SOMALI DEMOCRATIC REPUBLIC

MINISTRY OF JUBA VALLEY DEVELOPMENT

FEDERAL REPUBLIC OF GERMANY

DEUTSCHE GESELLSCHAFT FÜR
TECHNISCHE ZUSAMMENARBEIT (GTZ) GMBH

MASTERPLAN FOR JUBA VALLEY DEVELOPMENT

MAIN REPORT

APRIL 1990

AGRAR- UND HYDROTECHNIK GMBH
Beratende Ingenieure · Consulting Engineers · Ingénieurs-Conseils
Essen, Germany

Main Report

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List of Abbreviations

AFMET	-	Agricultural Farm Management, Extension and Training Project
CRO	-	Profile code for crop production (Appendix 1)
EDU	-	Profile code for education (Appendix 1)
EEC	-	European Economic Community
ENEE	-	National Agency for Electricity Generation
ENV	-	Profile code for environment (Appendix 1)
FEA	-	Field Extension Agent
FIS	-	Profile code for fisheries (Appendix 1)
FLEC	-	Family Life Education Center
GTZ	-	German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH), Eschborn/Germany
HEA	-	Profile code for health (Appendix 1)
IND	-	Profile code for industry (Appendix 1)
IRR	-	Profile Code for irrigation (Appendix 1)
LIV	-	Profile code for livestock (Appendix 1)
MFMR	-	Ministry of Fisheries and Marine Resources
MLFR	-	Ministry of Livestock, Forestry and Range
MWMR	-	Ministry of Water and Mineral Resources
MJVD	-	Ministry of Juba Development
MoA	-	Ministry of Agriculture
MoE	-	Ministry of Education
MoH	-	Ministry of Health
MoI	-	Ministry of Industry
MPWH	-	Ministry of Public Works and Housing
NAHA	-	Nomadic Animal Health Auxiliary
NGO	-	Non-Governmental Organization
NRA	-	National Range Agency
NTTCP	-	National Tsetse and Trypanosomiasis Control Project
ORG	-	Profile code for organization and management (Appendix 1)
PHC	-	Primary Health Care
RAN	-	Profile code for range and forestry (Appendix 1)

List of Abbreviations (cont.)

SET	-	Profile code for settlement and infrastructure (Appendix 1)
SGU	-	Socio-geographic Unit
SLA	-	Somalia Leather Agency
SSE	-	Small-scale Enterprise
USAID	-	United States Agency for International Development
WAT	-	Profile code for water resources (Appendix 1)
WDA	-	Water Development Agency
WUG	-	Water User Group

Local Terms

Beel	-	Administrative subdivision below District
Der	-	Season from September to December
Deshek	-	Natural floodplain depression
Gu	-	Season from April to June
Jiimo	-	Land type on river levees
Jilaal	-	Season from December to April
Xagai	-	Season from June to September

Currency Equivalents

US$ 1 = Somalia Shilling (SoSh) 130 (mid-1987)
US$ 1 = SoSh 255 (end-1988)

S O M A L I A

Masterplan for Juba Valley Development

Main Report

1. Introduction

The Juba River is situated in the South of Somalia and is one of the two main rivers in the country, the other being the Shebelli (Figure 1/1). Since the mid-19th century sedentary rainfed farming has been practiced in the valley but the nomadic population is still considerable and amounts to about 30% of the total estimated population of approximately 510,000 persons.

Since the beginning of the twentieth century construction of a dam on the Juba River at the present site was proposed. However, it was not until 1981 that a pledging conference was held in Brussels to fund the construction of a multipurpose dam near the town of Bardheere in the Juba Valley to generate power and regulate the downstream water regime to reduce flood damages and supply irrigation water on a continuous basis. In 1983, the Government obtained consulting services to prepare a detailed design for the Bardheere Dam. The tender documents for the Project were completed in 1987 and the Project will take six years to complete after commencement of its construction.

After the pledging conference in 1980, the Government of Somalia decided to establish the Juba Valley Development Authority, operating as a specialized agency of the Ministry of National Planning (MNP), which was to initiate and coordinate all development activities in the valley, in particular those activities closely related to the planned dam. For the latter, an autonomous organization, the Bardheere Dam Project (BDP) was created. In 1982, the Authority became the Ministry of Juba Valley Development (MJVD). In 1987, MJVD was merged with MNP, but this has in the meantime again been reversed so that MJVD is again the responsible agency for the development activities in the Juba Valley.

