COMMUNITY WATER SUPPLY AND SANITATION PROGRAMME

POKHARA

STATUS SURVEY
OF
200 WATER SUPPLY PROJECTS

FINAL REPORT

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SUMMARY

The Community Water Supply and Sanitation Programme is implementing water supply schemes in rural areas of Western Development Region of Nepal since 1976 on the basis of standard designs. In this past 13 years about 230 projects have been completed. Apart from construction a lot of inputs have gone into continuous training of staff and into software components such as sanitation, maintenance and communication.

In 1988 a survey of some 207 projects was executed in order to get a comprehensive picture of the condition of the schemes, and at the same time to establish a data base for the Maintenance Unit. The fieldwork was done by a consultant and required four survey teams for about 8 months. The detailed results of the evaluated data are presented in this report.

The assessment of the schemes shows that about 58% of the projects provide water to the village in a satisfactory manner. About 20% of the projects require quite some repair and therefore do not deliver a proper service. Finally about 20% show serious flaws and thus do not really serve the purpose.

The data were also evaluated with regard to the various structures. The standardisation of the design obviously has yielded good results, as there are few shortcomings originating from design. Also construction quality is found to be satisfactory with 70 to 90% of the structures, depending on the type of structure. This may definitely be seen as a result of the continuous training that has been given to the Water Supply Technicians, the main persons involved in the construction and supervision of the schemes. Major problems with regard to design and construction occur in particular with catchments and pipelines, both structures where standardisation is possible only to a limited extent.
Significant shortcomings are found with the protection of sources and structures to avoid contamination of the water. This is an issue which can not be tackled with technical means, but which rather needs the realisation of the users for the risks of contaminated water.

What becomes obvious is that most of the shortcomings result from insufficient maintenance, even though this has improved since 1981 (survey of Gurung/Schramm). In particular with pipelines and valve chambers there is still a serious problem. In terms of figures the maintenance arrangements look already quite good with 78% of the projects having a Village Maintenance Worker (thereof 62% trained) and 78% having a User's Committee (thereof 72% active). However the evaluation of data somehow reflects that the biggest concern of the users is to get water to the tapstands, whereas preventive maintenance that aims at keeping the system intact and thus avoiding contamination is not yet so much a matter of concern to them.

Looking at the relations between performance/condition of a the projects and influencing factors there are some interesting results. In those projects where there is an active User's Committee, the maintenance is usually well organised and the VMW is mostly paid (78%), wheras in all other cases the payment of the VMW is a uncertain issue. Trained VMWs perform a bit better than untrained ones, but only as long as they are paid. Among the VMWs that get no remuneration the untrained ones do a better job, which might be because they work out of their own interest and initiative.

Finally the relation between economic condition of the villages and the maintenance set-up reveals that actually poor villages more often have a VMW (80%) than rich villages (62%) and with regard to the payment of VMWs they do not perform worse than rich villages. Also the condition of the projects in poor villages is equally good as in the average villages. This is an indication that good maintenance is not so much a matter of whether people can afford it , but rather whether they realize the importancy of it and accordingly take an interest in keeping the water supply scheme in good shape.

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I INTRODUCTION

The Community Water Supply and Sanitation Programme Pokhara has been implementing piped water supply schemes in the rural areas of Western Development Region since 1971. In the initial stage the programme was run by His Majesty's Government (HMG) and UNICEF jointly with the assistance of foreign volunteers for the technical supervision. As from 1976 this regular programme was followed-up by the so-called "Noted-A"-programme under which the Swiss Government provided the funds to UNICEF and HELVETAS provided the technical assistance.

By now about 230 water supply scheme were completed under this programme. Besides pure construction other components, such as sanitation, maintenance, communication and women involvement have been added and/or extended over the years, so that the programme has become a quite comprehensive approach to water supply.
Even though all these components deserve attention, this report concerns itself mainly with the physical output of the programme.

In the course of the implementation of the programme various efforts have been undertaken to assess the status of the completed projects.
A first survey was conducted in 1977 by New Era to assess the achievements of the regular programme.
In 1980 a survey of 45 selected projects was executed by Gurung/Schramm to get an information basis for a proposal for a feasible maintenance management system. Under this survey 18 projects of the regular programme (1971-1976) and 27 so-called standardized projects (built after 1976, under Noted-A) were assessed.
In 1986 a mail survey was lanced to get information about the maintenance arrangements in the projects.
The survey presented in this report was initiated in 1987 and executed in 1988 in view of an evaluation of the programme which took place in February 1989. The objectives of this survey are described below.

A draft report with the results of the survey was made available in January 1989 for the use of the evaluation team. However the completion of this final version has taken a bit longer due to various reasons. The report aims not only at providing the results but also intends to give a little insight into the methodology applied which might be of interest for professionals activ in the field of water supplies. Therefore it is a bit more elaborate on the description of the survey than would be necessary for the mere presentation of the results.

II OBJECTIVES OF SURVEY

The objectives of the survey were twofold. In view of the evaluation it was of particular interest to find out about the physical condition of the water supply schemes and their utility. In addition the chance to visit all completed projects made it possible to gather data which is of interest for the Maintenance Unit. Thus the objectives can be summarized as follows:

- assess the present condition of (preferrably) all water supply schemes built between 1971 and 1986 in Western Region by the Ministry of Panchayat and Local Development (MPLD) with the assistence of UNICEF and HELVETAS.

- to provide the necessary information for a data base which will be used (and up-dated) by the Maintenance Unit

The projects completed between 1986 and 1988 were basically not surveyed since it was assumed that they are still in good condition and it is planned to take them up first under the routine visits of the Maintenance Unit.
The collection of social data was limited to those issues which might have a significant relation with the well-functioning of the scheme. The time available did not allow for in-depth study of the social relations within the village. This could be the task of a separate survey.

III METHODOLOGY

1. EXECUTING AGENCY / RESPONSIBILITIES

At the same time that CWSS/HELVETAS was planning this survey, Suspension Bridge Division, another project assisted by HELVETAS, was about to survey completed bridges all over Nepal in order to establish a Central Bridge Register (CBR). Since in both cases the surveys were financed by HELVETAS, the CWSS and the CBR-survey for Western Region were combined.
The survey was contracted out to NO-FRILLS CONSULTANTS, Jawalakhel, Kathmandu.

NO-FRILLS was responsible to organise and execute the survey fieldwork and to compile and partly process the gathered data by entering it into Basic Record Forms and evaluation formats.

CWSS/HELVETAS-staff and the Coordinator of NO-FRILLS jointly prepared and tested the survey- and evaluation-formats and the Basic Record Forms. They ran the fieldtrainings for the surveyors and rechecked projects visited by the surveyors to cross-check the results.
The evaluation of the compiled data and the presentation of the results was done by the author of this report.

SBD/HELVETAS provided the necessary formats and the training of surveyors for the CBR-part of the survey.

2. VOLUME OF SURVEY

Initially on the basis of available project lists it was expected to survey about 230 CWSS-schemes and 60 SBD-bridge sites. Finally 213 CWSS-projects and 85 SBD-bridge sites were visited by the survey teams.

3. MANPOWER / DURATION

NO-FRILLS assigned 1 Coordinator and 4 fieldteams, each consisting of 1 engineer and 1 assistant for the survey, assisted by 2 parttime office staff. It was a great advantage for the whole survey that the post of Coordinator could be filled by an engineer who previously had been a longtime overseer in CWSS Pokhara and was one of the authors (Gurung) of the survey executed in 1980.
CWSS/HELVETAS-staff was involved parttime in the supervision of the whole survey. CWSS/HMG-engineers and overseers assisted in the cross-checking of projects.

The whole survey lasted eight and a half months from April 1988 to December 1989. This meant that part of the survey took place during the rainy season (July to September) which might have affected the results partly. However this was unavoidable since the results had to be ready by the end of 1988 and a shorter period for the survey with accordingly more input in terms of staff was not feasible, considering the necessary qualifications of involved staff.

For the budget it was assumed that the time necessary to survey an average CWSS-project (10 km. length, 12 tapstands) including travel time between projects would be 3 days whereas for one bridge site 1 day was assumed. On this basis the total of fielddays for the surveyed 213 CWSS-projects and 85 bridges would have been 724 days whereas actually 770 fielddays were spent. this means that the input was underestimated by 6.4 %.

4. ORGANISATION OF FIELDTRIPS

The survey teams usually spent about one month in the field in one go and then took about two to three days in the office to compile the gathered data before they went for a new serie of surveys.

While visiting the individual projects the surveyors first had to contact the responsible persons in the village, i.e. User's Committee Chairman and/or Members, Village Maintenance Worker (VMW) or if none of them was present, other competent villagers. By interviewing them they got a first overview of the project.

Together with the contacted persons the surveyors then checked all structures of the system from the source to the last tapstand. During this check they had the opportunity to discuss with the individual users of the scheme at the tapstands while collecting information on number of users.

At the end of the physical survey a meeting with the VMW, User Committee and other authorities of the village was held to collect information on the maintenance arrangements and to get an idea of the social environment in the village.

5. ASSESSMENT OF PROJECTS

For the assessment of the physical condition of the systems and their structures as well as for the collection of data on maintenance management and social factors standardized Record Forms (see annex 1) were developed. The concept of this forms is described in brief below.

5.1 General Information on Project

The first page A1 should help the surveyor to get an overall idea of the size of the scheme while starting with the survey. This information had to be complemented at the end of the survey on the basis of the detail information gathered.

5.2 Assessment of Structures

To assess the individual structures, forms (B1 to F1) for each type of structure were available. Some of the structures, e.g. different types of valve chambers were integrated in one form to simplify the evaluation.

a) Detail Assessment

The various parts of each structure were assessed according to a list of given items, that were thought to be relevant. In general for each item the surveyor could choose among three options, which in general stand for good, medium and bad. The surveyors were supposed to give individual comments only in extraordinary cases. This procedure on one hand aimed at getting uniform and thus comparable results throughout the projects and among the individual survey teams and on the other hand it was not possible to evaluate a too big number of individual comments.

b) General Assessment

At the end of the detailed inspection of the structure, the surveyor had to give a general statement on the structure regarding the quality of Design, Construction and Maintenance, whereby he could avail of three categories, i.e. satisfactory, some shortcomings, serious shortcomings. This allowed for a distinction of the origin of possible shortcomings. The design has mainly an influence with the intake structures and the pipelines, whereas for other structures which are built according to a standardized design, it is not very relevant as a criteria.
This general assessment also helped to cross-check the detail assessment of the structures during the data evaluation.

c) Repair Requirements

Finally the Repair Requirements of each structure had to be judged. The following definitions for the applied categories were used:

minor: small damages which can be repaired by the villagers with little input out of their own resources.

major: damages that require a bigger input of material and/or manpower which usually exceeds the resources of the villagers

urgent: the damage is threatening the well-functioning of the structure or scheme instantly.

5.3 Social Aspects / Maintenance Arrangements

At the end of the survey and after having held a meeting the surveyors had to fill the forms A2 and A3 which refer to some basic social aspects of the projects and to the maintenance arrangements for the scheme. They further had to give their overall judgement of the condition of the project and had to indicate which, in their opinion is the major reason for the actual condition of the project. This overall judgement allowed again to cross-check the detail assessments.

