



## TABLE OF CONTENTS

1. INTRODUCTION .....	1
1.1. BACKGROUND.....	1
1.2. OBJECTIVES OF THE PREPARATION MISSION .....	1
1.3. BRIEF DESCRIPTION OF MISSION ACTIVITIES.....	2
1.4. NAME OF THE PROGRAMME .....	2
2. GENERAL DESCRIPTION OF THE BARI REGION.....	3
2.1. MAP OF THE REGION .....	3
2.2. GENERAL DESCRIPTION .....	4
2.2.1. <i>Geography</i> .....	4
2.2.2. <i>Living and Working</i> .....	4
2.2.3. <i>Historical, political and organisational aspects</i> .....	4
3. STATEMENT OF THE PROBLEM .....	6
3.1. PROGRAMME AND METHODOLOGIES .....	6
3.2. FINDINGS CONCERNING SOCIAL FACTORS.....	8
3.2.1. <i>The Background to Social Factors</i> .....	8
3.2.2. <i>Socio-Economic Findings</i> .....	8
3.2.3. <i>Findings concerning Women and their Position</i> .....	9
3.2.4. <i>Findings Concerning Health</i> .....	10
3.2.5. <i>Findings concerning Water</i> .....	11
3.2.6. <i>Findings concerning water-related behaviour</i> .....	12
3.2.7. <i>Findings Concerning Sanitation</i> .....	13
4. POSSIBLE SOLUTIONS.....	14
4.1. GOALS & INDICATORS .....	14
4.2. PHYSICAL/TECHNICAL SOLUTIONS.....	16
4.2.1. <i>Water supply</i> .....	16
4.2.2. <i>Berkads</i> .....	16
4.2.3. <i>Springs</i> .....	17
4.2.4. <i>Boreholes</i> .....	17
4.2.5. <i>Togga (riverbank infiltration)</i> .....	17
4.2.6. <i>Sanitation</i> .....	18
4.3. HYGIENE EDUCATION.....	18
5. SUSTAINABILITY OF THE WATER SUPPLY SYSTEMS.....	21
5.1. ORGANISATIONS & STRUCTURE AT VILLAGE LEVEL.....	21
5.2. ORGANISATIONS & STRUCTURES AT REGIONAL LEVEL.....	22
5.2.1. <i>Central Supplies</i> .....	22
5.2.2. <i>Production of manuals</i> .....	22
5.2.3. <i>Building Additional income</i> .....	22
6. CONCLUSIONS & RECOMMENDATIONS .....	24
ANNEX 1. GLOSSARY & LIST OF ABBREVIATIONS .....	I - 1
ANNEX 2. TRAVEL AND VISIT PROGRAMME OF THE MISSION.....	II - 1

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ANNEX 3. LIST OF PEOPLE MET/SPOKEN TO.....	III - 1
ANNEX 4. DESCRIPTION OF THE VILLAGES.....	IV - 1
ANNEX 6. DESIGNS, CALCULATIONS AND DRAWINGS .....	V - 1
ANNEX 7. LIST OF PRICES AND AVAILABILITY OF MATERIALS .....	VI - 1
ANNEX 8. TERMS OF REFERENCE.....	VIII - 1
ANNEX 9. LITERATURE.....	IX - 1
ANNEX 10. WOMEN AND HEALTH.....	X - 1
ANNEX 11. HYGIENE ALPHABET.....	XI - 1

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## **1. Introduction**

### **1.1. Background**

After the collapse of the former Somali government in 1990, the country experienced war, anarchy and destruction, with looting of existing water supply systems and a prolonged lack of adequate maintenance. As a result, the water supply systems of Bari Region (North East Somalia) have deteriorated drastically. The previously active Water Development Agency (WDA) disappeared. Now, the Bari Regional Authority, with the assistance of local and international NGOs, intends to rehabilitate the water supply in the region. SAWA and SPDS have reconstructed the water supply system in Qandala town, with finance from the European Union and NOVIB. Other interventions have been carried out by GTZ, Africare, UNICEF, Care and THW.

In 1995, on the request of the European Union/Somalia Unit in Nairobi, SAWA and SPDS undertook a mission to Bari Region. The result of this mission was the report "Bari Water Rehabilitation Study" (Volumes I & II), presented in September 1995.

Following the 1995 study and the rehabilitation of the Qandala system in July 1997, SAWA submitted a proposal for a "Rehabilitation Programme for Water Supply Systems in small towns and urban centres in the Bari Region of Somalia" to the European Commission/Somalia Unit and the Ministry of Foreign Affairs (DGIS) - The Netherlands. This proposal was approved by both organisations together in November 1997. The Programme's overall objective is the rehabilitation of the water supply system in 20 villages and small towns of Bari Region, during a period of almost two years, starting with first five and then ten villages proposed by the Regional Authority and Elders. From October 28 - November 8 SAWA and SPDS held several discussions with the Bari Regional Authority and several Village Water Committees about the institutional setup of the Programme. A Preparation Mission to Somalia, consisting of three persons took place in the period between November 23<sup>rd</sup> and December 14<sup>th</sup>, 1997.

### **1.2. Objectives of the Preparation Mission**

The mandate of the preparation mission was to conduct a baseline survey covering socio-economic, health, and technical aspects. In addition, the mission was to finalise the first and second five programme villages. The focus of the mission was deliberately on remote rural villages of the Bari Region that need water supply services. While the need for water extends beyond the villages visited, the purpose of the field visit was to deepen the understanding of the team in the rural areas so that clusters of villages could be selected as having priority and appropriate activities be planned in hygiene education and cost recovery.

The general and specific objectives are mentioned in the Terms of Reference, which can be found in Annex 8.

### **1.3. *Brief description of Mission Activities***

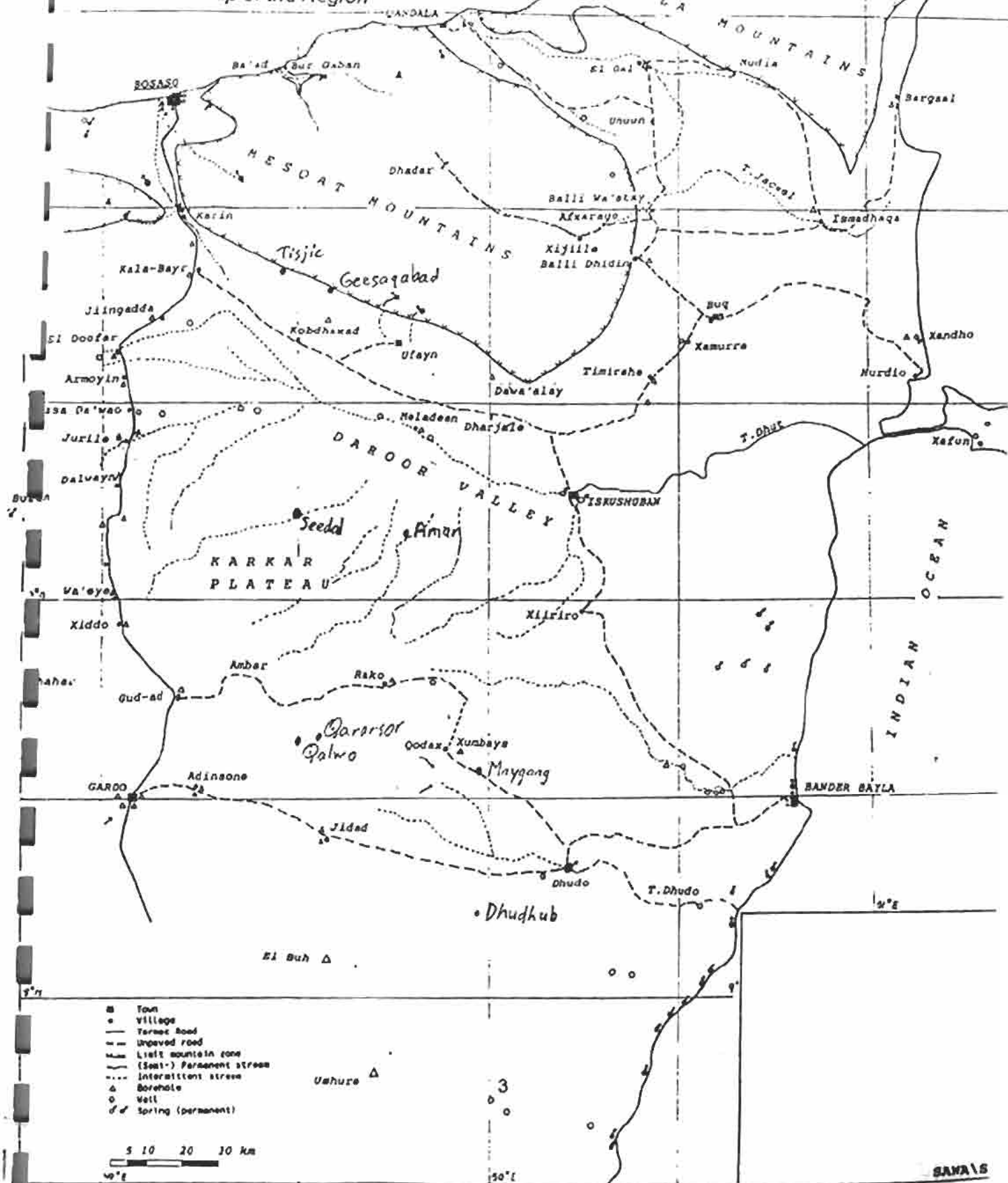
During two field trips, the team visited two areas in the South-East and North-East of the Bari Region. Because of the constraints of time and resources, the mission was unable to visit other parts of the region (South, North and East). However, it is clear that if the mission had visited more villages, it would have been confronted with more needs and requests for water projects. Everywhere, the team encountered severe needs and people asking for assistance (Water, Sanitation, Health, Education, etc.).

### **1.4. *Name of the Programme***

One of the specific objectives of the Mission was to find a proper name for the Programme. The Mission proposes to call this Programme "Biyo", which in Somali means "water". In the Somali tradition water also has the meaning of "life", as in this arid climate "water is life". The complete name of the programme then will read: "BIYO, Bari Rural Water Programme".

## 2. General description of the Bari Region

### 2.1. Map of the Region



## **2.2. General description**

### **2.2.1. Geography**

The Bari Region is located in the Horn of Africa and is the most north-eastern region of Africa. It has an arid tropical climate. Annual rainfall is less than 50 mm in the coastal fringe (Bosaso 15 mm), between 50 and 100 mm on the lower plateaux (Iskushuban 70 mm), between 100 and 150 mm on the higher plateaux (Gardo 100 mm) and between 100 and 400 mm in the mountain zone. Serious droughts occur once every five to seven years including 1954, 1968, 1974, 1983, 1989 and 1996/97.

Rainfall is concentrated in 2 rainy seasons: April-June and October-December. It occurs mainly during torrential storms. The period July-September is the hot season, during which strong winds prevail.

The population of the Bari Region is estimated to be 440,000 people (UN estimation, 1994), but figures are highly unreliable. The population increased after the civil war with displaced and refugee populations.

### **2.2.2. Living and Working**

Livestock, fisheries, frankincense and gums are the most important sources of income and employment for the people of the region. Other economic activities include small retail trade, import and export activities and service outlets (hotels, repair shops, barbers, etc.)

Outside of Bosaso and Gardo, settlement is quite recent. Until the end of the fifties there were hardly any permanent houses, except along the coast and around traditional water sources. With the introduction of boreholes and the improvement of the roads, people started to settle. A second impulse was given by the introduction of berkads in the early sixties; now constructing a new berkad marks the start of a new village.

Seasonal migration is a common phenomenon, not only for the nomadic people, who return to permanent water sources during the dry season, but also for the people along the coast, who during the hot season move to the cooler highlands, where they have second houses or live with family.

As well as seasonal migration and the movements of families in and out of villages, there are rural-urban shifts during the lifetimes of individuals. Within the family, the husband may work in the town while the wife follows a nomad life with the small children and animals, a lifestyle which is seen as healthier. The price for young children is an absentee father. Then, at perhaps eight, their schooling is seen as important and they are sent to the town to live with their father, returning to mother during the long summer holidays. One consequence is that the middle classes are more in touch with their rural roots than in many countries.

### **2.2.3. Historical, political and organisational aspects.**

In 1991, Somalia as a nation-state ceased to exist. As the last government collapsed, the clan-based factions which had joined together in the effort to defeat the military regime, then came



into armed conflict with each other, and in most parts of the country have now broken internally into even smaller units and splinter groups, all mutually opposed.

The society of Bari Region, like the rest of Somalia is divided into clans and sub-clans, with the Harti clan forming the overwhelming majority of the inhabitants. There are a number of other smaller clans and subclans, and they merge in the villages where they are each represented by their elders and respective community leaders. In many villages there are now committees which can answer to District and Regional administrations. On the household level, however, the traditional hierarchy of elders is still in control.

Bari Region has a regional administration headed by a governor who is assisted by four deputies and eight heads of departments. The council of traditional leaders, which is made up of chiefs of different sub-clans, plays the legislative role. There are judiciary courts which apply mixed Islamic law and old Somali penal codes, but most disputes are resolved by traditional leaders.

The dominant political organisation in the North Eastern Region is the Somali Salvation Democratic Front (SSDF) which was until recently allied with the "SODARE GROUP".

#### GOVERNANCE:

Many aspects of daily life are affected by the lack of governance in Somalia today. However, together with this problem goes a craving for return to dependable structures.

#### ISLAM:

Islam plays a dominant role in many aspects of social life. The closeness of Bari to the Gulf, and the economic and social links across the Red Sea, has led to more emphasis on the outer signs of the religion than in other black Moslem cultures; more women, for example, cover their faces.

#### EDUCATION AND LITERACY RATES

Statistics for Bari Region are not available. Overall literacy rates in Somalia are 36% of adult males and 14% of females. This represents a major decline from the mid-eighties, due to the collapse of the western school system. However a proportion of these figures reflects literacy in Arabic, learnt in the Koranic schools which did not close. It enables students to read the Koran but not necessarily other Arabic texts. Enrolment before the war in the 1,224 western-style primary schools was 13% of boys and 7% of girls; however in Bari today, hardly any primary school is functioning.

In El Gal, a village gathering was asked about literacy. Four out of the twelve boys could read Somali and five could read Arabic. Most of the men could read Somali, but none of the thirteen women or ten girls. All groups said strongly that they wanted to read and write.



### 3. Statement of the problem

#### 3.1. Programme and Methodologies

After travelling to Bosaso, the first three days were used to gather general information from all relevant parties and institutions. This period was followed by the first field trip of three days, visiting villages in the Southern part of the region. The results and impressions of this field trip were discussed and reported during a two day stay in Bosaso. Next, a field trip of five days followed, to villages in the Eastern and North-eastern part of the region. The final five days in Bosaso were spent in feed-back, tallying forms, report writing, internal discussions and presentation of results. The timetable of the Mission can be found in Annex III.

First field trip: 28, 29 and 30 November 1997.