In view of the fundamental impact the dam will have in the valley, a bilateral agreement was concluded between the Government of Somalia and the Government of the Federal Republic of Germany to prepare through the German Agency for Technical Cooperation (GTZ) a Masterplan to serve as a guide for the development of the valley. GTZ subsequently contracted Messrs. Agrar- und Hydrotechnik GmbH of the Federal Republic of Germany to undertake this task in close cooperation with MJVD.

The objective of the Masterplan is thus to identify the development potential and constraints in the Juba Valley, to define possible development objectives and to elaborate a development programme which should be considered a first step towards a guided development in the valley.

Parallel to the elaboration of the Masterplan, the Juba Environmental and Socioeconomic Studies (JESS) were carried out by Messrs. Associates in Rural Development, USA (ARD) under financing of USAID. The main findings of JESS have been incorporated in the Masterplan.

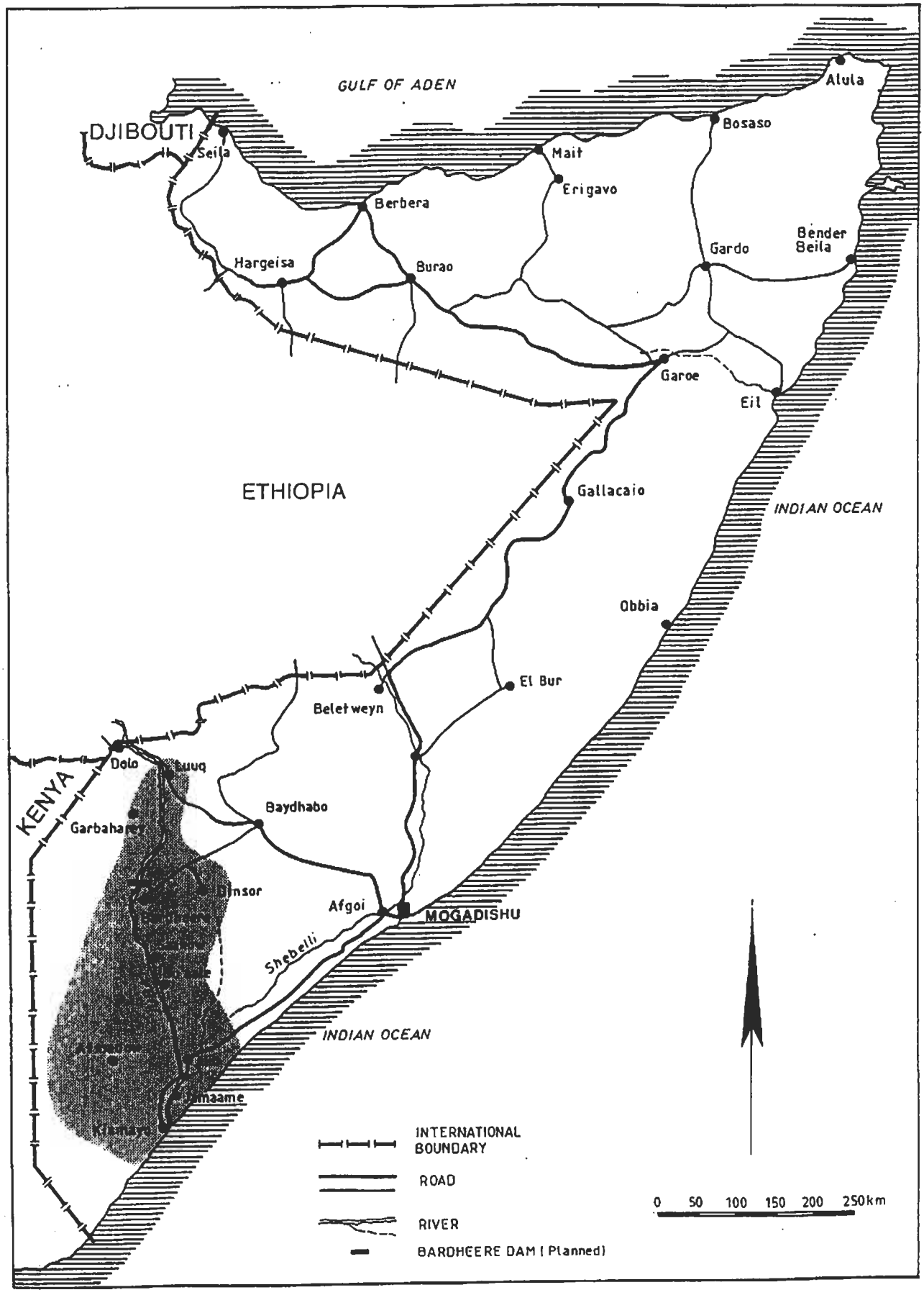


Figure 1/1 SOMALIA - LOCATION OF DEVELOPMENT AREA

Most of the field work for the Masterplan was carried out in 1987 and some in 1988. Unless otherwise mentioned, data describing the present situation refer to the year 1987.

The Masterplan consists of three main parts

Main Report	-	contains a summary of all the findings and recommendations (previously presented in two separate volumes)
Annexes	-	document the details of the analysis carried out
Atlas	-	comprises maps in support of the analysis presented (referred to as Map 1, 2, 3,.. throughout the Main Report and the Annexes).

The Masterplan was presented as a Draft Final Report in September 1989. Subsequently, comments were prepared by MJVD and GTZ and incorporated in this Final Report.

2. Definition of the Planning Area

Originally, the Masterplan was to deal only with the area of the Juba Valley downstream of the Bardheere Dam. However, general planning was also to be undertaken for a more broadly defined, larger area. It is, therefore, necessary to distinguish within the Masterplan between the larger Development Area and the more narrowly defined Study Area.