The survey intentionally concentrated on the assessment of the physical condition of the schemes. The socio/economic part of the survey is very limited. An in-depth study of the relation between the socio/economic conditions and the impact of a water supply scheme in the villages would be an interesting task in itself, but was beyond the scope and capacity of this survey. For the same reason an assessment of the sanitary situation in the villages was not included.

6. PROCESSING OF DATA

6.1 Data Base for Maintenance Unit

The most important and relevant data of the projects were transferred on to the **Basic Record** forms (see annex 2). This Basic Record consists of an information sheet that provides the data which are of particular interest to the Maintenance Unit and a second sheet that allows to continuously document all actions that are initiated and undertaken in the project (e.g. repair requests etc.) and that are registered by the Maintenance Unit. With the help of this file it should be possible to establish a more or less continuous project record for each of the projects at the District Water Supply Offices.

6.2 Assessment of Working Condition of Projects

To get results about the working condition of the schemes the available data was processed on one hand structurewise and totalled for all the projects and on the other hand projectwise to assess the preformance of the individual project

6.2.1 Structurewise Evaluation

To assess the performance of the individual parts of the schemes and to identify weak points in the design, construction and/or maintenance, all judgements as tick-marked on the Record Forms were added up for each structure and each item throughout the surveyed projects. This also provides some statistical information on the size of projects completed so far.

6.2.2 Projectwise Evaluation

A special **Evaluation Format** (see annex 3) was developed to process the data for each individual project. On this form in particular the data about repair requirements, general assessment of structures and flow from tapstands were entered and processed to classify the projects according to categories related to physical status and utility. The categories along with information on socio/economic situation, maintenance arrangement and other characteristics were marked along the perforated edge of the form. This allowed to "computerize" the identification of all possible relations between the various characteristics of the projects. For projects that consist of more than one system, the total of all systems was processed on one evaluation format.

III RESULTS

1. NUMBER OF PROJECTS SURVEYED / EVALUATED

The following list gives an overview of the number of projects taken up by CWSS Western Region so far and the number of projects actually surveyed and evaluated

Zone **** District	Projects listed mid 1988	Projects under construction	Projects not surveyed: completed 1986/88	Projects not surveyed: omitted	Projects surveyed & evaluated	Standardized projects surv. & eval.
GANDAKI *******						
Kaski	58	2	1	2	53	52
Syangja	23	4	1	1	17	17
Tanahun	23	4	1	2	16	16
Lamjung	21	4	1	-	16	16
Gorkha	19	2	1	-	16	15
Manang	4	-	-	2	2	2
DHAULAGIRI **********						
Parbat	25	5	1	-	19	17
Baglung	16	6	1	-	9	7
Myagdi	25	4	2	1	18	15
Mustang	9	-	-	4	5	-
LUMBINI *******						
Palpa	18	4	-	1	13	13
Gulmi	13	1	1	-	11	11
Argha-Khanchi	9	2	-	-	7	7
Nawal-Parasi	8	2	2	-	4	4
Rupandehi	1	-	-	-	1	1
TOTAL	271	39	12	13	**207**	**193**
					89 %	**83 %**
	a)	b)	c)	d)	e)	f)

Note: Total of **projects possible for survey**: a) - b) = 232

c) Some of the projects completed in 1986/88 were not surveyed because it is assumed that they still work satisfactorily.

d) Some projects were omitted in the survey for various reasons, e.g. unclear location or origin.

e) Total of projects surveyed and data compiled for **structurewise assessment:** **89 % of 232 projects**

f) Standardized projects means projects that were built under "Noted-A", when a standard design was available, or projects out of the regular programme (prestandard) that were rehabilitated or major repair and extension was made under "Noted-A". These projects were included in the **projectwise assessment:** **83 % of 232 projects**

2. ASSESSMENT OF STRUCTURES

2.1 Introduction

The results of the assessment of individual structures are displayed in the following tables. The tables follow the system of the Record Forms by giving the item assessed in the first column, followed in the second column by the options that were available for the assessment.
The third column shows how often a particular option was chosen as answer. This number is put into relation to the total number of structures surveyed. The resulting percentage is shown in the third column and gives a picture of the performance of a structure.
In general these figures are related to the total number of structures, e.g. flow from tapstand. However in some cases the figure has only a relation to a part of the structure which might not exist with all the structures, e.g. valve chambers of tapstands, which do not exist with all tapstands. Therefore the precentage is given in relation to the total of valve chambers and not tapstands. Such percentages are shown in the last column and the total on which they are based appears in column three in brackets. Some discrepancies also occured due to imcomplete Record Forms but this does not affect the overall picture very much.

With this basic information the tables are self-explanatory to a good extent. The assessment of the individual structures sorts out which parts of the water supply schemes work well and where there are shortcomings. This allows to draw conclusions on the quality of standard-designs and it also helps to identify critical points. It gives an idea into which direction further efforts and improvements have to go.

The assessment of structures is given in the following tables:

table 1a,1b : Intake/Collection Chamber
table 2: Pipelines
table 3: Storage Tanks
table 4: Chambers
table 5: Tapstands
table 6: Comparison of Structures
table 7: General Assessment (Design, Construction, Maintenance)

2.2 Statistical Results

In 207 projects surveyed and evaluated the total of structures assessed is as follows:

	Total:	Average per Project:
Number of Systems:	289	1.4
Intakes:	374	1.8
Collection Chambers:	356	1.7
Storage Tanks:	259	1.3
Chambers:	558	2.8
- Interruption Chamber:	73	0.4
- Break Pressure Tank:	203	1.0
- Air Valve:	102	.5
- others:	.180	.9
Tapstands:	2546	12.3

2.3 Assessment of Intake/Collection Chamber

table 1a

Note: ( )=total of relevant criteria

1) INTAKE STRUCTURE:

		TOTAL	in % of total number of structures	in % of total of relevant criteria
Total No. of Structures:		374		
General Working Conditions	satisfactory	295	79	
	partly damaged	49	13	
	out of order	30	8	
Intake structure damaged	landslide	26	7	
	flood	56	15	
	malicious	16	4	
Seepage	natural cause	110	29	
	poor construction	15	4	
	malicious (human)	4	1	
Leakage	natural cause	32	9	
	poor construction	38	10	
	malicious (human)	5	1	
Contamination of water	intake well sealed	114	30	
	contamin. possible	168	45	
	contamin. obvious	83	22	

2) COLLECTION CHAMBER

Collection channel (intake)	in working condition	308		87
	small leakage	28		8
	serious leakage	20	(356)	6
Collection chamber	in working condition	264		79
	not clean	46		14
	leaks seriously	24	(334)	7
Fittings	in working condition	195		72
	partly damaged	60		22
	out of order	17	(272)	6
Cover	undamaged, in place	250		81
	damaged	31		10
	missing	29	(310)	9
Reasons for damages of Coll. chamber	poor design	6		2
	poor construction	28		8
	no maintenance	40		12
	natural causes	24	(98)	7

table 1b

3) SOURCE YIELD

Total No. of Structures:		TOTAL 374	in % of number of struc-tures	in % of total of relevant criteria
Supply from the source	yearround sufficient	221	59	
	seasonally insuffic.	137	37	
	never sufficient	14	4	

4) PROTECTION OF AREA

Trees, Jungle, Afforestation,	dense jungle, forest	223	60	
	few trees, bushes	176	47	
	never existed	23	6	
	existed,but destroyed	25	7	
	new afforestation	11	3	
	erosion in the area	28	8	
	endangers catchment	22	6	
Fencing	existing, good	14	4	
	existing,needs repair	12	3	
	fencing destroyed	7	2	
	was never fenced	338	91	
Risk of contamination	houses nearby (100 m)	36	10	
	trails in the area	87	23	
	animal grazing	197	53	
	animal faeces	22	6	
	human faeces	44	12	
	no risk of contamin.	97	26	
	some danger of cont.	194	52	
	high risk of contam.	82	22	

The performance of Intake Structures and Collection Chambers is fairly good with a 79% working satisfactorily. The condition of fittings lies in the same range. Major reasons for damages are flood and landslides (22%). The figures imply that in general the users take care of the functioning of the intake structures but the protection is neglected in most cases. With about two third of the catchments contamination is possible or even obvious. A mere 7% of the catchments are somewhat fenced whereas 91% never had been fenced at all. This reflects the fact that the villagers care for the amount of water that the system delivers to the village, but still the quality of the water is not a matter of concern.

A good result is that only 4% of the sources never provide sufficient water but the rate of projects with sufficient water yearround is still not very high (59%). Comparing this with the figures ascertained 1981 (Gurung/Schramm), where 47% are shown as yearround sufficient and 47% as seasonally adequate, the improvement is not extraordinary. In combination with the experience how preliminary surveys are actually executed, it shows that still the importancy of careful and repeated measuring of the source yield during the appropriate season is not recognized.

2.4 Pipeline

table 2

Order of Rank of Defects on Pipelines

Total No. of Systems:		TOTAL 289	in %
Most frequent defect:	not buried	214	74
	leakages	9	3
	cuts	28	10
	landslides	9	3
Second most frequent defect:	not buried	23	8
	leakages	54	19
	cuts	105	36
	landslides	24	8

The assessment of the pipelines required a different approach, since they are basically not visible as long as they are in good order. Thus for the pipelines the frequency of four major visible defects was counted, i.e. the number of places where the pipeline was not buried, where it was leaking or cut or where it was damaged by landslides. Table 2 shows in how many systems which of these defects occured most frequently and in how many as second most frequent defect. That means for example that "not buried" is the most frequent defect on pipelines in 214 systems, i.e. 74%, whereas in 23 systems it is the second most frequent defect only.

It is obvious that not buried pipelines are found as major defect. This tallies with the experience that it is difficult to convince the villagers, who have to dig the trenches, to dig them deep enough so that the pipeline is properly buried. As a consequence of this, exposed pipelines get cut frequently by people living nearby or passing by. This is reflected in the fact that cuts are the second most frequent damage in 105 systems (36%).

In comparison to this, leakages and landslides are much less frequent, which may be taken as an indication that the joining of pipelines and the alignment is mostly done properly. This is reconfirmed by the General Assessment of pipelines (table 7) which shows that with the construction of pipelines only 2% serious shortcomingsare observed and 70% are judged as satisfactory. Insufficient maintenance (only 41% satisfactory) definitely increases the problem of exposed pipes. Thus the figures confirm that initially not properly buried pipes "invite" people to cut them and even under maintenance not much consideration is given to the burying, most probably because this involves quite some input by the villagers. In comparison to this work the welding of a cut or joining of the pipe with a bamboo-"socket" is an easy and quickly done job.

2.5 Storage Tanks

(table 3 see page 14)

Up to 1984 all storage tanks were built in stone masonry with arch roofs. Since then Ferrocement-tanks are introduced as a standard. The detail assessment does not distinguish between this two types. Table 7 (General Assessment) shows that there is not much of a difference between the two types taking into consideration that stonemasonry tanks are older.

