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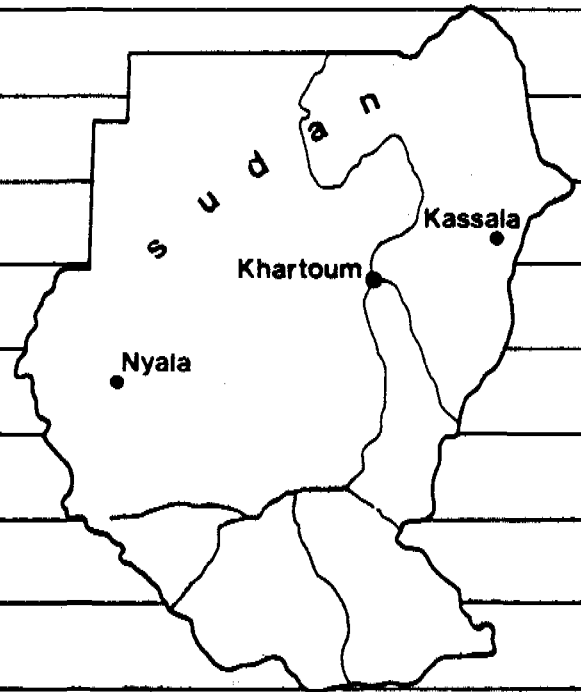
Institute of applied geoscience

National corporation for the development
of rural water resources

Water resources assessment and development project in the **Sudan** (WADS)

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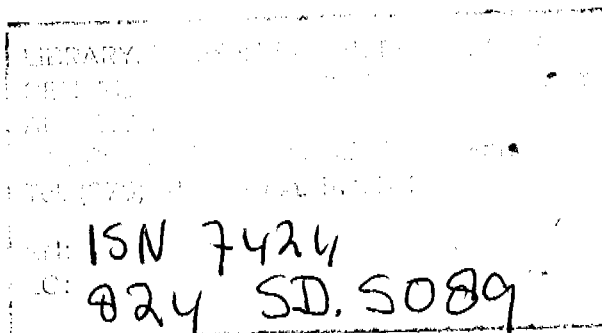
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Extension for village water supply

Appendix G

EXTENSION
for
VILLAGE WATER SUPPLY



Water Resources Assessment and
Development Project in Sudan
WADS Nyala
July 1989

FINAL REPORT WADS

The final report of WADS consists of:

Main Report (March, 1990)

Appendices

- A. Information Centre
- B. Hydrogeological map of Sudan
- C. Hydrogeological databank
- D. Technical Committee Kassala + Annexes (2 volumes)
- E. Modelstudy Gash Basin
- F. Village water supply programme South Darfur
- G. Extension for village water supply
- H. Manuals for extension workers
- J. Hydrogeology and development of the water resources of South Darfur
- K. Siting for hand-dug wells
- L. Construction and maintenance of hand-dug wells
- M. Aspects of a masterplan for groundwater development in South Darfur
- N. Hydrogeological studies South Darfur
- O. Technical Committee Nyala-Geneina
- P. Training

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List of Acronyms and Abbreviations

CDD	Control of Diarrhoeal Disease programme
CHW	Community Health Worker
GES	Groundwater Exploration Section
H/hh	Household
IRC	International Reference Centre for Community Water Supply and Sanitation
IWSS	Improved Water Supply System
l	Liter
l.c.d.	Liter per capita per day
LS	Sudanese Pound
MOH	Ministry of Health
MSF(B)	Medecins Sans Frontieres (Belgium)
NCDRWR	National Corporation for Development of Rural Water Resources
NGO	Non-Governmental Organization
PHCU	Primary Health Care Unit
SCF	Save the Children Fund
SRC	Sudanese Red Crescent
UNHCR	United Nations High Commissioner for Refugees
UNDP	United Nations Development Programme
VHC	Village Health Committee
VLOM	Village Level Operation and Maintenance
VPS	Village Project Section
VWC	Village Water Committee
VWSP	Village Water Supply Programme
WADS	Water Resources Assessment and Development Project in Sudan
WCS	Well Construction Section
WHO	World Health Organization
WSDC	Western Savannah Development Corporation

1 INTRODUCTION

1.1 General

This report is a reflection of the project's efforts to formulate and develop an extension package, extension materials and methods of village organization, geared towards the technological concept of village water supply systems adopted by the project. The systems should be sustainable and should entail a reduced health risk. It describes the feasibility of the participatory approach in the production of these systems at a future rate of sixty per year, with special reference to the extension component.

The report has been prepared by the Water Resources Assessment and Development Project in Sudan (WADS), which was executed by the NCDRWR in Khartoum and TNO-DGV Institute of Applied Geoscience of Delft, the Netherlands and was financed by the Sudanese and Dutch Governments. The project started in 1986 and was completed by mid 1989.

The Village Water Supply component, however, started only in the first half of 1987, and will now be continued for a period of five years under financing by the same agencies.

The report is Appendix G of the final project report which deals with all project activities, and should be read as the mother report of Appendix H of the final report: "Extension Manuals".

For the framework within which the extension activities took place, reference is made to Appendix F of the final report: "Village Water Supply Programme South Darfur".

1.2 Summary

The operational objective of the project's extension work is to motivate villagers to:

- participate in the decision making and planning for their Improved Water Supply System (IWSS);
- participate during the construction phase in cash and labour; and later, after implementation:
- to operate and maintain it with commitment towards the agreements reached between them and extension workers during extension visits, training events and village meetings.

Collective commitment can only partially be achieved by means of "hard agreements", as laid down in a contract; a dialogue has to be built up, which enforces a sense of ownership and responsibility for the IWSS on the side of the villagers.

Extension messages, arranged in manuals, are the tools with which this work is done. They are derived from project objectives, and conform to findings of baseline studies in the project area and of systematic data collection in project villages.

The extension messages had to be adapted to feed-back from the villagers and to the experiences of the project during its pilot phase.

In how far the method of village approach and the design of the extension messages are appropriate to the aim of reaching the project objectives, is verified when implemented IWSS are monitored.

Monitoring and evaluation are as important tasks for the project as its extension activities during the implementation phase of the VWSP. Items of monitoring are the operation of the water lifting device, the functioning of committees and caretakers, and water collection including time saving, per capita consumption and pressure on the IWSS. Comparative analysis of data received from a sample of project villages provide findings, which will verify in how far the WADS-approach can be called promising and successful.

Chapter 3 of the report describes the approach and methodology of extension applied in the project. The socio-cultural and -economic conditions in South Darfur in which the project is executed, is described in Chapter 4.

In Chapter 5 the proposed organization on village level for planning, implementation, operation and maintenance of the improved water supply system is discussed.

Chapters 6 and 7 outline the extension messages, and the strategies chosen for communicating these messages.

Chapter 8 on monitoring and evaluation, gives the findings related to overall and project objectives, targets and indicators for achievement.

The organization of the manifold activities in the field of extension is described in Chapter 9.

In annexes a summary of baseline data concerning physical and social infrastructure of the villages in the project area, and the developed monitoring tools are given.

Manuals for extension workers on pre- and post construction extension, and on water collection monitoring can be found in Appendix H of the main report of the project.

2 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

2.1 Main findings and conclusions

1. In the present form the extension messages are considered to be operational. However, each extension message is set within a force field, where supporting and jeopardizing vectors in the form of people's interests are present. Being successful depends on the benefit it can offer to the villagers from their perspective. It is them who have to do something with the messages, also when initiative does not come anymore from the project. All extension messages have been arranged in extension workers' manuals, which can be found in Appendix H of the final report: "Extension manuals".
2. On a modern topic like hygiene, only few traditional patterns can offer support to the project's effort in propagating a change in behaviour and attitude. A longer term programme in this field will be necessary. WADS can only introduce to handle water more safely at the well site and at home, to operate the system in the proposed way and to maintain it so that the villagers benefit for a long period from their IWSS.
3. Labour and cash contribution in community projects is well understood and practised by villagers. The expected benefit of having sufficient water near the village also during the dry season is a strong motivation to pull as a community on one string, even though the multi-tribal characteristics of the project area may jeopardize the effort made.
4. Systematic introduction of the WADS-VWSP, and organization and scheduling of villagers' responsibilities and tasks is necessary, in order to make the overall frame, within which extension messages are placed, transparent to the villagers and operational.
5. With respect to the institutional set-up on village level - especially the forming of committees - nothing new is proposed. Only, that women's importance in 'Water and Health' is stressed and reflected in a bundle of responsibilities and activities in system operation and hygiene, which should be organized and carried out relatively independently from men.
6. The introduced village organization is presented as an initial proposal to the villages eligible for the construction of a well. They are requested to appoint a Village Water Committee (VWC), a Village Health Committee

(VHC) and a caretaker.

Deviations from this organizational form proposed by the villages are always possible and even most welcome, because they may reflect genuine efforts of the village to organize itself in a more efficient or locally better suiting manner.

7. No blueprint of such organization can be given as yet, because:

- the wells and windlasses did not require any minor repairs during their short existence, and therefore no appeal had to be made as yet to the village functions on maintenance
- introduction and internal dissemination of relatively modern concepts like hygiene and health in relation with water is a long-winded matter. The very short project duration in this respect, certainly could not allow for final conclusions.

8. Caretakers are not system-operators.

Experience shows:

- caretakers are paid low, if at all
- necessary discipline for daily care/operation of IWSS cannot be expected from a farmer/artisan
- women make 'jokes on men' at the well site, which is their domain
- female caretakers as operators is not considered a feasible option so far: they would be forced to neglect other, more important household tasks

9. Selling water is not practised in South Darfurian villages and it should not be introduced.

Even if villagers would agree, outsiders could easily use force to fetch water free of charge.

10. In the villages of South Darfur, dominant groups usually exercise control over others. Long term commitment towards a community project by the entire population is seldom found (mostly in the spheres of religion, education and security, and only then in village water supply). The integration of all villagers into decision making in village water- and health committees is proposed in order not to reduce the user groups to a small size from the very beginning.

Concerning this topic of institution building not in all villages only success can be expected. There is not a common solution which fits all interests to be found in a village.

11. The project's approach to offer low-cost technology and to concentrate on sustainability and system reliability is in line with this sociological parameter. This keeps operation and maintenance of the IWSS easy.

its costs reduced to a minimum, and it makes villagers quite independent from the commitments of others.

12. An increase in per capita consumption can be expected with the implementation of WADS-IWSS.

Values in monitored villages: 17% on an average.

Variables for higher/lower water consumption rates are:

- household size
- means of water transport
- children as water collectors or not (often related to distance)
- use of water lifting device (further verification necessary)

Water is mainly collected by women (about 70%), but the nearer the water source is located to the village, the more children are sent on water journeys.

13. Time savings in fetching water with the implementation of the wells are considerable in all project villages.

Range : from 28% to 80%

Median: 64%

In absolute values:

Range : from 0.5 to 7.0 hours/household/day

Median: 3 hours

Large time savings are related first to 'reduction in waiting time' (high yield of the wells) and only then to 'reduced distance to the water source'.

14. Waiting times at the wells during rush hours (7 to 10 a.m. / 4 to 6 p.m.) range from 0 to 30 minutes, depending on:

- number of users
- device used/not used

When livestock is watered at the well, the waiting time increases considerably.

The presence of nomads creates conflict between users and non-users of the windlass: water can only be drawn in turns.

In by-passing others superiority/inferiority is confirmed in the public.

15. At least 50 % of diseases prevailing in rural areas of South Darfur are water borne/washed diseases.

"Improvement of health" ranks, after "improvement of water supply", at the top of villagers' expressed need for development.

16. 'Dirt' is 'matter on the wrong place'.

Interpretations differ from culture to culture.

In traditional societies concepts of health/disease (and hygiene) are derived from religion. "Islam is up to 50 % cleanliness", as islamic scholars explain, but hygiene is handled rather in a ritualistic, and therefore mechanistic manner, while modern hygiene calls for attention towards profane situations and events.

17. Integration of MOH-staff into WADS/VPS proved to be efficient for reasons of:
- experienced qualified senior staff in matters of hygiene and health
 - first step for necessary and further cooperation between WADS/NWC and MOH

2.2 Recommendations

1. For selection of project areas (e.g. spread or coverage options) WADS should
 - select areas which are suitable for the proposed technology
 - be in line with policies of rural water supply and development programmes of official bodies
 - take decisions in accordance with Steering Committee and higher administrative levels of Darfur, e.g. Area Council
 - favour regions which are disadvantaged with respect to village water supply
 - be in line with water supply and health education activities of other agencies than WADS
 - consider a not too large geographical spread of activities at the time, in order to increase efficiency of work organization and logistics
2. For village selection the following procedure is proposed:
 - only 'good' and 'medium' hydrogeological verdicts should be considered
 - PHCU villages (or those covered by one), extremes in bad water quality of dry season water sources, and larger size villages should be given priority
 - in a final breakdown a further distinction could be made between waiting time and walking time
3. During reconnaissance visits baseline data on waiting time (peak of dry season) should be collected through interviews.
Sample size: at least 10 (women).
Distance to dry season water source of main village should be checked by car.
4. As to the application procedure for village wells an alternative option to that presently practised might be tested: RC's are informed via Area Council and supply WADS directly with requests for an improved village water supply.
Rural Councils are well acquainted with the needs of 'their' villagers. Village Councils are represented in the RC, regular meetings are held. In tax collection, sugar distribution and rural development

(water supply / education / security) the RC's are directly involved. The relationship between village representatives and RC officials can be called organic and relatively informal. It rests to a certain extent on mutual dependency and goodwill. WADS might consider Rural Councils as positive 'local resources.

5. The cut-down of pre-construction extension visits to two proves to be realistic, but more emphasis should be put on active involvement of villagers into discussions: consultative process, especially on details of villagers' responsibilities in system operation and maintenance.

Key-persons should be more activated in the village approach, especially school teacher, trained midwives, imam. Their authority is less 'group-bound' and their functions are more concerned with the village as a whole.

6. In the future, the consequences of applying for a water lifting device should be discussed more intensely with the villagers and baseline/background data should be evaluated in order to avoid, that only for being considered as modern the installation of a device is asked for by the villagers.

It is recommended to make use of first hand experience by inviting villagers (including women) to visit project villages where devices have been installed.

7. Not all extension material has its final form.

Photos of the WADS-IWSS are needed and more slides for hygiene education should be shot in villages, households and at water sources.

Extension tools should be adapted, when new insights enforce changes in extension approach.

This seems to be obvious, but it asks for an overview on all extension elements and is a time consuming activity. It also needs skills in operating word-processing computer programmes, because this job should be done by VPS-staff, and not by secretaries.

8. How to make 'safe water, hygiene and better health' operational, has to be devised in close cooperation with MOH. Short/long term objectives are not yet sufficiently identified. They will be derived from an overall concept; they depend directly on the capacity of the MOH and official policy for improvement of health conditions in rural areas in South Darfur.

Only then realistic objectives can be defined and monitoring results can be evaluated with the necessary accuracy.

Meanwhile, participation in training programmes for CHW's as it is practised by WADS/VPS, should continue.

9. If such concepts cannot be put into practice by MOH in longer term implementation-and follow-up programmes, the WADS-achievements in introducing 'safe water and hygiene': "higher awareness on part of villagers of the need of hygienic behaviour and proper handling of water" will most probably be lost.

10. Earlier made recommendations to support MOH by an (female) adviser/expert should be considered.

Five fields of activities are proposed:

- collection of baseline data on water and health in a representative sample of project villages by means of an intense field study.
- translation of findings into didactic material including extension tools
- institutionalization and intensification of cooperation between NCDRWR and MOH
- organization of workshops and on the job training of extension workers
- coordination of activities with other organizations active in the health sector (e.g. CDD, SRC, MSF-B)

11. The purpose of WADS monitoring- and evaluation procedures is:

- to adapt the present approach/system design to findings in order to come to final recommendations; this process is not yet fully completed (e.g. water lifting device/animal watering facilities) and should be taken up at the very start of the next phase.
- to provide results on the validity of the project's approach in terms of:
 - * viability and sustainability of wells
 - * actual impact of new wells on water use

12. The former needs quite intensive monitoring in order to arrive at reliable findings. Shortcomings result in high costs for the project and in frustration on part of villagers.

For 'viability and impact' sample sizes for monitoring can be decreased, when clear positive trends can be established. There is no need for detail analysis and academic exercises.

13. A number of villages/IWSS should be followed up throughout the whole implementation phase of WADS.

Sample size: at least 10 villages.

A miscellaneous bundle of findings is expected, which will add experience to Rural Water Supply agencies, also beyond WADS.

14. At least 50 % of the VPS-staff should be female: target groups are composed mainly of women.

Female MOH-staff or development workers from other organizations should join WADS/VPS for extension in hygiene-education.

15. VPS-meetings should be institutionalized on a two-weekly basis for purpose of:

- planning
- exchange of field experience

More independence of extension teams/VPS-staff in planning and decision making should be allowed and trained. Didactic material is available in the VPS-library.

Exchange of field experience/data between extension teams can be planned as training events (role play; selected thematic topics; etc.).

16. Improved village water supply is regarded by officials and villagers alike as the first element in the chain of rural development. Extension workers should attend workshops, which place WADS-activities into this framework.

The extension workers themselves feel and express this lack of orientation.

17. Extension messages are the tools with which VPS-staff is executing the job. Extension messages are complex; positive and negative vectors are supporting and jeopardizing its efficiency. More training on this topic is regarded as being necessary.

18. Workshops should be organized exclusively for female extension workers:

- extension messages concerning hygiene are partly 'women talk'
- women communicate (and learn) more easily among themselves

19. Computerization of data processing needs skills.

Within the VPS this has not yet been sufficiently trained, but all VPS-staff should be enabled to handle computer programmes.

Data processing and evaluation (extension and monitoring) should be guided by a trained and experienced sudanese sociologist.

20. In central field stations extension teams should stay longer than only few days:

- higher work efficiency
- lower costs

Extension teams should be equipped with radio, in order to:

- keep regularly in contact with office for decision making in the field
- communication in emergency situations

3 EXTENSION APPROACH

3.1 The technology

The technology for village water supply that the project has introduced in Southern Darfur, is in fact a relatively simple improvement of the traditional village well. In its most elementary form it consists of a hand dug, shallow well of some 15 to 25 meters depth, with a lining of concrete rings or masoned concrete blocks. The wells penetrate into the aquifer over a height of at least 1, but mostly 3 to 4 m below the dry season water level.

A concrete parapet to prevent flooding and people from falling into the well, an elevated concrete slab on which to stand while drawing water, and a concrete drain for spill water that ultimately ends in a soak pit, are constructed.

To avoid contamination the villagers are supposed to use special containers for drawing water (and not their own), to keep the slab and the drain clean, and to prevent animals from nearing the well by putting up a fence around its immediate area.

A well can be equipped with a windlass if the village wants one. A few wells with a windlass have a storage tank built next to them. When filled in the evening, the tank can be used as a reservoir from which to draw water quickly during the rush hours of the next morning. This facility is, however, no longer provided.

3.2 Project implementation

Table 3.1 below shows the steps taken in selecting project villages and in implementing the well construction programme there.

Table 3.1 Village selection and programme implementation

Step	Activity
1.	Project informs Rural Council, and Administrative Officer informs Village Councils. Interested Village Councils report to Admin. Officer from whom a shortlist of interested villages is collected by the project.

2. All shortlisted villages are surveyed hydrogeolo-gically and socio-economically.
 3. Project prepares a priority list of villages and contacts the first 20 villages on the list in each Rural Council.
 4. Three extension meetings (incl. one introductory meeting) are held in each village, that should result in the signing of a contract between the village and the project (*).
 5. Selection of possible well sites in consultation with the village community and augering for final site selection (**).
 6. Actual construction of the well by village and project labour, and training of caretakers.
 7. Building of a fence by the village, inauguration of the well.
 8. Hygiene education programme, follow-up, and monitoring and evaluation (***) .
-

Notes

- (*) If a village wishes to have a well, it should agree to:
- pay LS 1,000 for a simple well, or LS 1,250 for one with a windlass;
 - provide labour (12 men) for well siting and construction;
 - appoint a (mainly male) Village Water Committee with specified responsibilities;
 - appoint a (mainly female) Village Health Committee with specified responsibilities;
 - appoint 2 caretakers for maintenance of the well and if applicable, the windlass;
 - participate in training events organized by the project.
- (**) In a number of cases, disagreements have arisen in villages after contracts had been signed. This was usually due to the fact that the owner or user of the plot where a suitable place for a well had been found, did not agree to have it constructed there. Such cases are incidents, however, and their frequency did not necessitate a change in the project approach.
- (***) The hygiene education programme is an introductory one, mainly aimed at training of Village Health Committee members to further train villagers (women) in topics like:

- sanitation at the well site;
- use of communal buckets and ropes;
- transport and storage of water;
- utilization of water at home.

3.3 Extension work

3.3.1 Objectives

Figure 3.1 below shows all the elements that are present in extension work or primary health education. It also shows that these elements are all inter-connected: if one of them is changed, all the others may very well have to be changed as well.

