bowl was 27. But the distribution of latrines and urinal seats is uneven and there are places where one seat of latrine is used by 248 users and one seat of urinal bowl is used by 65 people. More than half

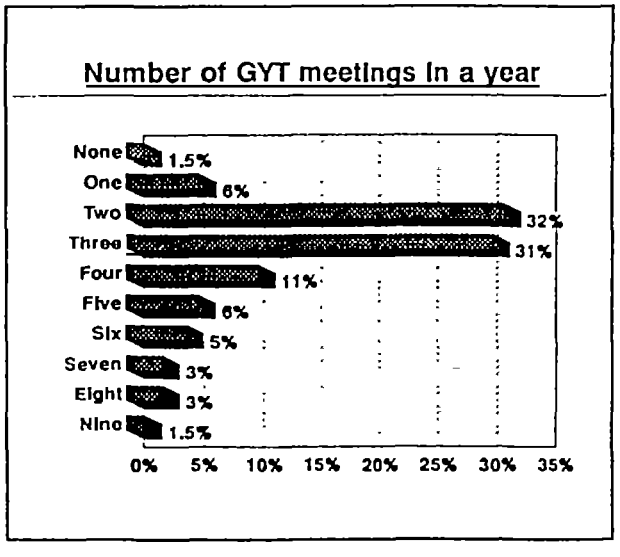
of respondents considered the latrine and urinal facilities inadequate. The level of dissatisfaction with institutional latrines either in terms of design or in terms of seating capacity needs to be addressed.

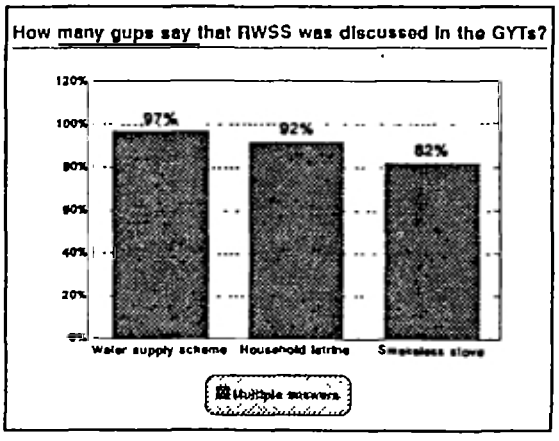
Community organizations and institutions related to water and sanitation programme

22. There is an array of staff employed by the district administration. Most of them are involved only partially (not full time) in the implementation of the water and sanitation programme. The staff consist of, in order of rank, district administrator, district engineer, district medical officer, basic health worker, health assistant, section officers, laboratory technicians, work assistants, fitter, plumber and mason. Parrallel to the district staff are certain members of the community involved in the programme. They are the gup, the members of the District Development Committee, the members of the Block Development Committee, Village Maintenance Commitee for water scheme, caretaker (chunyer) of water scheme, women volunteers for installation of smokeless stoves, members of the National Women's Association, village health worker, tsangda tshogpa (community sanitation master) etc

23. Under the EU assisted programme, a great deal of short term training was offered to the section officers, district engineers, laboratory technicians, work assistants, fitters, plumbers, masons, women volunteers etc. These responsibilities of these staff are multi-sectoral and therefore they work only part of their time on water and sanitation programme. The training course were also geared to meeting their multi-sectoral functions.The titles of short term courses included integrated RWSS, ferro cement construction, smokeless stoves installation, spring protection, computer design of water scheme, water sampling and testing, bridge construction and training of trainers for VMC members and caretakers

24 Nevertheless, there is a general opinion among the staff that the improvement of their performance would depend on further training, timely supply of construction materials, and provision of transportation facilities. There is an serious staffing constraint in terms of plumbers, masons and fitters 69% of the section officers felt that they could do with more plumbers, masons and fitters.

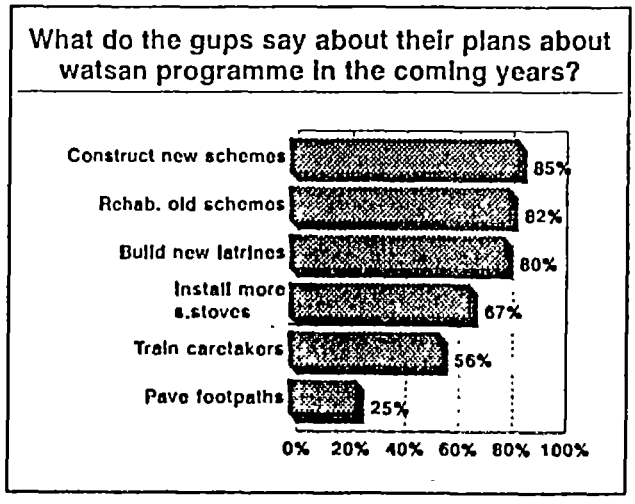




25. At the gewog level, most community activities are coordinated by the gup and the

members of the Gewog Development Committee. This is true of the functions performed by VMCs, caretakers and women volunteers whose roles have been briefly described earlier. The Block Development Committee meets on average 3 times a year. The GYT members were asked whether water and sanitation issues were discussed in the GYT meetings. An overwhelming proportion of the GYT members, show in the graph on the right side below, said that water and sanitation issues were discussed in the GYT meetings, indicating broad based discussion on the programme within the community forum. As the users are responsible for the maintenance and operation of the water supply schemes, such forum for community decision making has become very important.

26. As the coordinator of development activities at the gewog level, the gups and the GYT members are well aware of their priority needs and the capacity to implement programmes. The 61 gups (31% of the total) who were interviewed, were asked to state their plans for water and sanitation programme in the coming years. Their responses, which is shown in the graph on the right side, indicate the importance they attach to water and sanitation programme. It is a clear evidence of the presence of grass-root motivation for the programme. Equally, there is commitment to this programme from the highest level, manifested in the 'Royal Decree on Water and Sanitation' of August 1992.



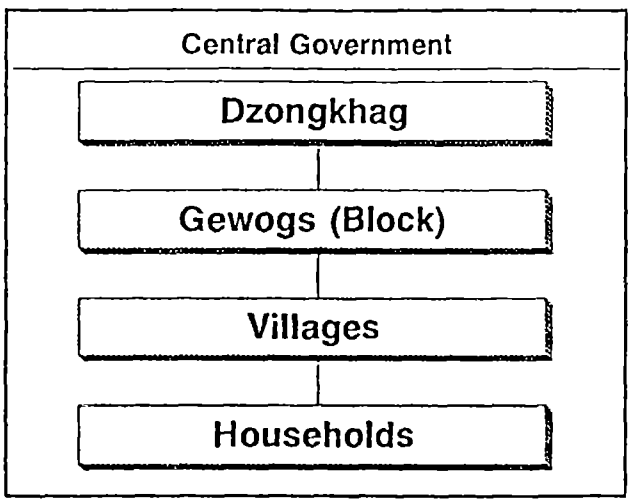
CHAPTER 2.

GUP

The position of the gup in the administration and the community

1. The country is governed through three tiers of administration - the central government agencies, district administrations, and gewogs 'administrations.' The country is divided into districts, and districts are further divided into gewogs or blocks. There are 20 districts and 196 gewogs. A gewog is further broken down into villages, and villages into households (gungs).

2. A group of households make a village A group of villages in turn makes a gewog. Each village elects a maangaap (literally, 'father of the community') and several chupens. A chupen is a liaison agent between the section of the village which he represents and the gup. As it is both impractical and inefficient for every household to work directly with the gup on a day to day basis, the maangaap and chupens or other members of the GYT represent the villages and act on their behalf.



3 The duties and responsiblilities of the gup include the following: collection of rural tases; endorsing applications by the people to the district administration for subsidies and compensations, screening of applications for bank loans; collection of food and money from the households for public rituals, ceremonies and hospitality, maintenance of the land registeres and census records; identification of landless people in the gewog for land grants; articulation of development needs such as irrigation channels, motor roads, schools, electricity supply, extension centres etc.; submission of points to the National Assembly in consultation with the people and the chimi; (member of National Assembly) arbitration of disputes and litigations in the gewog; mobilization of labour contribution; supervision and coordination of construction activities and maintenance of such collective facilities like irrigation channels, clinics, extension centres and schools, maintenance of community property and assets, not supported by the government, such as community temples, knolls, common land, footpath and bridges To discharge this long list of duties, a gup is assisted by maangaaps, chupens and other specialized members of the gewog

4 In 1991, the present King instituted GYTs in every gewog in the country. The objective of establishing GYTs was to promote further decentralization by taking the decision-making process to the village level. The GYTs were also established to regenerate a sense of control, ownership and responsibility for the maintenance of collective local resources which had declined with a concomitant rise in bureaucratic power.

5. Corresponding to the 196 gewogs, there are 196 GYTs with 2589 elected members in these GYTs. There is on an average 13 GYT members in a GYT. The members of each GYT

consist of chupens and maangaaps with the gup as its chairman. Government field staff working in the gewog are given observer status only. According to the constitution, a two-third quorum is needed for any decision.

Sample size

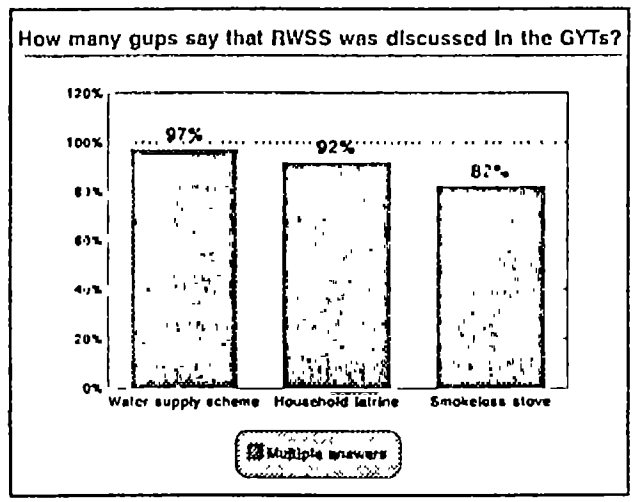
6. Given the importance of a gup as a link between district administrations and the communities, a questionaire was formulated specifically for the gup. The data collection team interviewed 61 gups based in 18 districts. As there are 196 gewogs in the country, 61 represents a good sample.

Provision of water and sanitation facilities in the gups houses

7. An assessment of the availability of water and sanitation facilities showed that 77% of the gups have access to tap stand water supply scheme, 84% have household latrines and 44% have smokeless stoves.

Frequency and agenda of GYT meetings

8. The gups were asked to recall the frequency of the GYT meetings in the past one year. As reported by other GYT members, the average number of the GYT meetings is about three, although some GYTs meetings were convened more than three times in a year. The number of the GYT meeting per year were as high as nine in a year. Water and sanitation was discussed in the GYT meetings. 97% of the gups interviewed said the GYTs discussed piped water supply in their meetings in the past one year, 92% of the gups said that they discussed household latrines and 82 % said that they discussed smokeless stoves in these meetings in the past year



Water and sanitation facilities the gewog

9. 61 gups, who were interviewed, were asked to produce the records he had about the converage of water and sanitation programme in their respective gewogs. It must be bone in mind that the basis of information used in the estimates is gups' records. The number of houses in a gewog ranged from 77 households in Dagala gewog in Thimphu to 763 households in Orong gewog in Samdrup Jongkhar. On average there are 317 households in a gewog. There were 610 schemes in the 61 gewogs but 25% of these schemes had broken down. 72% of the schemes had a VMCand 74% of the schemes had trained village caretakers. Over half of the schemes had women caretakers.

10. In the 61 gewogs surveyed by the data collection teams, there were a total of 19,342 households. Out of 19,342 households, 11099 had access to water from the rural water supply

schemes. We can therefore deduce that the rural water supply coverage had reached 57%, a figure which matches the estimate used by Public Health engineering Unit, Ministry of Communication. Although there were 11099 households who were drinking water from rural water supply schemes, survey reveals that only 3575 households participated in operation and maintenance. That means, only 33% of the households who took water from the schemes were paying either cash or kind for the maintenance and operation of the schemes.

11. According to the records maintained by the gups, the coverage of household latrines worked out to 58%. Smokeless stoves coverage had reached about 39%. 5751 households out of 19,342 households had smokeless stoves and 11,163 households out of 19,342 households surveyed had latrines.

Estimates from the Records of 61 Gups
Highlights on national coverage of watsan programme

* 25% of the water supply schemes are broken down
* 72% of the schemes have Village Maintenance Committees
* 74% of the schemes have trained Village Caretakers
* 52% of the schemes have women Village Caretakers
* 33% of the users pay either in kind or cash for O&M

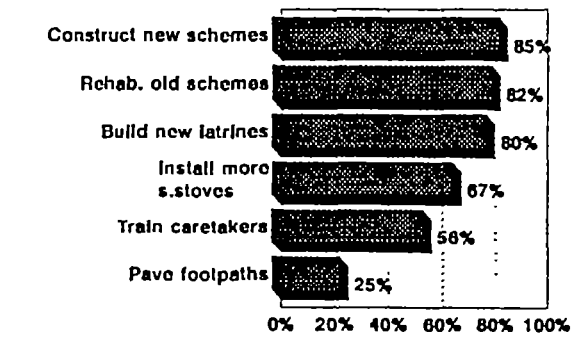
Role of gups in water and sanitation programme

12. The gups performed a variety of functions during the construction of the water supply scheme in the gewog. 87% of the gups participated in the survey of the water supply schemes. Their had further tasks during the construction of the schemes. 84% of the gups organised labour during the construction, 44% of the gups became chairpersons of the village maintenance committees. Gups are also extensively involved in the supervision of construction Gups have therefore multiple roles especially during survey and construction phases.

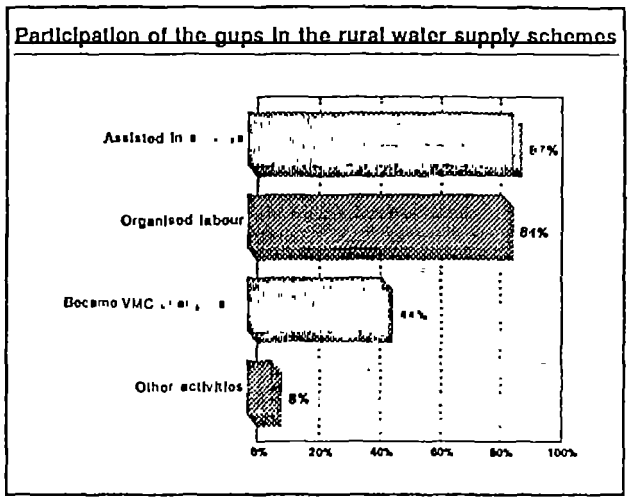
13. For maintenance and repair of the water supply schemes in the gewogs, the gups try to mobilize contributions from the users of water supply schemes. As the responses show, this has not been very successful so far. They also appoint the village caretakers and send them for training whenever the courses are organized by district administrations.

14 The gups were asked to state the various problems they face with the technical staff of the district authorities during the construction of the water supply schemes. Most of the respondents said that they had no problems with the district technical staff or the people. However, a small percentage of the gups said that the district authorities started the construction of water schemes in the wrong season when the villagers were busy with other things to do The gups' responses point out that there is very little problem for labour contribution to be organized during the construction.

What do the gups say about their plans about watsan programme in the coming years?

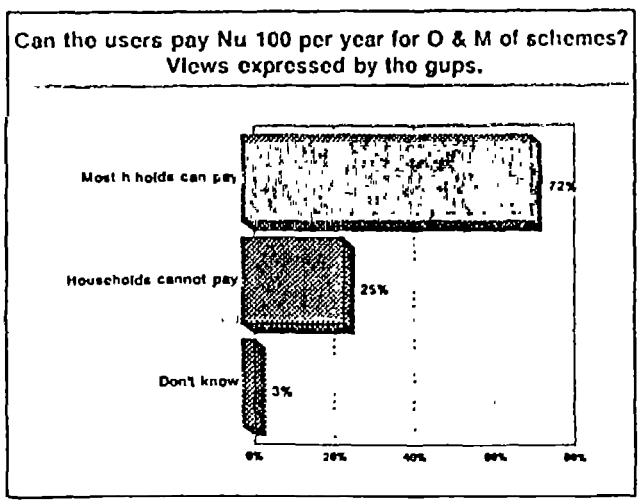


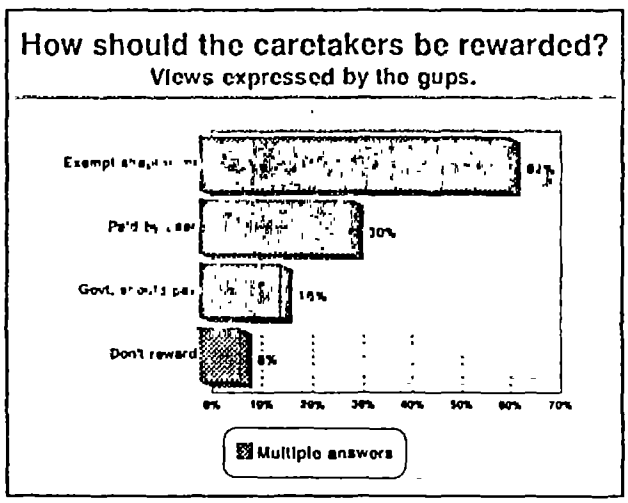
Watsan programme for the coming years



15. The collective decisions of the community about the development programmes in the near future are well known to the gups. So, the gups were asked about the water and sanitation programmes in their respective gewogs in the coming years. 85% of the gups advocated or planned to construct new piped water supply schemes, 82% planned to repair and improve the old piped water supply schemes, 80% planned to build more household latrines, 67% planned to install more smokeless stoves, 56% planned to send village caretakers for training, 25% planned to pave footpaths in the village and 8% planned other things including chlorination of water and training of the members of the village maintenance committees. It is clear that an overwhelming proportion of the gups are keen to continue with sanitation and water programme

Incentives for caretakers and willingness to contribute for O & M





16. The gups are in charge of moblization of labour contributions for development activities in their gewogs. In this respect they can exempt certain households if these households need to be compensated for community services rendered by them. The gups also can levy certain amount of fees for community's benefit. Caretakers of water supply schemes also fall the category of people who render community services. The gups were therefore asked what kind of incentive should be provided for their services 62% of the gups said that they should be exempt from shaptolemi (contribution of labour), 30% said that they should be paid in cash or in kind by the users, 16% said that they should paid in cash or in kind by the government, and 8% said that no rewards were necessary

17 71% of the gups said that they have been encouraging the users to contribute money for

maintenance and operation of the schemes. But whether the users are albe to do so or not is a different issue. It also depends on the amount. The gup were asked if each household could pay Nu. 100 per year. 72% of the gups said that most households could do so, while 25% of the gups pointed out that households would not be able to pay the amount. 3% of the gups were not certain either way. The gups were also asked whether all households could construct their latrines without getting materials from the government. 80% of the gups said that most households could and 20% of them mantioned that most households would not be able to do so. The type of latrines to be constructed was not discussed. Most probably, the gups meant that most of the households would be able to build simple pit latrines. Otherwise, their responses are not consistent with the overwhelming expression of need for construction material like concrete slabs for latrines. The gups were asked whether households are ready to pay Nu. 60 to get a smokeless stove installed 84% said that nearly all households are interested to install smokeless stoves. About 9% of the gups dissented.

Summary

18. A gup has many responsibilities; he shoulders an amazingly wide range of duties. He is also the chairman of the GYT, which discusses and decides many issues affecting the community. With regard to the water and sanitation, the gups are heavily involved at the stage of surveying the water source, appointing caretakers and organizing labour contribution. 44% of the gups acts as chairpersons of the village maintenance committees. Like the GYT members who were interviewed, majority of (62%) gups feel that the caretakers hould be rewarded for their services by exempting them from shaptolemi. 30% of the gups suggested that the users should pay the caretakers either in kind or cash. The proportion of tups who said that the caretakers should be exempt from shaptolemi is much higher than the proportion of GYT members who said so. The proportion of gups who said that the users should pay the caretakers either in kind or cash is also much higher compared to GYT members. The gups are enthusiastic about the continuation of water and sanitation programmes They wish to build new water schemes as well as rehabilitate old ones The gups' responses who that they attach considerable importance to the training of caretakers as part of future activities, compared to the views of GYR members. The gups give high priorities for the installtion of smokeless stoves and construction of household latrines in the plans for coming years. The gups consider thay levying of fees in the order of Nu 100 per year is generally feasible. They also confirmed that most of the households are keen to install smokeless stoves at the rate of Nu. 60 per stove as installation fee.

19. The gups maintain various kind of records pertaining to their gewogs. Based on the records the gups keep, the coverage of water and sanitation programmes was estimated It was found that the coverage of tap stand water was 57% and for smokeless stove was 30%.

CHAPTER 3.

GEWOG TSHOGPA OR MEMBERS OF THE BLOCK DEVELOPMENT COMMITTEE

Extent of survey

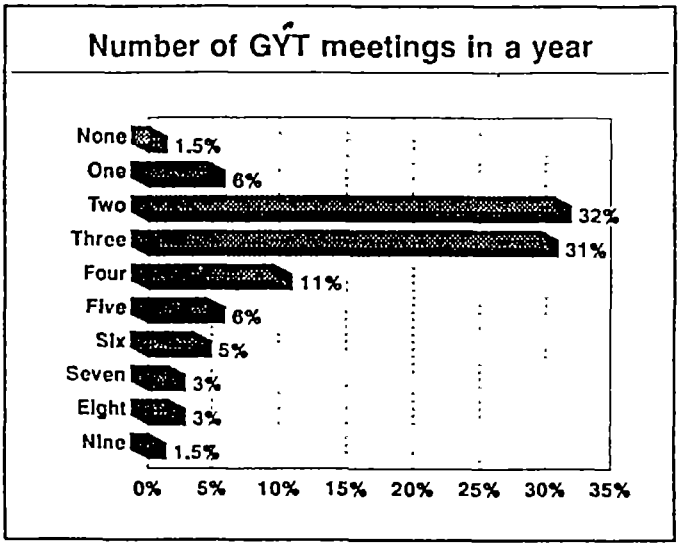
1. A gewog tshogpa is an elected member of the Gewog Yargay Tshogchung, (Block Development Committee). The Block Development Committee is the forum for decision making at the block level, and is chaired by the gup. The members of the Block Development Committee serve for a term of three years. Issues of water and sanitation are discussed in the Block Development Committee and it was therefore considered important to interview members of the Gewog Yargye Tshogchung

2 During the period 27 December 1994 to 9 March 1995, the data collection teams attempted to meet 69 GYT members. They were sampled from 66 gewogs in 17 districts. As four of them were out of station, interviews could be held only with 65 respondents. As there are 196 gewogs or blocks in the country, the sample size is quite large.

GYT members' water and sanitation situation

3. The data collection team asked the members of the GYTs about the provision of water and sanitation facilities in their respective houses. 83% of the members interviewed used water from tap stands, 12% had private piped water supply, 83% had household latrines and 62% had smokeless stoves. This sample of GYT members show that they were not necessarily fully equipped in terms of water and sanitation facilities and they are not exemplary figures in the community with regard to water and sanitation. All of them do not have water and sanitation facilities which tends to show that GYT members are not particularly privileged persons, despite being involved in the decision making process about water and sanitation projects.

Frequency and themes of GYT Meetings

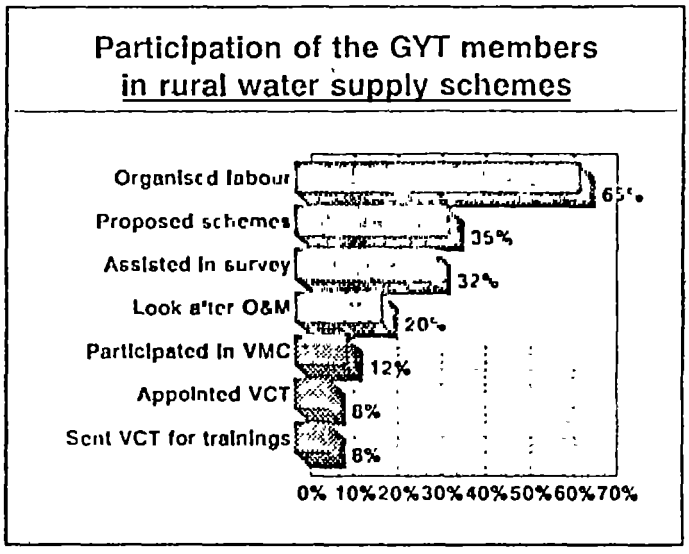


4 The survey also carried a question to find out the frequency of GYT meetings. This was perhaps the first time that the frequency of GYT meetings was counted, since the GYT Chatrim (Constitution) was enacted in 1992. The Chatrim requires the GYTs to meet thrice a year. In practice, the percentage of GYTs who meet either twice or thrice a year is almost equal. The survey revealed that 32% of the GYTs meet twice a year and 31% of the GYTs meet thrice a year. 11% of the GYTs meet four times a year. There are GYTs who meet even seven to eight times a year. Among the sampled gewogs, in 1994, unusually frequent GYT meetings were held Menji, Katsho,

Chumei, Tashiding, Yangner and Phuentsholing. Such high frequency points to abnormal activities such as building primary schools and disputes about siting of extension centres, taking place in those gewogs which requires collective decision making. However, on average, a GYT meets thrice a year.

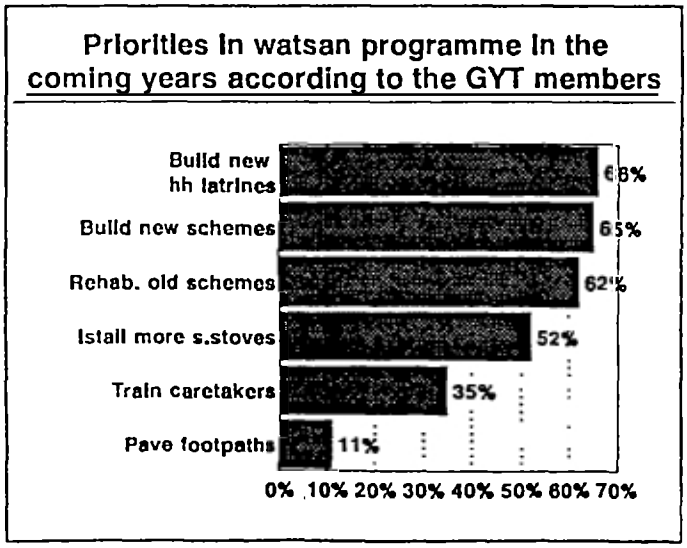
5. A GYT may discuss any matter related to the community and make a decision by consensus or by majority. The minutes of the GYT is recorded by the secretary of the GYT who is usually the headmaster of the local primary school. Water and sanitation is discussed quite frequently in the meetings. The members were asked whether they discussed matters related to water, sanitation and smokeless stoves in the GYTs. In response, 94% respondents stated that piped water supply was discussed in the GYTs 95% said that household latrines were discussed, and 80% stated that smokeless stoves were discussed. It is clear from the result of the survey that water and sanitation issues are discussed extensively in the GYTs.

