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# WATER PROVISION TECHNOLOGIES FOR MANDERA DISTRICT

A CONSULTING REPORT FOR DFID AND EPAG

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## 1. RECOMMENDATIONS.

**Recommendation 1.** It is recommended that EPAG initiate a subsurface (note not a sand dam) programme in the western and southwestern parts of Mandera district as a pilot.

More specifically construction should be in sequence on the Sure Laga, Katilo Laga and small laggas to the east and west of Sure Laga. The consultant and the team, which accompanied him from EPG and District Water Engineer's office, concur on this conclusion on the area of focus. The Area of Focus is shown in Appendix 14: Proposed Sub-Surface Dam Project Area.

Construction should be in the range areas and not in the settlements for the objective is to enable pastoralists to take advantage of the available range biomass, which in the past has not been utilised for lack of water for both animals and humans. In the settled areas other water provision technologies can be used.

**Recommendation 2.** It is recommended that EPAG dam pilot programme should not construct sand dams initially. It should concentrate on subsurface dams.

**Recommendation 3:** It is recommended that initially EPAG build small standard subsurface dams in the narrow parts of laggas not longer than 17 meters.

**Recommendation 4.** It is recommended that EPAG hire two experienced masons locally if they are to build subsurface/sand dams.

**Recommendation 5:** It is recommended that the two experienced EPAG masons be trained by SASOL in Kitui on the construction of Subsurface and Sand dams. Further, it is recommended that EPAG consider hiring a consultant from SASOL for supervising the quality of the first dams for a period of one month.

**Recommendation 6:** In the first phase of dam construction, whose objective is to provide water for areas where there is fodder and no water for livestock and humans, there will be no possibility of utilising community labour for construction. Construction labour will have to be hired. In a later phase where construction will be in established settlements, community labour can be used.

**Recommendation 7:** Save for schools or settled communities where there is no proximate laga, it is not recommended that runoff be harvested into underground tanks for it is not cost effective.

**Recommendation 8:** Pans should be constructed as a method of scattering livestock to areas of under-utilised forage. They, in comparison to subsurface and sand dams, loose too much water due to evaporation to become a preferred technology in the district. They should only be constructed where there is no possibility of building a subsurface or a sand dam.

**Recommendation 9:** Boreholes are not favoured as a method of water supply, unless it is a large urban agglomeration, for reasons of cost as well as problematic O&M. It is not recommended that EPAG construct them. Given that Rural Focus and THW are in the district with a very large programme of rehabilitation of boreholes and capacity building for O&M, it is not clear whether there is a residual maintenance role for EPAG either.

**Recommendation 10:** EPAG may wish to introduce ferro cement water tank construction technology into the district. These could be constructed as a measure of assuring schools and small settlements of a reliable supply of water.

**Recommendation 11:** It is highly recommended that EPAG commission a hydro geological survey of the Western and South Western part of Mandera district to establish the ground water potential so as to facilitate the construction of wells in areas where water supply is currently very problematic and where dams are not feasible for lack of lagas.

**Recommendations 12:** Rock catchments are not a major technology for the district. EPAG should construct them, with covered ground water tanks, only where other more cost effective technologies are not viable.

**Recommendation 13:** It is highly recommended that EPAG institute participatory resource analysis of both water and forage in all the areas it is to construct water structures.

**Recommendation 14:** It is recommended that an officer be found and hired by EPAG for training communities in participatory resources analysis, development and management. Such an officer will be the supervisor of the extension staff already in place.

**Recommendation 15:** In the view of the consultant, subsurface and sand dams are an effective way of providing community water for both humans and livestock. However, delivering such a programme systematically and in a sustainable manner, meaning with full community participation in the planning, construction and O&M of the structures, is a major long-term undertaking calling for in house management. It does not easily lend itself to the contracting development model.

Previous recommendations in this report have been made from the point of view that EPAG should begin to staff up on the subsurface/sand dam technology for it will be extremely useful to the district.

The recommendations have identified a specific area of the district where the pilot should be undertaken so as to create linkage to the major mode of production in the district.

It remains to be said that EPAG should review its future strategy and decide whether to put water into the centre of its staffing. Then it will be able to take advantage of this simple technology, which delivers water at very cost effective levels of investment.



## **2. INTRODUCTION**

The TORs for this work are found in Appendix 1. They called for the consultant to travel to Mandera and to investigate the feasibility of utilising subsurface/sand dams, the feasibility of using community labour in the construction of the same, the utility of underground water tanks and other methods of catching and storing water and, finally, the role participatory resources analysis by communities for the development of water resources.

The consultant travelled to Mandera on 21/11/2000 and arrived in the morning. The balance of the day was spent debriefing with EPAG staff. From 22/11/2000 to the 24/11/2000 the consultant travelled from Mandera Town to Khalali, Rahmu, Guba, Juroq, Banisa, Kiliwaheri, Dandu, Takaba, Duduble, Shimbir Fatuma, Wargaduda, Gari, Warankara Rahmu, Kalali and back to Mandera. The route and dates are shown in Appendix 2. Mandera District: Field work Route and Major Lagas. The consultant got very sick in the field and is extremely grateful to those who rushed him to hospital and took care of him. The consultant returned to Nairobi on 29/11/2000.

A close reading of Appendix 2 shows that the bulk of the district was covered save for the easternmost part abutting Somalia. In discussion with EPAG, supported by data shown in Appendix 3: Mandera District: Type and Location of Water Resources and Appendix 4: Figure 1: Targeted Boreholes, it is clear that past interventions in the water sector had concentrated on the eastern and south eastern part of the district.

Since, according to both local knowledge and officialdom, there was better water potential and hence the historic provision, the area was scheduled for a visit so as to get better comparison with the deprived west and southwest. This did not work out for it was raining heavily in the region and it was doubtful whether a vehicle could have got from El Wak to Mandera Town through the border road.

Historic writing and general knowledge of the district has it that there is little ground water potential in the Western and South Western part of the district. The boreholes dug in times past are mainly in the eastern end of the district as shown in Appendix 3 and Appendix 4. Given these facts fieldwork concentrated on the western and southwestern parts.

The consultant is very grateful to the Director of EPAG and staff who not only organised transport, outside catering and sleeping but were very useful in assembling members of the various communities for unscheduled discussions. An officer from the District Water Engineer's office also accompanied the consultant in the fieldwork. Since he had been involved in water point construction, his experience was extremely useful.

## **3. DATA COLLECTION AND AREA OF FOCUS**

### **A. INTERVIEWS**

This report relies heavily on data collected first from EPAG staff that has been involved in pastoral training, emergency water supply and micro enterprise development in the district. A limited number of interviews were conducted with a few officers in the District Commissioners

Office, the District Water Engineers Office and in the District Livestock Development Office. These interviews were critical in ultimately deciding on the area to concentrate fieldwork for these officers were some of the most experienced in the district.

In each of the market centres during fieldwork, the consultant sought people to discuss the water provision problems. In some of the centres this was not possible for distances and resources militated against sending word ahead. However, significant numbers of local administrators, committee members from previous water development activities and community persons were group interviewed. The list of persons interviewed is found in Appendix 5: List of Persons Interviewed.

## **B. DISTRICT BACK GROUND DATA**

Data on the District was collected from the past District Development Plans. The 1989 Census data was collected from CBS in Nairobi for 1999 data was not available officially. The District Demographic data is found in Appendix 6: District Population Projections, sourced from the 1997 -2001 District Development Plan. The Kenya National Archives files on Mandera were reviewed unsuccessfully with the objective of establishing what was the basis of limiting ground water exploration to the eastern part of the district. Dated Administrative Boundaries are found in Appendix 7: Mandera District Administrative Boundaries. Since 1997, the district has created 18 divisions but the boundaries are yet to be mapped. There also is a proposal to hive off a district around El Wak.

The most important source turned out to be the *Ministry of Livestock Development's Range Handbook* for it mapped runoff regions and water sources for the whole district as shown in Appendix 8: Run-Off Regions and Type and Location of Water Sources. There are three runoff regions with the central area having a closed system. People in the centre of the district and to the west and southwest do not even have significant numbers of permanent sources. These are the areas where EPAG was supplying water by tanker over the past year.

The same sources shows distances to permanent water sources as is shown in Appendix 9: Mandera and Wajir Districts: Distance to Permanent Water. One should note that the reliable sources are to the east and south east of the district.

Yet, perhaps the most important data from this source is the map on the range conditions shown as Appendix 10: Mandera and Wajir Districts: Range Condition. In a classification of Good, Fair and Poor, the east, southeast and north are in the fair and poor categories for the existence of permanent water means that livestock congregate there with the attendant extensive localised desertification. On the other hand the areas of good range condition are found in the western and southwestern areas. The range has not been exploited as in the other areas because of lack of reliable water sources.

In 1999, VSF mapped the Dry Season Cattle Movements in the District. This is shown in Appendix 11: Mandera District: Dry Season Cattle Movements. Their work confirms the earlier range work as well as recent EPAG development experience. A close look at the map, in Appendix 11, shows cattle moving from the west and south west either into Ethiopia in the north or to the east of the district. The key determinant is water for there is spare forage even in the driest of years according to both local knowledge and past research.

The centrality of pastoralism in the district is shown in Appendix 12: Employment Profile. Pastoral occupation accounts for more than 50% of employment. The current District Development Plan argues that 85% of the population is in pastoralism. Consequently, since the basic occupation in the district is pastoralism, it makes development sense to support it to utilise available biomass in effective ways.

These facts on unavailability of water, the movement of livestock out of the region found in all the historical writings, the experience of EPAG in implementing the Drought Recovery Programme and by the EPAG and District Water Engineer's office staff was confirmed during the consultant's fieldwork.

It should also be noted that there is currently a programme of rehabilitating old boreholes, including community capacity building in water resource management by Rural Focus and THW, a local consulting firm and a German firm, with funds from the USAID, will concentrate on the east and southeastern parts of the district. This effort should improve source reliability in the area. The proposed rehabilitation boreholes are found in Appendix 4: Figure 1: Targeted Boreholes.

Appendix 13: Data Sources lists some of the key documents on the district.

### **C. EPAG SUBSURFACE DAM PROJECT AREA OF FOCUS**

Development of ground water resources in the western and southwestern parts of the district has historically been neglected. This neglect was driven by a conclusion that there is no potential for ground water, a conclusion whose veracity this consultant has not been able to establish. Since there are no reliable water sources, the range is in much better condition than the range in eastern and southeastern regions of the district. This was confirmed by historical analysis, field interviews and visual checks by, not only the consultant but also by the water, veterinary and range specialists who accompanied the consultant from EPAG.

**Recommendation 1.** It is therefore recommended that EPAG initiate a subsurface (note not a sand dam) programme in the western and southwestern parts of Mandera district as a pilot. More specifically construction should be in sequence on the Sure Laga, Katilo Laga and small laggas to the east and west of Sure Laga. The consultant and the team, which accompanied him from EPG and District Water Engineer's office, concur on this conclusion on the area of focus. The Area of Focus is shown in Appendix 14: Proposed Sub-Surface Dam Project Area.

Construction should be in the range areas and not in the settlements for the objective is to enable pastoralists to take advantage of the available range biomass, which in the past has not been utilised for lack of water for both animals and humans. In the settled areas other water provision technologies can be used.



## **4. RESPONSE TO THE SPECIFIC TORS**

### **A. EVALUATE AND ADVISE ON FEASIBILITY OF EPAG USING SUBSURFACE OR SAND DAMS FOR WATER PROVISION.**

#### **1. Subsurface Dams are Feasible**

It is the considered opinion of the consultant that subsurface dams are feasible in Mandera for there are enough lagas (seasonal rivers) with enough short-term flow.

A subsurface dam is one where the wall does not come above the existing river sand. The idea of constructing a subsurface dam is to excavate until a firm foundation is met. It can be rock, clay or firm murrum.

Construction of the wall should terminate a half a metre below normal channel sand level. Water will be retained upstream and could be exploited by scoop wells. Ideal sites are down stream from points where water is historically held up for a while after the rains. Given the extreme temperatures construction must be just before the rainy season to allow the dam to cure in more ambient temperatures.

Sand dams are feasible where the river has cut a deep channel and the dam wall can be raised in the channel to a level, which contains the sand in the channel, without busting the banks. Appendix 17: Construction Stages of Sand Dams, Appendix 18: Seasonal River Utilisation and Appendix 19: Construction: From Passing Water to Standby Water, show the various stages of constructing sand dams as is practiced in Kitui through the SASOL programme. These are the bulk of the Kitui constructions although in flat areas SASOL has built subsurface dams. The construction techniques are the same for both types of dams other than the wall of subsurface dams terminating below river flow level.

In the recommended project area sand dams are not feasible given the fact that the bulk of the terrain is generally flat and attempts to raise the dam walls to retain the sand would lead to the lagas changing course and leaving the dam hanging. This has been the SASOL experience in Kitui during the past ten years. Where such dams were attempted in Machakos, Kitui, Makueni, Mwingi, Turkana, Kajiado and Samburu, in the past, on flat lands, the ephemeral rivers have changed course. There is no recharge on the hanging dams.

**Recommendation 2. It is recommended that EPAG dam pilot programme should not construct sand dams initially.**

#### **2. Subsurface Dam Costs**

Construction in Mandera will be expensive for general labour; masons, materials and transport are expensive given the distance from suppliers. Water and rubble construction stone will also have to be trucked in some sites. The consultant collected Mandera cost data from EPAG and Mandera suppliers. Whereas SASOL is able to construct a dam for **Ksh. 250,000** (including community labour) on average, it is estimated that an equivalent dam will cost **Ksh. 1,011,400** in the Mandera Project area. In SASOL construction, stone rubble, sand and water are collected on site by community labour.