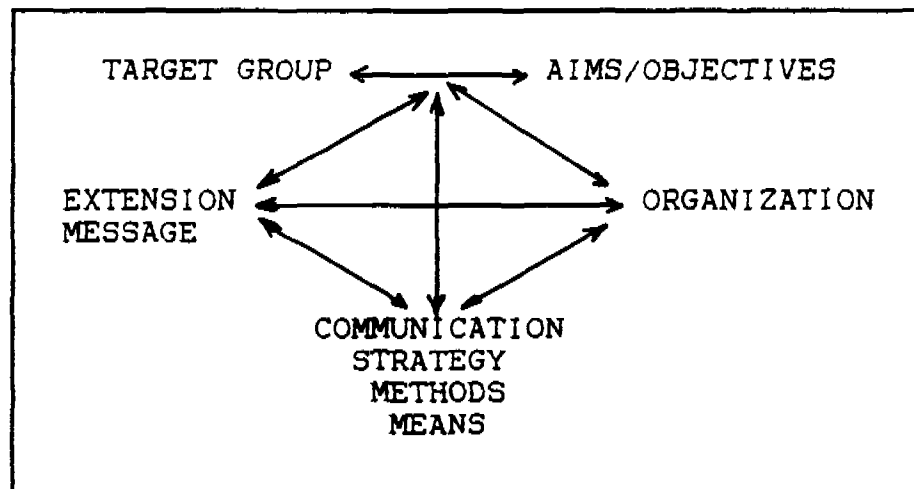


Figure 3.1 Elements in the extension process

The starting point in this picture are always the aims and objectives.
In the project's extension work the following objectives can be distinguished:

- set-up of a village organization for the planning, implementation, operation and maintenance of the new well;
- a well-considered decision by the village on the type of water supply system (within the scope of the project this means a well with or without a windlass);
- a well-considered selection of the well site(s) so that all village segments will profit from the new facility;
- siting and construction of the well (and installation of the windlass) with participation of

the village in the form of cash and labour contributions;

- proper operation and maintenance of the well (and the windlass) by the village;
- improved health conditions in the village through proper operation of the facility, and proper transport, domestic storage and use of the water.

3.3.2 Outline of methodology

Based on these objectives and on project experience, the contents of the extension messages, type of organization (village and project), and the strategy, methods and means of communication have been developed, as shown in Table 3.1. below.

Table 3.1 Outline of extension methodology

Objective	Target group	Organization	Ext. message	Communication		
				Strategy	Methods	Means
Decisions on type of supply and selection of site	Village population (male and female)	Village Water Committee	Intro of WADS Technology and consequences for O & M	Public meeting Men and women addressed separately	Explanation Demonstration Question and answer	Flipchart Photo's Model Contract Handouts
Organization for implementation, operation and maintenance	-idea-	Existing village organization ("council", key persons)	Tasks and responsibilities of village and proposed committees	-idea-	Consultative process via participatory extension	Examples of other villages Contract Handouts
Cash and labour contribution	-idea-	Village Water Committee	Requirements from project: LS 1000/1250 12 labour	-idea-	-idea-	-idea-
Proper maintenance of system	Village Water Committee, caretaker	-idea-	Responsibilities of village Remuneration of caretaker Spare parts Influence on lifetime and health	Public meeting Training for caretaker and VWC + tools Spareparts available	Participatory extension On-the-job training + course Spares via project or RC	Contract Handouts Well construction Models Tools Instruct. booklet

Table 3.1 Outline of extension methodology (continued)

Objective	Target group	Organization	Ext. message	Communication		
				Strategy	Methods	Means
Proper operation and cleaning of system	Committees, caretakers and female population	Village Health Committee	Responsibilities of village water and health	Public meeting Training for VHC, caretaker Extension to women by VHC	Consultative approach, observation, adult educ.,	Contract Handouts Well (and windlass) Slides Drawings Posters

Note: The institutionalization of the village organization has become an objective in itself, which contributes to the complexity of the extension work.

Of course, the extension work had to be designed for the socio-economic, cultural and political situation of South Darfur. Otherwise any of the above described elements might be out of place: messages might not be understood, proposed organization forms not feasible, methods and means of communication not possible.

A summarized description of this context is given in the next chapter.

More details can be found in Annex G.1 to this report: "Baseline Data".

A second boundary condition for the set-up of the extension work were the available resources: staff, finance, transport and equipment, within the short duration of the project and the limited possibilities for quick procurement. Logistics for a project in Darfur is a chapter on its own.

Monitoring and evaluation of pre-defined indicators for target achievement, and analysis of possible bottlenecks formed the basis of changes in any of the extension components made.

Although the project had to start from scratch and necessary changes in the initial set-up could be expected, not too many changes could be made for reasons of:

- the short duration of the project: a period of two years means virtually nothing in terms of execution, monitoring and evaluation of extension work;
- discomfort on the side of extension workers and management of the section responsible for the extension work: none of the staff has had a professional training in this field.

3.4 Limitation of applied method

3.4.1 **Target group**

Tribal Conflict

Usually, various tribal segments compose a village. They are rivals especially when they belong to the arab- or non-arab cluster of tribal groups. Since June 1988 the situation in the project area is tense. Sometimes entire villages are deserted when project teams arrive to hold village meetings. In other cases dominant groups prevent "active village participation" as it is proposed by WADS. The target group is thus radically diminished.

(Semi-) nomadic life style

Villagers are farmers, but every year, from 2 to 5 months, groups of villagers move with their livestock in search for grazing land (villages with high livestock figures).

In many of the project villages, nomads arrive in large numbers as "guests", using its grazing land and water sources.

For reason of population fluctuation extension messages do not always reach all members of the target group.

3.4.2 **Hygiene as a modern concept**

More intensive follow-up programmes in health and hygiene will certainly contribute to an improvement of the health conditions in the villages.

However, considerable success rates in improved health through safe handling of water will most probably only be achieved when:

- the workload in general for women and children will be reduced, also in other activities than "water collection";
- the educational standard can be raised: the large majority of women is illiterate.

Hygiene extension messages are not that easy to be conveyed and put into practice, like those concerning participation in labour, because they do not fit neatly into locally known patterns of thinking and practices.

But with an approach based on systematically collected data and additional institutional support for MOH there will be success, because villagers are motivated for a change for the better.

4 THE CONTEXT OF SOUTH DARFUR

4.1 Physical infrastructure

4.1.1 **Roads**

In the project area there is only one asphalted all-weather road: from Nyala town to Zalingei town via Kas town.

An all-weather gravel road connects Nyala with El Fasher in North Darfur (provincial and regional capital).

All other roads in the province are multiple tracks. Most of these tracks are inaccessible for vehicles during and for some time after the rainy season, also due to the many wadi crossings.

During the rest of the year there is relatively frequent "soukh-lorry" traffic, at least to all villages with a weekly market, and those on the route between the market villages and larger provincial market centres.

4.1.2 **Spatial characteristics of villages**

The Village Councils in the project area generally comprise a number of villages (on the average 5 to 10).

These villages in turn consist of a "main village", which may be surrounded by a large number of "hamlets" (varying from 5 to 20). The people living in the hamlets mostly belong to tribes different from the one in the main village.

4.1.3 **Services**

The following services can be found in the indicated percentage of villages where project activities took place:

-	mosque	81 %
-	primary school	46 %
-	secondary school	2 %
-	soukh	43 %
-	dispensary	4 %
-	PHCU	33 %
-	grainmill	61 %
-	bakery	31 %
-	plant protection office	6 %
-	veterinary	2 %
-	improved water supply, which may need rehabil.	4 %

4.2 Social infrastructure

4.2.1 Tribal structure

In the three Rural Councils (Kas - Nyala S.W. - Idd el Ghanam), where WADS has been implementing wells during its pilot phase, 21 different ethnic groups are represented, all with islamic religious affiliation.

The more significant opposition, which is created by the structural characteristics of the project area, appears between arab- and non-arab tribes (valid for villages and area). Non-arab tribes outnumber arabic tribes.

Ten different languages are spoken. Arabic is understood by almost all men. But many Fur-women and others, who live in hamlets relatively isolated from their main village, only speak their tribal languages.

4.2.2 Homogeneity of villages

Social stratification and cultural hierarchy is de-emphasized in the Islam. Villagers do speak of community members as being all equal. However, usually one dominant group is found to have the say in a village.

The social distance between villagers, who belong to different tribal segments or kinship-groups, is expressed in the spatial organization within the village area:

- the centre of the main village is the location of the dominant group;
- the village periphery is occupied by villagers more far related by kinship to the 'village centre', or by small segments of a different tribe;
- hamlets, located up to 5 km from the main village, are inhabited by tribal groups "inferior" to the dominant group; they have their own leaders; their social contact to main village fellows is more limited.

Due to the heterogeneous, multi-tribal structure of the villages, the population does not act as a strong unit. Competition and rivalry outweigh co-operation and solidarity.

Few villages can be called homogeneous; generally they have a higher organizational and financial capacity in "getting things done".

The strongest uniting force among all villagers is their commitment towards the Islam.

4.2.3 Village administration

Villages do have a tradition in establishing an elaborate administrative structure for handling community affairs by forming committees for:

- village / RC politics
- water supply
- religious ceremonies
- education
- women's affairs

Committee members are appointed by village elders. Offices are semi-hereditary and they are invested into (dominant) kinship-groups.

4.3 Communication pattern and decision making

Communication is "giving and taking"; it is generally functioning best, where the duty to exchange is structured: kinship relations.

Beyond the household^[1], marriage circles form the strongest co-operating units: those who exchange women for marriage, also have the most intense exchange of goods, services and information.

Dominant groups monopolize offices and exercise control and power. Decisions made by its leaders "at home" are presented in village meetings and can hardly be challenged through argumentation.

Key-persons like

- school teacher
- imam
- local doctors
- shaykha/hakamas
- shaykh/agiid
- midwives
- persons with initiative and commitment towards the welfare of the village

are accepted as authority: they are agents of social change.

Women do have a say in matters of:

- marriage
- education
- household management

Women are not considered as political personalities. In matters beyond the household sphere they are poorly informed and in the public not present as decision makers. The large majority of the women is illiterate.

[1] In islamic culture a man forms with each of his wives and their common children a separate household.

4.4 The roles of men and women

The role-division between men and women corresponds to the separation of the private- from the public sphere, which is highly stressed in islamic culture.

Women act in the back-stage of village life, while men represent their kin-groups during informal gatherings and official meetings.

Typical men's roles are:

- decision maker (household/village)
- active in religious ceremonies
- father
- kins-men
- husband having up to 4 wives
- farming and livestock-keeping
- fully responsible community member
- representative of his family

Typical women's roles are:

- mother
- kins-women
- wife having up to 3 co-wives
- care for household tasks
- farming and livestock-keeping
- giving support/advise to husbands in village matters
- support of men in village activities as a group:
preparation of food during ceremonies/communal work.

Men and women share roles in:

- care for household budget
- education of children
- care for health of household members

4.5 Village economy

4.5.1 **General**

Traditional elements in economic thinking allow that social aims outrange purely economic calculations: cash is preferably invested into prestige and marriage.

Villages are found to be economically stratified:

- Rich persons usually:
 - own much livestock
 - belong to "old" and big families, whose members share economic risk

- Men and women are independent property holders, but they differ in income and agricultural productivity:
 - women cultivate less land and make less cash than men do (about one third) [2]
 - women's input into the household budget is usually asked first.

Beyond kinship obligations, villagers practice among friends and kinsmen voluntary exchange in labour and kind during agricultural peak times.

Economic relations beyond the village:

- soukh
- villagers exchange goods and services with nomads: for herding their livestock they supply them with basic food.
- villagers also hire herdsmen for moving with their livestock to more fertile grazing land. These herdsmen belong to arab tribes.

4.5.2 Sources of income

Agriculture is the main economic activity of villagers (men and women). Livestock is in most project villages in Kas and Nyala S.W Rural Councils of minor importance. However, in Idd el Ghanam Rural Council the situation is different. There the Beni Halba (dominant tribe) are traditional livestock raisers and sellers.

As secondary sources of income should be mentioned:

- agricultural or other labour for hire
- production of charcoal, building materials
- trade, shopkeeping etc.
- petty trade: selling at small markets
- market craft: carpentry, blacksmithing, masonry, tannery, shoemaking, tailoring, butchering etc.
- home craft: mat and basket weaving etc.
- cattle herding: other people's stock
- government service

Income generating projects are mostly organized as co-operatives: close kinsmen run a grainmill or bakery. Membership of various sugar co-operatives, which are established in all villages, has a high value: surplus of subsidized sugar distributed through the RC is sold in the soukh. Profit rate: 70% to 90%.

[2] Figures obtained from a field study in five project villages

4.5.3 Community activities

There are only few occasions, on which villagers "pull economically on one string":

- religious ceremonies
- education (school building)
- well construction
- security

Cash for community projects / activities is collected in different modes:

- per head
- per household (often this is levied on sugar)
- only adult men (from 17 years onwards)
- only dominant group (in particular by "donations" of wealthy kinsmen outside the village)

Homogeneous villages can easily raise community funds with LS 15,000 and more.

4.6 The agricultural calendar

The cultivated crops and the resulting annual cycle of agricultural activities is mainly determined by the type of soil, its condition and the climate.

Millet is the main subsistence crop (in Nyala and Kas RC's also sorghum), and cash crops are groundnuts and sesame (on qoz and alluvial) and vegetables and fruits (along the wadi's).

The agricultural season runs from April till January. Table 4.1 below shows the different activities per period.

Table 4.1 The annual agricultural cycle

Period	Agricultural activity
April - May	Clearing of fields
May - June	Sowing of first crops
July - August	Weeding and thinning
October - November	First harvest
December - January	Second harvest

5.1 Proposed structure

For the execution of tasks, related to the implementation, operation and maintenance of the well (and windlass), the organization form shown in Figure 5.1 below is proposed.

The choice was made on the basis of consultations with a number of villages, and on project experiences with a number of variants.

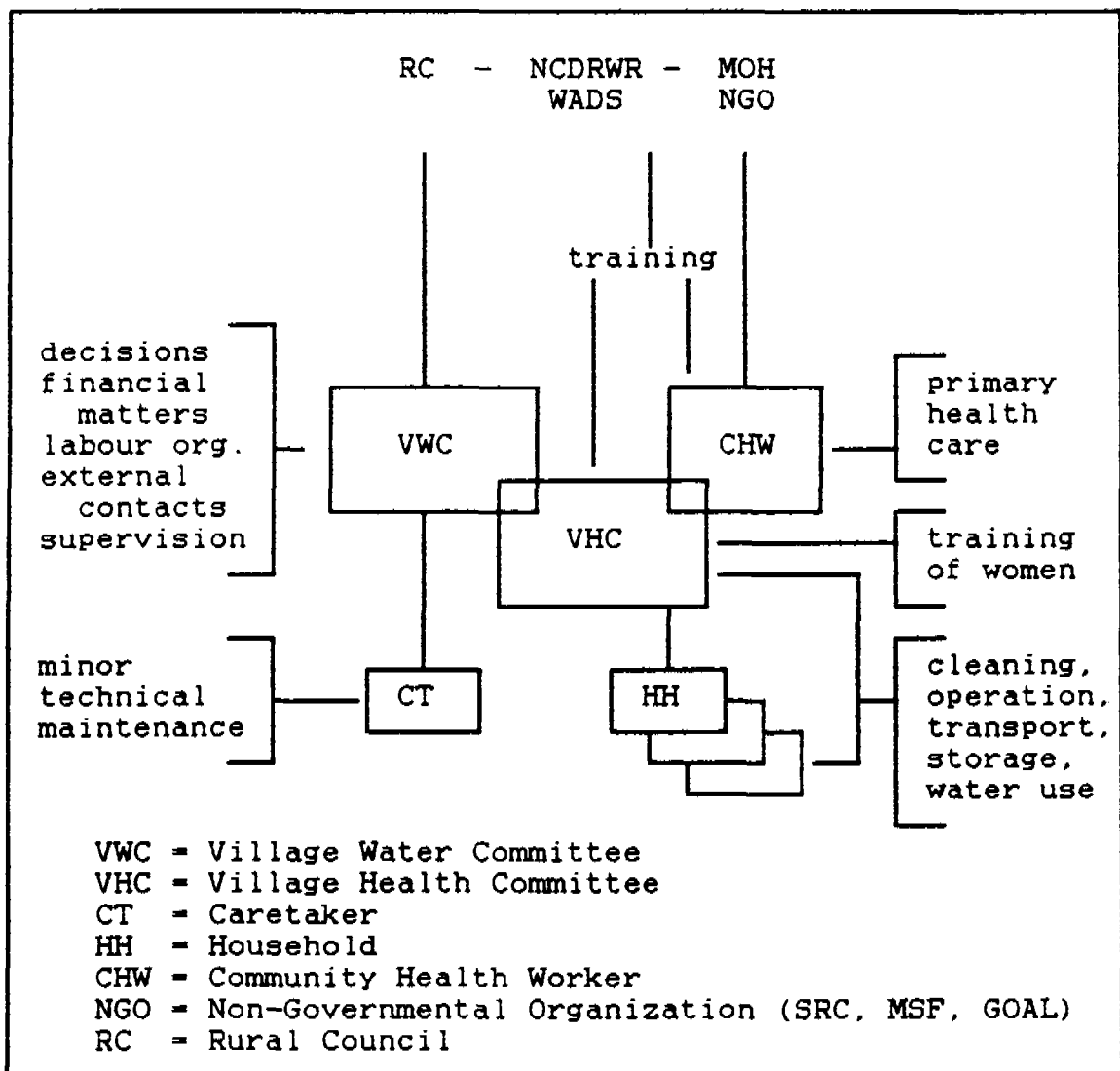


Figure 5.1 Proposed village organization, internal and external relationships, and responsibilities.

For two reasons, however, this cannot be the final word on the most efficient organization on village level:

- the wells and windlasses did not require any minor repairs during their short existence, and therefore no appeal had to be made as yet to the village functions on maintenance
- introduction and internal dissemination of relatively modern concepts like hygiene and health in relation with water is a long-winded matter. The very short project duration in this respect, certainly could not allow for final conclusions.

The above sketched organization is presented as an initial proposal to the villages eligible for the construction of a well. They are requested to appoint a Village Water Committee (VWC), a Village Health Committee (VHC) and a caretaker.

Deviations from this organizational form proposed by the villages are always possible and even most welcome, because they may reflect genuine efforts of the village to organize itself in a more efficient or locally better suiting manner.

The scopes of responsibilities of the Committees and the caretaker may vary from village to village because they are supposed to be the result of meetings held in the villages, both internally, and between the village and the extension workers.

The sum of the respective responsibilities, however, should meet the minimum demands of the project: proper operation and maintenance on village level.

Decisions on how the different responsibilities are dealt with are entirely left to the villagers, so that the organization will be optimally adapted to local conditions.

5.2 Village Water Committee (VWC)

It is important to assure that the composition of the committee will reflect the tribal composition and/or the segments/hamlets of the village. If this is not the case, it can be expected that the VWC will further the interests, like access to the well, of the group(s) they represent, thereby neglecting the others. For example, in Kogara village in Kas RC a segment was not asked to contribute in labour nor in cash, with the result that they had hardly any right to use the well.

The VWC usually counts between five and eight members. Often some members of the Sugar Committee are also member of the VWC, including the sheikh. If the village has a school, the teacher is mostly a member of the VWC.

This committee will normally consist of men only, due to the characteristics of the assigned duties and the traditional role pattern of men and women in the villages.

The tasks and responsibilities of the VWC are proposed to be the following:

before construction:

1. Represent the entire village on all matters concerning the well.
2. Sign the contract between the village and the project.
3. Appoint at least one caretaker, for maintenance of the well.
4. Organize labour required for siting and construction of the well.
5. Organize fund collection required for construction.
6. Appoint a representative in the Village Health Committee.
7. Agree on one of the three sites proposed by WADS for constructing a well.

after construction:

1. Supervise the caretaker(s), and support them in their job performance.
2. Organize fund collection for well-maintenance and spare parts purchase.
3. Be responsible for the timely purchase of spare parts for well and windlass (buckets, bucket holders and ropes included).
4. Give the Village Health Committee the necessary support in job performance.
5. Organize monthly meetings with the caretaker(s) and the VHC.
6. Construction and maintenance of a fence.
7. Contact the project, in case bigger repairs are required.
8. Introduction of system operation to nomads.

The tasks of the VWC on communication and co-ordination with the VHC and the caretakers should be stressed. (post-construction tasks nos. 1, 4, and 5). This is mainly to prevent that the VHC becomes isolated, and consequently that their influence on water use behaviour will be curtailed.

5.3 Caretaker

The role of the caretaker is rather restricted. His only responsibility will be to do maintenance on the

well (and windlass, if applicable) like greasing, tightening of bolts and nuts, and filling up cracks in well-lining, slab, or parapet.

Whenever present he should assist the VHC in supervising hygienic behaviour at the well-site.