Participation of GYT members in rural water supply schemes



6. The survey also tried to ascertain the kind of involvement of the GYT members in the construction of rural water supply schemes. A range of involvement were suggested to the respondents The GYT member could have proposed the scheme in the GYT; assisted in the survey; organized labour; become chairperson or member of a VMC; appointed a caretaker; looked after maintenance and operation and sent caretakers for training. The proportion of GYT members who mentioned that they were involved in one way or the other is presented in graph (right side). The GYT members were mostly involved in organizing labour for the construction of scheme. To a lesser degree, they were engaged in proposing the scheme, assisting in the survey and then maintaining the schemes

Priorities in water and sanitation programme



7 Since the members of the GYTs are considered to be closely involved in identifying the development activities in their respective gewogs, the GYT members are aware of the priorities for the gewog relating to water and sanitation programmes. GYT members were asked what they would like to take up in water and sanitation programme in the coming years. Options for multiple answers were

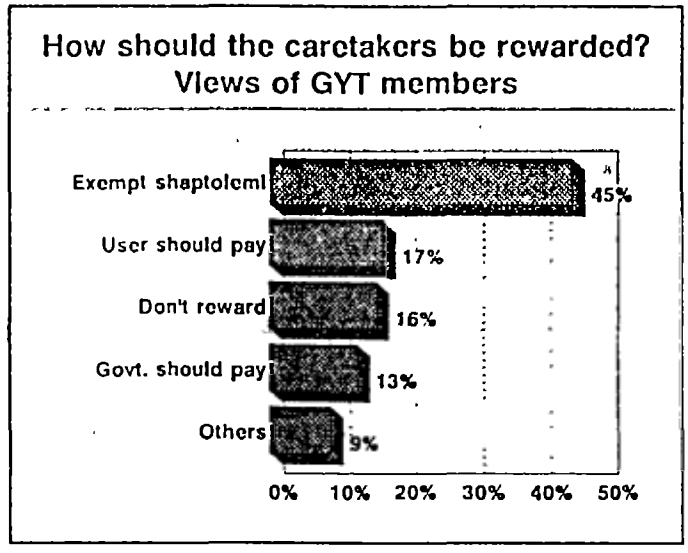
given: new piped water supply schemes; rehabilitation of old schemes; construction of household latrines; installation of smokeless stoves; pavement of footpaths around the villages and training of caretakers. As the graph shows, the GYT members' responses identify construction of household latrines and new water supply schemes, and rehabilitation of water supply schemes as the main priorities. Pavement of footpath around the villages was given the least priority by the GYT members. According to the opinion fielded among the GYTs members, pavement of the footpaths around the villages can be taken up only after the other priorities are fulfilled.

User contribution for maintenance and repair

8 The GYT members were asked whether the beneficiaries of the rural water supply schemes did or did not pay money for operation and maintenance 39% of the GYT members said that the beneficiaries paid money for maintenance and operation and 56% of the GYT members said that the beneficiaries did not pay money for operation and maintenance. Their statements corroborate the findings in the questionnaire on "Water Supply Schemes" about the lack of payment on the part of substantial proportion of households. A substantial proportion of households are unable to pay in cash despite the encouragement by the GYT members.

Incentives for village caretakers

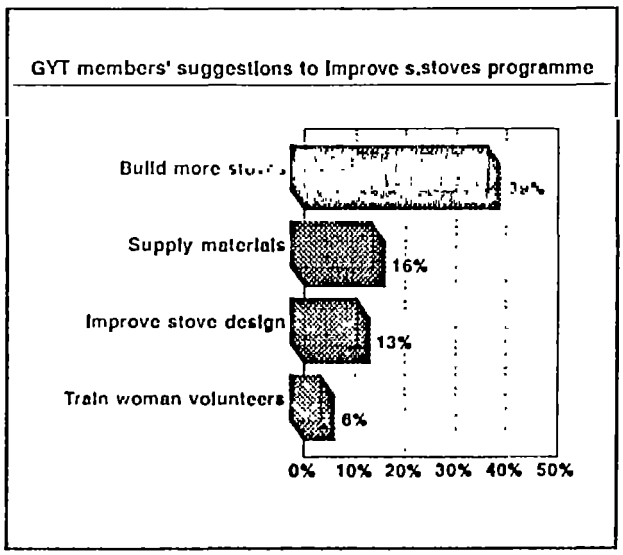
9. The views of GYT members were sought on the issue of incentives for caretakers of water supply schemes. What sort of incentives should be given to the caretakers? 13% of the GYT members thought that the district administrations/government, should pay the caretakers either in cash or in kind. 16% of the GYT members thought that no reward was necessary. 17% of the GYT members said that the beneficiaries should pay the caretakers in cash or in kind. 45% of the GYT members said that the caretakers should be exempt from shaptolemi as an incentive. The majority opinion is that caretakers should be compensated by exemption from shaptolemi labour contribution which is requisitioned for community development projects. If the exemption from shaptolemi labour is not considered adequate, users could make additional payment either in kind or cash.

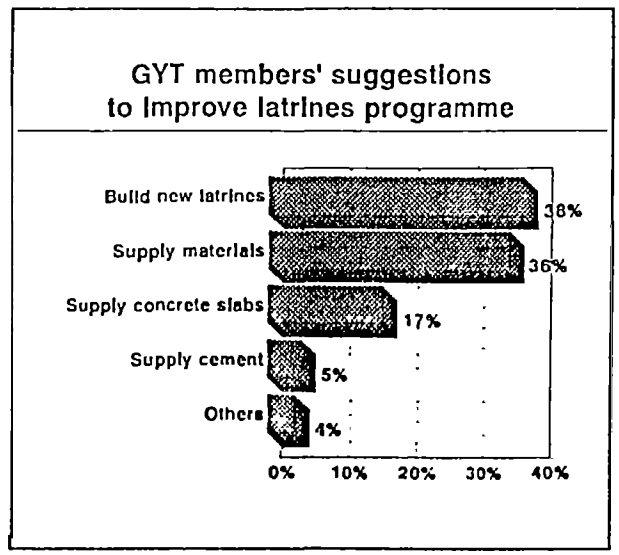


GYT members' suggestions for water and sanitation programme

10 The GYT members were asked for suggestions to improve the water supply schemes, household latrines and smokeless stoves. These were open ended questions i.e. there were no multiple choice answers which they could choose. Naturally, their responses were highly varied, as it depended on their particular situations But, the suggestions have been grouped and presented in the graph below.

11. Surprisingly, the training of the caretakers was the most frequent suggestion among the GYT members. 13% of the responses pointed out the need for new water schemes and another 13% of the responses suggested that the supply of materials or parts. Improvements to intakes and sources were also highlighted as important measures to improve the rural water supply schemes Rehabilitation of old schemes also emerged as an important recommendation.





12 The GYT members' views were also solicited for the improvement of household latrines and smokeless stoves. With respect to household latrines, the GYT members' suggested that more latrines needs to be built. for which materials were requested Some GYT members specifically mentioned that supply of concrete slabs as crucial inputs. If such inputs were made available. they could undertake the construction

13 The pattern of suggestions with respect to smokeless stoves was similar The main recommendations of the GYT members were that more smokeless stoves should be installed and materials for the smokeless stoves, which were in shortage, should be supplied A substantial proportion (13%) also suggested that the design of smokeless stoves should be improved

Summary

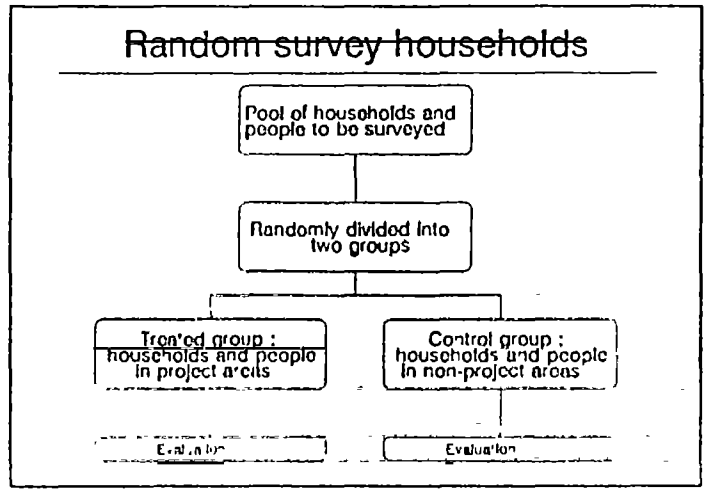
14. As an elected members of the Block Development Commitee (acronym GYT in English), GYT members are involved in various ways in water and sanitation programme. Block Development Commitee, the decision making body at the block level, meets on average thrice a year In such meetings, water and sanitation programmes are extensively discussed . In the context of the programme, the GYT members propose the rural water supply scheme to the government and the DYT, assist in the survey of the site and later help in the operation and the maintenance of the rural water supply scheme However, by and large, their role consist of organizing labour in the construction and maintenance of the rural water supply scheme. The GYTs members were overwhelmingly keen on the water and sanitation programmes and they anticipated the programme to continue. Paving footpaths, however, was low in their list of priorities. The majority of the GYT members also support the trend in exempting caretakers from shaptolemi labour.

CHAPTER 4.

CONTROL GROUP: WHERE THERE IS NO RURAL WATER SUPPLY SCHEME

Control group and treated group

1. Rural water supply and sanitation projects have not started in the areas of these households. It would be of interest to assess the situation of such households who have not had the benefit of piped rural water supply schemes, compared to those households who have tap stand water installed under the auspices of the rural water supply and sanitation project. In the scheme of survey, the households and people fall into two groups: those who are part of rural water supply project (let them be called the treated group) and those who are not (let them be called the control group). The results of the survey attempt to evaluate the differences between the control group and the treated group so that the impact of the project is delineated, to the extent possible.



Timing of the survey

2 The survey took place between 24 December 1994 and 6 March 1995. It should be borne in mind that the survey took place during a very dry and cold part of the year The timing of the survey makes a difference to the results of the survey especially when it is related to drinking water supply and water borne diseases. Vectors multiply during the summer and disappear or reach a low point during winter. Survey results might have come out slightly different had it been carried out in the rainy season or in summer. However, the results are taken for granted in this case, as the extraneous influence of seasons can not be removed

Sample size and sex of respondents

3. 121 households were randomly sampled from 13 gewogs in 13 dzongkhags. Owing to absence of people in some houses or closure of houses in five cases, only 116 houses could be actually interviewed. Among those interviewed, 85.3% of the respondents were women and 14 7% of the respondents were men. Preponderance of women among the respondents was not a random outcome. The interviewers were asked to interview women to the extent the circumstances permitted them to do so The preference for women to men is not an odd choice in this particular survey In the households, women have a primary role to play with respect to water and sanitation. Their experience and knowledge arising out of this role makes them the natural choice as respondents

Sources of drinking water

4. Out of 116 households, it was found that 53.4% drew water from springs, 28.4% from streams, 12.9% from irrigation canals and 13.7% from other sources. **Some households draw water from more than one source, so the total exceeds 100%.** Springs and streams were by far the most important sources of drinking water supply. This at once shows the importance of protection of springs and streams, as perpetual sources, for drinking water supply. It also suggest the difficulty of securing safe drinking water, if the course of the streams and the devices such as wooden channel for the carriage of spring water from its source to the door, stretches over a long distance. As the course of such channels for conducting spring water and streams get longer through human settlements, chances of pollution are also increased.

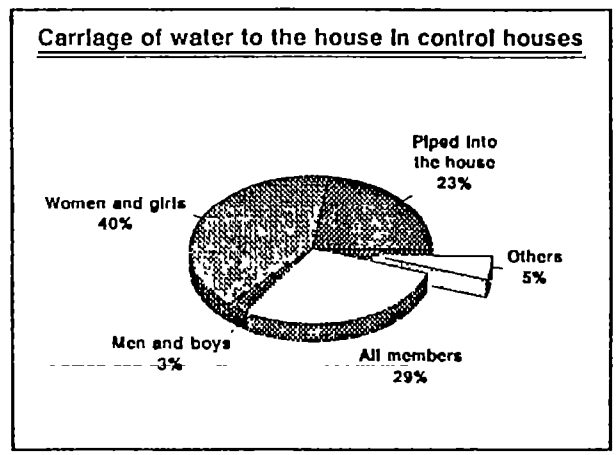
Sources of water	%
Spring	53.4
Stream	28.4
Irrigation channel	12.9
Others	13.7

Note: multiple answers

Sufficiency of drinking water supply

5 In the sample households, 75.2% reported that water supply was sufficient all the time 20% said it was insufficient in the dry reason and 19 8% said it was insufficient most of the time We can deduce that about 20% of the households faced insufficiency of water during the dry seasons It seems that they are dependent on non- perennial sources of water, which are fed or supplemented by rain water But there were another 20% of the households who said that the water was insufficient most of the time and it is a problem which requires attention Water is a basic necessity and its scarcity or insufficiency has serious ramifications.

Responsibility for fetching water



6. The question who goes to collect the water has become a significant inquiry in its own right because of the interest to ascertain the gender division of labor in household activities and the practical interest in identifying the members of family who manage water. The findings would enable the information on safe drinking water to be targeted to those members of the household who are responsible for transportation, collection and storage of water. Respondents were asked about division of responsibility for collecting or carrying water from the sources. The result is shown in graph on the right.

7 Households where girls and women carry water come to 40% of the total. Some people

would expect this proportion is to be true in the whole country which are not part of the rural supply scheme. However, those who are familiar with statistics know that a percentage derived from a simple random sample will not reflect the underlying population perfectly, for various reasons. **It should be noted that for simple random sampling like the present one, we can be sure with approximately 95% confidence that the proportion of households where girls and women carry water would be between 30.69% to 49.15% of the households.** This confidence interval gives us an idea of the precision of the results of the survey. Such confidence interval can be estimated for every percentage, but only certain percentages are selected for doing so. There is a large sampling allowance (interval limit) because the sample size is quite small.

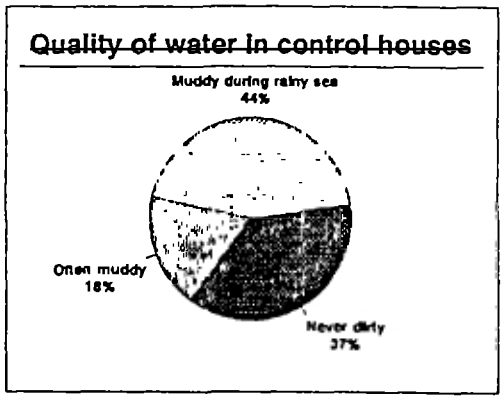
Time taken to fetch water

8. Besides knowing which members of the households collect water, it would be instructive to know how long it takes for a round trip to fetch water. The time required to collect water was measured by the enumerators for 116 households. On an average, it took about 7.1 minutes. But this duration was estimated by including 27 households who have piped water. If the samples of households who have water piped into their houses is excluded from the calculation, then the samples of households who have to fetch water from outside decreases to 89. For 89 households, the average duration increases to 9.12 minutes, as shown in table below. When the data is adjusted to exclude those households with piped water, lower quartile is 3 minutes and upper quartile is 15 minutes. Median is 7 minutes and mode is 15 minutes. Time taken to collect water ranged from 1 minute to 35 minutes.

No. of Households	Total duration taken by 89 households	Mean	Variance	Std Dev	Std Err
89	820 minutes	9.12	49.62	7.04	0.74

Std Dev = root of variance. Std Err= Std dev/ root of sample size which is 89 in this case.

9. Mean time required to collect water in one round trip among 89 households was, as mentioned above, 9.12 minutes. There is a tendency, especially among those who are not familiar with statistics to believe firmly that estimated mean would apply to the whole country with precision. But we can not be sure that the sample mean is equal to the true population mean. In other words, how much confidence can we place that the random sample mean of 9.12 minutes approximates the true population mean? There is 95% probability that this random sample mean will fall in the range of 7.67 minutes to 10.57 minutes.



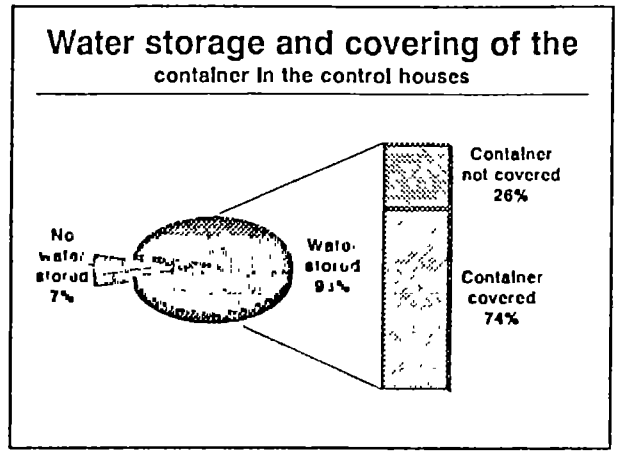
Quality of water

10 Respondents were further asked about the turbidity or muddiness of their water sources. 43.5% said that it was dirty during the rainy season. 18.3% said that it was very often

muddy, even during the dry season. 36.5% said that it was never dirty. It is rather interesting to note that most of the villages who face insufficiency of water most of the time are also the villages whose water is muddy and dirty most of the time. For example, sample villages where water is insufficient most of the time and water is dirty and muddy most of the time are Shevrang in Tang in Bumthang, Longkhar in Bumdeling in Trashiyangtse, Lunakha in Kabji in Punakha and Changdukha in Wangchey in Paro. These two phenomenon are closely correlated. Thus, it appears that those who are confronted with an overall shortage of water around the year are also the people who, because of or in spite of the shortage, drink dirty water.

Storage of Water

11. After collecting, storage of water in a safe way prevents contamination. Out of 116 households surveyed, the enumerators found that 93.1% (108) of the households had water for drinking stored in their houses. Out of 108 households, 74.1% had their water storage covered and the remaining 25.9% did not cover their water containers. The lack of some kind of cover or lid leaves the water to vulnerable dust particles, entry of flies and even rodents.



12 69.4% of the households had ladles or dippers to scoop water out of water containers In the remaining households, water was presumably poured from one containers to another directly, without the use of dippers and ladles. It is possible to do so in the case of plastic jerricans and bamboo containers. Among those who possessed ladles and dippers, 82.7% of the people kept ladles or dippers out of reach of dogs, chickens or cats

Habit of boiling water

13 The habit of boiling water before drinking is not widespread among the respondents. Only 15 5% of the respondents said that they boiled their drinking water. 44% said they never boil it and 40.5% said that they boil it sometimes To curtail the spread of diseases borne by water, the most effective measure would be to drink only boiled water. People do not boil drinking water for various reasons. But the main reasons are likely to be the belief that raw water does not pose any health hazard and a dislike for the taste of water which has been boiled.

Incidence of some illnesses among children under five

14 Polluted water poses serious health risks, above all to children. In all the 116 households, the respondents were asked as to how many children under five there were in the household 52.6% of the household did not have any children under five 47 4% of the households had children under five. 25.9% of the households had one child under five, 18 1% had two children under five and 2.6% had 3 children under five. 0.9% of the households had four children under five. **The total number of children under five in 116 households was 85.**

15. It would be of interest to calculate the underlying population percentage of households,

as opposed to sample percentage of 47 '%, who have children under five. There is 95% probability that the sample percentage will ll between 38.06% and 56.89% of the households.

16. Those 55 households who had children under five were further asked to report whether their children suffered from diarrhoea or dysentery, skin rashes and eye infection in the two weeks preceding the survey. The percentage of incidence is reported in the table below.

Illness reported for children under five in the two weeks preceding the survey	% of children under five who were ill in the two weeks preceding the survey (Dec.94, Jan. 95 and Feb.95)
Diarrhoea or dysentery	**12.90**
Skin Rashes	**7.05**
Eye Infection	**10.58**

Knowledge and beliefs about causes of diseases

17. The enumerators inquired into the knowledge of the respondents: whether they thought that dysentery or diarrhoea could be spread by flies. An overwhelming majority (70.4%) thought that flies could spread such diseases However, there was also a large proportion (28.7%) who did not know either way. They had no views on whether the flies could be carriers of such diseases.

18. The next set of questions were designed to explore peoples knowledge about the link between washing hands and causing illness or infection. If hands are washed, traces of faecal matter can be removed from the hands and therefore germs of diseases do not get orally transferred into the stomach where the first symptom may be pain. 25% of the respondents did not know whether dysentery and diarrhoea could be caused by drinking dirty water. 75% knew that people could get such diseases by drinking dirty water. Respondents were also asked whether they thought that there was a link between stomach pain and not washing hands with soap and water every day. Proportion of respondents between those who said "yes" was 72.4% and those who said "they do not know" was 27.6%. Finally, the respondents were asked as to whether they thought eye infection could be caused by not washing hands with soap and water every day. Once again, the pattern of response was similar : 70.7% "yes" and another 29 3% said "they do not know".

Prevalence of soap

19. Soap is widely used. 94% of the respondents washed their hands with soap. 2.6% of the respondents still use ash and 3 4% used only water. Villages such as Kangpara in Trashigang and Drakten in Trongsa continue to depend on ash as an alternative to soap Respondents in villages such as Martang in Samdrupjonkha and Lapcha in Monggar neither use soap nor ash to wash their hands. They use water alone when they wash hands

Awareness about sanitation

20. 99% of the respondents had been informed about the importance of clean and safe drinking water. The survey questions were designed to find out who were active in the

dissemination of health messages. The most active persons to disseminate the information are health workers. 87.9% of the respondents had learnt it from the health workers; 26.7% from the gups; 21.5% from the dzongkhag technicians; 4.3% from relatives and friends; and 17.2% from others. **The questions in the survey forms were not open ended, so there was no scope for identifying other agents of health campaign such as Kuensel, the national newspaper and Bhutan Broadcasting Services. In fact these media are important agents who raise awareness about sanitation.**

21. Similarly, the enumerators asked about the awareness of having and using latrines and from whom the respondents heard about the importance of latrines. The message about the importance of having and using latrines had reached 100% of the respondents. Someone or the other had explained to them the importance of constructing and using latrines. It is plausible to believe that there exists a universal knowledge about the importance of latrines because of the campaign that followed the declaration of "Royal Decree" on water and sanitation. 82.7% of the respondents said that they learnt about the importance of latrines from health workers; 27.5% from dzongkhag technicians; 26.7% from gups; 3.4% from friends and relatives; and 14.6% from others.

Highlights of survey of 116 control households

- 53% draw water from springs and 28% from streams
- 20% have insufficient water supply most of the time
- Average time required for round trip to collect water is 9 minutes
- 44% find water muddy during rainy season
- 93% store water in houses
- 16% boil their drinking water
- 47% have children under five
- 25% don't know that dirty water causes diarrhoea/dysentery

CHAPTER 5.

TREATED GROUP: WHERE THERE ARE RURAL WATER SUPPLY SCHEMES

1. In the immediately preceding chapter, the findings of the random sample survey conducted in areas which were, so far, not part of the rural water supply schemes (control group) were presented. This was done deliberately to set the stage for comparison with areas where there are rural water supply schemes (treated group). In this chapter, the findings of the survey in areas where rural water and sanitation schemes have been implemented are explained. Chapter 7. presents the evaluation of the main differences in the experiences of control group and treated group.

Timing and the extent of random sample survey

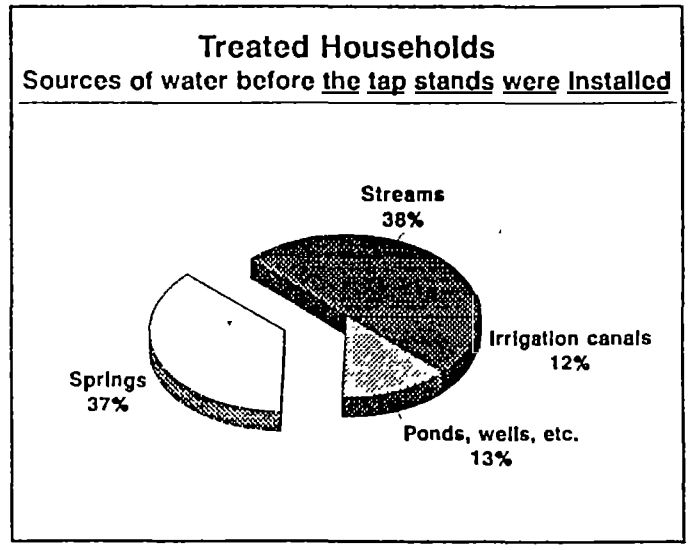
2. The survey of treated households was carried out between 25 December 1994 and 24 March 1995. 65 gewogs in 18 dzongkhags were covered by the survey. Gasa and Sarpang were not sampled. In 65 gewogs, 368 households were approached. But 20 households could not be interviewed either because their houses were locked or the members of the household present at that time were deemed unfit to be interviewed as they were children or incapable of answering the questions. So 348 people, one from each household, were interviewed.

Sex of the respondents

3. Out of 348 respondents, 85.1% of the respondents were female and 14.9% were male. The women are thus the primary source of information. The data collection teams were directed to interview women as far as possible. But 3.4% of the respondents did not use project tap stands, possibly because their tap stands were no longer functioning. 96.6% (336 households) were using water from the tap stands. The result is hardly surprising because the sample of respondents (households) were confined to those who were users of tap stand water.

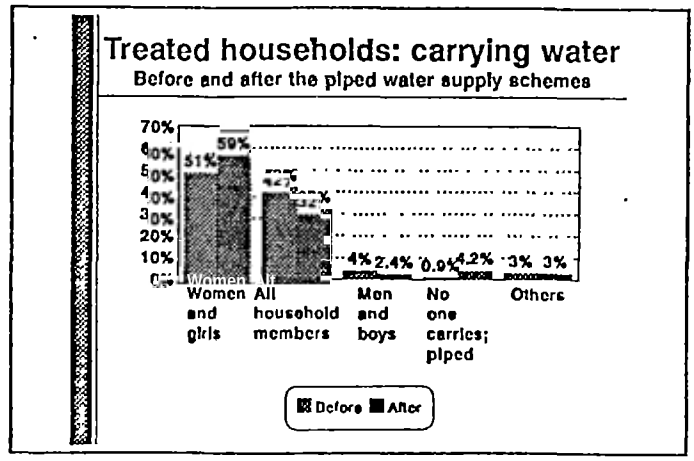
Changes in sources of water with the advent of tap stand water

4. The 336 households using water from tap stands were asked about the source of their water before the water supply schemes were constructed The question inquired as to where they went to get water before the introduction of water supply schemes. 36.2% fetched water from springs, 37.3% from streams and 12% from irrigation channel. The last 12.6% drew water from other sources such as ponds, rivers, wells, etc.



Responsibility for fetching water

12. Before the introduction of tap stands, in 50.7% of the households water was carried to the house from various sources by women and girls. In 42% of the households, all the members of the households used to collect water. In 3.5% of the households, only men and boys used to collect water.



13. There is a modest change in the pattern of responsibility between the members of the family for collecting water since the introduction of rural water supply schemes. The role of collecting water seems to have further increased for women and girls, as shown by the incvrease by the proportion of girls and women collecting water going from 51% before the schemes were introduced to 59% after the schemes were introduced. **But this may not mean that the work load in terms of hours of collecting water has increased because the introduction of water supply schemes has halved the time required to collect water.** In 31.8% of the households, the task for collecting water is carried out equally by all members of the households. The proportion of households where only men and boys collect water is 2.4%. There are about 4.2% of households where water is piped from the tap stands into the houses and thus do not assign anybody to collect water.

Time taken to a round trip to fetch water

14 The time taken for a round trip between the 336 houses and their respective tap stands were observed and measured. Time taken ranged from 45 minutes to less than a minute Households who have water from the tap stands piped into the houses or the collection point are so near that, for them, it takes less than one minute to get water. There were 6.3% of households who could fetch water in less than a minute. In terms of inter-quartile measure, it takes less than one minute for 25% of the households to go and come back from the tap stands Lower quartile is 1 minute. 75% of the household have to spend less than 5 minutes to fetch water from their tap stands. 90% of the households have to spend less than 10 minutes per trip to fetch water.

15. Upper quartile is 5 minutes Therefore, inter-quartile range is 4 minutes. **Mean time taken is 5.6 minutes,** mode is 5 minutes and median is 3 minutes.

No. of Households	Total duration taken by 336 households	Mean	Variance	Std Dev	Std Err
336	1882 minutes	5 6	42 67	6.53	0.35

Forms of contribution for the construction of schemes

16. Virtually no household (96.5%) paid any money for the construction of the rural water scheme. They did not need to pay for the materials which were provided by the project. But the beneficiaries contributed substantially in terms of labor. The number of days contributed by each household ranged from zero to 180. **The average number of days each household worked for the construction of the rural water supply scheme was 56.** Lower quartile was 30 days and upper quartile was 90 days.

17. If the daily wage is arbitrarily assumed to be Nu 20 at the time of construction, the labor contributed by the beneficiaries can be converted into a cash contribution. The size of the cash contribution calculated in this way shows the range to vary from Nu. 0 to Nu. 3600 per household. However, the average amount is Nu. 1116. Lower quartile is Nu 600 and upper quartile is Nu. 1800. Most households (93.6%) did not contribute anything else beside their labor to the construction of rural water supply schemes.