The following is a costing of a 17-meter long dam, with a width of 1 meter and a depth of 3 meters. In the opinion of the consultant this should be the maximum dam until experience is developed in EPAG. Further, since the project area does not have easily available population for migration is encouraged by lack of reliable water sources, labour for construction will have to initially be hired. Since there is no water, water will have to be trucked into construction sites. The same is true of stone rubble.

Wall Length	17 meters
Wall Width Base	1 meter
Wall Width Top	1 meter
Wall Depth Centre	3 meters
Wall Bar Reinforcement	Each Metre
Barbed Wire Reinforcement	2 Centimetres
Construction Period	30 days of which
Excavation	20 days
Construction	10 days
Curing	32 days
Cement Ratios	
Foundation	1:3
Construction	1:4
Plaster Upstream	1:4

Two Masons	30 days @ Ksh. 400 per day per mason x 2	=Ksh. 24,000
Ten Labourers	30days @ Ksh. 200 per day per labourer x 10	=Ksh. 60,000
One Labourer	32 days @ Ksh. 200 per day	=Ksh. 6,400
Subtotal		<u>+Ksh. 90,400</u>

Rubble Stone	50 tons @ Ksh. 6,000 per ton	=Ksh. 300,000
Sand	70 tons @ Ksh. 6,000 per ton	=Ksh. 300,000
Constr. Water	4 tankers of 8 cubic meter @ Ksh. 30,000 per tanker	=Ksh. 120,000
Curing Water	3 Tankers of 8cubic meters @ Ksh. 30,000 per tanker	=Ksh. 90,000
Cement	100 bags @ Ksh. 100,000 per bag including transport	=Ksh. 100,000
5 cm Reinforcement Bars	4 pieces @ Ksh. 500 per piece	=Ksh. 2,000
16 Gauge Barbed Wire	Three 90 meter rolls @ Ksh. 3,000 per roll	=Ksh. 9,000
Subtotal		=Ksh. 921,000

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### 3. Training in Subsurface/Sand Dam Construction

There is no EPAG staff with experience in construction of subsurface/sand dams. In fact there are no construction staff at all in the organisation. To date it has contracted all construction.

In the view of the consultant, contracting is not a good alternative if EPAG is to embark subsurface and sand dam construction for no local contractors seem to have experience in this type of construction first. Second, quality control is of essence. It can best be assured by inhouse construction and supervision.

**Recommendation 4. It is recommended that EPAG hire two experienced masons locally if they are to build subsurface/sand dams.**

The experienced masons need to be trained in technology related to the construction of subsurface/sand dams. Given the objective of DFID programs of lessons learned in one project being extended to other projects it funds, discussions have been held with SASOL about the feasibility of training some EPAG staff in their project in Kitui. SASOL recommends that, if EPAG wants masons trained, they should be sent to Kitui for a period of two months. SASOL specifically states that these must be experienced masons. If they come to SASOL for training, they must accept to be located in the field to actually do construction for the whole period. They will be taught how to site a dam, to excavate, to build the wall, to cure and to plant protective plants.

SASOL will nominally charge Ksh. 1,000 daily for supervising the mason trainees. It is estimated that each mason will need Ksh. 200 per day for subsistence. Thus the total training cost would be:

Nominal Fees to SASOL	Ksh. 1,000 x 30 days	=Ksh. 30,000
Two Masons Allowances in Kitui	2 x Ksh. 1,000 x 30 days	=Ksh. 60,000
Total		=Ksh. 90,000

Travel from Mandera to Kitui will have to be born by EPAG.

In the interest of quality control of the first EPAG dams, SASOL is of the view that it may be necessary to get one of its experienced managers to go to supervise the first ones. The cost would be travel and Ksh. 5,000 per day.

Alternatively EPAG can use the services of one officer in the Ministry of Agriculture and Livestock Development, who in past postings supervised the construction of a massive sand dam on the Ewaso Nyiro River in Isiolo District.

**Recommendation 5: It is recommended that the two experienced EPAG masons be trained by SASOL in Kitui on the construction of Subsurface and Sand dams. Further, it is recommended that EPAG consider hiring a consultant from SASOL for supervising the quality of the first dams for a period of one month.**

## **B. EVALUATE AND ADVISE ON THE POSSIBILITY OF UTILISING COMMUNITY LABOUR FOR THE CONSTRUCTION OF THE DAMS**

Dams will initially be built in to facilitate utilisation of grazing lands where water is in extreme shortage. These areas do not have extensive permanent settlements. Community labour is therefore not easily available. It is thus not possible to use community labour in the initial proposed pilot area.

Where there are settlements, after EPAG has gained experience in construction of dams, it is feasible that large sub-surface dams and, even sand dams, can be built using community labour. This will no doubt be after the current funding, which the consultant understands is for two years.

**Recommendation 6: In the first phase of dam construction, whose objective is to provide water for areas where there is fodder and no water for livestock and humans, there will be no possibility of utilising community labour for construction. Construction labour will have to be hired. In a later phase where construction will be in established settlements, community labour can be used.**

## **C. EVALUATE AND ADVISE ON THE POSSIBILITY OF USING UNDERGROUND TANKS AS A CATCHMENT OF RUNOFF.**

In the opinion of the consultant, underground tanks, are feasible for settlements in general and particularly for schools. Many agencies have built them in parts of the district. There are enough masons and construction firms with construction skills and experience in the district. The District Water Engineer's Office has supervised construction of the same in many places in the district.

On the construction technology, Mandera experience is with prefabricated blocs. It is estimated that a 50 cubic meter bloc tank will cost between Ksh. 800,000 to Ksh. 1,000,000 if done by contract depending on distance from Mandera town. This can be reduced if masons are internal staff.

Individuals and settlements have built very large ground tanks made with prefabricated blocs. There are designs available from Ministry of Agriculture and Livestock Development as well as the Ministry of Water Development. There are other designs from neighbouring Somalia.

What is lacking in the district is experience of ground tanks made with ferro cement. The District Water Engineer's Office worked out the cost of a very large (400 cubic meters) design of a ground water tank constructed with 1. prefabricated blocs and 2. ferro cement. The former would cost Ksh. 2,500,000 and the later Ksh. 1,300,000. The differences in cost are similar to SASOL experience in Kitui.

The point ought to be made here that tanks are not cost effective in comparison to sub-surface or sand dams. Experience in Kitui shows that the cost of a ferro cement tank, which is half of the cost of one made with prefabricated blocs, is enough to build a dam which typically stores anywhere from 4 to 30 times more water!

**Recommendation 7: Save for schools or settled communities, where there is no proximate laga, it is not recommended that runoff be harvested into underground tanks for it is not cost effective.**

**D. EVALUATE AND ADVISE ON ANY OTHER METHOD OF CATCHING AND STORING WATER THAT MIGHT BE USED IN THE AREA**

**a. Pans**

EPAG and many other donors have rehabilitated or constructed pans in the district. These dry up after some time. Their management has been problematic for community utilisation does not pay attention to protecting silt from entering the pans. This shortens their life and utility. They are advantageous since they can be constructed in such a way that they force livestock to move from the proximate area thereby reducing localised desertification and increasing use of biomass effectively. Their major limitation is the high rate of evaporation given the high temperatures in the district.

**Recommendation 8: Pans should be constructed as a method of scattering livestock to areas of under-utilised forage. They, in comparison to subsurface and sand dams, lose too much water due to evaporation to become a preferred technology in the district. They should only be constructed where there is no possibility of building a subsurface or sand dam.**

**b. Boreholes**

Rural Focus Ltd. Visited 28 boreholes in 1999. The current District Development Plan identifies 26. In any case there are not that many more. Many are dysfunctional - mainly problems of spares and meaningful O&M. Boreholes are concentrated in the eastern and southeastern parts of the district.

Their major limitations are high cost of construction and high cost of spares and organisational problems of O&M particularly given that government policy states that they are to be community run.

**Recommendation 9: Boreholes are not favoured as a method of water supply, unless it is a large urban agglomeration, for reasons of cost as well as problematic O&M. It is not recommended that EPAG construct them. Given that Rural Focus and THW are in the district with a very large programme of rehabilitation of boreholes and capacity building for O&M, it is not clear whether there is a residual maintenance role for EPAG either.**

**c. Water Tanks**

Water tanks are useful in harvesting roof or ground water. In many of the settled communities individuals and institutions have built them either underground or aboveground. The technology used is fabricated blocs.

Their major limitation is that they are very expensive per cubic meter of water harvested but the cost can be reduced by ferro-cement construction technology. This cuts by half the cost generally.



**Recommendation 10:** EPAG may wish to introduce ferro cement water tank construction technology into the district. These could be constructed as a measure of assuring schools and small settlements of a reliable supply of water.

**d. Wells/Water Holes**

Wells and water holes are an old technology in Mandera. Some of the wells in the district go back to more than two hundred years. Yet in the Western and South western parts there are not as many wells. The argument is that the geology does not favour wells.

A similar argument is found in the colonial and postcolonial literature on Kitui. SASOL spend some money on hydro geological mapping of well sites in Kitui to establish parameters for locating good wells. To date SASOL has more than 200 high yielding school wells. An unknown number of community members have taken courage after seeing the school wells and have dug wells in family compounds. The point is simply that wells can be established in areas where past conclusions state that it is not possible.

**Recommendation 11:** It is highly recommended that EPAG commission a hydro geological survey of the Western and South Western part of Mandera district to establish the ground water potential so as to facilitate the construction of wells in areas where water supply is currently very problematic and where dams are not feasible for lack of lagas.

**e. Rock Catchments**

In a few areas of the district, there are rocky inselbergs. A few rock catchments have been built. Where these are exposed, the water lasts a short time due to the high rate of evaporation. There however, have been innovations where rock catchment water is fed into covered underground tanks. This protects the water from evaporating. There is extensive knowledge of technology for constructing rock catchments and tanks with masons and contractors in the district.

**Recommendations 12:** Rock catchments are not a major technology for the district. EPAG should construct them, with covered ground water tanks, only where other more cost effective technologies are not viable.

**E. EVALUATE AND ADVISE ON THE UTILITY OF PARTICIPATORY RESOURCE ANALYSIS BY COMMUNITIES FOR THE DEVELOPMENT OF WATER RESOURCES.**

**a. Centrality of Participatory Resource Analysis**

In the opinion of the consultant, participatory resource analysis is mandatory for the development of community water resources. There are many reasons for this. First, development is about people struggling with their circumstances. Many who claim to be development workers generally forget this. Second, in traditional Somali culture water, like forage, is a shared resource in the public arena and not in the private arena. Thus there always is constant dialogue about use rights and obligations. In the currently evolving circumstances, where some community members, generally the local elites, seek to move water and forage into the private arena, it is crucial that this be constantly discussed and

subjected to constant public scrutiny. This is most efficaciously assured by participatory dialogue about resources and their utilisation. Where constant dialogue has failed, there is constant conflict. Where effective community participation is institutionalised, there is more equitable access to resources.

In Mandera district, the need for participatory resource analysis has been recognised by many NGOs. EPAG is certainly aware of it in its work. It will need to anchor communities in the analysis so as to move them to more sustainable management systems of the resources. Rural Focus is doing it as a step in its training communities about managing water structures.

**Recommendation 13: It is highly recommended that EPAG institute participatory resource analysis of both water and forage in all the areas it is to construct water structures.**

#### **b. EPAG Capacity for Participatory Resource Analysis and Management Training**

EPAG has had a long tradition of community mobilisation and creation of community institutions. Among these are Pan committees, Drug User Associations, Water User Associations and Micro enterprise committees. The consultant was informed that the immediate future plan is to link all these community institutions to Pastoral Associations, which will have advocacy and development objectives, at various administrative levels. The effect would then be to have relations from the locational to the district level and then to get the associations to function as area specific development committees.

The provincial administration, other government departments and most donors working in the district, among which Oxfam Quebec, Arid Lands etc, share the objective of creating pastoral associations. Clearly such harmonisation will lead to more effective coordination in the field.

The EPAG organograms is shown in Appendix 15: EPAG Organogram. The EPAG staff is composed of the following categories and specialisations.

Title	Specialisation
Programme Coordinator	Range Management
Programme Officer Veterinary	Veterinary
Programme Officer Micro enterprise	Development/Management
Project Accountant	Accounts
Administration Officer	Administration
3 Trained Trainers Micro enterprise	Micro enterprise
4 Trainers Veterinary	Animal Health/Water

It is clear that no senior staff member is a specialist in PRA methodologies and their use in development to include and not be limited to participatory resource analysis, planning resources use and development as well as community resource management and audit.

**Recommendation 14: It is recommended that a senior officer be found and hired by EPAG for training communities in participatory resources analysis, development and management. Such an officer will be the supervisor of the extension staff already in place.**



## 5. WATER RESOURCES DEVELOPMENT AND MANAGEMENT CAPACITY

Strictly speaking this was not in the consultant's TORS. Hereunder I want to raise the issue of EPAG's long term strategy for it will have a bearing on whether EPAG builds up capacity to manage the development of sustainable assorted water technologies for the benefit of the communities. This is done in good faith and not a criticism. It is my hope and prayer that EPAG and its donors will think about it seriously. It calls for long-term commitment on both sides.

In the *Report on EPAG Strategic Planning Workshop 25-29 May '99, Final Report: September 1999* by Dr. Robert Nurick, the Future section, (pp.35-44) many new activities in Veterinary Programme, and in the Micro enterprise Programme are identified. An additional Credit Programme is identified. So are Programmes on Education and Peace and Reconciliation. Nowhere is water resources treated as a stand-alone.