Villages visited:

- Ambar
- Ambar Hose
- Rako
- Rako II
- Xumbays
- Maygaag
- Dhudo
- Dhudhub
- Jedad
- Libah-har
- Qalwo
- Qararsor

Second field trip: 3, 4, 5, 6, 7 and 8 December 1997

Villages visited:

- Tisjic
- Balidoog (Tisjic II)
- Geesaqabad
- Jeedal
- Aman
- Iskushuban
- Timirshe
- Xamurre
- Balli Dhidin
- El Gal
- Mudia

Most of these villages were not on the original list of ten, proposed by the Bari Regional Authority and the elders. They were included on the request of the elders, in order to have a more general view of the problems and the ways they might be solved, and in the hope that some villages on the original list might be changed for others. The description of the villages can be found in Annex IV.

Almost all villages were sketched. In some cases the sketch from the '95 report was used. Of two villages no sketch is available, one having only one house, one having only two. In all but a few villages, the water sources were observed and measurements taken. Observations were made, information gathered, ideas for possible solutions were generated and discussed while still in the field. The latitude, longitude and altitude were noted for each village and for each water source visited.

#### **METHODOLOGY:**

To gather specific information needed to meet the terms of reference, an approach was adopted of using different research tools for different answers. Some of these answers needed to be objective and verifiable. Other answers were ideas and opinions, so focus group discussions were used and the active participation by the communities was invited.

The techniques used include the following:

##### **1. Collection and review of relevant local information:**

The major objective of collecting and reviewing the local information was to map out the socio-economic and hygiene/health situations under which the Bari Rural water programme, if implemented in a participatory form, would have to operate. To this end, local information was reviewed on the geographical, political, economical and social settings of the Bari Region, both currently as well as in the future.

##### **2. Focus Group Discussions:**

In-depth discussions were held with the Bari Regional Authority, the traditional leaders as well as the political leaders and village elders. Such discussions were focused on their views on the importance of implementing the Bari Rural water programme, the best approaches and their prospects of success.

Focus group discussions were also held on Knowledge, Attitudes, Beliefs and Practices (KABP) concerning water, health and sickness, etc. among the communities visited, particularly the women.

##### **3. Survey:**

In order to identify the specific needs for water in each village, structured questionnaires (see appendix) were administered by the SPDS/SAWA team. A quota sample of households were interviewed concerning income, water use and illnesses recall. Village leaders were interviewed about settled, nomad and livestock populations, present water sources and related information. The present situation of other basic services such as health and education were also examined.

Most of the results of the investigations are presented in Annex V.

## 3.2. Findings Concerning Social Factors

### 3.2.1. The Background to Social Factors

Poverty is almost inevitable given a nomadic population, in a country that regularly suffers from drought and which has an expanding population. A mission in the wet season will not see the privations of the dry season, but reliable informants made it clear that for at least half the year many families have insufficient food for healthy living.

### 3.2.2. Socio-Economic Findings

Purchasing power and water consumption:

An average Somali household that consists of six persons normally uses 20 litres of water per day. Village people usually use a 20 litre container called "Teneg" as their measurement. A typical family will use one Teneg of water every day for all purposes including washing, drinking, cleaning, cooking, preparing for prayers five times a day for all adults, and making provision for guests.

The average price of one drum (200 lts) of water is So.Sh. 5,000 in rural areas in the wet season. These drums are of 10 tenegs capacity (10 X 20 litres = 2,000).

If the family uses one teneg per day the total yearly water consumption of the household is 365 tenegs x 20 litres = 7,300 litres of water .

The cost of a teneg of water is around So.Sh. 500 and the total cost per year will be about So.Sh. 182,500.

The majority of the village households are able to buy water at these rates but some cannot afford to pay. Normally the elders know the poor and collect money among themselves and from the relatives of the poor to provide water. These very poor families are mostly displaced people or refugees.

The estimations given here apply only to the village people. The nomads use far less water for human consumption but they use a lot of water for livestock consumption. The main income of most settled people, out of which they would find the cost of water, are remittances from family members elsewhere. Nomads get their main income from selling animals during the wet season, when they will also buy food for the dry.

Livestock Consumption of water during the dry seasons:

Camels:	20 - 30 litres per week
Cows/Donkeys:	10 - 15 litres per three days
Sheep and goats:	5 - 10 litres per four days

The average livestock heads for a nomadic household:

goats	110 heads
sheep	70 heads
Cows	3 heads
Camels	5 heads

### 3.2.3. Findings concerning Women and their Position.

In the last few years, each village has created a Village Committee to deal with outside agencies. Most have at least one woman member. As a modern construction, these committees offer possibilities for an enlargement of the role of women. Larger villages may also have a Woman's Committee linked to a Woman's Association. Some of these will have a man on the committee to ensure that everyone is kept informed.

There are other ways in which women can have their say. Although women cannot talk in front of the elders they can sometimes talk from the side. In Timirshe the Chair of the Women's Association spoke to the mission team and to the elders from the doorway. Less important women should be able to voice concerns through their families, if, for example, they had problems with the character of the CHW. A woman on her own without family can ask an elder or a sheikh to speak for her, and it was said that a village would consider it shameful if a woman could not put forward her opinion or complaint for consideration.

Women's informal use of influence in decision-making was said to be their most important pathway, through their husbands. It is said that decisions made by elders have been changed when they realised that their wives did not agree (no example available). However there are examples where an issue dear to the women gets nowhere; one is the need to get the school in Rako functioning. It is closed because the town has been unable to organise to keep a teacher.

Women do not have to obey men per se. During the polio campaign the vaccination team arriving at Xamurre found that all the responsible people were away, and a number of younger men told them they could do nothing and should go away. However the women just ignored these men and brought the children anyway.

#### WOMEN'S ASSOCIATIONS:

In the small towns (Rako, Bali Dhidin, Iskushuban), where there are Women's Associations, their level of activity depends on their access to funding and on the specific politics of the village:

- In Iskushuban, funding from UNDP and CARE means that 125 women now have small loans. So far there has been no problem with repayment. Until the funders of the MCH Clinic withdrew, the Association paid 25% of the staff salaries. The Chairwoman remarked that, these days, women can only rely on women; men spend on luxuries such as cigarettes and khat.
- In Bali Dhidin, the main function of the Association seems to be in providing a building where women can meet.
- In Rako, women weave the beautiful mats of the area, but members are not yet able to co-operate in getting their produce to Bosaso, and they get only poor prices.

### 3.2.4. Findings Concerning Health

#### HEALTH PROBLEMS:

Bari region presents a picture of major health problems, with water- and sanitation-related illnesses among the most serious. The big twins are malaria and diarrhoea in children. This assessment was confirmed by a sickness recall survey of 31 households visited by the team. In addition, during the field trips, four villages had epidemics of diarrhoea among the babies and small children (we considered more than ten cases at once as an epidemic). In one village, Timirshe, 27 children with diarrhoea were brought to the team.

Additional diseases associated with inadequate quantities of water, such as eye infections, ring worm and scabies, were commonly observed. Additional conditions reported as important by the community included hepatitis and T.B. Other major problems are concentrated around women and childbirth, and around small children and infectious disease (measles, respiratory tract infections etc.). These are discussed in more detail in Annex X.

A major underlying problem is diet: for most people this is unbalanced, consisting of cereals (rice or spaghetti) milk and occasionally meat. The amount of milk depends on the number of animals belonging to the family, and in the hot season milk dries up. Iron and vitamin deficiencies were observed in many women. In some villages potatoes and onions are available, but green vegetables are grown only in Iskushuban.

#### HEALTH SERVICES

"If you work with a plan, it works. If you work with no plan, nothing works" Mrs Xaawa Ducaale Adam.

On paper there are four levels of health service delivery in Bari Region: Primary Health Care in villages, Mother-and-Child Health Clinics (MCHs), District Hospitals and one Regional Hospital. What is called Primary Health Care is not in fact any more than minimal basic health services, with no community involvement or committees, inadequately trained and supervised CHWs and few and random drugs. For example, Rako had ORS, aluminium tablets and some gentian violet.

One organisational achievement in November 1997 was the first two days of Polio Eradication, organised by WHO, which reached about eighty percent of the villages in the region.



The current status of services is as follows:

LEVEL OF SERVICE	NGO	STATUS
Regional Hospital Bosaso	Africa 70 (gone)	functioning OK
District Hospitals		
Iskushuban	GTZ (gone)	closed; fully
Gardo	MDM (gone); GTZ (gone)	equipped; open
Balli Dhidin	UNDP (gone)	never opened
Bandar Bayla	-	closed
Alula	-	closed
Qandala	-	closed
PHC		
District Bosaso	Africa 70 (gone)	collapsed
8 villages		
Dist. Iskushuban	AICF (gone)	collapsed
11 villages		
Dist. Gardo	AICF (gone)	collapsed
5 villages		
Dist. Qandala	World Vision(gone)	collapsed
5 villages		
Dist. Alula	World Vision(gone)	collapsed
5 villages		
Dist. Bandar Bayla	UNICEF(current)	running
Dist. Gardo	MDM (93-93; gone)	collapsed
MOBILE HEALTH	CARE	running
EDUCATION		
WATER & SANITATION	CARE	just started
3 villages Bosaso Dist.		

Notes: AICF-AMERICA is Action International Contre la Faim.

IPPF has an Egyptian doctor carrying out training in Family Planning etc.

UNICEF has a Dr. Samy Abdel Latif Sabir PHD working with Islam & water.

### 3.2.5. Findings concerning Water

Of the 25 villages visited, 17 depend on berkads as their primary source of water. There is 1 borehole with a handpump and 2 with generators and submersible pumps. Of the remaining villages, 3 have a spring, 1 has shallow wells and 1 gets stagnant water from a nearby togga. All villages with a borehole also have berkads as additional source. The shallow wells are of the open type and in the centre of a togga, which means that they are flooded several times a year. In two villages, wars are used as an additional water source, especially for the livestock.

Of the 3 springs used all year, one has a submersible pump installed. They do not have any protection at all. One village uses berkads in the wet season and a spring in the dry one. The water in all 4 springs was observed to be contaminated.

In all cases, the water in the berkads was observed to be very contaminated. The berkads are fed with surface run-off water, which mixes with animal manure, human excreta, sand,

silt, etc. As the berkads are not covered, considerable algae growth occurs. They also form a breeding place for larvae of the malaria mosquito. People extract the water with buckets or containers on a rope. Ropes, buckets, containers and hands tend to become dirty, thus contaminating the water even more. Another problem with all berkads is the loss of water through cracked linings. These cracks occur in walls, floors and especially at the connection between walls and floor. Another source of water loss is evaporation.

At the moment, the boreholes seem to offer the cleanest source of water. Because of lack of equipment, it was not possible to do bacteriological tests on all of them. Only the water of the borehole with a handpump installed (Timirshe) was tested. The result was MPN 3/100 ml. This means that even here some contamination takes place. Further investigation on this topic is necessary and it is imperative for the Programme to have equipment to do routine bacteriological tests on water.

Transport of the water is mostly done in plastic containers. These containers are handy for this purpose, but are very difficult to clean inside. Some people use sand or detergent mixed with pebbles to wash them, which must scratch and make the problem worse. A more thorough study is necessary to establish the effects of dirty containers on water quality and what to do about it - probably chlorination.

### 3.2.6. Findings concerning water-related behaviour

Water is hard to get, precious and used very carefully. Water sources are often heavily polluted, particularly berkads. Less polluted alternatives cost more - the spring which is one kilometre up a mountain, the pump that costs a few hundred shillings a can.

The Household survey carried out during the mission on 53 households showed the following:

#### QUANTITY: WATER QUANTITY USED BY HOUSEHOLDS DURING PREVIOUS WEEK (INTERVIEWS 28th Nov.-8th Dec.)

LITRES	HOUSE TYPE/PERMANENT	TEMPORARY	ALL
less than 200	7	5	12
200-399	11	1	12
400-599	10	6	16
600-799	10	-	10
800 or more	2	1	3
<b>TOTAL</b>	<b>40</b>	<b>13</b>	<b>53</b>

Most temporary houses are occupied by nomads, and a few by displaced people. It is likely that this group uses less water. The numbers in the household survey are small, but show



that 92% of temporary house dwellers use less than 600 litres a week, as opposed to 70% of dwellers in permanent houses. This difference may become greater in the dry season.

**COST:** Three of the respondents living in temporary houses get their water free, and fourteen of the residents in permanent houses. This would mostly be from their own berkads; others pay 500/sh. per 20 litres.

**HOUSEHOLD HYGIENE:** Hand-washing facilities with soap or ash were observed near water storage in four of thirteen nomadic households and seventeen of forty permanent households.

### 3.2.7. Findings Concerning Sanitation

It was observed that in all but a few villages there is a huge deficit of latrines. Defecation in the open is common practice. Garbage is not disposed of properly. Combined with polluted water, this results in an unhealthy environment. The effects of this could be seen in the high incidence of cases of diarrhoea. In four villages, an epidemic of diarrhoea in children coincided with the visit of the Mission.

**PERSONAL HYGIENE:** Women normally defecate and bathe very early in the morning, before five, so that darkness gives privacy. They want latrines, and in several villages requested these before the subject was raised by the team. It was reported that because women cannot defecate and urinate when they want, they suffer from constipation and even kidney stones. Women also want latrines big enough to wash in, if the prices can be kept down. One reason is that washing is a cold business so early in the morning and therefore minimal. Inadequate washing leads to increased urino-genital infections.

**VILLAGE HYGIENE:** Some villages are kept scrupulously tidy and swept, particularly the tiny nomad villages. Bigger villages have a lot of litter. Because of the shortage of latrines, all villages are surrounded by areas of defecation and because of the lack of organised garbage disposal all villages are surrounded by a ring of rusting tomato puree cans and increasing amounts of plastic.

#### 4. Possible solutions

##### 4.1. Goals & indicators

The goals and indicators proposed follow the lines of those developed by PROWWESS in the 1980s. The two goals are Effective Use and Sustainability. Effective Use is divided into Optimal Use, Hygienic Use and Consistent Use.

The Indicators and their sources are as follows:

EFFECTIVE USE	SOURCE OF DATA
<b>OPTIMAL USE</b>	
Increased quantity of water (min. 15lpcd)	base-line + follow-up
Shorter distance to source	" "
availability to poorest	monitoring in villages
<b>HYGIENIC USE</b>	
increased w. quality source to mouth	bact. testing in base-line & follow-up
practices to improve quality	monitoring + check-list
site & home hygiene	" "
No. of latrines constructed	project documents
safe placing of latrines	project maps
hygienic latrine use	monitoring + check-list
better personal hygiene	focus group discussions
no more diarrhoea epidemics	project records
<b>CONSISTENT USE</b>	
maintenance of quantity in dry season	base-line in dry period 98 and follow-up

## SUSTAINABILITY

### INSTALLED & FUNCTIONING SYSTEMS

community decisions in installation	records of meetings
Water quality/quantity at source	base-line data
Operation and maintenance	project records
avail./afford. of spare parts	checks
cost recovery	project records
linked income generation	" "

### CONFIDENT/COMPETENT VILLAGE ACTORS

#### STRONG VILLAGE ORGANISATION

committee autonomy	" "
supportive leadership	" "
systems for problem-solving	" "

### CONFIDENT/COMPETENT AGENCY ACTORS

management skills	records of village meetings
knowledge and skills	" "

#### STRONG AGENCY ORGANISATION

committee autonomy	" "
supportive leadership	" "
systems for problem-solving	" "

### ENVIRONMENTAL CONSERVATION

choice of site technologies	" "
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INTERORGANISATIONAL COLLABORATION	project documents
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## 4.2. *Physical/technical Solutions*

### 4.2.1. Water supply

For each type of water supply, there are different technical options of solution. Each will be described in general below.