The performance of storage tanks is very good with 93% being in satisfactory condition. It is most probable that the tank is seen as the crucial part of the system and usually is located close to the village which both increases the attention given to the structure. Even then the protection of tanks and of the stored water against contamination is not as good as it should be.

2.6 Chambers

(table 4 see page 15)

In comparison to other structures (see table 6) the chambers are ranking last with regard to working condition. An explanation could be that these structures are usually (I.C., B.P.T) far away from the village and even sometimes in places not easy accessible. Furthermore their function is not so obvious for the users.

The assessment of the fittings shows further that float valves and air valves (only 53 to 59% working properly) are vulnerable parts and at the same time it is difficult for the users to repair these parts.

2.7 Tapstands

(table5see page 16)

For the users the tapstand is the most important and thus central part of the system. The figure of 76% of the tapstands providing adequate water may be seen as a good achievement. The physical condition of the tapstands (pillars and platforms about 80% okay) tallies with this. On the other hand the condition of the fittings is far below that. For the brasstaps this can be explained by the fact that they are the most heavily used parts of the whole system, whereas the stopcocks, which are there to regulate the pressure and thus the flow at the tapstand are most probably the parts villagers are tampering with most often.

A comparison with the results of the 1981-survey shows that the situation with regard to flow (Gurung/Schramm: 75% adequate) and to physical condition of tapstands is still about the same.

As major reason for shortcomings again the lack of maintenance is stated. However this has to be seen together with the fact that tapstands are the most exposed part of the scheme.

The utilisation of wastewater (21%) has increased since the 1981-survey (3%), whereas the cleanliness, drainage of tapstand area is still something that needs big improvements.

Assessment of Storage Tanks

table 3

1) GENERAL CONDITIONS

		TOTAL	in % of number of structures	in % of total of relevant criteria
Total No. of Structures:		259		
General Working Conditions	satisfactory	240	93	
	partly damaged	13	5	
	out of order	7	3	
Leakage	no leaks	210	81	
	little leakage	44	17	
	serious leakage	4	2	
Contamination of water	Tank well covered	165		70
	contamin. possible	64		11
	contamin. obvious	8 (237)		3

2) TANK STRUCTURES

Storage Chamber	in good condition	216	83	
	leaks partly	25	10	
	needs repair	18	7	
Operation Chamber	in good condition	198		88
	partly damaged	27		12
	seriously damaged	1 (226)		-
Cover	undamaged, in place	209	82	
	damaged	29	11	
	missing	16	6	
Fittings	in working condition	174		73
	partly damaged, leaks	61		25
	out of order	5 (240)		2

3) PROTECTION / PREVENTION

Fencing	existing, good	45	17	
	existing, needs repair	22	8	
	fencing destroyed	-	-	
	was never fenced	185	71	
Prevention	well protected	142		59
	poor care, maint.	78		33
	vandalism, malicious	19 (239)		8
Maintenance	routine maintenance	74	29	
	occasional	127	49	
	no maintenance	53	20	

1) GENERAL CONDITIONS

		TOTAL	in % of total number of structures	in % of total of relevant criteria
Total No. of Structures:		570		
General Working Conditions	satisfactory	366	64	
	partly damaged	105	18	
	out of order	99	17	
Leakage (only for I.C. and B.P.T. ¹)	no leaks	215		77
	little leakage	53		19
	serious leakage	13 (281)		5
Contamination of water	Tank well covered	265		64
	contamin. possible	130		31
	contamin. obvious	19 (414)		5

2) CONDITION OF CHAMBERS

Chamber	in good condition	430	75	
	partly damaged	73	13	
	seriously damaged	55	10	
Cover	undamaged, in place	440	77	
	damaged	58	10	
	missing	58	10	

3) FITTINGS

I.C. Inlet elbow	in place	19		26
	not existing	54 (73)		74
B.P.T.: Gate Valves	okay	144		71
	leaking	32		16
	dismantled	27 (203)		13
Float Valve	okay	97		53
	leaking	8		4
	not working	77		42
Air Valve	okay	60		59
	damaged but working	20		20
	not working	22 (102)		21
C.O.: Gate Valve others	okay	102		57
	leaking	42		23
	dismantled	36 (180)		20

table 5

Assessment of Tapstands

		TOTAL	in % of total number of structures	in % of total of relevant criteria
Total No. of Structures:		2546		
Number of households using tap		33752		
Flow	Adequate	1937	76	
	too little	166	7	
	no flow	443	17	
Brass tap	okay	1457	57	
	damaged	544	21	
	not in place	542	21	
Pillar	okay	2217	87	
	damaged,but working	97	4	
	needs rebuilding	221	9	
Platform	okay	1753		72
	partly broken	518		21
	destroyed	158(2429)		7
Valve-chamber	okay	1495		75
	partly broken	231		12
	destroyed	256(1982)		13
Cover	okay	1574		79
	not in place, damaged	178		9
	missing	212		11
Stopcock	okay	1128		57
	damaged	568		29
	dismantled	237		13
Cleanliness of surroundin	clean, drained	1281	50	
	some shortcomings	919	36	
	dirty	289	11	
Wastewater productively used?		546	21	
Reasons for damage	poor construction	150		12
	no maintenance	809		64
	malicious, vandalism	301(1260)		24
Regular maintenance executed?	yes	1125	44	
	no	1421	56	

2.8 Comparison of Structures

The figures in table 6 are given as percentage (%).

		Catch-ments	Collection-Chambers	Storage-Tanks	Chambers	Tap-stands
General Conditions	satisfactory	79	79	93	64	80*
	partly damaged	13	14	5	18	12
	out of order	8	7	3	17	8
Fittings	working		72	73	60	57*
	partly damaged		22	25	15	25
	out of order		6	2	24	17
Chambers (water-storage)	good condition		79	83	75	
	partly damaged		14	10	13	
	seriously damaged		7	7	10	
Contamination Cleanliness	no risk	30	26	64	64	50
	some risk	45	52	25	31	36
	contam. obvious	22	22	3	5	11
Protection	fencing good		4	17		
	to be repaired		3	8		
	destroyed		2	0		
	never fenced		91	71		

table 6

Note: * General Condition Tap: average of platform and pillar
Fittings Tap: average of brasstap and stopcock

Table 6 gives a comparison of the structures with regard to a few items. The difference between the figure for "satisfactory" and the one for "out of order" (e.g. Catchments: General Condition 79 - 8 = 69) gives a comparative scale. The bigger this figure the better the performance of the structure and vice versa.

According to this the storage tanks in all aspects are in the best condition whereas chambers show the lowest performance.
Overall the structures are in good condition with a percentage ranging from 79 to 93%. Considering the fact that fittings on tapstands are in heavy use and their replacement is a serious problem for the villagers, even the condition of fittings can be considered as fairly good.

As mentioned earlier the protection of the water against contamination and cleanliness is not yet a real concern of the users.

2.9 General Assessment

The figures in table 7 are given as percentage (%). The figures in brackets are taken from the 1981-survey.

		Catch-ment	Stone-masonry Tanks	Ferro-cement Tanks	Pipe-line	B.P T. I.C.'s	other Chamber
Design	satisfactory	85(74)	94(96)	100	87(93)	98(100)	94(89)
	some shortcomings	13(22)	6 (4)	-	13 (7)	2	6(11)
	serious shortcoming	2 (4)	-	-	1	1	-
Construction	satisfactory	65(41)	77(58)	91	70(59)	86 (7)	73(37)
	some shortcomings	32(48)	22(42)	8	22(33)	13(73)	25(41)
	serious shortcoming	3(11)	1	1	2 (7)	1(20)	2(22)
Maintenance	satisfactory	45(11)	39(19)	60	41 (4)	34	37 (4)
	some shortcomings	45(37)	52(69)	35	43(74)	50(67)	49(44)
	serious shortcoming	10(52)	9(11)	4	16(22)	16(33)	13(52)

table 7

Table 7 shows that for standardized structures (tanks, chambers) the design yields good results, whereas with catchments and pipelines where no standard design is possible shortcomings due to design are more frequent. The same is true for the construction. This tallies with the observation that the Water Supply Technicians have achieved a very good level of performance in the construction of structures, which they know "by heart", whereas they still have some problems with structures that need adjustment to the particular situation, such as catchments.

In the survey of Gurung/Schramm 1981 the same system for the general assessment was used, which allows for a good comparison now. The figures obtained then are shown in brackets. They reflect only the standardized projects surveyed at that time.

Even if it is taken in count that the judgement of the surveyors in 1981 and now is not exactly the same, the figures show some significant improvements. Whereas in Design about the same level is maintained, which is a result of the standardisation, the Construction has improved quite a lot, in particular with valve chambers. Figurewise the biggest improvement was achieved in Maintenance, where the scores for "satisfactory" have risen from an average of about 8% to about 45%. This may indicate that the inputs in maintenance over the past years show tangible results. However it will take more efforts to get Maintenance to the same level as Design and Construction.

Thus major shortcomings still lay with the maintenance of the schemes and/or with issues like cleanliness/contamination of water and protection of structures. These are all issues that can be improved only by increasing the understanding of the users for the correlations between maintenance, the well-functioning of the scheme, water-quality and eventually health. It does not mean that the villagers are not willing to take their part of the responsibility. It rather reconfirms the realisation that it is comparingly easy to achieve good results in the construction part by standardizing

designs and giving continuous training to staff, whereas those issues of the implementation of a water supply that require the understanding and initiative of the users are much more difficult to achieve. They take more time because they involve a change in attitude.

3. ASSESSMENT OF PROJECTS

3.1 Introduction

The basic idea of the project-wise assessment is to categorize the projects according to their performance and consequentially find out correlations between performance and factors that possible influence this performance. In a simple way the same task was given to the surveyors on Record Form A/2. They had to decide whether the project as a whole is in good ar bad condition and they had to give a major reason for it. Apart from this overall judgement an attempt was made to evaluate the available, detailed data in such a way, that a more objective and well based judgement of the working condition of the individual project was possible.

3.2 Classification

It turned out to be the most difficult part of the data evaluation to find objective and easy applicable criteria to make a distinction between good and bad projects. Evidently the most important criteria is the service, the project provides to the users (servicability, utility), which is easiest to judge by the fact whether the taps provide sufficient water. However if one tries to introduce grades, the difficulty shows in deciding on the margins of these grades.