2.1 The Development Area

The Masterplan is, in very broad terms concerned with the development of that part of southern Somalia which is approximately delineated, as shown in Figure 2/1 (Map 1), by the Kenyan border to the West, the Indian Ocean to the South and the Ethiopian border to the North. To the East, the boundary has been defined to extend approximately along the 43°50' longitudinal as neither natural nor administrative boundaries can be utilized there. This area is in the following referred to as the Development Area, and measures about 100,000 km^2, or 15% of the whole of Somalia. The analysis undertaken and the specific measures proposed for the whole of the Development Area are however different and not as detailed from the one done for the more narrowly defined Study Area.

2.2 The Study Area

The decision to undertake a Masterplan for the development of the Juba Valley was triggered by the need to assess the impact the Bardheere Dam would have on the area downstream of the dam. The analysis and planning undertaken within the Masterplan, therefore, is mainly concerned with the development of the area on which the dam will have an impact. This is referred to as the Study Area, for which the boundaries are shown in Figure 2/1. In the West and East the boundaries are the longitudinals of 43° and 42° respectively, in the North it is the future dam site at Markabley and in the South the Indian Ocean. The Study Area covers about 35,000 km^2, which is 35% of the Development Are and 5% of the whole of Somalia.

Administratively, the Study Area can be subdivided along regional and district boundaries, as also shown in Figure 2/1.

2.3 The Socio-Geographic Units

Administrative boundaries do not necessarily provide a suitable basis for regional analysis and planning. The Study Area has therefore also been subdivided into ten Socio-Geographic Units (SGUs), which form reasonably homogeneous zones within the Study Area. In defining the SGUs, which are shown in Figure 2/2, the main factors determining homogenity that have been taken into account are:

- resources (human, land, water)
- land use (crop production, livestock, settlements)
- physical infrastructure
- social services.