Village maintenance committees

18. 70.6% of the households said that they have set up Village Maintenance Committees for rural water supply schemes. 27.6% of the households reported Village Maintenance Committee and 1.7% were not aware either way. The beneficiaries of the rural water supply schemes had different notions about the ownership of the rural water supply schemes. 68.3% thought that it belonged to them and their villages while 26.7% attributed the ownership to the district administrations or the government. The persistence of such ideas has effects on fixing the responsibility to keep the water supply running. By and large the people (89.5%) felt that the village care taker appointed by the village should be responsible for the running of the rural water supply scheme. 7.6% felt that the whole village was collectively responsible for the maintenance of the rural water supply scheme. A small proportion (2.6%) said that there was no one responsible for maintenance of the rural water supply scheme.

User contribtutions for construction and maintenance

For construction:

- PHE estimate: Nu 1,040
- Users estimate: Nu 1,116

For maintenance (in past one year):

- 78 % did nothing
- 22 % contributed Nu 332 equivalent

Contribution for the maintenance and operation of schemes

Cash contribution

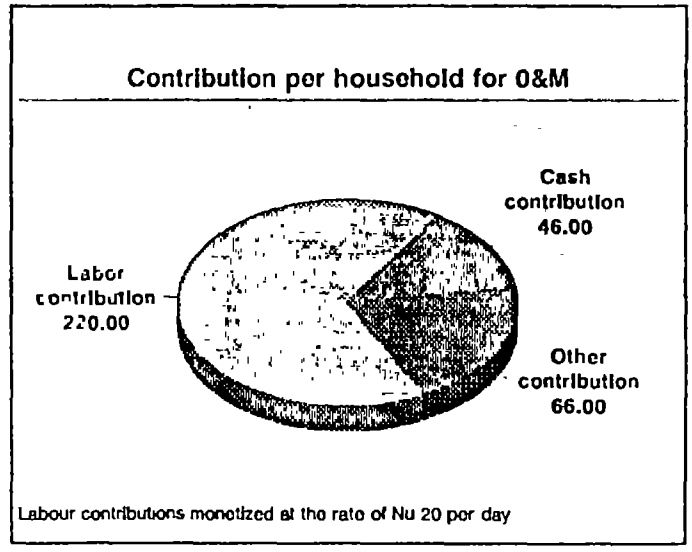
19. Some amount was paid towards the maintenance of the rural water supply schemes including the honorarium for the village care takers to maintain water supply schemes. 77.3% of the households have not paid anything at all in previous year. The remaining 22.7% (46 households in the sample) paid amounts varying from Nu 4 to a maximum of Nu 240 per household in the past year. Among 22.7% households, the average amount paid towards the maintenance of the rural water supply schemes was Nu 46.34 per household. However, if we find the average of all the households, the yearly household contribution is only about Nu. 10.33

Contribution in the form of labor

20. Usually, households do not contribute cash but they renovate and work on the schemes. There is a large proportion of households who also did not contribute any labor. This proportion goes as high as 61%, which implies that only 39% contributed labor towards the maintenance of the schemes in the previous year. The labor contribution of those 39% can be expressed in financial terms as a product of man days and daily wage which was assumed to be Nu 20 per day. The average amount paid by these 39% of the households was Nu. 219.54 per household per year. Every household worked on average 11 days per year.

Other contributions

21. Households were further asked if they contributed anything besides labor and cash. The value of such contributions were monetized. Again 96 1% of the households did not contribute anything. 3.2% contributed something and the average value of such contribution by these 3.2% of the households was estimated at Nu 65.91 per household per year.



22. The table on the next page shows that the total contribution of each household per year towards maintenance and operation was on average about Nu. 331.79, among those who paid There was a large percentage of households who did not contribute either in labor or cash for various reasons. When households who did not pay both cash or labor are included to derive the yearly average contribution from by each household, the amount comes down to Nu 99.45 per year.

	Forms of yearly contribution per household			Mean of all observations (n=344)
1.	*% of households who contributed cash*	*22.7% paid*	*77.3% did not pay*	*100%*
	Average cash contribution	**Nu. 46.34**	**Nu. 0.0**	**Nu. 10.33**
2.	*% of households who contributed labor*	*39.0% contributed*	*61.0% did not contribute*	*100%*
	Average labor contribution converted into monetary terms at the rate of Nu 20 per day	**Nu. 219.54**	**Nu. 0.0**	**Nu. 84.88**
3.	*% of households who contributed other things besides 1 and 2.*	*3.2% contributed*	*96.1% did not contribute*	*100%*
	Mean of other forms of contribution	**Nu. 65.91**	**Nu. 0.0**	**Nu. 4.24**
	Grand total for three forms of contribution	**Nu. 331.79**	**Nu. 0.0**	**Nu. 99.45**

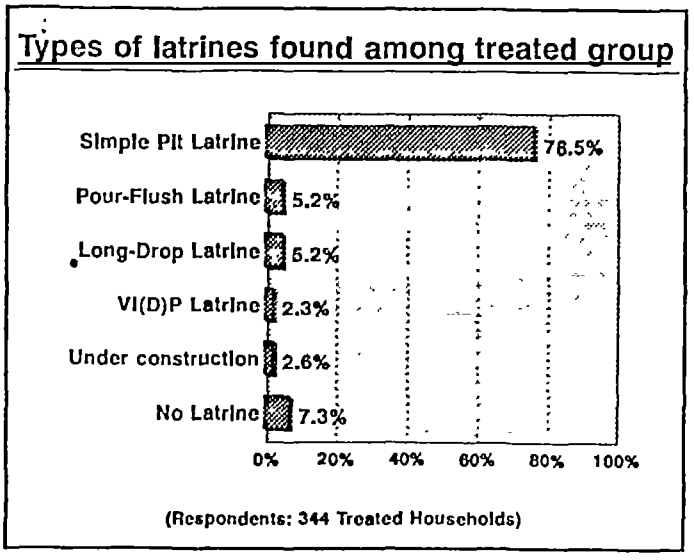
Unexpected problems with water supply schemes

23. Water flow was reported to be blocked at least once during the past year by 66.9 % of the households. **This happens due to entry of leaf, litter, crabs and frogs. In many of the cases, there is no option but to cut pipes at suspected places to draw out those leaf litter, crabs and frogs.** 16.% of the households also said that pipe lines were cut. 18 3% mentioned that the flow of the water had stopped sometimes due to freezing. This would be an experience only in the high altitude areas. In case of problems with water supply schemes, 68.9% said that it was resolved by the caretaker. 16.8% said that the entire village worked together to repair the schemes. An entire village working together to repair water supply scheme might indicatet non-existence of VMC or caretaker so that the whole village has to organize themselves to renovate the scheme. Interestingly, it turns out that some of the villages where the whole villages worked together to repair their schemes did not have VMCs.

LATRINES

Coverage of latrines and types of latrines constructed

24. The interviewers inspected 344 households to ascertain whether they had latrines or not. 319 households or 92.7 % had latrines. Out of the 319 households, 76.5% had simple pit latrines, 2.6% were under construction; 5.2% had pour flush latrines and 5.2% had long-drop compost latrines. 2.3% had ventilated pit latrines. **Therefore, 92.7% of the households, including those households whose latrines were being constructed at the time of survey, had one or the other type of latrines.**



Reasons for not building latrines

25 Among 7.3% (25) households who did not have latrines, the interviewers asked for various reasons for not building latrines. Almost 60% of the households said that they did not have time to build latrines and 16% pleaded ignorance about the knowledge to construct latrines.

26 Among those 319 households who built latrines, 65.5% did not receive any assistance in the forms of material, skilled labor or money. 34.2% had, however, received such assistance.

Reasons and advantages of having latrines and habit of using latrines

27 Platforms of the latrines were observed to be clean, with no deposit of excreta on the platforms, in 89.7% of the cases The users also had a high awareness of the purpose of building a latrine for health and hygiene reasons. 19% cited the persuasion of the government officials as their reason for building latrines while 13.5% said they built it because of the convenience the latrines provided.

28 The most important question is whether people have a habit of using the latrines, once they have been built. The extent of usage might also differ from adults to children (those above 3 years old) 98 4% of the adults claimed to used it always and 71.1% claimed their children use the latrines always

29 90 4% (314) of the households expressed their satisfaction about their latrines Other 9.6% (30) households complained about the smell and the lack of safety for the children in using the latrines. Out of these 30 households, 53% expressed their preference for open space to latrines..

SMOKELESS STOVES

Coverage of smokeless stoves

30. Out of 342 households surveyed, 27.8% (95) had smokeless stoves; 72.2% (247) of the households did not have smokeless stoves. Those 72.2% (247 households) were asked to express whether they would like to have one in the house. 87% affirmed the question, 8.5% did not want

to have smokeless stoves and 4.5% could not make up their mind whether they would like to have smokeless stoves or not.

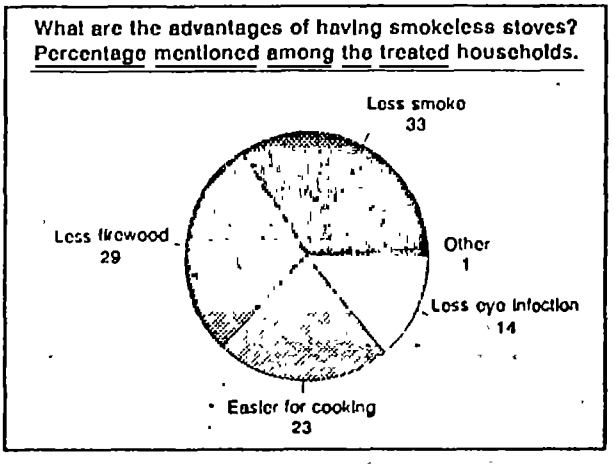
31. 42.1% of the smokeless stoves were installed before 1991, 53.7% in or after 1991. The remainder (4.2%) did not know when their smokeless stoves were installed. 95.8% of the households use the smokeless stoves. Only 4.2% did not use it. The main reasons for not using smokeless stoves were their inability to generate enough heat to warm the houses and the inability for the chimneys to draw the smoke out adequately.

Use of bukhari and mesa

32. Out of the households who have smokeless stoves, most households (75.8%) do not use either use bukhari or mesa in the winter. 13.6% use mesa and 10.1% use bukhari in winter in addition to the smokeless stoves.

Advantage of smokeless stoves

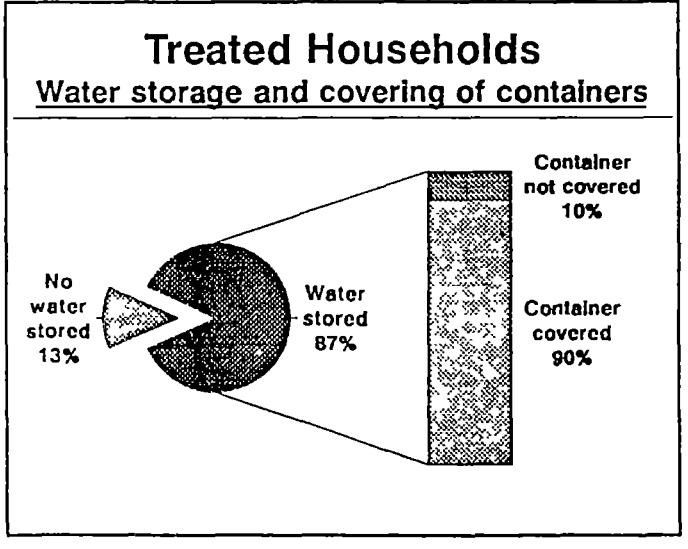
33. Several advantage accrue to the members of a household who use smokeless stove. A range of advantages expressed by the users were noted. A respondent may list more than one advantages. The following tables summarizes the scores against each advantage out of a total score of 259.



Storage of water and habit of boiling drinking water

34. 86.9% (299 out of 344) of the households had water stored in or near to the house Out of those 299 households, 86.6% stored water in a container which was covered so that foreign bodies might be kept out. Ladles for scooping the water out of the container were kept out of the reach of domestic animals and poultry birds in 81.9% (212 out of 259) of the households.

35. **Drinking boiled water is not a wide spread habit.14.5% drank boiled water always and 51.5% drank boil water sometimes. 34% never boiled their drinking water.**



Incidences of some illnesses among children under five

36. 45.1% (155) of the households did not have any child under five years of age. 26.2% of the households had one child and 20.3% had two children under five years of age. 7.3% of the

households had three children under five years of age. **In all there were 322 children under five in those 155 households.** The average number of children under five for a household was 0.936. (It must be noted that the incidence of diseases such as dysentery, skin rashes and eye infection is expressed out of 322 children and not out of the number of households.). **The sample of children is too small for the results to be valid for the whole country. The number of children sampled in the control group was even smaller - only 85 children. Such a small sample is not large enough to represent the whole population and the result must be considered with skeptism on methodoligical grounds.**

37. The incidence of diarrhoea or dysentery, skin rashes and eye infection among the children under five years of age is reported in the following table

Illness report for children under five in the two week preceding the survey	% of children under five who were ill in the two weeks preceding the survey (Dec '94, Jan. and Feb.95)
Diarrhoea or dysentery	**16.1**
Skin Rashes	**10.5**
Eye Infection	**5.3**

Awareness about causes of some illnesses

38 People were asked about their awareness as to the cause of certain diseases. 19% of the people did not know or did not believe that diarrhoea or dysentery could be spread by flies and 14.5% did not know or did not believe that diarrhoea and dysentery could be caused by drinking dirty water. The importance of washing hands with water and soap for avoiding illness was also not universally known. 26.5% did not know or did not believe that eye infection can be caused if they do not wash hands with soap and water. Likewise, 17.7% did not know or did not believe that diarrhoea and dysentery can be contracted by not washing hands with soap and water. 96.2% of the people claimed to usually wash their hands with soap. This naturally implies that 96.2% of households had soap The others claim to do it with ash or using water alone.

Dissemination of Information on Water and Sanitation

39. Except 3.5%, all the households have been made aware of the importance of clean and safe drinking water. Out of 332 households to whom the importance of clean and safe drinking water was explained, 84.9% received such explanations from health workers. Around 30% of the households said that the importance of clean and safe and drinking water were explained to them by dzongkhag technicians and gup. Relatives, friends and others do not play such an important role in this regard. As in the case of clean and safe drinking water, people have received extensive information on the importance of constructing and using latrines. 97.7% of the households had done so. The health workers were largely responsible for dissemination of such information, as 78 8% of the households mentioned that they came to know the importance of constructing and using latrines from the health workers. 35% of the households came to know it from the dzongkhag technicians and 29.5% of the households came to know it from relatives or friends.

CHAPTER 6.

BACTERIAL TEST OF WATER

Sample size and collection points

1. To analyze water samples for safe drinking, 308 water samples were collected. Out of 308 water samples, 40 samples were taken from control villages and 268 from sources under the projects. Water samples were collected from over 70 different villages in 40 gewogs in 14 districts. The purpose of collecting samples from water supplied from the schemes and from areas where there is no rural water supply schemes was to assess any significant difference in the safety of drinking water.

2. Samples were collected from different collection points. Samples were collected from water collected in the households and reservoir tank. Samples were also collected from irrigation streams, springs, streams and tap stands.

3. The samples were analyzed in 11 hospitals, each based in Lhuntse, Monggar, Pema Gatshel, Samdrupjongkha, Wangdue, Wangdichholing in Bumthang, Yebilaptsa, Samtse, Trashigang, Thimphu and Trongsa The analysis of the water samples to assess the presence of faecal coliform was conducted mostly by the laboratory analysts of the respective hospitals, within six hours of sample collection.

4 The following table gives the proportion of samples collected by different sources divided into sources associated with project schemes and control sources:

Point of collection	Numbers of total samples collected	% of total samples collected	% of samples collected from project schemes. Absolute numbers in bracket		% of samples collected from control sources. Absolute numbers in bracket	
Households	123	39.9	37.7	*(101)*	55.0	*(22)*
Tap stands	106	34.4	38.8	*(104)*	5 0	*(2)*
Source (spring)	46	14.9	14.1	*(38)*	20 0	*(8)*
Source (stream)	31	10.1	9.3	*(25)*	37.5	*(6)*
Source (Irrigation stream)	2	0.6	0.0	*(0)*	5.0	*(2)*
Total	308	100	100	*(268)*	100	*(40)*

Comparisons of contamination levels between control group and treated group

5. One should normally expect the proportion of samples of water which are free of contamination i.e. in the category 0 faecal coliform per 100 ml, to be higher under the rural water supply schemes than control group. This is clearly the case, as reported in first table on the next page. 40.7% of the samples of water collected from the rural water supply schemes is safe. In contrast, the proportion is only 22.5% in the samples of water collected from control group. We can infer that in general water from rural water supply schemes is safer than water from control group.

6. With respect to the category "grossly polluted water", one should expect the proportion of samples of water collected from the rural water supply schemes to be lower than the proportion of samples of water collected from the control group. This again conforms to expectations The percentage of samples which were grossly polluted is 6.3% in the case of rural water supply schemes and more than double that number (15%) in the case of control group.

Water classification according to faecal coliform per 100 ml of water	**% samples of water in control group. Absolute numbers in bracket**		**% of samples of water under project schemes. Absolute numbers in bracket**	
0 f.c.* per 100 ml **(safe water)**	22.5	*(19)*	40.7	*(109)*
1-10 f.c. per 100 ml **(low health risk)**	47.5	*(19)*	35.4	*(95)*
10-50 f.c. per 100 ml **(intermediate to high health risk)**	15.0	*(6)*	17.5	*(47)*
> 50 f.c. per 100 ml **(grossly polluted water)**	15.0	*(6)*	6.3	*(17)*
Total	100	*(40)*	100	*(268)*
Mean faecal coliform per 100 ml	19.1		14.1	
Standard deviation	33.9		36.2	

f.c *=faecal coliform

7. With respect to the category low health risk (1-10 per 100 ml), the proportion of samples collected from the control group is higher than the proportion of samples collected from rural supply schemes The chances of drinking water contaminated by faecal coliform, termed low health risk, is higher under the control group than the rural water supply schemes. In other words, more people are exposed to water containing 1-10 faecal coliform per 100 ml in the control group than in the rural water supply schemes The result is as expected.

Comparison of samples contaminated by sources of collection of water samples

8. Overall, 77 5% of the samples collected from the control group was contaminated by

faecal coliform. The estimate is reassuringly lower at 59.2% for the samples collected from the rural water supply schemes.

9. In the sample collected from the control group, the highest proportion of contaminated samples were found among the samples collected from the households, out of water containers. This suggest that the storage and handling of water, which had been stored in the households, contributes drastically to the contamination of the water. Almost one third of the households in the control group from whom samples were collected were drinking water which were contaminated to a degree that can be classified as "intermediate to high risk" and "grossly polluted."

10. A marginally more samples of water collected from springs were found to be more polluted than samples of water collected from streams. This is anomalous result contrary to expectation. This can be explained in as follows. Springs are not usually tapped right at the source. It is allowed to flow a few metres down before it is tapped. The open exposure of water for some distance may leave it vulnerable to contamination. The new technology now allows the springs to be tapped at the spot where water oozes out.

11. As in the case of samples of water collected from the households from the control group, the proportion of contaminated samples was the highest among the samples of water collected from the households dependent on the rural water supply schemes. Maximum percentage of contaminated samples originated from the households, as shown by the following two tables

Proportions of samples of water classified into different contamination levels by different sources in **control group expressed as a percentage of sample total** of a particular source. Absolute numbers in italics.

Contamination Levels	**% of House-holds**		**% of Tap stands**		**% of Source (Spring)**		**% of Source (Stream)**		**Total**	
Safe (0 f.c*./100 ml)	13.6	*3*	100	*2*	25	*2*	25	*2*	22.5	*9*
Low risk (1-10 f.c /100 ml)	54.5	*12*	0	*0*	25	*2*	62.5	*5*	47.5	*19*
Intermediate to high risk (10-50 f c /100 ml)	13.6	*3*	0	*0*	25	*2*	12.5	*1*	15.0	*6*
Grossly polluted (>50 f.c /100 ml)	18.1	*4*	0	*0*	25	*2*	0	*0*	15.0	*6*
Total	100	*22*	100	*2*	100	*8*	100	*8*	100.0	*40*

Proportion of samples of water classified into different contamination levels by different sources in treated group expressed as a percentage of sample total of a particular sources. Absolute numbers in italics

Contamination Levels	% of House-holds		% of Tap stands		% of Source (Spring)		% of Source (Stream)		Total	
Safe 0 f c* /100 ml)	36.6	*37*	45.1	*47*	34.2	*13*	48	*12*	40.6	*109*
Low risk (1-10 f c /100 ml)	32.6	*40*	34.6	*36*	31.5	*12*	28	*7*	35.4	*95*
Intermediate to high risk (10-50 f c./100 ml)	16.8	*17*	16.3	*17*	23.6	*9*	16	*4*	17.5	*47*
Grossly polluted (>50 f.c./100 ml)	6.9	*7*	3.8	*4*	10.5	*4*	8	*2*	6.3	*17*
Total	100	*101*	100	*104*	100	*38*	100	*25*	100	*268*

CHAPTER 7.

COMPARATIVE EVALUATION OF CONTROL GROUP AND TREATED GROUP

Sample size and sex ratio of respondents

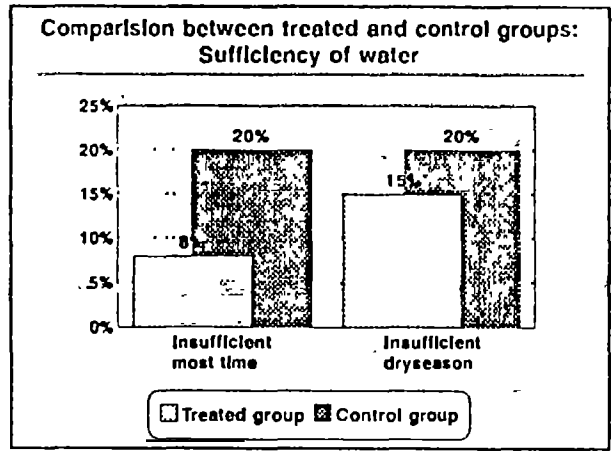
1. The sample sizes for the control group was 116 and for the treated group 336 households The sex ratio of the respondents was highly stable across both the control and treated groups. In both cases, 85% of the respondents were female.

Sources of water

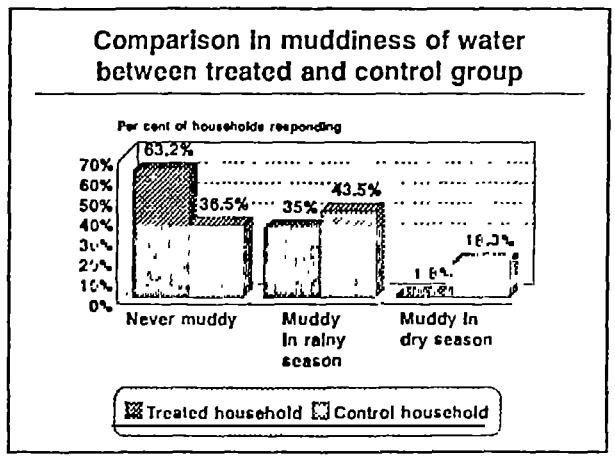
2. Sources of water in the control group and sources of water in the treated group before the introduction of tap stands do not show difference with respect to irrigation channel However, 37.5% of the treated group used to draw water from springs before they got water through tap stands, whereas in the control group, 53.4% used to draw water from springs. With respect to streams as sources of water, 28.4% of the households from the control group draw water from streams whereas 38.6% of the households from the treated group depended on streams before they got tap stand water.

Benefits of rural water supply schemes

3. One important impact of the introduction of tap stand water is that the insufficiency of water is reduced This comes out clearly when the percentage of households who reported insufficiency of water is compared between the treated group and control group. In the control group, 19.8% of the households said that water was insufficient most of the time. In the treated group, only 7.6% of the households said that water was insufficient most of the time. There is also considerable difference in the percentage of households who experience shortage of water during dry season between the treated group and control group. In the treated group, 14 8% of the households said that water was not sufficient during the dry season. But, the proportion is much higher in the control group at 20% Although the rural supply scheme programme has not eliminated the shortage of water, it has reduced insufficiency among the treated group in an impressive way.

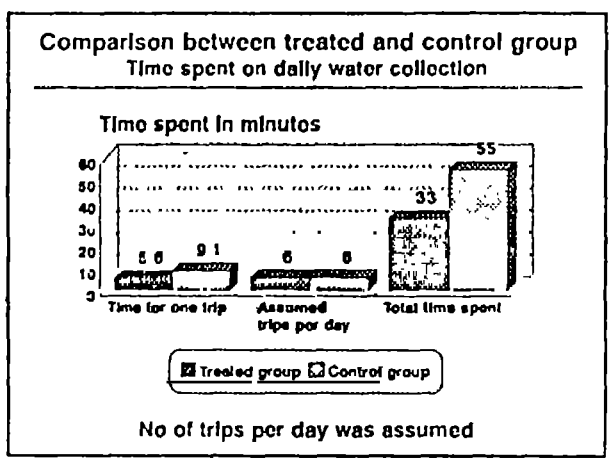


4 In addition to reducing the insufficiency of water, water drawn from rural water supply is, as expected, less muddy than water from sources in non-project areas. Rural water supply schemes have made water not only more available, but also cleaner. In the control group, 18.3% of the households reported that water they used was muddy even during the dry season In sharp



contrast, only 1.8% of the households in the treated group reported that water they used was muddy during dry season. Similarly, 43.5% of the households in the control group said that their water was muddy during rainy season. The proportion is much less at 35% in the treated group.

5. There is also a significant difference in the time required per trip to collect water between the control and the treated group. On average, it takes 9.12 minutes per trip to collect water in the control group, whereas it is 5.6 minutes in the treated group. There is, on average, a saving of 3.52 per trip per household due to the introduction of tap stand water. **If we assume that the average number of trips a household in the treated group makes in a day is six as found in a study by PHE in 1993, then there is a rough saving of about 21 minutes per household per day in the treated group. Such saving of time would apply only to drinking water, which has to be fetched. For other activities such as washing oneself and washing clothes people go to the tap stand water, which also entail time saving.**



6. But it would be erroneous to consider the benefits of the rural water supply schemes only in accordance with the advantages mentioned so far. There are other direct as well as indirect benefits. One of the more obvious direct benefits is the higher level of consumption of water for washing, cooking and watering animals. An indirect or unintended effect of the introduction of tap stands water is irrigation of kitchen gardens and orchards Such unintended benefits might have resulted in higher yield of vegetables and fruits which bring cash income and increase the scope for dietary improvements

Health and hygiene awareness

7. Hygienic practices are more ingrained among the households in the treated group than in the control group. Better hygienic practices related to water management and storage in the treated households might be a result of a more intense dissemination of health education in those areas. Water containers were found covered only in 74% of the households in the control group whereas 86.6% of the households in the treated group covered their water containers. The proportion of households who believed that drinking dirty water could cause dysentery and diarrhoea was 25% in the control group but only 14.5% in the treated group. With respect to the habit of drinking boiled water, the proportion of households who always boil drinking water is about 15.5% in the control group and 14.5% in the treated group. The figures are surprisingly close. These households may represent a core group who have been decisively influenced by

health education to take such a precaution. The percentage of households who boil drinking water sometimes are 40.5% and 51.5% for control group and treated group respectively. The percentage of households who never boil drinking water are 44% and 34% for the control group and treated group respectively.