### 4.2.2. Berkads

As already described in Chapter 3, the berkads that are in use at the moment have different problems. The cracked lining is mostly caused by design and construction failures. When constructing the floor, not enough attention is given to penetration of the mortar between the stones, in order to make a good, unified plate. Then, the connection of the walls and the floor gives problems. Before starting the construction of the walls, enough care has to be given to the edge of the floor, as this is where the walls are going to join. These edges have to be very rough, in order to make the adhesion of the wall mortar to the floor as good as possible. The best way is to leave sharp, edgy stones sticking out of the floor. Then, still before starting constructing the wall, the rough edges of the floor should be cleaned and soaked with water. The cracking of the walls can be prevented by constructing them on a slope of 1 : 2. This helps them to resist the pressure exercised by water and mud from the outside. Here too, as in the floor construction, special attention must be given to the penetration of the mortar between the stones. The mortar used in both floor and walls should be of 1 part cement and 2 parts sand (by volume). Enough water should be added to make the mortar workable: not too wet, but certainly not too dry (for each part of cement approx. 1/2 part of water). When the whole construction is ready, a plaster layer of at least 2 cm thick should be applied. Mortar for plastering: 1 part cement and 2 parts sand (by volume).

The water quality in the berkads can be improved by clearing the surface run-off water, before it enters the berkad. In order to do this, a series of installations is necessary. First, a screen made out of strong iron bars is needed, in order to keep out branches, big stones, dead animals and other large materials. After that, a sedimentation tank is needed, where gravel and sand will settle. Next, a horizontal roughing filter will take out the finer matter, such as silt and other sedimentables. After this treatment, the water that enters the berkad will be quite clear. The bacteriological quality will not be up to standard though. This might be done by chlorinating the water, once it is inside the berkad.

In order not to let the water become contaminated again, the berkad should be roofed. This will keep the sunlight out, thus preventing algae growth. In addition, contamination by animals, humans or unhygienic extraction methods will be prevented. An extra advantage of roofing is that it prevents the growth of larvae of the malaria mosquito. There is a whole range of technical possible solutions for the roof construction, ranging from a concrete plate to simple plastic sheeting.

After closing the berkad, a way of extracting the water has to be created. This can be done by putting a handpump right on top of the berkad. Another solution is the construction of an extraction pit in the berkad floor. From here, water flows through a pipeline to a suction

well, from where it is pumped by a handpump. With this solution the system is closed, until the water comes out of the pump. The second system means that the suction well and handpump can be located near the village, thus reducing time spent by women and children on the transport of water.

An example sketch of this improved berkad system can be found in Annex VI.

#### 4.2.3. Springs

As described in Chapter 3, in four villages there were springs. Two of these were found in the mountains, on a higher level than the village itself. This makes the construction of small gravity systems possible, the solution by choice in these cases. Normally, the investment costs of a small gravity system are quite high, but operation and maintenance are simple and cheap.

With the other two springs, the situation is not that simple. Both are on a lower level than the adjoining village, making pumping necessary. In one case (Iskushuban) a submersible pump powered by a diesel generator had already been installed by UNICEF, so the Programme will not undertake any action here. The other spring is located at Dhudo. It is in the centre of the nearby togga and gets contaminated by flooding. The people of the village use the dry togga bed as a public latrine. The best solution for this case is described in Annex IV, where Dhudo is described.

#### 4.2.4. Boreholes

Of the three functionable boreholes seen by the mission, two had a submersible pump installed, with generators. In one case (Rako), where the system was being rehabilitated by UNICEF, the generator was old and leaking oil, because of the lack of spare parts. In the other case (Jedad) the system did not work because of a broken-down generator. The third functioning borehole had a handpump installed (Timirshe). For this system, a solar pump would be one of the solutions. All this has been described in more detail in Annex IV.

In this country, where the sun shines more than 300 days a year, solar pumps are the obvious alternative to generator-powered systems. It is the opinion of the Mission, that with a borehole system the possibility of the application of a solar pump should be investigated first, before making a choice for other technologies.

#### 4.2.5. Togga (riverbank infiltration)

Some of the villages, such as for instance Mudia, have a togga nearby. Depending on the sub-surface structures (impermeable layers, aquifers), it may be possible to construct surface or sub-surface dams, in order to improve riverbank infiltration. The stagnant water behind the dam can be used for animal watering and gardening purposes, while the infiltrated water can be extracted by a handpump from a shallow well, for human consumption.



#### 4.2.6. Sanitation

The solution for the lack of latrines is obviously the construction of them. Because in the actual Programme Proposal there is no budget foreseen for this purpose, an additional proposal will be necessary. In general terms, private latrines should be installed for each household. Near the waterpoints public latrines should be installed, for use by nomadic people. For the private latrines, a combination of a VIP latrine and bathing facilities would be the preference of the Mission, thus offering a private place for all, but especially for women, when taking their daily bath. A sketch of such a combined latrine/bathroom can be found in Annex VI.

#### 4.3. *Hygiene education*

"Nin naagi waddo iy rati rati wado midna kaama noqdo." Somali saying (translation: dirt near, disease near; dirt far, disease far.)

The hygiene education component proposed here is concerned strictly with preventive efforts linked to water and sanitation. However, to provide only this, where there are no other programmes, would be insane. Ways are being sought to reanimate or maintain the PHC projects which geographically overlap the project villages. This may involve SAWA/SPDS allowing the supervisor to share their transport. It would certainly demand a close working relationship between water and health.

Hygiene education is concerned with behaviour change. In the Somali situation the chief actors around water are women, helped by children. With latrine use, women have a significant role teaching good practice to the children. However they operate in a climate where their behaviour is modified by others - elders, religious figures, mothers-in-law and husbands. As well as more straight-forward hygiene education for women, therefore, different kinds of efforts are needed, aimed at these other groups, to make change possible.

The focus of hygiene education, at least at first, should be diarrhoea. It is a visible problem, and its prevention involves all the important hygiene changes of behaviour. However, boundaries will have to be set; a cause of diarrhoea beyond water is the pattern of supplementing breast-milk from the start; this in turn is because women are overworked and malnourished. This is a trickier area and should be handled carefully. After diarrhoea, the next problem is malaria.

#### METHODOLOGY

Step One: setting up Committees in each village which are likely to be effective.

Step Two: a modified PRA in each village. This must be clearly aimed, not at identifying all the problems of the village, but at identifying the causes of diarrhoea and ways of reducing it. The process educates the committee and the village, and also enables the committee to start working together and organising.

It would be desirable to take either an artist or a musician with the team so that in the problem-solving stage of the PRA, the village itself starts developing its own educational materials.

Step Three: Identifying strategies for the different village groups: visuals such as flip-charts are used by health personnel with some success, but oral methods are closer to the culture and should be considered.

Strategies and methods for all the villages:

- joint clean-up actions;
- chlorination of berkads;
- Simple leaflets on A4 paper, with bigger-than-normal printing, are good for providing precise information, for example on chlorination. To prevent these leaflets from being buried, a village notice board would be useful.

Approaches for Elders, Sheikhs, mothers-in-law, husbands:

Older people learn new things mainly by conversation, and older men spend much time just discussing ( a Somali saying: "men are for tea; women are for gossip" seems inaccurate; men gossip too). Methods that might inform this discussion could include:

- identifying an enlightened sheikh or elder to be a member of the committee with responsibility for organising discussions in the village;
- following techniques currently being developed by Dr Samy Abdel Latif Sabir PHD of UNICEF, who is working with sheikhs in water and sanitation;
- developing serious cassette tapes with a recognised religious leader linking Koranic texts to cleanliness;
- developing lighter cassette tapes with popular songs and slogans:

For women:

- talks, discussions, demonstrations using any flip-chart that seems appropriate; UNICEF have one on diarrhoea; the RDWSSP project in Kenya also has flipcharts on water and latrines that proved acceptable; copyright is with BKH in Delft and with their agreement the charts could be duplicated.
- making cheaper soap available in the villages;

For children:

- Schools do not seem a promising route to hygiene education; the Koranic schools follow a very fixed timetable and discussions with three teachers found them unresponsive. However Dr Sabir is also developing materials for Koranic schools which may prove useful. Western-style schools are mostly not functioning.



- Any method that seems like a game is not socially acceptable.
- The team felt that children could be reached via an alphabet booklet or wall-hanging, since adults and children want to learn to read Somali. Each letter would have a word related to water and sanitation, a picture and a short message in readable letters such as "L is for latrine; use it always, keep it clean". Each message should be a positive one. (see Annex XI for the alphabet)

#### EQUIPMENT NEEDED FOR MAKING HYGIENE EDUCATION MATERIALS

- a desk-top publishing programme for the office computer;
- a small library which includes photo-copiable pictures;
- a stock of pens, paper for local artists, letterers etc.,
- At least two good-quality cassette players for recording educational tapes, and blank cassettes.

## 5. Sustainability of the water supply systems

### 5.1. Organisations & Structure at Village Level

The team sees the following function as essential for each village even if the structure or name is different:

The Village Development Committee should have the following functions: it should be representative of the different stake-holders in the village, including elders, women and minorities. Through the VDC the voice of the users/beneficiaries will be heard, and they can be informed of what is going on.

Their second job is gate-keeping and coordination; organisations wishing to work in the village should only be allowed in through them, and all activities should be reported to them to stop any overlap.

The Village Water Committee has to carry out the following main tasks:

- Participating at the installation stage;
- Operation & Maintenance;
- Fee-setting, Collection & Accounting;
- Hygiene Education;
- Management and planning;
- Informing The VDC of progress and problems;

A Village Water Committee is the most indicated form of organisation to do all this. The committee has to consist of five or seven members, as the circumstances demand. An odd number makes voting easier. The VWC should consist of at least: a chairman/woman, an accountant and a caretaker/water seller. Ideally, at least one of the members is female. This ensures that the female voice is heard and their interests are being taken care of. The Committee should be kept small and practical. If it gets expanded to make everyone happy, then decision-making is no longer done by the people doing the work.

The specific tasks listed above can be done by groupings of two or three members of the committee; Accounting could be done by the caretaker and the treasurer; or they may need a bigger co-opted group of people; with Hygiene Education, for example, the CHW could be co-opted.

All of these groups need sensitive training adapted to their educational levels and understanding. There is no need to exclude the non-literate, especially since this would exclude most women. Educational materials must be developed with the non-literate in mind and non-literate committee members can be paired with a literate relative. - see also under O&M.

Participating in the Installation stage:

The Committee needs to take shape in some form early enough to become involved during planning. Local knowledge of local circumstances has to be taken into account from the beginning, in order not to make avoidable mistakes. Changes to local customary designs and the advantages and disadvantages of different solutions should be discussed. All this

will make the beneficiaries more aware of the functions of the different parts of the system and why they are there. The beneficiaries start to develop a feeling of ownership towards the system, which in turn will motivate them in operating and maintaining it.

#### **Operation & Maintenance**

The key to good O&M is good training. The key to good training is:

- a) gearing the training to the level of the trainees, and ensuring understanding however long it takes; people must really understand why and how to operate and maintain their water systems, and how and why the technology is as it is.
- b) training until they really master the skills involved. Much training fails because people are taught about the importance of changing a washer, but are not made to practice changing the washer twenty times, so that they can do it during a dark and stormy night.

#### **Accounting Group**

The desire for sustainable O&M activities inevitably means charging for water in some way. The system operator and water seller have to be paid, spare parts and chlorine have to be bought. Reservations for future repairs and replacements have to be made. If pricing is fixed by the community or its committee then under-pricing at first is common. This does not matter providing there is transparency in the way the price is fixed and in the history of the money.

#### **Hygiene Education Group**

The activities envisaged for these groups are outlined in section 4.3.

### **5.2. Organisations & Structures at Regional Level**

#### **5.2.1. Central Supplies**

A central provision of spare parts and technical back-up in Bari would be a major step in building sustainability in village water. Such an initiative would have to get the co-operation of the major donors in the sector and agreements on standardisation of models. Some organisations have already expressed an interest.

#### **5.2.2. Production of manuals**

One of the early activities of the project team must be developing good manuals on O&M. These need to be in Somali, to be easily readable and therefore in large type; to have good clear visuals and most important to be pre-tested. They should be designed with non-literates in mind, so that they can also become simple readers.

#### **5.2.3. Building Additional Income**

Building additional incomes into communities is to build sustainability, since it increases the chances of users paying for services. Small-scale credit for women is one route: The Women's Association in Iskushuban demonstrates that income-generation for women is practicable and that women repay loans:

- the activity most directly linked to water is growing vegetables or young trees in or near the village;

- if the Women's Associations in Bosaso could improve outlets for handicrafts, then more women would spend time making mats etc. However Bosaso politics play a role here.
- many Iskushuban women have invested in small service enterprises such as tea stalls, charcoal booths or butchering. But in the service sector, markets are limited. Greater investment, in for example sewing machines, may prove to be better in the long term.

It would be foolish, however to neglect the needs of male house-hold heads. Ways of making credit available while insuring repayment can be developed if carefully adapted to the Somali culture - by having a respected Elder as a guarantor, for example.

## 6. Conclusions & recommendations

conclusion: ideas about the causes of illness include modern ideas such as dirt;  
recommendation: with provision of water, and with these kinds of ideas, hygiene education has a good chance of success.

conclusion: there is a major need for latrines  
recommendation: financing for latrines should be sought as soon as possible

conclusion: women need privacy for washing;  
recommendation: the latrine design should allow for a washing area;

conclusion: the current project caters for villages with cheap solutions to water problems;  
recommendation: the current plan should include some villages with more expensive solutions. A medium-term plan should be made for future priorities and funding.

conclusion: raising water in Somalia brings problems with energy sources;  
recommendation: more thought should be given to the best use of solar power.

conclusion: plastic water storage cans and drums are handy but difficult to clean;  
recommendation: the SAWA Engineer should experiment to find optimum ways of chlorinating the cans and drums. Chlorine could be provided to the Water Committees for selling on to make a small profit.

conclusion: soap is available in remote villages but of an expensive brand;  
recommendation: cheaper imported soap or local production by women's groups should be investigated

conclusion: underlying the water- and health-related problems in Bari region is severe poverty;  
recommendation: assisting women in income generation would help the other aims of the project.  
credit schemes to help men with income generation should be developed with better ways of ensuring repayments.

## Future of SPDS and training needs

SPDS is already recruiting for the two posts of Hygiene Educators. Mohamed Ahmed Yusuf is proposed as one of the two hygiene educators, and seems suitable. A woman is being looked for to fill the other post. It is assumed that they will be in place for the training planned by CARE during the next month on PRAs.

All staff involved in Hygiene education need a serious course in the theory and practice of behaviour change, including practice in small-group education methods. It is worth remembering that expert health workers also get rusty and need to rediscover skills. A Dr. Rahman, working with CARE, is said to be an expert in Health Education and might be the right person to do such a course, perhaps together with the SAWA consultant. The course must be in Somali.

Currently there are four posted staff members in SPDS. The two young staff members are not specifically trained for their posts;

WARSAME ABDULLAH JAMA, the Social Worker, has a two-year diploma in Teacher Training for secondary schools, and was a teacher.