Appendix 16: History of EPG-K Accountable Grants Received, prepared for the consultant by the organisation shows a variety of programmes also. Again water is always an appendage to other programmes.

The Emergency Pastoralist Assistance Group (EPAG-K) Brief Report on EPAG-K Activities of October 2000 also details very widely diverse activities under the headings of Community Animal Health Project, Community Micro Project and Emergency Drought Mitigation. The way forward is specified in six broad areas to wit, drought and disease monitoring, strengthening central drug shop, expansion of micro project to new communities and training of leaders, revolving credit for dropout pastoralists, look for alternatives to tankering water to western Mandera and to explore renewable technologies for effective drought mitigation. Water is one of the six broad areas but it still is a sub-set of other activities.

The version of the Log frame for the next phase, given to the consultant at DFID, shows activities in creating pastoral institutions, in desilting pans, documentation of traditional drought prediction, training water pan and borehole management committees, supporting community water initiatives, revising curricula, training trainers, training LDUs, strengthening drug stores and training herders, giving livestock drug credit and conducting a gender study. Water features here.

In my view each of the many areas identified for future programming are major development concerns with implications for the mix of staff within EPAG. For example if water is to become a major area of programming focus, then the organisation will have to staff up at the officer level with people who can plan, supervise and monitor and evaluate the water programmes. If EPAG decides to continue the contracting mode, with its attendant problem of structure quality control and lack of community participation, such a minimal staffing up may be sufficient. On the other hand, to ultimately achieve community participation in water structures construction and effective long term O&M of structures, made to enable communities to use the resource sustainably and with equitable access, there is need to get at least a manager and field trainers and masons in the organisation working on water issues so as to get communities involved effectively.

It is clear to the consultant that EPAG is interested in introducing the technologies related to subsurface/sand dam planning, management and eventual involvement of communities in construction dams. The issue is whether dams will be delivered through existing programmes.

There are several problems with such an approach which at best can be put as questions in the present circumstances. Is EPAG interested in building up a major programme in water? How is an expanded water resources development programme to be delivered? Through the veterinary programme structures and processes? By contracting construction to private sector construction and EPAG doing mobilisation and training? By building in house capacities for planning, construction and supervision? Which water provision technologies are viable for different sections of the Mandera population? Which water provision technologies are sustainable for settled communities, partial nomads, and full time nomads? Should schools be targeted in planning water resources development? How about small settlements?

Developing sustainable water resources with communities in a participatory manner is complex and it calls for committing professional staff to a long-term systematic water programme. This is an issue the Board and Management of EPAG need to clarify in setting strategy for the future.

**Recommendation 15: In the view of the consultant, subsurface and sand dams are an effective way of providing community water for both humans and livestock. However, delivering such a programme systematically and in a sustainable manner, meaning with full community participation in the planning, construction and O&M of the structures, is a major long-term undertaking calling for in house management. It does not easily lend itself to the contracting development model.**

Previous recommendations in this report have been made from the point of view that EPAG should begin to staff up on the subsurface/sand dam technology for it will be extremely useful to the district.

The recommendations have identified a specific area of the district where the pilot should be undertaken so as to create linkage to the major mode of production in the district.

It remains to be said that EPAG should review its future strategy and decide whether to put water into the centre of its staffing. Then it will be able to take advantage of this simple technology, which delivers water at very cost effective levels of investment.

## **6. APPENDICES**

- Appendix 1: Terms of Reference
- Appendix 2. Mandera District: Field work Route and Major Lagas.
- Appendix 3. Mandera District: Type and Location of Water Resources
- Appendix 4. Figure 1: Targeted Boreholes
- Appendix 5. List of Persons Interviewed
- Appendix 6. District Population Projections
- Appendix 7. Mandera District Administrative Boundaries.
- Appendix 8. Run-Off Regions and Type and Location of Water Sources
- Appendix 9. Mandera and Wajir Districts: Distance to Permanent Water.
- Appendix 10. Mandera and Wajir Districts: Range Condition
- Appendix 11. Mandera District: Dry Season Cattle Movements.
- Appendix 12. Employment Profile
- Appendix 13. Data Sources
- Appendix 14. Proposed Subsurface Dam Project Area
- Appendix 15. EPAG Organogram
- Appendix 16. History of EPG-K Accountable Grants Received
- Appendix 17. Construction Stages of Sand Dams
- Appendix 18. Seasonal River Utilisation
- Appendix 19. Construction: From Passing Water to "Standby" Water



Appendix 1:

**Terms of Reference****Water catchment consultancy****1. Background**

EPAG-K is a local NGO based and operating in Mandera District. It has been in the area since 1992 undertaking Community Animal Health Project which entailed the training of livestock owners and herders on the prevention and treatment of common livestock diseases in the area. EPAG is more recently viewed as a particularly resourceful and responsive locally owned institution with a potential of being a premier advocate for pastoralist needs. Of late EPAG has been undertaking emergency water projects such as water tankering and dam-desilting. The organisation and DFID are now looking at ways of developing water resources especially in areas lacking underground water potential in order to resolve persistent water needs.

**2. Terms of reference**

The purpose of the consultancy is to discuss and advise EPAG and DFID on alternative technologies for water provision in areas that are traditionally lacking underground water potentiality. More specifically the tasks of the consultancy is to:-

- (i) evaluate and advise on the feasibility of EPAG using sub-surface/sand dams for water provision
- (ii) evaluate and advise on the possibility of utilising community labour for the construction of the dams
- (iii) evaluate and advise on the possibility of using underground tanks (Berkad) as a catchment for run-off.
- (iv) evaluate and advise on the utility of participatory resource analysis by communities for the development of water resources
- (v) evaluate and advise on any other method of catching and storing water that might be used in the area
- (vi) produce a report for EPAG and DFID on the above

**3. Duration**

The consultancy is expected to take 15 days including travel, field work and report writing. The work is to begin as from mid November

**4. Travel arrangements**

EPAG-K will facilitate the travel of the consultant from Nairobi to Mandera and back. EPAG-Kenya will also make arrangements for travel to potential sites and discussions with partner groups

Reduce to  $A_4$

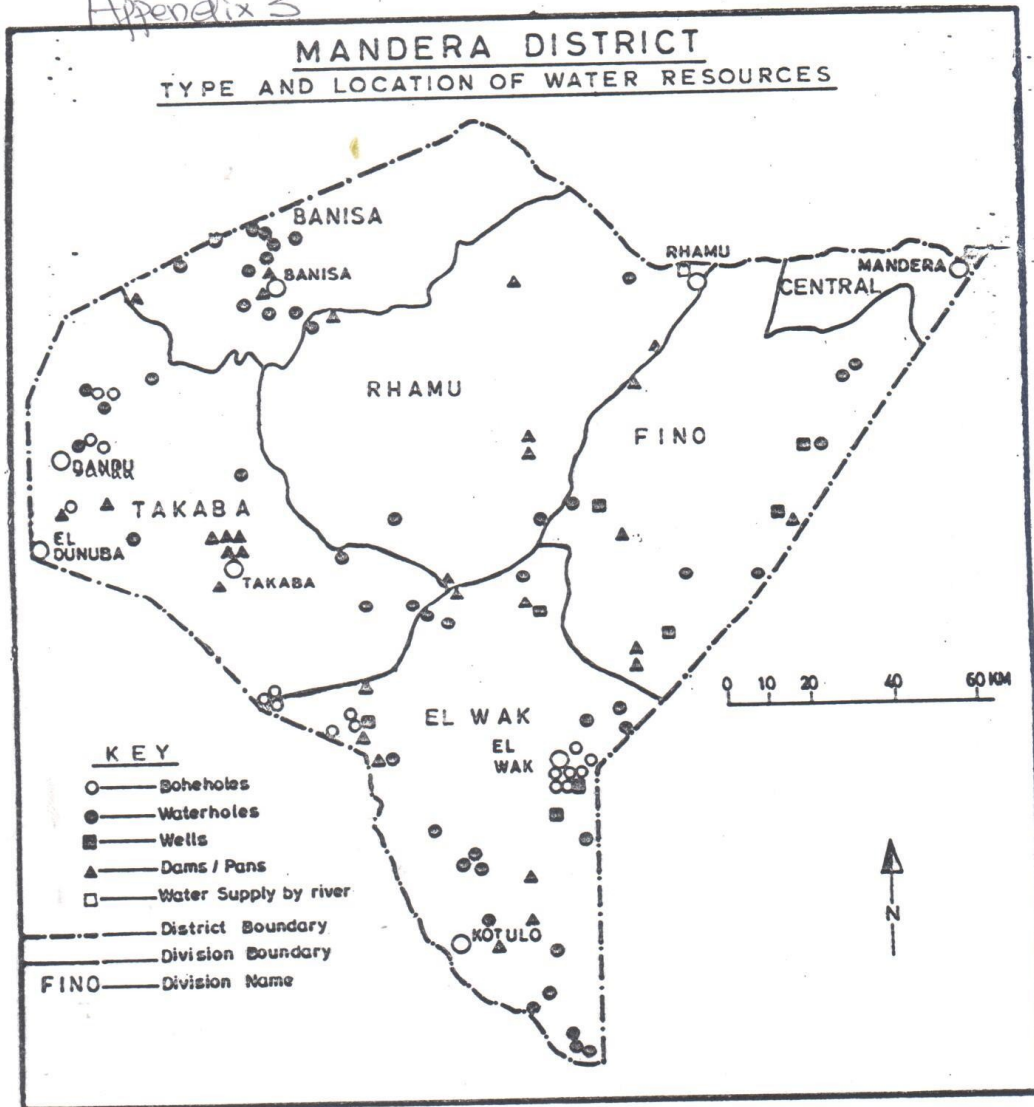
A hand-drawn map of Mandera District, Kenya, showing military movements and positions from November 2000. The map includes the following locations and dates:

- TAWANI**: 23-11-2000
- BEMISA**: 22-11-2000
- DLA**: 22-11-2000
- RAUD**: 24-11-2000
- ANGERDA**: 24-11-2000
- MINDELA**: 22-11-2000
- WARANARA**: 24-11-2000
- EGARI**: 24-11-2000
- WADJADUDA**: 24-11-2000
- SHUBIR FUDUMA**: 23-11-2000
- ELWAK**: 23/24-11-2000

The map also shows roads, rivers, and various symbols (circles, triangles, squares) representing military units or positions. The district name "MANDERA DISTRICT" is prominently displayed in the center.

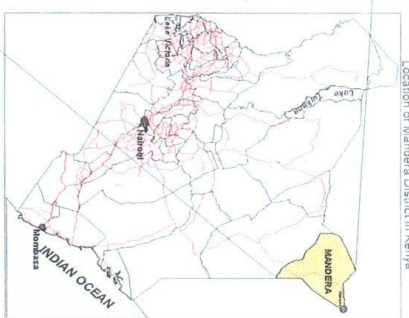
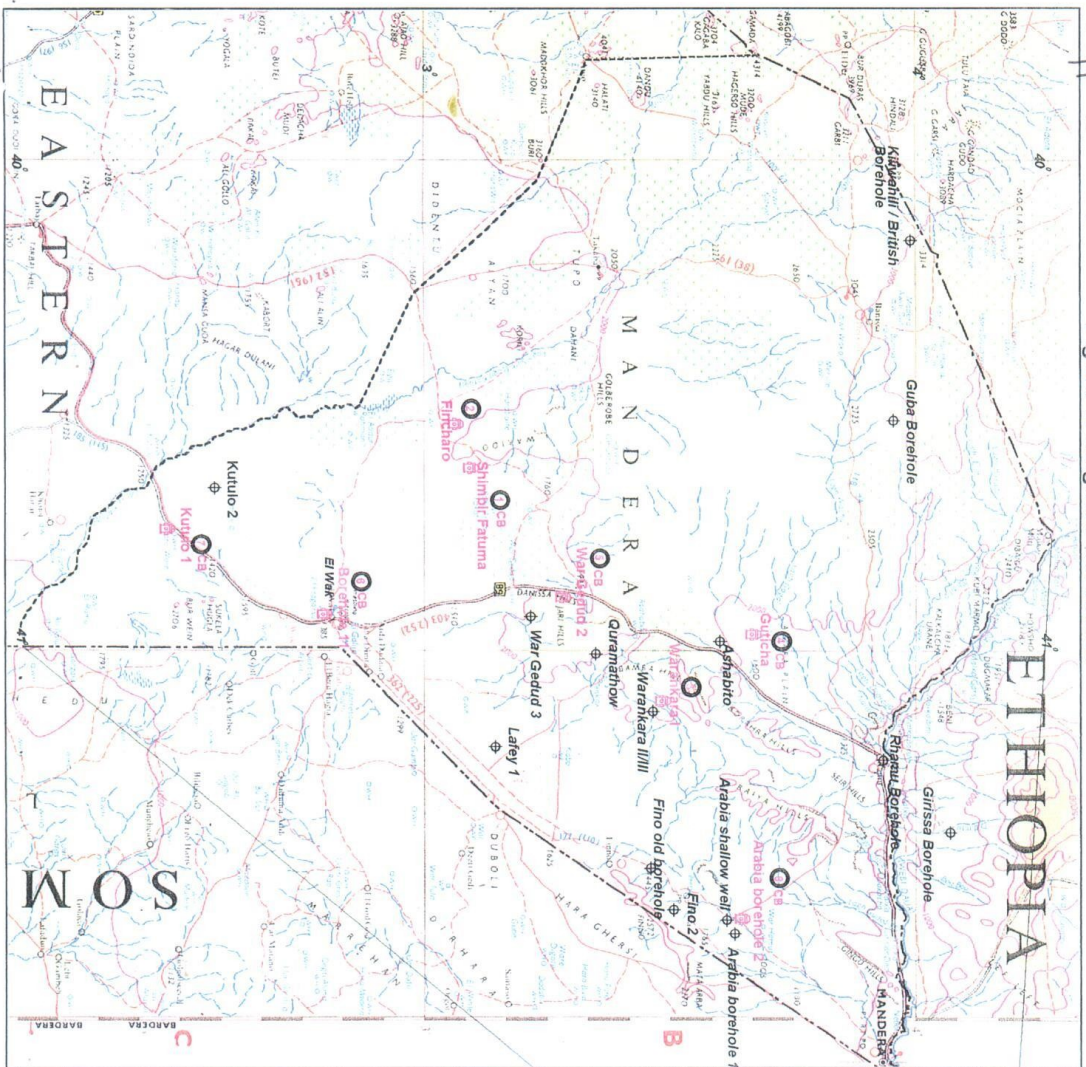