Incidences of illness of children under five

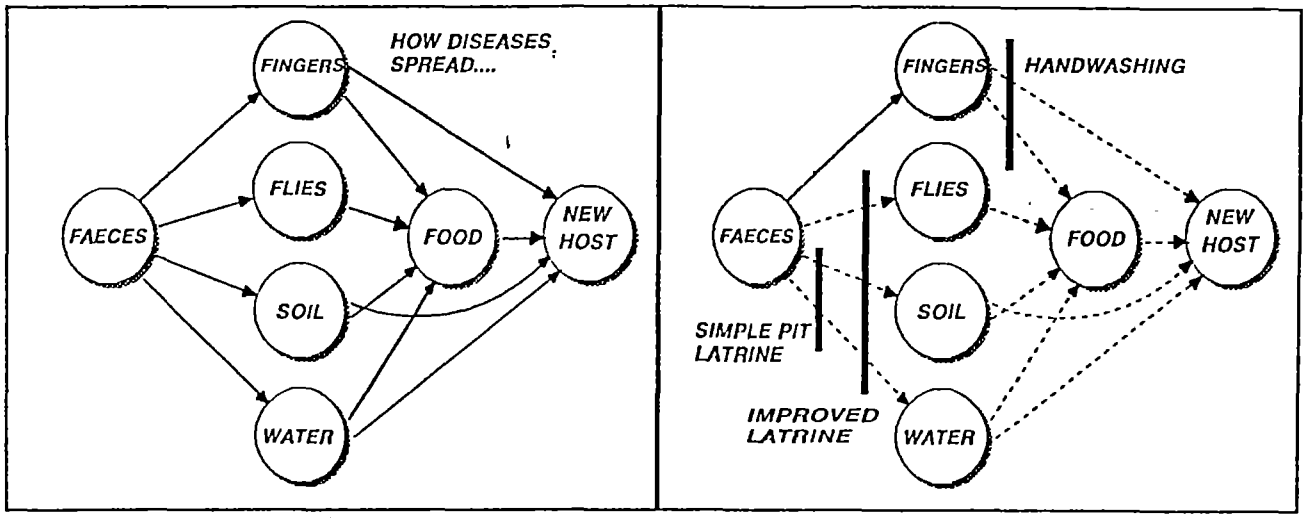
8. Table below presents comparisons of the incidence of certain illnesses for children under five in control group and treated group. The results are contrary to expectation. The incidence of certain diseases reported in the two weeks preceding the survey were higher in the treated group than in the control group Only figures pertaining to the incidence of eye infection confirms to our expectation that illnesses should be less in the treated group. Thus there is a need to reconcile the findings of the survey to expectation.

Illness reported for children under five in the two weeks preceding the survey	% of children under five who were ill in the control group **Total number of children=85**	% of children under five who were ill in the treated group **Total number of children=322**
Diarrhoea or dysentery	**12.9**	**16.1**
Skin rashes	**7.1**	**10.5**
Eye Infection	**10.6**	**5.3**

9. **The unexpected results, especially with respect control group, may be due to small sample and is unacceptable on methodological ground.** There is evident of the control group being an unrepresentative sample By sheer chance, the proportion of households who had children under five happened to be greater in the treated group. The percentage of households who had children under five in the control group was 47.5%. In contrast, the percentage of households who had children under five in the treated group was 54.9%. This means that the age structure of treated group and control group was slightly different. The difference , though normalized by expressing as a percentage, is an additional source of bias or unexpected result The treated group has a broader base of population than control group. Since children under five may be more vulnerable to diarrhoea or dysentery, skin rashes and eye infection, a broader population base naturally results in a higher incidence of illnesses.

10. Further, clean water and smokeless stoves are not the only factors contributing to control of diarrhoea, dysentery, skin rashes and eye infections. The two graphs below demonstrate the faecal-oral routes of disease transmission. The graph on the right shows how different interventions can break these transmission routes From this graph it is evident that for the faecal-oral routes of transmission to be broken, latrine use and hand washing are essential. Improved water supply will reduce, if not eliminate, pollution of water with pathogens. Improved water supply will also facilitate hand washing, bathing, laundering and home cleaning, while at the same time allowing for better latrine hygiene. The graphs also demonstrate that water supply

improvements alone are unable to break the routes of disease transmission.

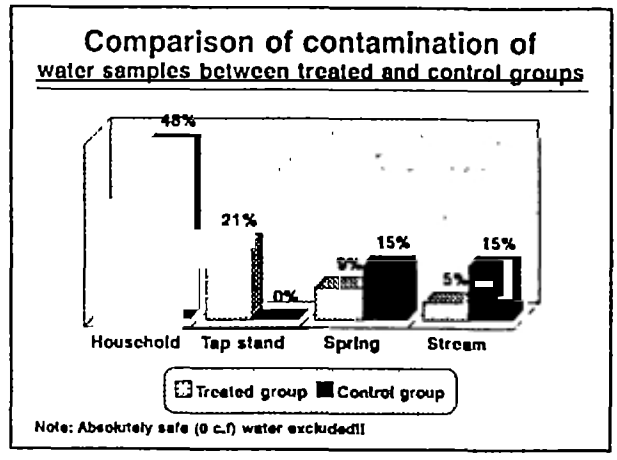


Bacterial analysis of water

Comparison by degree of contamination

11 Water can be classified into five categories of contamination levels from 'safe drinking water' when it has no coliform per 100 ml to 'grossly polluted water' when it has over 50 f.c. per 100 ml. In the control group, the percentage of samples which are safe for drinking is 22.5% whereas in the control group it is 40.7%. 15% of the samples in the control group were dependent on grossly polluted water whereas the percentage is 6.3% in the treated group. The difference between control group and treated group in 'intermediate to high health risk' with 10-50 f.c. per 100 ml is quite marginal.

Comparison by sources of water



12 The bacterial analysis show that the **77.5% of the samples in the control group are contaminated compared to 59.2% in the treated group.** In the control group, contamination was found mostly in the samples collected from the households. 47 5% of the samples which were contaminated, were traced to the households compared to 15% each to springs and streams. In the treated group too, samples collected from the households and tap stands were more contaminated than those collected from either springs or streams. 23.8% and 21.2% of samples collected from households and tap stands respectively were contaminated in the treated group. 9.3% and 4.8% of the samples collected from the springs and streams respectively were contaminated.

13. The comparison given in the preceding paragraph allow us to generalize in three ways. First, contamination is increased after the water reaches the house in both treated group and control group. Transportation, storage and handling of water within the houses compound the problem of contamination. Second, springs and streams in the treated group are less contaminated than the springs and streams in the control group. This difference can be attributed to the protection and fencing of the springs and streams at the intake points in the treated group. Samples might have been taken at the intake or sources where such fencing and protection were in place For there is no other reason why springs and streams in the treated group should be inherently purer than the springs and streams in the control group. Water gets increasingly polluted during its course towards the households, where it is consumed in various ways. As a public health programme, it might be more cost effective to stabilize the pollution of water at the stage of household storage by promoting boiled drinking water and clean storage.

CHAPTER 8.

SURVEY OF WATER SUPPLY SCHEMES

Extent of survey and sex of respondents

1. The survey of water supply schemes took place from 26 December 1995 to 16 March 1995. It covered about 91 villages/settlements spread over 60 gewogs in 18 districts The number of water supply schemes was 91. Each data collection team was guided during the field trip by one of the following: a village care taker, a member of the Village Maintenance Committee, the gup or a person well informed about the water supply scheme. In 74% of the cases, it was the caretaker who led the data collection team in the area.

Highlights of water supply schemes survey

- √ 91 schemes surveyed: 57 new and 34 rehabilitation
- √ 685 tapstands surveyed: In 90% water was flowing
- √ On average, each scheme has:
  - 138 users: 115 villagers and 23 inst. users
  - 7.5 tapstands per scheme
- √ 26% of VMCs/gups/users keep record on O&M contribution
- √ 20% of VMCs/gups/users keep scheme Completion Report with them
- √ 0% of VMCs/gups/users keep design and estimate with them

Distance from road head

2 Water supply schemes were located away from the road head. Time taken by the data collection team to walk from the road head to the water supply scheme areas were noted. In 75 % of the water supply schemes, the data collection team took 3 hours That is to say, the upper quartile was 3 hours The mean time taken was 2 42 hours

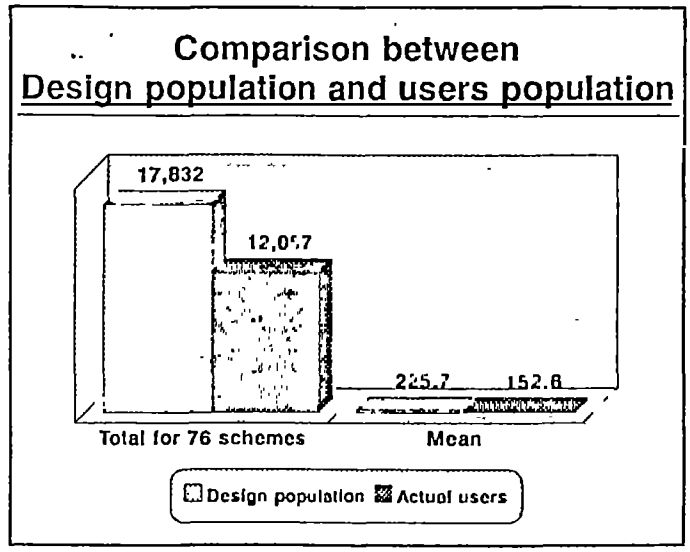
Number of houses and inhabitants served by a water supply scheme

3 These 91 water supply schemes served 1544 households. One water supply scheme serves on average 17 households. The maximum of households served by a water supply scheme is 65 households. The mode is 6 and upper quartile is 23 households. Apart from the households, institutions like monasteries, schools and health units were also connected to the water supply schemes.

4 The number of inhabitants served by those 91 schemes was estimated The total users or population in the 1544 households was 10,498 people, in addition to 2141 people found in the institutions like monasteries, schools and health units On average, a water supply scheme was serving 115 people in the households and 23 people in the institutions. Thus, each scheme was serving on a total of 138 users on average.

Design and actual user population

5. The purpose of finding the actual users is to compare it with the population size the schemes are designed to serve. In order to do this, **only 76 rural water schemes were selected. The rest had missing data.** Among the 76 water supply schemes the actual users population was 12,057 compared to 17,832 people it was designed to serve. The pair wise comparison of some descriptive statistics pertaining to actual users and 'design population' is shown in the table below.



	Design Population	Actual Users	Difference
Total for 79 schemes	17,832	12,057	5,775
Mean	225.7	152.6	73.1
Std. Dev.	199.68	134.18	

6. The table above shows that the design population exceeds the population of actual users This excess is planned. On average, a scheme is designed to serve 226 people. But it is actually used by 153 people, which leaves allowance for 73 more people. Assuming that the per capita consumption of water is constant, the excess capacity that could be supplied to 73 more people in every scheme is the provision kept for growth in population. If we suppose that the population of actual users (153) is growing at the rate of 3%, then in 13 years time (2008) the population of actual users per scheme would increase to 224 people. Such an increase can be absorbed easily by the allowance made in the design population. The schemes, therefore, seem to have been constructed with a perspective of 10 to 15 years However, it must be noted that at the time of survey, most schemes built with EU assistance have already served four to five years.

7. Out of 1,554 households which were connected to the 91 water supply schemes, 41.8% had smokeless stoves and 83.3 % had household latrines.

Functioning of tap stands

8 The data collection team counted the number of public tap stands served by a water supply scheme Within the sample of 91 water supply schemes, 685 public tap stands were built. The data collection team found that 616 public tap stands were fully functioning: water was flowing in them. Only 10% of public tap stands were without water at the moment of survey. On an average, there were 7.5 public tap stands to a water supply scheme with a standard deviation of 5.6.

Structures found on site versus structures supposed to have been installed

9. The data collection team also surveyed whether various components of water supply scheme issued were found in the site. Discrepancies between equipment issued/planned and use in the site were checked. Table below reports the findings. The deviation between units of components which ought to be found and which were found was tabulated. Negative deviation implies that a particular component is missing. Positive deviation means that there are more components in the site compared to what was issued/planned. If the sample population is assumed to approximate the underlying population, then we can infer that the percentage deviation of components issued and components found on site is applicable to the whole country

Components of the scheme	Units given to the scheme	Units found in the scheme	% deviation
Spring intake	59	48	-18 6
Stream intake	40	43	-6.9
Sub total of spring and stream intake	**99**	**91**	**-8.1**
Stone masonry reservoirs	48	44	-8 3
Ferro-cemént reservoirs (round)	24	17	-29.1
Sub total of stone masonry and ferro cement reservoirs	**72**	**61**	**-15.2**
BPT with float valves	73	77	-41.9
BPT no float valves	19	16	-15.7
Sub total of BPT with and without float valves	**92**	**93**	**+1.1**
Pipe line washout	33	2	-93.9
Pipe line control valves	48	19	-60.4
Pipe line air valves	37	38	+ 2 7
Suspended crossing	63	19	-69.8
Public tap stands	685	629	-8.1
Private tap stands (illegal)	0	18	

10. With respect to public taps stand, there is - 8% deviation. The number of public tap stands which ought to have been installed in the sample was 685 but only 629 were installed, leaving a difference of 56 taps stands. It is reasonable to assume that 18 illegal private tap stands partly explain 56 missing public stands.

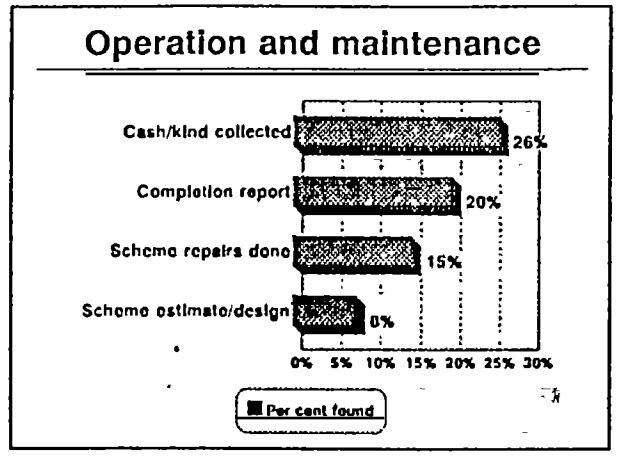
11. There is negative deviation of 94% in the case of pipe line washout and negative deviation

of 60% in the case of the pipe line air valves. An astonishingly high percentage of pipe line washout and pipe line control valves were not found on site. Since such a large percentage can not go missing on site, primarily because villagers have no alternative use for such components, there is room for believing that these components were perhaps not issued at all.

12. There are serious consequences of not using pipe line washout and pipe lines control valves The function of pipe line washout is to flush out mud in the pipeline. Without pipe line washout, the water pipe will get choked with mud totally or lead to irregular or insufficient flow of water. The function of pipe line control valve is also vital. Its function is to properly distribute the water to various end points in the scheme.

Maintenance and repair

13. If the Village Maintenance Committee, users or gup has to look after the water supply scheme, they must have some notion of the design of the scheme as well as the cost of each component (i.e. estimate of parts). The understanding of the layout of the whole scheme is embodied in the design. The more complex a scheme, the higher is the necessity for a design to be with the users so that they can maintain it. The design and estimates of the 7.7% of the schemes were available with of the respective VMCs/gups/users . The design needs to be with the users (VMC/Gup) and with the technical support agencies (PWD-Dzongkhag) Similarly, the proportion of schemes whose Completion Report was with the VMC/users/ gups was only 19 8%.



14. The percentage of schemes where the users/VMC/gups had maintained records of cash or kind collection used for the maintenance of the schemes was 26%. This type of record is useful for assessing the cost of maintenance and operation for a scheme. The percentage of schemes where there were records of what components of schemes were repaired was only 15%. A written record of what was repaired in a scheme is useful for reference for maintaining and operating

Condition of schemes

15. The data collection teams were asked to record their observations on the conditions of 91 sample schemes during their inspection of the sites. They inspected the fencing and protection of the sources and intakes, cleanliness of the sources of intake, leakages in the pipe line, air valves, pipeline washouts, reservoirs, cleanliness of tap stands and surrounding area, degree of damage and associated repair for each scheme. Some of the salient findings are reported in table on the next page.

Type of Problem	Sample size	percentage
Protection of source and intake		
Scheme where both source and intake are fenced	91	46.2
Scheme where intake is fenced, but not the source	91	30.8
Scheme where neither intake not source is fenced	91	16.5
Scheme where the fence is broken	91	6.6
Sub total	**91**	**100**
Scheme where the source and intake area is kept clean	91	74.7
Scheme where the pipeline is leaking	91	25 3
Scheme where the HDPE plastic pipe is exposed	91	37.4
Scheme where the airvalve is leaking	38	7.8
Scheme where the pipe line washout is leaking	2*	100
Schemes where the reservoir is leaking	65	18 5
Protection of reservoir		
Scheme where the reservoir has a proper fence	66	77.3
Scheme where the reservoir has no fence	66	13.6
Scheme where the reservoir fence has fallen down	66	7.6
Scheme where the reservoir has an uncovered opening in	65	16 9
Sub total		**100**
Leaking tapstands	685	35.8
Tap stands with dirty surrounding	685	50 5
Tap stands with dirty platform	685	38 8
Tap stands from where water is piped into the house	685	9 0
Physical status of the scheme		
Scheme where no repair is needed	91	40.7
Scheme where minor repair is needed	91	39.6
Scheme where major repair is needed	91	14.3
Scheme which are completely damaged and needs	91	5.5
Sub total	**91**	**100**

* Although 35 pipeline washout ought to be there, only 2 were found installed on site

Assessment of a schemes for repair

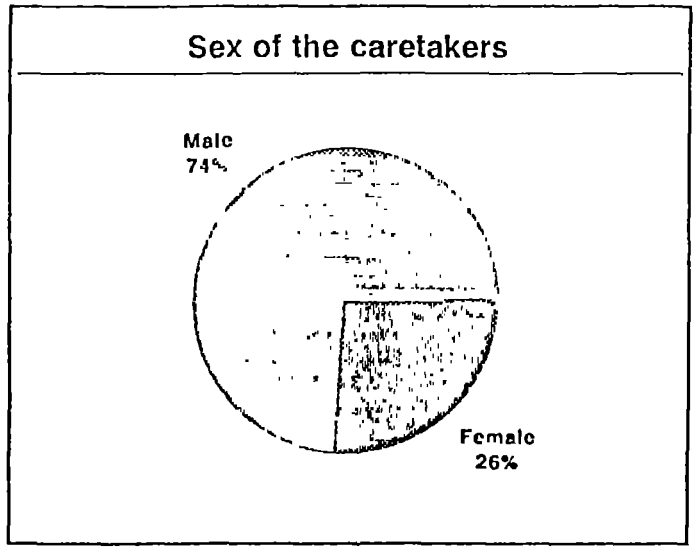
16. To comment briefly on the results of above table, fencing of source and intake needs to be taken up in substantial proportion of the schemes. Protection around the reservoirs also need to be undertaken. A significant proportion of reservoirs is leaking or has uncovered openings that makes them vulnerable to entry of foreign bodies. Over 35% of the tap stands are leaking. Over 25% of the schemes have leaking pipes. Both of these together increase the wastage of water. The data collection teams were asked to assess the degree of repair needed by water supply schemes. The scale of assessments ranged from 'no repairs needed' to 'completely damaged and needs reconstruction'. It was judged that 5.5% of the schemes needed complete reconstruction and 14 3% needed major repair.

CHAPTER 9.

CARETAKERS (CHU NYER) OF WATER SUPPLY SCHEMES

Role of village caretakers and sample size

1. A caretaker is responsible for routine maintenance, operation and minor repairs of the water scheme in their locality. They should be called **chu nyer** in dzongkha. Training and equipment are provided to the village caretakers. A hundred caretakers were interviewed



2. The caretakers polled happened to be from as many as 50 gewogs in 17 districts. Interviews were held from 25 December 1994 to 16 March 1995. Among the respondents, 74 were males and 26 were females, which implies that 26% of the caretakers were women.

3. An assessment of provision of water and sanitation facilities among the 100 caretakers show that 99 of them used water from piped water supply schemes, 85 have household latrines and 33 have smokeless stoves. A caretaker - Namgay Wangdi - of Shegana has reported that he has no access to water supply scheme although he is the caretaker.

Literacy and training of village caretakers

4. Only 12% of the respondents had gone to school, none higher than class VI. The remaining 88% did not get any formal education But 32% of the caretakers had taught themselves basic literarcy for they claimed that they could read and write Dzongkha and 9% claimed that they could read and write English. There is a slight preponderance of males in terms of being literate.

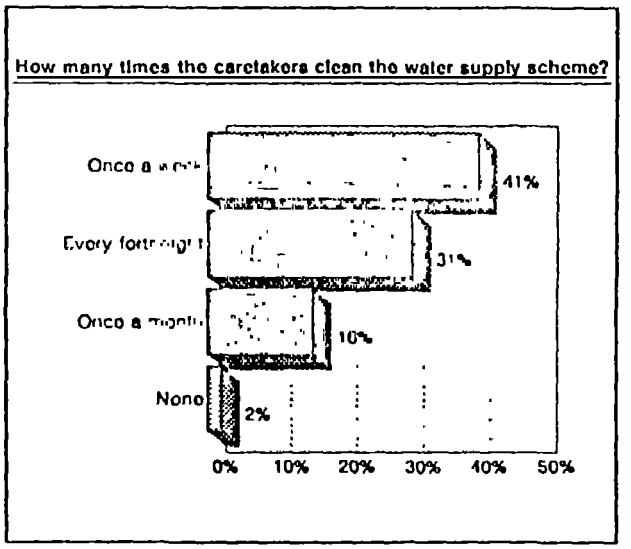
5 Most of the caretakers were selected after the construction of water schemes. Only 14% of the caretakers were selected before the schemes were constructed. 6% of the caretkaers were appointed during construction and the remaining 80% after the construction of schemes.

6. Most of the caretakers (89%) were trained in their work between 1989 and 1994. In fact their training were concentrated in 1992 and 1993. Those who were trained earlier were again given refresher training between 1992 and 1994.

Work intensity of caretakers

7 The data collection teams asked the caretakers how often they cleaned the water supply scheme. 2% of the caretakers did not clean the schemes at all. 41% caretakers cleaned the water

supply scheme once a week, 31% did it every forthnight, and 16% did once a month. The time spent by the caretakers to inspect and clean the water supply schemes ranged from zero to 92 hours in a month. **However, one must be skeptical about the number of hours reported because most of the caretakers probably did not possess watches. They might have simply guessed the hours they worked, which might be highly imprecise. It seems that the number of hours they worked on the schemes were grossly underestimated. A person usually underestimates the amount of time required in a task with the passing of time.** Almost all the caretakers claimed that they spent some time in inspecting and cleaning the water schemes. For each caretaker, average time spent worked out to 13 hours per month. The frequency distribution of hours spent working on the water supply schemes is, as they recalled, shown in Table below. **If the average number of hours worked on the scheme is as low as 13 hours per month, the input of time is incommensurate with the exemption given in terms of shaptolemi.**



No of hours spent by the caretakers	Percentage of caretakers
0-10	54.1
10-20	29.6
20-30	11.2
30-40	2
40-50	0
50-60	1 1
60-70	0
70-80	1
80-90	0
90-100	1

8. Respondents were asked to recall if they had repaired the bib-cocks. 30% of the caretakers had repaired faucets (bib-cocks); the rest did not. Of the 29 respondents who had repaired faucets, 24 repaired 5 or fewer faucets. Repair of the fence of the intake or reservoir tank was done by 38% of the caretakers In reporting damages to the schemes to the district authorities, the respondents were relatively prompt . 77% of the caretakers said that they reported the damage to the district authorities.

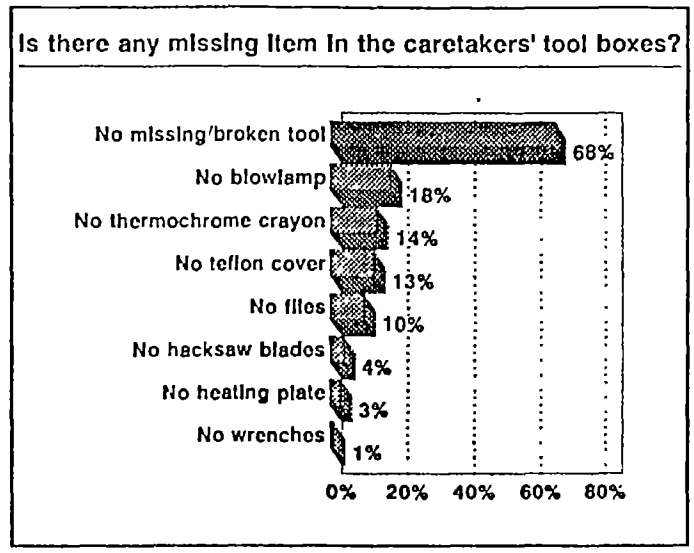
Damage and repair works

9. The caretakers were further asked to state the frequency of problems that occured in the water supply schemes over the last year. 39% of the caretakers reported that problems did occur but that rest said that problem did not arise. When such damage occurred, 89% of the 38 respondents repaired it and 11% did not go on to repair the schemes. During the repair, caretakers

or village maintenance committees seek help from the district administrations and they get assistance. 77% of those who sought help from the district administrations got it.

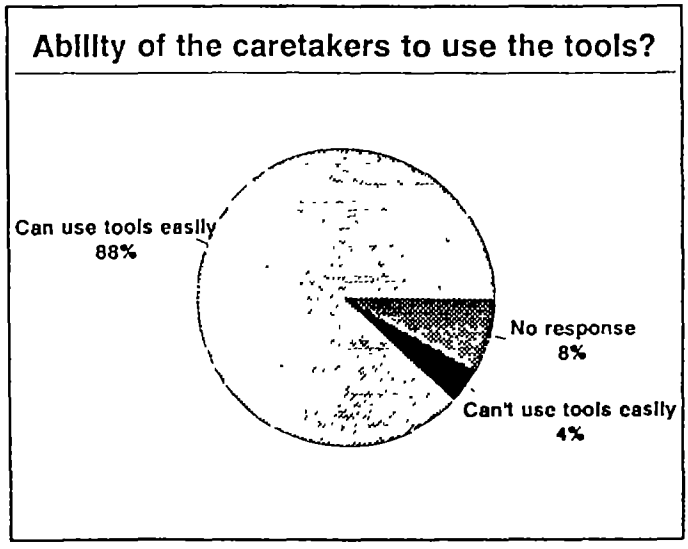
Availability of tools

10. The caretakers are provided with a tool box after their training It is not issued to untrained caretakers. Only one tool box was issued per scheme At the time of issue, the following tools should be included in the tool set heating plate, teflon cover, thermochrome crayons, blow lamp, wrench, hacksaw, hacksaw blades, files The survey found that 72% of the caretakers had tool boxes with themselves and 20% stated the tool boxes were with the other caretakers or with members of VMCs. A further 8% stated that they did not have any tool box.

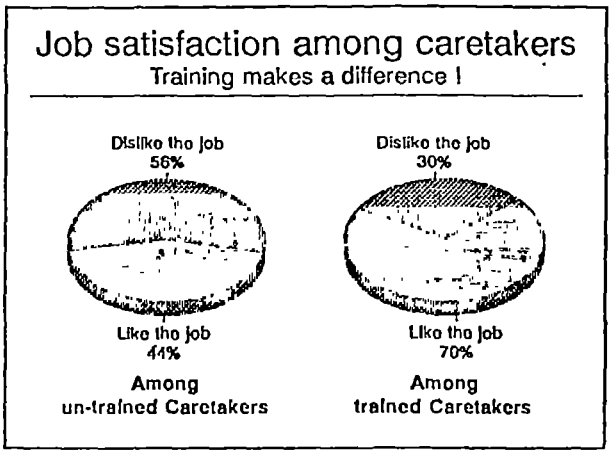


11. An examination of tool boxes was also done by the data collection teams with the 72 caretakers who had tool boxes. It was found that in 68% of the tool boxes, no tool was missing or broken. In the remaining 32% of the tool boxes, some items were missing. The proportion of tools missing from the tool boxes are shown in the graph (right side). More than one item can be reported missing and because of this fact, there was multiple answers and percentages shown in the graph will exceed 100%.

12 The response from the total of 100 respondents regarding their ability to easily use all the tools showed that 88 could do so and four could not The tools which gave problems to the 4 respondents who could not use them easily were the wrenches, blow lamps, hack saws and files. Others did not respond or their responses were not noted Interestingly, 3 respondents who were trained (and one of them had even a second training!) admitted that they could not use the tools easily, while 6 respondents who were not trained claimed that they could use the tools easily.