To secure his functioning he should be supervised by the VWC

and possibly remunerated by the same.

The qualifications required are some masonry and mechanical skills, and basic reading and writing.

His training by the project is split up in two parts:

- on-the-job by participation in well construction (and windlass installation);
- short course in the village on routine maintenance and repairs.

5.4 Village Health Committee (VHC)

Preventive health care and water are considered by the villagers the sole responsibility of women. Therefore, the VHC consists mostly of women.

If present however, also the Community Health Worker is a member of this committee.

When important decisions have to be taken, the VHC always has to consult the VWC and ask for their support. This is the reason, why also the Sheikha is asked to be member of this committee: she has the status and relative power to freely express, communicate and defend the VHC's points of view towards the VWC.

Moreover, the VWC is requested to appoint a representative in the VHC to ensure open lines of communication between the two committees. This is also done, to prevent the VWC from feeling excluded from any activities undertaken by the VHC.

Emanating from the above mentioned traditional task division the following duties were formulated for the VHC:

1. Organize cleaning of the well-site if necessary.
2. Participate in hygiene education training.
3. Supervise and promote hygienic behaviour at the well-site as well as in the households.
4. Do household visits for monitoring storage in the household and discuss hygiene.
5. Monitor sanitary conditions at the well-site.
6. Monitor water transport.
7. Organize neighbourhood hygiene education meetings in which also the monitoring results are discussed.
8. Co-ordinate with the Village Water Committee and the caretaker.

6.1 The project and the offered technology

6.1.1 Introduction of the project

In brief the aims and objectives of the project, and its approach towards Village Water Supply should be explained.

The messages are simple and straightforward.

With regard to aims and objectives:

- improvement of water supply and health conditions
- alleviation of women's daily burden
- number of wells to be constructed in the project duration in the project area
- participating agencies (GOS and GON)
- relationship with the NCDRWR

With regard to the project approach:

- close co-operation with local government, i.c. Rural Councils
- low cost technology with VLOM
- participation by the villagers in decision making, planning, implementation, operation and maintenance
- contract between village and project
- sequence of project activities
- training events on village level

6.1.2 Low cost technology

Of course, it must be explained to the villages eligible for a well, why only low cost technology options are offered, because for them a dieselpump (on a borehole) usually seems to be the best solution.

To justify this choice and to make it acceptable, the following message has to be extended to the villagers and their representatives, i.c. the VWC:

By choosing for low cost technology, more villages can be served with a system, that can be repaired and maintained by themselves more easily.

- Notes:
- Sudan cannot afford expensive systems, when it wants to serve many villages.
 - The country cannot afford to import many spareparts which are needed to maintain more complicated systems.
 - Even if those spareparts could be imported, it would be very expensive for the villagers to buy them.
 - If the villagers could buy them it would still be very difficult to do repairs on the more complicated systems.

6.1.3 The options offered

During the geohydrological reconnaissance possibly suitable areas for well construction in or near the village are identified. These are communicated to the village by the hydrogeologist.

If possible, three areas are indicated within which the village will have to choose the future well site.

After the contract has been signed the actual siting by test drilling will be carried out at the chosen location.

If this is not successful, siting will be continued at the secondly preferred location.

The well structure consists of three distinct elements:

- the well itself, either built with concrete bricks or concrete rings (telescopic or not telescopic)
- the slab with drainage system
- the water lifting device

Concerning the well, slab and drainage, it is for the villagers merely a matter of accepting or not.

With regard to the water lifting device, however, a choice has to be made for one of the two options that are offered:

- a well with a windlass with communal buckets and ropes;
- a well without any special provision for lifting water.

These options, and their consequences for operation and maintenance, should be made very clear to the villagers and their representatives, the VWC, to facilitate a well-considered decision.

6.1.4 Decisions by the village

The village has to take two important decisions by concerning the choice between the different options offered by the project.

Thus the messages are:

Which of the three proposed sites for the well do you prefer?

Note: The distance from the chosen well site to the different segments/hamlets of the village should be as equal as possible, for a fair distribution of access to the well.
When the village does not agree with any of the sites proposed by WADS, it will be skipped from the programme, as was for example the case with Umm Gedeiti and Dagareis.

Considering the consequences for implementation, operation and maintenance, which type of system do you prefer:

- a well with a windlass, and communal buckets and ropes, or
- a well without this facility?

Note: The various arguments in favour or against a certain decision should be discussed with the representatives of the village in order to come to a well-considered decision.

Example: windlass with communal buckets and ropes

In favour: It makes water lifting easier.
More water can be lifted in one haul.
There is less risk for contamination of the water in the well.
It costs only LS 250 extra.

Against: It requires some maintenance.
Sometimes spareparts have to be bought.
The communal buckets and ropes need to be removed during night time to prevent theft.

These decisions lie in the field of responsibility of the VWC, and thus the messages are directed at this committee.

6.2 Operation and maintenance

6.2.1 **Operation of the system**

It is necessary to explain how the well should be operated as a system. Information should be given concerning:

- ease of lifting by means of a windlass (model)
- expected shorter waiting time with the new well
- cleaning of private buckets
- filling of transport containers
- risks of animals near the well

The messages are thus:

For wells with a windlass

The windlass works most easily when lowering one bucket while lifting the other one. This reduces the time it takes for one person to get sufficient water. Also the waiting time will be shortest, when operated like that. Only the communal buckets and ropes should be used for drawing water from the well.

For wells without windlass

No private buckets and ropes should be used for drawing water from the well. They might be dirty and might contaminate the water in the well and consequently unhealthy water will be consumed.

General

- The transport containers should be filled on and not off the slab.
- The slab and drain should be kept clean and smooth.
- A fence should be built, to prevent animals from coming too near to the well.

Notes: - Spilling of water outside the slab creates a muddy area around the well, which attracts mosquitoes and flies: carriers of diseases.

- Water spilled outside the slab will seep through the soil back into the well and may cause contamination, particularly when animal dung is around.

- Animals will touch water containers when they get the chance. It can be prevented by a fence.

6.2.2 Maintenance of the system

Although the WADS well and the water lifting device are very simple in their set-up, still some maintenance will be required to keep them operational.

It is important to discuss, why this maintenance has to be done on the village level. An understanding must be created of the village' own responsibilities towards the well, in order to minimize the dependency on external agencies.

Accordingly the sustainability of the well on the village level will be increased.

The pro's and cons of VLOM must be discussed, so that everybody concerned sees the inherent advantages.

Thus the message is:

- Routine maintenance and small repairs should be done and organized by the village.
- Caretakers should be appointed and possibly remunerated for this job. They will be trained by the project.
- Only big repairs which go beyond the capacity of the village, will be executed by the project.

Note: By this partial transfer of responsibilities to the village, the recurrent costs for the agency (i.c. the NCDRWR) will be reduced.

6.3 Contributions from the village

6.3.1 Cash contribution

As pointed out in the contract, a contribution from the village in cash is requested for siting and construction of the well.

The extension messages to the VWC on this topic are:

- An amount in cash of LS 1,000 should be paid to WADS, to contribute in the costs of the well.
- When a windlass is requested, this amount will be increased by LS 250.
- This amount should be paid when the contract is signed at the project office in Nyala.

- Notes:- The aim of the contribution is to facilitate the construction of as many wells as possible.
- Compared to the total cost of a well, this amount is still neglectable.

6.3.2 Labour contribution

The extension messages are here as follows:

- The village should provide 12 labour for the entire periods of siting and construction.
- The appointed caretaker(s) should participate in the construction of the well.

- Notes: - By this contribution the project can construct more wells in a shorter time.
- The caretaker will learn about the construction and maintenance of a well.

6.3.3 Ownership and user rights

It should be avoided that dominant groups succeed in pushing private interests, as it happened in at least one project village (Kogara, Kas RC).

Therefore the following message should be conveyed:

The legal owner of the WADS-IWSS is the NCDRWR. WADS offers the well as a community project. All villagers, who contribute to this village water supply project in labour and cash, or are represented by persons who do so, have equal user rights.

- Notes: - Villagers are fully aware of the meaning of this message. They know by experience, that water sources are useful means for political ends.
- Pointing out these legal facts during extension meetings, where usually hamlets and tribal segments of the village are represented, makes all participants aware of the rights they gain by participating in labour teams and in cash contribution.

6.4 Training at village level

6.4.1 Introduction

For a better performance of the various village activities in terms of operation and maintenance, the villagers should be convinced of the necessity for training.

Training at village level asks for a certain time and energy investment. Therefore, the reasons for or advantages of taking part in those training events have to be discussed extensively.

The extension messages are:

For maintenance of the system

The appointed caretakers should attend a training on maintenance of the improved system.

This training will take one morning.
Target group: caretakers and VWC.

For operation and cleaning of the system

The VHC should attend a training on:
- basic water hygiene education
- transmission of this knowledge to the villagers (i.c. the women).

This training will take 3 days in total, spread over three subsequent weeks, in which there will be a morning-, an afternoon- and an evening session.
Target group: VHC and VWC.

Note: The aim of the hygiene education training is twofold:

- To facilitate continued hygiene education by trainers from the village. The language of VHC members is more adapted to the language of the villagers.
- To establish a basis for further hygiene / health education to be carried out by an other organization like MOH or an NGO.

As many villagers as possible, especially women, should attend the evening sessions of the hygiene education training, which will be given by the VHC assisted by WADS personnel.

This training will take 3 evenings from 7 to 10.
Target group: villagers and VWC.

- Notes: - A better appreciation of hygiene among as many villagers as possible will lead to better health conditions in the village.
- Further hygiene/health education by MOH or an NGO will be facilitated when some basic awareness of hygiene is already present.

6.4.2 Training for caretakers

Details of this training are described in Appendix L of the final report of the project: "Construction and Maintenance of Hand dug Wells".

6.4.3 Training on hygiene education

The WADS hygiene education programme cannot be more than an introduction. In order to achieve significant changes in water and hygiene related behaviour, it should be followed up by a more intensive health education programme.

Such a programme can best be implemented by the responsible organizations which can fully focus on this subject, like the MOH or an NGO.

For this reason the messages are totally focused on water fetching and water use. They are derived from the following project targets:

- (a) Increased appreciation among villagers of the need of hygienic behaviour and proper handling of water.
- (b) Improved quality of the water in the well.
- (c) Permanent use of the well, also during and immediately after the rainy season.
- (d) Increased per capita consumption.

Target (a) forms, at least partly, the foundation of changes in the under (b). (c) and (d) described direction.

The reasons why a certain change of behaviour is desired, are therefore discussed with the training attendants in connection with the concrete messages, derived from the above mentioned targets:

How to safeguard the (bacteriological) quality of the water in the well.

- Keep the well-site clean.
- Prevent that the area around the well gets muddy.
- Do the laundry outside the fence, so that the well-site does not become muddy.
- Build and maintain the fence, so that no animals can come in, and no animals can defecate close to the well.
- Water animals outside the fence, so that no animal defecation is done close to the well and containers cannot be touched by them.
- Use clean buckets/containers and ropes, if applicable the communal ones.
- When fetching water, (if applicable) use the windlass and keep buckets/containers and ropes on the slab
- Store buckets/water containers and ropes in a safe/clean place at home.

How to safeguard the quality of the water unto consumption.

- Transport water in clean and closed containers and do not touch the water.
- Prevent animal drinking from containers not meant for that purpose.
- Keep the water storage containers ("Zeer") at home clean.
- Take water from the storage container in such a way that it does not get dirty, by using the "two-mug system".
- Store water at home in a clean and safe place, so that dirt cannot fall in, and children or animals cannot touch it.

To use more water for personal and domestic hygiene.

- Use more water when taking a bath.
- Take a bath more often, for yourself and your family.
- Use more water to clean household utensils.
- Clean household utensils more often.
- Wash your clothes more often.

To use the WADS-well throughout the year

Also when an alternative watersource becomes available, stick to the WADS-well, because its water is cleaner.

It is important to keep the training as pragmatic as possible: it is better to do something together with the villagers, then only discuss with them. Theoretical concepts are not in the scope of the villagers' daily experiences.

The training is held on three days in consecutive weeks, while the training days are split up in three sessions:

1. A morning session in which observation is done with the VHC on the topic of the day: hygienic behaviour at the well site, hygienic water transport, resp. hygienic water storage and use.
2. An afternoon session with the VHC in which the observations are analyzed and discussed, and in which the evening session with the villagers is prepared.
3. An evening session where the VHC members are in charge, during which the observations are discussed with the villagers, using flip-over sheets and colour slides as extension aids.

6.5 Monitoring and follow-up

Also in the next (production) phase of the project, monitoring on a variety of subjects will still be necessary. Such visits to the villages often comprise interviewing, which may take quite some time from the villagers. Therefore, they should be briefed on the monitoring to be carried out after completion of the well.

The message should be as follows:

Project staff will regularly visit your village to observe and ask about the following topics:

- technical condition of the well and the windlass
- operation of the windlass
- sanitary condition at the well-site
- water level and water quality in the well
- water quality in the households
- functioning of the VWC, the VHC and the caretakers
- after training is given: results of hygiene education.

- Notes:
- Other villages will profit from the findings on water and well use.
 - It can be checked if the well and/or windlass need maintenance, repairing, or adapting.
 - Further training needs can be identified.

In this chapter we have limited ourselves to describing the strategies of communication. "Methods and Means" are explicitly dealt with in Appendix H to the main report: "Extension Manuals".

Extension messages are used to communicate the WADS approach and to make it operational during preparation and implementation of the VWSP in the villages.

They are meant to:

- explain "hard" agreements in the contract
- help and find agreements on further topics of mutual interest
- inform villagers on forthcoming activities
- make the consequences of villagers' choices c.q. project proposals, transparent
- provide a blueprint for active village participation

The vehicles for transmission of these messages by the extension workers to the different target groups are:

- village meetings in the pre-construction stage
- training sessions in the post-construction stage.

Of course, these meetings and sessions are preceded by announcement visits or introductory meetings.

7.1 Village meetings

Two village meetings for each village are planned during the pre-construction stage.

Village meetings take between 2 and 3 hours. For men and women separate meetings are held simultaneously.

Male and female extension workers are indispensable for doing this job in order to be in line with cultural/social realities.

For both men and women, equal extension messages are conveyed.

Since a collective commitment towards the VWSP is requested, all villagers are invited to participate in the village meetings.

This is made clearly understood to the village authorities during announcement visits.

Furthermore, the need of key-persons being present is stressed:

- | | |
|---------------------|-----------------------|
| - political leaders | - CHW |
| - imam | - midwives |
| - school teacher | - traditional doctors |

7.2 Training sessions

7.2.1 **Caretakers**

Caretakers' responsibilities are few (see 5.3), but a proper introduction into system operation and maintenance tasks is indispensable.

Caretakers should be skilled in masonry and should have participated already during well construction in order to understand the overall technological concept of the system.

An important topic of training of caretakers is the installation of the windlass, its operation and maintenance requirements.

For installation of windlasses and for training events a number of villages, if possible, is clustered together as soon as the construction of wells is completed.

Duration of training:

- one evening for organization
- following (full) day for installation of device together with the caretakers.

7.2.2 **Hygiene education**

For training of VHC-members on "safe water, hygiene and better health" various morning-, afternoon- and evening sessions are organized during 3 days in consecutive weeks.

VWC-members, key persons and as many villagers as possible, in particular women, are also invited to participate.

When a change in behaviour patterns is asked by introducing modern concepts of hygiene, bottlenecks will be faced. Better health is highly appreciated by the villagers, but the way to achieve this through safer handling of water is not yet fully understood and followed.

In this case the quality of relationship built up between extension workers and villagers will be important for stimulation of collective commitment.

Even more important may be the design of a longer term hygiene programme with emphasis on implementation of hardware and activities related to reach the objectives.

The hygiene education messages may have to be more adapted to baseline data, onto which strategies can be built. At present only few data are available.

7.3 Extension tools

The extension tools applied in the project are strongly symbolic: mainly words and pictures. They are less handy than technical hardware, but they should prove to be as efficient as the latter.

7.3.1 **Manuals**

Manuals serve as guidelines for the extension workers in order to:

- structure village meetings and training events
- stick to proposed sequences of processing monitoring data

Four manuals have been prepared:

- Manual for Pre-construction Extension
- Manual for Hygiene Education
- Manual for Water Use Monitoring
- Manual for processing Water Use Monitoring Data

Reference is made to Parts A, B, and C of Appendix H of the final report: "Manuals for extension workers".

7.3.2 **Questionnaires and checklists**

For data collection during extension, hygiene education and monitoring, 12 forms have been prepared, - most of them used for monitoring purposes. Some of these forms have been included in Annex G.2 of this report, others can be found in Appendix H of the final report.

7.3.3 **Didactical extension material**

During pre-construction village meetings photos are used in order to show to the villagers the various technical elements/options of the water supply system. A scale model of a windlass has been prepared in the project's workshop.

For hygiene education the following material is used, which is described in detail in Appendix H:

- a flip chart from SRC/North Darfur. Various pictures were adjusted to the technical design of the WADS wells;
- a slide show of pictures shot at traditional water sources / WADS-wells in project villages;
- drawings which can be used for pin-board or flanel board of typical topics related to hygienic behaviour;
- a poster has been designed and will be printed soonest.

7.3.4 Contract and hand-outs

The contract (in Arabic) is handed over to the villagers during the first village meeting.

Rights and duties on part of the villagers and on part of WADS as well as the role of the Steering Committee as arbitrator are explained in all details to the villagers.

Hand-outs in Arabic containing the topics of pre-construction village meetings are also left to the villagers for further discussions and preparation of the second meeting.

This material can be found in Part A of Appendix H.

7.4 Feed-back

The degree to which two-way communication can be realized is an indicator for

- the quality of the extension work (planning, skills, materials, etc.)
- how much villagers are willing to co-operate
- how much villagers share / diverge from others' opinions

Topics of discussion and agreements / disagreements are noted down in reporting forms, and evaluated in the office.

Via a system of training-and-visit (fieldwork in alternation with regular training on basis of experiences of the teams and supervisory staff), the Village Projects Section attempts to overcome any observed short-comings in its extension work.

8.1 Design of monitoring system8.1.1 **Some remarks on impact-related targets and indicators for achievement**

- a) "Increased appreciation among villagers of the need of hygienic behaviour and proper handling of water"

is difficult to measure, if the risk of only receiving lip-services to extension messages should be avoided.

"Increase" to such an extent that health is really positively influenced can only be expected on the longer term, when during more intense extension work (by the MOH) positive and negative vectors, which support and jeopardize change of behaviour pattern with respect to water use, are identified together with the villagers, - and tackled by them, because they have become aware of the benefit.

All depends on to what extent villagers make the hygiene-extension messages operational, in how far they actually do something with them.

'Safer Water Storage', for example, needs additional supervision functions within households (to teach children), and it costs also some money.

- b) "Use of the well during- and immediately after the rainy season"

will, in this form, hardly be a successful extension message.

As a matter of fact, most villagers choose the water source more near to their premises, even if they know, that they do not choose for the more clean/clear water. In individual cases time might be invested into hygiene more easily, but for the majority of villagers it is expected, that they will hardly accept longer water journeys, when rahads (pools) are just beside their compounds.

- c) "Reduced time required for fetching water to the premises"

will be broken down into Waiting time at the source and Walking time to the source.

The former asks for the yield of the source, the latter for distance, and both are of quite different importance when Time savings will be analyzed.

But 'Time saving' for whom?

The nearer to the village WADS is able to provide a successful site, the more time women will gain for other household tasks, or for taking what they really need most: more rest.

Also: because their children will take over water collection, carrying less water per water journey, and doing therefore more. And if in addition higher water consumption is propagated, then for some households water collection might take longer with- than before WADS.

d) "Increased per capita consumption of water"

is dependent on several variables, -means of water transport is one.

'Water transport in a more economic way' should become a topic of hygiene education.

e) In order to demonstrate "Viability of the participatory Approach", the IWSS should be monitored for long.

Most activities involved in 'maintenance' and in 'proper handling of water' are laying in front of the villagers.

Best monitored is the activation of the villagers in augering and well construction, and in participation in training events.

8.1.2 **Monitoring tools**

The range of indicators for achieving objectives and targets corresponds to a number of monitoring tools needed for data collection.

It was important to keep the check-lists, questionnaires and monitoring sheets, which were prepared, as short as possible for the following reasons:

- to restrict the sacrifice of time from the villagers;
- to keep the data to be processed limited.

The code book, which is used for processing of data from the monitoring sheet for water use was translated by staff of the WADS - database in Khartoum into the dBase computer programme: Quest (see Appendix H: "Manuals for extension workers").

8.2 Active village participation

8.2.1 **Selection of options**

As could be expected, it was very difficult, to convince the target group, that the low cost water lifting technology offered by WADS, has real benefits in comparison with more expensive ones. This is demonstrated by the large number of requests for a dieselpump. Consequently, one can draw the conclusion, that the choice for low cost technology is not discussed sufficiently with the villagers.

More or less the same can be said about the messages concerning the choice for a certain water lifting device and the inherent operation.