Appendix 3

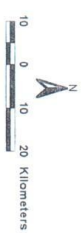


# Appendix 4:

Figure 1: Targeted Boreholes



- Targeted boreholes
- Other boreholes
- Communities targeted for capacity building
- Priority of Regeneration & Rehabilitation



Map reproduced by:  
**Rural Focus Ltd.**  
 P.O. Box 1011  
 Nanyuki  
 Data source:  
 GOK (1996) Kenya Route Map  
 September 2000

#### Appendix 5: List of Persons Interviewed

Mandera District Commissioner Haji  
Mohamed Abdulla Yusuf      DA&LE Officer

Abdillahi Gessey	EPAG Programme Coordinator
Dhahabu Daudi	EPAG Micro projects
Abdullahi Hersi	Field Officer
Abdi Hussein Kahiye	Senior Field Assistant
Mohamed Sahal	Administrator
William Ocharo	Accountant
Abdirizak M. Abdullahi	Artist

Guba  
Chief Abbas Ilmi Mohamad      Guba  
Asst. Chief Abdi Haji Mohamad      Guba  
30 Community Persons

Jurog  
Maalim Sheikh Abdillahi      Jurog  
Maalim Adan Mohamad      "  
Ahmad Maalim Mohamad      "  
Abdi Rahman M. Salat  
Suleman Sheikh Hassan  
Mohamad Adan Sheikh  
Abdillahi Abdi Hassan  
Adow Osman Ibrahim  
Farah Ibrahim Abdalla  
10 Community Persons

#### Kiliwaheri

Councillor Ali Mohamad Isaak  
Senior Chief Ibrahim Abdi Mohamad  
Haji K. Mohamad  
Abdulahi Ismael  
M. Abdi Ibrahim  
Sheikh Alio Adow  
Osman Yerrow  
M. Abdi Nurrow  
30 Community Persons

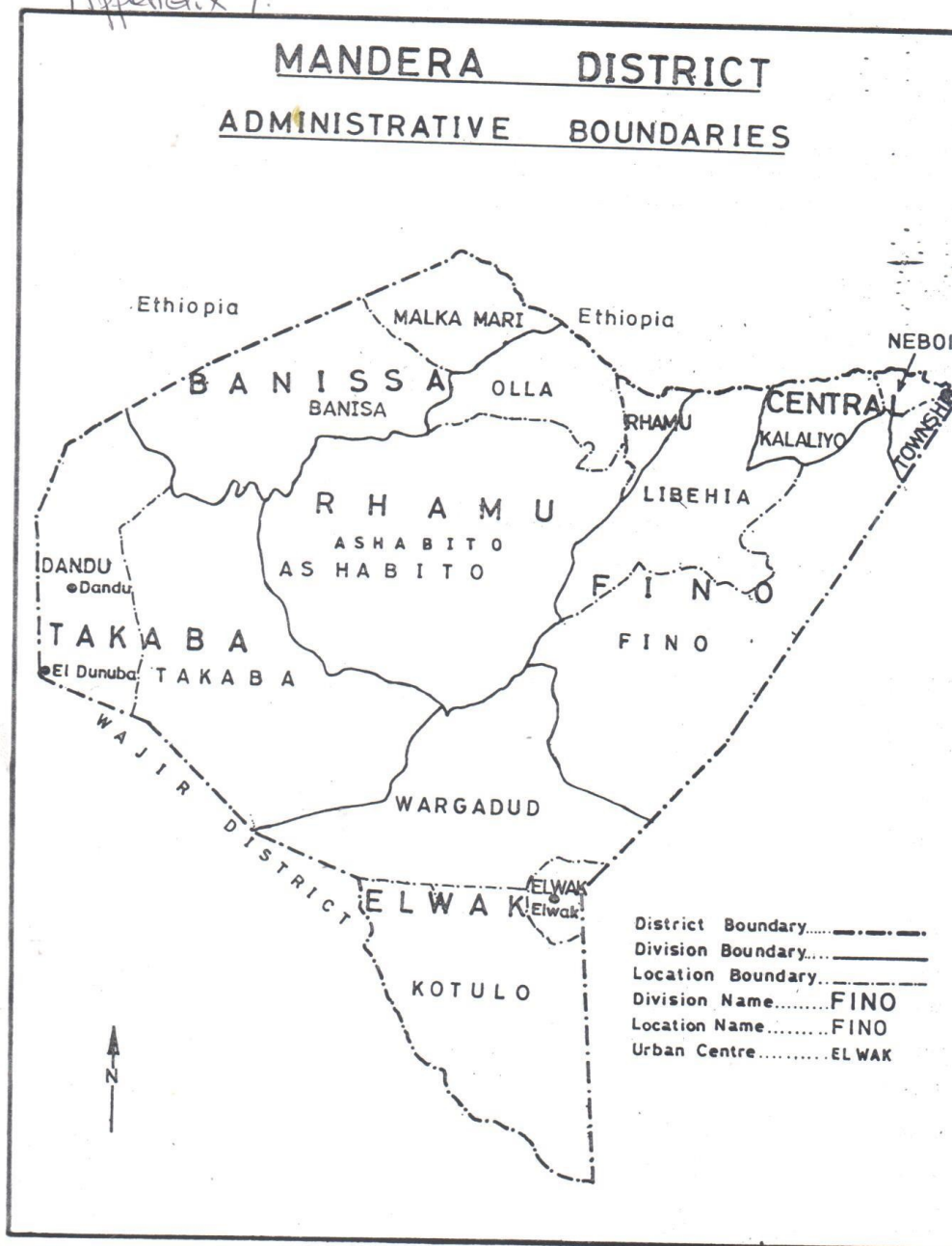
Duduble  
Assistant Chief Mohamed Isaak  
Councillor Isaak Alio Hillow  
Elder Kullow Ali

Ctd.

has 17.

East,  
Central,  
covers  
Shimbir  
amari,

Appendix 7:





# Appendix 6:

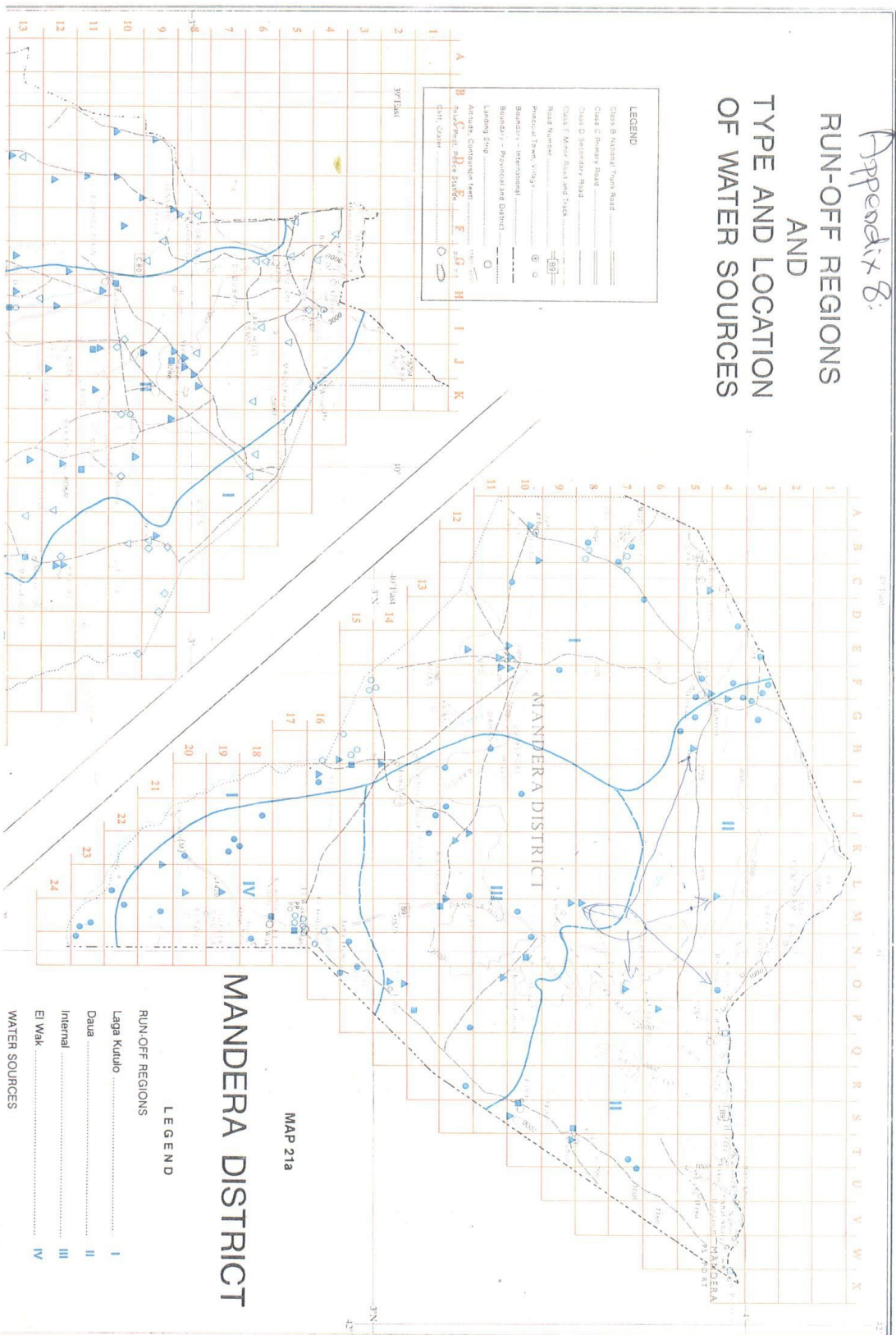
**Table 1.3**  
**District Population Projections**

Age Cohorts	1989	1997	1999	2001
0-4	20,816	40,075	43,336	46,985
5-9	20,259	39,703	42,451	45,913
10-14	17,362	36,028	38,463	41,473
15-19	14,639	25,900	27,554	29,834
20-24	11,033	19,810	21,231	23,015
25-29	9,028	16,025	17,195	18,654
30-34	7,713	15,050	16,142	17,498
35-39	4,171	10,207	10,920	11,826
40-44	5,235	11,022	11,775	12,748
45-49	2,413	6,767	7,226	7,824
50-54	4,006	7,346	7,859	8,524
55-59	1,266	4,521	4,842	5,280
60-64	2,333	2,619	2,813	3,068
65-69	692	2,211	2,386	2,619
70+	2,666	2,558	2,759	2,998
<b>Total</b>	<b>123,787</b>	<b>239,841</b>	<b>256,952</b>	<b>278,261</b>

**Source:** District Statistics Office, Mandera, 1996.



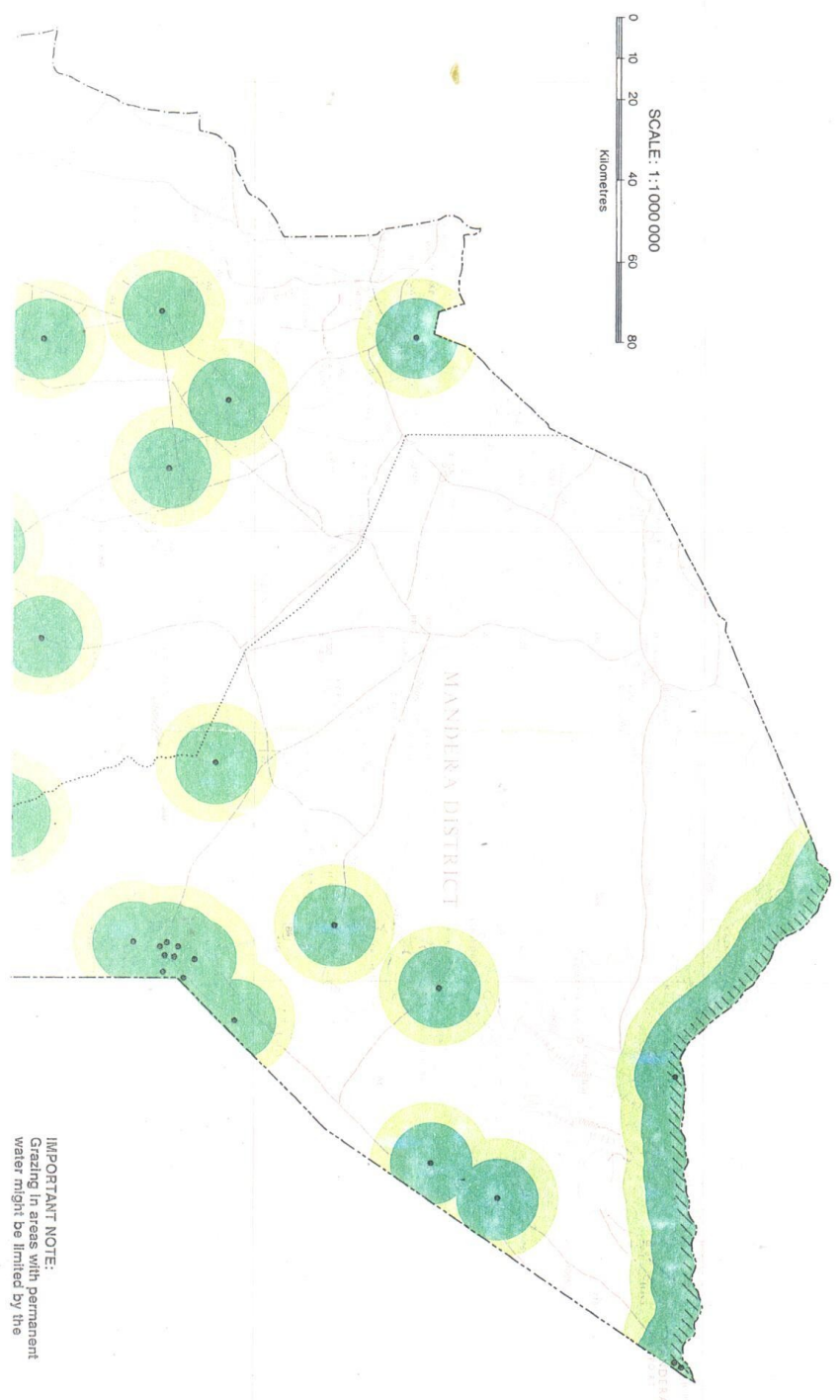
# Appendix 8. RUN-OFF REGIONS AND TYPE AND LOCATION OF WATER SOURCES