MOXAMED AHMED YUSUF, the Water & Sanitation Worker, is BS in Agriculture Education and worked in Agriculture Extension.

Staff are asking for training in accounting, administration and computer use. This seems a sensible suggestion.

It is likely that the staffing pattern will change over the next six months and the situation needs to be kept under review.

## VILLAGES WHERE THE PROGRAMME WILL START

The 1<sup>st</sup> batch of villages, those where the programme will work during the months February - June 1998, are:

Ambar Hose	-	improved berkad system
Rako II	-	annex to the Rako I system
Xumbays	-	improved berkad system
Maygaag	-	improved berkad system
Qalwo	-	improved berkad system

For the 2<sup>nd</sup> batch of villages (July - December 1998), tentatively the following list has been presented. These will have to be reviewed during the first half year:

Balli Dhidin	-	flood protection + improved berkad
Mudla	-	small dams in togga, infiltration, shallow well, handpump
Jeedal	-	improved berkad (small dams in togga)
Aman	-	improved berkad or improved war, still to be discussed with elders and beneficiaries

Annex 1. GLOSSARY & LIST OF ABBREVIATIONS	
Berkad	tank lined with stones and cement
Togga	river bed
War	small lake
CHW	Community Health Worker
EPI	Expanded Programme of Immunisation
MCH	Maternal & Child Health
MPN	Most Probable Number (E-coli count/100 ml of tested water)
ORS	Oral Rehydration Solution
PHC	Primary Health Care
SORSO	Somali Relief Society
SPDS	Somali Peace and Development Society
SSDF	Somali Salvation Democratic Front
TBA	Traditional Birth Attendant
WHO	World Health Organisation
UNDP	United Nations Development Programme
UNICEF	United Nations Fund for Children



## Annex 2. TRAVEL AND VISIT PROGRAMME OF THE MISSION

Sunday 23/11	travel Amsterdam - Djibouti
Monday 24/11	Djibouti: <ul style="list-style-type: none"><li>- shopping for office supplies</li><li>- planning meeting of mission team</li><li>- preparing investigation forms for field visits</li></ul>
Tuesday 25/11	morning: <ul style="list-style-type: none"><li>- travel Djibouti - Bosaso</li></ul> afternoon: <ul style="list-style-type: none"><li>- visit Bosaso hospital: pharmacy, laboratory, wards, water system, grounds</li><li>- print forms for field visits</li></ul>
Wednesday 26/11	Bosaso: <ul style="list-style-type: none"><li>- meeting at Sorso (Somali NGO);</li><li>- meeting WHO</li><li>- visit Bosaso hospital: out patients</li><li>- visit UNICEF: health sector, water sector</li><li>- short observation of family planning training course for hospital nurses</li><li>- print forms for field visits</li></ul>
Thursday 27/11	Bosaso: <ul style="list-style-type: none"><li>- meeting with the elders</li><li>- visit UNICEF: water sector</li><li>- visit public library (Sorso)</li><li>- instruction session for field team: form filling</li></ul>
Friday 28/11	start 1 <sup>st</sup> field trip: <ul style="list-style-type: none"><li>- visit villages of Ambar, Ambar Hose, Rako</li><li>- sleep in Rako</li></ul>
Saturday 29/11	continue 1 <sup>st</sup> field trip: <ul style="list-style-type: none"><li>- visit villages of Rako, Rako II, Xumbays, Maygaag and Dhudo</li><li>- sleep in Dhudo</li></ul>
Sunday 30/11	continue 1 <sup>st</sup> field trip: <ul style="list-style-type: none"><li>- visit villages of Dhudhub, Jedad, Libahar, Qalwo, Qararsor</li><li>- travel back to Bosaso</li></ul>

- Monday 1/12**      **Bosaso:**
- visit hospital laboratory
  - visit UNICEF: water sector, health sector, R.P.O.
  - report writing
  - preparation meeting for next field trip
  - visit EU/Africa 70 (last not seen)
  - meeting with governor of Bari region
- Tuesday 2/12**      **Bosaso:**
- report writing
  - lunch with Bari Governor and acting chairman of SSDF
- Wednesday 3/12**      **start 2<sup>nd</sup> field trip:**
- visit villages of Tisjic, Geesaqabad
  - sleep in Geesaqabad
- Thursday 4/12**      **continue 2<sup>nd</sup> field trip:**
- visit villages of Jeedal, Aman, Iskushuban
  - sleep in Iskushuban
- Friday 5/12**      **continue 2<sup>nd</sup> field trip:**
- visit villages of Iskushuban, Timirsho, Xamurre, Balli Dhidin
  - sleep in Balli Dhidin
- Saturday 6/12**      **continue 2<sup>nd</sup> field trip:**
- visit villages of Balli Dhidin, El Gal
  - sleep in El Gal
- Sunday 7/12**      **continue 2<sup>nd</sup> field trip:**
- visit villages of El Gal, Mudia
  - start travel back to Bosaso
- Monday 8/12**      **continue 2<sup>nd</sup> field trip:**
- travel back to Bosaso
- Bosaso:**
- visit CARE - Bosaso
  - report writing
  - diner with Secretary General of SSDF
- Tuesday 9/12**      **Bosaso:**
- tallying of forms
  - report writing
- Wednesday 10/12**      **Bosaso:**
- tallying of forms
  - report writing

Thursday 11/12	Bosaso: <ul style="list-style-type: none"> <li>- meeting with the elders, SSDF and Governor</li> <li>- report writing</li> </ul>
Friday 12/12	Bosaso: <ul style="list-style-type: none"> <li>- meeting with most senior Traditional Leader</li> <li>- report writing</li> </ul>
Saturday 13/12	travel Bosaso - Amsterdam
Sunday 14/12	

### Annex 3. LIST OF PEOPLE MET/SPOKEN TO

Abdijabar Hasan Dini	- CAR: - Bosaso; P.O.
Abdirahman Mohamed Ali	- SORSO; Chairman
Abdirahman Yuusuf Muuse	- UNICEF; nutrition section; resp. hardware
Abdirasach Ali Hadji	- SORSO; Vice Chairman
Abshir Musse Said	- SSDF; acting chairman
Ahmed Moalin Hirsi	- community nurse; member field team
Axmed Gelle Omar	- SORSO; Rural Development
Dr. Abdirahman Aise Sheywal	- Bosaso Hospital;
Dr. Abdirahman Saciid	- ex - Iskushuban Hospital; polio eradication
Dr. Abdullaahi Asad Cumar	- Bosaso Hospital; surgeon
Dr. Ali Abdi Essa	- WHO
Dr. Ciise Axmed '	- Bosaso Hospital; gynaecologist
Dr. Faarax Xaaji Saciid	- Bosaso Hospital; director
Dr. Maxed Cali Kawir	- Bosaso Hospital; surgeon
Dr. Saciid Ducaale	- Bosaso Hospital; anaesthetic doctor
Ismail Shire Jame	- Bosaso Hospital; administrator
Kunal Banchi	- UNICEF Bosaso; Regional Programme Officer
Moxamed Abshir Waldo	- SSDF; secretary general
Moxamed Ahmed Yusuf	- SPDS water & sanitation; member field team
Moxamed El Fatih	- UNICEF Somalia; Head Water Section
Moxamed Moumin Yusuf	- SORSO; Accountant
Peter Arube	- WHO; Bosaso hospital laboratory
Said Ahmed Dad	- UNICEF Bari; Head Water Section
Said H. Musa	- Governor Bari Region
Said Salah	- SSDF; member of the political committee
Samy Abdel Latif Saber	- UNICEF Water Section; Koranic Project
Warsame Abdullaai Sama	- SPDS social worker; member field team
Xaawa Ducaale Aadam	- nurse/midwife; member field team

List of Participating Elders and Traditional Leaders in the Final Presentation of the Mission's Findings

Nuur Farah	(Beeldaje)
Ali Farah	(Beeldaje)
Musse Farah Musse	(Suldaan)
Siciid Guuled Muuse	(Suldaan)
A/llahi Xildiid	(Suldaan)
A/kadir Suldan Ali	(Suldaan)
Mohamed Ali	(Suldaan)
Mohamed Isma'il	(Suldaan)
Cubayd Mohamed	(Suldaan)
Abdale Said	
Mohamed Haji Yusuf	
Saciid Isma'il	
Shini Yusuf Mohamed	
Abshir Idiris Ali	
Mohamud Omar Dhoolawaa	
Abdi Said	
A/kariin Said	
Bashiir Abdi Cismaan	
Mohamed Said Mohamud	
Mohamud Yusuf Ali	
Mohamud Abdi Ali	
Shire Mohamud	
Yusuf Salah Xaliye	
Mohamed Aadan Isse	
A/kadir Ahmed Farasedeh	
Bashiir Mire Jam'a	
A/llahi Haji Farah	
Timir A/dale Yusuf	
Huruse Mohamed Musse	
Mohamed Khalid Ali	
A/llahi Yusuf Hassan	
Weyrah Jam'a Yusuf	
Mire Camale Hussen	
Mohamed Jam'a Salah	
A/llahi Osman Samatar	
Mohamed Jam'a Mohamed	
Yusuf Teetano	
Ahmed A/rhman Samatar	

#### Annex 4. DESCRIPTION OF THE VILLAGES

village name	page
Ambar	iv - 2
Ambar Hose	iv - 4
Rako	iv - 5
Rako II	iv - 6
Xumbays	iv - 7
Maygaag	iv - 8
Dhudo	iv - 9
Dhudhub	iv - 10
Jedad	iv - 11
Libahar	iv - 12
Qalwo	iv - 13
Qararsor	iv - 14
Tisjic	iv - 15
Geesaqabad	iv - 16
Jeedal	iv - 17
Aman	iv - 18
Iskushuban	iv - 19
Timirshe	iv - 20
Xamurre	iv - 21
Balli Dhidin	iv - 22
El Gal	iv - 23
Mudia	iv - 24

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Dhudhub	iv - 10
Jedad	iv - 11
Libahar	iv - 12
Qalwo	iv - 13
Qararsor	iv - 14
Tisjic	iv - 15
Geesaqabad	iv - 16
Jeedal	iv - 17
Aman	iv - 18
Iskushuban	iv - 19
Timirshe	iv - 20
Xamurre	iv - 21
Balli Dhidin	iv - 22
El Gal	iv - 23
Mudia	iv - 24



of the berkad. The water then flows through a pipeline to a suction well, from which it is extracted by a handpump. If necessary, it is possible to install a sand filter (medium sized sand grains) somewhere in the pipeline, to improve water quality even more. Apart from being a closed system (so no contamination possible), this also allows for placing of the handpump near the village, thus reducing the need for long walks to get the water and also reducing the chance of contamination of the water in the berkad itself and of its surroundings. The last measure to improve water quality would be chlorination: each time after the berkad is filled give it a high dosage of chlorine. Water testing afterwards will have to indicate if further chlorination is necessary.

"AFRICARE" war:

Looking at the size of the war, it would be far too expensive to close it in order to reduce evaporation.

The filtration can be reduced by installing a plastic layer on the bottom of the war. The sheets of plastic should be glued or welded together, in order to reduce leakage between them.

Broken, private berkads:

The breaking of these berkads is caused by construction failures. At first, the walls should be constructed at an inclination of 1 : 2. Enough mortar should be used between the stones and the walls should be at least 20 - 25 cm thick (all filled up with stones and mortar). The mortar should consist of 1 part cement and 2 parts sand (by volume). After that, the walls need to be plastered. The plastering should at least be 2 cm thick. The mortar should consist of 1 part cement and 2 parts sand. If necessary, an extra impermeable layer of just cement and water can be applied.

## Ambar (Hose)

### description

The village of Ambar Hose is located 252 km from Bosaso, 13 km. from Ambar (Sare) and ca. 43 km from the tarmac road Bosaso - Gardo (9044.75 N; 49033.38 E). Main source of income is livestock and frankincense. The village consists of 52 permanent houses.

The nearest CHW is in Ambar.

### water supply

The only water source available at the moment in Ambar Hose is berkads (lined and unlined). The same problems as in Ambar (Sare) occur: leakage through cracked walls and especially the connection between bottom and walls, evaporation, bad water quality.

### possible solutions

The solution in this village would be the same as in the previous one. In this village, there is no community berkad, so if the programme wants to include this village, a community berkad would be the best solution to supply drinking water. The general description of this berkad would be the same as that given for the one in Ambar (Sare).

## Rako

### description

The village of Rako is located 275 km from Bosaso, 23 km from Ambar Hose and ca. 63 km. East from the tarmac road Bosaso - Gardo (9047.08 N; 49043.71 E; 710 masl). Main source of income is livestock and frankincense. The village consists of 350 permanent houses.

It seems that the village is disorganised or divided. The Women's Association knows how to produce handicrafts but cannot organise to get them to a market. The women want the school to be functioning; this also requires organisation; fifty children paying 2,500 sh per month would provide a salary for the teacher but the men are not interested so nothing is done. The CHW badly needs supervision and a supply of medicines.

### water supply

The people of Rako have 40 big berkads and several smaller ones. There is a borehole in the village, with a depth of 430 m. The SWL is 298 m. At present, UNICEF is rehabilitating the water system. They are constructing two communal water points and one water point where tanker trucks can load. Several drinking troughs for goats and sheep are being rehabilitated and a new trough for camels has been built. The existing two tanks are being repaired (I: round, 12,5 m<sup>3</sup>, bottom level 1 m; II: rectangular, 32 m<sup>3</sup>, bottom level 2 m). The rehabilitating constructor reported that the installed submersible pump has a capacity of 8 m<sup>3</sup>/h. The pump is powered by a Deutz diesel generator (type F3 6L 912). The characteristics of the generator are: capacity 48 kVA/38,4 kW; 400 V; 50 Hz; 3 p.H. The caretaker stated that the generator is in bad need for spare parts, because it leaks oil.

### possible solutions

As the water supply system of Rako is presently being rehabilitated, at the moment no action from the programme is necessary.

## Rako II

### description

Rako II is a small satellite village of Rako, at a distance of 1,7 km (9046.44 N, 49043.09 E; 720 masl). It has 50 permanent households and 20 fluctuating. The people have livestock as their main source of income. They reported to own 200 goats, 300 sheep, 150 camels and 100 cows.

### water supply

The people of Rako II presently use 2 berkads as their only water source. They say that the capacity of these two berkads together only lasts them for one month.

### possible solutions

UNICEF already has plans for the water supply of this village. The idea is, to connect it to the Rako system, by means of a 1,7 km pipeline. An elevated reservoir should be constructed and a booster pump installed. The distribution of the water will be done by the installation of two water points. According to the people of Rako II, UNICEF has planned to construct a tank with capacity of 10 m<sup>3</sup> (50 barrels). They claim that this is not big enough and asked for a bigger one.

UNICEF claims, that they already have all materials in stock. It was unclear to the team why they did not include this sub-system in the planning for the whole system. The team was asked whether SAWA/SPDS would be interested in co-operating with UNICEF in this project. The materials would be donated by UNICEF, while SAWA/SPDS would do the supervision, community mobilisation and health education. The community would do the construction and digging of trenches. The mission expressed their interest in co-operating in such a way, but stated that the programme would not start before February 1998.

UNICEF stated that this might not be a problem and would try to shift the implementation time for the project forward until March 1<sup>st</sup>, 1998. In February, the exact details of the co-operation will have to worked out.