There is a tendency in the villages to ask for anything that WADS would supply, without a thorough consideration of the required changes of behaviour coming with that choice. Indicators for this are the frequent not using of the windlass, the often deplorable state of the fence, the not or not timely daily installing of the communal buckets.

This means, that the features of the IWSS should be discussed more extensively with the applicants. For example, for the lifting device:

- Management is needed to keep the system operational.
- Basic maintenance has to be assured by the village, on the windlass as well as on the slab, the drainage, the well-site and the fence.
- The village has to buy spareparts.
- Extra discipline is needed for queuing up, and not to throw in the private lifting bucket.

In these fields there is an important task for the extension workers.

8.2.2 **Attendance to meetings and training events**

The pre-construction extension meetings (simultaneous for men and women) are generally well visited. Upto over 100 participants in one meeting has been recorded.

However, the variation is large; it also happened that only 10 people were present of a village population of 800.

Attendance rates of these meetings tend to be higher during and in:

- the dry season (no agricultural activities);
- when no or only few traditional water sources are available (the need for an improved water supply is then more pressing);
- relatively small villages (probably more homogeneous, with a consequently stronger communal involve-

- ment and social control);
- villages further away from towns (less distraction of participants to social meeting places like soukhs).

Concerning the training of VHC members, it appeared to be very important to fully inform the VWC on the hygiene education programme, in order to prevent feelings of being excluded with the VWC members. This should be done in the first, introductory meeting.

In this way it is also ensured, that the VWC will give full support to the training programme, and that women will not be forbidden to attend the training meetings, as happened in one of the villages.

It was also learned, that it is important, to explain beforehand, that when the VHC members visit the households, this is not done, to pry into private affairs, as was thought in some, but to assist in a good hygienic behaviour.

Figure 8.1 shows that the use of slides during the evening sessions of the hygiene education training (2nd batch of villages) has quite a positive influence on the attendance rates. However, more investigation is necessary to see if this large attendance does not have a negative effect on the impact of the presented messages.

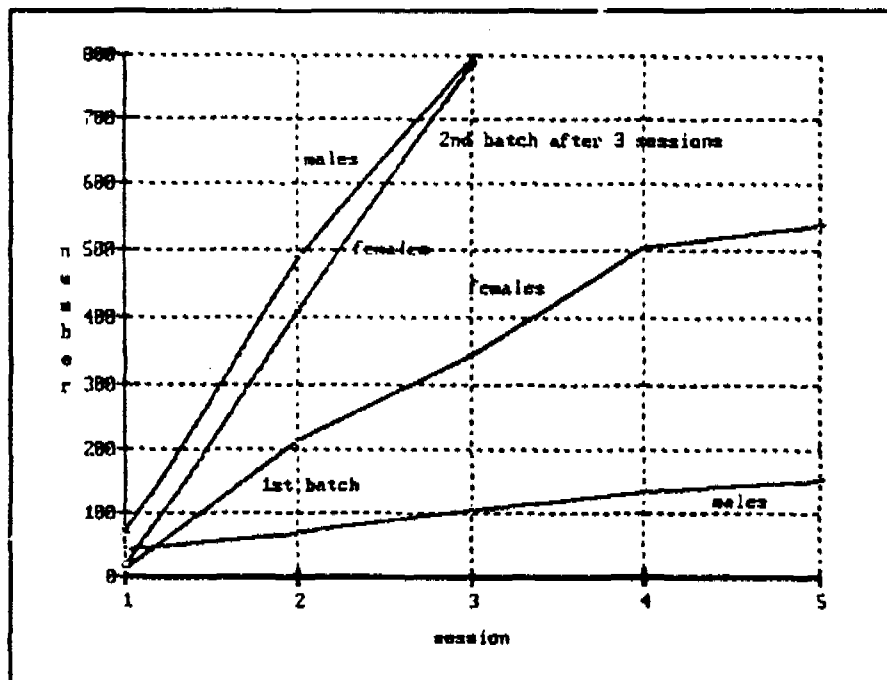


Figure 8.1 Cumulative attendance to hygiene education evening sessions, by sex and by batch. Four villages in each batch.

On several occasions, villagers complained about the time investment asked from them for the hygiene education programme. This was the reason, why the number of meetings was reduced from 5 to 4. More testing should be done, however, to see if a further reduction can be realised without loss of quality of the training.

8.2.3 Cash and labour contributions

Active village participation during augering and construction is easy to achieve, because the villagers' effort of building/repairing their water sources is a well known community activity, which usually has to be repeated every year.

The means-end relation is fully transparent to the villagers, and extension messages are easy to formulate, in principle. Tribal conflict, however, may cause a bottleneck and in that case WADS wells and village participation may become topics of political interest and competition (see Section 6.3.3: Ownership and user rights).

Both qualitative and quantitative data were gathered on this field of participation by the siting and construction teams of WADS which assisted the villagers.

In general it can be said, that participation in siting and construction was quite good: the villages complied to the labour requirements asked for in the contract.

Participation is better during or in: see Section 8.2.2 above.

Participation is less during or in:

- the agricultural season (there is much work to be done in the fields; in addition the wages rise for agricultural labour);
- village soukh days;
- when the watertable has been reached (traditionally the well is considered to be deep enough at that level, and the participants may not see any reason to continue; also, the work becomes more difficult).

The obligatory cash contribution by the village of LS 1,000 (just a well) or LS 1,250 (well with windlass) has never formed an obstacle for the villages, except in one case.

The village concerned was small and could not to their saying "not possibly collect so much money".

After consultation with the Steering Committee, the project decided not to create any precedent and the "poor" village was skipped from the shortlist.

The above mentioned down payment, however, is generally not the only financial contribution by the village. It appeared that about 60% of the villages pay the labourers, while about 40% use voluntary labour. The money

involved can be estimated at LS 4,000 to 6,000, depending on the season. Occasionally, when difficulties are met during construction, this amount may even rise to LS 10,000.

There seems to be a relationship between the homogeneity of a village and whether the labour is paid or not: homogeneous villages seem to be able to get voluntary labourers more easily.

On an average, therefore, the villages pay approximately LS 4,000 in total, which stands for 10 % of the total cost of the well.

The amount of LS 1,000 (or 1,250) was not changed during the project. Meanwhile, the Sudanese Pound devaluated by approx. 60 %, which would justify an increase to LS 2,500. However, the average income did not keep pace with this development, and moreover the rural areas do not yet know real money economies.

Unless financial benefits of improved health conditions (less payment to doctors and on medicine) can be proven to the villagers, there seems not to be much space for a further increase of the cash contribution.

8.3 Village organization

8.3.1 **Village water committee**

The monitoring activities dealing with the VWC are focused on their post construction responsibilities.

Part of them can be assessed by observation, by checking:

- the state of the windlass,
- of the fence and
- of the drainage system.

because these should be maintained by the caretaker under supervision of the VWC.

To appraise the VWC performance in its other functions, combined^[3] monitoring questionnaires were developed, to assess whether the VWC did:

- 1) Organize money collection for well-maintenance and spare parts purchase.
- 2) Carry the responsibility for the timely purchase of spare parts for well and windlass, buckets, bucket holders and ropes included.
- 3) Give the Village Health Committee the necessary support in performing its' job.

[3] Combined, because in the same questionnaires the functioning of the Village Health Committee and caretaker is monitored.

- 4) Organize monthly meetings with the caretaker(s) and the VHC
- 5) Contact WADS. in case large maintenance is required.

One monitoring questionnaire on functioning of the VWC is meant to be asked to the VWC, one to the VHC, one to the caretaker, and one to a sample of 10% of the households of the target population.

Thus the following questionnaires are dealing with the functioning of the VWC:

- Monitoring questions for VWC (Annex G.2, sheet 2)
- Monitoring questions for VHC (Annex G.2, sheet 3)
- Monitoring questions for caretaker (Annex G.2, sheet 4)
- Monitoring questions for villagers (Annex G.2, sheet 5)

Due to a late start of the monitoring activities and civil disturbances in the project area, adequate field testing was impossible before finalizing this report. And no systematic monitoring results can be given.

But obviously the crucial task of the VWC (maintenance responsibility) is still ahead: cases of the need of village level maintenance have not been reported yet, and therefore no judgement can be given yet on its functioning.

8.3.2 Village health committee

The functioning of the VHC is monitored on three different levels:

- How it functions in the village's organizational structure.
- Whether the members are active in hygiene education matters.
- Whether they supervise and promote hygienic behaviour at the well-site.
- Whether they have a good understanding of hygienic (water related) behaviour.

Like for the VWC, monitoring is done in combined questionnaires, aimed at the VHC itself, the VWC and the villagers. Additional information is obtained from an observation sheet on sanitary conditions at the well-site, and a questionnaire directed to the villagers, to assess the results of hygiene education.

The monitoring tools dealing with the VHC thus are:

- Monitoring questions for VWC (G.2, 2)
- Monitoring questions for VHC (G.2, 3)

- Monitoring questions for villagers (G.2, 5)
- Monitoring sheet for observation on sanitary conditions at the well-site (G.2, 6)
- Health education results monitoring list (G.2, 7)

For the same reasons as mentioned under 8.3.1, adequate field testing was impossible before finalizing this report. Subsequently no systematic monitoring results can be presented, except for the monitoring on sanitary conditions at the well site. This will be dealt with in section 8.5.

To give the VHC more power to enforce certain required behavioural changes, it can have a positive influence to appoint one VWC member in the VHC. This also improves the communication and understanding between the both committees.

When the village is asked to appoint a VHC, it should be stressed that women should be appointed who are active in the village, to prevent, that only 'seat-fillers' are appointed. They should be more or less assertive women, who dare to say things in public. That they can read and write will most certainly be an advantage.

8.3.3 Caretaker

No systematic monitoring data are available yet on this sub-ject. The first monitoring round in March 1989 showed that at that time only 2 out of 15 caretakers were operating the device. They could be found in Hay Draig (quarter of Nyala town), where the water clients pay for the water, and in Karo Karo. By June, however, also the caretaker in Karo Karo had stopped operating the device.

The reasons mentioned by the caretakers for stopping the operation are, that the device can easily be operated by the water clients themselves, and that it is too much work, to lift water for all the clients. Other data suggest, that some caretakers are usually not present at the well-site every day of the week and then only during part of the day.

For these reasons his duties have been reduced to maintenance and (occasional) supervision of hygienic behaviour at the well-site. Supervision at the well-site is left as a duty, because as some monitoring showed, this was by everyone considered as a task for the caretaker. Interesting in this respect is, that in all of the five villages monitored in May 1989, the VWC considered repair of the device and well already a responsibility of the VWC.

A monitoring tool is developed, to assess whether the decision, to cut the caretakers' responsibilities was right.

8.4 Utilization of water lifting device

Several aspects of the water lifting device were monitored during the pilot phase:

- the technical condition
- the utilization of the device
- possible adaptations proposed by the users

The monitoring results concerning the technical condition of the waterlifting device are discussed in Appendix L of the final report: "Construction and maintenance of hand-dug wells".

The other two items were checked during two monitoring rounds, the results of which are presented in Figures 8.2 and 8.3 below.

The first round from 27-03-89 till 02-04-89, containing 12 villages.

The second one on 16-05-89. In the second round project staff had to return to Nyala for security reasons after having monitored only 5 villages.

None of the villages where the spokes of the device were cut after the first round could be included in the second round. Hence, no data is available whether the cutting of the spokes did result in a larger percentage of well-users using these devices.

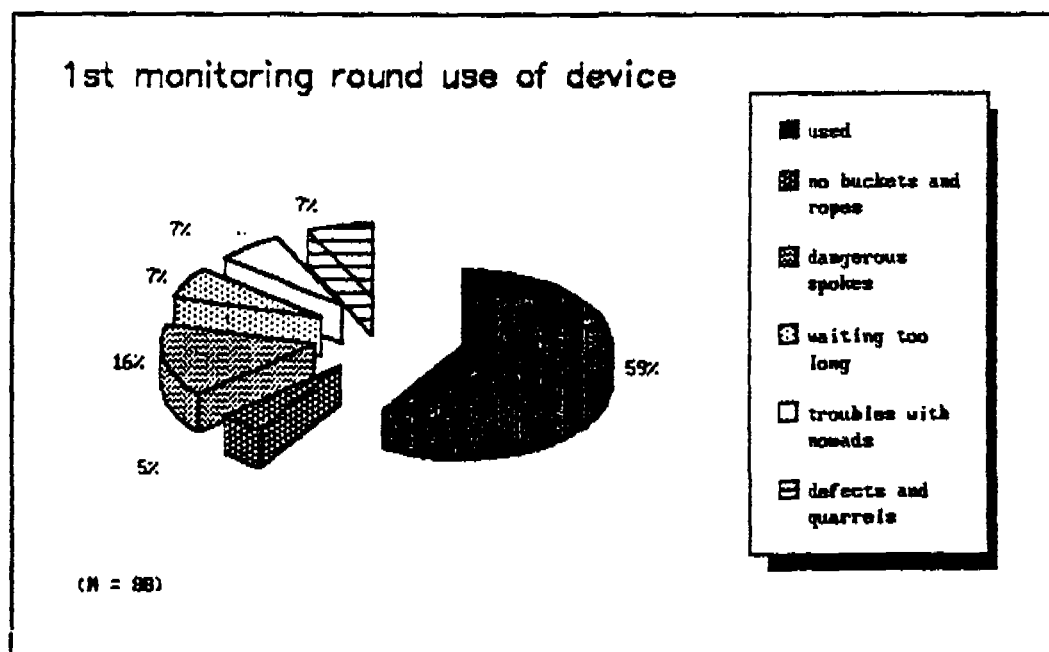


Figure 8.2 Monitoring results on utilization of windlass in 11 villages in Kas Rural Council. First monitoring round, March 1989.

The eight percent of the non-users in the second round who mention, that the device functions too heavy as a reason, could all be found in Nyama. There the device needed some maintenance. In Teigi, the use of the device was skipped, after the caretaker had been threatened by nomads, and subsequently stopped supervising the well-site.

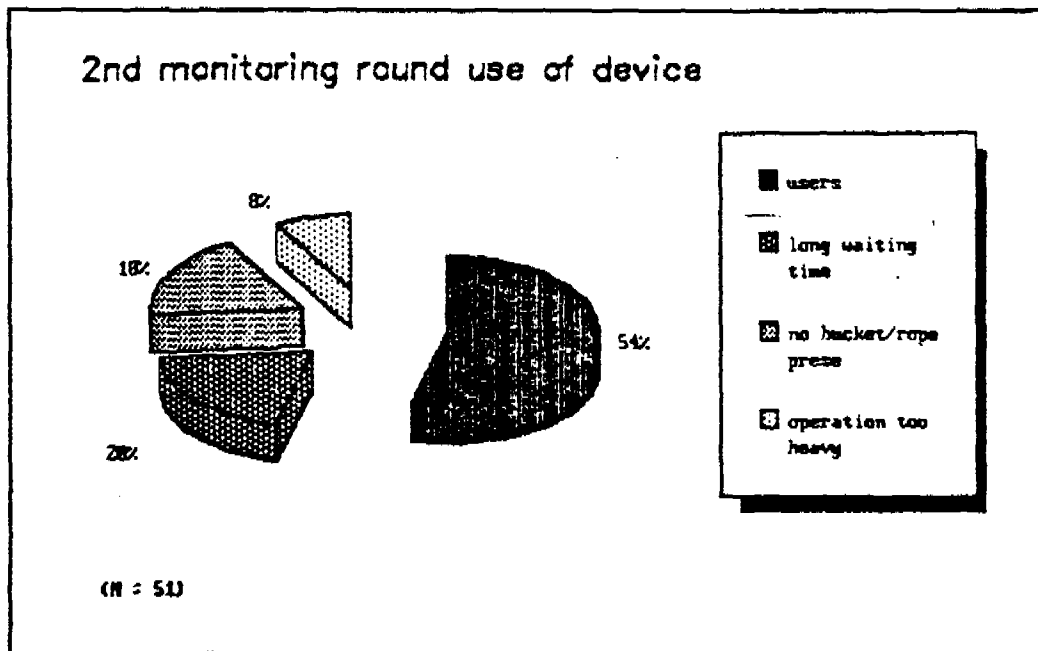


Figure 8.3 Monitoring results on utilization of windlass in 5 other villages in Kas RC. Second monitoring round, May 1989.

Eighty percent of the respondents in the second round stated, that at least 31 people were before them when collecting water during peak hours.

This raises the question whether, also in the future, the water collectors will wait until it is their turn to use the windlass. For - now already - more than one third of the non-users mentions as reason for not using the device, that the waiting time is too long[*].

[*] By calculation one can arrive at waiting times during peak hours of more than 30 minutes. Assuming, that the respondents estimate the number of people before them a little bit high and that it are only 20 people, one still arrives at 30 minutes or more when hauling up one bucket might take 1.5 minutes. Of course this is long for the water collector, especially when he/she sees, that the yield of the well is large enough, and that there is enough room left to throw in a private bucket.

However, one should be careful in judging this situation. Waiting time is psychologically loaded. What is important for the people is the time from arrival at the well until the first container can be drawn, however small that container.

Moreover, the project had a policy of digging only one well per village. With a large population (> 750) this might easily lead to additional waiting time.

From other monitoring activities a wider idea can be given on the usage of the device. Throughout the first months of 1989, 18 villages were monitored several times on sanitary conditions at the well-site (which will be dealt with later in this chapter). From this monitoring it appeared, that 7 villages were using the device and communal buckets exclusively, to lift water. The eleven other villages were using also or exclusively private lifting material. This means that in more than 60% of the villages with a device, it is not always used (see Table 8.1 below).

Table 8.1 Villages monitored throughout 1989

Device always used	Device not always used
Gemeiza	Karandei
Kebketta	Alla Jabu
Karo Karo	Alhamia Dirsu (hooks)
Kogara	Nyama
Daba Naira	Lawiya
Nabagaya	Dulu
Daba Kafot	Hellelat Kunjar
	Mileibida
	Teigi
	Bereidiko (hooks)
	Kalma Fur

It needs mentioning, that this picture might still be little optimistic, because the observations are done only during a short timespan. The chance exists, that during the day, especially when no WADS-personnel is present, people will use their private buckets and ropes.

The adaptations proposed by the users after the spokes were cut, were not dealing with the windlass. Most often a need for metal buckets was expressed, second the need for a dieselpump, third the need for an animal watering trough.

8.5 Impact of hygiene education

8.5.1 **Prospects and limitations**

The prospects of hygiene education in the case of open wells seem rather limited. On an individual level the larger part of the population may be handling the water very hygienically. When however, some individuals keep up an unhygienic behaviour at the well, the water will most probably continue to be contaminated.

The result will then be, that all people drawing and drinking water from the well, whether behaving hygienically or unhygienically, still can get sick from using the water.

Accordingly they will not get a positive reinforcement on their hygienic behaviour, consequently the chance that they will skip their hygienic behaviour will steadily increase.

Hence, it will be difficult to reach a significant decrease in water-borne^[3] diseases like diarrhoea and dysentery.

The prospects of hygiene education are more in the field of water-washed^[*] diseases, like skin- and eye infections. These problems can be tackled on an individual level. An improvement of individual hygiene can be expected to result in a reduced chance for eye- and skin infections.

This means, that the main prospects are expected in fields, where results of individual change in behaviour are least affected by the behaviour of other people.

8.5.2 **Indicators**

To be able to assess the hygienic condition in a village it is necessary first to identify indicators for hygienic behaviour.

The main indicators are:

- Sanitary conditions at the well-site.
The sanitary condition of the well-site will give a picture of the communal level of hygiene. Hereby this indicator will also give an idea of the functioning and impact of the VHC which should also

[³] Water-borne diseases: Infections spread through water supplies.

[*] Water washed diseases: Diseases due to lack of water for personal hygiene.

raise communal awareness concerning the importance of hygiene. No impression of the individual level of hygiene will be given however, like is done by the following main indicators.

- Hygiene related water-use, storage and transport patterns, like:
 - Liters per capita consumption per day.
 - Sanitary conditions of transport and storage containers.
 - Hygiene concerning water-use.
 - Used watersources.

These indicators give a clear picture of the individual level of hygiene.

8.5.3 **Monitoring tools**

Based on the indicators a "Monitoring sheet for observation on sanitary condition at the well-site" was developed.

In this sheet the following topics are covered which form part of the sanitary condition of the well-site:

- Whether a fence is present and in good condition.
- Whether there are animals or laundry within the fence.
- Whether the slab is clean and in good condition.
- Whether the drainage is clean and in good condition.
- Where the water-transport containers are placed.
- Whether the windlass (if present) and communal buckets and ropes are used.
- (When private buckets are used) Whether the private lifting buckets are cleaned before use.
- Whether the area around the well is clean.
- Whether there is a soaking pit.

On the basis of the data gathered by this monitoring tool a rating system was developed to assess the relative hygienic condition of the well-site. A scale from 1 to 10 is applied.

For the data on sanitary condition at the well-site a dBase programme should be developed. A proposal for the design of such a programme has already been prepared.