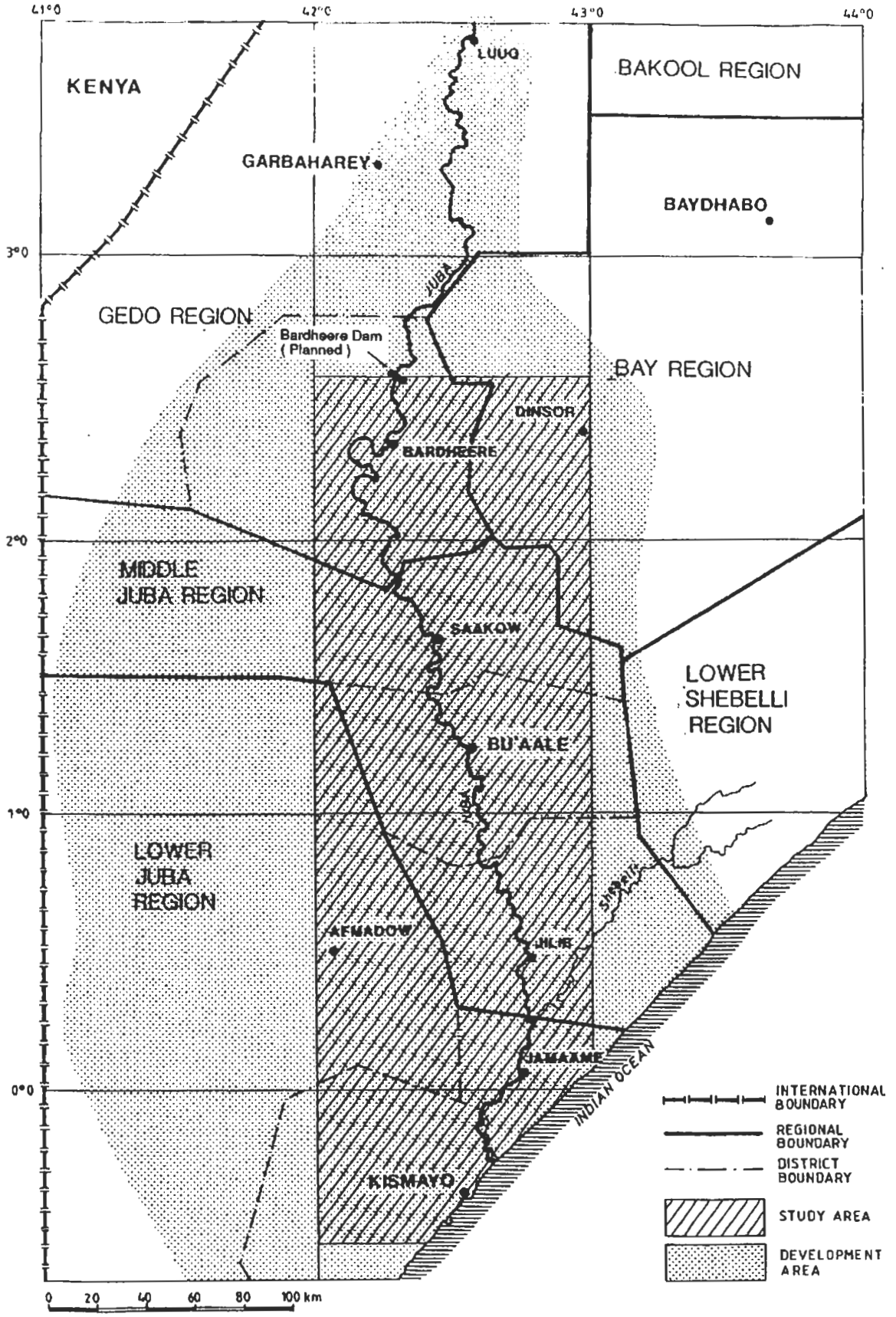


Figure 2/1 DEFINITION OF THE PLANNING AREA

Figure 2/2 