## Xumbays

### description

The village of Xumbays is located at 305 km from Bosaso, 30 km from Rako and ca. 96 km East from the tarmac road Bosaso - Gardo (9038.51 N; 49053.47 E; 720 masl). The main source of income is livestock. The village consists of 30 houses.

The village has a woman, Xalimo Muuse Yuusuf, trained by the Red Cross in Mogadishu in the seventies. She has helped get the village to hire a building as Health Post; UNICEF has "donated" drugs - out-of-date ferrous sulphate and nearly out-of-date ORS packets. CARE had spent four days in the village ten days before the team visit doing Health Education, and many of the messages were still remembered. Liaising with CARE will be necessary.

### water supply

The water of the village is collected in berkads. The people own an average of one berkad per four families. One of the berkads is a "government" (communal) berkad. Nearby, at 1,7 km, a borehole was drilled in 1960, which functioned until 1963 (9038.69 N; 49054.41 E; 550 masl). This is completely filled with stones and can not be rehabilitated.

### possible solutions

The "government" berkad can be rehabilitated and improved, so it might serve as a drinking water source for the people of Xumbays. Another possible solution, as already mentioned in the Bari Water Rehabilitation Study, is the construction of small dams in the nearby togga. Even the construction of sub-surface dams might be considered. Extraction of the water then should take place by means of a handpump in a shallow well. These options will have to be studied further, before a decision can be taken.

## Maygaag

### description

The village of Maygaag is located at 324 km from Bosaso, 19 km from Xumbays and ca. 115 km East of the tarmac road Bosaso - Gardo (9°31.05' N; 49°55.15' E; 500 masl). The main economic activity is livestock keeping, while some people depend on marine resources (Bander Bayla, fishing). The village consists of 35 permanent houses.

The village has no PHC.

### water supply

For its water supply, the village depends entirely on berkads. These do not have enough capacity to satisfy the demand of both humans and animals.

### possible solutions

The only possible solution for the problem of water supply in Maygaag is the construction of an improved community berkad.

## Dhudo

### description

The village of Dhudo is located at 375 km from Bosaso, 51 km from Maygaag and ca. 166 km East of the tarmac road Bosaso - Gardo (9019.47 N; 50012.37 E; 300 masl). It consists of 175 houses. The main source of income is livestock, small farms and some people go to Bander Bayla for fishing. The village health situation is poor, diarrhoea and other common diseases were mentioned most and an elder reported that several babies had died, despite a CHW trained in oral rehydration and with a supply of packets. Hardly any latrines could be found by the Mission. The people use the dry riverbed to defecate.

### water supply

The only available water source of the village is a spring, which emerges in the togga exactly at the point where the village is. The water is highly contaminated. During the dry season people, tankers and animals come from far away, as this is the only permanent source of water in a vast area. Therefore, in the dry season the capacity of the spring is not enough to satisfy all demands.

### possible solutions

The spring should be protected, in order to prevent the water from being contaminated by external factors. Also, it should be protected from the floods. At the same time, these floods make it impossible to install a pump at the location of the spring itself. The best solution would be: construct an extraction well on the bank of the togga. This extraction well should be connected to the protected spring by a pipeline. For this pipeline a trench has to be dug in the riverbed. As the riverbed consists of rock and big boulders, this will be a difficult job and some special equipment (explosives, pneumatic hammers, etc.) is necessary. From the extraction well, the water has to be pumped into a reservoir in the nearby hill and from there it can flow by gravity to a distribution system. At least 3 water points and 2 animal water points will have to be installed. It has to be considered to install a water point to fill up tankers, too.



## Dhudhub

### description

The village of Dhudhub is located at 361 km from Bosaso, 42 km from Dhudo and ca. 152 km East from the road Bosaso - Gardo (9013.81 N; 49055.07 E; +25 masl). The population depends on herding for their income. The village consists of 17 permanent houses. Diarrhoea is present and in the village there are no latrines.

### water supply

The only water source available in the village is formed by 14 berkads (both lined and unlined). The major problems with these berkads are cracked and broken linings. Especially the community berkad is in a bad shape. The amount of water is not sufficient to cover all demands.

### possible solutions

The only possible short term solution for the village is to rehabilitate and improve the community berkad.

## Jedad

### description

The village of Jedad is located at 313 km from Bosaso, 48 km from Dhudub and ca. 104 km East of the tarmac road Bosaso - Gardo (9024.08 N; 49035.23 E; 562 masl). Livestock is the main source income. The village consists of 250 permanent houses.

### water supply

The main water source of the village is a borehole, with a submersible pump, a generator and a reservoir. This system has recently been rehabilitated by UNICEF. At the moment of the Mission's visit, the generator had broken down and could not be repaired because of lack of spare parts. When UNICEF was confronted with this problem, they said to be aware of this problem and that a new generator already had been ordered. The people of Jedad certainly were not aware of this! Apart from the borehole some berkads exist and that is what the people at the moment are using as a watersource.

### possible solutions

As the system already has been rehabilitated by UNICEF and a new generator is on its way, no action from the programme is necessary.

## Libahar

### description

The village of Libahar is located at 287 km from Bosaso, 26 km from Jedad and ca. 78 km East from the tarmac road Bosaso - Gardo (9029.24 N; 49024.04 E; 650 masl). The main economic activity of the people is livestock keeping. The village consists of 64 permanent houses. No latrines were observed.

### water supply

Berkads are the only water source available in the village. The same problems as with berkads in other villages occur. When in the dry season the berkads dry up, the people migrate to places with permanent water.

### possible solutions

As in other villages with berkads as their sole water source, the solution would be to build an improved community berkad.

## Qalwo

### description

The village of Qalwo is located at 261 km from Bosaso, 25 km from Libahar and ca. 52 km East of the tarmac road Bosaso - Gardo (9038.11 N; 49030.85 E; 712 masl). The main source of income is livestock. The village consists of 78 permanent houses. No latrines were observed.

The village has never been part of a PHC project but has selected a CHW and TBA for training and have collected wood and stones for a Health Post. They have a Woman's Committee of six women

### water supply

The village has berkads as water source (lined and unlined). No community berkad exists. Here, too, problems with leakage through cracked/broken floor and walls occur, as well as problems at the connection between floor and walls.

### possible solutions

The best short term solution for Qalwo would be to construct a community berkad of the improved type.

## Qararsor

### description

The village of Qararsor is located at 255 km from Bosaso, 6 km from Qalwo and ca. 46 km East of the tarmac road Bosaso - Gardo (9038.76 N; 49034.31 E; 690 masl). Livestock keeping is the main source of income. There are no latrines in the village.

### water supply

Berkads (some constructed, some under construction) form the only water source of the village. The problems here are similar to other places. There is no "government" (community) berkad. In the dry season, the capacity of the berkads is not enough to serve all needs.

### possible solutions

Construction of an improved type community berkad would be the short term solution in this case.

## Tisjic/Balidoog (Tisjic II)

### description

The village of Tisjic is located at 91 km from Bosaso and ca. 30 rough km from the tarmac road Bosaso - Gardo (10051.83 N; 49027.39 E; 638 masl). It is located between the slopes of the Mesqat Mountains. As a main source of income the population is involved in frankincense collection. The second source of income is formed by livestock keeping. The village consists of two parts, 2 km apart. There are a togga and a mountain between the two parts. The village consists of 160 permanent houses. The health condition of the people is very poor. In Balidoog, one community latrine was observed.

### water supply

There is a permanent water source, in the form of a spring. There are also some berkads, mainly in Balidoog. The spring is located at 1300 m from the main village, at 680 masl. The estimated capacity is 6,5 l/s (23,4 m<sup>3</sup>/h). In the dry season this will be less, but according to the people of the village it maintains its capacity. This means that as a minimum, the capacity will be ca. 3 l/s (10,8 m<sup>3</sup>/h). Water characteristics are: EC 740; pH 7,0; turbidity < 5 TU; 0,7 m deep.

### possible solutions

The solution for Tisjic would be the construction of a small gravity system,, consisting of a spring box, a reservoir, 1.300 m transport line, 3 water points and 2 animal water points. Balidoog would have to be connected by a 2 km pipeline. There, one water point and one animal water point would have to be installed.

## **Geesaqabad**

### description

The village of Geesaqabad is located at 122 km from Bosaso (10048.77 N; 49035.83 E; 660 masl). The village is isolated and the road conditions are very rough. The main sources of income are frankincense collection, livestock keeping and hay farming. It consists of 52 permanent houses. The health situation is very poor. At the moment of the Mission's visit, there was an outbreak of diarrhoea amongst children. The village does not have one single latrine. An elderly man has been selected for training as a CHW but did not seem suitable as he is often away from the village and regards deaths from diarrhoea as unavoidable, being an act of God.

### water supply

The village owns three berkads as a main water supply. Also, there is a small spring at 2 km distance and 110 m higher than the village. Normally, the people use the berkad water, because it is nearby. The mission observed the water to be very dirty. The spring is mainly used in the dry season. Next to it, there is a small artificial pond, where people as well as animals get their water from. In the pond, the water contains many algae, larvae frogs and animal dung. Water characteristics: EC 650; pH 7,5; turbidity < 5 TU. The capacity of the spring is estimated to be 0,5 - 1 l/s (1,8 - 3,6 m<sup>3</sup>/h). According to the people, the capacity of the spring is the same in the dry season. This means that it can be estimated at ca. 0,5 l/s (1,8 m<sup>3</sup>/h).

### possible solutions

The solution for Geesaqabad would be the construction of a small gravity system, consisting of a spring box, 1 km of transport line, maybe 1 break pressure tank, a reservoir, one kilometre of distribution mains, one water point and two animal water points. Seeing the very bad health situation in the village, on short notice the water of the berkads should be chlorinated. One berkad was measured to contain 75 m<sup>3</sup> of water. In order to clean the water, an initial boost of 5 mg/l chlorine should be administered. For the measured berkad of 75 m<sup>3</sup> this means a dosification of 800 g of NaHOCl. After the initial boost, the water should be tested at regular intervals and NaHOCl added as necessary to maintain a chlorine of ca 1 mg/l. Care has been asked to visit and chlorinate as they are working nearby.



## Jeedal

### description

The village of Jeedal is located at 165 km from Bosaso (10012.05 N; 40030.48 E; 510 masl). It is a very isolated village, which can only be reached via a road that the investigation team identified as being "rough". The "village" actually consists of only one permanent house, but the area around it is an important grazing area for livestock. No latrines are present.

### water supply

The village and its surrounding count with only two small berkads for its main source of water. These do not have sufficient capacity for humans and livestock. During the dry season, people migrate to areas where permanent water sources are available. After each rainfall, during a dew days stagnant water is collected from the nearby togga.

### possible solutions

The best short term solution for the water supply of Jeedal would be the construction of an improved berkad system. It might be possible to increase the infiltration of water in the togga by the construction of small dams. Water then could be extracted by a handpump from a shallow well in the riverbank (to be dug). In order to know if this is a viable solution, more investigation of the subsoil is necessary.

## Aman

### description

The village of Aman is located at 210 km from Bosaso (10009.72 N; 49049.75 E; 440 masl). As Jeedal, the village is very isolated and the road conditions are rough. The economic resources of the village are livestock keeping and frankincense collection. Again like Jeedal, Aman consists of only one permanent house. No latrines could be found. Aman is the centre of an important grazing area for livestock.

### water supply

The water source of the village consists of 2 small lined berkads. At 6 km from the village, a war was constructed by Africare. This war is not lined. It is being used mainly by nomadic people, to water their animals. They also use the war as drinking water source.

### possible solutions

In first instance, the Mission proposed to improve the war, by using plastic sheeting to reduce leakage. A small sub-soil canal could then be constructed, where the water could filter to a shallow well (to be dug). From there it could be extracted by a handpump. When presented with this conclusion, the elders of Aman indicated not to be too happy about this solution, because they had already started the excavation of a very large berkad. The Mission answered them, that this information would certainly be given on to the Programme Team, that will arrive somewhere in February 1998. They should discuss with the elders what is the best solution.

## Iskushuban

### description

The town of Iskushuban is located at 185 km from Bosaso (10017.13 N; 50013.86 E; 290 masl). The road conditions are between normal and rough. The economic activity of the people centres around livestock keeping, frankincense collection and small farms. The town consists of 370 permanent houses. It does not have enough latrines.

There is a fully equipped district hospital, closed for two years, and MCH centre functioning at a good level; records showed one-third of the under-fives attending to be 80% of expected weight-for-age or less; proper funders have left the district.

### water supply

Iskushuban has a permanent water source, in the form of a spring. UNICEF installed a submersible pump in a pond, that is being fed by the spring. The water is contaminated, because animals are watered here and people take their baths. The pump is powered by a diesel generator. The distribution system has two water points. No animal water points are installed (they go directly to the stream that comes out of the spring). The operator of the pump and generator mentioned that the capacity of the generator was far too big for the small submersible pump. The Mission told him, that technically speaking this is not a problem. It will not do the efficiency of diesel use any good, though. The town lacks spare parts, such as pipes, etc.

### possible solutions

As the water system already has been rehabilitated, the Programme will not take actions in Iskushuban.

## Timirshe

### description

The village of Timirshe is located at 235 km from Bosaso (10033.80 N; 50025.32 E; 310 masl). The road conditions are between normal and rough. The main economic activities are livestock keeping and frankincense collection. The village consists of 160 permanent houses. Only 20 latrines were counted, of which two are at the Koranic school. An epidemic of diarrhoea in children coincided with the visit of the Mission. The people of the village reported that malaria was also a big problem as is child-birth; there had been three deaths in childbirth in the previous 35 days.

### water supply

Timirshe has a borehole, with a handpump installed on it. The borehole was drilled by Western Geophysics, who carried out seismic oil investigations in the area. The well was abandoned and another one was drilled, at 12 km to the South, at Dhumoole. This borehole is not in use.

In 1992, THW placed the actual Karda handpump on the well, with a capacity of 1,3 m<sup>3</sup>/h. The depth of the well is 72 m; SWL = 21m; the pump is at 30 m. Characteristics of the water: EC = 1.700 1S/cm; pH = 8; T.H. > 370 mg/l; NO<sub>3</sub><sup>-</sup> = 10 mg/l; MPN = 3.

The first problem is, that during the dry season, when there are a lot of nomads with their livestock, long lines develop. At times, people even have to wait 48 hours for their turn. This causes too much strain on the handpump, too, which has to be repaired frequently. The caretaker said that he was out of spare parts. He went several times to Bosaso to look for them, but he could not find them anywhere. He now "fabricates" his own spare parts, mainly out of rubber. When the PVC rising mains break, he just cuts the broken piece off and fits the remaining pieces together, with the heat of a fire. When he was asked if he would like another type of pump, like the Afridev which is being installed by UNICEF, he answered: no! He claimed that the Afridev rising mains were very difficult to lift out of the borehole and that it occurs occasionally that they fall into the well altogether. He claims, that this could not happen with "his" Karda pump.

### possible solutions

The best solution would be, to replace the handpump by a solar pump. The water could then be pumped to a reservoir, that is to be constructed on the slopes of the nearby hill. From there, the water can flow under gravity to 2 water points and 2 animal water points.

As stated in the 1995 study, the possibilities to rehabilitate the Dhumoole borehole should be investigated.