Since the service provided does not necessarily correlate with the physical condition of the project (in an almost broken system, the taps still might provide water), a second criteria had to be found for this part. Thus the assessment of the Repair Requirements was taken as a standard for the physical condition.

a) Servicability / Utility

To categorize the projects according to utility, the flow from tapstand was taken as a standard. One condition is that a certain percentage of the taps is providing adequate water, whereas the second condition is that only a limited number of taps may have no flow at all. With these two conditions the following categories were defined:

	Condition 1: Percentage of tapstands with adequate flow	Condition 2: Percentage of tapstands with no flow
Category I :	more than 90%	0%
Category II :	71% to 90%	less than 15%
Category III :	51% to 70%	15% to 33%
Category IV :	less than 50%	more than 33%

For an average Project with 12 tapstands this means:

Category I : 11 taps provide adequate water
none of the taps has no flow
Category II : at least 9 taps provide adequate water
maximum 1 tap has no flow

Category III : at least 7 taps provide adequate water
maximum 4 taps have no flow
Category IV : less than 6 taps provide adequate water
more than 4 taps have no flow

The example shows that at least the first two categories apply a rather rigid standard, whereas projects in category III might still be considered as halfway functioning.

b) Physical Condition

To classify the projects with regard to their physical condition the repair requirements were taken as criteria. To define four categories again two conditions were chosen. One condition is the percentage of structures that require major repair and the other condition is the precentage of structures where the repair is urgent. The definition of the terms major repair and urgent as they were applied in the survey are given in chapter II, 5.2c.

To get the percentage, the number of structures within a project that need major repair, respectively where the repair is urgent, was put into relation to the total number of structures in the project. Intentionally no weighting for different structures was given.
Since pipelines were assessed differently their repair requirements were evaluated separately.

The categories are defined as follows:

	Condition 1: Major Repair	Condition 2: Execution urgent	(in % of all structures)
Category I :	less than 30%	less than 5%	
Category II :	31 to 50%	5 to 20%	
Category III :	51 to 70%	21 to 40%	
Category IV :	more than 71%	more than 41%	

The criteria "urgent" was also applied rather rigid, since this criteria will decide about the further well-functioning of the project, whereas repair work as such does not necessarily endanger the service delivered by the project.

Since both for utility and physical condition two conditions were used for the classification, there were a few projects where the allocation to one category was not definite so that an individual judgement was necessary.

It is obvious that by altering the chosen conditions, the result of the survey looks different. Therefore they were thoroughly discussed before being fixed. The results of the classification were furthermore checked against the subjective judgement of the surveyors. Each of them had to name a project that he would assign to one of the categories "very good", "good", "average" and "bad". This comparison for about 20 projects showed a fairly good correspondence. Similarly the general judgement (good/bad) of each project which the surveyors had to give on Record Form A/2, corresponds with the results of the categorisation as can be seen from table .

3.3 Results of Classification

With these four categories for utility and physical condition each, the projects could be allocated to one of the 16 possible combined categories.

Table 8 shows the result of the classification. For each combined category a window with the following information is given:

1) Number of projects that fall into this category
   (in actual and as percentage of total number of projects)
2) Number of rehabilitated projects in category
   (they are also included in the first figure)
3) Number of projects that were assessed as in bad working condition by the surveyors acc. to Record Form A/2

In order to have a sufficient numerical basis to obtain statistically relevant statements, the 16 categories were grouped four by four into the following categories:

A/I, A/II, B/I, B/II as : **A/I - B/II**
C/I, C/II, D/I, D/II as : **C/I - D/II**
A/III, A/IV, B/III, B/IV as : **A/III - B/IV**
C/III, C/IV, D/III, D/IV as : **C/III - D/IV**

In the 4 by 4 matrix of table 8 (and following) the projects in the upper left corner are the best ones (A/I), whereas the worst projects (D/IV) are in the lower right corner.

Looking at the general assessment of the projects made by the surveyors it seems that the classification is rather rigid since those projects judged as bad, mainly occur in the lowest category (D/IV) and even there do not come up to the number of projects allocated by the classification.

To show the distribution of the projects better, in figure 1 the percentage of each category is shown as an equivalent area.

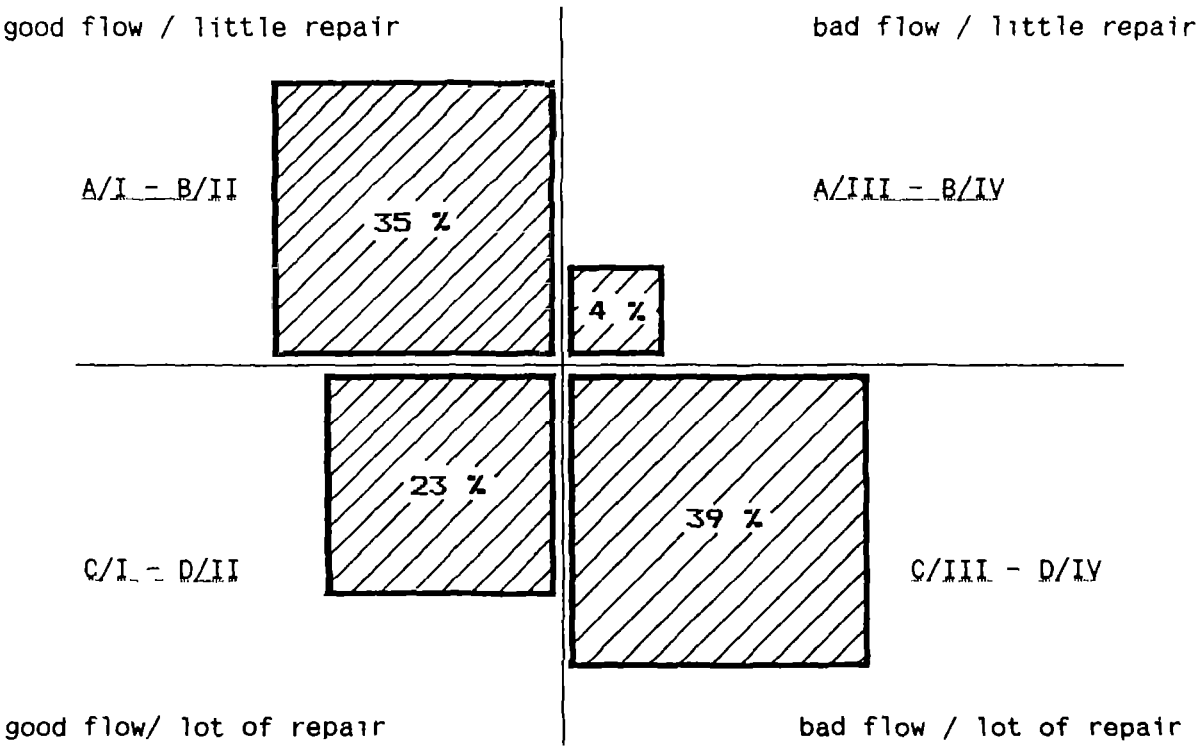


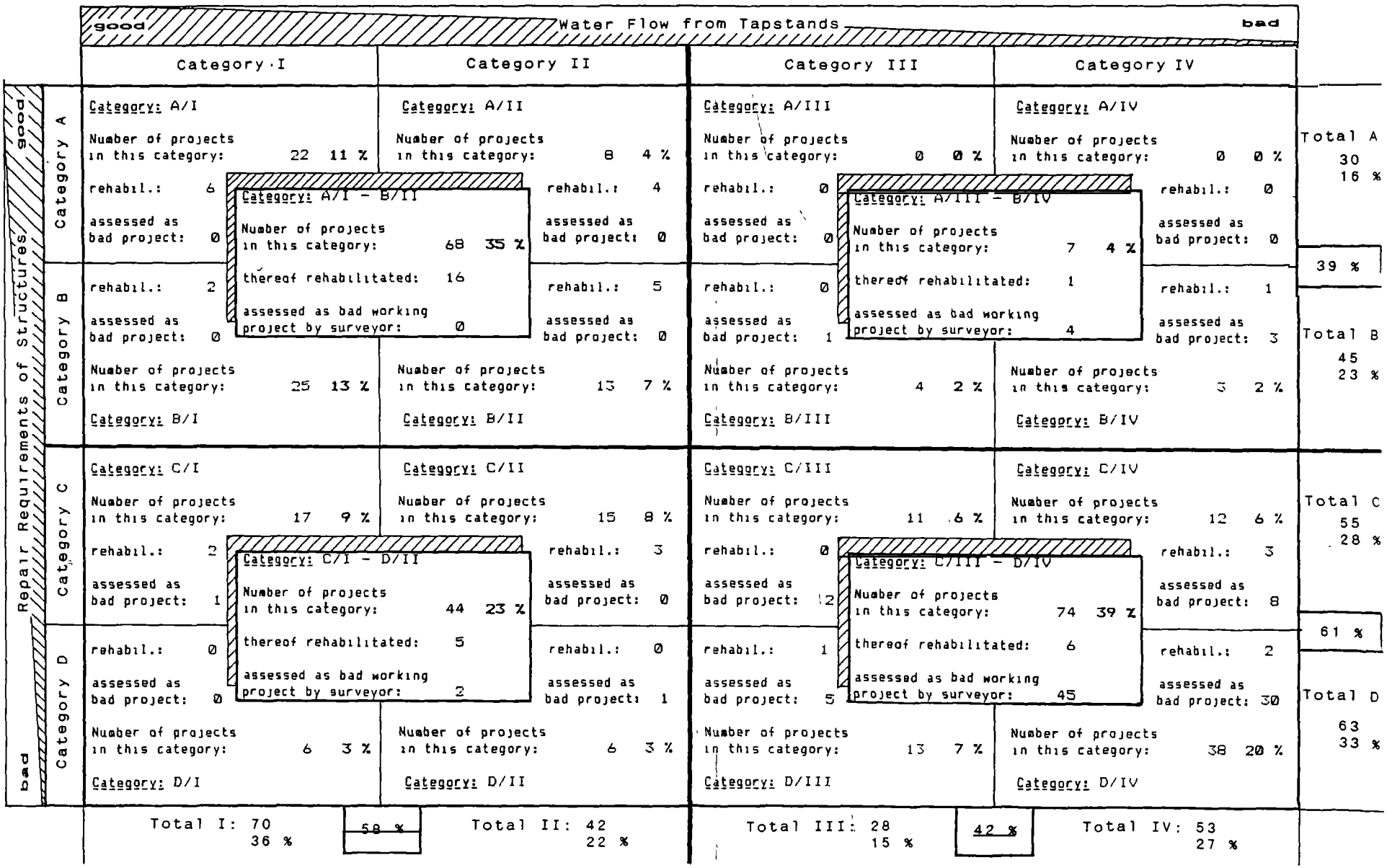
figure 1

DISTRIBUTION OF PROJECTS CATEGORIZED ACCORDING TO:

- Water Flow from Tapstands (Utility, Serviceability)
- Repair Requirements of Structures (Physical Condition)

Total of Projects evaluated: 193

table 8



4. CORRELATIONS: PERFORMANCE OF PROJECTS / INFLUENCING FACTORS

4.1 Introduction

In the tables 9,10,11 and 15, the following system was chosen to display the correlation between certain factors/features that influence the performance of a project and the quality of the projects. The tables basically follow the system of table 8, by distinguishing the four major categories. In the middle a window displays the average figures (for all 193 projects) for a particular feature whereas in the surrounding windows the figures for the according category are shown. Like this it is possible to see how the figures vary among the different categories of projects and in comparison to the overall average. In some cases where it was thought to be relevant even the figures for the best (A/I) and the worst (D/IV) sub-category are displayed separately.