Appendix Q:

# MANDERA AND WAJIR DISTRICTS DISTANCE TO PERMANENT WATER

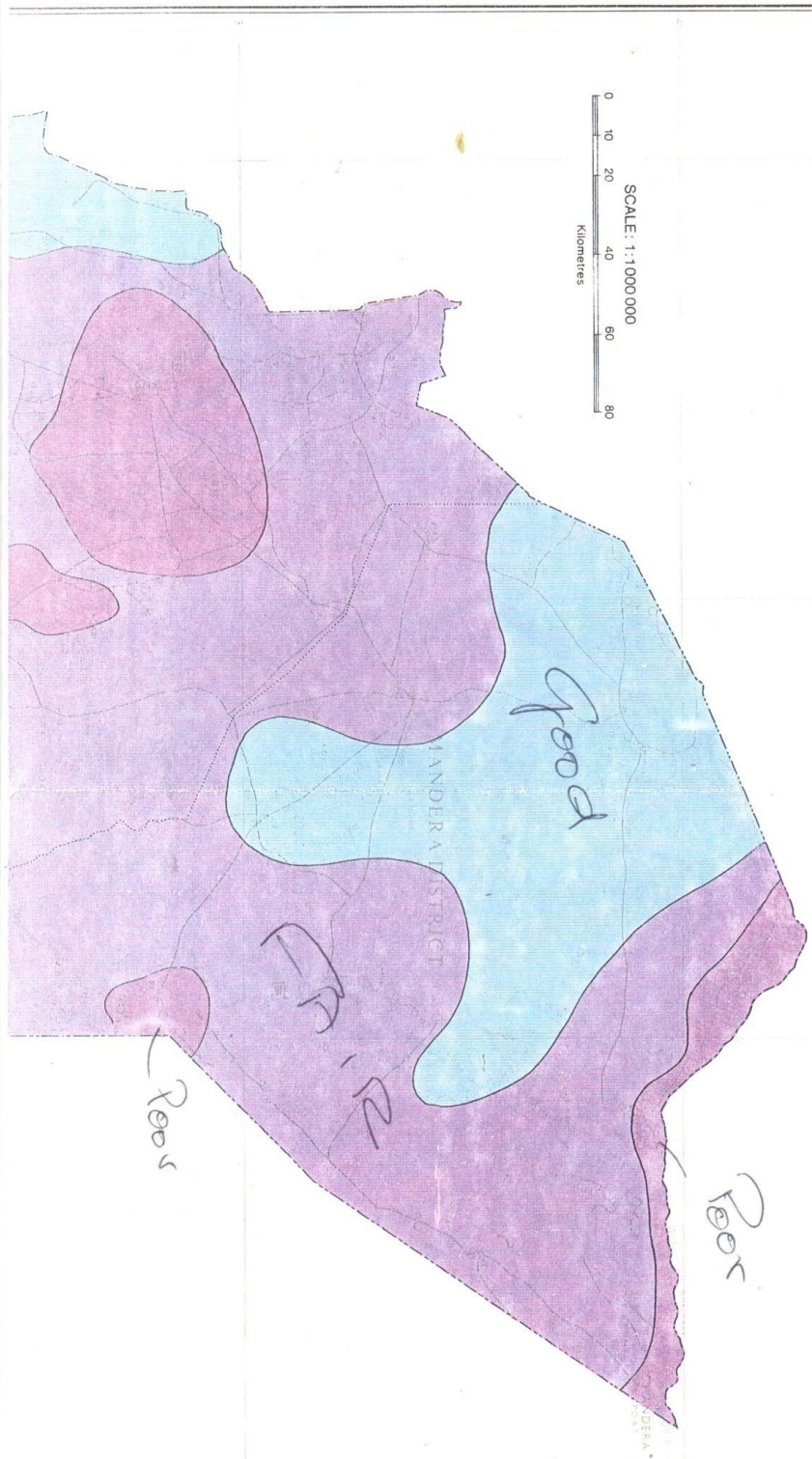
MAP  
22



IMPORTANT NOTE:  
Grazing in areas with permanent  
water might be limited by the

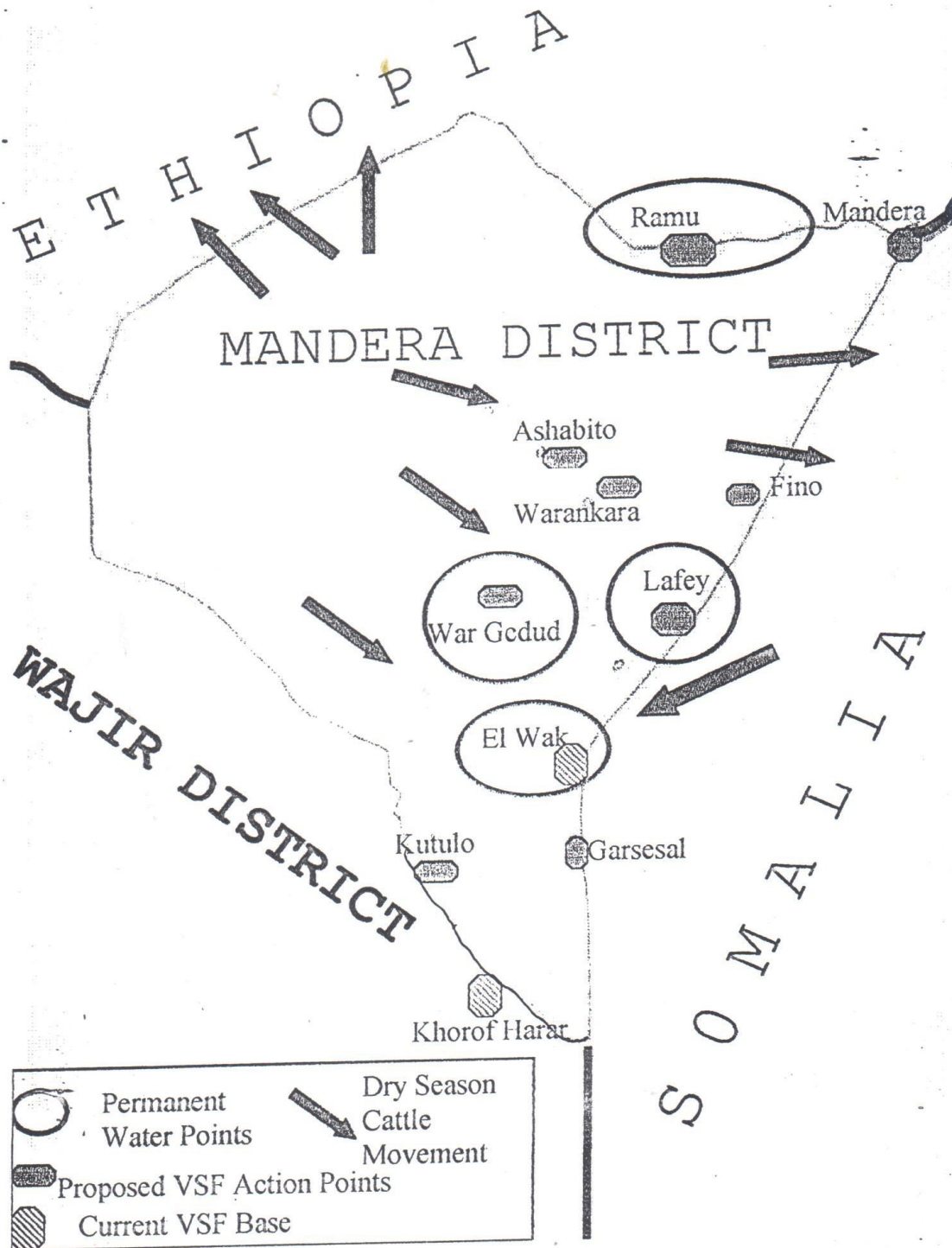
Appendix 15: **MANDERA AND WAJIR DISTRICTS**  
**RANGE CONDITION**

MAP  
18

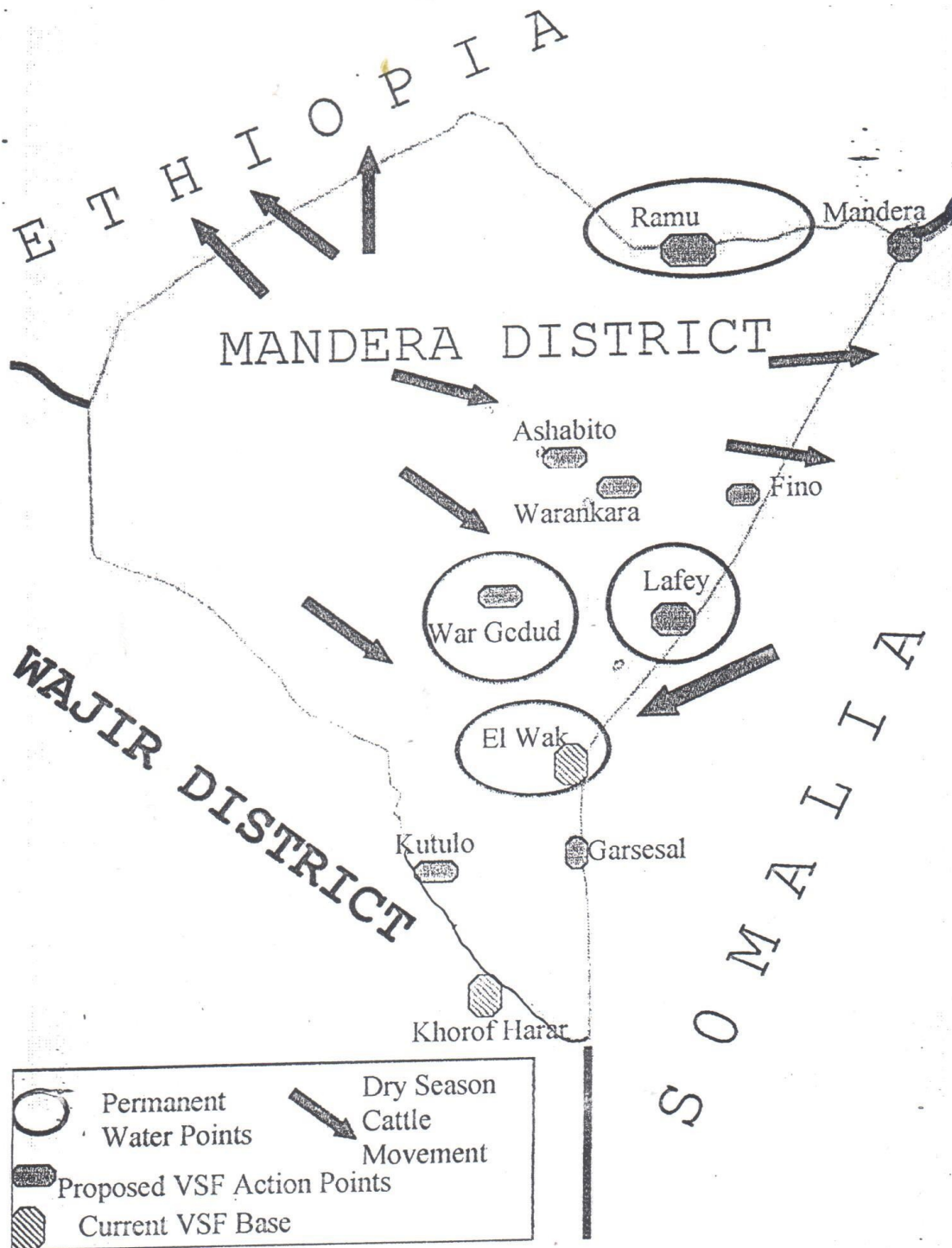




# Appendix II: Dry Season Cattle Movements.



# Appendix II: Dry Season Cattle Movements.



Appendix 12:

Table 1.22

Employment Profile

	1989	1997	1998	2001
Labour Force	53,824	107,316	114,764	124,437
<u>Agricultural Labour</u>				
Small Scale	2,273	3,981	5,028	6,770
Migrant/Seasonal	108	312	520	792
Pastoral	42,422	54,808	57,112	62,021
<u>Wage Employment</u>				
Main Towns	2,221	4,270	5,951	8,340
Rural/Market Centres	974	2,605	3,104	3,979
Public Sector	1,961	2,590	2,500	2,000
Private Sector	1,234	2,822	4,013	5,819
<u>Urban Self Employment</u>				
Commercial Business	1,646	4,400	5,754	6,428
Informal Sector	90	400	660	800

Source: District Trade Office, County Council, Mandera, 1996.