Socio-Geographic Units

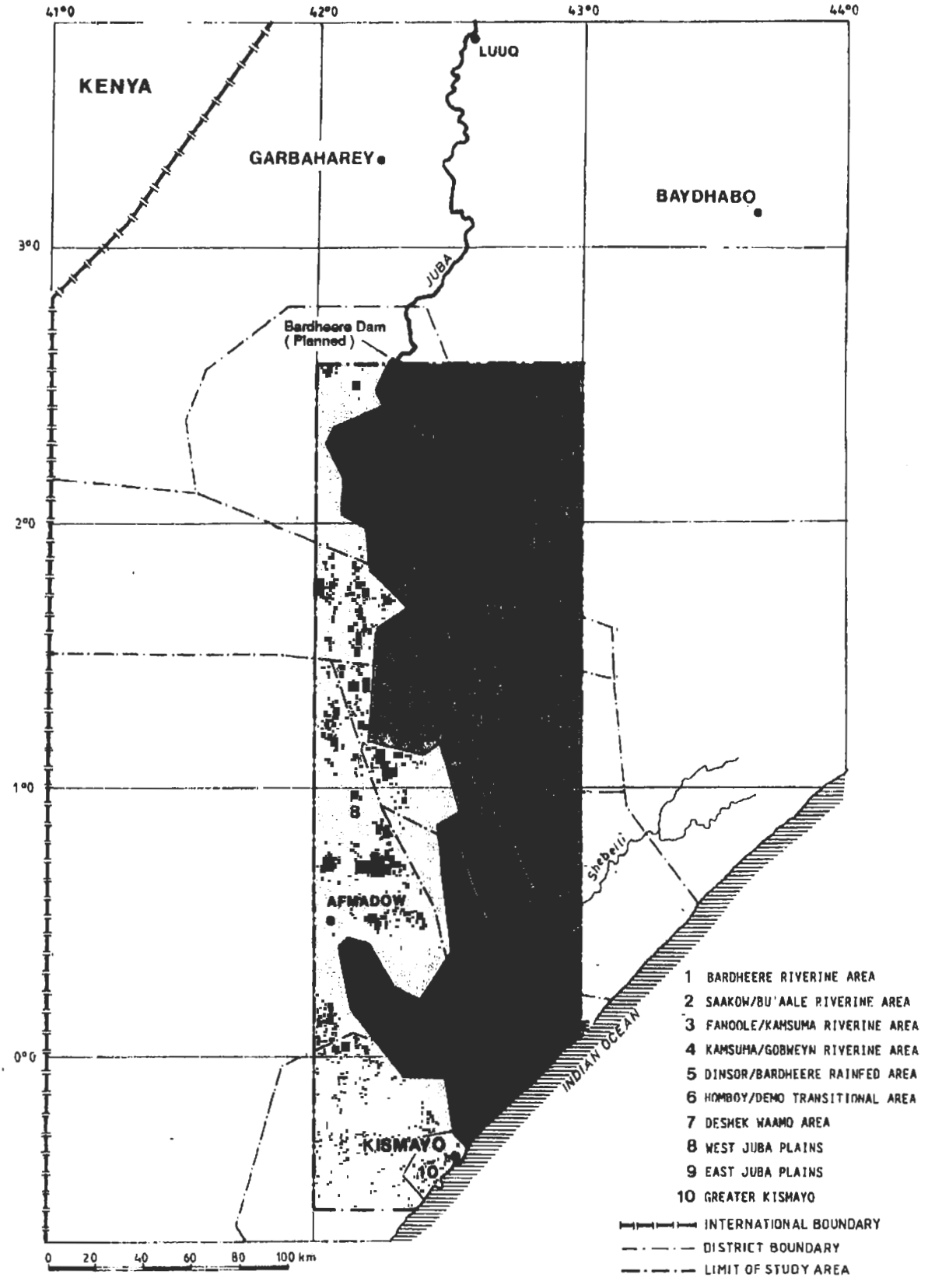
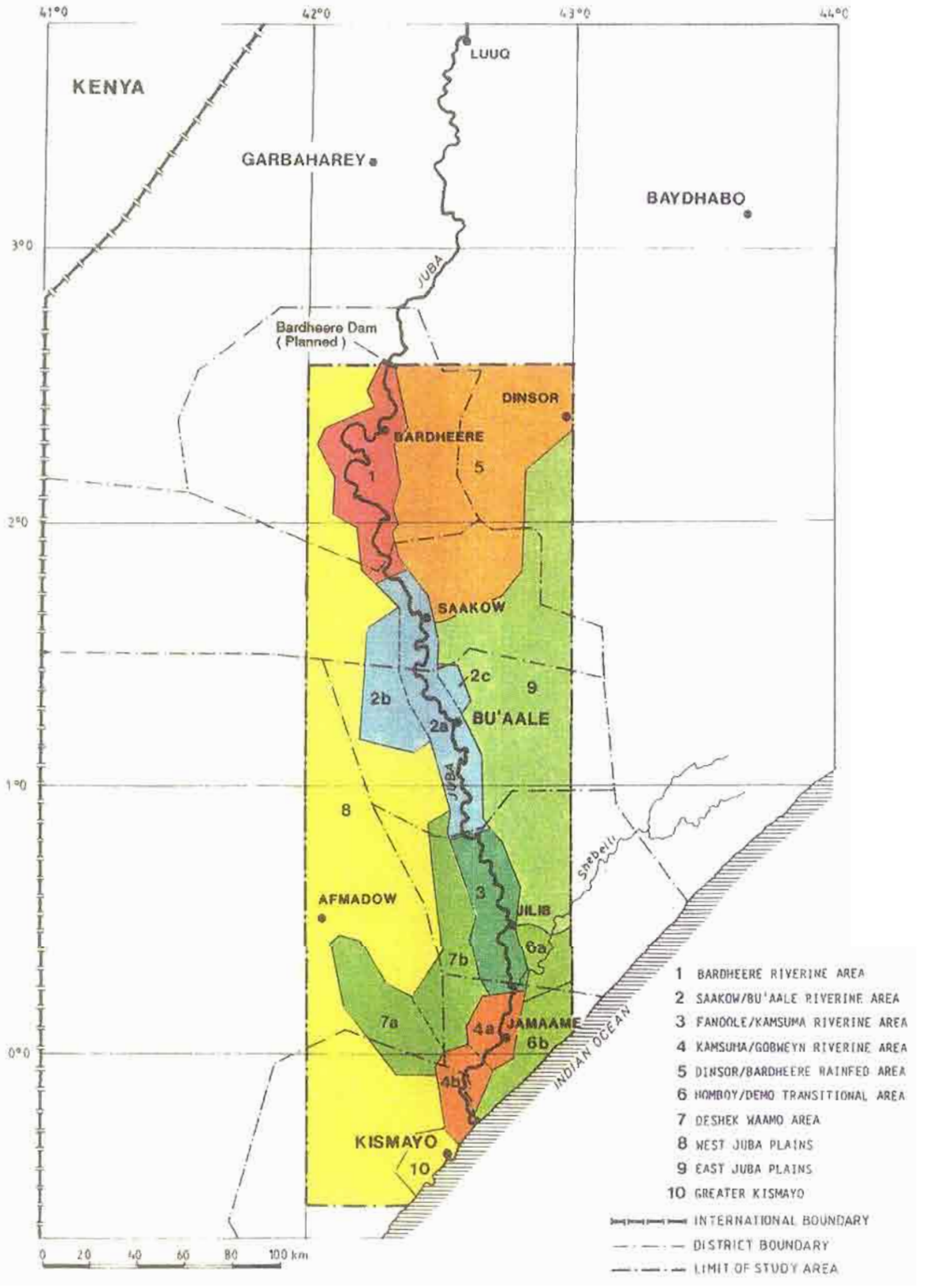