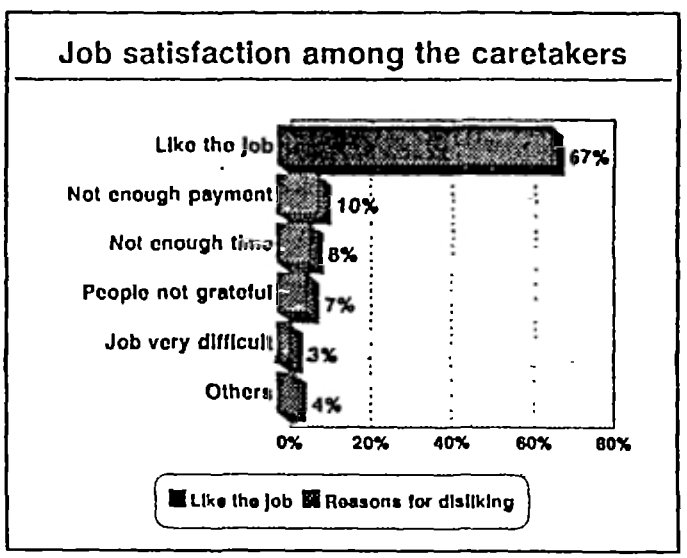


Attitude and job statisfaction among the caretakers



13. Questions were also put to find out the job satisfaction among the caretakers. 67% of the caretakers mentioned that they liked their job. 10% of the caretakers did not find the job likeable because the payment made was not enough. 8% stated that they did not have enough time for it, 7% said that people were not thankful enough for the work they did. 3% considered that the work was too difficult and 4% gave various other reasons, such as not getting exemption from shaptolemi, for disliking the job.

14. The graph above shows the percentage of caretakers who like the job and who do not, among both trained and untrained caretakers. It appears that the motivation of the caretakers increases with training. The proprotion of caretakers who feel motivated is higher among those trained



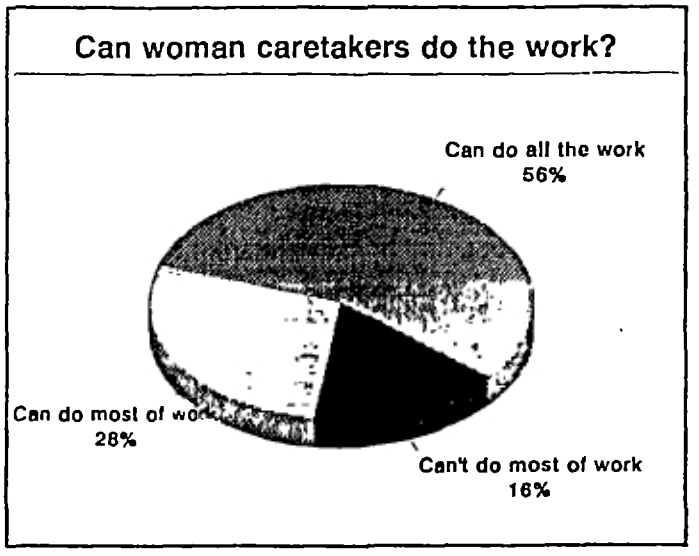
15. Woman caretakers were specifically asked if they could do all the work of a caretaker. In response, 56% woman caretakers affirmed that they could do all the work, 28% stated that they could do most of the work but not all and 16% admitted that they could not do most of the work. However, the same question was not put to the man caretakers and there is no basis of comparison between the two sexes.

Incentives for the caretakers

16. Caretakers were asked whether they received any kind of renumeration in cash or kind from the users of water supply schemes. 21% of the caretakers admitted receiving money from the users and 8% said that they got grains or other things. The amount of money received by the 21% of the respondents ranged from Nu 20 to Nu 2,820. That means the vast majority of caretakers do not get paid either in cash or kind by the users Among those 21% of the caretakers who got money, the average amount works to Nu 538 per caretaker but the distribution of money among the caretakers is highly skewed as can be gathered from the payment of Nu 2,820 to one caretaker. It is, however, very odd that the respondent who received the highest amount of money (Nu 2,820) and was also exempt from shaptolemi stated that he did not like the work as a caretaker because the work was too difficult.

Exemptions from Shaptolemi

17. The villagers are expected to contribute voluntary labor as the most usual form of beneficiary participation. Such participation is termed shaptolemi. The gup or the block development committee may exempt a person from shaptolemi. While 51% of the caretakers said that they did not get exempted from shaptolemi, 45% affirmed that they were exempted and 4% affirmed that they were partly exempted from shaptolemi. There is no gender bias in granting exemption from shaptolemi as 44% out of 25 female respondents and 45% out of 73 male respondents were exempt from shaptolemi.



18. But those who are not exempted from shaptolemi might be paid in cash. To find whether this is the case, a matrix between payment and shaptolemi participation is tabulated below. 35% of the caretakers who are exempt fully from shaptolemi are not paid by the users. 38% of the caretakers who are not exempted from shaptolemi are also not paid by the users. Therefore, there is no clear correlation between not being paid and being exempted from shaptolemi. In fact the correlation tends to be slightly negative That is, if the caretaker is paid, he or she is, at the same time, exempted from shaptolemi.

Whether paid or not paid?	Not exempted from Shaptolemi	Exempted fully from Shaptolemi	Partly exempted from Shaptolemi	Total
No	38	35	4	77
Yes	6	15	0	23
Total	44	50	4	100

Summary

19. For the operation and maintenance of the rural water supply schemes, the appointment of caretakers or chu nyer is quite crucial. The profile of caretakers show that the senior most among them was appointed in 1989 and most of them got training in 1992 and 1993. They lack formal education background, although a significant percentage of them claim to be able to read and write. 74% of the caretakers are man.

20. The function of a caretaker is to look after the scheme. The caretakers are provided with tool boxes after their training. Each scheme is issued with a tool box. About 72% of the caretakers have tool boxes. In addition, some tool boxes are kept with the other members of the village maintenance committees or other villagers keep the tool boxes. Only in 32% of tool boxes examined, one or more items were missing or broken.

21. In recognition of the responsility the caretakers face, they may be exempt from shaptolemi or paid in cash or kind by the communities. However, in practice, less than half of the caretakers are exempt from shaptolemi and only one fifth of the caretakers are paid certain amount by the users. The belief that payment of money to the caretakers is a substitute for not exempting from shaptolemi is not true, as there is no significant positive correlation between cash payment and non-exemption from shaptolemi. There is no uniform practice with regard to exemption from shaptolemi or payment to caretakers by the users On the whole, only 67% of the caretakers find the job agreeable. The rest find their job as caretakers too time consuming, too demaning or thankless.

CHAPTER 10.

VILLAGE MAINTENANCE COMMITTEE (CHU NYER TSHOGPA)

Sample size

1. The village maintenance committees (VMC) are the managing bodies of the rural water supply schemes. To collect information from the VMCs, the first preference was to interview the chairperson of the VMC, provided the chairman of the VMC was not a gup. But the gup is often the chairman of the VMC. In such cases, the alternative person to be interviewed was another member of the VMC. The data collection teams were again reminded to interview a member of the VMCs who is not the caretaker. Not interviewing gup or the caretaker was to avoid duplication. There were separate questionnaires devoted to gups and caretakers.

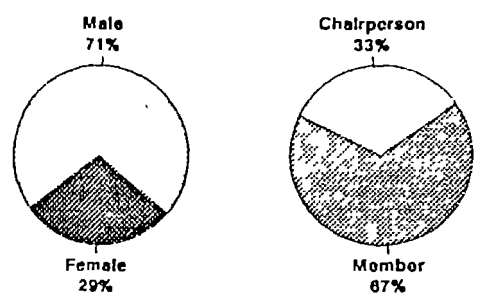
Highlights about village maintenance committees

- 92% of VMCs were formed after construction
- VMCs have an average of 3.8 members
- 29% of VMC members are women
- 81% of VMCs members want more training
- 78% of the schemes have established VMCs

2. The data collection teams collected information from 25 December 1994 to 16 March 1995. The survey encompassed 66 VMCs in 42 gewogs in 16 districts. It was found that 78% of the schemes have established VMCs. The VMCs were formed at various stages: 92% after construction of the schemes, 2% during construction and 6% before construction of the schemes.

3. 48 persons were finally interviewed corresponding to 48 VMCs. The remaining 15 persons happened to be caretakers or gups who were chairmen of VMCs. Among the 48 persons interviewed, 71% were men and 29% were women. Only 33% were chairpersons (although they were not gups) of VMCs and the remaining 67% were members of the VMCs.

Composition of vmc member interviewed by gender and designation

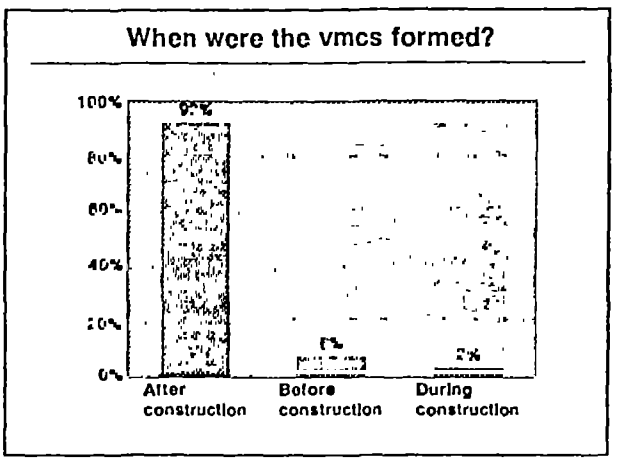


4. The assessment of provision of water and sanitation facilities among the 48 respondents show that 98% used piped water from the schemes, 90% have household latrines and 40% have smokeless stoves.

Composition of the VMCs

5. A VMC has, on average, 3.8 persons with 2.6 male and 1.2 female member. The maximum number of people in a VMC is 14 with four women and 10 men. Such a large number is likely to be associated with a scheme which serves an extremely large number of people. It happened to

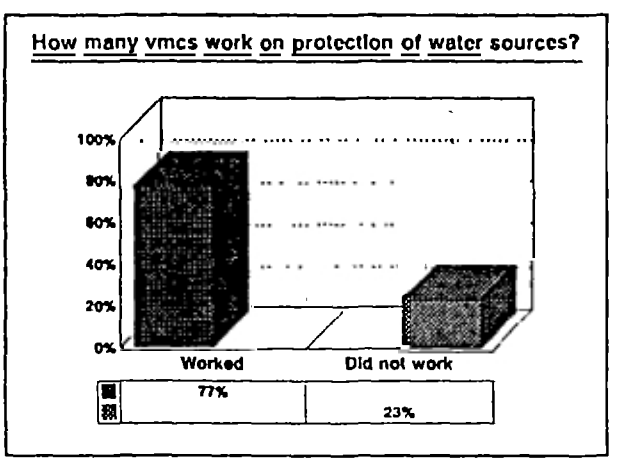
be in Shyango village in Shaba in Paro. The maximum number of women VMC member is 4 whereas the maximum number of men in a VMC is 10. Total number of women in the 48 VMCs was 58 whereas the total male members were 124. While there was 33% of the VMCs found without a female member, there were only 3 VMCs without a male member. Seven VMCs had only one member. The low percentage of women in VMCs is not necessarily a negative thing. If all that VMC members do is physically repair the schemes, one may wonder if their low participation is an indication of less burden on women in terms of work.



Training for VMC members

6. From 1991 to 1994, 56% of the respondent chairpersons and members of VMCs have attended training courses organized for the VMCs. Incidentally, a large number of them attended the training in the year 1993. The participants appreciated the value of training as 81% expressed that the VMC members should get more training from the district authorities.

Involvement in source protection and repair

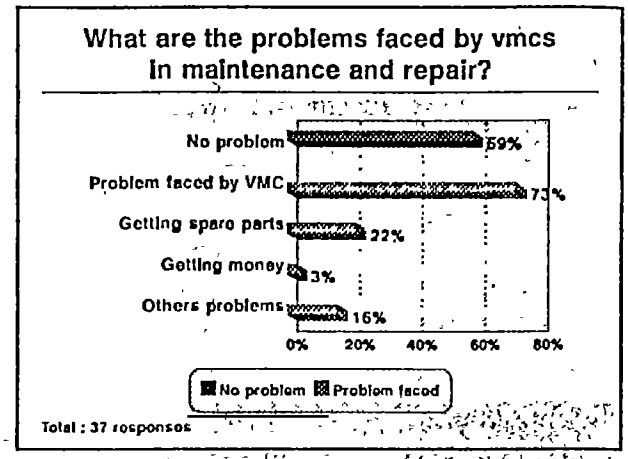


7. Of the VMCs represented by 48 respondents, 75% worked for maintenance and repair of the water supply schemes. The remaining 25% did not do any work for maintenance and repair of the water schemes, perhaps these schemes were quite new and needed no repair at this early stage.

8. The VMC members were asked whether they were involved in the construction of the schemes. 52% of the respondents affirmed that VMCs worked when the water schemes were being built. They were also asked whether they were involved in the survey of the schemes. 33% of the respondents affirmed that VMCs worked when the survey for the water schemes were done. This could not be possible because only three VMCs were formed before their water schemes were constructed and one VMC was formed while its water scheme was being constructed. Presumably, the respondents meant that, in some cases, local persons, who eventually became the chairpersons or members of the VMCs, were informally associated with the survey and construction of water schemes

9. About the role performed by the VMCs, 77% respondents stated that the VMC protected the water source for water schemes. Only 6% stated that the VMCs had any written records of the maintenance and repairs done in water schemes. The assumption that the VMCs should maintain a written record about the repair and maintenance done is somewhat misplaced as majority of the VMC members could be anyway illiterate.

10. Only 73% of the 48 respondents mentioned that the problems the VMCs faced in the maintenance and repair of water schemes. The kind of problems faced by the VMCs are shown in the graph (on the right). The problems include not getting spare parts like pipes of right size and valve boxes, not getting money from the users, and lack of training.



Fund raising for repair and maintenance

11 Some VMCs were found collecting money VMCs also mobilize labor from the user households for maintenance and repair of water schemes. 81% of the respondents felt that the VMC had sufficient power to do so while the remaining 19% thought otherwise. Even then, 71% VMCs did not collect any money from the users. Once again, it is possible that some of schemes built in recent years do not require as yet fund for buying spare parts. The remaining 29% of the VMCs collected various amounts in a year. The maximum collected in a year was Nu. 4,200 in Drukgyal Dingkha in Shaba in Paro, a relatively better off place. The second highest was Nu 1020 in Shankhari village in Isu gewog in Haa The average amount collected was Nu. 536 among those who collected fund. The pattern of monetary contribution among the users is shown in the table on the right side. Only 2% of the respondents, (which means only one respondent in the sample) stated that the VMC collected grain or other things from the user households It took place in Tshanglajong in Zhemgang.

Amount of money collected in a year by VMCs

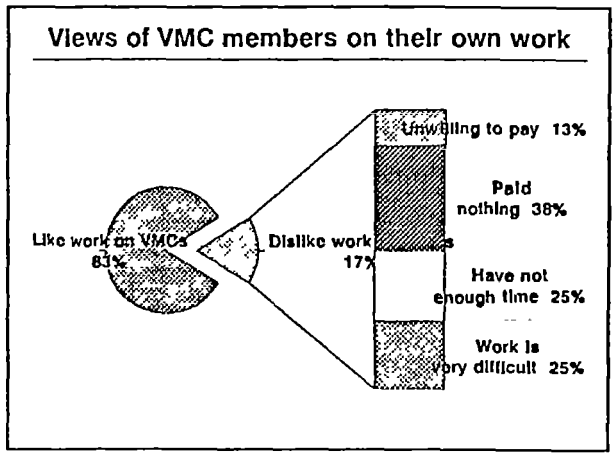
Amount collected Nu.	Percentage of VMCs
0	70.8
30	6.3
40	2.1
50	4.2
95	2.1
120	2.1
200	2.1
300	2.1
444	2.1
900	2.1
1020	2.1
4200	2.1
7509	100

Attitude of VMC members towards their appointment

12. By and large, the respondent chair persons and members of the VMCs seemed to like their work. 83% said so while the remaining 17% gave reasons for not liking being a member. The reasons range from the work being extremely demanding, too time consuming, to not being paid enough by the users.

13 The members of the VMCs were also asked about their opinion on the ability of women to do the work of a village caretaker. In majority of the schemes, there are no woman caretaker; so the question would be entirely hypothetical. Overall, 69% of the respondents felt that a woman can do all the work or most of the work. 16% of the respondents

felt that women can not do most of the work or any of the work as caretakers.



Summary

14. Although the formation of the VMCs was promoted in a vigorous manner only in the last three years, it is note worthy that 78% of the schemes have VMCs, most of them formed after the construction of the schemes were completed. 29% of the VMC members are women. A VMC has on average 3.8 members with 2.6 men and 1.2 women. Over half of the VMC members have attended some training courses, mostly in 1993. The main responsibility of the VMCs is to repair and maintain the water supply schemes which includes the protection of sources of water supply. To a lesser degree they have also worked during survey and construction phases. The VMCs, besides mobilizing labour contribution during maintenance work, also collect money from the users. Only 29% of the VMCs have collected money from the users. The amount collected per year by VMCs ranged from Nu 30 to Nu 4200 and the average amount was Nu 536. The fact that 71% of the VMCs did not collect any money might be an indication that the need for spare parts has not yet become acute. This may in turn be due to the fact that the schemes have been constructed recently.

CHAPTER 11.

LABORATORY TECHNICIANS

Extent of interviews

1. An equipped laboratory and a laboratory technician trained in the collection and analysis of water samples are needed in every district to check on the quality of drinking water supply. Some of the districts do not have a laboratory equipped for testing the quality of water. Because there was no laboratory for testing water in each district, some samples were brought to Thimphu for testing.

2. The survey teams interviewed the laboratory technicians of 14 districts. Since the number of laboratory technicians is only 14, absolute number rather than percentage will be used.

Qualification and training

3. All the technicians have at least passed class VIII. The basic educational attainment of the 14 laboratory technicians are tabulated below: They were recruited since 1984. The recruitment was intensified from 1990, peaking in 1994. 5 out of 14 laboratory technicians were recruited in 1994. There is no indication that more qualified persons are being recruited as laboratory technicians. 4 technicians who were recruited over the last few years were class VIII graduates.

No. of laboratory technicians	Formal educational level
2	Class X
2	Class IX
9	Class VIII
1	unknown

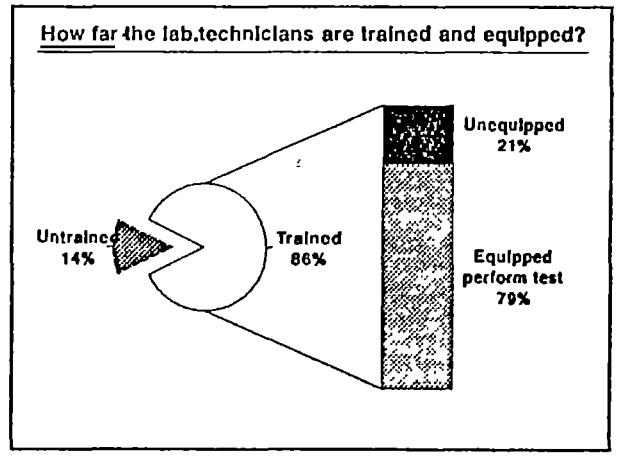
4. The 14 respondents have received in-service training in 32 courses since 1988. The duration of the courses lasted from 1 to 24 weeks However, 75% of the training courses lasted only a week. The training courses were not exclusively focused on water analysis. The laboratory technicians have to perform a variety of functions and accordingly they are offered course in a number of fields The following are the training courses enrolled by the 14 laboratory technicians:

- Laboratory procedures
- Smear technique
- STD/AID
- T.B.
- Blood bank and blood transfusion
- HERM (Health Equipment Repair Maintenance)
- M.C.P.
- Rapid lab. diagnosis

- Quality assurance
- Water sampling and testing

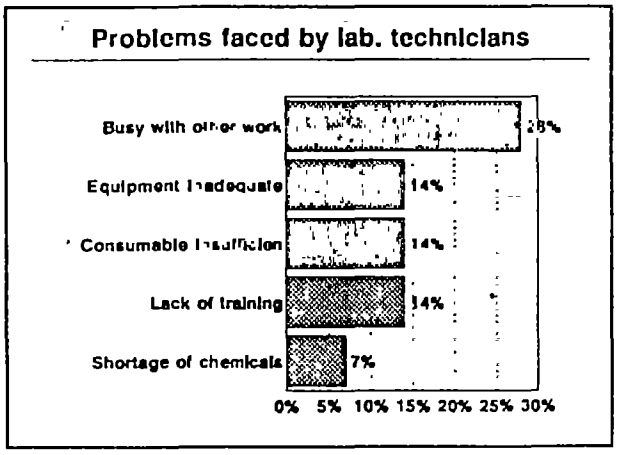
5. As it is shown above, most of the courses were not related to water sampling and analysis This information was reconciled with that given by the Public Health Engineering Unit (PHEU), Thimphu. There were also a few laboratory technicians who were not at all trained in water analysis.The lack of emphasis on training in water related subjects needs attention.

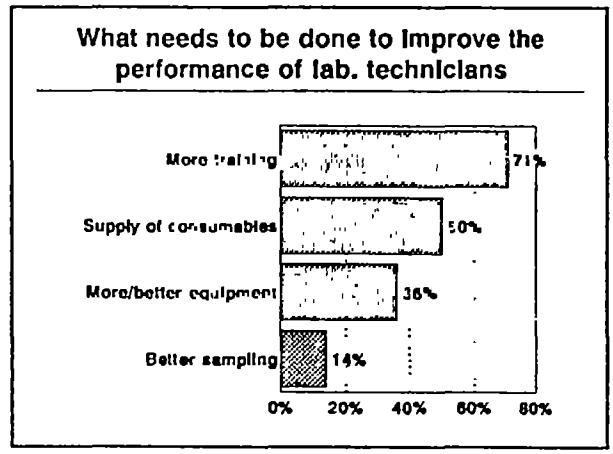
6. Testing water samples for faecal coliform contamination is important for evaluating the bacteriological quality of drinking water. Training in performing this test was given to12 out of the 14 laboratory technicians interviewed. Among the 14 laboratories, 11 are equipped and trained to perform this test. One technician trained in water sampling and testing is working in a laboratory that has no equipment for testing water samples. There were 2 laboratories which has neither a trained technician nor an equipment for such test.



7. The laboratory technician is often, but not always, the person who also collects water samples. The persons who collected water samples were trained in collecting samples in most cases: 8 out of 14 were trained, 2 were not trained and information was uncertain about the remaining 4.

Constraints faced by laboratory technicians





8. A number of difficulties are faced by the 14 laboratory technicians in testing water samples 4 of them said that they were too busy with other laboratory works. 2 out of these four also felt that the testing equipment was inadequate. 2 felt that the supply of consumable items was insufficient. Lack of training was specifically mentioned by 2 of the technicians and shortage of chemicals by another technician. Almost all, 10 out of 14, of laboratory technicians suggested more training was required for improving their performance. Regular supply of consumables

(media, filter paper, glass ware etc) and improvement in testing equipment were also mentioned by 7 and 5 of the laboratory technicians respectively. Interestingly, only 2 laboratory technicians suggested better or more regular sampling for improving their performance. It indicates the fact that the significance of water sampling is not well understood by them.

Summary

9. In relation to the analysis of the water samples, laboratory technicians of 14 districts were also interviewed. Among those interviewed, the basic level of education of the technicians is class VIII. They have recieved in service training related to a variety of functions they perform as general lab. technicians rather than specialized lab. technicians. They have a broad range of responsibilities which includes examining or taking smear, blood transfusion, repair health equipment, water sampling and analysis etc. Understandably, substantial proportion of the lab. technicians said that they are too busy with works other than water sampling and analysis. Training on water sampling and testing as well as regular supply of consumeables were identified as important means to improve their performance.

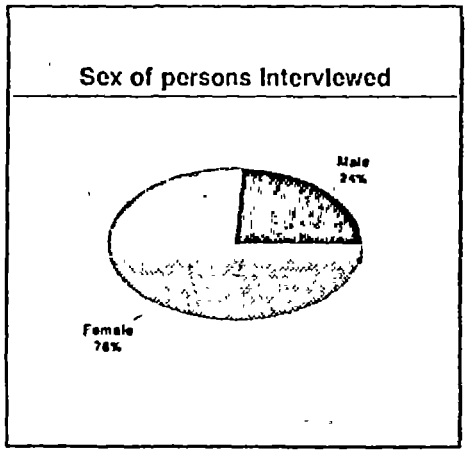
CHAPTER 12.

SMOKELESS STOVES

Sample size and sex of respondents,

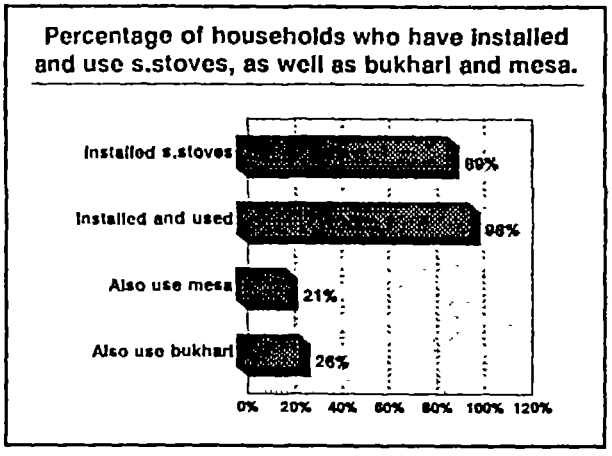
1. 263 households were selected through randomized sampling prior to the field visit. These households were chosen because smokeless stoves were reportedly constructed in these households under the EU assisted project, through delivery system of the district administrations. But when the interviewer finally went to the door of the households, not all of them were accessible. 28 houses were found locked. In others, they were confronted only by children and or the disabled who could not give intelligible answers to the questions about smokeless stoves. As a result, the number of actual respondents came down to 235.

2 Among the 235 (100%) houses where interviews were held, 76.2 % of the respondents were female; 23.8% of the respondents were male. Our knowledge about the performance of smokeless stoves is largely dependent on the information provided by women. It would be interesting to dissect further the information by gender to find out whether perceptions do vary according to gender. If the women are more familiar with the smokeless stoves than the men, the overwhelming participation of the women in the interview would yield accurate data about the performance of smokeless stoves.



Coverage and usage of smokeless stoves

3. All the households which were interviewed were expected to have a smokeless stove each. These households were sampled from the group of households in which the smokeless stoves should have been installed, according to the list given by PHE. But the interviewers observed personally that only 89.4% or 210 households had the smokeless stoves installed. 10.6% did not have the smokeless stoves installed, though these households ought to have done so. There might be several reasons for the apparent delays in installation. Such reasons might have to do with change of mind, lack of confidence in the smokeless stoves compared with the existing one, waiting to see how the smokeless stoves performs in the neighborhood etc. One can speculate on many other reasons for receiving a smokeless stove from the district administrations, but delaying their installation. However, the main reason for the delay was attributed to the failure of the technicians or women volunteers to come and do it, with them. This emerged from the survey as the main reason for the delay.



4. It is sometimes possible for the smokeless stoves to be installed, but not used. People might install because of persuasiveness of the officials, only to be left idle and shown when the officials come around again. They may continue to utilize the traditional means of cooking, while the smokeless stoves sits in another corner of the room as a mere artifact of the project. The survey found that the a negligible per cent (3.3%) of the smokeless stoves installed were not put to use.

Bukhari and mesa as complements to smokeless stoves

5. Once the smokeless stoves are installed and functioning in place of traditional ones, they are deemed to emit less heat and produce less embers. Embers and hot ash is necessary for cooking certain dishes. Traditional stoves are the only source of room heating. Thus replacing traditional stoves with smokeless stoves would reduce the room temperatures, especially in winter. The interviewers thus asked the 210 households who have installed smokeless stoves whether they used either mesa or bukhari which are appliances to generate heat by using fuel wood 25.8% of households who have smokeless stoves also use bukhari in the winter. The percentage of households who have smokeless and use mesa is not far behind at 20.5%. Because of the chimney pipe attached to a bukhari, the amount of smoke trapped inside the room is less. It therefore does not defeat the major purpose of promoting the smokeless stoves in the rural areas. On the other hand, a mesa is possibly a wood or charcoal burner without an attached chimney pipe. It makes the room air dense with particles of smoke, soot and flakes The presence of these particles from mesa offsets the beneficial effects of smokeless stoves, though it enhances the room temperature 53.1% of the households who have smokeless stoves use neither mesa nor bukhari in the winter.