Appendix 13: Data Sources

Echo in Kenya. "North-Eastern Kenya Veterinary Relief Program > Project Proposal, Seven Months August 2000-February 2001. Submitted to the European Humanitarian Office August 2000. Final Draft."

EPAG-K Brief. "Report on EPAG-K Activities October 2000"

Gakunga, Sam and Dan Owuor. "Output to Purpose Review of the Community Animal Health Project of EPAG"

Gakunga, Sam. "Review of the Community Micro Projects of the EPAG-K"

Gessey, A. A. "DFID Review of Current Drought Strategy"

Ministry of Livestock Development. "Kenya "Range Management Handbook"

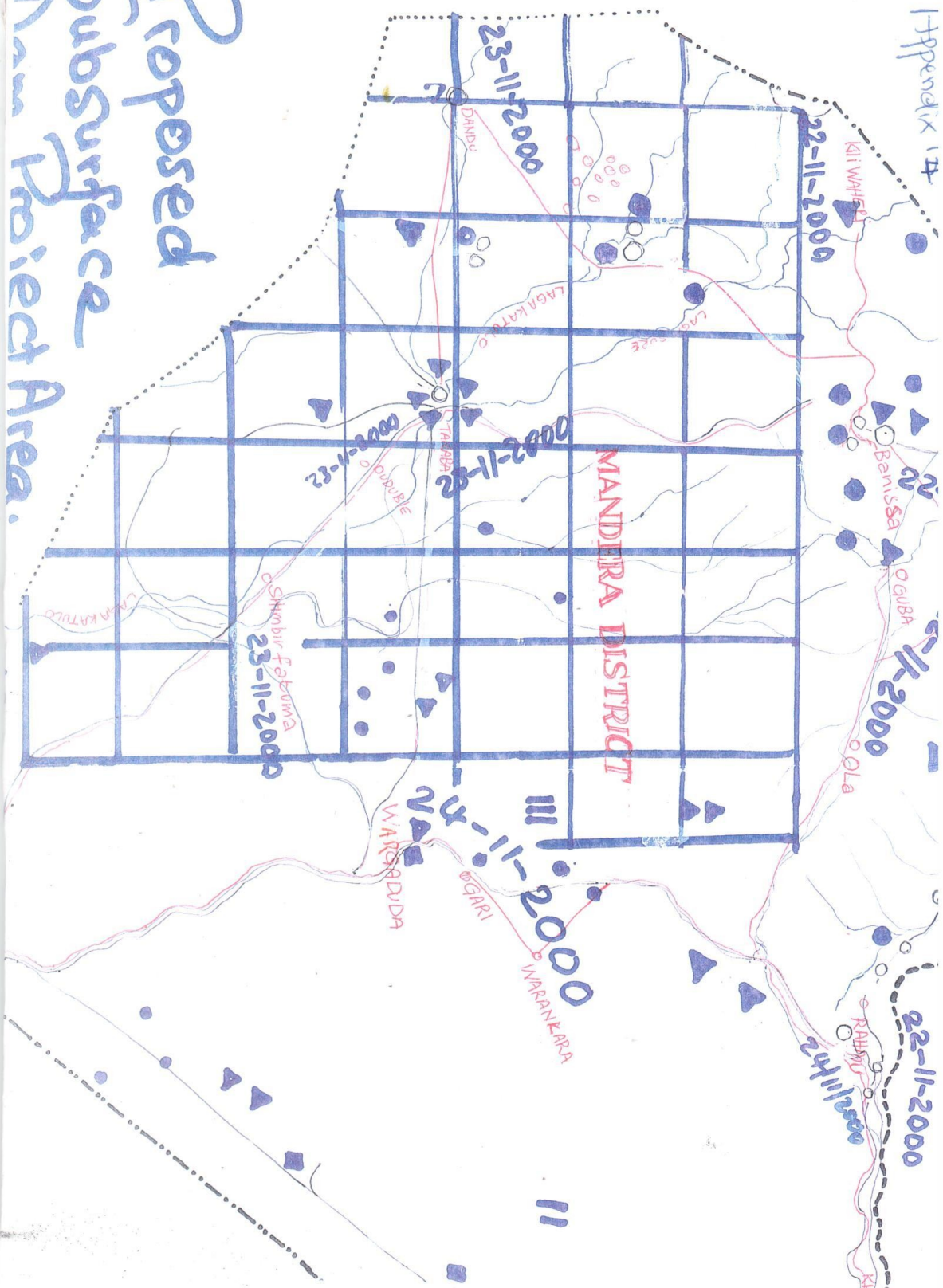
Niedrum, Susanne and Alloys Omolo. "A Draft Concept Paper for Emergency Funding: The Maintenance of Animal Health and Pastoral Livelihoods in the 2000 Drought: Mandera, Wajir, Garissa, Tana River District. September 2000 to August 2001" CARE.

Nurick, Dr. Robert. "Report on EPAG Strategic Planning Workshop 25-29 May '99. Final Report." September 1999.

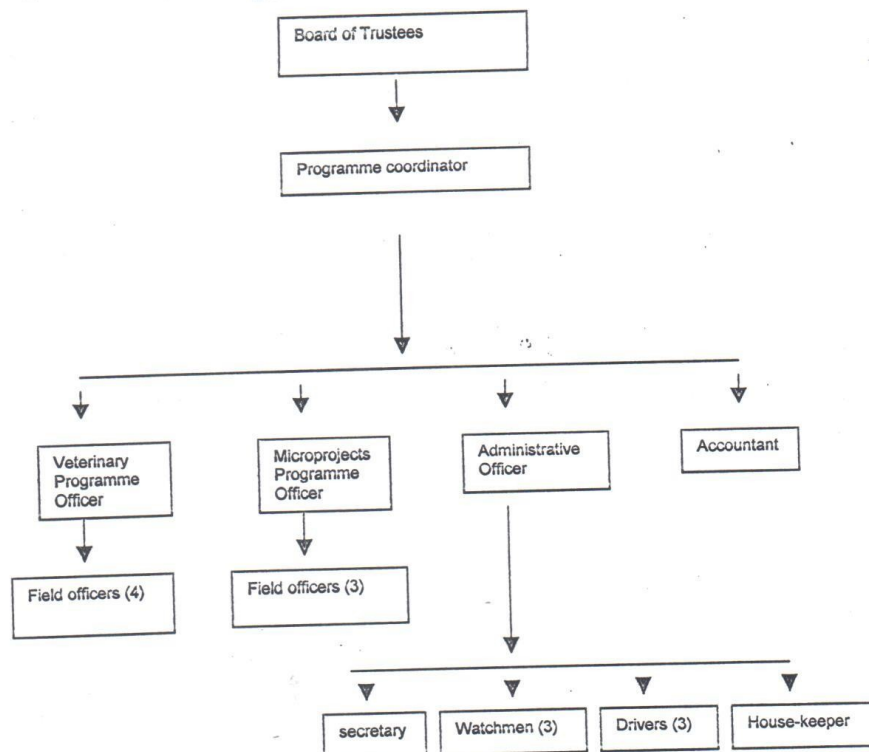
Office of the Vice President and Ministry of Planning and National Development. "Mandera District Development Plan" 1994-1996 and 1997-2001

Rural Focus Ltd. THW. "Regeneration and Rehabilitation of Boreholes and Capacity Building in Water Resource Management in Mandera District, Kenya. Identification of Community Management Approaches and Assessment of Community Training Needs" Submitted to USAID/OFDA October 2000.

Proposed  
Subsurface  
Project Area



## Appendix 15. EPAG ORGANOGRAM.



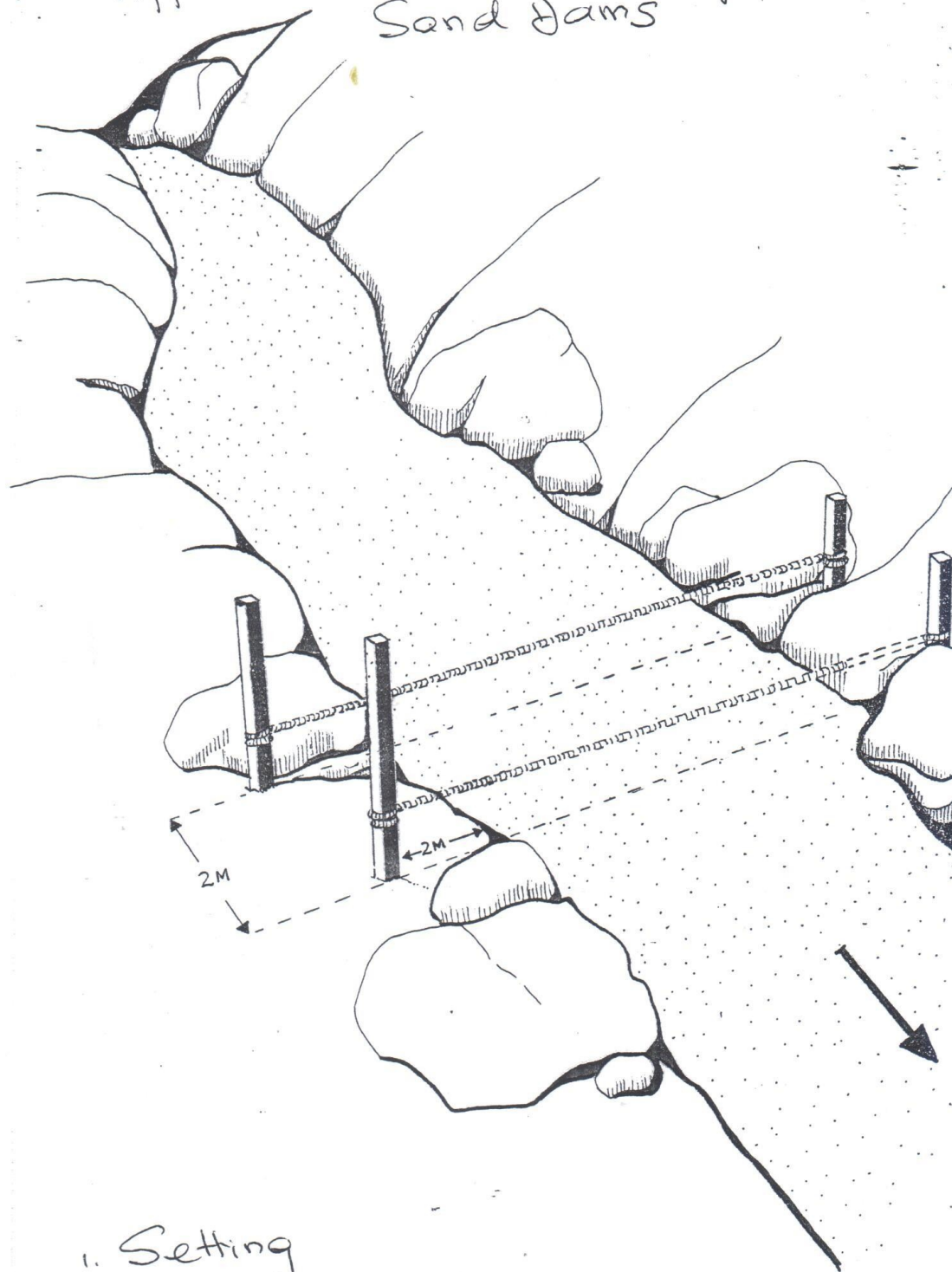


Appendix 16:

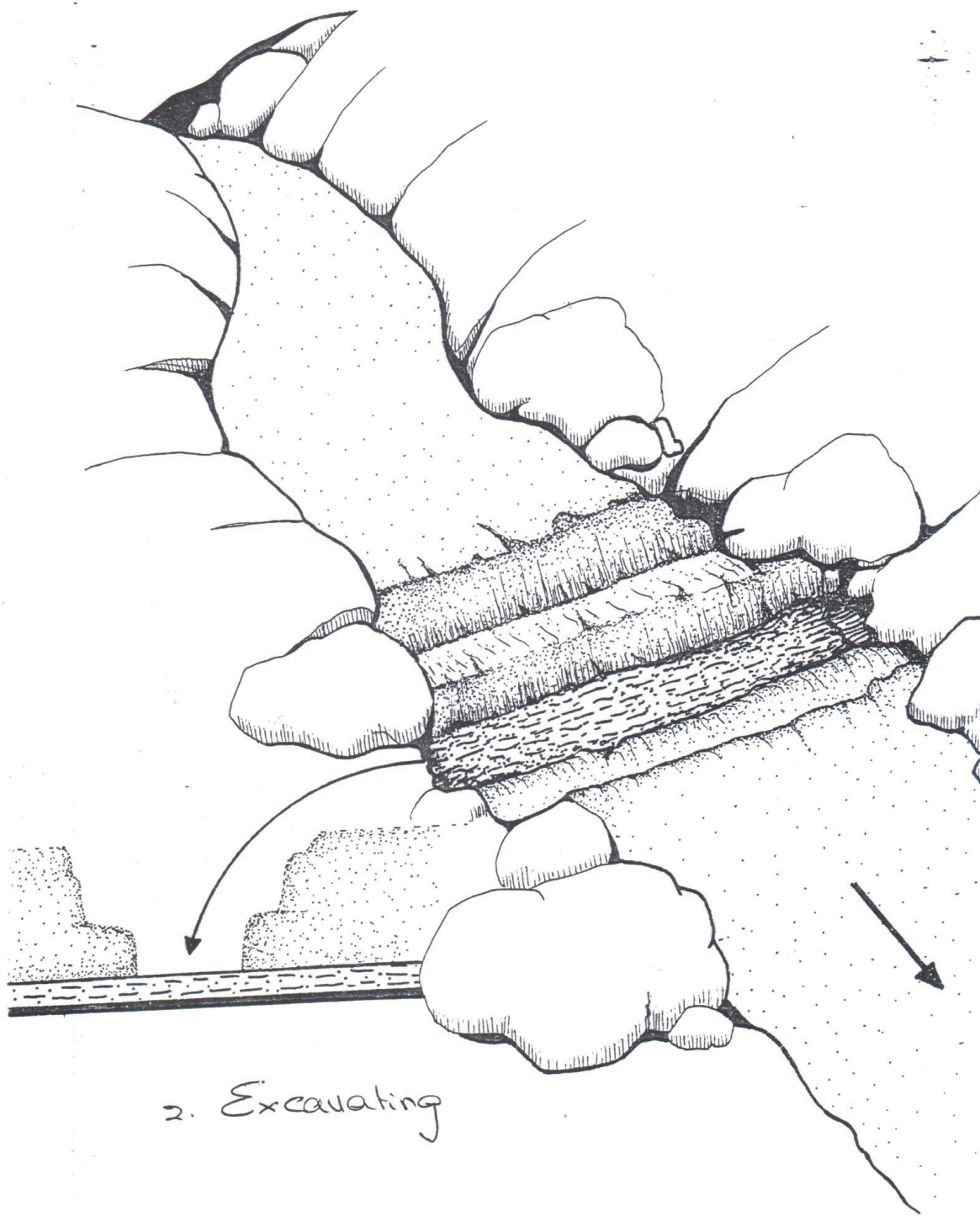
# HISTORY OF EPAG-K ACCOUNTABLE GRANTS RECEIVED

PROJECT	PERIOD	DONOR	TOTAL FUNDS (KSH)
EPAG-UK			
1. Livestock redistribution project	1993/94/95	UNICEF, OFDA, ODA	4,406,287.00
2. Livestock redistribution Project	1994/95	JMP (Joint Mobilization Project)	4,637,806.00
3. Veterinary Project	1994/95	UNHCR	3,203,191.00
4. Veterinary Project	1994/95	ODA	3,523,246.00
5. Credit & Resource Management Project	1994/96	CARE	7,413,990.00
SUBTOTAL	K.SHS		23,184,520.00
EPAG-K			
6. Community Animal Health Project (CAHP)	March 1996 to 1999	ODA	31,910,837.00
7. Emergency Water Tankering	September 1999 to Sept. 2000	DFID	18,557,175.40
8. Dam/Pan De-silting	Feb. 2000 to Feb. 2001	DFID	14,935,429.80
9. Emergency Drought Mitigation Project	Sept. 2000 to Feb. 2001	CDTF	13,596,450.00
SUB - TOTALS	K.SHS		78,999,892.20