## Xamurre

### description

The village of Xamurre is located at 255 km from Bosaso (10039.96 N; 50032.12 E; 290 masl). The access road is very rough. The main economic activities are livestock keeping and frankincense collection. On a small island in the nearby togga, at 800 m from the village, a small farm exists. The village consists of 50 permanent houses. In the whole village, only one latrine could be found.

### water supply

During the wet season, the people use stagnant water from the nearby togga. The farm on the island has a shallow well with permanent water. In the dry season, people take their animals and migrate to places with permanent water sources. The villagers had started to dig a shallow well, near the village. They had given up at a depth of four meters. As they started digging on a place that is at least 8 m higher than the bottom of the togga, they should dig more than 4 metres extra, before finding any water. The Mission advised them, to try and dig in another place, which is lower and more towards the togga.

### possible solutions

If the digging of the shallow well is successful, it should be protected and a handpump should be installed. In a later stage, the installation of a windmill or a solar pump could be considered. If the well fails, the owner of the farm well offers his well to be improved and protected and he said that if a handpump was installed he certainly would give water rights to his fellow villagers.

In order to enhance infiltration of water into the aquifer, small dams could be constructed in the togga, making use of gabions.

## **Balli Dhidin**

### **description**

The village of Balli Dhidin is located at 289 km from Bosaso (10052.88 N; 50023.45 E; 640 masl). The road conditions are very rough. The main sources of income are livestock and frankincense. It is a large village, consisting of ca. 390 permanent houses. During the latest rains, the villages was flooded and a number of houses is seriously threatened to collapse.

The Village Development Committee has 4 men and one woman, the Woman's Committee has four women and one man, so that everyone will be informed. The Woman's Association does not even have the money to buy dye to make mats. The Trained CHW needs supervision. There used to be a Health Post but the roof blew off. One village shop sells a number of drugs, but out of date. UNDP built a hospital but it has never been equipped or staffed.

### **water supply**

The water supply of the village is formed by berkads. The capacity of the berkads is not enough to serve people and livestock during the whole dry season. The berkads have serious leakage problems, because of cracked lining.

### **possible solutions**

As the village is flooded regularly, a protection dam of ca. 20 - 40 cm high should be constructed. As an earthen dam would be enough, this could easily be done by the people themselves. They only need instructions and supervision. In this dam, openings should be made, in order to feed the actual berkads with water.

At the end of the dam, a big communal berkad of the improved type should be constructed, in order to capture enough water to last through the dry season.

## El Gal

### description

The village of El Gal is located at 335 km from Bosaso (11022.54 N; 50023.64 E; 320 masl). The access road is very bad. The main economic activity is frankincense collection. Livestock keeping is the second one. The village consists of 155 permanent houses. The village has 4 latrines. Two of them are public, the other two belong to the school, which at present is not in use.

### water supply

The village has two shallow wells in the togga nearby. The distance between the wells and the village is approx. 650 m. One well, constructed by the Italians, is lined and is mainly used for human use. The other one, which is not lined, is more used for animal watering. Both wells are regularly affected by flooding. As neither well is protected, the water will be contaminated.

### possible solutions

The best solution will be, to dig a well near the village and install a handpump on it. In the future, if considered feasible, a solar pump might be installed.

Special care must be given to the location of the well. As the people explained, they have tried digging wells in different locations and the results were mostly negative. A thorough study of the underground and the position and capacity would be wise, before doing any large investments of labour and money.



## Mudia

### description

The village of Mudia is located at 368 km from Bosaso (11021.20 N; 50040.75 E; 620 masl). It consists of 190 permanent houses in three sub-villages. Frankincense collection is the main source of income and livestock keeping the second. Six latrines were counted.

The village does not have CHW.

### water supply

The main water source of Mudia is formed by 30 small berkads. In the wet season, the people also use stagnant water from the nearby togga.

### possible solutions

According to the mission, the best option would be the construction of small dams in the togga, using gabions. There are some good locations at only a few hundred meters east of the first nucleus. Water then would infiltrate and could be extracted via a shallow well with a handpump.

BARI RURAL WATER PROGRAMME  
Information gathered on the villages

village name	°N	°E	masl	accessibility (road condition)	present water source type	berkads	b. sketch (y/n; no.)	war	w. sketch (y/n; no)	spring sketch
Ambar Sare	09°44.25	49°26.59	780	normal; rough track	berkads, war	?	y; 2	1	y; 1	
Ambar Hose	09°44.75	49°33.38		normal; rough road	berkads		n			
Rako	09°47.08	49°43.71	710	normal; rough road	borehole; berkads		n			
Rako II	09°46.44	49°43.09	720	normal; rough road	berkads	2	y; 1			
Xumbays	09°38.51	49°53.47	535	normal; rough road	berkads		y; 1			
Maygaaq	09°31.09	49°55.15	500	normal; rough road	berkads		y; 1			
Dhudo	09°19.47	50°12.37	380	normal; rough road	spring	0		0		y
Dhudhup	09°13.81	49°55.07	425	normal; rough road	berkads	14	y; 3	0		
Jedad	09°24.08	49°35.28	562	normal; rough road	borehole; berkads		n	0		
Libahar	09°29.24	49°24.04	650	normal; rough road	berkads		n	0		
Qahwo	09°38.11	49°30.85	712	normal; rough road	berkads		n	0		
Qararsor	09°38.76	49°34.31	690	normal; rough road	berkads		n	0		
Tisjic	10°51.83	49°27.39	638	very rough; isolated	spring					n
Balidoog (Tisjic II)	10°50.95	49°27.03	605	very rough; isolated	berkads	6	n	0		
Geesaqabad	10°48.77	49°35.83	660	very rough; isolated	berkads; spring	3	y	0		n

**Annex 5. INFORMATION GATHERED ON THE VILLAGES**

table of all the information

BARI RURAL WATER PROGRAMME  
Information gathered on the villages

village name	°N	°E	masl	accessibility (road condition)	present water source type	berkads	b. sketch (y/n; no.)	war	w. sketch (y/n; no)	spring sketch
Jeedal	10°12.05	49°30.48	510	rough road; isolated	berkads	2	y; 2	0		
Aman	10°09.72	49°49.75	440	rough road; isolated	berkads; war	2	y; 1	1	y; 1	
Iskushuban	10°17.13	50°13.86	270	normal; rough	spring	0		0		y
Timirshe	10°33.80	50°25.32	310	normal; rough	borehole + handpump; berkads		n	0		
Xamurre	10°39.96	50°32.12	290	normal; rough	stagnant water in togga; private shallow well	0		0		
Bali Dhidin	10°52.88	50°23.45	640	very rough	berkads		n	0		
El Gal	11°22.54	50°23.64	320	very rough	2 shallow wells in togga	0		0		
Mudia	11°21.20	50°40.75	620	very very rough	berkads, stagnant water in togga	30	n	0		

**BARI RURAL WATER PROGRAMME**  
Information gathered on the villages

village name	village sketch	water quantity	water quality	average water price (SoSh)		present means of water transport		no. households	no. village people (ca.)	no. nomad people (ca.)
				wet s.	dry s.	wet s.	dry s.			
Ambar Sare	y			5.000	15.000	wheel barrow	trucks	132	792	2.376
Ambar Hose	y			5.000	15.000	wheel barrow	trucks	56	336	1.008
Rako	y			5.000	15.000	wheel barrow	wheel barrow	350	2.100	6.300
Rako II	y							50	300	900
Xumbays	y			5.000	15.000	wheel barrow	trucks	30	180	540
Maygaaq	y			5.000	15.000	wheel barrow	trucks	35	210	630
Dhudo	y					women and children	women and children	175	1.050	3.150
Dhudhup	y					women and children	women and children	17	102	612
Jedad	y							250	1.500	4.500
Libahar	y			5.000	15.000	women and children	women and children	64	384	1.920
Qalwo	y			5.000	15.000	women and children	women and children	78	468	2.340
Qararsor	y			5.000	15.000	women and children	women and children	108	648	3.240
Tisjic	y	enough	poor	5.000	15.000	donkey, women, children	donkey, women, children	150	900	2.700
Balidoog (Tisjic II)	y							10	60	180
Geesaqabad	y	enough	poor	5.000	15.000	donkey, women, children	donkey, women, children	52	312	1.560

**BARI RURAL WATER PROGRAMME**  
Information gathered on the villages

village name	village sketch	water quantity	water quality	average water price (SoSh)		present means of water transport		no. households	no. village people (ca.)	no. nomad people (ca.)
				wet s.	dry s.	wet s.	dry s.			
Jeedal	n	very little	poor	5.000	25.000	donkey, women, children	donkey, women, children	1	6	1.000
Aman	n	little	poor	5.000	25.000	donkey, women, children	donkey, women, children	1	6	1.000
Iskushuban	y	enough	good	free	free	donkey, women, children	donkey, women, children	370	2.220	6.660
Timirshe	y	enough	poor	5.000	15.000	donkey, women, children	donkey, women, children	160	960	2.880
Xamurre	y	enough	good	free	free	donkey, women, children	donkey, women, children	50	300	900
Bali Dhidin	y	scarce		5.000	15.000	donkey, women, children	donkey, women, children			0
El Gal	y	enough	good	free	free	donkey, women, children	donkey, women, children	155	930	4.650
Mudia	y	scarce	good	5.000	25.000	donkey, women, children	donkey, women, children	190	1.140	5.700

**BARU RURAL WATER PROGRAMME**  
Information gathered on the villages

village name	total population (ca.)	no. ari (sheep + goats)	no. cows + donkeys	no. camels	potential additional econ. act. when water av.	present health situation	sanitation situation	no. latrines	present situation in education	
									koranic	normal
Ambar Sare	3.168	156.900	1.000	4.000	gardening	normal	normal		yes	no
Ambar Hose	1.344	30.240	550	1.000	gardening	malaria outbreak	normal	2	yes	no
Rako	8.400	313.200	1.500	8.700	gardening	normal	poor		yes	no
Rako II	1.200	500	100	150	gardening	normal				
Xumbays	720	91.800	600	2.650	gardening	very poor	poor		yes	no
Maygaaq	840	18.900	100	600	gardening	normal	poor	0	yes	no
Dhudo	4.200	140.400	200	6.000	farming	diarrhoea	very poor	± 0	yes	no
Dhudhup	714	18.540	90	500	gardening	diarrhoea	poor	0	no	no
Jedad	6.000	135.000	500	4.000	gardening	normal	very poor		yes	no
Libahar	2.304	57.600	600	2.000	gardening	normal	poor	± 0	yes	no
Qalwo	2.808	70.200	400	3.000	gardening	normal	poor	± 0	yes	no
Qararsor	3.888	97.200	200	1.500	gardening	normal	poor	± 0	yes	no
Tisjic	3.600	86.400	100	300	gardening	very poor	very poor	0	yes	no
Ballidog (Tisjic II)	240							1		
Geesaqabad	1.872	46.800	100	300	gardening, hay farming	diarrhoea	very poor	0	yes	no



**BARI RURAL WATER PROGRAMME**  
Information gathered on the villages

village name	total population (ca.)	no. an (sheep + goats)	no. cows + donkeys	no. camels	potential additional econ. act. when water av.	present health situation	sanitation situation	no. latrines	present situation in education	
									koranic	normal
Jeedal	1.006	72.000	200	2.000	gardening, hay farming	very poor	poor	0	no	no
Aman	1.006	64.800	1.200	2.000	gardening, hay farming	very poor	poor	0	no	no
Iskushuban	8.880	198.000	200	1.000	farming	poor	poor		yes	no
Timirshe	3.840	97.200	100	1.000	gardening, hay farming	diarrhoea	very poor	20	yes	no
Xamurre	1.200	27.000	50	300	gardening	very poor	very poor	1	yes	no
Bali Dindin	0	162.000	50	500	gardening, hay farming	normal	poor	some	yes	no
El Gal	5.580	139.500	50	2.000	gardening	very poor	poor	4	yes	no
Mudia	6.840	171.000	50	1.500	gardening	very poor	very poor	6	no	no

**BARI RURAL WATER PROGRAMME**  
Information gathered on the villages

village name	solution(s) water	± cost water (US\$)	solution(s) sanitation	± cost san. (US\$)
Ambar Sare				
Ambar Hose			add 2 latrines	
Rako				
Rako II	connect to borehole		1 public latrine (double)	
Xumbays	improved berkad; small dams in togga + shallow well and handpump		2 public latrines	
Maygaaq	improved berkad		2 public latrines	
Qalwo	springbox, extraction well, solar pump, reservoir, 3 water points, 2 animal water points		latrification; garbage clearing	
Dhudhup	improved berkad		2 public latrines	
Jedjad				
Libahar	improved berkad		latrification	
Qalwo	improved berkad		latrification	
Qararsor	improved berkad		latrification	
Tisjic	springbox; small gravity system		latrification	
Balidoog (Tisjic II)	connect to Tisjic system		1 public latrine	
Geesaqabad	small gravity system		latrification	

**BARI RURAL WATER PROGRAMME**  
Information gathered on the villages

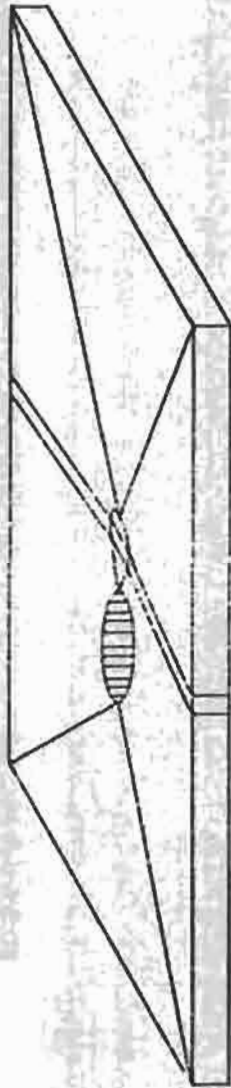
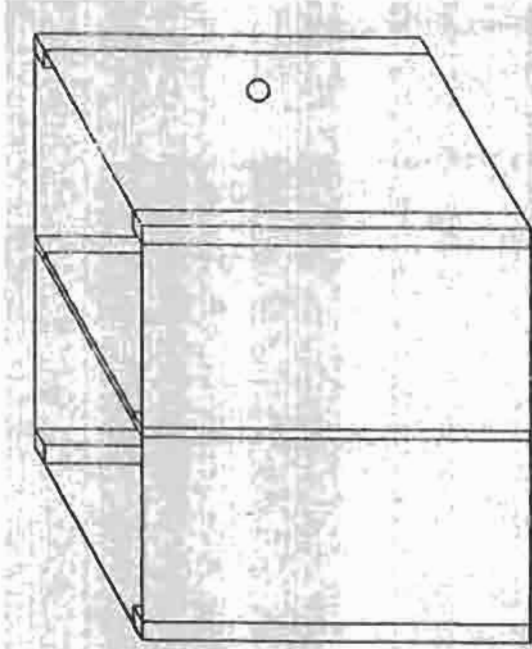
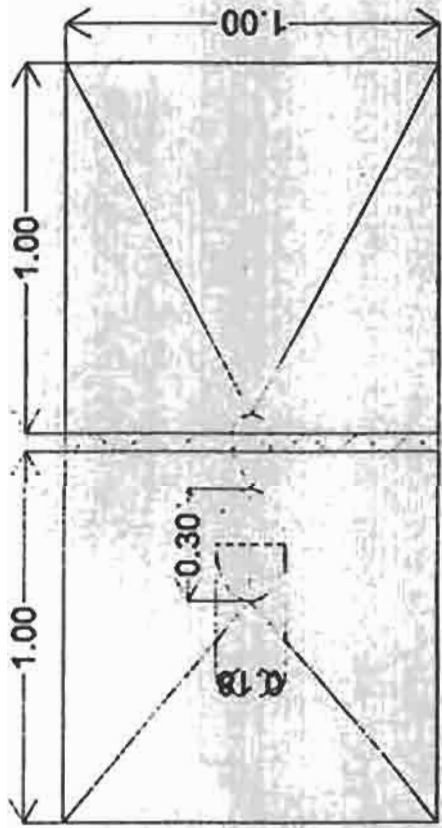
village name	solution(s) water	± cost water (US\$)	solution(s) sanitation	± cost san. (US\$)
Jeedal	improved berkad; small dams in togga + shallow well and handpump		latrification	
Aman	improved berkad; improved war		latrification	
Iskushuban	pump and reservoir system rehabilitated by UNICEF			
Timirshe	solar pump on borehole; reservoir; two water points; 2 animal water points; maybe rehabilitate borehole at Dhumoole (12 km South) for nomads and gardening		latrification	
Xamurre	dig shallow well near village, construct + handpump		latrification	
Bali Dhidin	flood protection with small dam (20 - 40 cm high), water to big community berkad of improved type		latrification	
El Gal	dig new well near village, solar pump, 2 water points, 2 animal water points		latrification	
Mudia	small dams in togga, shallow well + handpump		latrification	