Period of installation

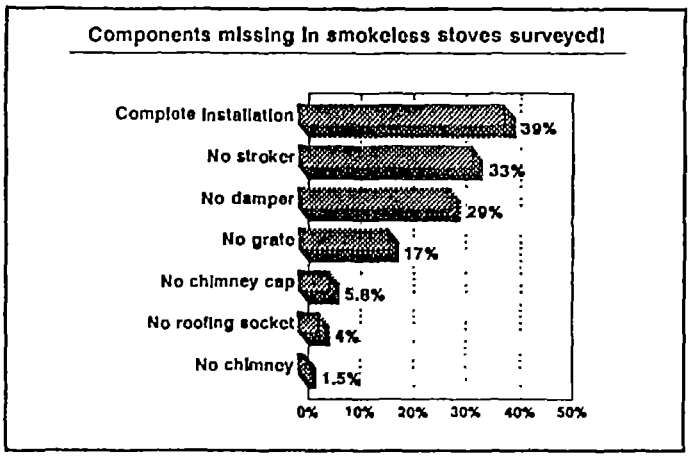
6 All the smokeless stoves were installed in or after 1991. It implies that all the smokeless stoves are installed under the auspices of the EU assisted project. The survey deliberately targeted only those smokeless stoves built by the project. Those smokeless stoves built before 1991, prior to the commencement of the project, were not included in the survey.

Payment for installation

7 While installing the smokeless stoves, 55.2% of the people paid money to the women volunteer, 16 1% paid money to the gup and the remaining 28.6% of the people paid to others. The amount paid did not vary much. Those who paid Nu 60 for installation of one smokeless stove constituted about 90.3%. 2.9% paid Nu 65 and 6.8% got it done free of payment. The average cost of installing a smokeless stove is Nu.56 93.8% People did not consider the amount paid excessive.

Availability of parts

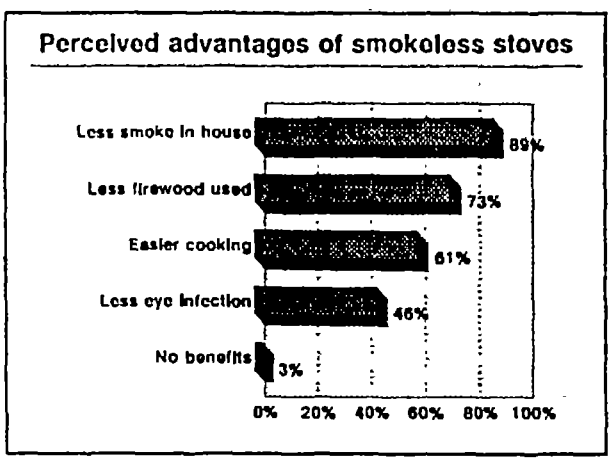
8. The efficiency of a smokeless stove depends on the presence of the complete set that includes damper, grate, chimney and chimney cap, roofing socket and stoker. The potential benefits of a smokeless stove in terms of both cooking and sanitation is reduced if certain parts are missing. Among the smokeless stoves being used, dampers were missing among 29 1%, grates among 17%, and stokers among 32.5%. These three were the main items missing. Why they disappear or get exhausted remains to be found out. Very negligible proportion - 1.5% - of households using smokeless stoves did not have chimneys. Still, it is a quaint situation. A smokeless stove without a chimney is a contradiction in terms. 5.8% of the smokeless stoves being used did not install chimney caps. 3.9% did not install chimney roofing sockets onto their smokeless stoves.



9. Using cross tabulation, it was found that the proportion of smokeless stoves with both stoker and damper was 45.1%. Likewise, the proportion of smokeless stoves with both damper and grate was 54.4%.

Benefits of installing smokeless stoves

10. What might be the major advantages to the users of smokeless stoves? 88.7% of the users felt that the reduction in smoke emission was an advantage. Less firewood consumption was reported to be the advantage by the next highest proportion at 73.4% 60.6% of the users reported that it was easier to cook on the smokeless stoves. 45.8% of the users thought that the smokeless stoves contributed to less eye infections among the members of the family. An extreme minority (2.5%) reported that smokeless stoves did not confer any advantage.



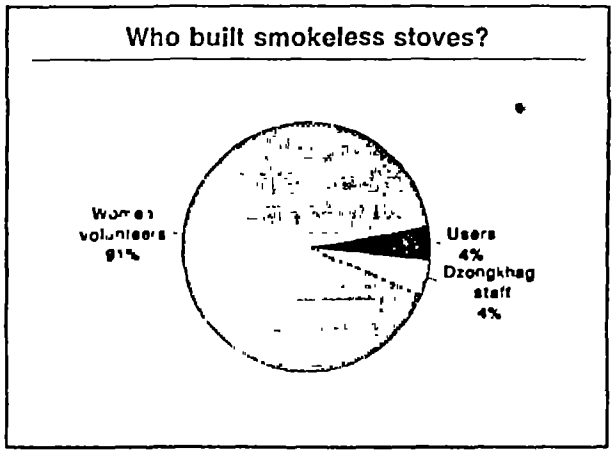
11. The proportion of users who noted both advantages i e. less smoke in the house as well as less firewood required is also high at 64.6%.

Spot checking of the performance of smokeless stoves

12. Fire was lighted in the smokeless stoves and a pot of water made to boil. This exercise was carried out to observe whether the chimney was drawing out smoke and the potholes were covered during cooking. 93.1% of the users covered the potholes during this exercise. This is the right way so that the smoke does not escape into the room. Correspondingly, 95.1% of the

chimneys were found drawing out the smoke above the roof top. Some 10.3% of the users were seen placing stones under the pots, which meant that the function of the chimney was being impaired. If stones are placed under the pots, smoke will leak into the room.

13. Using cross tabulation, it is possible to examine the proportion of people who did not place stones under the pots and simultaneously observe exhaust of smokes through chimneys. This proportion was 85.7%. If the stones are not placed under the pots and pans, smoke gets drawn more easily into the chimneys. Similar result can be obtained if the pot holes are covered during the cooking The proportion who covered the pot holes during cooking while smoke was observed emitting out of chimneys was about 89.7%. Thus, both the results corroborate each other



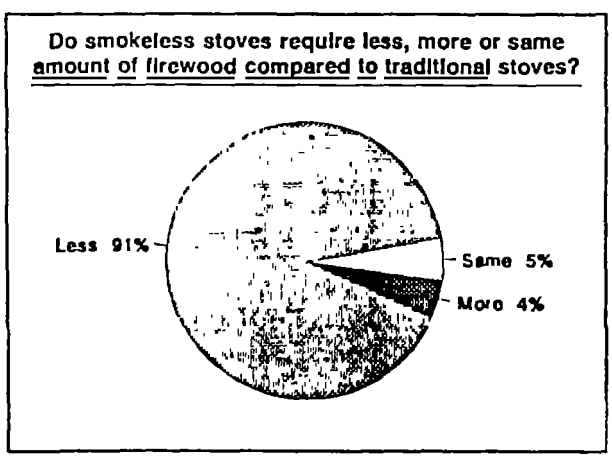
Design and builders of smokeless stoves

14 An overwhelming proportion of the smokeless stoves was built by the women volunteers. The percentage of smokeless stoves built by women volunteers is as high as 90.3%. The role of women volunteers in the diffusion and construction of smokeless stoves is clearly pivotal. This is not surprising given the emphatic role given to women volunteers to do so, through training Dzongkhag or PWD staff from Thimphu built 4.4% of the smokeless stoves. Another 4 4% were built by the owners or users

15 The size of the pot holes can be adjusted to suit the size of the pots and pans the users have The diameter of the potholes are to be designed in a way that caters to sizes of pots and pans which might further be related to the size of the family. The different sizes of the pots and pans should match the potholes of the stoves. It is noteworthy to find from the responses that 98.1% of the users said the sizes of their pots and pans match that of the pot holes

16 Most people (92.7%) said that they know how to fix cracks in the body of the stoves 18.4% of the smokeless stoves had chimneys with rain water leaking down the pipes

Impact of smokeless stoves on fuelwood consumption and cooking



17. Specific question was asked as to whether the smokeless stoves require more firewood than the traditional ones, assuming a comparable duration of cooking. There is a clear opinion, as expressed by 90.8% of the users, that the smokeless stoves consume less firewood. 4.4% reported to the contrary. Finally, 4.9% thought that there was no difference between the smokeless stoves and the traditional stoves: both types take the

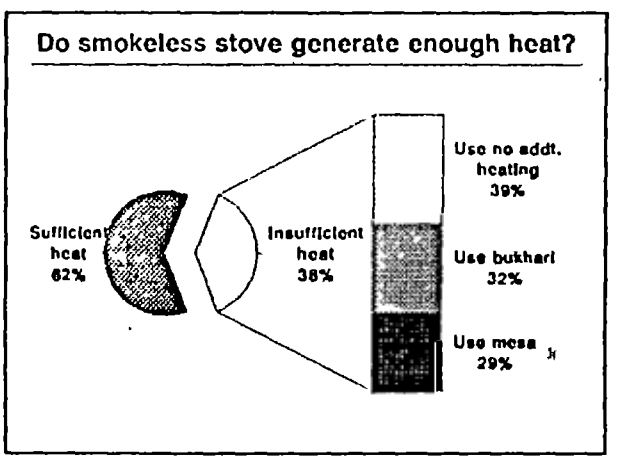
same quantity of fuel wood.

18. Questions were also asked about the risk of fire posed by the smokeless stoves. 85% thought that there was no risk of fire due to the smokeless stoves. This response is an understatement, perhaps compelled by the way the question was formulated. For risk is not a matter of all or nothing. It is only a matter of degree. Only 8.7% thought that the smokeless stoves posed fire hazard.

19. An earlier question queried into the impact of smokeless stoves on the fuel wood consumption. The overwhelming number of users responded that the use of smokeless stoves resulted in lower amount of fuel wood consumption. Another question was related to the speed of cooking. 84% of the users considered that cooking was faster on the smokeless stoves. 11.2% registered 'no difference' while 4.9% experienced slower rate of cooking.

Heat generation by smokeless stoves and alternative heating appliances

20. 61.7% (127 households) of the respondents said that the smokeless stoves generated enough room heat in the winter and 38 3% (79 households) reported that the smokeless stoves did not generate sufficient heat in their houses during winter. There are two ways they can make up for insufficiency in heating from the smokeless stoves. They can either use a mesa or a bukhari. Out of the 79 households who found room heating inadequate, 27.8% of the households used mesa 71.2% did not use mesa. Out of the 79 households who said that the smokeless stoves did not generate enough heat in the winter, 31.6% used bukhari and 68 4% did not resort to bukhari.



21 By adding the proportion of people who use either bukhari or mesa, we can get the total percentage of households who use either of these heating appliances because they felt that the heat from the smokeless stoves was not enough. The total percentage is therefore 59.4% of the households. Conversely, it means that 40.6% of the households who said that the smokeless stoves did not generate enough heat did not install either mesa or bukhari for additional heating.

22 Out of 127 households who admitted that the smokeless stoves provided enough heat, 17 households were nevertheless using either bukhari or mesa.

Use and Maintenance

23. 98.1% of the households, who have smokeless stoves, reported that women volunteers visited the households, but a small proportion of households said that the women volunteers did not discuss maintenance and use during their visits. 82% mentioned that the women volunteers discussed chimney cleaning with them during their visits. 60.1% mentioned that the women volunteers discussed about soot removal and 54% mentioned that she discussed about the need

to cover potholes. A similar number - 53% - said that the women volunteers asked them not to place stones under the pots.

24. Chimneys of 1.5% of the smokeless stoves being used were never cleaned since they were installed. Chimneys of 45.6% of the smokeless stoves being used were cleaned more than once a week. 27.7% said they cleaned the chimneys once every two weeks and 20.4% said they cleaned the chimneys once a month.

25. The smokeless stoves were generally free of problem, as 66.5% of the people said that they did not have any problem with the smokeless stoves. 8.3% said they fixed it themselves when any problem did occur. 22.8% sought help from the local women volunteers. Whenever, help was sought, the women volunteers obliged. Only 5.9% chance was there for her not to come to help.

CHAPTER 13.

SMOKELESS STOVES' WOMEN VOLUNTEERS

Sample size

1. Women volunteers were specifically trained to play a key role in extending the programme for installation of smokeless stoves in the rural areas. According to Public Health Engineering Unit, more than 270 women volunteers were trained between 1991 and 1993. In the present survey, 35 women volunteers were randomly selected for interview. They belonged to 33 gewogs spread over 11 districts. The interviews were held during from 28 December 1994 to 17 March 1995.

Highlights of interview with women volunteers

270 women volunteers trained by RWSS between 1991-93

35 women volunteers interviewed during the survey

69% women volunteers were also trained to contruct latrines

A woman volunteer has built 37 smokeless stoves on average

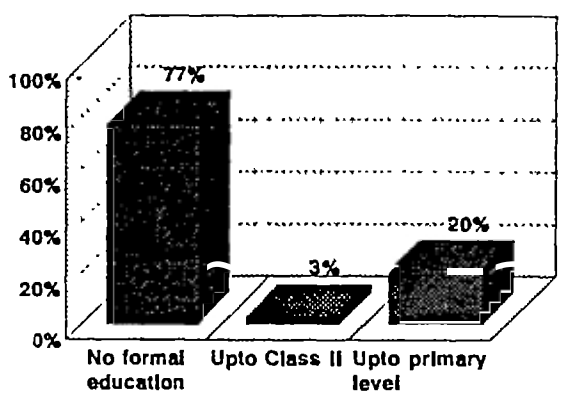
A woman volunteer gets Nu 56 on average as installation fee

2. The responses related to personal uses of water supply and sanitation facilities by the women volunteers show that 69% use water from piped water supply schemes, 74% have household latrines and 77% have smokeless stoves. The last figure is interesting. It shows that smokeless stoves are not necessarily installed in the houses of women volunteers themselves.

Age, literacy and training of the respondents

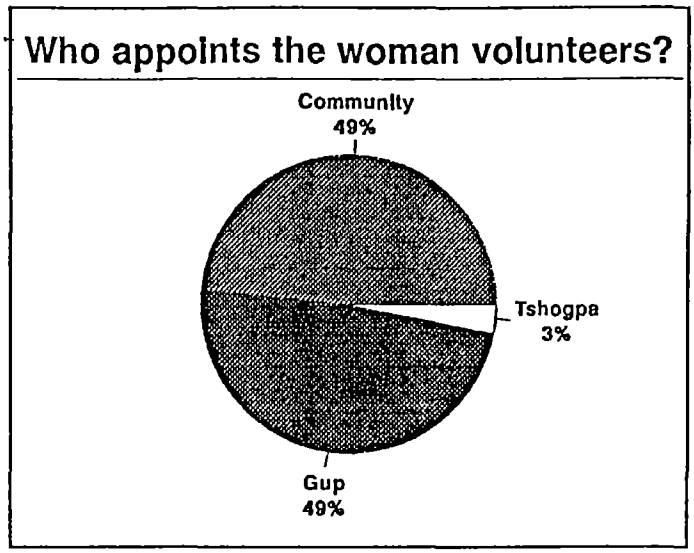
3. The age of the women volunteers ranged between 17 and 52 years, with a mean age of 28 years More than half of them were younger than 24 years. As regards educational level, 77% had no formal education, 3% had studied upto class II, and the remaining 20% had studied only upto the primary school level.

Educational profile of women volunteers

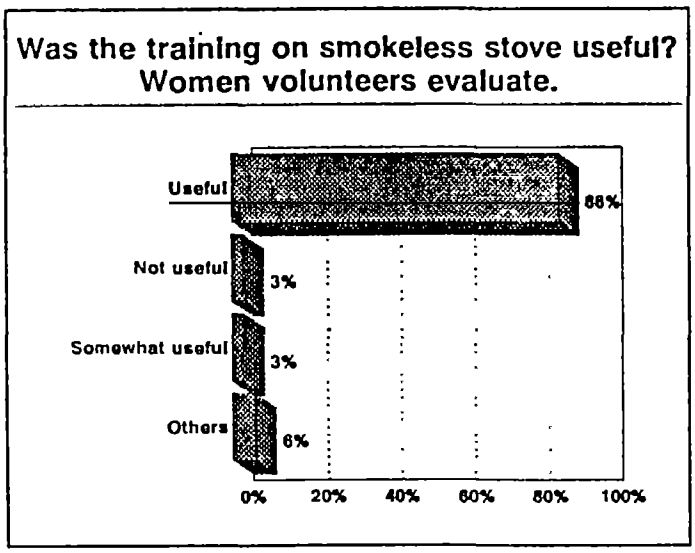


4 The respondents were selected to become women volunteers either by the community or by the gup, 49% of them in both cases. Only in 3% of the cases, the tshogpa (a member of Block Development Commitee) appointed them. All of them, except one, had been trained in the

installation of smokeless stoves. In addition to training on the installation of smokeless stoves, 69% of them were trained to construct household latrines. Consequently, 7 woman volunteers, who were trained to help in building pit latrines, also helped 121 households to build latrines, representing a mean of 17 latrines for woman volunteer. 49% of them were trained to teach others about the use and maintenace of smokeless stoves. A second (refresher) training on smokeless stoves had also been attended by 37% of the respondents.



5. An overwhelming majority of 88% of the respondents considered the training on smokeless stoves useful. 3% of the woman volunteers considered that the training was somewhat useful and another 3% considered that the training was not useful. Of the remaining 6% of the respondents, 3% stated that they never got a chance to use what they learnt and the other 3% were not trained on smokeless stoves but on some aspect of sanitation. 31 of the respondents had gone to other districts to work as an instructor in the training of other women volunteers.



How many stoves were built by a woman volunteer?

6 The number of households in which smokeless stoves were built by a woman volunteer ranged from 0 to 200 The feat of building 200 smokeless stoves is credited to Ms Zomba of Katsho gewog in Haa On average, a woman volunteer had built 37 smokeless stoves. This is quite a lot considering they began their activities only in 1991. Three respondents reported that they had installed only one stove each. Interview ended at this stage for the (6 volunteers) 17% respondents who had not installed any smokeless stove.

Problems faced by women volunteers

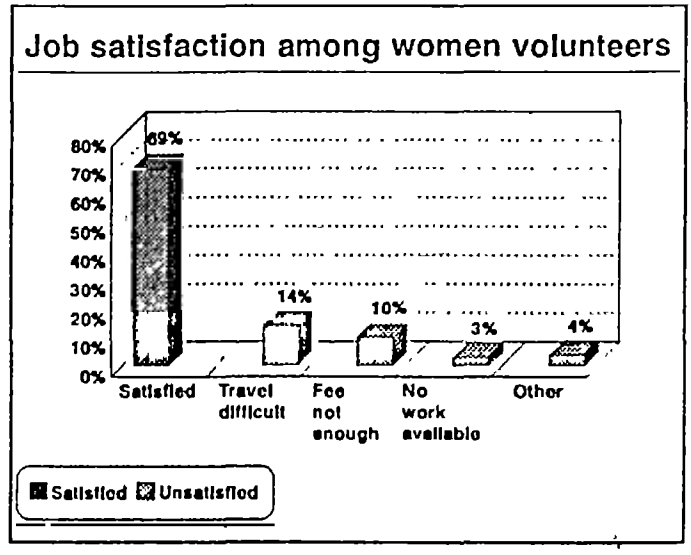
7. The remaining 29 respondents were asked to indentify the problems they faced. The problems they normally faced were: lack of timely supply of stove materials from the district authorities, delay in the payment of installation fee, lack of help came from the user households, lack of support from district authorities and non-availability of tools like grates and stokers.

Installation fee

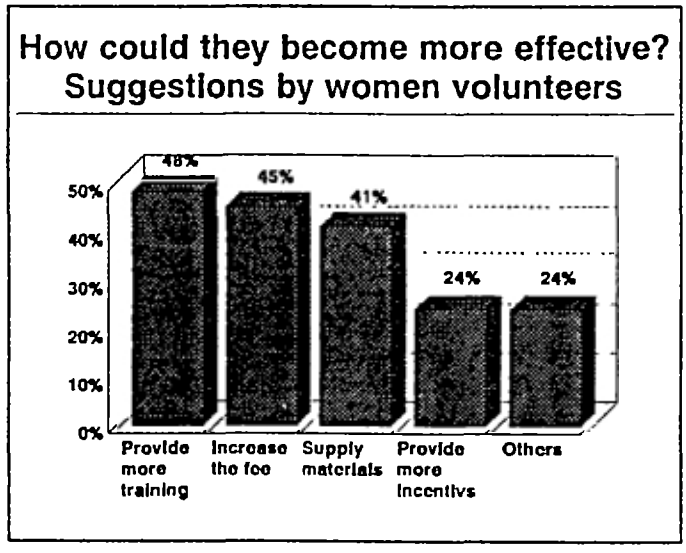
8. A fee of Nu 60 per stove is paid to the woman volunteer for the installation of one smokeless stove. This sum was reportedly received by 86% of the women volunteers. The remaining 14% respondents did not receive any money. The total amount received by the respondents varied with the number of installation made by the respondent. The maximum amount received by one respondent was Nu 12,000. The average amount a woman volunteer had received was Nu.2,334. This is the entire cumulative amount they have received over the years.

Attitude towards their work and their suggestions

9. The women volunteers were asked about work satisfaction. 69% stated that they were satisfied, 14% considered that the travel involved in the work was difficult, 10% felt that the payment was not enough and 3% said that not enough work was available while another 3% said that there was a need for helpers (new woman volunteers) as their earlier companions had quit this work.



10. The suggestions of the respondents about what district authorities could do so that the women volunteers could work better in the installation of smokeless stoves included the following: more training by 48% respondents, increase in the rate of fee for installation of a smokeless stove by 45%, timely supply of stove materials from the district stores by 41% respondents and the provision of incentives by 24% respondents. Other suggestions included introduction of exemption from *shaptolemi* and daily support allowance that could be paid by the district authorities.



Summary

11. Under the RWSS programme, women volunteers were introduced since 1991. Communities or gups appoint or cojole them to take up the role. They are generally young and have not been to school.They were trained since 1991 in the installation of smokeless stoves and household latrines 89% of the women volunteers rated the trainings as useful and 48% also

identified further training as a means to improve their effectiveness. As the materials for the smokeless stoves are supplied, households request the women volunteers to install them by paying a fee ranging from Nu 60 to Nu 65 per smokeless stove. A women volunteer has built an average cumulative total of 37 smokeless stoves and 17 household latrines. Contrary to expectation, all women volunteers have not installed smokeless stoves in their own houses. Though travelling to and fro to install smokeless stoves in other people' s houses is undoubtedly difficult, 69% of the women volunteers expressed that they were satisfied with what they were doing. But there is a clear suggestion that it is time for increasing installation fees or other type of incentives To facilitate their work, they have also suggested that the materials should be supplied on time from the district authorities.

CHAPTER 14.

HOUSEHOLD LATRINES

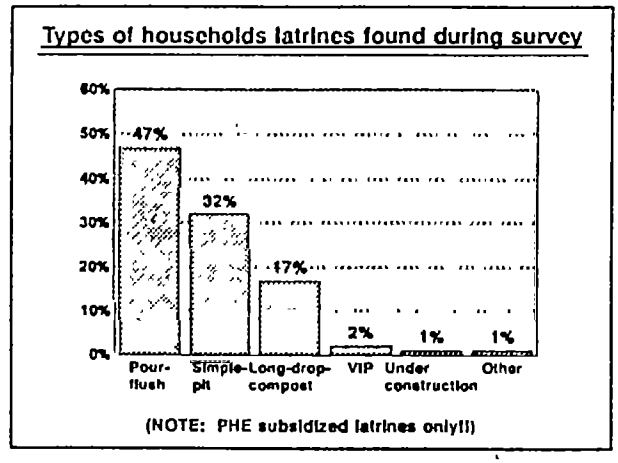
Sample size and time of the survey

1. The survey of household latrines, which was conducted between 26 December 1994 and 3 March 1995, was confined to household latrines constructed as part of the project. The distinguishing feature of a household latrine built with the help of the project is the presence of at least a concrete slab. Moreover, the households' latrines supported by the project were built either in 1991 or afterwards. The household latrines built by the project that satisfied these two conditions were sampled from 19 villages in 13 gewogs in 9 dzongkhags. During the survey, 233 people were interviewed.

2. The planned targets to be covered by the household latrine survey was 244 households. But only 233 households could be interviewed as 11 households were closed or suitable respondents were not present in the house. Out of 233 respondents, 79.8% were women and 20 2% were male 233 respondents also include two households who were still constructing their latrines at the time of survey.

Household Latrines
Highlights

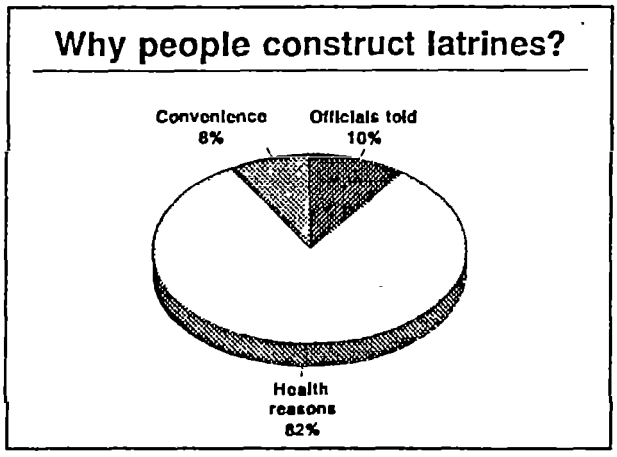
- 231 household latrines inspected
- 96 % found in use
- 99 % happy with latrines
- 99 % of adults use always
- 85 % of children use always

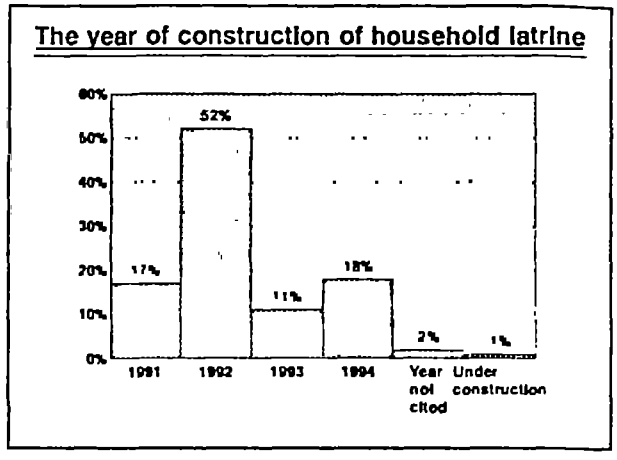


Varieties of latrines and period of construction

3. Majority of the household latrines in the sample were constructed in 1992. Pour flush latrines and simple pit latrines are by far the most common type of latrines promoted. **There was 100% latrines coverage in the sample.** The type of latrines found in the samples are reported in the graph above on the right side.

4. However, because of the erratic data, only 227 household latrines have been selected for further analysis.





5. The 227 household latrines were inspected by the data collection teams to see if there was any excreta on the platform. 95.6% of the household latrines were adjudged clean, but the platforms of remaining 4.4% of the households latrines had deposits of excreta on them.

Reasons and desire for constructing latrines

6. Out of 227 respondents, 74% percent claimed that they had persuaded their neighbours to construct household latrines. The respondents were asked as to why they built the latrines. The percentage of respondents who said that they did it for health and hygiene purposes was 80 6%. A small percentage 10.1% said they did it because officials told them and 7.9% said that they did it for convenience. It is quite remarkable that 99.1% of the respondents said that all the adults use household latrines always. With respect to children, only 84.6% of all the children were reported to use household latrines always. Almost all the people said that they were satisfied with their household latrines. They did not complain about smells or the latrines not being safe for children.