8.6 Water collection and consumption

8.6.1 **Introduction**

For the purpose of verification of (secondary) impact targets a rather sophisticated monitoring system has been designed and implemented, which is not only applicable

for the WADS-wells, but also for other water supply systems.

It aims at getting an indication:

- how many people are using the well
- how many people from what distance can be served by one well without creating problems in accessibility of the well and availability of water.
- of water consumption for drinking and personal and domestic hygiene.
- time savings with the implementation of the WADS well.

It also aims at providing:

- data to decide on well siting criteria and an optimum number of persons-well ratio.
- background data for the further development of the hygiene education programme to help increase hygienic practices and to contribute to a hygienic situation around the well.

The entire procedure of data collection, processing and interpretation is extensively described in Part C of Appendix H to the final report of the project: "Manuals for extension workers"

8.6.2 Methodology

In total some 40 wells have been constructed during the pilot phase of WADS. Eight of these (\pm 20 %) were monitored on water collection and consumption patterns.

In order to arrive at a meaningful sample stratification, a number of parameters had to be selected, which were expected to be relevant for differences in water use patterns.

Table 8.2 below shows the selected villages and the different parameter values.

Per village two field days were required for data collection. On the first day interviews were held in households to get some idea about irregularities in water collection, size of containers, influence of the presence of nomads, etc.

Also a village map and an area sketch map were drawn on that day.

On the second day observation and interviewing takes place at the well-site, whereby raw data are entered on a monitoring sheet.

In the office the data processing (countings and calculations) are executed by the specially designed dBase programme "QUEST". It provides statistics and a Data Display Sheet for each monitored village well.

Further background data on methodology (data collection and limitations of the method) are given in Annex G.3 of this report.

VILLAGE	TRIBE(S)	VILL. POPUL. STATED	LIVESTOCK OWNED DONKEYS	DEPTH OF WELL	DE-VICE INTRO DUCED	HYG. EXT. YES/ NO	DIST. WADS WELL	DRY S. WATER DIST- ANCE	WAIT. TIME (min)	WATER PROBLEMS QUALITY
KOGARA	FUR	300	3000 280	22 m	NO	NO	0.7km	3 km	60	BAD
DAWRA	FUR	4260	6000 150	14 m	---	NO	0.7km	1.9km	90	GOOD
AWEEN RADO	FUR ZACHAUA	760	2900 300	13 m	---	YES	1.2km	2.1km	240	GOOD
GAMAIZA	FUR	1500	15000 40	9.6m	YES	NO	0.6km	2 km	150	BAD
DABA KAFOT	RIZEIGAT DAJU	800	8600 400	14 m	YES	YES	0.3km	0.3km	60	BAD
DABA NYRA	FUR	1500	20600 500	17 m	YES	NO	0.2km	0.7km	90	BAD
KARO KARO	FUR BANIHAB	2650	3500 80	13 m	YES	NO	0.7km	1.5km	90	BAD
ALLA GABU	ISSERRA SAADA	910	4500 1000	16 m	HOOKS YES	NO	1.3km	1.3km	90	BAD

Table 8.2 Selected villages and characteristics

8.6.3 Findings

An overview of the more important data/findings for all eight monitored villages is given in Table 8.3.

They are based on:

- results of 2 monitoring rounds in Nov./Dec. '88 (shortly after rainy season) and March '89 (middle of dry season).
- observation/interviews done during extension

Detailed findings of this monitoring exercise are given in Annex G.3 of this report.

VILLAGE RURAL COUNCIL	KOGARA KAS	DAWRA KAS	AWEEN RADO KAS	GAMAIZA KAS	KARO KARO NYALA-SW	ALLA GABU NYALA-SW	DABAKAFOT KAS	DABA NYRA KAS
TRIBE(S)	FUR	FUR	FUR ZACHAU	FUR	FUR BANI HALBA	ISSERRA SAADA	RIZEIGAT	FUR
DATE OF SURVEY	01/11/88	06/12/88	07/12/88	01/03/89	13/03/89	14/03/89	21/03/89	20/03/89
PERSONS SERVED	383	894	143	589	348	378	201	401
DEPTH OF WELL	22 m	14 m	13 m	9.6 m	13 m	16 m	13.8 m	17 m
WATER LIFTING DEVICE:-TYPE -OPERATED YES/NO	WINDL/TANK NO	-----	-----	HANDLES YES	TANK/HANDLE YES	HOOKS YES	HANDLE YES	HANDLE YES
HYGIENE EDUCATION YES/NO DATE	NO	NO	YES 12/88	NO	NO	NO	YES 12/88	YES 12/88
CONTAM.:TOT/FAEC./DATE CHLORINATION: NO / YES-DATE	30/10/389 Y-7.2.89	20/12/389 NO	26/12/389 NO	4/0/3.89 Y-13.2.89	20/16/389 Y-1.3.89	150/12/389 Y-28.2.89	2/0/3.89 Y-3.2.89	8/2/3.89 Y-4.2.89
DISTANCE TO WADS WELL	0.7 km	0.7 km	1.2 km	0.6 km	0.7 km	1.3 km	0.3 km	0.2 km
DISTANCE TO TRADITIONAL DRY SEASON WATER SOURCE	3.0 km	1.85km	2.05km	2.0 km	1.5 km	1.3 km	0.3 km	0.7 km
REDUCED DISTANCE TO WATER SOURCE WITH WADS	2.3 km	1.15km	0.85km	1.4 km	0.8 km	0.0 km	0.0 km	0.5 km
IN-/DECREASE OF W.JOURNEYS PER DAY/H.H. WITH WADS	+ 69%	+ 7%	+ 7%	+ 19.5%	+ 40%	+ 30%	+ 15%	+ 9%
INCREASE/DECREASE OF LENGTH OF W.J.PER DAY/H.H.WITH WADS	- 60%	- 59%	- 37%	- 64%	- 35%	+ 30%	+ 15%	- 70%
WATER COLLECTORS: CH / F / M (IN %)	30/65/5			20/79/1	34/59/7	18/77/5	36/59/5	25/71/4
WATER COLLECTED: ON FOOT (IN %) BY DONKEY	67 33	62 38	42 58	94.5 5.5	61% 39%	27% 73%	86% 14%	63% 37%
WATER COLLECTED BY CHILDREN: (IN %)				16.8	42%	27%	24%	30%
AMOUNT OF WATER CARRIED PER WATER JOURNEY: AVERAGE ON FOOT BY DONKEY	17.5 l 14.2 l 32.4 l	20.9 l 16.3 l 38.6 l	25.2 l 17.6 l 36.9 l	16.2 l 15.5 l 61.4 l	22.6 l 16.8 l 50.9 l	33.7 l 18.3 l 49.3 l	19.1 l 17.1 l 60.0 l	23.4 l 17.4 l 56.3 l
L.C.D.- AVERAGE BEFORE WADS	7.7 l	7.3 l	5.8 l	9.65l	9.7 l	8.1 l	10.0 l	8.4 l
L.C.D.- AVERAGE WITH WADS	10.0 l	7.8 l	6.2 l	10.8 l	13.2 l	10.2 l	11.0 l	9.1 l
L.C.D.- IN-/DECREASE WITH WADS (IN %)	+ 30%	+ 7%	+ 7%	+ 12.4%	36%	27%	10%	9%
HOUSEHOLD SIZE: AVERAGE	5.7	5.3	5.1	3.8	4	6.5	4.7	5.2
L.C.D.- IN HOUSEHOLDS > AVERAGE H.SIZE	6.7 l	6.1 l	4.3 l	7.8 l	11.6 l	9.4 l	9.4 l	7.6 l
L.C.D.- IN HOUSEHOLDS < AVERAGE H.SIZE	13.6 l	9.9 l	9.4 l	18.4 l	15.8 l	11.6.l	14.4 l	12.0 l
L.C.D.- IN HOUSEHOLDS WHICH DO W.J. ON FOOT	9.2 l	6.8 l	4.8 l	10.8 l	12.6 l	8.3 l	10.6 l	8.6 l
TIME: FOR WATER COLL.BEFORE WADS PER DAY/H.H.-DRY SEASON	4 h 40	4 h 27	8 h 47	8 h 15	3 h 00	3 h 52	1 h 40	3 h 48
TIME: FOR WATER COLL. WITH WADS PER DAY/H.H.	1 h 52	1 h 35	1 h 42	2 h 05	1 h 41	2 h 40	1 h 12	0 h 58
TIME GAIN (%): DIFFERENCES IN L.C.D. CONSIDERED	60%	64%	80%	75%	43%	31%	28%	74%
WAITING TIME-AVERAGE WITHWADS PER W.J. (min)	0	7	0	20	5	11	14	20
WAITING TIME-AVERAGE PER WJ BEFORE WADS DRY SEASON (min)	60	90	240	150	90	90	60	90

Table 8.3 Summary of water collection and consumption monitoring data and findings

9.1 Planning

The planning procedure for the Village Projects Section (VPS) is rather complex due to the many activities the section is involved in.

In addition all activities of the VPS are intertwined with the activities of the other sections. This means, that a certain activity must be well under way, before another one can start, subsequently a strong interdependency is created between the different sections.

9.1.1 Pre-construction extension

The following activities can be distinguished of which the starting date is directly determined by the progress of the previous activity.

- * Bringing the request forms to the Rural Council, and explaining what the RC is requested to do (1 person):
 - Distribute them to the villages according to their priority.
 - Explain to the villages to which they gave a request form, what it is all about.
 - Explain the deadline for returning the request forms to the rural council (usually two weeks after they have been handed over to the Rural Council).
 - Gather the request forms before the deadline.
- * Collecting the request forms at the Rural Council at the agreed upon date (about 14 days later) and handing over of the requests to the Groundwater Exploration section (GES). This section is going to do the baseline survey (i.e. preliminary geohydrological data, data on distance to traditional well, average waiting time with traditional well, population size, hamlets using the well).

About 10 days later the GES hands over a priority list of the first 20 or more villages (more if necessary to facilitate clustering of villages for efficiency reasons). In this priority list the villages which requested a WADS-well are ranked good, medium or bad (concerning geohydrological conditions) and according to waiting time and distance to traditional well.

- * The VPS then makes clusters of villages located close together, and starts pre-construction extension.
- Every village is visited twice. Every visit takes half a day. This means, that to cover one village one full "teamday" is needed.
- The first visit deals with What WADS is all about, i.e. an introductory meeting.
 - During the second meeting it is explained more specifically, what is required from the village before being eligible for a WADS-well:
 - Forming of committees.
 - Providing labour.
 - Providing material.
 - Pay LS 1000 for well and LS 250 for windlass.
 - Housing for construction team.
 - Agree on one of the three sites for a well found viable by WADS.
 - During the second meeting the contracts are explained and handed over to the village, with the request, to return them to WADS filled and signed within 14 days.
 - The following two weeks signed contracts drop in at the office.

When sufficient contracts have been returned to facilitate clustering of villages, which will approximately be after 14 days, the GES can start augering and siting in the villages which have signed the contract. With five hand auger teams maximum 12 wells per month can be sited.

Clusters of villages have to be made for efficiency reasons. If planned well, it should be possible to make clusters for construction after 2 weeks, when about 6 villages have been augered.

When this is done the Well Construction Section (WCS) can start construction in those villages.

From this point onward the WCS takes to organize construction of the wells, which takes \pm 1 month per well per team.

The above is represented in the barchart in Table 9.1 below, for a fictional number of 20 wells in one rural council.

Table 9.1 Planning of the pre-construction phase

activity	1	2	3	4	5	6	F	1	2	3	4	5	6	F	1	2	3	4	5	6	F	1	2	3	4	5	6	F	1	2	3	4	5	6	F	1	2	3	4	5	6	F
requests 1	■																																									
requests 2																																										
baseline																																										
cont. pres.																																										
cont. back																																										
augering																																										
construction																																										

Legend

■	= estimated time required to be able to create clusters of villages.
▨	= estimated time for 20 villages/wells.
1	= continues for 1 more month (2 machine + 1 hand auger team)
2	= extends for a longer period. 10 constr. teams 10 wells/month

Thus on day:

- 1: Handing over of request forms to Rural Council and explanation of what we ask from them by VPS.
- 15: Collecting of returned request forms at Rural Council by VPS.
- 16: GES can start with baseline survey in villages which returned request forms in time (\pm 2 villages per day).
- 22: Collecting of request forms by VPS which were returned after the deadline.
- 29: VPS can start extension on contract preparation in villages which received a good or medium verdict by GES (2 meetings per village = 1 day per village).
- 37: Signed contracts can be expected back by this time.
- 43: Augering by GES can start in the villages which returned the signed contract (\pm 3 days per village)
- 57: Construction by WCS can start in the villages where good sites were located.

Of course, the time schedule explained above is nothing but an ideal typical schedule, which gives the minimal time requirements for pre-construction activities.

9.1.2 Post-construction extension

The post-construction extension activities are less inter-twined with the activities of other sections, and therefore somewhat simpler to be planned.

The first extension should be started immediately after installation of the lifting device and the caretaker training by the WCS.

It deals with an explanation to the villagers on how to use the well and lifting device, technically as well as hygienically.

This meeting should be followed by the official inauguration and handing over of responsibility for the well.

This would take one day per village/well.

Hygiene education could best be started shortly after the inauguration of the well, when the well is still new to the people and they are still enthusiastic about it. Two weeks in between would be a good timespan.

One hygiene education team could cover 4 villages/wells in one month.

Approximately 10 wells will be constructed per month. This means, that there have to be at least three hygiene education teams. In every cycle of ten wells, there will be one team which covers 4 villages with hygiene education, and two which cover 3 villages each.

The teams only covering three villages have time to spare to do monitoring or office activities. The team which covers four villages should be a different one for every cycle of ten wells.

The schedule given in Table 9.2 could be the planning guide-line for a construction season of ± 6 months. The other months can be used for holidays, training, more extensive reporting and thorough analysis of the monitoring data.

It should be mentioned once again, that these schedules are merely guidelines, and that flexibility in implementation is a prerequisite.

Table 9.2 Planning of the post-construction phase

Cycle one

activity	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F
10 wells	■ 1 ■■■■■■■■■■																													
extension	■■■■■■■■■■■■■■■■■■■■																													
inauguration	■■■■■■■■■■■■■■■■■■■■																													
hygiene 4 vit																														
hygiene 3 vit																														
hygiene 3 vit																														
10 wells																														

Cycle two:

activity	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F	1	2	3	4	5	F
10 wells	■ 2 ■■■■■■■■■■																													
extension	■■■■■■■■■■■■■■■■■■■■																													
inauguration	■■■■■■■■■■■■■■■■■■■■																													
hygiene 4 vit																														
hygiene 3 vit																														
hygiene 3 vit																														
10 wells																														

Legend

■	= introduction	■■■	= 2nd session
■■■	= 1st session	■■■■	= 3rd session

spaces between bars = days available for monitoring or office work.

9.1.3 Monitoring

Several topics have to be monitored in the WADS village water supply programme programme by the VPS:

- Operation of device.
- Sanitary conditions at the well-site.
- Functioning of VWC.
- Functioning of caretaker.
- Functioning of VHC.
- Results of hygiene education.
- Village organization.

This is done by means of the following questionnaires and/or observation sheets:

- Operation of device (observation + questions, 5 to 10 minutes per sheet).
- Sanitary conditions at the well-site (observation, 5 minutes).
- Questions to VWC (functioning of VHC, caretaker and VHC, 30 minutes)
- Questions to caretaker (functioning of caretaker, VWC and VHC, 20 minutes)
- Questions to villagers (functioning of VWC and VHC, 20 minutes)
- Questions to VHC (functioning of VWC and VHC, 30 minutes)
- Questions to villagers on hygiene education results (results hygiene education, questions + observation on storage, 20 minutes)

The times mentioned are estimated averages.

In an assumed village of 100 households, to do all the subjects to be monitored would require 8.5 working hours. In practice this would mean that one day is needed to cover one village of this size by one team of one male and one female extension worker.

The female extension worker should start immediately doing the interviews which have to be done in the households, while the male extension worker interviews the VWC, the Caretaker and watercollectors at the well-site on operation of device.

To prevent that the individual villagers are questioned for too long a time, the first questionnaire for villagers could be done in every 10th household, skip 5 households, then do the second questionnaire for villagers.

When following this schedule this means, that every village can be monitored 2 times every three months. The monitoring could be performed in the time gaps between the hygiene education sessions of the teams which cover a cluster of only three villages.

However, this is an ideal situation, with an optimal output, without taking into account any constraint or backlash.

This would work for the first year. For the subsequent years it is proposed to continue monitoring on a number of 50 to 60 wells. The schedule proposed in Table 9.3 is a tentative one and should be adapted when the monitoring results ask for it.

Table 9.3 Tentative VPS monitoring schedule

year	number of wells	number of wells to be monitored constructed in different years	total number of wells to be monitored
1	60	60 (1)	60
2	120	30 (1) + 90 (2)	60
3	180	15 (1) + 15 (2) + 150 (3)	60
4	240	10 (1) + 10 (2) + 10 (3) + 210 (4)	60
5	300	10 (1) + 10 (2) + 10 (3) + 15 (4) + 255 (5)	60

9.1.4 Further monitoring of water collection

Criteria for sample choice

The results of ongoing monitoring activities will influence the precision with which criterions will be applied, when findings are analyzed and compared with past experiences.

The following criteria for sample stratification are proposed for the coming monitoring round:

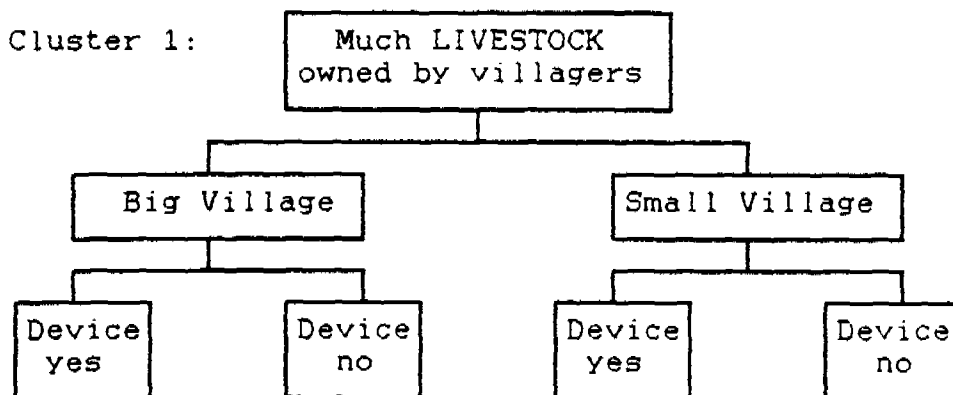
- SEASON - 4 seasons can be identified:
 - Jul-Sep: rains; pools/wadi used as water sources; peak in agric. activ.
 - Oct-Jan: many mashish available as sources rel. near to village; peak agr. activ.
 - Feb-Apr: shift to only sources available till rainy season: WADS wells/ biar/ hafir/ water-yards; slack time in agric. act.
 - May-Jun: peak dry season; some of the water sources used till now run dry start with agricultural activities

- VILLAGE SIZE. Attention should be paid to 'stated population size' and 'actual Nr. of well users'
- Number of NOMADS settling in vicinity of village
- Installation of WATER LIFTING DEVICE
- HYGIENE EXTENSION carried out
- Number of LIVESTOCK owned by the villagers
The pattern of livestock watering is still quite vague. Realistic figures are needed for planning animal watering facilities.
This criterion should be integrated into sample stratification during a full monitoring season.
- DEPTH of WADS well
- DISTANCE to the WADS well
- ACCESSIBILITY of site. During the dry- and subsequent rainy season 2 wells should be monitored which are not easily accessible during the rains.

Proposed choice

Each monitoring round could be planned under a specific "leitmotif", which splits the sample into two from the very beginning e.g. hygiene education carried out or not, nomads, village size etc.

An elaborated proposal is given in Figure 9.1 below. In further breakdowns other priorities can be integrated.



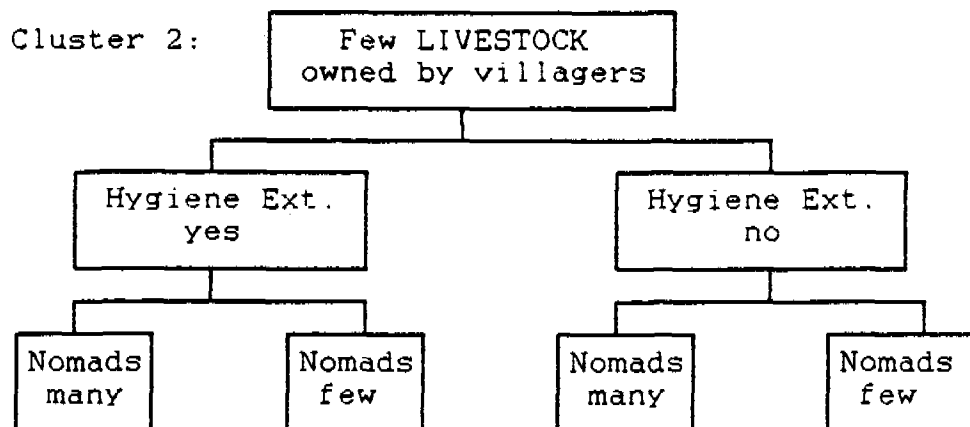


Figure 9.1 Proposal for monitoring 8 villages on water collection and consumption

Sample size

For Water Use Monitoring a sample of 20% of all implemented IWSS is considered necessary by reason of high sample stratification: 9 criteria are considered to be relevant for differences in water use patterns (see above).