4.2 Age of Project

In the figures below the utility of the project (flow of water from tapstands) and the physical condition in relation to the age of the project is shown. Rehabilitated projects are taken by the year in which the rehabilitation was completed.
Above the axis the two good categories are shown and below the axis the two bad ones.

Utility (Flow from tapstand):

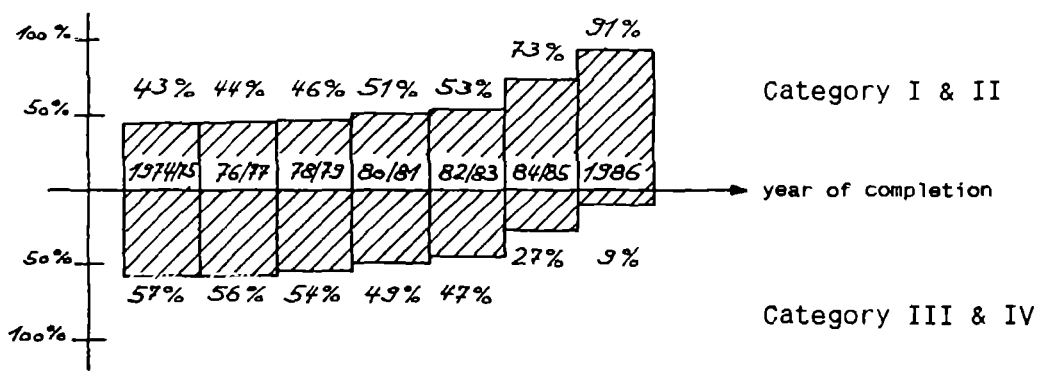


figure 2

Physical Condition (Repair Requirements)

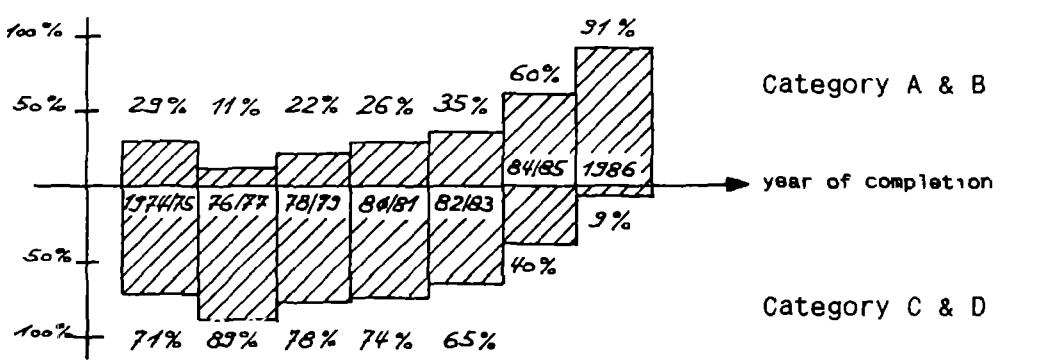


figure 3

Figure 2 and 3 show that the utility of the projects is not decreasing at the same speed as is the physical condition of the projects. It indicates that the users will keep the water running as good as they can even if major parts of the project fall into disrepair.

4.3 Repair Requirements Pipeline / Adequacy of Source Yield

(table 9 see page 25)

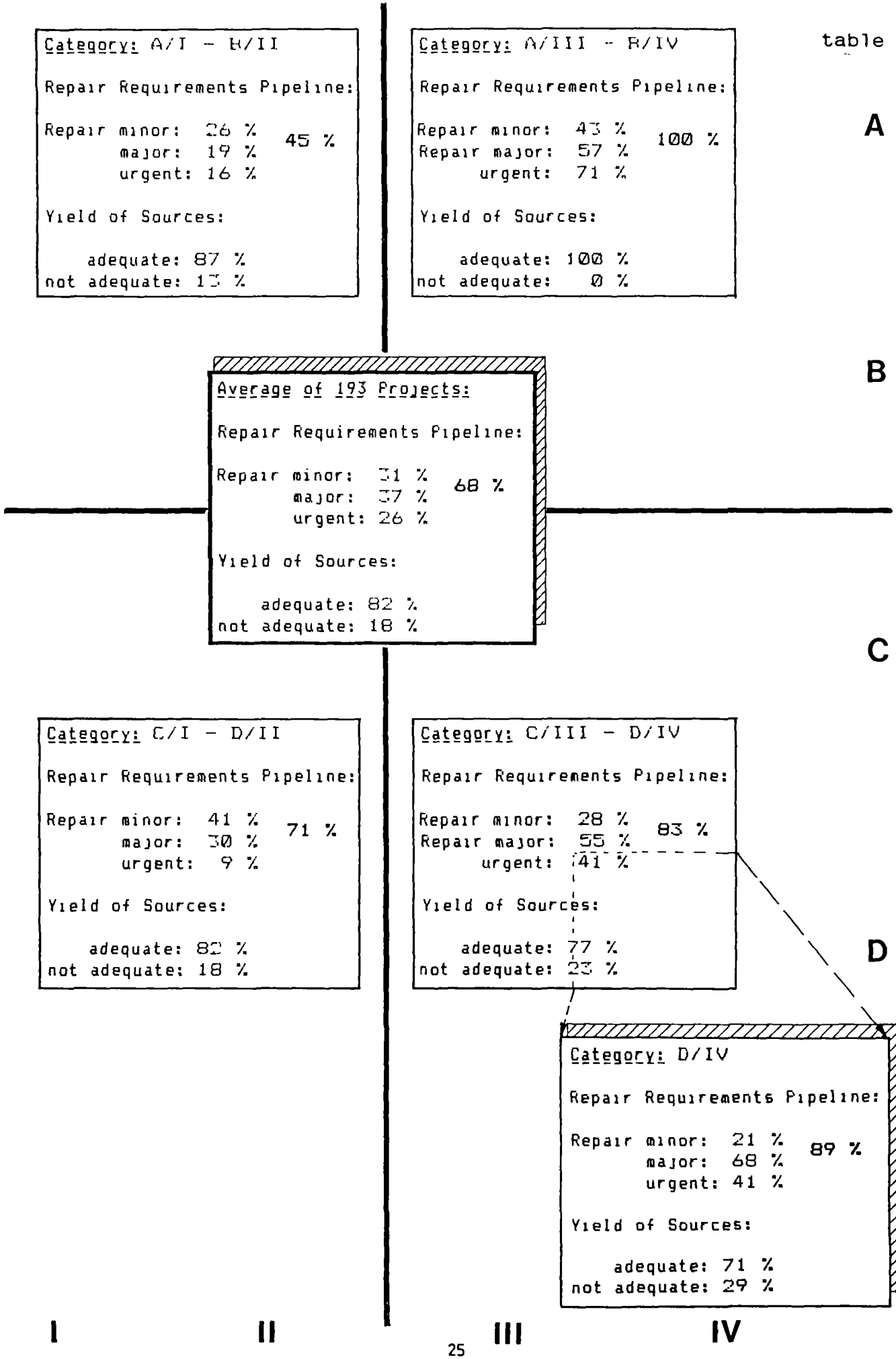
With an average of 68% (31% minor, 37% major) the repair requirements on pipelines seem quite high in comparison to the structures. It shows clearly that in the better categories regarding flow (I & II), minor repair outweighs major repair, whereas in the bad categories (III & IV) it is just opposite. Together with the fact that the figures for the source yield do not vary to the same extent as do the repair requirements among the categories, this proves that the condition of the pipeline has much more of an influence on the performance of a system than the adequacy of the source yield.
If one takes further into consideration the results of table 10, discussed below, one can see that with improved maintenance still a lot can be achieved in improving the performance of the systems.

4.4 Construction Quality / Maintenance Quality

(table 10 see page 26)

Comparing the figures for the various categories with the average figures it shows that the scores for maintenance quality vary much more than those for construction quality. It is obvious that the construction quality in good projects is better than on the average and vice versa. However the fact that the discrepancy between maintenance quality in good projects and that in bad projects is significantly higher than with construction quality, indicates that the major reason for poor performance of a project is insufficient maintenance and not so much the construction quality.

table 9


Category: A/I - B/II
Repair Requirements Pipeline:
Repair minor: 26 %
major: 19 %
urgent: 16 %
45 %
Yield of Sources:
adequate: 87 %
not adequate: 13 %
Category: A/III - B/IV
Repair Requirements Pipeline:
Repair minor: 43 %
Repair major: 57 %
urgent: 71 %
100 %
Yield of Sources:
adequate: 100 %
not adequate: 0 %
A
B
Average of 193 Projects:
Repair Requirements Pipeline:
Repair minor: 31 %
major: 37 %
urgent: 26 %
68 %
Yield of Sources:
adequate: 82 %
not adequate: 18 %
C
Category: C/I - D/II
Repair Requirements Pipeline:
Repair minor: 41 %
major: 30 %
urgent: 9 %
71 %
Yield of Sources:
adequate: 82 %
not adequate: 18 %
Category: C/III - D/IV
Repair Requirements Pipeline:
Repair minor: 28 %
Repair major: 55 %
urgent: 41 %
83 %
Yield of Sources:
adequate: 77 %
not adequate: 23 %
D
Category: D/IV
Repair Requirements Pipeline:
Repair minor: 21 %
major: 68 %
urgent: 41 %
89 %
Yield of Sources:
adequate: 71 %
not adequate: 29 %
I
II
III
IV

GENERAL ASSESSMENT OF STRUCTURES: - CONSTRUCTION QUALITY
- MAINTENANCE QUALITY

table 10

Category: A/I - B/II

General Assessment of:

Construction:	good:	62	(91 %)
	medium:	6	(9 %)
	bad:	-	(0 %)
Maintenance:	good:	48	(71 %)
	medium:	20	(29 %)
	bad:	-	(0 %)

Category: A/III - B/IV

General Assessment of:

Construction:	good:	4	(57 %)
	medium:	3	(43 %)
	bad:	-	(0 %)
Maintenance:	good:	1	(14 %)
	medium:	3	(43 %)
	bad:	3	(43 %)

A

B

For all 193 Projects:

General Assessment of:

Construction:	satisfactory (good):	149	(77 %)
	some shortcomings (medium):	39	(20 %)
	serious shortcomings (bad):	5	(3 %)
Maintenance:	satisfactory (good):	75	(39 %)
	some shortcomings (medium):	91	(47 %)
	serious shortcomings (bad):	27	(14 %)

C

Category: C/I - D/II

General Assessment of:

Construction:	good:	33	(75 %)
	medium:	10	(23 %)
	bad:	1	(2 %)
Maintenance:	good:	17	(39 %)
	medium:	25	(57 %)
	bad:	2	(5 %)

Category: C/III - D/IV

General Assessment of:

Construction:	good:	50	(68 %)
	medium:	20	(27 %)
	bad:	4	(5 %)
Maintenance:	good:	9	(12 %)
	medium:	43	(58 %)
	bad:	22	(30 %)

Category: D/IV

General Assessment of:

Construction:	good:	21	(55 %)
	medium:	13	(34 %)
	bad:	4	(11 %)
Maintenance:	good	-	(0 %)
	medium:	21	(55 %)
	bad:	17	(45 %)

D

I II III IV

4.5 Maintenance Arrangements

(table 11 see page 29)

Table 11 shows some major features of the maintenance arrangements. The number of projects that have a Village Maintenance Worker (78%) is a good achievement and it shows an improvement from the situation in 1981, when only about 63% of the projects had a VMW. With regard to remuneration the situation has improved even more. Whereas in 1981 only 31% of the VMW's got some kind of payment it is now 77% and 61% get even regular payment.