**Annex 2. DESIGNS, CALCULATIONS AND DRAWINGS**

Combination VIP-latrines/bathrooms

Improved Ferkad

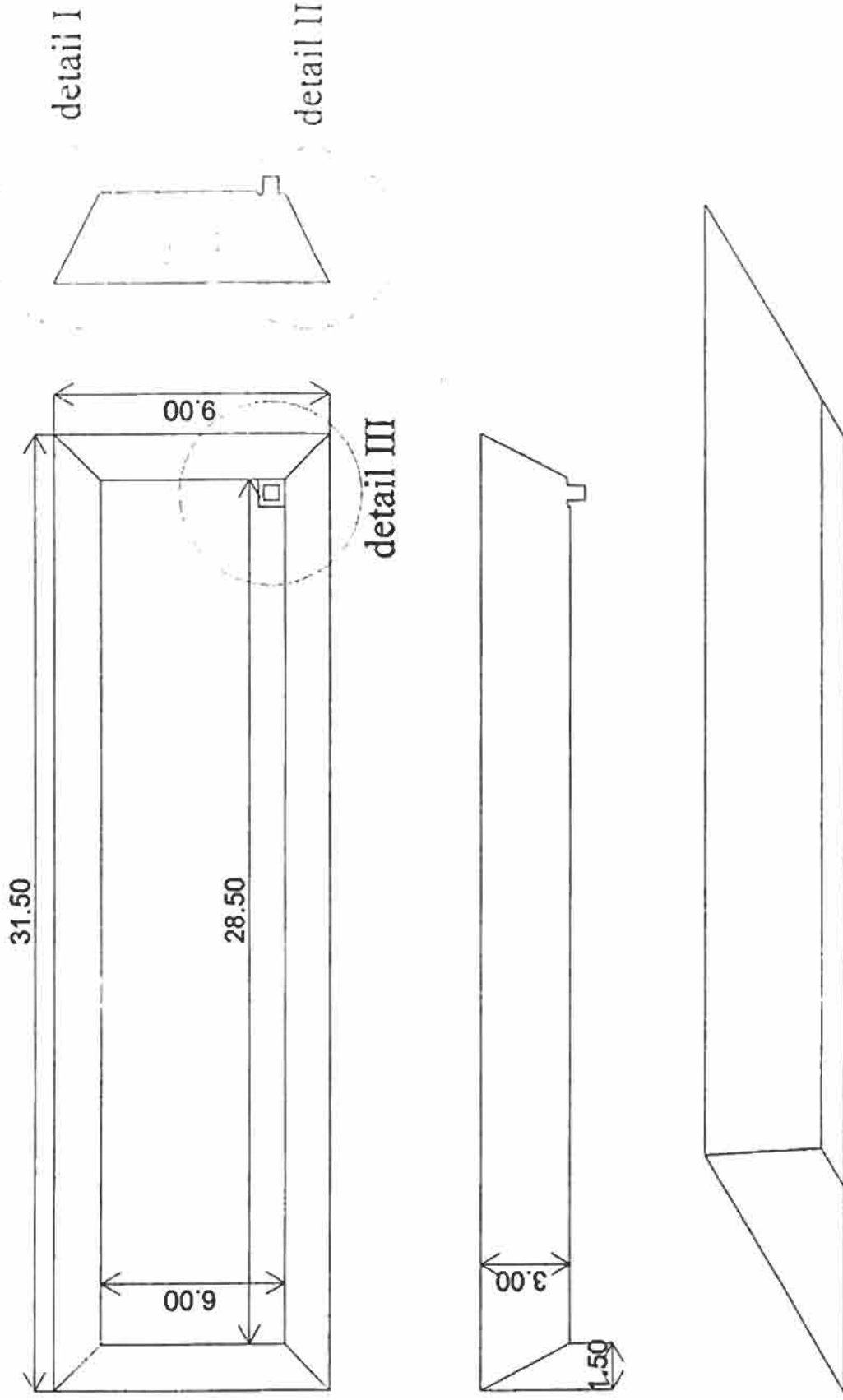
System small dams-shallow well - handpump



# Combined Latrine/Bathroom

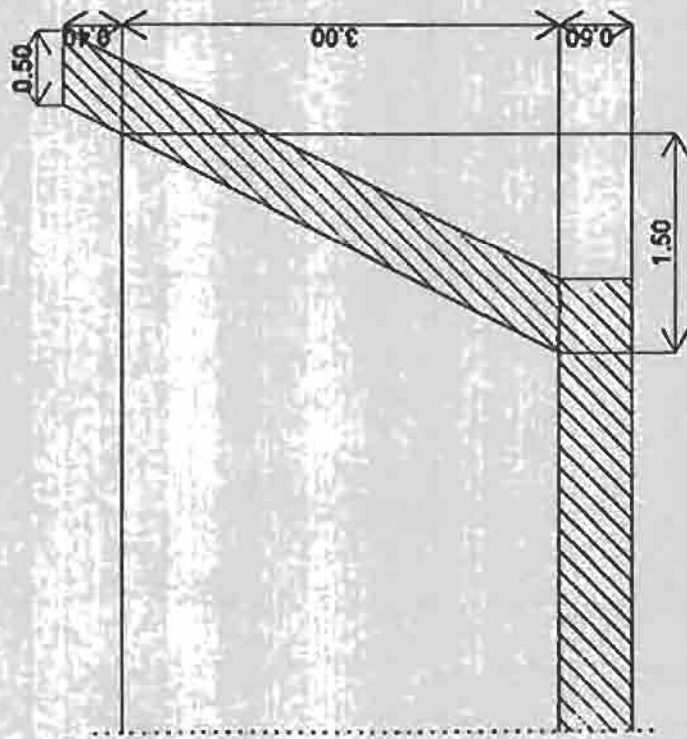
not to scale

# Ambar Hose; improved berkad

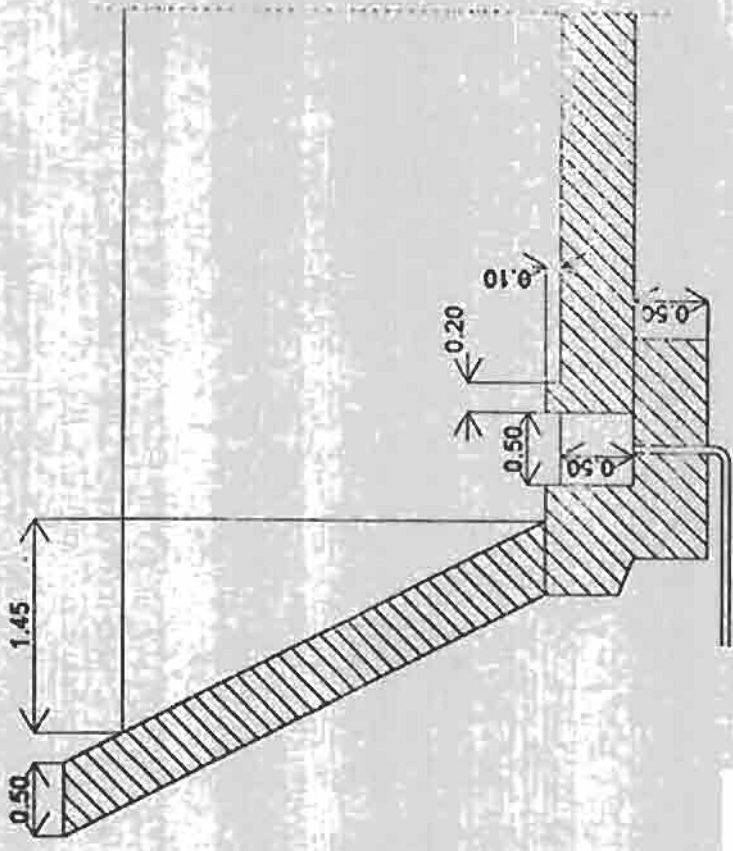


# Ambar Hose; improved berkad

detail I

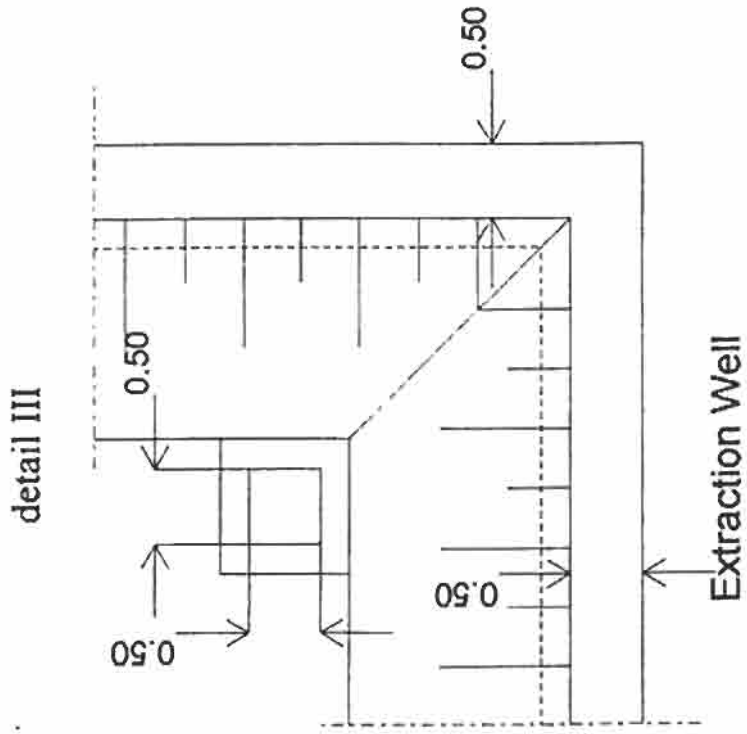
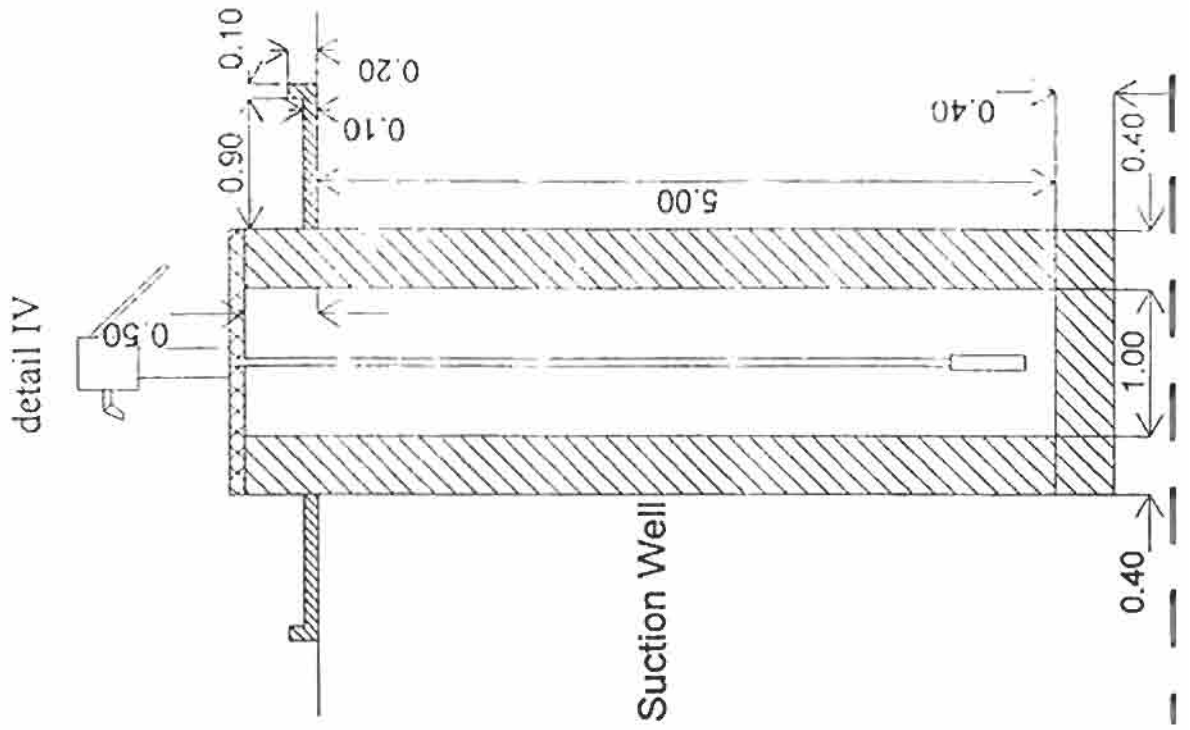


detail II





# Ambar Hose; improved berkad



Annex 7. LIST OF PRICES AND AVAILABILITY OF MATERIALS  
prices are average

description	unit	locally available (Y/N)	price (SoSh)	price (US\$)	remarks
cement	bag; 50 kg	y	45.500	5,83	
lime	bag; 50 kg	y	22.500	2,88	
sand	3 - 4 m <sup>3</sup>	y	140.500	18,00	
gravel	3 - 4 m <sup>3</sup>	y	147.000	18,85	
stones; big	3 - 4 m <sup>3</sup>	y	191.500	24,55	berkad
stones; small	3 - 4 m <sup>3</sup>	y	155.000	19,87	house
reinforcement steel	bar; 6 m	y	7.250	0,93	6 mm
binding wire	kg	n			
fence wire	roll	n			
nails	kg	y	10.000	1,28	4 - 10 inch
chicken wire	roll	y	110.000	14,10	length? width?
strong wire netting	roll	n			
wood; planking	pcs	y	107.250	13,75	3 x 4 cm
wood; beams	6 m	y	75.500	9,68	2 x 2 cm
wood; other	6 m	y	80.000	10,26	30 cm flat
water piping GI; 1"	6 m	n			
water piping GI; 1.5"	6 m	n			
water piping GI; 2"	6 m	n			
water piping GI; 3"	6 m	n			
water piping GI; 4"	6 m	n			
water piping PVC; 1"	6 m; roll?	n			
water piping PVC;	6 m	n			
water piping PVC; 2"	6 m	n			
water piping PVC; 3"	6 m	n			
water piping PVC; 4"	6 m	n			
water piping HPE; 1"	6 m	n			
water piping HPE;	6 m	n			
water piping HPE; 2"	6 m	n			
water piping HPE; 3"	6 m	n			
water piping HPE; 4"	6 m	n			
transport	/4 m <sup>3</sup>		1.800.000	230,77	Bosaso - Rako
			2.500.000	320,51	Bosaso - Dhudo
			2.500.000	320,51	Bosaso - Qandala

## Annex 5. TERMS OF REFERENCE

### Terms of Reference

Preparation Mission Bari Region, 23 November - 13 December 1997

#### General objectives of the mission:

- A. the mission team will have discussions with all stakeholders involved in the implementation of the Water Supply Rehabilitation Programme in the Bari Region
- B. the mission team will visit at least 10 villages that will be nominated by the Regional Authority to participate in the programme
- C. the mission combines 3 disciplines (socio - economic, public health and water supply) to conduct essential baseline surveys and collect necessary and relevant information for the implementation of the programme
- D. by the end of the mission the mission team will present a report which includes the survey, studies, interviews and other data that have been collected and assembled
- E. the mission report will also present major findings and final advice for water supply of the villages which have been discussed and agreed upon by the Village Water Committee and the Bari Regional Authority

## **Public Health consultant and Team leader**

In general the team leader of the consultancy team, consisting of a Public health consultant, a socio-economist and a water and sanitation expert, will present the team in any official event and will elaborate on objectives of the mission.