In addition a small sample (5 villages/IWSS) should be followed up preferably over the whole production phase of WADS (5 years).

Table 9.4 Sample size in production phase

Construction period	Nr. of IWSS implemented	Nr. of IWSS monitored
0	40	8
1	40 + 30	4 + 4 + 5
2	70 + 60	4 + 8 + 5
3	130 + 60	4 + 8 + 5
4	190 + 60	4 + 8 + 5
5	250 + 60	4 + 8 + 5
total	310	89 = 29 %

Water distribution in the household

In addition to monitoring WADS IWSS, water use at home should be observed in a few villages.

'How much' and 'What kind of' water is used for 'Which purpose' cannot be answered at the moment for the project villages. But systematic studies done within this field provide useful findings. [']

9.2 (Wo-)manpower

9.2.1. **Qualifications of extension workers**

It is the extension workers' task to help and lay the foundation for an active and effective village participation in the WADS village water supply programme.

Their qualifications should be manifold:

- firm in all topics concerning the VWSP
- knowledgeable about technical aspects of improved water supply systems
- trained in extension techniques (data collection/ map drawing/ sampling/ communication skills)
- open-mindedness and moral commitment to use acquired knowledge for the benefit of others, otherwise the relationship between extension workers and villagers will lack depth and credibility.
- understanding of socio-economic/cultural constraints and positive resources for WADS-VWS policy.
- trained in data analysis
- basic knowledge of computer programmes operation
- good knowledge of the english language
- ability to work independently within a team

9.2.2. **Training**

Training of extension workers on the job and in the office has been, and should continue to be, regarded as having high priority.

During the project's pilot phase the following training has been given for VPS-extension workers:

- | | |
|----------|---|
| Sep. '87 | <ul style="list-style-type: none">- plan of operation- well construction technique- siting and augering- drawing maps- communication skills |
|----------|---|

['] Sandy Cairncross, Joanne Kinnear: Measurement of the elasticity of domestic water demand, London School of Hygiene and Tropical Medicine, London, 1988.

- data collection methods
 - village organization
 - topics of hygiene-education
 - role of women in village water supply
 - village selection/priority ranking
- Nov. '87
- applying learned sampling technique
 - leading formal/informal interviews
 - doing independently small research of own choice: structure / interpretation / presentation
 - drawing accurate village maps
- Febr. '88
- training on pre-construction extension/ extension messages (lectures/role play)
- Aug. '88
- office training on topics of 'safe water, hygiene and health'
- Nov. '88
- training on 'water use monitoring'
- April '89
- training on operating QUEST-computer programme

In the course of the project a start was made to develop a "training-and-visit" system, whereby:

- field data / experiences among VPS-staff is exchanged on a regular basis;
- processing and interpretation of field/monitoring data are organized as training events.

9.2.3 Staff requirements

For the distribution and collection of request forms to/from a Rural Council 1 person is sufficient. Depending on the distance (s)he can probably do it in one or two days.

To facilitate a quick contract preparation cutting the time needed to do extension and contract preparation in half (the time schedule in Table 9.1 is based on one extension team) two teams would be advisable. Every team should be composed of one male and one female member.

For 60 wells per year, these two teams would be occupied for a total period of 5 to 6 weeks. In other words: 10 to 12 team-weeks, or 20 to 25 man-weeks are required.

In order to carry out the post-construction extension tasks, it would be recommendable to have four hygiene extension teams.

Three teams will be in the field permanently, while the fourth team is dealing with more extensive reporting.

monitoring data analysis and other office jobs. Additionally this extra team can assist the other teams if there is need for it.

To have access to both male and female villagers it is required, that the hygiene education teams are constituted of a male and a female extension worker.

Monitoring on the topics mentioned in 9.1.3, can be done by the same hygiene education teams.

Man-weeks required per construction period for monitoring on water collection and consumption:

a) Fieldwork:		
3 x 17 (IWSS) x 1/2 (week) x 4 (ext. workers)	=	102
1 x 2 (IWSS) x 1/2 (week) x 4 (ext. workers)	=	4
b) Data processing:		
3 x 2 (week) x 4 (ext. workers)	=	24
		130
Total man-weeks		130

The barchart in Table 9.5 shows the distribution of staff over a period of one year. In total 12 extension workers will be required, of whom 50 % men and 50% women.

Table 9.5 Barchart of extension staff

Activity	J	A	S	O	N	D	J	F	M	A	M	J	J
Pre-constr. extension	:	:	:	:	:	:	4	:	:	:	:	:	:
Hyg. educ. + inaugur.	:	:	:	:	:	:	:	5	:	:	:	:	:
Monitoring	:	:	:	:	:	:	:	2	:	:	:	:	:
Mon. water collection	:	4	:	:	4	:	:	4	:	:	:	4	:
Training	:	:	:	:	3	:	:	:	:	:	:	:	:
n.ed. staff	:	:	:	:	:	:	:	:	:	:	:	:	:

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ANNEXES

ANNEX G.1	BASELINE DATA
ANNEX G.2	MONITORING SHEETS
ANNEX G.3	MONITORING OF WATER COLLECTION AND CONSUMPTION

ANNEX G.1

BASELINE DATA

- 1 Method of data collection
- 2 Physical infrastructure
- 3 Social structure
- 4 Organizational capacity
- 5 Communication pattern and decision making
- 6 Village economy
- 7 Ownership and user rights

1 METHOD OF DATA COLLECTION

Findings are based on data received from villagers in the project area through

- formal interviews
- informal interviews
- observation
- village (sketch) maps

A: In 5 WADS-project villages a survey has been done during 2 weeks (RC Kas/Sept. '87).
Following topics were covered:

- Census data
- Village organizations
- Communication channels
- Decision making
- Village economy
- WADS-well
- Women and Water
- Position of women in village life

B: During extension activities relevant data from each project village were collected systematically (questionnaires/village sketch map/reporting forms)

C: Background information about socio-structural and cultural properties of Darfur was gained by literature study (sociolog./ethnolog.).

D: Reports from other organizations than WADS active in South Darfur/West Sudan have been studied (UNDP/UNHCR/WSDC/Oxfam/MSF/SCF).

2 PHYSICAL INFRASTRUCTURE

Physical Infra - Structure
in WADS - Project Villages
Comparison between Rural Councils

Rural Council	Kas	Nyala South - West	Id El Ghanam
Nr. of Project Villages	17	15	22
Mosque	15	10	19
Primary School	5	9	11
Secondary School	0	1	0
PHCU	3	7	8
Dispensary	0	1	1
Veterinary	0	1	0
Plant Protection Office	0	1	2
Experimental Farm	0	1	0
Oil Factory	0	1	0
Scikh	3	7	13
Grainmill	6	13	14
Bakery	0	12	5
Village Shops	20	38	42
Police Station	0	2	1

EXPRESSED NEED FOR RURAL DEVELOPMENT
BY VILLAGERS IN KAS /NYALA S.W.

RURAL COUNCIL	HEALTH PHCU/Midwives	EDUCATION Schools/Adult Education	SECURITY Police Post
K A S	21	10	4
N Y A L A South-West	19	10	12

RURAL COUNCIL	INCOME GEN. PROJECT	A G R I C U L T U R E		
	Grainmill Bakery	Water Pump	Plant Protec. Office	Tractor
K A S	4	1	0	1
N Y A L A South-West	5	0	3	3

'Improvement of Village Water Supply' is expressed by almost all villagers as a first need.

Next to it come:

- Health 43%
- Education 22%
- Security 17%
- others 18%

3 SOCIAL STRUCTURE

A: An important characteristic of the project area is its multi-tribal structure. In the first 3 Rural Councils, where WADS has been active up to now,

21 different ethnic groups are represented, all with islamic religious affiliations:

<u>Tribes claiming arabic origin</u>	<u>Non-arabic tribes</u>
Bani Halba	Fur
Bani Hussein	Zaghawa
Isserra	Daju
Mahadi	Tunjur
Tarijam	Falata
Selamat	Birgit
Hutia	Bargo
Kinana	Tama
Ta'alba	Massalit
Sa'ada	
Zayadia	
Misseria	

10 different languages are spoken:

Arabic	Fur	Zachaua
Daju	Tama	Massalit
Borgu	Fallata	Hama
Tunjur		

Arabic is understood by almost all men, but many women, especially Fur, speak their tribal language only.

The more isolated hamlets are located, the more do women communicate in their tribal languages.

The more significant opposition, which is created by the structural characteristics of the project area, appears between arabic- and non-arabic tribes.

In Kas/Nyala-S.W./Idd El Ghanam the non-arabic tribes make up 61% of the population of WADS-project villages.

Arabic tribes: 39%

Rural Council	T r i b e s	
	Non- Arabic (Fur)	Arabic
Kas	80% (73%)	20%
Nyala S.- W.	79% (31%)	21%
Id El Ghanam	25%	75%

B: Dominant Groups

The more important criterion for Dominance is the size of a tribe.

Dominant in the project area might be called the Fur (RC Kas) and the Bani Halba (Id El Ghanam).

But on village level dominance and control can be exercised by any tribal group through:

- holding key offices
- wealth in land

In situations of tribal conflict alliances are formed on area- and village level.

C: Spatial Characteristics

The social distance between villagers, who belong to different tribal segments/kinship groups is expressed in the organization of space within the village area.

In the centre of the main-village the dominant tribal segment is living (close kinsfolk).

The periphery is occupied by villagers more far related through kinship to the 'village centre', or by small segments of a different tribe.

Hamlets, which are located up to 5km away from the main village, are occupied by smaller tribal groups. Its inhabitants do usually have a more limited social contact to fellow villagers.

They do have their own leaders (shaykh/a/hakama), but these are inferior to those of the dominant group when village affairs are concerned.

Two tribal segments, which are similar strong in size and which could realistically compete for village leadership, are usually not found to live in close neighbourhood.

D: Offices

Offices are bound to kin-groups, -and indirectly to territory.

The first settlers invest offices into their strongest/biggest families: shaykh/imam/shayka/hakama/agiid.

In principle the oldest son follows the foot-paths of his father. Competing for an office as a modern political exercise is, traditionally, not practiced because it would involve public accusation and serious conflict.

Office holders are the oldest, and therefore most respected members of a kinship group, - or persons appointed by them. Open disputes are avoided for the principle of seniority: Elders are best acquainted with the tradition and ethical values of the group.

4 ORGANIZATIONAL CAPACITY

A: Communal Activities

Villagers do have a tradition in establishing an elaborate local administrative structure for handling community affairs by forming committees:

Administration Committee	:	represents the village in the Village Council
Fathers' Committee	:	cares for education of children
Water Committee	:	is responsible to solve the village water problem every year anew
Women-Village Committee	:	organizes all communal activities concerning women (mainly food preparation during marriages or for men-working teams)
Agiid Committee	:	responsible for village defence and organization of working teams for heavy manual work

- Baramka Committee : organizes the 3 major islamic ceremonies: id ramadan; id tahia; karama
- Doha Committee: : organizes the yearly rain-making ceremony

Committees do have a common structure: - Head
- Assistant
- Treasurer

Committee members are appointed in Village Meetings. Only those participate who, actually have a say in village affairs.

Women participate only in the Women Village Committee.

When committees decide for a certain communal activity, participation of all villagers (sending representatives) is obligatory. Non-participation can be sued, but usually villagers know best what are the adequate measures to be taken.

How strong/weak the organizational capacity of a community is, depends on its socio-structural characteristics. Homogeneous communities are advantaged.

B: Cooperatives

Sugar is distributed by Rural Councils to Sugar Cooperatives in the villages (fixed prices, ca 10% of market price). In Villages up to 5 sugar cooperatives can be formed and to be member in as many as possible is for those who succeed profitable in terms of cash: surplus sugar is sold in the market.

Cooperatives are also formed for income-generating projects, like grainmills, bakeries or agricultural cooperatives. These are mostly not communal activities. The social distance between various tribal segments is too large in order to rely on each other when cash is involved (see: G.1.6 below).

C: Neighbourhood Help

During agricultural peak times villagers are dependent on each others support, when intense work in the fields has to be done most efficiently.

Villagers call for Nafiirs (voluntary labour teams). In doing so a person actualizes loyalty bonds created throughout the year with his/her fellow villagers. There is no compensation beside provision of food, and usually there is wine. Participation is understood as being reciprocal.

Only persons, who's reputation is not questioned, and who have trust into their firm standing in at least their neighborhood/kin-group, will call for nafiir.

Somebody who does not join cannot be fined or sued, like it is the case in communal activities, but disrespect will be expressed and the quality of the relationship will get measured anew.

D: Key - Persons

In getting things done efficiently, key-persons with initiative and know-how are quite important for a village.

Education plays a role, but even more important is the personality. A person, who is committed as much to the village as to his/her own tribal group, is highly respected by all villagers and often functions as a broker between the 'outside world' and the village.

Sometimes villagers, who travelled to other countries than the Sudan, take over this role, or educated persons, if they come back to their native place after having completed their studies (e.g. school teacher, medical assistants or midwives).

5 COMMUNICATION PATTERN AND DECISION MAKING

A: Role of Kinship

In their world view and life orientation villagers are first of all bound to their kin-groups (extended families/tribal segments). Here they find support, solidarity, marriage partners and a ready made life-path to proceed on.

Social status is confined to the position which a person keeps within his/her kinship group and is expressed in kinship terms.

Kinship groups share most strong common interest (marriage rules, inheritance rules) and they have no competitors in insisting on loyalty towards its members.

It is for this reason that the authority of the village shaykh is first restricted to his (dominant) group, while others will abide first to their own leaders.

If they decide to oppose the village shaykh, all group members will follow.

Village unity is achieved through the pressure of dominant groups, and only as an exception through the charisma of a leader accepted by all.

Modern marriage practices (inter-tribal/village-town) will change the rational of village politics, but still ca.75% of villagers marry their sons/daughters in the traditional way: bit'am (parallel cousin) and bit'chala (cross cousin) marriage forms.

The neatness of social relations created in this way results in:

- Communication functions best, where reciprocity, the duty to give and take in general is structured: kinship relations.
- Those, who exchange women, do exchange also most intense goods, services and information.

Each kinship group does decide on village affairs 'at home'. During village meetings space will get checked for support, but not by means of open exchange of opinions. Strong arguments are not necessarily superior in logic, but strong, because they are expressed by dominant groups.

Two modes of decision making are found. They correspond to two different patterns of Social Integration:

1. 'Structural' plural villages

Kinship groups and/or tribal segments have structural unequal access to decision making in the public sphere, where power in village politics is actualized.

Usually one dominant tribal segment monopolizes power and controls formal communication channels.

Dominance, dependency and privileges form part of the institutionalized system (differential incorporation).

The exclusion of some, or even the majority of the village population in decision making is primary a function of tribal differentiation, and not of social stratification and unequal distribution of wealth.

2. 'Social' plural villages

Integrated kinship groups and/or tribal segments of similar size cooperate in decision making.

They differ in respect of cultural properties and they form own systems of 'distribution of power' and 'commitment towards loyalty', but all groups exercise equal or complementary rights in decision making (consociational incorporation).

All villagers have access to decision making through the representatives of their groups.

B: Role-Division between Men and Women

Tasks and roles in village life are well defined and differentiated.

Women stress their importance in organizing the household and express their dependency on man in terms of responsibility.

Women are not regarded, and do not regard themselves, as political personalities. Women are discouraged to act in the public as soon as they move from childhood to adulthood.

Decision making, politics and money collection for communal activities are men's responsibilities, and formal information channels are controlled by them.

Women are less informed about village affairs, and "decisions" made in village women committees have to be confirmed by men.

Role division between men and women corresponds to the separation of the private- from the public sphere, which as principle is valid generally, but it is highly stressed in islamic culture.

Women act in the back-stage of village life, while men represent their kin-groups in the public during informal gathering and official meetings.

Spheres of influence for women are:

- marriage
- household budget
- education

C: Key-Persons with Influence and Power

In the following hierarchy villagers name the more powerful persons within their villages:

- | | | |
|-----------|------------------------|-------------------|
| 1. Imam | 2. Fakir/Local Doctors | 3. School Teacher |
| 4. Shaykh | 5. Shaykh | 6. Rich People |

1. Imam

His task is more limited to the village proper in his function as religious leader. He will intervene, when the willingness to cooperate, the ethic of generosity, is endangered. In situations of conflicts he reminds the villagers to their commitment towards the Qur'an, where detailed descriptions of social values and behaviour are given.

2. Fakir/Local Doctors

When the imam can be described as the 'master of ceremony' having most knowledge of the Qur'an, local doctors, and especially fakir, are better described as magicians, who handle supra-human forces, also those minor to Allah.

In psychic crises and physical diseases, which prove to be uncontrollable with herbs and pills, the fakir addresses forces by means of holy verses, natural objects or charms, and makes them allies in curing the patient.

The pantheon of spiritual entities is quite elaborated in Darfurian culture, and surely it is a highly creative process to select 'meaningful samples' which fit the symptoms in question.

3. School Teacher

Education is a need strongly expressed by villagers and school teacher, it's personal agents, have a share in this highly regarded value. Education qualifies for participation in decision making beyond the limit of social status derived through traditional social systems, because it introduces a world-view wider than regional borders.

4. Shaykha

Usually, shaykhas are considered, by men and women alike, to be more influential than shaykhs.

Men's positions in social life are more clear defined and differentiated than those of women, because men inter-act much more intense than women do.

In social contact man's behaviour is corrected, and social status continuously re-confirmed and adjusted: the hierarchy of power is transparent and dynamic.

Somehow different this is for women.

They are attached to their male kinsfolk and do not have a similar large social network like men have. Their radius of social contact is restricted for the workload, that rests on their shoulders, and for cultural taboos. Sometimes, and different from (skeptical) men, this relative lack of social experience is expressed in possession-cults (zar), where women share in an atmosphere of rhythm and dance group spirit.

The shaykha is expected to exercises more direct control over women than the shaykh does over men.

Actually the shaykha is thought of having these highly valued qualities like 'patience', 'intellectual capacity' and the 'ability to speak with officials', which usually are acknowledged only among men.

5. Shaykh

The shaykh of the dominant group functions as village-representative towards the outside: he contacts officials in Kas, participates in the Village Council, collects- and pays tax and distributes land. Shayks do also negotiate about diyya/ compensation money in inter-tribal conflicts. Close kinsmen share power and responsibility with the shaykh, and decisions are more articulated by him than actually made.

6. Rich Persons

Money alone is not the highest value in traditional village life; it needs more, especially a strong supporting kin-group in order to gain influence in the village.

The prescribed way is not to create dependency through capital (e.g. demand for laborers in the fields) and gain 'political votes' from it, but to create dependency through kinship (marriage) and gain loyalty through blood-relationship.

Cash -> Prestige -> Marriage (kinship->political power) ->
Cash -> (see G.1.6 below).

6 VILLAGE ECONOMY

A: Economic Activities

1. Agriculture is the main economic activity of villagers and their main source of income.
2. Cash crops are tomatoes, groundnut, tumbac and simsim. Millet, sorghum and okhra are mainly used for household consumption.
3. Men, on an average, cultivate about 3 times more land than women do. Women provide most of their production for household consumption, and men have more space for making profit in the soukh.
4. Beside cultivating their own fields many villagers search for additional work as laborer in the soukh or on bigger farms.
5. Livestock is, economically, of minor importance to villagers, but in few project villages much livestock is owned and up to 30% of the village population is moving with their herds in search for grazing land from 2 to 5 months per year.

6. Usually there are artisans found in each village: carpenters/masons/smith/shoemaker/
7. Villagers' productivity is directly dependent on favorable climatic conditions and on security. Risk in agricultural activity and livestock keeping is a continuous concern.
8. For the time they are 'guests', nomads exchange goods and services with the villagers: they herd villagers' livestock and receive sugar and millet.

B: Economic Values

1. Villagers know a hierarchy of 3 categories, which determines the rational of economic choices they do:
 1. Kinship
 2. Prestige
 3. Subsistence

From the perspective of an individual capital investment is especially of interest, if it can be transformed into a higher category:

- Agricultural surplus and cash is invested into prestige, -e.g. hospitality, gifts, support for villagers in need (negative transformation: empirical values --> social values)
 - prestige again provides access to strong alliances through marriages, and
 - wide/reliable kinship bonds qualify, - and are a must, for a political career within the village and beyond.
2. These traditional elements in economic thinking allow that social aims outrange purely economic calculations. Planning for a higher investment on part of the villagers for infra-structural improvements should take this finding into account.