7 Nevertheless, out of 227 households, 66.1% of the respondents (150 households) said that they would like to improve their latrines. That means, 33.9% did not express any wish to improve their latrines. The percentage of scores are as follows:

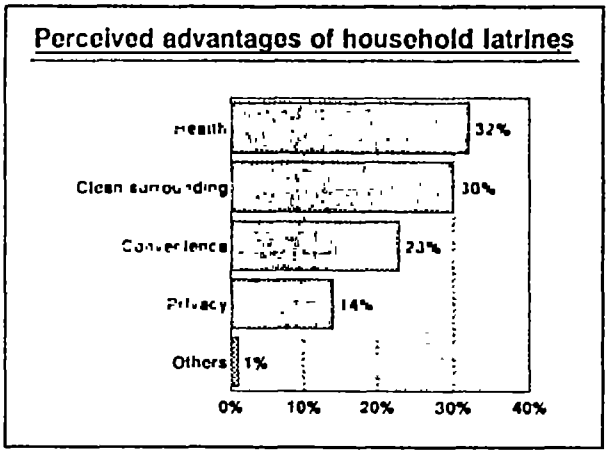
	Number of scores	Percent
Plan to build a new simple pit latrine	4	2.4
Plan to build a new pour flush latrine	20	12 1
Plan to build a long drop compost latrine	12	7.3
Plan to build a ventilated pit latrine	27	16.4
Plan to improve the existing latrine	41	25.0
Plan to improve the existing latrine, but do not know how	26	15.8
Other	33	20.1
Total	164	100

Assistance in terms of construction material and constructing latrines

8. While constructing household latrines by 227 respondents, 99% of the households received materials from the government and in 97% of the cases, the masons or PWD staff came from the dzongkhag to help them construct their latrines. Many households expressed that they would like to build improved latrines but they expect materials from the government.

Advantages of using latrines

9. While inspecting the 277 household latrines, it was obvious that in 95.6% of the cases, the latrines were being used. Respondents were asked to state what advantages they perceived in using households latrines. The percentage score of advantages reported are tabulated below. The total score was 614. Hence, the maximum percentage means that it is the most frequently cited advantage. Health reasons and clean surrounding were most cited advantages.

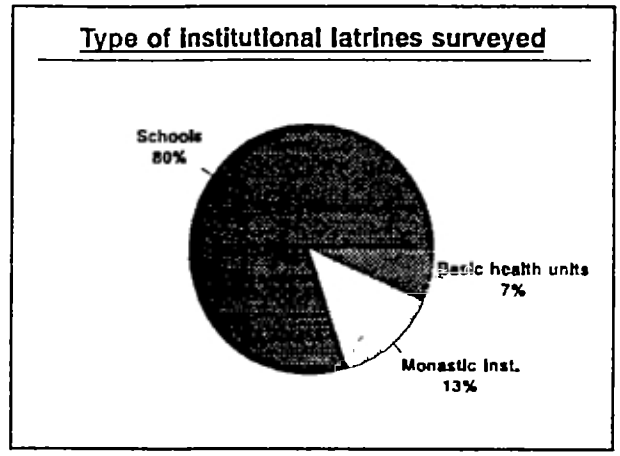


10 Advice on how to use and maintain household latrines comes from various sources. In order of importance of sources of advice are health workers, dzongkhag technicians and relatives and friends. There are households who did not hear anything about the use and maintenance of the latrines, but the percentage is not significant.

CHAPTER 15.

INSTITUTIONAL LATRINES IN SCHOOLS, MONASTERIES AND BASIC HEALTH UNITS

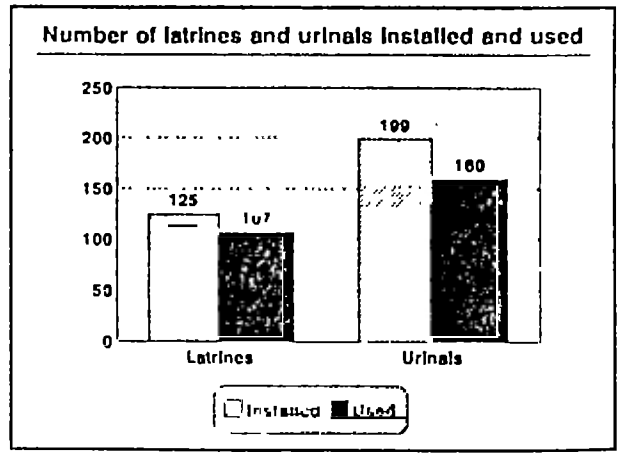
Extent of survey



1. Institutional latrines have been constructed at schools, monastic institutions, Basic Health Units (BHU) and hospitals. Data was collected from 19 such institutions which comprised 16 schools, 2 monastic institutions and one basic health unit.

2. It was intended that the head of the institution would be interviewed. However, this was not possible in many cases as the schools were closed for vacation .Head masters as well as teachers and caretakers were interviewed; a priest and a shedra (Buddhist college) lopen were interviewed in their respective monastic institutions, and a health assistant was interviewed in the BHU.

Construction of urinals and latrines under EU project

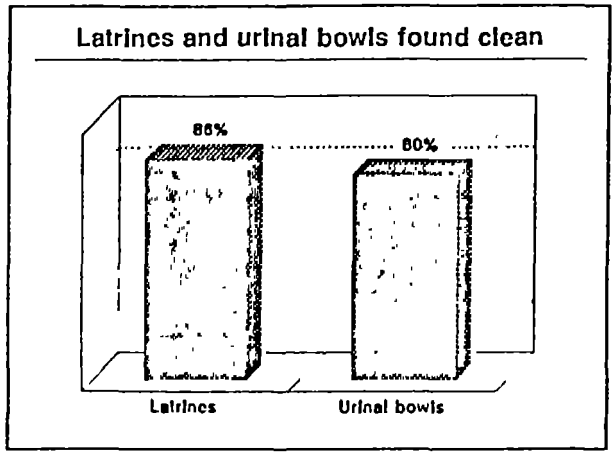


3 Under the EU assisted project, institutional latrines were constructed between 1992 and 1994. Only the latrines which were constructed under this project were visited, though some of these institutions had latrines constructed under other programmes before 1992. The data collected shows that only ventilated improved pit latrines were constructed in these 19 institutions under the EU-assisted programme. Other types of latrines, such as the pour flush, long drop and drain type, were not constructed in any of these institutions under the EU assisted project. The number of seats in the venitlated improved pit latrines in the institutions ranged widely from 1 to 20. There were 20 seats in the latrine of Chang Zamtog Primary School in Thimphu. The total number of seats constructed at 19 institutions was 125.

4. In addition to ventilated improved pit latrines, urinals were constructed under the EU assisted project. Urinals were not built in places other than the schools. A total of 199 bowls were installed in 19 institutions. The minimum and maximum number of bowls in a school was zero and 30 respectively. Pema Gatshel Junior High School has 30 urinals bowls and Chang Zamtog Primary School in Thimphu had 20 urinal bowls. The average number of bowls in a school was 10, but there is a wide dispersal in the number of bowls depending on the strength of the schools.

Cleanliness and usage of facilities

5. The survey teams noted that all the latrines and urinals were in use. Considering that the survey was conducted when schools were closed for winter vacation (from 18 December 1994 to 9 March 1995), the latrines and urinals in schools could not have been in normal use. It may therefore be construed that the data collection teams noted whether these facilities were in a usable condition or showed evidence of use prior to closing of the schools. As to how many of them were clean, it was observed that 86% of latrines and 80% of urinals were clean. This too should be seen skeptically given the fact that the schools were closed at the time of survey.



Types of latrines and no. of latrine seats and urinals found in 19 institutions.

Type of latrine	No. of seats in Non EUassisted project latrines	No. of seats in EU assisted project latrines	Total number of seats
Simple pit latrine	9	0	9
Ventilated improved pit latrine	43	125	168
Pour-flush latrine	20	0	20
Long drop compost latrine	2	0	2
Drain type latrine	15	0	15
Sub total for latrines	**89**	**125**	**214**
Urinal	9	199	208

Latrines and urinals built prior to the EU project

6 In 13 institutions, there were latrines and urinals that were constructed before 1992, i.e. outside the EU-assisted project. Simple pit latrines, ventilated improved pit latrines, pour flush latrine and drain types latrines were built. The long drop compost latrine, otherwise popular in private homes, was not constructed in any of the institutions surveyed. This is not surprising because the structure of schools in Bhutan is rarely two storyed. Some urinals were also constructed before the EU assisted project.

User ratios

7. As stated earlier, the institutions surveyed had latrines built under EU assisted project as well as non-EU assisted projects. In order to find user ratio, the total number of latrines' seats and urinals bowls among the 19 institutions have to be found. It would be useful to find the ratio of students to a latrine or a urinal in each school. With such ratios, the absolute numbers can be put into context. There were 214 latrine seats in 19 institutions and 208 urinal bowls in 19 institutions. The total number of users in 19 institutions was estimated at 5,610. That means there were about roughly 330 users in every institute.

8. Dividing the number of users by the number of latrine seats available gives us the user ratio. There is, on average, 26 users per latrine seat and 27 users per urinal bowl.

9. The number of users per latrine seat ranges from 8 to 248 and the number of users per urinal bowl from 11 to 65. Estimates from a sample of 19 institutions show that the users per toilet seat or urinal bowl is generally excessive, particularly their use is concentrated at certain part of the day. Overcrowding is evident during the interval when most students go to the toilets.

- 43% of the schools have 50 users or less per latrine seat,
- 50% of the schools have between 50 and 100 users per latrine seat,
- 7% of the schools have more than 100 users per latrine,

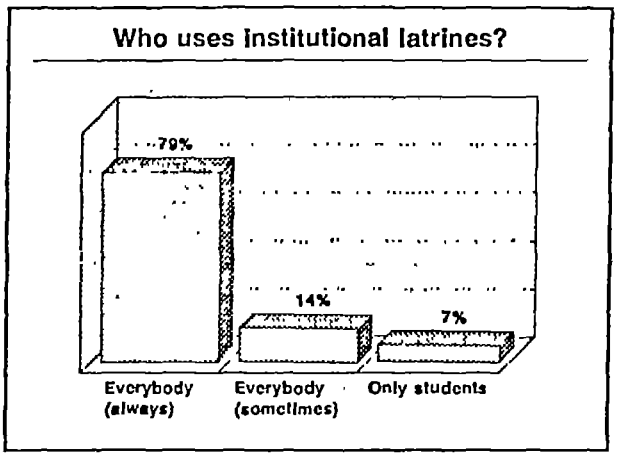
- 31% of the schools have less than 25 users per urinal bowl,
- 46% of the schools have between 25 and 50 users per urinal bowl, and
- 23% of the schools have more than 50 users per urinal bowl.

10. The interview related to adequacy of the facilities could be held only at 14 of the 19 institutions. Exactly half of the 14 respondents considered that the water supply to the institution was adequate and the other half of them considered that it was not so. Regarding the adequacy of the latrines and urinals, the views were almost equally divided. 43% respondents considered that the latrines were adequate and 57% considered them inadequate, and 50% considered that the urinals were adequate while 43% considered them inadequate.

Latrines' condition and usage

11. The latrines seem to be well used as 79% stated that everybody in the institution used them always while 14% stated that everybody used them sometimes. 93% of the respondents were 'happy' with the latrines. However, one respondent (7% of the respondents) stated that only the students used these latrines and that he was not happy with the latrines because of their smell. Other reasons, such as the latrines not being safe for small children and preference for going (for defaecation) in the open, were not endorsed by any respondent.

12. All respondents agreed that the latrines had advantages, in particular, for health reasons. Convenience and cleanliness were felt as an advantage by 93% respondents. 43% respondents also felt privacy as an advantage of having latrines.



Summary

13. The survey focused only on institutional latrines built under the EU assisted project. 19 institutions which included schools, monasteries and a basic health unit were covered. Under the EU assisted project, ventilated improved pit latrines and urinals were built. Most of the urinals and latrines were found clean, despite 79% of the respondents users claiming that everybody uses the latrines always. The vast majority of the users were children, as the schools surveyed happened to be primary schools. It is noteworthy that the respondents (headmasters or teachers) did not regard the latrines as unsafe for children. Nor did they mention that the users (children) prefer to go for open defaecation. However, over half of the respondents said that the toilet facilities were not adequate or sufficient given the number of users and the intense demand on the facilities within certain hours of the day. Taking into account the total seating capacity of the latrines and urinals, built under both EU assisted project and other project, the average number of users per latrine seat works out to 26 whereas the number of users per urinal bowl is estimated at about 27.

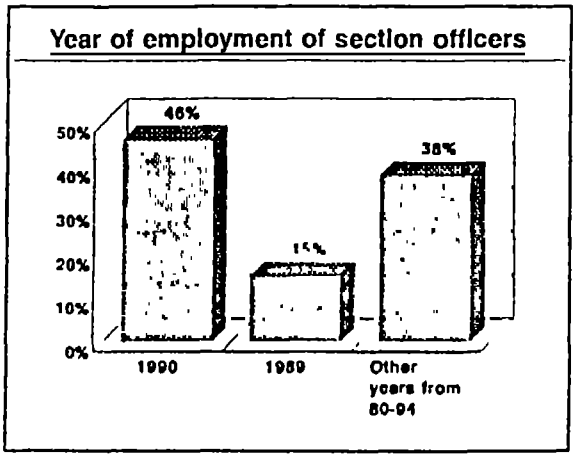
CHAPTER 16.

SECTION OFFICERS OF DZONGKHAGS

Qualification and responsibility of section officers

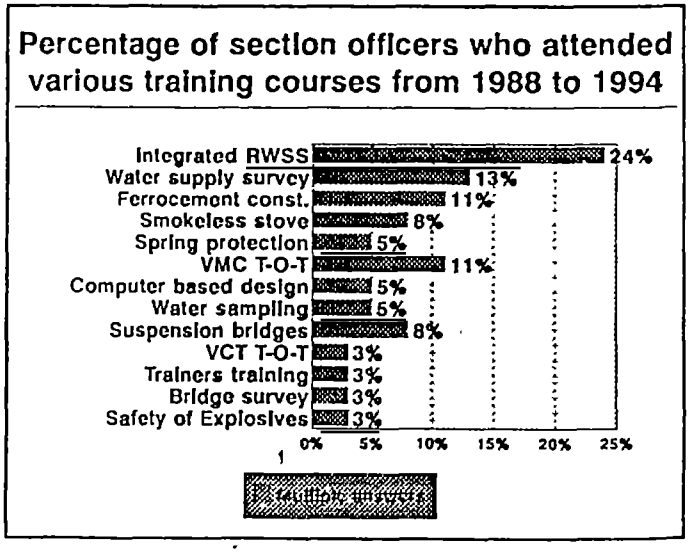
1. The section officer is an important functionary in the field for implementation of the RWSS programme. Only the section officer most closely associated with the implementation of rural water supply and sanitation programme in the district was to be interviewed. The section officers were expected to personally complete the questionnaire. Of the 18 districts visited by the data collection teams, sections officers could be interviewed only in 13 districts. One section officer was interviewed in each of these 13 districts.

2. A section officer is required to have technical qualification in civil engineering. Of the 13 respondents, 77% possess diploma in civil engineering, one (7.7%) has diploma presumably in civil engineering, one (7.7%) is a licenciate in civil engineering and the last one (7.7%) is S. F. in Secondary Education. Six of them were recruited in 1990. and 2 were employed in 1989. In other years, the maximum number recruited was one.



Training

3. All the section officers have received training in various subjects. 87% (33 out of 38) of the courses attended by the section officers were directly related to RWSS. The training courses were mostly related to RWSS under various titles, such as

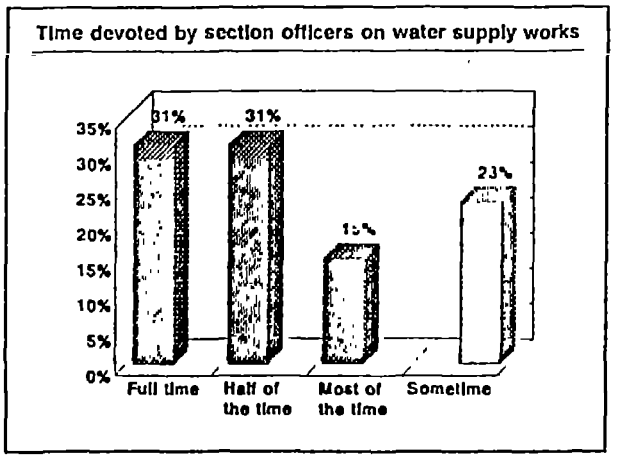


- integrated water supply and sanitation,
- survey for rural water supply,
- water sampling and test
- computer-based design of rural water supply scheme,
- spring protection,
- suspension bridge,
- construction of ferro cement tank, and
- training of trainers for village maintenance committees and village caretakers.

4. Some 38 courses were attended by some of the section officers from 1988 to 1994. The duration of the training courses ranged from 1 to 4 weeks. Data on the courses show that the

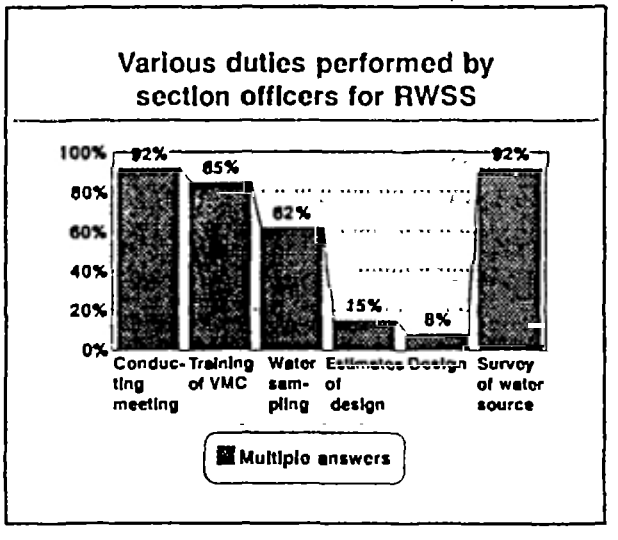
duration of 57% of the courses was one week, that of 19% of the courses was 2 weeks, that of 3% of the courses was three weeks and that of 22% of the courses was four weeks. The percentage of section officers who have attended each of these course is shown in the graph above.

How much do they work on water schemes?



5. The assessment of the part of time the section officers worked on water supply during the past two years shows that only 31% worked full-time, 15% worked most of the time, 31% worked half of the time and 23% worked some of the time. In comparison with time devoted to water supply, it appears that the training was liberally given on subjects related to water supply. Still, when they were asked about the need for further training, 85% stated that they needed it.

6 Section officers perform a variety of functions for RWSS. Almost all of them supervised construction of works and conducted training for the village caretakers. But they are less involved in design and estimate preparation because these are prepared by Public Health Engineering Unit at the headquarters.



Shortage of plumbers, fitters, tools etc.

7. Section officers felt there was an acute shortage of plumbers, fitters and masons in the district. Only 31% considered that they were enough while 69% felt otherwise. A still larger number of them (85%) felt that the plumbers, fitters and masons needed more training. As regards availability of tools to the plumbers, fitters and masons, 77% considered that they had sufficient tools. These views were corroborated by those of the plumbers, fitters and masons, 54% of whom considered that the districts did not have enough of them, 100% of whom considered that they needed more training, and 75% considered that they had sufficient tools.

Relationship between district engineers and section officers

8. The district engineer is the immediate superior of the section officer. To the question whether the district engineer was helpful to the section officer in his work, 77% agreed that he was helpful, 15% did not answer and 8% denied. As regards the frequency of the visits made by the district engineer in a year to the site of works where section officers may be, 31% stated that he visited often, 54% stated that he visited sometimes and 8% said that he never visited.

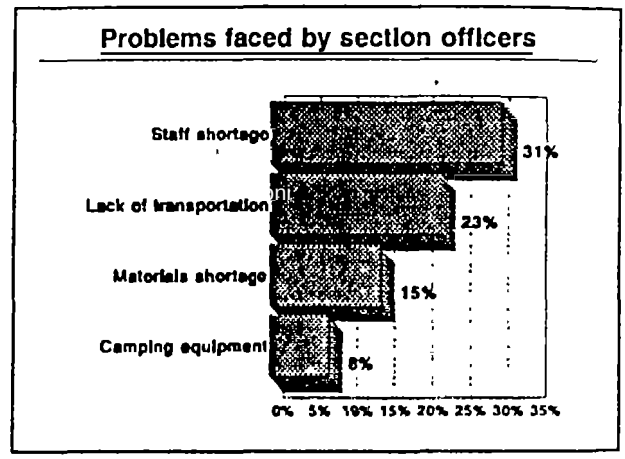
One (8%)of the section officers could not state his views as he was only recently posted in the district.

Promptness in payment

9. The payment of travelling allowance was reported to have been received in time by 54% section officers; 23% expressed that such payment was received in time only sometimes, and another 23% regretted that it was not received in time.

Problems

10. All of the respondent section officers stated that they had much work besides that associated with water supply. Section officers have to face many problems in the field. When they were asked whether they have problems with villagers to get water supply work done, 46% agreed that they did have problems, 15% stated that they had problems sometimes, and 38% denied having any problem. Several other problems were mentioned which broadly related to shortage of assisting staff and materials, and lack of transport facilities. The shortage of staff was mentioned by 31% of the respondents. Lack of transport facilities was mentioned by 23% of the respondents. Shortage of materials was mentioned by 15% of the respondents who referred to delays in sanction and despatch of materials and their availability. 8% of the respondents mentioned the need for camping equipment



Measures for improving the performance of section officers

11. Two main factors were identified by the section officers for improving their performance. These were more training and availability of transport to go to site. In addition, respondents mentioned the need for timely and adequate payment of travelling and daily allowances, more frequent on-site supervision by the District Engineer and more or better equipment and tools for work on site. Some were speficic enough to suggest that motorcycles should be provided to increase their mobility.

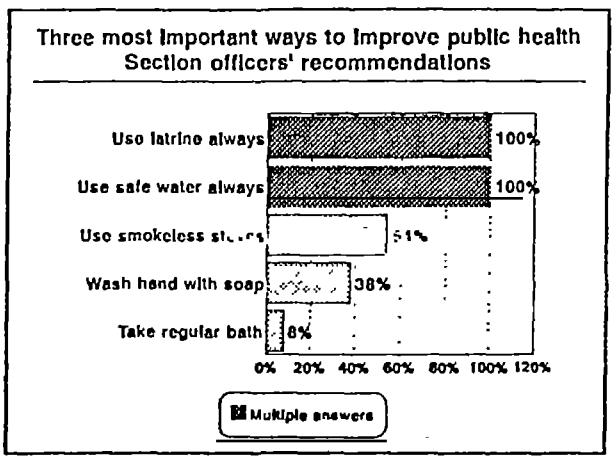
12. Training dominated the opinion expressed by the section officers regarding what must be done to make the users of piped water supply schemes more responsible for their maintenance and repair. Conducting training for the users to create more awareness was favoured by 77% respondents, more training of caretakers by 69% and more training of VMC members by 62%. Opinion of 46% respondents confirmed that there was a timely response by the District staff to any request made by the caretaker or the VMC.

Main areas identified for improvement of public health

13. Section officers were asked to select three actions which in their opinion were the most

important means of maintaining good public health. All of the 13 repondents selected the use of latrine and the use of safe water. For the third action, 54% selected using a smokeless stove, 38% selected the washing of hands with soap before eating and after using the toilet, and only 8% selected bathing regularly. Their opinion point to the vital importance of safe water and safe disposal of excreta to protect public health. But there is no widespread importance given to washing of hands or smokeless stoves.

14. The lack of sufficient technical staff with the district administration has been a general constraint. The opinion of the section officers was sought about other approaches that could be taken in rural water supply and sanitation to reduce the need for skilled technical workers including section officer, work assistant, plumber, fitter and mason. The responses emphasized training of the local people in the village maintenance committee, the care taker or the public.



15 Finally, the views of the section officers were sought on the ways in which the Public Health Engineering Unit at Thimphu could give support to them so that they can working environment is improved. Once again they reiterated that training, transport, availability of work assistants and skilled workers, and timely delivery of materials were important constraints to be alleviated.

Summary

16. Section officers are supervised by district engineers and form vital part of the implementation machinery of RWSS Most of the section officers have diplomas in civil engineering and have reinforced their basic qualification with numerous short training courses related to water supply and sanitation. Because of their responsibility towards many sectors, section officers do not devote all of their time to rural water supply schemes. **Only 31% of the section officers admitted to working full time on the water supply schemes and another 31% said that they work half the time on the water supply schemes.** They are beset occasionally by constraints arising out of staff shortage, lack of transportation and delays in the delivery of materials on site

17. Section officers work on site supervising construction of works and organization training for water caretakers. They are less involved in the design and estimate of schemes as they are task left to Public Health Engineering in Thimphu. The quality of contruction depends crucially on the capability of section officers. Section officers in turn depend on plumbers and masons. Plumbers and masons are in acute shortage, as 69% of the section officers said so. Section officers also said that the plumbers and masons they have need more training. In view of the shortage of technical manpower in the districts, section officers suggested that training of members of the Village Maintenance Commitees, caretakers and general users would be very useful option to obviate or reduce the need for technical manpower.

CHAPTER 17.

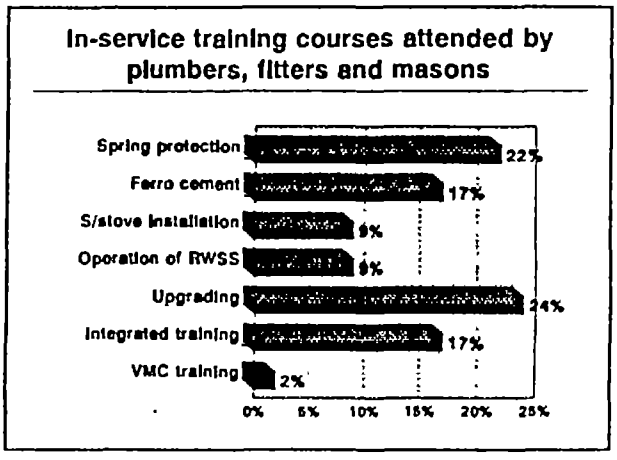
PLUMBERS, FITTERS AND MASONS

Pool of respondents

1. Plumbers, fitters and masons are employed in every district to to work on construction of water supply schemes and sanitation facilities. From each district, at least one of them was interviewed. Iin all, 24 people were interviewed. The respondents included 12 plumbers, 2 fitters and 10 masons. The seniormost among them was recruited in in 1976. At least one candidate was employed every year since then Since only 2 fitters were interviewed, their response can not be taken to represent their class.

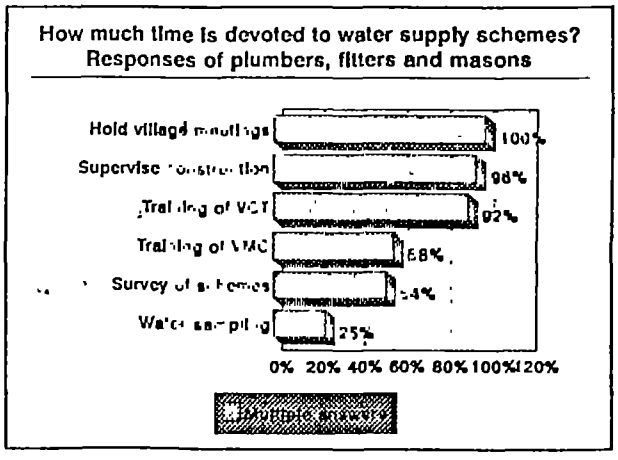
Training

2. Many in-service training courses were held for them. 20 of them attended at least one training course, 17 attended two courses and 9 attended three courses. Of these 46 courses, the most frequently attended courses were on spring protection , use of ferro cement, installation of smokeless stoves and operation of rural water supply. The opportunity for training seems to be well distributed as the 12 plumbers attended 21 courses, the two fitters attended 5 courses and the 10 masons attended 20 courses. The respondents may not have spontaneously recalled all the courses attended by them or the exact details of the title, year and the duration of a course. The courses on spring protection, ferro cement, smokeless stove and rural water supply were attended by each category of the skilled workers, namely, the plumbers, fitters and masons. The approach to involve all skills in the training programmes is also reflected in the courses for upgrading and intergrated training, which were attended by plumbers as well as masons.