The team leader will also put emphasis on the fact that water supply and sanitation infrastructure to be rehabilitated and constructed will be designed on gender relevant basis and facts with a sound socio-economic feasibility.

### *Specific responsibilities of the Public Health consultant:*

1. to identify relevant organisations and institutions which are acting on health programmes in Bari region
2. investigation activities and institutional capacity of local organisations and institutes involved in health extension in relation to the water and sanitation practices in Bari Region
3. to make an assessment of available data gathered by NGOs, international or national, regarding the health and sanitation aspects in Bari Region
4. to make an assessment of the water related health situation in the Bari Region
5. assessment of the existing health institutes in Bari Region
6. assessment of the institutional setting of the health situation in Bari Region
7. integration of the health extension into local institutes
8. assessment of attitudes towards and potential for community participation and the involvement of women in water and sanitation programmes
9. education and communication behaviour:
  - general formal and non-formal ways of communication with the outside world
  - effectiveness of different media for different tasks
  - audio-visual perceptions; literacy rates; language and dialect
10. set-up of social baseline study and testing it in 10 selected villages:
  - community structure
  - water usage, sanitation, management
    - (water rights and ownership and how they are obtained)
    - (preferred water source for each household)
    - (time and distance for water collection)
    - (water storage and use)
    - (household practices for waste disposal)
    - (household defecation)
  - water and sanitation beliefs
    - general perceptions of community and personal illness; tolerance for disease
    - concept of clean water and sanitation
    - credibility of official and indigenous medical personnel as opinion leaders
    - traditional beliefs concerning excreta and sanitation practices
    - personal hygiene habits and practices
11. set-up of evaluation and monitoring system for health extension programme
12. assessment of training needs for SPDS health extension staff, PRA, working out of data, extension, gender awareness
13. assessment of training needs for SPDS staff on Institutional Development
14. identify an appropriate name for the programme

## Socio-economic survey

- number of households in the village
- average size of households; number of adults (men, women, children)
- % female headed households
- average number of wage earners per household
- number of households with full plumbing
- number of households with yard taps
- number of households without own supply
- projected population growth in each year

### Daily water consumption (including seasonal changes)

- houses with full plumbing
- houses with yard taps
- houses without own supply

### Payment of drinking water

- houses with full plumbing
- houses with yard taps
- houses without own supply
- payment for other demand of water supply (livestock/irrigation)

### Other demands for water supply

- industrial users
- irrigation
- livestock

### Average household income (divided into income of female/male members)

- average household expenditure on food and other necessities
- seasonal variations in incomes of different groups within the community

### Community info

- organisational structures within the community
- source funds within the community
- what kind of collection system is being used?
- are there experiences with credit systems or cost-recovery funds?
- ability to pay of different groups within the community
- willingness to pay of different groups within the community
- literacy rates and availability within the community of skills that would enhance participation in projects
- cost recovery on other projects in same community
- to set up an evaluation and monitoring system, in co-operation with the community health expert
- to select measurable indicators for the evaluation and monitoring system

## W&S Expert

The T.O.R. of the W&S Expert during the November - December 1997 Somalia mission, can be described as a number of questions, for which the answers have to be found:

### Concerning the people:

1. where do people get water
2. how much water do they get
3. what quality water do they get
4. how much does it cost
5. what are the problems they encounter
6. are there any conflicts between uses (i.e. between population groups, between different uses, as humans, animals, agriculture, etc.)
7. what are the possible solutions to these problems
8. what do these solutions cost
9. are there any other consequences to these solutions
10. what is the acceptability of each solution

### Concerning the system

- I. What is the actual water source
  - A. characteristics (position, dimensions, make drawing/sketch)
  - B. capacity
  - C. water quality (physical/chemical; bacteriological)
  - D. problems
- II. what transport and/or distribution system is in use
  - A. characteristics (dimensions, drawing/sketch)
  - B. capacity
  - C. problems (water quality, leakage, etc.)
- III. what storage system is in use
  - A. characteristics (dimensions, drawing/sketch)
  - B. capacity
  - C. problems (water quality, leakage, etc.)
- IV. what are the possible solutions to these problems
  - A. characteristics
  - B. cost
  - C. other consequences
  - D. acceptability

### Concerning consumption and demand (input to solutions for system)

- I. what is the actual water consumption
  - A. by whom (people, animals, other uses)
  - B. how much (per person/animal/other; total)
- II. what is the actual demand (for the different uses)
  - A. quantity
  - B. quality
- III. projections for the future (20 years):
  - A. population
  - B. use per capita
  - C. use for other purposes (animals, agriculture, small scale industry, etc.)

### Concerning O&M

- I. is there a Village Water Committee
  - A. what are its tasks
  - B. who are the members
  - C. by whom is it formed
  - D. what are the bottlenecks
  - E. possible improvements
  - F. what are the implications of these improvements
- II. is there any O&M system
  - A. how is it organised
  - B. does it work
  - C. what are the problems/bottlenecks
- III. is there any tariff levying system
  - A. how does it work
  - B. who pays
  - C. who charges
  - D. is there any accounting system
  - E. what costs are covered
  - F. who decides on prices
- IV. what are the possible improvements in the O&M system
  - A. characteristics
  - B. implications
  - C. cost
  - D. acceptability

### General

- I. basic data on availability and prices of materials, tools and equipment; any constraints on quality and/or quality
- II. availability of contractors
  - A. specialisms covered (i.e. construction, transport, design/drawing, investigation, etc.)
  - B. location/coverage
  - C. specialisms not covered
  - D. how to cover the not covered
- III. availability of technicians and other potential personnel



## Annex 9. LITERATURE

Bari Water Rehabilitation Study  
Final Report  
Volumes I & II  
September 1995  
SAWA, SPDS

Rehabilitation Programme for Water Supply Systems in Small Towns and Urban  
Centres in the Bari Region of Somalia  
Final Version  
Technical and Financial Proposal  
July 1997  
SAWA

## Annex 10. Women and Health

### CIRCUMCISION

The form of female circumcision (or genital mutilation) practised in Somalia is quite severe. It contributes to the high maternal mortality rate. TBAs carry out the procedure, with nomadic TBAs being seen as more skilled. In consequence, some training programmes for TBAs include education aimed at modifying the procedure.

### PREGNANCY

Women enter pregnancy often with poor nutritional status, because of their susceptibility to malaria, anaemia is often a problem. The diet is unbalanced and with poorer families very limited in quantity. However the last thing women want is big babies, so they eat less not more as the babies grow. One TBA in Ambaar recommended a diet to keep the baby small, advising women more than four months pregnant to eat no meat, vitamins, vegetables, eggs or milk.

### CHILDBIRTH

Maternal Mortality in Somalia is 111 per 100,000 births, (as opposed to 7 in Europe, UNICEF figures). The problems include first babies born to very young women, a two-year birth interval, and a high number of pregnancies. Other factors are poor nutrition, circumcision, and inadequate health services.

An example met with on the mission was the village of Timirshe; the TBA was trained in the seventies, and moved to the village because of the amount of problems around childbirth. She reported three maternal deaths in the previous thirty-five days (either eclampsia or severe anaemia); she had identified four other women as high risk and persuaded them to go to Bosaso for delivery; they all gave birth without problems which has weakened her credibility. The midwife in our team also identified three women as high risk; they were all extremely anaemic; one was also facing her eleventh confinement, had a history of twins and little possibility of supplementing her very limited diet. Going to Bosaso was not an option as she had no family there and eleven children to look after.

One success is the absence of any reported cases of neonatal tetanus. the use of razor blades to cut the cord seems now universal; the pregnant woman is expected to buy one and keep it safe

### MISCARRIAGE, INFANT AND CHILD DEATH, & FAMILY PLANNING

The women of Bari suffer high rates of miscarriages - through malnutrition and associated anaemia, malaria, and sexually transmitted diseases. One woman had had nine miscarriages, probably from pre-eclampsia. Then mothers endure the further loss of children in the first years of life. Three groups of women were asked about their history: in Qalwo, five women reported 34 pregnancies resulting in 24 living children; in Xumbays eight women claimed 54 pregnancies resulting in 26 living children. In Tisjic, six women reported 48 pregnancies and 29 living children. Many of the children die of conditions easily treated at local level, such as diarrhoea, fever/malaria and pneumonia; while PHC programmes were functioning, CHWs were trained to distinguish pneumonia from malaria and treat accordingly. Several can still remember how to do this.

Family Planning is beginning to be accepted in Bari; the MCH in Iskushuban has three women using oral contraceptives and 20 men using condoms for FP purposes; when the MCH clinic in Bosaso was open it had about the same number of acceptors. A training in IUD insertion has just ended.

## BREAST-FEEDING, WEANING & THE FIRST YEARS

Patterns of breast-feeding present serious problems. Breast milk is supplemented from the beginning with goats milk. Bottles may be used, so diarrhoea starts in the babies. Since women are working hard and their nutritional status is poor, they often feel that their milk is inadequate, and therefore feed the child more supplementary milk, thus reducing their own production. Several interviewed women were stopping breast-feeding at forty days or three months.

Weaning starts at six months, with various porridges or mashed pancake. The measurement of nutritional status is not done routinely in Bari region, and there are claims that there is hardly any malnutrition in small children (UNICEF said it was only 2% to 9% weight-for-height). However in Iskushuban MCH clinic, which uses weight-for-age, records show one-third of children as 80% or below. This relatively high prevalence of malnutrition was confirmed by team observations.

EPI coverage depends on the ease of access from Bosaso; mothers in Tisjic had cards showing good coverage; other villages, such as Ambaar Hose, had had one or two visits from the EPI team or, like El Gal, had not been covered at all.

Diarrhoea among the nomads starts in babies at two months (see section on breast-feeding). It is seen at one level as caused by germs in dirt. A traditional curative method is to knock out or brand the eye teeth; this is probably because they erupt about the time when babies start to crawl and get more diarrhoea. Food seen as appropriate for diarrhoea includes: sour goat's milk with salt and sugar or with rice, salt and sugar.

## SEXUALLY TRANSMITTED DISEASES

It was reported that over half the married women attending the MCH Clinic in Bosaso had some kind of STD. HIV positivity is said to be low but WHO is currently doing a survey. When refugees start returning in greater numbers from overseas, especially from Kenya, the HIV virus will find a happy hunting ground.

## SICKNESS & KEEPING HEALTHY

Concepts of sickness can be grouped into three: modern, Koranic and pre-Koranic.

**modern:-** The number of internally displaced people and the constant visiting from town to country have led to modern explanations for illness. When asked about the causes of illness, people reply at least at first in quite scientific terms with explanations clustered around germs. The Somali word is jermis. Vitamins are also seen as important, and are in demand and on sale in small towns.

**Koranic:-** following Islam means following routines which play a preventive role, keeping the body clean, and washing before prayers several times a day. A folk belief is that neglect of duties such as prayers may lead to sickness in the forgetful adults or their children. Often the vehicle of the disease is seen as a wind. Curative measures can be provided by the sheikh of the village and cost around 10,000 sh. Verses from the Koran are written and put into a small pouch and hung round the necks of children; or they can be written on wool or a plate, which is then washed and the liquid used as a tea or poured over the body. A frequent statement was that the Koran is powerful against germs.

Pre-Koranic ideas include witchcraft, both white and black. White witches and some sheikhs can turn black witchcraft back onto the originator. The rural areas are also inhabited by an older race of people, sometimes invisible, living under the ground, who can be friendly and helpful or, if offended, seriously damaging.

#### OTHER SPECIFIC CONDITIONS & REMEDIES

- malaria, there were requests for window screens and assistance with proofing the houses. A local herb burnt to drive away mosquitoes is DA'AR, but no other traditional remedies were reported.
- any condition: honey and lemon is good for everything, particularly colds and weakness.
- traditional healers, such as a nomad met with at Dhudub, use scarification, usually with an umbrella spoke. The explanation is that illness and scarification cannot live together. However, modern medicines seem now to be preferred if available.
- a small market town stall or shop will have the following or similar in stock: antibiotics and chloroquine, cough syrup, vitamin syrup, paracetamol, injectable vitamin K and syringes. The medicines may be out of date. Alongside will be animal medicines such as oxytetracycline, with syringes used by the market lady. Soap is available everywhere, fancy bars costing around 3,000 sh. Razor blades are also available, costing either 500 or 1000 sh (for comparison, a kilo of rice costs 4,500 sh.)

#### OTHER SAYINGS CONCERNING WOMEN, WATER etc.:

"The sex that produces milk is not the sex with wisdom".

"If a woman leads a man, or a camel leads a camel, better get out of the way".

"A man nearly dying of thirst, approaching a village, hears with one ear 'there is water' and with the other 'there is no water'".

"A habitation with no water is no habitation".

"Long nails hide evil".

## Annex 11. Hygiene Alphabet

A	=	AR DAY
B	=	BI YO
C	=	CA AF IMAAD
D	=	DA MBAS
E	=	ED ED
F	=	FARADHAZ
G	=	GU UL
H	=	HO OYOI
I	=	IS LAAM
J	=	JIRIGAAN
K	=	KARKARI
L	=	LE BIS
M	=	MUSFUL
N	=	NADIIF
O	=	OM OS
Q	=	QU DAAR
R	=	RE ER
S	=	SA ABUUN
T	=	TAL O
U	=	
X	=	XUN
W	=	WASAKH
Y	=	UDUG/UBAX
KH	=	KHASAARO
DH	=	DHEEF
SH	=	HARAF