C: Cooperating Units

1. A South Darfurian village is a weak economic unit. Villagers have little tradition in communal investment. Exceptions are homogeneous communities.

2. Rules of inheritance determine only individuals as property holders (men as well as women). A person forms with his/her children the economically calculating unit.
3. Strongest cooperation in organizing each others economy exists within households. A man forms with each of his wives and their common children separate households.
4. Close kinsfolk keep property together and structure mutual support through marriage arrangements. Participants can firmly rely on each others support in any situation for the only reason of forming together the marriage circle.
5. Beyond kinship-obligations villagers practice voluntary exchange in labour and kind.¹
These systems serve to strengthen/widen existing cooperating units, to stress the need to make mutual concessions of equal kind among friends and kinsmen, and to meet the risk of agricultural production.
6. In community projects participation in cash and labour is expected from all adults, all men or all households.
7. With nomads, usually belonging to arabic tribes, villagers enter into small scale economic activities. Nomads keep villagers' livestock for the time they are camping in the vicinity of the village, or villagers agree with hired herdsmen on moving with their livestock in search for grazing land.

¹ Nafiir: voluntary working teams: its participants support each other during agricultural peak-periods.

Sual : exchange of fixed amount of millet/basic diet after harvest. One person can have 15 and more Sual partners.

7 OWNERSHIP AND USER RIGHTS

A: Definition of Terms

'Ownership' results in having full rights in property: to dispose of it freely.

Only Persons, or their legal representatives, do have the status to acquire property or to defend claims on property in the court.

A South Darfurian village, defined as a group of people with common residence and interest, is not a person in the legal sense, -it does not form a legal body like a corporation would do.

A village can not own anything.

But all inhabitants of a village share common duties, e.g. to participate in constructing a mosque, school or village well, or collecting money for it, when decided so by village authorities (shayk(s)).

By having contributed in cash/kind, but especially in labour, or being represented by kinsfolk who did so, superior (priority) rights are acquired. These can be defended legally in the court:

- e.g. - livestock owners dig a well and insist that they and their animals have precedence before others can use the well.
- or - villagers claim priority right towards nomads on using their land and water sources

B: Laws in Water Sources

Nobody can own or dispose of water sources privately, as it is the case with other natural resources found in the Sudan too.

Full Citizenship implies User Rights in water sources. This is pointed out in the Civil Law, which is applied together with the Traditional Law and Islamic Law in this topic, and it is guaranteed by the legal owner, the national government with its administrative/local representatives: NCDRWR/Councils.

More differentiated interpretations are given in the case of irrigation, but in water supply for humans the following hierarchy of User Rights in water sources is valid and known and accepted by the villagers:

1. those who contribute in constructing a water source or who are represented by persons (kinsfolk) who did so
2. fellow villagers
3. nomads/travellers
4. people from neighbour villages

ANNEX G.2

MONITORING SHEETS

- 1 Questions on operation of device
- 2 Monitoring questions for Village Water Committee
- 3 Monitoring questions for Village Health Committee
- 4 Questions for caretaker on functioning of caretaker
- 5 Monitoring questions for villagers
- 6 Monitoring sheet for observation of sanitary conditions at the well-site
- 7 Health education results monitoring list

QUESTIONS ON OPERATION OF DEVICE.

QUESTIONS FOR WELL USER

USING OR NOT USING THE DEVICE.

VILLAGE:.....

VILLAGE COUNCIL:.....

RURAL COUNCIL:.....

DATE:.....

SHEET NUMBER:.....

DEVICE HAS: SPOKES HANDLESS HOOKS COMMUNAL BUCKETS/ROPES

SEX OF RESPONDENT: MALE FEMALE CARETAKER/OPERATOR

CHILD UPTO 14 YEARS.

FOR USER OF DEVICE.

1) Do you always use the device? **(D)**
 (If Caretaker/operator) Do you always operate the device for water collectors? **(D + C)**

Yes (go to question 3)

No (go to question 2)

(for caretaker/operator only) Only during morning and afternoon or peak hours.

2) (if no) Why do you not always use the device?

Sometimes I do not use the device, when there is a long waiting time.

Sometimes it is broken

Other

CONTINUE WITH QUESTION 3.

FOR NOT USER OF DEVICE.

1a) Why are you not using the device?

Because waiting time becomes too long

It is too difficult/dangerous/heavy to work with the device.

Other

CONTINUE WITH QUESTION 3.

- 3) Do you want the device to be as it is, or could or should something be improved in the design of the device? (D)
- As it is
 - Improvement suggested (Note down in the square the suggested change.)

SUGGESTED CHANGE TO DEVICE:

- 7) During peak hours, about how many water collectors are in front of you before it is your turn to collect water? (D)
- Not more than 10.
 - 10 to 20
 - 21 to 30
 - 31 or more
 - Some, but they take a long time because they water a lot of animals.

REMARKS:

MONITORING QUESTIONS FOR V.W.C.

VILLAGE:.....

VILLAGE COUNCIL:.....

RURAL COUNCIL:.....

DATE:.....

SHEET NUMBER:.....

NUMBER OF MEMBERS: MALE FEMALE

COMMUNITY HEALTH WORKER: O YES O NO

- 1) Did the V.H.C. organize a cleaning party not more than two months ago when it was necessary, to clean the well-site? (H)
- Yes
- No
- 2) Did the V.H.C. propose any task division between V.W.C. and V.H.C.? (H)
- Yes
- No
- 3) Who will repair the well, slab or windlass when they have cracks or need other repairing? (W)
- Caretaker
- V.W.C.
- Wads
- Other
- 4) Is the caretaker paid?
- Yes
- No
- 5) Do you already have spare-parts, spare-buckets, spare-bucketholders and spare-ropes? (W)
- Yes
- No

- 6) (if yes) How did you organize the money to buy them? **(W)**
- Organized money collection in village
 - Took the money from village fund
 - Richer people/person paid it
 - Other
- 7) (if yes) How did you get them? **(W)**
- Buy them or have them made at soukh in
 - Have them made by local crafts man
 - Other
- 8) (if no) How do you plan to organize the money to buy them if you need it? **(W)**
- Money collection in households
 - Take money from existing village fund
 - Other
- 9) What support did you give the V.H.C. when somebody would not follow hygienic rules? **(W)**
- Support given.
 - Support **Not** given
- 10) Did you ever organize meetings with the V.H.C.? **(W + H)**
- Yes
 - No
- 11) (if yes) How often? **(W + H)**
-times per
- 12) (if yes) What topics were discussed? **(H + W)**
- Task division between V.W.C. and V.H.C.
 - Hygiene related problems around well-site
 - Other

REMARKS:

MONITORING QUESTIONS FOR VILLAGE HEALTH COMMITTEE.

VILLAGE:.....

VILLAGE COUNCIL:.....

RURAL COUNCIL:.....

DATE:.....

SHEET NUMBER:.....

NUMBER OF MEMBERS: MALE FEMALE

COMMUNITY HEALTH WORKER: O YES O NO

-
- 1) Are filled monitoring sheets for "sanitary conditions at the well" present which were done last month? (H)
- Yes
- No
- 2) Who did fill the "sanitary condition of well" monitoring form? (H)
- V.H.C. member.
- Somebody else.
- 3) Did you organize a cleaning party to clean the well-site if necessary, not more than two months ago? (H)
- Yes
- No
- 4) How often do you do household visits? (H)
- Visits **DONE** last month.
- NO** visits done last month.
- 5) What did you discuss in the household? (H)
- CLEAN WELL-SITE
- CLEAN STORAGE
- CLEAN TRANSPORT
- HYGIENIC HANDLING, CLEANING AND STORING OF BUCKETS, CONTAINERS AND ROPES
- WASHING AND BATHING
- OTHER
- NO VISITS DONE.
- 6) Are storage monitoring forms present which are filled last month? (H)
- Yes
- No

- 7) Are monitoring forms present on water transport which are filled last month? **(H)**
- Yes
- No
- 8) Did you organize meetings in the different parts of the village and hamlets within the last two months? **(H)**
- Yes
- No
- 9) What topics were discussed? **(H)**
- results of monitoring of storage
- results of monitoring well-site
- results of monitoring transport
- The organization of well-cleaning party
- The communication and co-ordination between VWC and VHC
- Other hygiene related topics
- None hygiene related topics
- 10) Whom do you contact when somebody does not want to follow the hygienic rules of the V.H.C. at the well? **(H + W)**
- V.W.C.
- Other
- 11) Did you have a meeting with the VWC the last two months? **(H+W)**
- Yes
- No
- 12) What did you discuss with the V.W.C.? **(H + W)**
- The task division between V.W.C. and V.H.C.
- Hygiene related problems at the well site
- Other
- 13) Does the V.W.C. take action when you ask help? **(W)**
- Yes
- No
- 14) Did you ever attend meetings with the VWC organized by VWC? **(W)**
- Yes
- No

- 15) (if yes) How often per month? (W)
- 1 time per month
 - Less than 1 time per month.

- 16) (the following question is to examine what V.H.C.-MEMBERS remember of hygiene education training sessions. **DO NOT GIVE POSSIBLE ANSWERS. BUT QUESTION THOROUGHLY!!!**)

WHICH HYGIENE EDUCATION TOPICS CAN YOU MENTION?

- CLEAN WELL-SITE
- NO ANIMALS ON SLAB
- NO ANIMALS WITHIN FENCE
- KEEP FENCE IN GOOD CONDITION
- USE COMMUNAL BUCKET AND ROPE
- KEEP COMMUNAL BUCKET AND ROPE CLEAN
- KEEP BUCKETS ON THE SLAB
- NO ANIMALS DRINKING FROM BUCKETS
- USE CLOSED CONTAINERS FOR TRANSPORT
- PUT TRANSPORT CONTAINER IN HYGIENIC PLACE
- DON'T TOUCH WATER WITH HANDS
- DON'T LEAVE CONTAINERS UNGUARDED
- CLOSE THE STORAGE CONTAINER
- PUT STORAGE CONTAINER ON HIGH PLACE
- USE SEPARATE CONTAINERS FOR HUMAN DRINKING AND OTHER PURPOSES
- KEEP CHILDREN AWAY FROM STORAGE CONTAINER
- USE TWO-MUG SYSTEM
- USE DEPOSITING METHOD
- USE FILTERING METHOD
- BATH/WASH OFTEN
- PUT PRIVATE BUCKET AND ROPE IN HYGIENIC PLACE

REMARKS:

QUESTIONS FOR CARETAKER ON FUNCTIONING OF CARETAKER.

DATE:

VILLAGE:

VILLAGE COUNCIL:

RURAL COUNCIL:

TYPE OF WINDLASS:

NOTE FOR INTERVIEWER: do not give possible answers, but question thoroughly. Try to get the right answer by asking through. The questions are meant as topics to be covered. Note down what you think is true!!!!

 1) HOW MANY CARETAKERS ARE THERE IN THE VILLAGE?

ONE

TWO

2) CAN YOU READ AND WRITE?

YES

NO

3) ARE YOU PAID?

NO

YES, HOW MUCH?POUNDS PER.....

4) WITH WHOM DO YOU DISCUSS WHAT SHOULD BE DONE AT THE WELL AND WINDLASS?

V.W.C.

V.H.C.

OTHER

NOBODY

5) HOW OFTEN DO YOU DISCUSS THESE TOPICS WITH THEM?

..... TIMES PER

6) WHAT ARE YOUR TASKS AND RESPONSIBILITIES?

DO MAINTENANCE ON THE WINDLASS, LIKE:
 O GREASING
 O TIGHTEN BOLTS/NUTS
 O
 O
 O
 O

DO MAINTENANCE ON WELL, LIKE:
 O REPAIR CRACKS
 O
 O
 O
 O

DO MAINTENANCE ON FENCE

DO MAINTENANCE ON DRAINAGE

SUPERVISE HYGIENIC BEHAVIOUR

CLEAN SLAB + WELL AREA

KEEP ANIMALS OUTSIDE FENCED AREA

TAKE AWAY BUCKETS AND ROPES DURING NIGHT.

OTHER

7) DO YOU DO THEM?

YES NO

8) HOW OFTEN?

..... times per

9) WHEN ARE YOU AT THE WELL-SITE?

EVERY DAY NOT EVERY DAY

WHOLE DAY MORNING + AFTERNOON

MONITORING QUESTIONS FOR VILLAGERS.

VILLAGE:.....

VILLAGE COUNCIL:.....

RURAL COUNCIL:.....

DATE:.....

SHEET NUMBER:.....

SEX OF RESPONDENT: MALE FEMALECOMMUNITY HEALTH WORKER: YES NO**75 % OF RESPONDENTS SHOULD BE FEMALE**

- 1) Did the V.H.C. organize a cleaning party not more than two months ago to clean the well-site when it was necessary? (H)
- Yes
- No
- 2) Did a member of the V.H.C. visit your household last month to discuss hygiene related topics? (H)
- Yes
- No
- 3) About which topics did you discuss? (H)
- CLEAN WELL-SITE
- CLEAN STORAGE
- CLEAN TRANSPORT
- HYGIENIC HANDLING, CLEANING AND STORING OF BUCKETS, CONTAINERS AND ROPES
- WASHING AND BATHING
- OTHER
- 4) Did the V.H.C. organize meetings on hygiene in the main village and hamlets last month? (H)
- Yes
- No
- 5) Who is responsible for repair of e.g. broken slab, broken windlass, cracks in lining, broken fence, blocked drainage? (W)
- V.W.C.
- Sheikh
- V.H.C.
- Caretaker
- Other

- 6) What is the name of the caretaker? (W)
- Right name mentioned
 - Wrong name mentioned
- 7) Who is responsible for cleaning the well-site? (H)
- V.H.C.
 - We, the villagers.
 - Caretaker
 - Others
- 8) Is the V.W.C. active? (W)
- Yes
 - No
- 9) (if yes) What did they do? (W)
-
- 10) (if no) Why not?
-
- 11) Who takes away the communal buckets and ropes in the evening, and who places them back in the morning?
- Caretaker.
 - V.W.C.
 - V.H.C.
 - Other.....
 - Not taken away during the night.

REMARKS:

**MONITORING SHEET FOR OBSERVATION OF
SANITARY CONDITIONS AT THE WELL-SITE**

VILLAGE:

VILLAGE COUNCIL:

DATE:

RURAL COUNCIL:

NAME EXT. WORKER:

HYGIENE:

0) Waterlevel and time it was
taken. (preferably before
7 am. or at 4 pm.)

waterlevel
time

I

- 1) Fence: present not present
- 2) Fence condition: good medium bad
- 3) Animals within fence: none few much
- 4) Laundry within fence: no yes
- 5) Gate present: no yes
- 6) Faecal deposits within
fence: no few much

II

- 7) Sand on the slab: no little much
- 8) Water on the slab: no little much
- 9) Dirt on the slab: no little much
- 10) Muddy area around well: no small large
- 11) Drainage clean: no medium yes
- 12) Soaking pit: not present present

III

- 13) Communal material used: never mostly always
- 14) (if also private) Are they
cleaned before use: never mostly always

IV

- 15) Watercontainers filled on
the slab: none most all

TYPE OF DEVICE AND CONDITION:
CONDITION SLAB:

CONDITION WELL:

HEALTH EDUCATION RESULTS MONITORING LIST

DATE: INTERVIEW NUMBER:

VILLAGE:

VILLAGE COUNCIL:

RURAL COUNCIL:

HYGIENE EDUCATION GIVEN?:

WHICH BATCH:

WHAT KIND OF DEVICE PRESENT:

TICK THE APPROPRIATE ANSWER.

- 1) SEXE OF RESPONDENT: MALE FEMALE
- 2) TOTAL HOUSEHOLD SIZE:.....
- 3) WHERE IS WATER COLLECTED? TRADITIONAL SOURCE
 WADS WELL
 BOTH
- 4) HOW MUCH IS COLLECTED PER DAY?
- 5) HOW IS WATER TRANSPORTED HOME? WALKING
 RIDING
 BOTH
- 6) IN WHAT KIND OF CONTAINER IS WATER TRANSPORTED?
 OPEN CLAY POT
 CLOSED CLAY POT
 OPEN JERRY CAN
 CLOSED JERRY CAN
 OPEN OTHER CONTAINER
 CLOSED OTHER CONTAINER
- 7) HOW OFTEN IS THE TRANSPORT CONTAINER CLEANED?
..... TIMES PERDAY(S).
- 8) WHERE IS TRANSPORT CONTAINER CLEANED?
 AT HOME
 AT WADS WELL
 AT OTHER SOURCE

9) IN WHAT KIND OF CONTAINER IS WATER STORED AT HOME?

- OPEN ZEER
- CLOSED ZEER
- OPEN BARREL
- CLOSED BARREL
- OPEN JERRY CAN
- CLOSED JERRYCAN
- OPEN OTHER CONTAINER
- CLOSED OTHER CONTAINER

10) WHERE IS THE STORAGE CONTAINER PLACED?

- GROUNDLEVEL
- HIGHER PLACE
- OTHER

11) IS IT PLACED INSIDE THE HOUSE OR IN OPEN AIR?

- INSIDE THE HOUSE
- OPEN AIR
- OTHER

12) HOW OFTEN ARE STORAGE CONTAINERS CLEANED?

..... times per

13) WHERE ARE STORAGE CONTAINERS CLEANED?

- AT HOME
- AT WADS WELL
- AT TRADITIONAL SOURCE

14) IS TWO-MUG SYSTEM USED?

- YES
- NO

15) DO YOU USE FILTERING METHOD?

- YES
- NO

16) DO YOU USE DEPOSITING METHOD?

- YES
- NO

- 17) WHERE DO YOU DO YOUR LAUNDRY? AT HOME
 AT WADS WELL
 AT TRADITIONAL SOURCE
 DIFFERENT PLACES
- 18) DO PEOPLE LOOK CLEAN? YES
 NO
- 19) DO YOU USE SEPARATE CONTAINERS FOR HUMAN DRINKING AND OTHER PURPOSES?
 YES
 NO
- 20) ARE (SOMETIMES) PRIVATE WELL BUCKET AND ROPE USED?
 YES
 NO
- 21) ARE PRIVATE BUCKET AND ROPE ALSO USED FOR OTHER PURPOSES?
 YES
 NO
- 22) WHERE ARE PRIVATE WELL BUCKET AND ROPE STORED?
 INSIDE HOUSE OUTSIDE
 HIGH PLACE ON GROUND
 OUT OF REACH OF CHILDREN AND ANIMALS IN REACH OF CHILDREN AND ANIMALS
- 23) WHERE IS TRANSPORT CONTAINER STORED?
 INSIDE HOUSE OUTSIDE HOUSE
 HIGH PLACE ON GROUND
 OUT OF REACH OF CHILDREN AND ANIMALS IN REACH OF CHILDREN AND ANIMALS
- 24) IS THE TRANSPORT CONTAINER ALSO USED FOR OTHER PURPOSES?
 YES
 NO

25) (the following question is to examine what people remember of hygiene education meetings/or topics discussed in the village. DO NOT GIVE POSSIBLE ANSWERS, BUT QUESTION THOROUGHLY!!!)

WHICH HYGIENE EDUCATION TOPICS CAN YOU MENTION?

- CLEAN WELL-SITE (1)
- NO ANIMALS ON SLAB (1)
- NO ANIMALS WITHIN FENCE (1)
- KEEP FENCE IN GOOD CONDITION (1)
- USE COMMUNAL BUCKET AND ROPE (1)
- KEEP COMMUNAL BUCKET AND ROPE CLEAN (1)
- KEEP BUCKETS ON THE SLAB (1)
- NO ANIMALS DRINKING FROM BUCKETS (2)
- USE CLOSED CONTAINERS FOR TRANSPORT (2)
- PUT TRANSPORT CONTAINER IN HYGIENIC PLACE (2)
- DON'T TOUCH WATER WITH HANDS (2)
- DON'T LEAVE CONTAINERS UNGUARDED (2)
- CLOSE THE STORAGE CONTAINER (3)
- PUT STORAGE CONTAINER ON HIGH PLACE (3)
- USE SEPARATE CONTAINERS FOR HUMAN DRINKING AND OTHER PURPOSES (3)
- KEEP CHILDREN AWAY FROM STORAGE CONTAINER (3)
- PUT PRIVATE BUCKET AND ROPE IN HYGIENIC PLACE (3)
- USE TWO-MUG SYSTEM (4)
- USE DEPOSITING METHOD (4)
- USE FILTERING METHOD (4)
- BATH/WASH OFTEN (4)

REMARKS:

ANNEX G.3

MONITORING OF WATER COLLECTION AND CONSUMPTION

- 1 **Methodology**
 - 1.1 Data collection
 - 1.2 Limitation of applied method
- 2 **Detailed findings**
 - 2.1 Pressure on WADS wells
 - 2.2 Transport of water
 - 2.3 Time savings
 - 2.4 Water consumption

MONITORING OF WATER COLLECTION AND CONSUMPTION

1 METHODOLOGY

1.1 DATA COLLECTION

1.1.1 Sample-criteria for village selection

1. Depth of WADS well - water level

Variation: from 6.6 m to 22 m

Expected Findings - differences in nr of livestock watered at WADS wells
 - differences in waiting time
 - differences in consumption

2. Distance to WADS well

In general, distance is a determining factor when people in South Darfur make a choice for a water source.