Duration of courses

3. The duration of the courses varied from 1 to 7 weeks. The most frequent duration was one week. Of the 46 courses, 41% were for one week, 9% were for two weeks, 20% were for three weeks, 24% were for four weeks, 4% were for six weeks and only one 2% was for seven weeks.



How much do they work for water supply schemes?

4. Although these skilled workers may be

deployed in various kinds of works, it is noteworthy that 19 of the 24 respondents i.e. 79% stated that they worked full time on water supply projects; 17% stated that they worked most of the time and only 4% stated that he worked half of the time on water supply. The nature of their duties in implementation of water supply schemes included survey, construction, holding village meetings, training of caretakers and village maintenance committee members and taking water samples for water quality testihg.

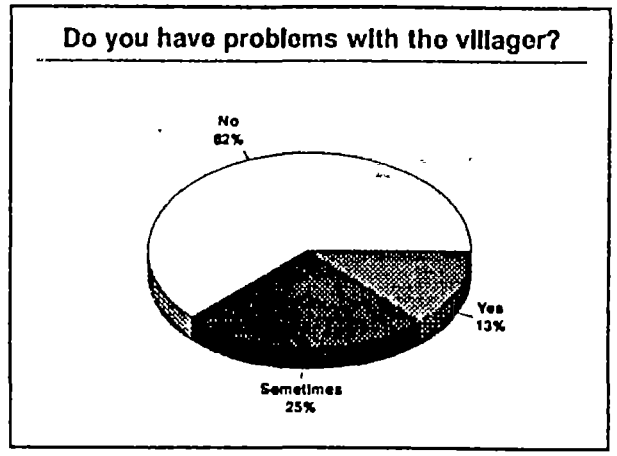
5. They were also asked about the adequacy of plumbers, masons and fitters in their respective districts. 46% thought that there were enough staff and 54% thought there was shortage. All of them said that they neede more training in water supply. To supervise their work on site, 58% of them said the district engineer or section officer visited them sometimes. 42% of them said that the district engineer or the section engineer visited them often on site.

Equipment and payment

6. The skillled workers need tools for work. 75% of them said that the tools they have were sufficient while the remaining 25% thought oftherwise. On the question of payment of travelling allowance, 67% of them were satisfied that it was paid on time all the time, 25% stated that they were paid in time sometimes and 8% stated that they were not paid in time.

Problems

7. 71% of the respondents thought that they had much work beside rural water supply. The remaining 29% did not think so. As regards problems with villagers to get water supply work done, 62% stated that they had no problem, 25% had problem sometimes and only 13% experienced such problem. The cause of such problem was not specifically investigated, but it may be assumed that it referred to getting co-operation of the villagers during construction.



Summary

8. The plumbing component of construction in Bhutan leaves much to be desired. Buildings are constructed at great cost, only to be damaged by bad plumbing work. It leaves one to suspect the level of skill among their class is not better in the districts. Much of the leakage and breakdown may be traced to the initial work done, rather than lack of maintenance. As plumbers, masons and fitters have important input into the water supply schemes, 12 plumbers, 2 fitters and 10 masons were interviewed. These skilled workers have attended numerous courses, most of which lasted one week, related to rural water supply and sanitation programme. 79% of them work full time on water supply schemes. This is much higher proportion of the time spent by sections officers. Among the problems they face, 54% of them feel that there is shortage of plumbers, masons and fitters in the districts, and 13% of them say that they do not get the co-operation of the villagers.

CHAPTER 18.

WORK ASSISTANTS

Education level and training

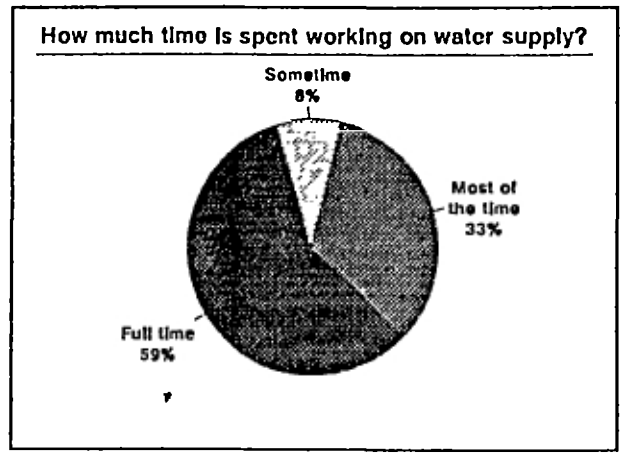
1. A work assistant supervises the skilled and unskilled workers in the field under the direction of a section officer. Interviews were conducted with 12 work assistants, all from different districts, from 25 December 1994 to 08 March 1995.

2. All work assistants interviewed had some formal education; 83% had passed class VIII and 17% had passed class IX. They started work in various years from 1985 to 1994. On an average, they had six years of experience.

3. The respondents have attended at least one training course. The duration of these 54 training courses varied from 1 to 6 weeks. Half of these course lasted only up to one week. The longest one was a six week course. The courses related to RWSS were generally of a longer duration than those on other subjects. Those who have worked for a longer period got opportunity to attend more courses (up to 7 courses in two cases). Total number of courses attended by this sample of 12 work assistants was 54, averaging to 4.5 courses per person. Training in the construction of ferro cement tanks was attended by 75% of them; in integrated RWSS by 67% work assistants; in installation of smokeless stoves by 42% of the work assistants. The list of training courses attended by the work assistants is as follows:

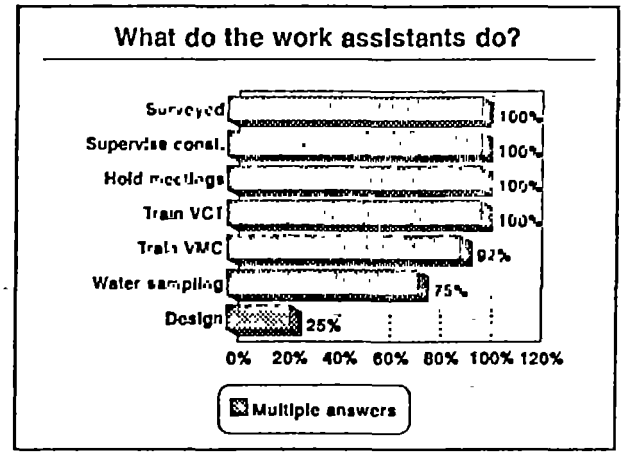
- construction of ferro cement tanks,
- installation of smokeless stoves,
- integrated RWSS,
- water sampling and testing,
- construction of suspension bridges,
- training of trainers of VMC,
- training of trainers of caretakers,
- design of rural water supply schemes,
- spring protection, and
- machine training.

How much they work for water supply schemes?



4. 59% of the work assistants stated that they worked full-time on water supply. This is much higher proportion than section officers. 33% stated that they did so most of the time and only 8% stated that he worked some of the time on water supply. All of them stated that their duties included survey, supervision of construction, holding of village meetings for water supply and training of village caretakers. As regards the training of members of village maintenance committees, 92% affirmed and 8% denied having given it. For water quality testing, 75% affirmed and 25% denied having taken water samples. But only 25% said that they were involved in design of water supply projects, 75% did not do it. Since design of RWSS projects is done by the Public Health Engineering Unit at the headquarters at Thimphu, hardly any of the work assistants could be expected to have done it.

Need for further training



5. All the respondent work assistants felt the need for more training in water supply. They also felt that the district engineers were helpful. However, perception about certain other matters varied considerably. Only 25% thought that the district engineers and the section officers often visited the sites of work and the remaining 75% thought that they visited the sites only sometimes. 33% felt that district had enough plumbers, fitters and masons. 67% considered that these skilled workers had sufficient tools. But 92% were of the view that they needed more training in water supply.

Payment

6. The respondents were mostly satisfied that the district authorities paid them the travelling allowance in time as 75% affirmed this and the remaining 25% denied. Regarding the duties assigned to them, 58% felt that they had much work besides water supply and 42% did not thinkg so.

Problems

7. The most frequent complaint made by the respondents was that their grade of service was too low. Lack of facilities of transport was another major constraint they faced.

Summary

8. Work assistants supervises skilled and unskilled workers under the direction of sections officers. Most of the work assistants have studied up to class VIII, though some have passed Class IX. They have an average working experience of 6 years. Like the section officers who supervises them, work assistants have undergone numerous short training courses lasting mostly a week or two. Most of their training was on construction of ferro cement tans and installation of smokeless stoves. 58% of the work assistants work full time on water supply schemes and 33% of the work assistants devote most of their time on water supply schemes. They are also involved in training of VMC and caretakers. They pointed out that the training in water supply would be useful for themselves, plumbers, fitters and masons. In carrying out their duties, they felt lack of transportation facilities and their low emolument level as general constraints.

CHAPTER 19

FINDINGS FROM THE FIELD VISIT

Background

1. The field visit was made by the entire Joint Evaluation Team from 29 May to 05 June 1995. The places and schemes visited are shown in Appendix 7. The exercise involved discussions with the Dzongda and district staff, and visits to a selection of RWSS schemes. Three groups were formed by the members of the evaluation team so that it could be possible to visit a larger number of sites in the time available for the field visit. Each group was also accompanied by a member of the district staff to guide the group to the site selected by the evaluation team and to establish contact with local functionaries. For the districts visited by the evaluation team, the files containing the questionnaires and formats filled at the randomly selected schemes and households and by interviewing concerned functionaries at the sub-district level were also taken for reference by the evaluation team.

2. The evaluation team set out to confirm "on-the-ground" achievements and weaknesses; collect any additional evidence of technical or socio-economic impact of the project; verify data; obtain the views of the staff at the district and village level about the project, and also the views of the villagers whether the project addressed their needs. It was considered particularly important that the visits would provide more qualitative evidence about users and their needs to supplement the quantitative survey information The findings are summarised below. Clearly, they do not provide a comprehensive picture but provide indications of conditions on the ground.

New Water Schemes

3. In some cases irrigation channels have been constructed which are used as a source of water. The channels are at a relatively short distance from the households. When a new water scheme is constructed, there may not be appreciable reduction in the time spent on collection of water. But the reliability of service and quality of water greatly improve with the new water scheme.

4. A written set of criteria for selection of schemes to be taken up for implementation does not seem to exist. Great importance is attached to the proposals made by the GYTs and how they are presented before the DYT. Still, some of the criteria mentioned by District Commissioners of Bumthang and Pemagatsel include the following:

a. distance people have to go to collect water
b. the yield of the source exceeds 0.1 litres per second
c. willingness of the people to contribute for the project
d. low per capita cost

5. The spring is very often the source of water supply in the schemes taken up under the EEC-assisted project. However, the water is often allowed to flow a short distance before it is tapped for supply. At this stage, despite fencing, the possibility of contamination of water by human beings, cattle, rodents and insects can not be ruled out. Capping of the spring has also

been done in the last couple of years at a few places, such as Samcholing Singkhar village and Refey village in Trongsa. Capping eliminates the chances of contamination at the source. However, at some places, including Pangkhar village in Bumthang, water from the spring is made to rotate a prayer wheel before it flows into the intake chamber. At such places, religious sentiments have been given due regard in designing a properly protected intake.

6. The source of Pangkhar village had a large yield. Still, a few houses which were at a relatively higher elevation did not receive continuous supply while others seemed to have sufficient even to run the tap continually. By regulation of valves, water was diverted for some time in a day to those who did not get it continuously. At one spot, a leakage which appeared to waste a day's supply was not repaired for nearly six weeks. Since most of the people got water in spite of the leak, there was no strong feeling to get the leak repaired. The problem thus seemed to be both in the design and in operational practice. Further, the local population did not seem to know whom to contact if the caretaker (one of them was sick and the other contended that the people themselves did not want the repair to be done) did not take action to set right the leakage

Rehabilitated Water Schemes

7. In the case of rehabilitated water schemes, there is hardly any saving of time in the collection of water for domestic use. The main improvements are in the reliability of supply and in water quality.

8. Ferro-cement reservoirs have replaced old and unserviceable masonry reservoirs. Where the masonry reservoir was still in good condition, its roof has been replaced with a reinforced concrete slab and a manhole cover. These modifications protect the reservoir against entry of contamination. Ferro-cement reservoirs were particularly appreciated for their low cost, ease in construction, watertightness and protection of water quality. There can be exceptions. At Refey village in Trongsa, spider and ants, a thin layer of sediment and some small twigs were seen inside the ferro-cement reservoir.

9. The tapstands in most of the villages visited by us were functioning well. But in Buligompa village in Bumthang, there was no water at the time of our visit. At Pangkhar village in Bumthang, houses at higher elevation could not get water if those at the lower elevation were drawing water. At the same village, a water leakage was accompanied with intermittent release of air from the same point. At Essa village in Trongsa, when one tap was on there was no flow in the other two taps. Such instances are indicative of the need for technical examination of the system for working out whether certain fittings have to be installed or regulated.

10. An old scheme, viz. at Tangsibi village in Bumthang, presented many disappointing features. The source was not protected, fenced, covered etc. Of the six taps, two were working and they were continually flowing. There was no caretaker nor VMC. People were washing clothes but said that they did not take drinking water from the same place. For drinking water, they went to the pond ! No wonder then that in this village when one person gets diarrhoea, all get it.

11. In contrast, another old scheme installed in 1983 at Tsangkha village in Trongsa was seen to be in full working condition. The caretaker and VMC started working since 1992.

Household Latrines

12. The simple pit latrines and the ventilated improved pit (VIP) latrines are provided with wooden covers to cover the hole. It is not uncommon, however, that the hole is left uncovered allowing access to the flies and in some cases, faeces is allowed to stay near the hole on the covering slab. Where the slab is kept clean and the wooden cover is placed over the hole, the latrine is of an acceptable grade.

13. The long-drop compost type of latrine is found convenient by the users as it is installed in the house on the living floor (usually the first floor) in the houses of traditional design.

14. Pour flush latrines were taken up as pilot schemes in several districts including Paro, Trongsa, Wangdue, Bumthang, Trashigang and Chukha. In Dhur village in Bumthang, as also at some other places visited by us, pour flush latrines seemed to be popular because they are odourless and the platform can be kept clean. However, as water is not commonly used for ablution, they tend to get choked by the materials used for anal cleansing. A user of pour flush latrine in Kormay village in Trongsa stated that if thin leaves are used for anal cleansing and the seat is flushed with water after use of the latrine, choking was avoided. High cost of materials and location outside the house were mentioned as the disadvantages of pour flush latrines In Tsangkha village in Trongsa, pour flush latrines in the clustered portion of the village have resulted in very dirty conditions and too many flies, presumably because of inadequate disposal arrangements.

Institutional Latrines

15. Aqua privy type of latrines have recently been constructed at Jakhar Primary School in Bumthang under a World Bank assisted project. There are 20 seats and four taps for washing hands. The unit seemed to be well constructed. However, all but one of the cubicles were locked because the water supply was interrupted due to some fault. The absence of soap and water pots was indicative of insufficient attention to sanitary aspects. It may also be noted that the cost of the unit was relatively high and its design might not serve as a suitable model for household latrines.

16. The urinals for use by boys in some of the schools constructed according to a design evolved by a UNV (who proposed it to UNICEF) have not been a success. At the school in Tsangkha village in Trongsa, they became blocked as the holes were found to be too small. At the Kuengarapten Primary School and the Langthel Primary School both of which are also in Trongsa, the urinals were apparently never used. The students said that they were open and uncovered and that they felt ashamed to use them. The soil characteristics were also apparently not considered in this design. Modifications may be possible to do away with the existing shortcomings in the design.

17. There are two blocks of VIP latrines at the Kuengarapten Primary School. One block has four seats and the other has six seats. Presumably, these latrines were constructed before the EEC-assisted project. The hole in these latrines seems to be too large for the children who tend to use the area around the hole rather than the hole. This results in a very dirty condition. A strange feature of the set of VIP latrines at this school is that a single door serves two cubicles resulting in total lack of privacy to the user. There is also a single-seated latrine installed under

the EEC-assisted project at this school which has a small hole but in this unit faeces were lying over the cover slab near the hole. The latrine at the Langthel Primary School was also found to be very dirty with excreta all round. It transpires from these observations that some detailed thinking and analysis of the shortcomings of the present design of latrines are necessary to evolve a suitable type of latrine for the schools. At the school, training of the staff and health education lectures for the students may be particularly helpful.

Household Smokeless Stoves

18. Besides the conventional chimneyless stove which produces a lot of smoke, several types of smokeless stoves are used in the households which include the Bumthang-type bukhari, the Swiss-type with rings to provide the desired size of hole or to cover the hole, and the earlier design of smokeless stove installed by the National Women's Association of Bhutan (NWAB) The Swiss-type has the best design of all but only a few villagers can afford it as the stove materials alone cost about Nu 3,700. The bukhari is essentially a room heating device though it is also suitable for baking any item of food on its flat top surface. NWAB has stopped its programme for installation of smokeless stoves as it has handed over the programme to PWD.

19. The smokeless stove installed under the EEC-assisted project is a modification of the NWAB design. We met, though rarely, persons who were not aware of the programme. But more often, there were persons who wished to have such stove installed in their dwellings and had even made a formal request to GYT for the purpose. Shortage of funds and/or materials was believed to hinder the acceptance of their request.

20. The smokeless stove of the EEC-assisted project is appreciated for reducing smoke inside the house, cooking time and eye infection as also making it easier to clean the cooking pots. A user also liked its shape and that it was made available by the government for a small fee of Nu 60 paid to the woman volunteer who installed it. For meeting the requirement of cooking for a feast, however, people have to resort to the conventional hearth. An on the spot examination showed that members of the household which did not have a smokeless stove suffered from chronic conjunctivitis.

21. The proper functioning of the smokeless stoves is interfered with by the users in many ways, such as by placing small stones below the pot, by allowing accumulation of ash, by not covering with a proper cover plate the holes that are not in use, and by not making proper use of the damper to regulate the flow of flue gases. By placing stones below the pots, the fuel efficiency of the stove is considerably reduced and smoke enters the living area. Some users explained that they did so in order to see the flame in the belief that the pot would then be getting full heat.

Institutional Support to RWSS

22. At some places, such as at Pangri village in Bumthang, the village caretakers could not be contacted as they have other jobs to do. They did not seem to be happy with the work of a caretaker. But in Dhur village in the same district, the caretaker seemed to be happy with the incentives consisting of exemption from *shaptolemi* (voluntary labour) and a contribution of one person-day work from each household per annum.

23. For the water supply scheme of Pangri village in Bumthang, there are village caretakers, but there is no VMC. The explanation that there was no VMC as the scheme was old is not convincing as a VMC could have been formed at the stage of rehabilitation. In fact, the VMC should be formed if people were willing to work on it irrespective of the age of the water scheme.

24. In most cases, a contribution of Nu 50 has been collected from each household. There are also cases in which Nu 100 has been collected per household, or only a fine has been collected from each household that did not participate in the construction of the scheme but subsequently desired to be served by the scheme, or the collection is made when funds are needed for a specific purpose to keep the service running. If someone breaks something, he has to pay for it. The collected sum is generally placed in the Bank. This has not been done in some cases for various reasons, such as non-availability of a branch of the bank within reasonable distance, illiteracy among the constituents, and the feeling of insecurity generated by a recent bank robbery. A bank account maintained by the VMC would go a long way in building a sense of its ownership of the scheme. The whole issue whether a VMC can have a bank account from the beginning of the water scheme needs to be looked into.

25. We learnt in Dhur village in Bumthang that open defecation was not allowed and a fine of Nu 50 was payable to the Health Committee for committing such nuisance.

26. There is a trend that the roles of the village caretaker and the village health worker are combined. This trend is present both among the male and the female caretakers. In Hurchi village in Bumthang, the VCT, VMC and the VHW were involved in the project from its very beginning.

27. Caretakers keep the water source clean and protected. The caretaker of Essa Chemjey village in Trongsa was planting a thorny bush around the reservoir at the source as the posts in the usual fencing tend to rot. In the present scheme of things, we feel that a good project is dependent on the initiative and effectiveness of the caretaker.

28. The insanitary conditions in the clustered portion of Tsangkha village in Trongsa highlight the significance of a strong health education component to go with the provision of water and sanitation facilities in the clustered areas.

29. The women volunteers are paid a fee of Nu 60 for installing a smokeless stove. She has no incentive to visit the household again. One of the main reasons for relative ignorance about the proper use of the smokeless stove is that the woman volunteer who installs the stove seldom returns to the same household to see if the unit is being properly used or if some repairs have become necessary for its proper functioning.

General Sanitation

30. Waste water from tapstands is conveniently used for irrigating the kitchen garden. Therefore, there is hardly any stagnation of waste water.

31. Tapstands were generally found to be clean. In Dhur village in Bumthang, they were even fenced with bamboo sticks. The platform was the only component which was found in the earlier schemes to be broken near the outlet pipe directly below the tap.

32. In Bumthang, strict discipline is observed to keep animals away from the dwellings, pave the footpaths up to the houses and to keep the road and its sides clear of rubbish. These measures are clearly worthy of being emulated elsewhere also.

33. The excessive quantity of wastewater, such as in Tsangkha village in Trongsa can cause damage to the foundations of the buildings in the clustered portion of the village unless it is drained away.

34. Langthel village in Trongsa was found relatively clean but a portion of the village which is clustered had an accumulation of solid wastes. Such wastes are amenable to be composted in a pit.

Training

35. With few exceptions, all caretakers are trained. The training makes a significant effect on their attitude to serve local population. The caretaker in Dhur village in Bumthang has attended two training courses and a refresher course. He is also a health worker, attends animal husbandry matters, runs a MCH clinic and wishes to train his son to replace him and his wife to be a VHW. Though he has no previous education, he trains other villagers and is well recognised by the village.

36. Training can be used, as by the District Engineer of Bumthang, to attract men and women to take up work of a caretaker or to join a village maintenance committee.

37. Training in the construction of ferro-cement reservoirs has helped in making them very popular.

38. Through exchange visits among villagers from various districts, dissemination of information is achieved under an ongoing programme sponsored by the Royal Government. The subjects covered include agriculture, animal husbandry, forestry, health, etc., but not RWSS. There is a good case that RWSS should also be among the subjects for exchange visits.

39 Training, or an awareness generation programme, seemed to us to be needed for the villagers to enable them to know who should be contacted to ensure timely repairs to leakage and other defects appearing during the operation of the scheme.

Equipment

40. The laboratories in district hospitals of Bumthang and Trongsa have membrane filter equipment for testing bacteriological quality of water. A suitably trained laboratory technician has been posted at each laboratory. However, the main difficulty faced by the laboratories is in obtaining the media used for the test. The media has a short shelf life and a refrigerator is needed to store it. For preparing the media at the laboratory, a precision scale is needed. For performing the test, a working incubator is needed. In the absence of some or all of these facilities, water quality can be tested at these laboratories only after making special arrangements for obtaining the media from the main laboratory at Thimphu and ensuring that the incubator is working. A simpler but more time consuming technique is the multiple tube method for performing the bacteriological test. In view of the problems associated with the membrane filter technique, it may

be a more viable alternative to adopt the multiple tube technique.

Supplies

41. Washers deteriorate with use resulting in considerable leakage from taps. The washer is a small and inexpensive item. We observed at Trongsa that the caretakers do not have a supply of washers. The user is required to procure it and give it to the caretaker for repairing the tap. The item is not available in the local market. It is only with difficulty and a lot of expenditure that a user may be able to procure it from Thimphu or Phuentsholing. In the meantime, wastage of water and inconvenience to the consumers are unavoidable. It should not present much problem if washers are included in the equipment made available to the caretakers or the caretakers may be trained to improvise washers from pieces of rubber or leather.

42. In the kit of tools issued to a caretaker after training, a blowlamp used to be included to facilitate jointing polyethylene pipes and fittings. The blow lamp is now excluded from the kit as ordinary fire can be used for heating the heating plate. Some caretakers expressed that the blow lamp was necessary for making a good joint and it should again be included in the tool kit. It was learnt that the blow lamps frequently went out of order, sometimes just because the washer of the air pump failed. That was the reason to exclude the blow lamp from the tool kit.

43. Like all other materials for the RWSS schemes, the materials for manufacturing smokeless stoves were distributed to the districts from the cental store at Phuentsholing. Some villagers had requested for installation of a smokeless stove at their houses but the issue of materials from the central store to dzongkhag authorities and from the dzongkhag authorities to the woman volunteer had already taken a long time.

Involvement of Women

44. In Dhur village of Bumthang district, the female caretaker did not wish to continue to work as a caretaker. She stated that the committee (VMC/GYT) decided that she would do this work.

45. There are various views about the selection of the woman caretaker. In the earlier stage of the programme, unmarried women were preferred in the expectation that they would be able to devote more time than a married woman might do. However, some of them married later and could not continue to give attention to the same extent as earlier, especially if they moved away from their village after marriage. The present view seems to favour the selection of married women who would stay on in the village.

46. Women are encouraged to be caretakers and members of the village maintenance committees (VMC). Still, there are villages which do not have woman caretakers and VMCs which do not have any female member. The main reasons advanced for it are that the Bhutanese women are not quite ambitious and that it is a new trend that women are made responsible to maintain a public utility.

47. Both in Bumthang and Trongsa, a female mason technician is working at each district as a new cadre of skilled persons trained at the Royal Technical Institute.

48. Fetching water is a variable task, requiring one to go to different sources during summer and winter. In most cases, girls and women fetch water, especially if it is not at a long distance.

49. There is a nation-wide campaign to move animals away from the dwellings. The programme is followed with varying strictness. However, where the animals have been housed away from the dwelling, the responsibility for feeding them has largely fallen on women.

Service Delivery

50. Schemes taken up now for implementation have the benefit of lessons learnt from the earlier schemes. Thereby the effectiveness and sustainability of the schemes are being improved.

51. Almost everywhere, personal hygiene was not indicative of a successful health education programme. A clean face, of a child in particular, was a rare sight in the villages. At schools, children looked clean and tidy.

52. Presence of air in the water supply systems was manifest at several places including the leakage at Pangkhar village in Bumthang, the tap at Kormay village and the ferro-cement reservoir at Refey village, both in Trongsa. For release of air from the water supply system, it will need to be examined that the air valves have been provided at appropriate locations and that they are functioning.

53. At Insholing village in Trongsa, the "waste-not" taps were replaced with the common faucets after it was seen that people tampered with the self-closing mechanism of the "waste-not" tap as they did not like to hold the tap while drawing water. The faucets replaced the "waste-not" taps since about 1990-91. The faucets go out of order frequently but the arrangement now arrived at is that a group of houses is made collectively responsible to repair or replace a defective faucet.

Health Impact of RWSS

54. It is a general perception that diarrhoea has significantly been reduced with the introduction of water schemes. Since the tapstands are nearby, the need to store water in the home is somewhat curtailed, thereby reducing the likely contamination of water before use. However, visually, there did not appear much evidence of improvement in cleanliness and hygiene in some of the villages including Dhur village in Bumthang.

55. The users appreciated that the water supplied by the project schemes did not get muddy during the rainy season, that the pots could be kept cleaner with adequate supply of water and that it is easier to fight fires with water available so conveniently. One benefit of being able to draw water in a short time was mentioned that cooking could be continued while going out for fetching water.

Other Impacts of RWSS

56. At several places, for example Refey village in Trongsa, taps were of a design that a polyethylene pipe could be conveniently connected to the tap. This arrangement was frequently used for conveying water inside the houses. Deliberate use of water for the kitchen garden could

also not be ruled out. At Refey village in Trongsa, use of tap water for cooling the engine of the grinding mill and oil expeller was observed. However, it was claimed that the communities were self-regulating and that such non-domestic consumption of water was not made if there was shortage of water.

57. In general, the sources are protected by fencing. Some of the sources are naturally protected as they are totally inaccessible due to dense vegetation and steep slope. Such sources are recorded as unfenced which gives an erroneous impression that they are unprotected.

58. The time saved in collection of water is available for other activities Weaving is one such activity which is generally favoured. The demand for electricity (i e. for lighting) is consequently growing in areas served by water schemes even if the supply of water may not be of a desired standard.

59. It is important that the cultural aspects are kept in view and due regard is shown to local customs. The success of a project may depend on the care exercised in such sensitive matters.