# Appendix 17: Construction Stages of Sand Dams

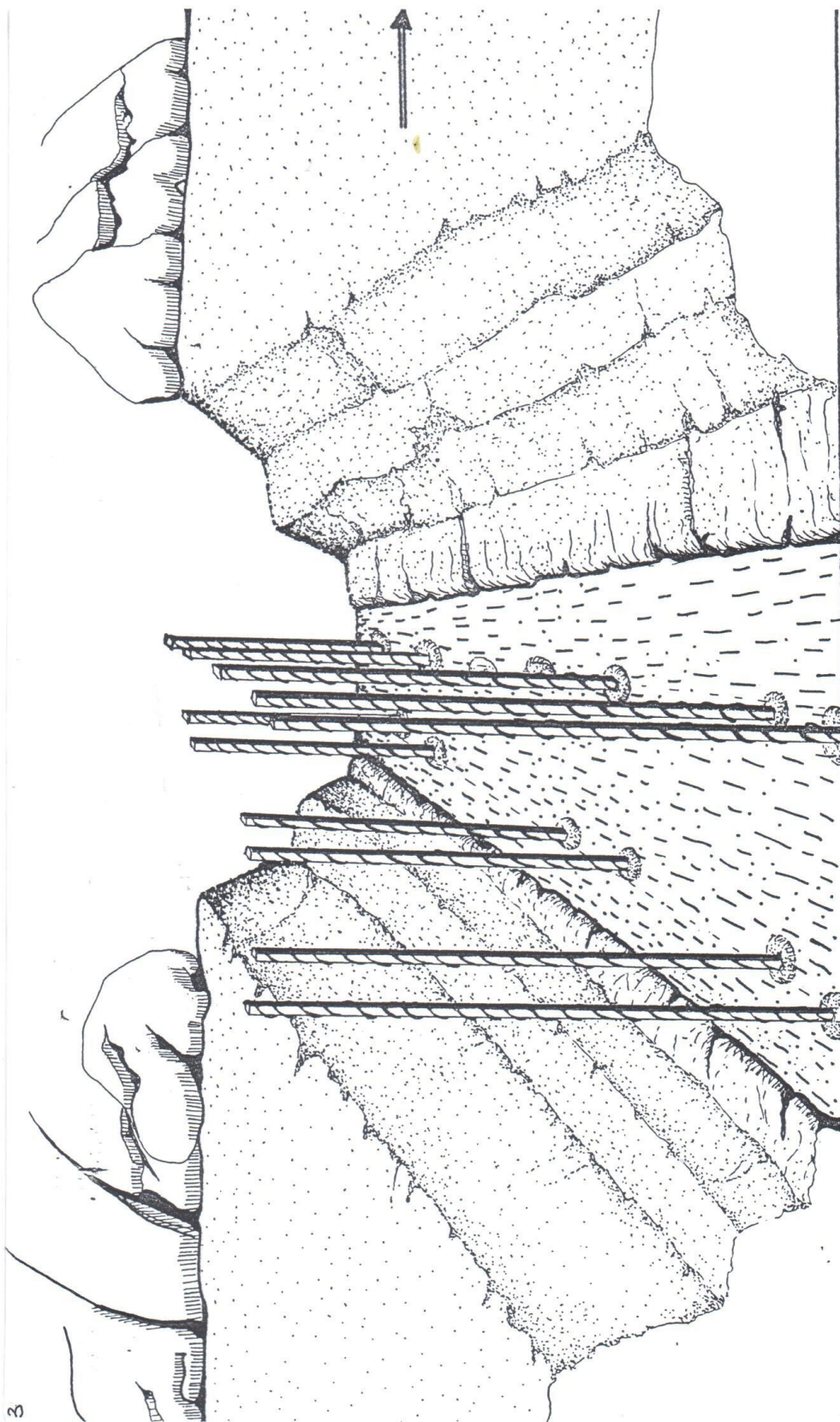


1. Setting



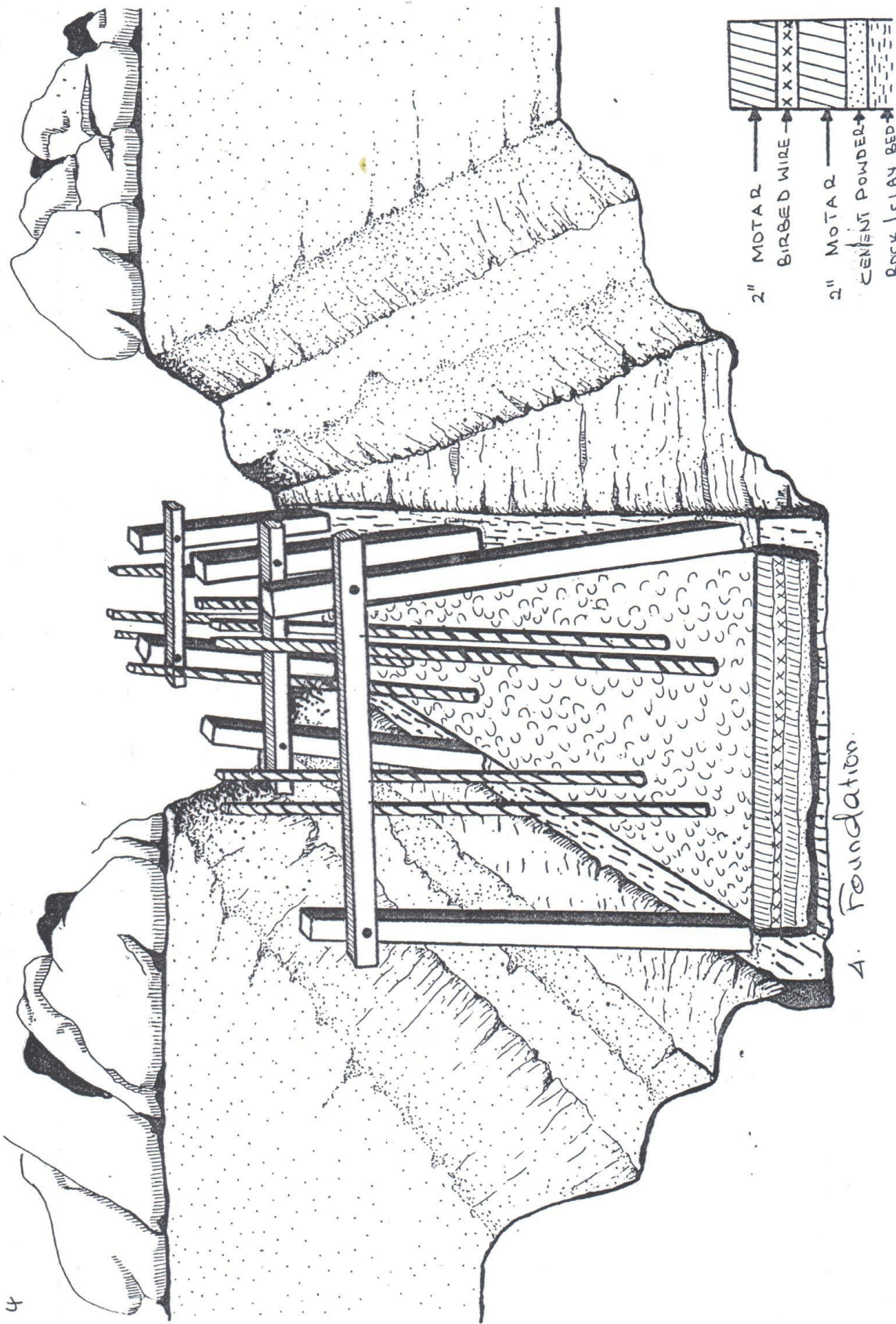
2. Excavating



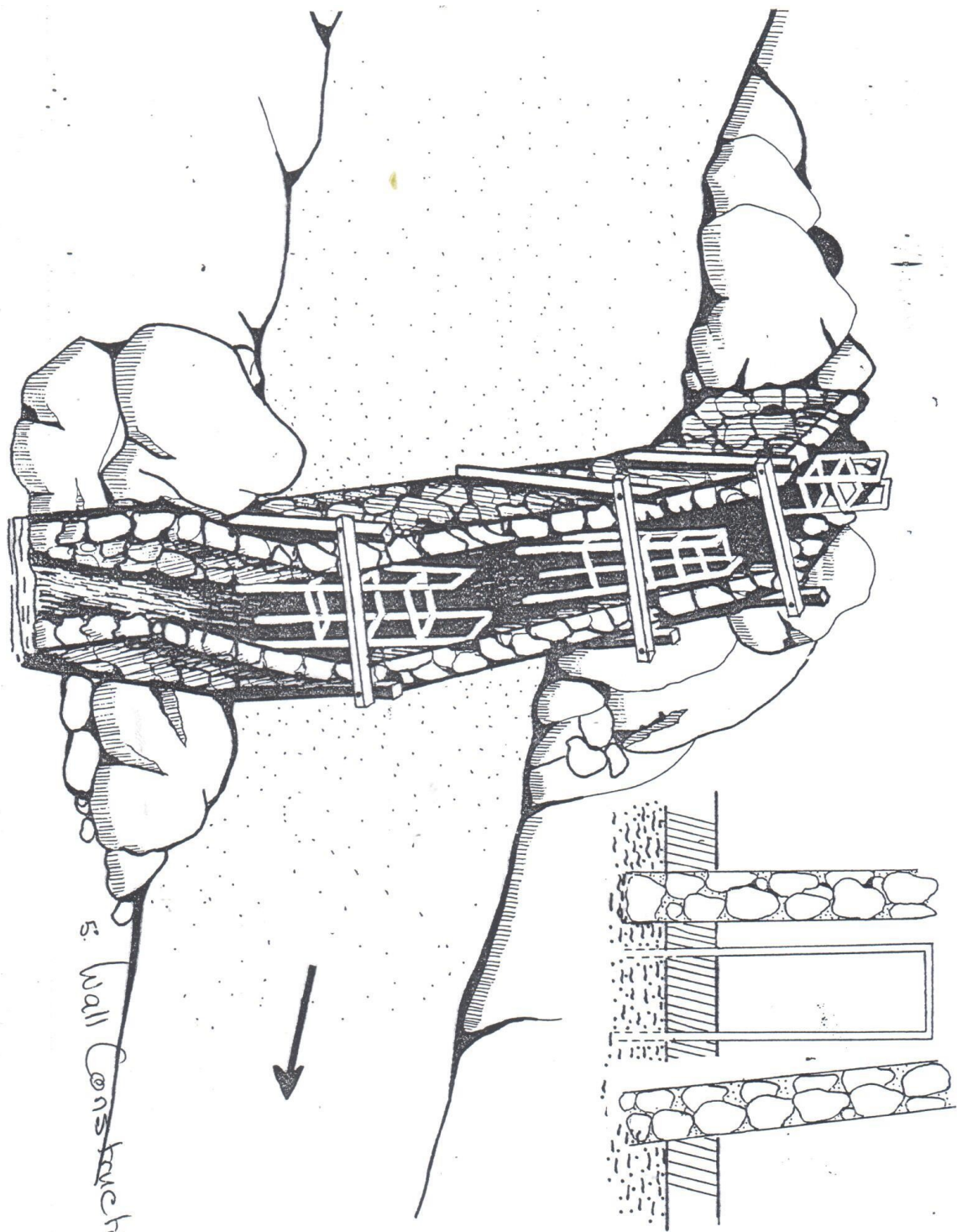


3. Anchoring Reinforcement Bars

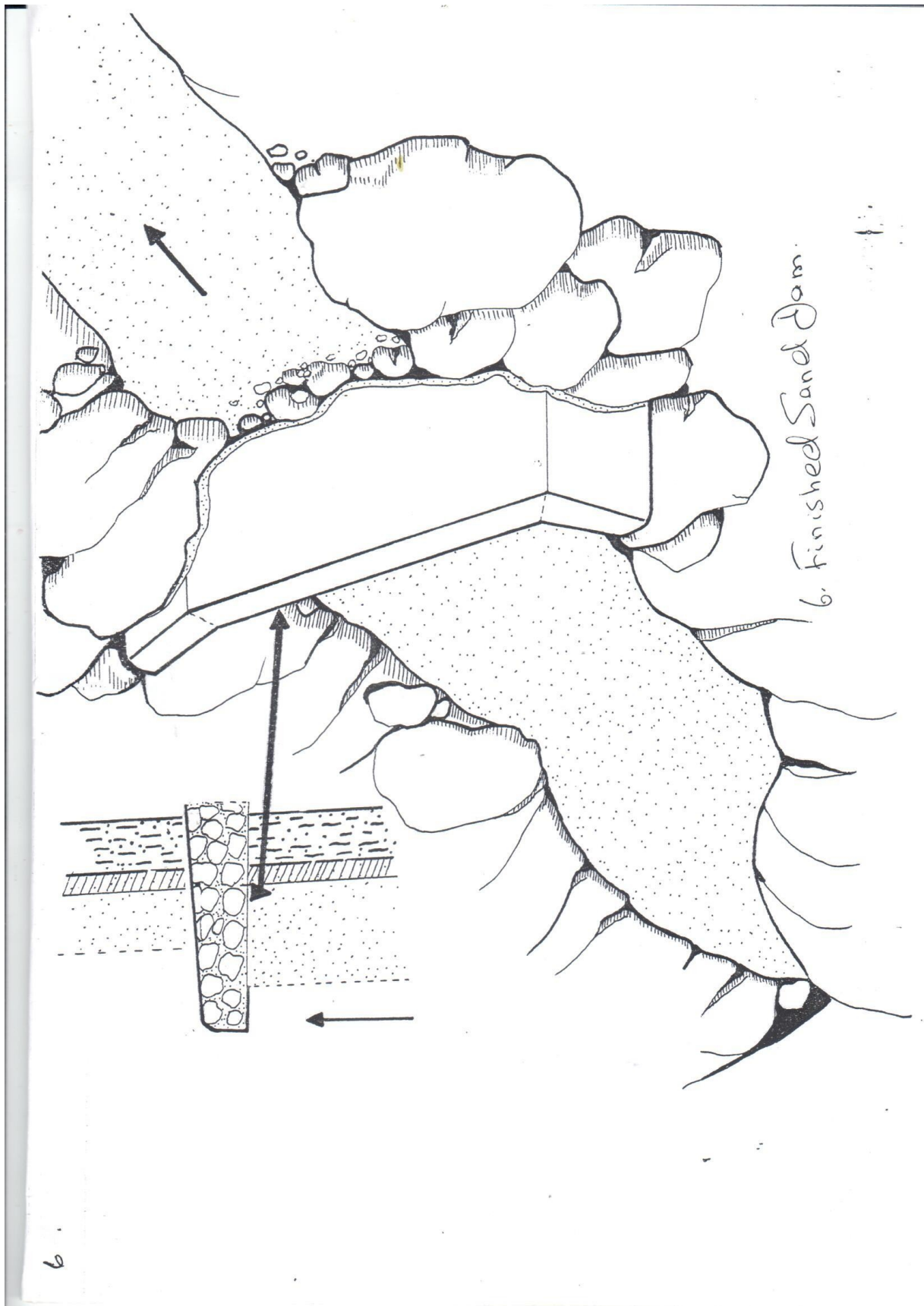




4. Foundation.



5. Wall Construction.





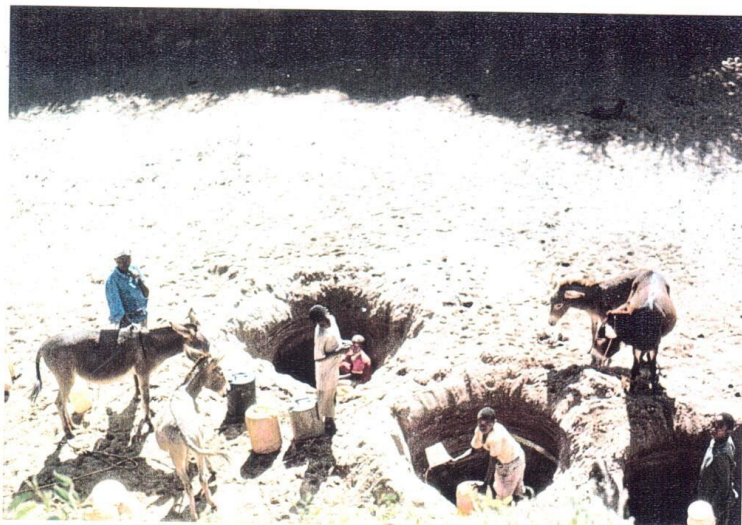
A

## Appendix 18: Seasonal River Utilization



Looking for Water

B



Scoop-Holes.



C



Planning with Community

D



Locating a dam



Waiting for the Rains



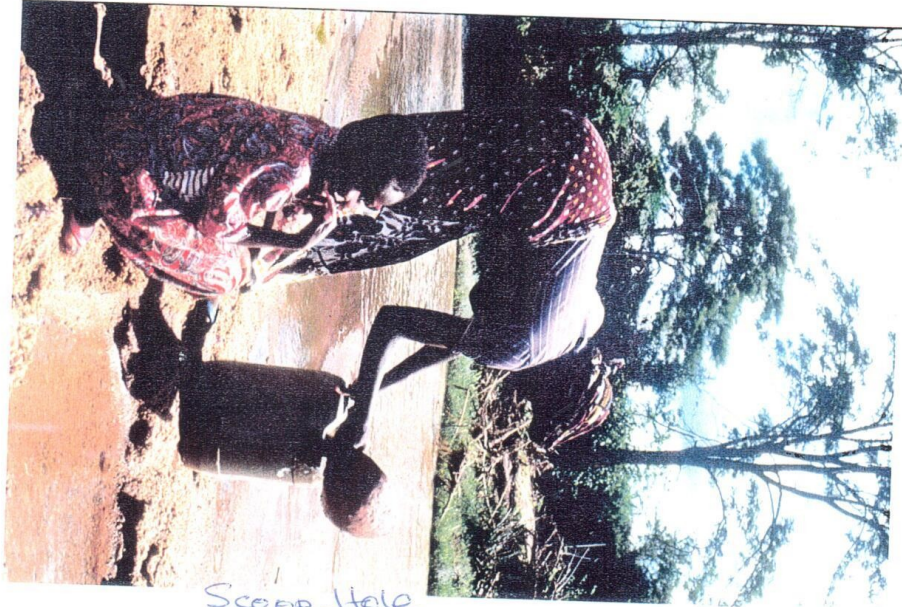
Upstream: There is water



Appendix 19:

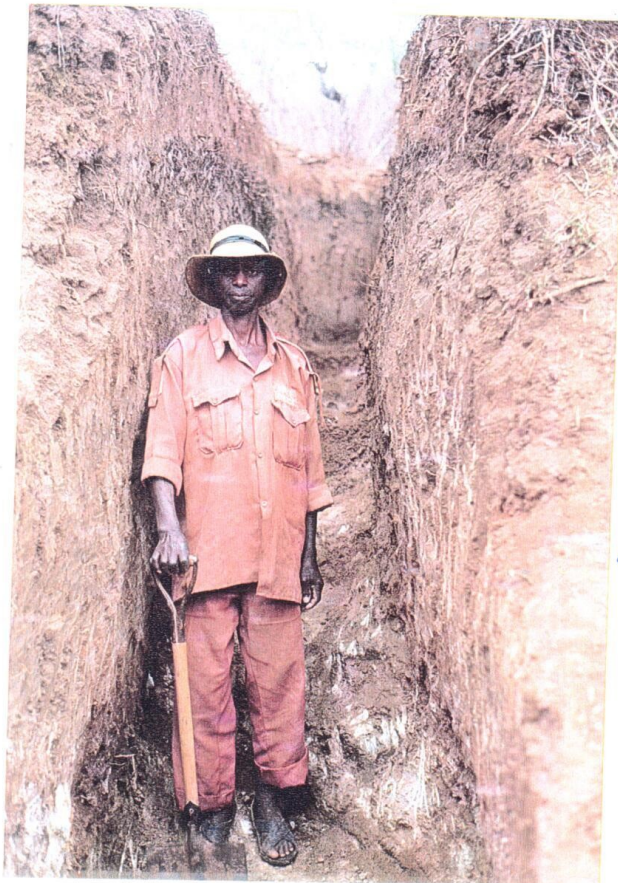
# CONSTRUCTION: From PASSING WATER TO "STANDBY" WATER

A



Scoop Hole

B



Excavation.

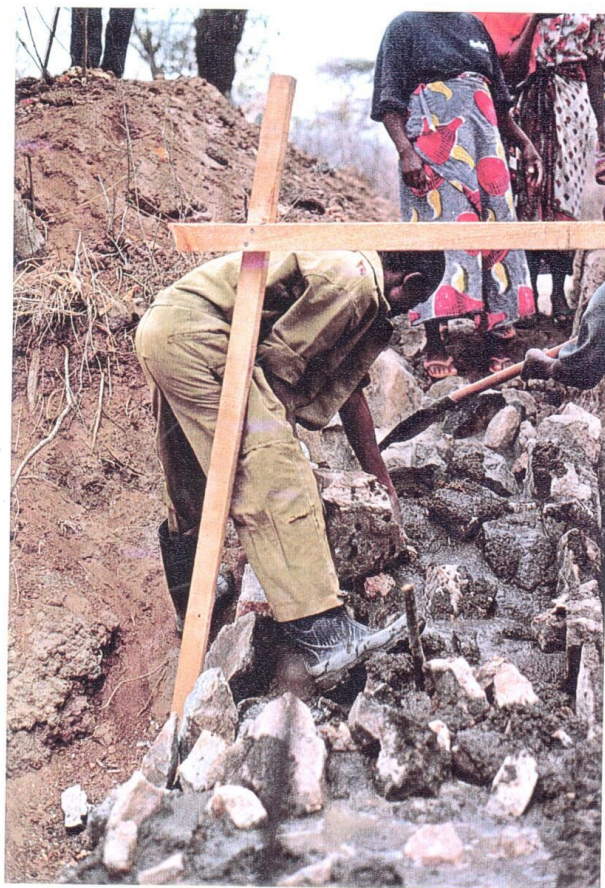


B



Walling

C



Walling



D



Wallling from the Banks

E



End Erosion

F



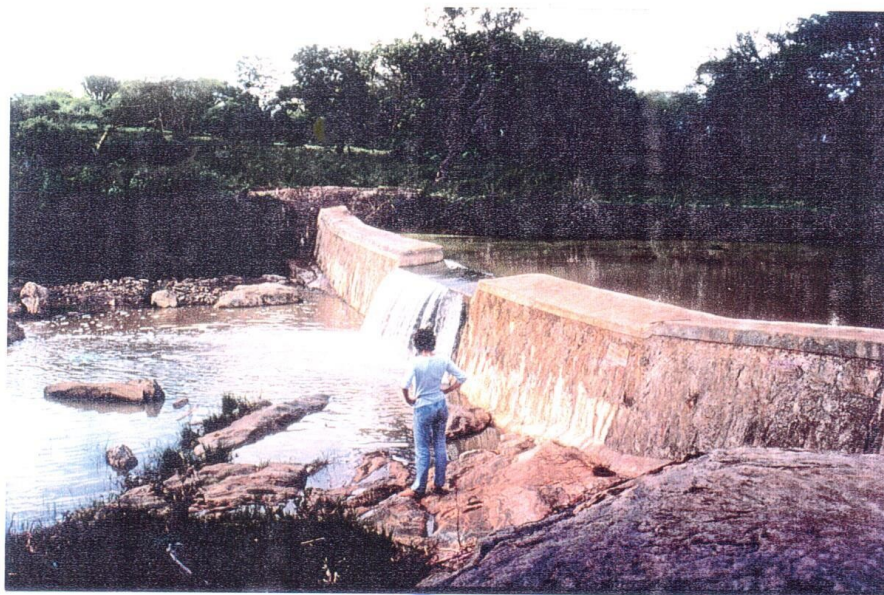
Gender Participation

G



Waiting for Imminent Storm





Flash Flood.



Good Bank Protection

C



Planning with Community

D



Locating a dam