Expected Findings - variations in consumption
 - differences in 'means of water transport'
 - variations in pressure on the well

3. Water Lifting Device

Devices are installed at 16 wells.

Expected Findings differences in waiting time during peak hours
 - differences in consumption

4. Hygiene Education

'Safe water and hygiene' is part of the extension package. It is introduced after the well has been constructed. Not all villages are covered until now.

Expected Findings differences in nr. of well users (compared with village population size) during- and after the rainy season.
 - differences in consumption

5. Livestock owned by the villagers

Each animal watered at the well is in addition to human beings another 'user'.

Expected Findings - differences in waiting time at WADS wells
- differences in consumption

6. Tribal structure

In troublesome villages the WADS wells might be under-utilized due to tribal conflicts.

Expected Findings variations in 'pressure on WADS wells'

7. Problematic water situation

Long waiting time at- and long distances to the water sources makes water collection the most time consuming household task of women and children. Significant improvement with an IWSS might lead to higher commitment on part of the villagers towards WADS - extension messages.

8. Season

Peak times in agricultural activities and changing climatic conditions will lead to

Expected Findings - variations in pressure on WADS wells
- differences in 'means of water transport'
- variations in consumption

9. In general it is pointed out in relevant literature that water use pattern vary among different geographical/cultural/ areas, which might also be unequal when infra-structural development is concerned. The expected wide range of received data on one topic results in higher standard deviations, which relativates the statistical value of findings. With ongoing monitoring activities and bigger sample sizes the involved bias will automatically be reduced.

1.1.2 **Monitoring sheet and Code book**

On the monitoring sheet 29 data are received from each water collector.

Its design is based on specifications of relevant project objectives/targets and has been devised in co-operation with the Wad El Magboul Institute and the IRC of the Hague.

Most collected data are 'raw' data. In order to arrive at findings, they have to be processed.

For a start 78 coding frames were prepared.¹

The number of proposed frames will decrease when more monitoring results are received and trends become statistically more significant than they can be until now. For further discussion of data and bias involved see below under 1.2.2.

Counting and calculations are done by the dBase-computer programme "Quest" (see Annex 7), which provides also a Data Display Sheet for each monitored village well with the more relevant findings integrated.

1.1.3 Household Questionnaire

Before monitoring the WADS well one day long, interviews are held in the village/hamlets in order to learn about:

- content (number of lts) of containers used for water collection by villagers: during monitoring through observation data are collected concerning amount of water extracted from the well and carried per water journey.
- how much additional water is collected during the week on peak day(s): calculation for per capita consumption
- regularity/irregularity of water collection pattern: is usually the same amount of water collected with- and before WADS?
- do villagers complain more about waiting time at- or walking time to their traditional water source: criterions for village selection (priority ranking)
- nomads camping in the vicinity of WADS-project villages: Nr.of people and livestock; expected pressure on the WADS well

1.1.4 Maps

Village maps help to verify hypothesis concerning water use patterns, because they provide a visual overview of the village area by means of the 'hardest' data available: exact distances to relevant locations

Clear conclusions can be drawn from findings provided by maps by checking some indicators for target-achievement against Distance (e.g. higher/lower water consumption).

¹ The Code Book has not been added to this annex.

It is part of a WADS-report: "Some Aspects of Water Use of Traditional Water Sources and WADS-Improved Water Supply Systems in South Darfur, Parts I and II.

1. A village map is drawn, main village and hamlets (population size/tribal segments) are integrated:
 - exact distance from hamlet to hamlet/hamlet to WADS well/hamlet to traditional water source is signed (distance checked by car)
 - directions are taken with compass
 - all water sources used by the villagers are indicated (distance/direction/type)
 - water sources used by each hamlet on survey day

2. An Area Sketch Map is drawn, upon which are indicated:
 - neighbour villages of WADS-project villages (distance and direction/compass)
 - population size
 - tribal structure
 - dry season water sources used by project villages and its neighbour villages

Area Sketch Maps give indications about the expected pressure on the WADS wells during the dry season. (examples of area/village maps see Annex 9)

1.2 LIMITATION OF APPLIED METHOD

The complex field, within which 'impact related targets' are placed, could not be fully considered for monitoring purpose.

In how far e.g. seasonal changes influence water use patterns concerning: means of transport / percentage of children as water collectors / water consumption / livestock watered at WADS wells cannot be answered yet. Estimations are hypothetical in character.

Also: in order to know how actually the water is used at home, an intense study (observation / informal interviews) of a sample of households in selected villages is necessary.

These limitations result in a split-up of findings, some based on 'hard data' : counted / measured others on 'weak data': stated / processed

1.2.1 Hard Data

Only few quantitative data can be collected through observation at the well site:

- Number and sexe of water collectors
- Amount of water collected per water journey
- means of water transport
- waiting time at the well
- livestock watered at well site
- time

1.2.2 Weak Data

- a) Using the hard data a bias factor is calculated for each village (see coding frame 45 in Code book), which is introduced for further calculations e.g.
- Per capita consumption before WADS
 - Increase of consumption with WADS
 - Time saving

The accuracy of this factor is considered to be sufficient; it will be automatically re-defined when the sample size (Nr. of monitored wells) increases.

Bias Factor:	Average	0.558	Sample size	8
	St.Dev.	0.124		
	Median	0.559		

- b) No bias factor is introduced for "Household Size" and "Number of Households in the village", even if these data are used intensively for further data processing.²

But: - the sample size is very large (all water collectors using the WADS wells), which limits the deviation factor involved considerably, and

- comparison is done with data from other surveys done in the project area

Therefore: variations behind the comma are not considered; the answers received from the villagers are taken for granted.

- c) A quite important bias factor is defined concerning the relation between stated population size and actual number of WADS well users (see 2.1 below). This factor introduced leads to more realistic data with respect to "number of persons-well ratio".

At present, with a sample of 8 villages, the average factor is 0.29 with a st.deviation of 0.12. This low figure is not surprising taking into account:

- the wide dispersion of hamlets
- the time of the year when the surveys took place
- over-estimates by villagers in order to be shortlisted for the "development train".

².Husbands form in polygynous marriage systems with each of their wives (in islamic culture upto 4) separate households.

No one, or all of the water collectors of each of a man's households might mention him as household member. Also: The question if guests are served, or if some house-hold members are absent on the survey day, was not asked.

Detailed figures are shown in Table 1 of this Annex.

Applied to a stated population size of e.g. 1000 inhabitants, the actual number of users during the period February-March would be estimated between 170 and 410.

It is important to obtain the "end-of-dry-season" figure soonest possible, in order to be able to:

- plan in line with rural development policies of Rural/Area Councils:
village/area selection
 - decide on number of wells provided per village (one WADS well can serve from 500 to 750 persons)
- d) The findings concerning "amount of water fetched by children" is in so far biased as also those containers are counted, which are actually carried by adults who accompany the child(ren).
- e) Livestock watered at home cannot be observed systematically with the applied method.
- f) "Additional water collected at peak day(s) per h.h./week": data received through questionnaires filled in the village.

2 FINDINGS

2.1 PRESSURE ON WADS WELLS

1. On an average per monitored village 417 people were served on survey day.

When both monitoring rounds are compared with each other:

11/12 '88: 473 persons per village on an average
= 24% of stated population size.

3 '89: 383 persons per village on an average
= 26% of stated population size.

2. The actual maximum number of users of WADS wells cannot yet be deducted directly from the stated population size of WADS -project villages. At least one more monitoring round at the end of the dry season has to take place.

Population figures stated by the villagers, have to be multiplied by a coefficient (0.29 which is valid for the period February-March), in order to arrive at data, which realistically can give indications on "pressure on WADS wells" (see Table 1)

3. Livestock was watered at the monitored WADS wells at an insignificant rate.
But this is not the same for all project villages.
4. The maximum distance to WADS wells which is accepted by villagers is 4.5 km (sample size: 8).
Most wells are used by inhabitants of the main village and few adjacent hamlets.
5. The choices, which villagers do with respect to what water source to use, are first of all determined by: how to distribute time and energy in the most economic way among all activities with which villagers have to cover their basic needs.

The distance to the water source and the time needed to fetch water should be as short as possible.

But also other factors are considered by the villagers:

- Depth of the water level, especially when villagers combine water collection for household purpose with watering their livestock.
- Quality of water, is not used as a major criterion, but when diseases can be directly related to water consumption (Kogara/hafir water), villagers

do integrate this aspect into their rational of choices.

- Socio-political factors
Villagers try to avoid waiting time at the water source also because they do not want to be put into the position to accept others people claim on priority right over a water source (e.g.Kogara): competitive relation between inhabitants of different villages/hamlets and among the women (main users) themselves.

2.2 TRANSPORT OF WATER

1. Mainly women do collect water:
Range: from 65 % to 79 %.

But children (girls) participate to a considerable degree: Range from 18% to 36%
They collect between 17% and 42% of the total of water extracted from monitored WADS wells.

The nearer the water source is located to the village, the more children are sent to fetch water.

Only few men do collect water (range from 0.5% to 7%), and then usually by donkey.
Carrying water for a man is considered to be shameful, if domestic circumstances do not force him (diseases, absence of women).

2. Most water journeys are made on foot.
63% of the total of water extracted from WADS wells is carried on foot.

By donkey: 37%

3. The average amount of water carried per water journey is: 22 lts.

on foot	:	17 lts.
by donkey	:	46 lts

Aiming at higher water consumption, longer term hygiene programmes (MOH) should focus on "organization of water collection by donkey".

In homogeneous communities it is expected to be feasible. It should, however, not be introduced during agricultural peak periods.

2.3 TIME SAVINGS

In all following findings concerning 'time saving', differences in water consumption between the time 'with- and before WADS' are considered.

For calculations of 'walking time' a walking velocity of 2 km/hr is considered. Finding is based on data stated by villagers.

An overview on Time Savings in all project villages in Kas and Nyala Rural Councils where IWSS have been installed, is given in Tables 2 and 3 at the end of this Annex.

1. In monitored villages the median time saving in water collection per day/hh since WADS-I.W.S.S were installed is 64%

Sample size: 8
Range: from 28% to 80%

2. Differences in time saving appear, when the two Rural Councils, where WADS has constructed wells up to now, are compared with each other.

Kas : 74 % (sample size: 6)
Nyala South-West: 43 % (sample size: 2)

3. When findings from monitored villages are applied to other project villages:

Kas : 72 % (sample size: 16)
Nyala South-West: 68 % (sample size: 12)

4. High time savings are first of all related to the achieved considerable reduction in Waiting Time at the water source (high yield of WADS wells), and only then to shorter water journeys.

Median Reduction Waiting Time:

Kas : 87 % (sample size: 16)
Nyala South-West: 93 % (" 12)

This fact fully satisfies the villagers' interest, who point to Waiting Time as the more serious water problem they face with their traditional sources.

Median Reduction Walking Time:

Kas : 39 % (sample size: 16)
Nyala South-West: 39 % (" 12)

5. Compared with the situation before WADS, the relation between Walking- and Waiting time during the dry season has in most project villages changed with the implementation of an I.W.S.S.:

With WADS villagers spend from 18% to 28% of the time needed for water collection per day/hh in Waiting, and from 72% to 82% in Walking.

Before WADS villagers spent from 60% to 64% in Waiting, and from 40% to 56% in Walking

RELATION BETWEEN WALKING TIME AND
WAITING TIME WITH/BEFORE WADS

K A S

		WALK	WAIT		
WITH		72 %	28 %	=	7 : 3
	WADS	40 %	60 %	=	2 : 3
	BEFORE				

N Y A L A
SOUTH-WEST

		WALK	WAIT		
WITH		82 %	18 %	=	8 : 2
	WADS	56 %	64 %	=	5.5:6.5
	BEFORE				

6. In Idd El Ghanam only areas have been defined until now, where augering is expected to be successful. Rough estimations concerning time gains show, that these are not as considerable as in the former two Rural Councils.

This is explained by two different methods, which were de facto applied for village selection:

- in Kas and Nyala S.-W. the seriousness of the water supply situation in the villages was taken into account for priority ranking
- in Idd El Ghanam, where hydrogeologists faced the problem to find promising sites for shallow wells, the only criterion for village selection has been the hydrogeological verdict.

7. If the pressure on WADS wells does not increase considerably, waiting times can be expected to range from 0 to 30 minutes during peak times (7am to 10am; 4 pm to 6pm).

Also: The water lifting devices should be operated as they have been introduced.

WAITING TIME WITH WADS WELLS
DURING PEAK HOURS

NR.OF USERS	WAITING TIME (min)	DEVICE OP. YES/NO
> 200	5	Y
	0	N
200>400	15	Y
	5	N
400>600	20	Y
	10	N
600>800	25	Y
	15	N
800>1000	30	Y
	20	N

(see also Table 4)

2.4 WATER CONSUMPTION

1. The water consumption ranges in the 8 monitored villages

from 6.2 to 13.2 l/c/d

Average: 9.8 (st. dev. 2.12)

Median : 10.2

Before WADS: from 5.8 to 10.0 l/c/d

Average: 8.3 (st. dev. 1.43)

Median : 8.4

The wide range is explained by the complexity of relevant variables involved.

2. When differences in household size and means of water transport (on foot/by donkey) are considered, the range of consumption varies from 4.3 to 18.4 l/c/d.
3. The 3 villages with the smallest average household size (from 3.8 to 4.7) show highest consumption figures (from 10.8 to 13.2 l/c/d).
4. Villagers who belong to households bigger than the average household size consume 40% less water than those who belong to smaller ones.

5. When households within a village are compared, then do those persons, for whom water is carried on foot, consume 9% less water than the average consumption in the village.
Comparison between villages do not confirm this finding. For L.C.D.-values other variables must therefore be more influential.
6. In the village with the highest consumption a well with the tank/windlass option was installed and operated on the survey day.
- This village was found to have
- highest increase in consumption with WADS (36.5%)
 - high increase in Nr.of water journeys per day/hh (40%)
 - second highest rate of children as water collectors (34%)
 - small average household size (4)
7. In villages where water lifting devices are installed, the average consumption is 35% higher than in those without.
- In two villages where no water lifting device is installed, the average consumption is lowest:
6.2 and 7.8 l/c/d
8. In those villages, where the percentage of children as water collectors is highest, also the consumption is highest.
9. In all monitored villages an increase in water consumption is achieved.
- Range : 7 to 36 %
Average : 17 %
10. For the only reason of high time gains with the installation of an I.W.S.S villagers do not consume more water than those who benefit less.
11. Depth to water table and hygiene education carried out or not, if taken alone, are not valid indicators for variations in consumption figures.

2.5 MISCELLANEOUS FINDINGS

1. Bathing is done exclusively at home by villagers.
Only children feel free to bath in the public.
2. Laundry is done preferably at home.
When the distance to the water source exceeds 1 km. some women do laundry at the source.

3. The influence of 'Livestock watering at WADS Wells' was not significant for findings concerning variations in water use pattern.

However, it is known that this is not the case in other project villages, which were not integrated into the sample.

4. Villagers are aware that nobody can be prevented to use water sources, and also with a WADS well they do not intend to do so.

Exception: if there is a shortage of water which endangers the water supply of the village.

5. In some project villages people are exercising their priority right on using the WADS wells/trad.water-sources:

- In Daba Nyra (RC Kas) nomads are asked by the villagers not to come to fetch water during peak times (from 7 to 10 am) at the WADS well in order to help reduce waiting times.
- In Kogara (RC Kas) only one tribal segment out of 8 was represented in the working team for constructing the WADS well. Later, the women of those segments not represented by laborers were pushed to leave precedence to others before they could fetch water from the well. As a result they go on to use their traditional water sources even if each water journey becomes 4.6km longer.
- In Nabagaya (RC Kas), before having been supplied with a WADS well, livestock owners insisted to water their animals in wells, dug by themselves, before fellow villagers could fetch water for water supply of their households. This practice was kept even during the drought in '84, when water became a more rare resource than ever.

Concerning water needs humans and livestock are thought so close together, that no precedence is considered by livestock owners. Others do have different opinions.

Table 1

RELATION BETWEEN
VILLAGE POPULATION SIZE STATED
AND
NUMBER OF USERS OF WADS WELLS
AT A GIVEN TIME

VILLAGE	STATED POP. SIZE	NUMBER OF USERS	CAL. FACTOR	DATE
KOGARA	800	383	0.48	11/88
DAWRA	4260	894	0.21	12/88
AWEEN RADO	760	143	0.19	12/88
GAMAIZA	1500	590	0.39	3/89
DABA KAFOT	800	200	0.25	3/89
DABA NYRA	1500	401	0.27	3/89
KAROKARO	2650	350	0.13	3/89
ALLA GABU	910	380	0.42	3/89

Table 2

K A S - TIME SAVINGS

VILLAGE	TIME GAIN TOTAL	TIME GAIN IN WALKING-TIME	TIME GAIN IN WAITING-TIME	WITH WADS		BEFORE WADS	
				WALK	WAIT	WALK	WAIT
KOGARA	60%	61%	58%	73%	27%	74%	26%
DAWRA	64%	60%	73%	74%	26%	65%	35%
AWEENRADO	80%	37%	95%	82%	18%	25%	75%
DABA NYRA	74%	71%	76%	36%	64%	32%	68%
DABAKAFOT	28%	- 9%	46%	50%	50%	30%	67%
NYAMA	77%	2%	95%	83%	17%	19%	81%
KUNTAR	80%	62%	90%	65%	35%	33%	67%
NABAGAYA	59%	39%	80%	75%	25%	50%	50%
DIRSU	54%	26%	63%	64%	36%	67%	33%
BILEIL	78%	26%	96%	85%	15%	25%	75%
TERLI	90%	63%	97%	74%	26%	19%	81%
WARU	83%	26%	97%	85%	15%	19%	81%
DULLU	39%	20%	63%	72%	28%	55%	45%
KARANDEI	70%	2%	87%	66%	34%	20%	80%
MILEBEEDA	50%	41%	90%	86%	14%	29%	71%
TEIGI	72%	69%	80%	83%	17%	76%	24%

sample	16	16	16	16		16	
maximum	90%	71%	97%	86%	14%	76%	24%
minimum	28%	- 9%	46%	36%	64%	19%	81%
average	66%	37%	80%	72%	28%	40%	60%
median	72%	39%	87%	74%	26%	33%	67%
stand.dev	16.93	25.59	15.94	13.71		20.95	
st.dev/mean	4.23	6.39	3.98	3.42		5.23	

Table 3

N Y A L A S O U T H - W E S T
T I M E S A V I N G S

VILLAGE	TIME GAIN TOTAL	TIME GAIN IN WALKING TIME	TIME GAIN IN WAITING TIME	WITH WADS		BEFORE WADS	
				WALK	WAIT	WALK	WAIT
DAL. ANGARA	32%	39%	19%	60% / 40%		67% / 33%	
BABA	92%	90%	95%	75% / 25%		60% / 40%	
MARLA	89%	91%	76%	75% / 25%		89% / 11%	
KALMAFUR	78%	71%	93%	89% / 11%		67% / 33%	
UMKADOS	87%	80%	93%	67% / 33%		42% / 58%	
LAWIA	33%	-268%	83%	78% / 22%		14% / 86%	
KUNDUA	32%	-104%	99%	99% / 1%		33% / 67%	
BIRIDIKU	78%	75%	87%	85% / 15%		75% / 25%	
HUG. TUNO	54%	39%	97%	98% / 2%		73% / 27%	
KEBEKETA	68%	19%	93%	86% / 14%		33% / 67%	
ALLA GABU	31%	-30%	85%	88% / 12%		47% / 53%	
KARO KARO	43%	36%	72%	89% / 11%		78% / 22%	

sample	12	12	12	12		12	
maximum	92%	91%	99%	99% / 1%		89% / 11%	
minimum	31%	-268%	19%	60% / 40%		14% / 86%	
average	60%	9%	83%	82% / 18%		56% / 64%	
median	68%	39%	93%	86% / 14%		67% / 33%	
st. deviat.	24.80	109.21	21.70	11.77		22.51	
st. dev./mean	7.16	32.92	6.26	3.39		6.50	

Table 4

RELATION BETWEEN NUMBER
OF USERS/OPERATION OF
WATER LIFTING DEVICE
AND WAITING TIME

VILLAGE	DATE	WAITING TIME (min)	DEVICE OPERATED	NR. OF USERS
KOGARA	11/88	0	-----	383
DAWRA	12/88	7	-----	894
AWEEN RADO	12/88	0	-----	143
DABA KAFOT	3/89	14	WINDLASS HANDLES	200
DABA NAYRA	3/89	20	WINDLASS HANDLES	401
KAROKARO	3/89	5	TANK WINDLASS	350
ALI.A GABU	3/89	11	HOOKS	380
GAMAIZA	3/89	20	WINDLASS HANDLES	590