Comparing the various categories it shows that the percentage of "VMW existing" as well as that for "VMW trained" does not vary very much as compared to the average. To a lesser extent this is also true for the payment, whereas the mode of payment (regular) shows bigger differences. Significant is the variation in the frequency of "Checking the system". In the good projects this checking happens obviously more often than in the bad ones. Below there are more tables (12, 13) which help to find out factors that influence the performance of the VMW.

As concerns the User's Committee the figure of 80% existing and 72% active shows that the efforts of the programme in this matter pay off. Maybe a little limitation is that the fact, whether a committee is really active or not, was difficult to verify for the surveyors. Whereas among the good and average projects these figures do not vary too much there is a significant drop in the bad projects.

Both the results about VMW and User Committees show that the maintenance arrangements and therein in particular the interest the users take, has a strong influence on the performance of the water supply.

a) Relation: Existance of VWM / Maintenance Quality

Maintenance Quality	VMW exists	VMW not existing
satisfactory:	68 (45%)	9 (21%)
some shortcomings:	68 (45%)	21 (49%)
serious shortcomings:	14 (10%)	13 (30%)

table 12

b) Relation: Training of VMW / Payment of VMW / Maintenance Quality

Payment of VMW:	Trained VMW:	Maintenance of project assessed as satisfactory	Untrained VMW:	Maintenance of project assessed as satisfactory
Regularly paid	55 (59%)	31 (56%)	36 (63%)	16 (44%)
Occasionally paid	16 (17%)	5 (31%)	10 (18%)	5 (50%)
Not paid	22 (24%)	6 (27%)	11 (19%)	5 (46%)
		42 (45%)		26 (46%)

table 13

Table 12 shows that in those projects which have a Village Maintenance Worker the maintenance of the project is significantly better.
According to table 13 the fact whether the VMW had a training has not much of an influence on his payment. On the other hand among those VMW that get regularly paid the trained ones perform a bit better than the untrained ones. With the unpaid VMW's this is exactly opposite. An explanation could be that a good, trained VMW will not work if he gets no payment, whereas there are a number of projects where an untrained person even without payment is taking care of the project out of his own initiative. Such persons will definitely perform well even without payment. This is most probably also the explanation that overall, trained and untrained VMW's perform about the same (45%, 46% respectively satisfactory).

c) Relation: User Committee / Payment of VMW

User Committee:	Payment of VMW		
	regularly	occasionally	not paid
not existing	7 (18%)	1 (3%)	30 (79%)
whole Committee active	70 (63%)	17 (15%)	25 (22%)
only Chairman active	9 (39%)	2 (8%)	12 (52%)
Committee inactive	4 (20%)	5 (25%)	11 (55%)

table 14

Table 14 indicates that only in projects where the whole User Committee is active, the payment of the VMW is usually taken care of (78%). In all other cases the arrangements for the payment of VMW are rather poor.

MAINTENANCE ARRANGEMENTS table 11

Category: A/I - B/II

Village Maintenance Worker:
existing: 59 (87%) Trained: 36 (61%)
not existing: 9 (13%) Not trained: 23 (39%)

Remuneration:
cash: 32 (54%)
kind: 19 (32%)
none. 8 (14%)
regular: 43 (73%)

Checking system:
Weekly: 37 (63%)
Monthly: 8 (14%)
Occasionally: 14 (24%)

User's Committee:
not existing: 8 (12%)
existing: 60 (88%)
Committee active: 47 (78%)
only Chairman active: 9 (15%)
Committee not active: 4 (7%)

Category: A/III - B/IV

Village Maintenance Worker:
existing: 5 (71%) Trained: 4 (80%)
not existing: 2 (29%) Not trained: 1 (20%)

Remuneration:
cash: 3 (60%)
kind: 1 (20%)
none: 1 (20%)
regular: 3 (60%)

Checking system:
Weekly: 2 (40%)
Monthly: 2 (40%)
Occasionally: 1 (20%)

User's Committee:
not existing: 1 (14%)
existing: 6 (86%)
Committee active: 5 (83%)
only Chairman active: 1 (17%)
Committee not active: - (0%)

A

B

Village Maintenance Worker:
existing: 150 (78%) Trained: 93 (62%) (48% of all projects)
not existing: 43 (22%) Not trained: 57 (38%) (30% of all projects)

Remuneration:
cash: 74 (49%)
kind 43 (29%)
none: 33 (22%)
regular: 91 (61%)

Checking system:
Weekly: 77 (51%)
Monthly: 26 (17%)
Occasionally: 47 (31%)

User's Committee:
not existing: 38 (20%)
existing: 155 (80%)
Committee active: 112 (72%)
only Chairman active: 23 (15%)
Committee not active: 20 (13%)

C

Category: C/I - D/II

Village Maintenance Worker:
existing: 33 (75%) Trained: 23 (70%)
not existing: 11 (25%) Not trained: 10 (30%)

Remuneration:
cash: 18 (55%)
kind: 8 (24%)
none: 7 (21%)
regular: 22 (67%)

Checking system:
Weekly: 20 (61%)
Monthly: 3 (9%)
Occasionally: 10 (30%)

User's Committee:
not existing: 8 (18%)
existing: 36 (82%)
Committee active. 28 (78%)
only Chairman active: 3 (8%)
Committee not active: 5 (14%)

Category: : C/III - D/IV

Village Maintenarce Worker:
existing: 53 (72%) Trained: 30 (57%)
not existing: 21 (28%) Not trained: 23 (43%)

Remuneration:
cash: 21 (40%)
kind: 15 (28%)
none: 17 (32%)
regular: 23 (43%)

Checking system:
Weekly: 18 (34%)
Monthly: 13 (25%)
Occasionally: 22 (41%)

User's Committee.
not existing: 21 (28%)
existing: 53 (72%)
Committee active: 32 (60%)
only Chairman active: 10 (19%)
Committee not active: 11 (21%)

Category: D/IV

Village Maintenance Worker:
existing:24 (63%) Trained: 12 (50%)
not ex.: 14 (37%) Not tr.: 12 (50%)

Remuneration:
cash: 10 (42%)
kind: 5 (21%)
none: 9 (43%)
regular: 9 (38%)

Checking system:
Weekly: 6 (25%)
Monthly: 6 (25%)
Occas.: 12 (50%)

User's Committee:
not existing: 13 (34%)
existing: 25 (66%)
Committee active: 13 (52%)
only Chairman active: 5 (20%)
Committee not active: 7 (28%)

D

I II III IV

4.6 Relation: Economic Condition/Ethnic Groups/Village Maintenance Worker

(table 15 see page 31)

Table 15 shows the situation in the different categories of projects with regard to the economic condition and the ethnic groups.
The figures indicate clearly that the economic condition of the village does not have much of an influence on the performance of the project. Whereas among the best projects the percentage of poor villages is slightly lower than average, there is the same amount of poor villages under the worst projects as there is on the average.
The same is true for the ethnic groups. Even though the assessment of the social structure in this survey is a very rough one, some statement is possible. The table does not show any significant difference that would indicate that the ethnic group has an influence on the performance of the projects. This somehow stands in contrast to the experience that is made during construction period, where the social structure and ethnic mixture has a strong influence on the smooth running of the projects. However an explanation could be that the construction requires much more of organisation and exchange among the villagers than the situation of the completed project where a certain agreement can be found and followed for a long period

In the graph below the economic situation of the village was put into relation to the arrangements for the Village Maintenance Worker.

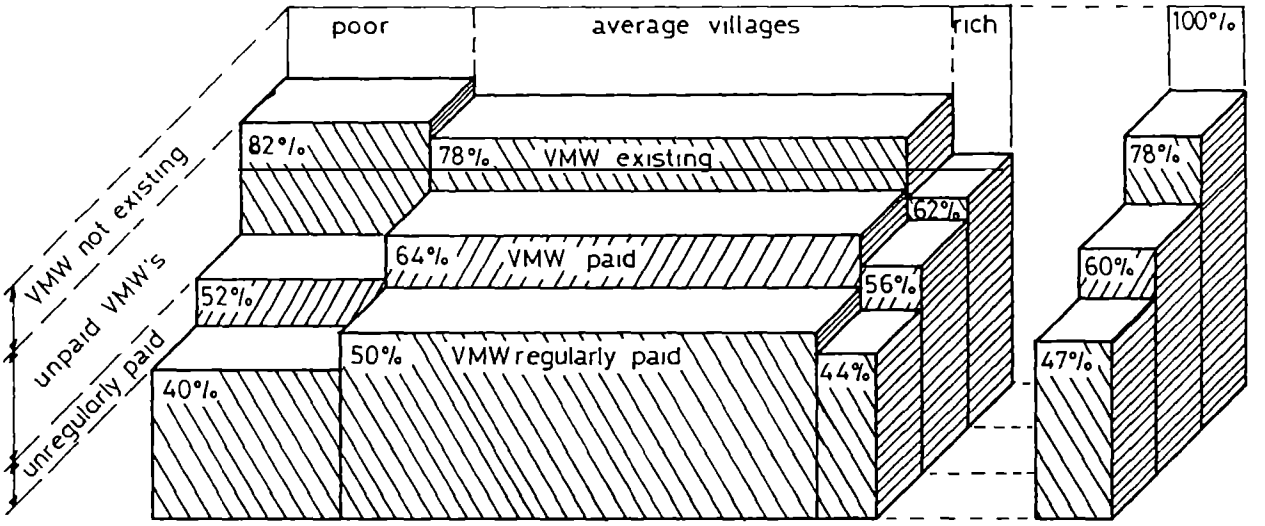
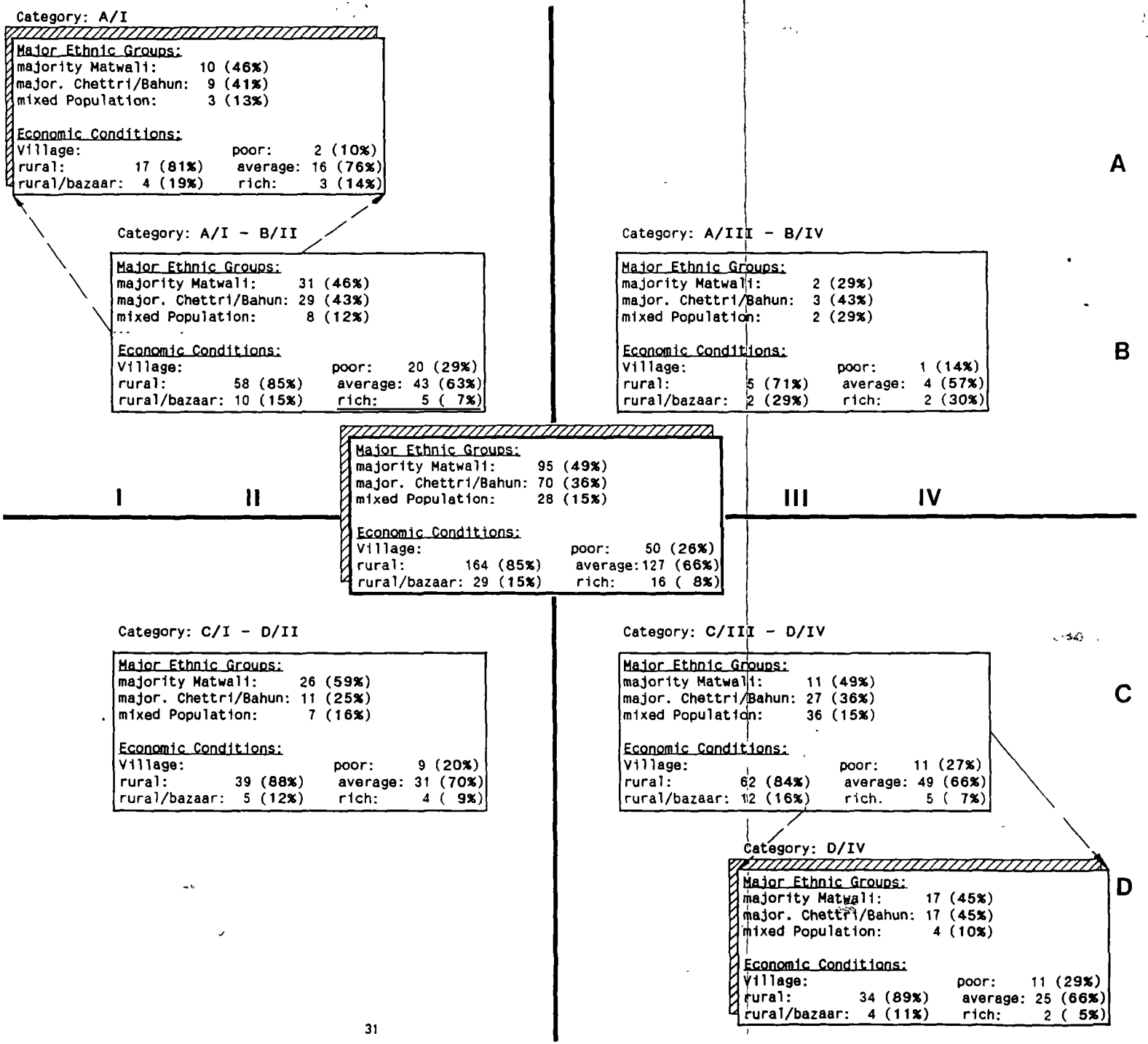


figure 4

It shows that poor villages much more often have a VMW than rich villages (82% against 62%). With regard to payment they are situated about the same (40 % against 44%). There is not much of variation with regard to payment of the VMW's. Most probably in poor villages the system of voluntary labour still works whereas in rich villages the VMW's will work only if they are also paid properly.
This and the figures of table 15 indicate that the economic condition of the villages is not necessarily a limiting factor for a good maintenance of the project as it is often assumed. The villagers obviously find ways and means provided they are interested in the well-functioning of the scheme.

ECONOMIC CONDITIONS / ETHNIC GROUPS

table 15



GENERAL INFORMATION ON SURVEYED PROJECT

NAME OF PROJECT:	
VILLAGE PANCHAYAT:	
WARDS COVERED:	DISTRICT:

Surveyor:_____ Survey Date:_____

Name of Pradhan Pancha:_____

Maintenance Committee Chairman:_____

Village Maintenance Worker:_____ Ward No.:____

Construction started: Year 20 /	Project completed: Year 20 /
Project rehabilitated: Year 20 /	

1) GENERAL TECHNICAL INFORMATION

	System 1	System 2	System 3	System 4	System 5
Number of Sources					
Number of Tanks					
Number of Tapstands					
Break Pressure Tanks					
Type of System	open closed	open closed	open closed	open closed	open closed
Type of Pipe	HDP / PVC	HDP / PVC	HDP / PVC	HDP / PVC	HDP / PVC
Approx. length (km)					
Wards covered *)					

Note: One "project" may consist of one or more "systems".
"Project" denotes a water supply system built under one agreement between MPLD and the village.
"System" denotes that part of a project which is supplied with water from the same source(s).

First find out how many systems there are and of what major structures they consist.

*) If a ward is only partly covered by a system mark it by encircling its number: ⑤

PROJECTNAME:_____

2) SOCIAL ASPECTS OF PROJECT

a) Major ethnic groups in the project area:

1st:_____ 2nd:_____ 3rd:_____ 4th:_____

b) Settlement Pattern: scattered, concentrated, Bazaar areas,

c) Major Sources of Income:_____

d) Economic Conditions: in general: poor / average / rich
with: poor fractions / rich fractions

e) If the project is in **good working condition**, what could be the reasons for it?

a) good construction quality of project
b) good maintenance due to interest of VMW
c) good maintenance due to strong maintenance committee
d) good care taken by the individual user
e) others:_____

Comment: (i.e. system how village is organised, etc.)

f) If the project is in **bad working condition / disrepair** what are the reasons for it?

a) poor construction quality
b) poor maintenance due to disinterest of VMW
c) poor maintenance due to disinterest of Maintenance Committe
d) carelessness by individual users
e) malicious destruction of the system
f) social disputes among village fractions
g) others:_____

Comment: (i.e. type of dispute, problems)

ANNEX 1a

3) MAINTENANCE ARRANGEMENTS

a) Is there a User's Committee, Maintenance Committee? yes / no

How often does the Committee get active? _____

Is the whole Committee or only chairman active? all / only chairman

b) Is there a Village Maintenance Worker (VMW) ? yes / no Age:_____

Is he trained? yes / no if yes: Year 20 /

Place:_____

Compensation of VMW: cash / kind Amount:_____

regularly / occasionaly

c) Village Contribution to Maintenance

Does village contribute to maintenance of system? yes / no

if yes, contribution voluntary / compulsary
contribution cash / kind

Does village contribute to purchase of maintenance supplies and materials? yes / no

Is labour contribution organised by Committee / VMW ?

d) Are tools and materials available for VMW? sufficient
incomplete
partly broken
no basic tools, material

Where are tools and materials kept:_____

e) Is Village Maintenance Worker interested? yes / no

if no, reason:_____

How often does VMW check the system? weekly / monthly / _____

How are problems located? report by users of the system
regular inspection by VMW
others:_____

What are regular jobs executed by VMW? _____

_____

_____

How often did village get maintenance assistence from MPLD?

Materials:_____

Technician:_____

ASSESSMENT OF RESERVOIR , STORAGE TANK

PROJECTNAME:_____

1) TANK TYPE & CAPACITY

With the following remarks and the table below, figure out the type and the capacity of the storage tanks and fill in the last table of this page with this information.

Note: (a) **Prestandard reservoir tanks** refers to tanks made of stone masonry with a CGI-sheet-roof. (rectangular shape)

(b) **Standard reservoir tanks** refer to tanks made of stone masonry with an arch-stone-roof. (rectangular shape)

(c) **Ferrocement reservoir tanks** refer to tanks made of ferrocement plaster with a dome-shaped roof.(circular ground plan)

The table below shows the volume of Standard and Ferrocement Tanks respectively according to their length and diameter respectively.

Measure the surveyed tank and determine its volume as per the table

For Prestandard Tanks measure length, width and height (up to outlet) and fill in the according information in the last table.

Tank	CAPACITY								
	2.5m3	5m3	9m3	10m3	16m3	20m3	22m3	30m3	38m3
Standard reservoir tank	l=3.7m w=1.5m slab		l=4.8m w=2.7m 1 arch		l=5.9m w=2.7m 1 arch		l=5.4m w=5.25 2 arch	l=5.5m w=5.3m 2 arch	l=6.5m w=5.3m 2 arch
Ferrocement res. tank	outer diameter D=1.7m	D=2.3m		D=3.1m		D=4.1m			

Fill in the table with Capacity for Standard, Ferrocement Tank resp. and with measurements for Prestandard Tanks

TYPE OF TANK	Tank 1 System__	Tank 2 System__	Tank 3 System__	Tank 4 System__	Tank 5 System__	Tank 6 System__
Prestandard (CGI sheet roofing)	l= w= h=	l= w= h=	l= w= h=	l= w= h=	l= w= h=	l= w= h=
Standard (stone arch roofing)	V=	V=	V=	V=	V=	V=
Ferrocement (circular,dome roof)	V=	V=	V=	V=	V=	V=

ANNEX 1b

RECORD FORM NO. B/1 CWSS Pokhara SOURCE page 1

ASSESSMENT OF SOURCES/CATCHMENT

PROJECTNAME: _____ SYSTEM NO.: _____

NAME OF SOURCE NO. 1: _____ TYPE: spring / stream
NO. 2: _____ spring / stream
NO. 3: _____ spring / stream

1) INTAKE STRUCTURE:

		Source 1	2	3	Comments (if any)
General Working Conditions	satisfactory				
	partly damaged				
	out of order				
Intake structure damaged	landslide				
	flood				
	malicious				
Seepage (if existing, give reason)	natural cause				
	poor construction				
	malicious (human)				
Leakage (if existing, give reason)	natural cause				
	poor construction				
	malicious (human)				
Contamination of water	intake well sealed				
	contamin. possible				
	contamin. obvious				

2) COLLECTION CHAMBER

		Source 1	2	3	Comment (if any)
Collection channel (intake)	in working condition				
	small leakage				
	serious leakage				
Collection chamber	in working condition				
	not clean				
	leaks seriously				
Fittings	in working condition				
	partly damaged				
	out of order				
Cover	undamaged, in place				
	damaged				
	missing				
Reasons for damages of Coll. chamber	poor design				
	poor construction				
	no maintenance				
	natural causes				

RECORD FORM NO. B/2 CWSS Pokhara SOURCE page 2

3) SOURCE YIELD

		Source 1	2	3	Comment (if any)
Supply from the source (collection chamber)	yearround sufficient				
	seasonally insuffic.				
	never sufficient				

4) PROTECTION OF AREA

		Source 1	2	3	Comment (if any)
Trees, Jungle, Afforestation,	dense jungle, forest				
	few trees, bushes				
	never existed				
	existed,but destroyed				
	new afforestation				
	erosion in the area				
	endangers catchment				
Fencing	existing, good				
	existing,needs repair				
	fencing destroyed				
	was never fenced				
Risk of contamination	houses nearby (100 m)				
	trails in the area				
	animal grazing				
	animal faeces				
	human faeces				
	no risk of contamin.				
	some danger of cont.				
	high risk of contam.				

5) GENERAL ASSESSMENT

Source No.:	satisfactory 1	2	3	some shortcomings 1	2	3	serious shortcomings 1	2	3
Design									
Construction									
Maintenance									

6) REPAIR REQUIREMENTS

	Source No. 1		Source No. 2		Source No. 3	
Repair needed?	Yes	No	Yes	No	Yes	No
if yes, extent of repair	minor	major	minor	major	minor	major
execution of repair urgent?	Yes	No	Yes	No	Yes	No

Outside assistance required? Yes / No

7) COMMENTS: (if any)

ANNEX 1c

PROJECTNAME: _____ SYSTEM NO.: _____

2) GENERAL CONDITIONS

		Tank 1	Tank 2	Tank 3	Comments (if any)
General Working Conditions	satisfactory				
	partly damaged				
	out of order				
Leakage	no leaks				
	little leakage				
	serious leakage				
Contamination of water	Tank well covered				
	contamin. possible				
	contamin. obvious				

3) TANK STRUCTURES

		Tank 1	Tank 2	Tank 3	Comment (if any)
Storage Chamber	in good condition				
	leaks partly				
	needs repair				
	stored water clean				
	dirt in the water				
Operation Chamber	in good condition				
	partly damaged				
	seriously damaged				
Cover	undamaged, in place				
	damaged				
	missing				
Fittings	in working condition				if out of order, note which:
	partly damaged, leaks				
	out of order				

4) PROTECTION / PREVENTION

		Tank 1	Tank 2	Tank 3	Comment (if any)
Fencing	existing, good				
	existing, needs repair				
	fencing destroyed				
	was never fenced				
Prevention:	well protected				
	poor care, maint.				
	vandalism, malicious				
Maintenance	routine maintenance				
	occasional				
	no maintenance				

5) GENERAL ASSESSMENT

Tank No.:	satisfactory 1	2	3	some shortcomings 1	2	3	serious shortcomings 1	2	3
Design									
Construction									
Maintenance									

6) REPAIR REQUIREMENTS

	Tank No. 1		Tank No. 2		Tank No. 3	
Repair needed?	Yes	No	Yes	No	Yes	No
if yes, extent of repair	minor	major	minor	major	minor	major
execution of repair urgent?	Yes	No	Yes	No	Yes	No

Outside assistance required? Yes / No

7) COMMENTS: (if any)

ANNEX 1d

ASSESSMENT OF PIPELINE

PROJECTNAME: _____ SYSTEM NO.: _____

Note: A well buried pipeline is not visible ! Therefore you have to follow the alignment of the pipeline as good as possible (ask villagers, follow reasonable alignment). You can assess it only where it is visible, means not in order. Therefore **fill in only where found damaged.**
For each place where the pipeline is damaged make a slash in the concerning column.
For unburied pipe note the approx. length of each section.
For rivercrossings note one of the following options: okay, damaged, or broken

Section from	to	not buried	leakages	cuts	landslide	river crossing	others

Section from	to	not buried	leakages	cuts	landslide	river crossing	others

2) GENERAL ASSESSMENT

	satisfactory	some shortcomings	serious shortcomings
Design			
Construction			
Maintenance			

3) REPAIR REQUIREMENTS

Repair needed?	Yes	No
if yes, extent of repair	minor	major
execution of repair urgent?	Yes	No
Outside assistance required? Yes / No		

if yes mention most urgent sections:
from: _____ to: _____
from: _____ to: _____
from: _____ to: _____

4) COMMENTS: (if any)

ANNEX 1e

RECORD FORM NO. F/1 CWSS Pothara TAP page 1

ASSESSMENT OF TAPSTANDS

PROJECTNAME:_____ SYSTEM NO.:_____

	Tapstand No. (cross out non applicable line)	1	2	3	4	5	6	7	8	9	10	11	12	13	good	medium	bad
		14	15	16	17	18	19	20	21	22	23	24	25	26			
Number of households using tap																	
Flow	Adequate																
	too little																
	no flow																
Brass tap	okay																
	damaged																
	not in place																
Pillar	okay																
	damaged,but working																
	needs rebuilding																
Platform	okay																
	partly broken																
	destroyed																
Valve-chamber	okay																
	partly broken																
	destroyed																
Cover	okay																
	not in place, damaged																
	missing																
Stopcock	okay																
	damaged																
	dismantled																
Cleanliness of surroundin	clean, drained																
	some shortcomings																
	dirty																
Wastewater productively used?																	
Reasons for damage	poor construction																
	no maintenance																
	malicious, vandalism																
Regular maintenance executed?	yes																
	no																
Repair needed?	yes																
	no																
if yes: Extent of repair?	major																
	minor																
Execution of repair urgent?	urgent																
	not urgent																

Outside assistance required? Yes / No

ANNEX 1g

BASIC RECORD FORM I CWSS Pokhara sheet __ of __

NAME OF PROJECT:	FILE No.:
DISTRICT:	ZONE:
PANCHAYAT:	WARDS:

Project constructed: Year 20 /	Project handed over: Year 20 /
Project rehabilitated: Year 20 /	Surveyed by consultancy: ___ / 2045

MAINTENANCE COMMITTEE: yes no active not active

Committee Chairman: _____ Ward No.: _____

Village Maintenance Worker: _____ Ward No.: _____

trained: yes no / regular remuneration: yes no
in: cash kind

Tools: yes incomplete none

TECHNICAL INFORMATION Total Number of Systems: ____

		Total	System 1	System 2	System 3	System 4
Sources (name/type) see note	1	_____	_____/__	_____/__	_____/__	_____/__
	2		_____/__	_____/__	_____/__	_____/__
	3		_____/__	_____/__	_____/__	_____/__
Tanks (volume/type) see note	1	_____	_____m^2/___	_____m^2/___	_____m^2/___	_____m^2/___
	2		_____m^2/___	_____m^2/___	_____m^2/___	_____m^2/___
	3		_____m^2/___	_____m^2/___	_____m^2/___	_____m^2/___
Type of System			open closed	open closed	open closed	open closed
Type of Pipe			HDP/PVC	HDP/PVC	HDP/PVC	HDP/PVC
Overall length		_____	_____km	_____km	_____km	_____km
Number of Tapstands		_____	_____	_____	_____	_____
Number of B.P.T.		_____	_____	_____	_____	_____
Number of Air Valves		_____	_____	_____	_____	__ ____
Number of Cleaning-out		_____	_____	_____	_____	_____
Wards covered			_____	_____	_____	_____
Number of Households		_____	_____	_____	_____	_____

Note: Sources: **sp.** = spring / **st.** = stream
Tanks: **pr.** = prestandard / **ma.** = masonry / **fe.** = ferrocement tank

SOCIAL ASPECTS

Major ethnic groups:

1st: _____ 2nd: _____ 3rd: _____ 4th: _____

Settlement: scattered concentrated bazaar areas

Project is in: **good** **average** **bad** working condition

Reasons for the mentioned conditions: (briefly) _____

_____

_____

REPAIR REQUIREMENTS

	Number of structures	repair needed		minor repair	major repair	not urgent	urgent	outside assistence needed
		no	yes					
System 1								
Sources								
Tanks								
Pipeline								
BPT/IC/VC								
Tapstands								
System 2								
Sources								
Tanks								
Pipeline								
BPT/IC/VC								
Tapstands								
System 3								
Sources								
Tanks								
Pipeline								
BPT/IC/VC								
Tapstands								
System 4								
Sources								
Tanks								
Pipeline								
BPT/IC/VC								
Tapstands								

Special Remarks: _____

_____

_____

_____

ANNEX 2a

BASIC RECORD FORM II CWSS Pokhara sheet _1_ of __

NAME OF PROJECT	VILLAGE PANCHAYAT	WARD NO.	FILE NO.

S.No.	Date	Repair Requirements, Activities, Decisions	System No.	Request received	Estimate prepared	Material sent	Work completed

ANNEX 2b

project rehabilitated ③

MAJOR ETHNIC GROUPS ⑤
- majority are Matwali
- majority are Chettri/Bahun
- mixed population

② YEAR OF CONSTRUCTION/ Rehabilitation
2029 / 30 | 2031 / 32 | 2033 / 34 | 2035 / 36 | 2037 / 38 | 2039 / 40 | 2041 / 42 | 2043 / 44

⑰ CLASSIFICATION REPAIR REQUIREMENTS
Class A | Class B | Class C | Class D | OUTSIDE ASSISTENCE NECESSARY

⑩ REPAIR REQUIREMENTS PIPELINE
MINOR | MAJOR | URGENT

⑭ SOURCE-YIELD
ADEQUATE | NOT ADEQUATE

⑬ CLASSIFICATION OF FLOW FROM TAPSTAND
Class I | Class II | Class III | Class IV

⑮ GENERAL ASSESSMENT CONSTRUCTION
satisfactory | some shortcomings | serious shortcomings

④ NUMBER OF SYSTEMS (if more than one)
three (3) and more than three (3)
two (2)

⑤ ECONOMIC CONDITIONS
- Rural economy agriculture
- pure bazaar economy
- mixed rural / bazaar
- poor village
- average village
- rich village

① District: _____ Projectname: _____ Number of Systems: _____

⑨

REPAIR REQUIREMENTS		SOURCE	TANKS	CHAMBERS	TAPS	TOTAL	PER CENTAGE
Number of structures							100
REPAIR NEEDED	NO						
	YES						
EXTENT OF REPAIR	MINOR						
	MAJOR						
EXECUTION	URGENT						
	NOT URGENT						
OUTSIDE ASSISTANCE	YES						

⑧

GENERAL ASSESSMENT		SOURCE	TANKS	CHAMBERS	PIPELINE	TOTAL	PER-CENTAGE
Number of Structures							100
DESIGN	satisfactory						
	some shortcomings						
	serious shortcomings						
CONSTRUCTION	satisfactory						
	some shortcomings						
	serious shortcomings						
MAINTENANCE	satisfactory						
	some shortcomings						
	serious shortcomings						

⑯ GENERAL ASSESSMENT MAINTENANCE
satisfactory | some shortcomings | serious shortcomings

⑥ VILLAGE MAINTENANCE WORKER
existing | trained
Remuneration in: cash | kind
gets remuneration: regular
checks project: weekly | monthly | less frequent

VILLAGE CONTRIBUTION to Maintenance: yes

MAINTENANCE COMMITT: existing | only chairman is active | whole committee

ANNEX 3

⑦

SOURCE YIELD		%
YEARROUND SUFFICIENT		
SEASONALLY INSUFFICIENT		
NEVER SUFFICIENT		

⑪

FLOW FROM TAPSTANDS		%	
ADEQUATE			A
TOO LITTLE			B
NO FLOW			C

⑫

Classification of project with regard to FLOW FROM TAPSTANDS		
	Class I	A > 80 % C = 0 %
	Class II	A > 50 % C < 15 %
	Class III	A > 33 % C < 25 %
	Class IV	C > 33 %

BAD WORKING CONDITION/DISREPAIR
- a) constr. quality
- b) due to VMW
- c) due to committee
- d) individual user
- e) malicious
- f) social dispute

GOOD WORKING CONDITION
- a) constr. quality
- b) due to VMW
- c) due to committee
- d) individual user