Figure 2/2 Socio-Geographic Units



In very broad terms, the Study Area can be subdivided on the basis of the land and water resources and settlement patterns into four larger zones. The first zone comprises the riverine areas most suitable for crop production. The second zone comprises transitional areas between the riverine areas and the bushlands to the East and West of the Juba, the latter forming the third zone, while the fourth one covers the only larger urban center, i.e. the area around Kismayo. Accordingly, SGUs 1 to 4 are primarily crop production, SGUs 5 to 7 transitional, SGUs 8 and 9 livestock production areas, while SGU 10 covers the urban area of greater Kismayo.

The riverine areas themselves, can be divided into four SGUs, each having its own unique characteristics. From the dam site to Gurmeyso (about 10 km North of Saakow), the river moves only infrequently outside its main channel. Flooding of the adjacent areas does therefore not normally occur. It is in this area (SGU 1) that small-scale irrigation on the levees has rapidly increased in the recent past.

Further downstream, however, flooding of the adjacent plains occurs regularly, which led to the traditional system of flood recession, or deshek crop production, typically for SGU 2a which extends down to the Fanoole barrage. Attached to this are the SGUs 2b and 2c to the left and right of the river which are not normally flooded but have good alluvial soils, well suited for crop production.

Downstream of the Fanoole barrage, agriculture is dominated by the two large irrigation schemes (Juba Sugar Project, Fanoole Irrigation Project), which have their own flood protection systems (SGU 3).

At the Kamsuma bridge, SGU 4 commences which is characterized by a different flooding regime caused by the confluence of the Juba and the Shebelli rivers at this point. The northern part (SGU 4a) from Kamsuma to Bulo Guduud includes the Mogambo Irrigation Project and most of the banana estates using small- and medium-scale irrigation. There are salinity problems caused by return flows and groundwater level fluctuations. The southern part (SGU 4b), is the estuary section, ending at the coast at Gobweyn, which is influenced by tidal action and seawater intrusion. Bananas and cotton are the predominant crops.

Apart from the riverine areas, crop production activities are carried out also in SGU 5, the Bardheere/Dinsor/Saakow triangle, where rainfed agriculture is practiced on 30% of the area.

SGU 6, the Homboy/Demo Transitional Area, is influenced by runoff from the Shebelli and backwater effects during high flows of the Juba and includes in the southern part (SGU 6b) the coastal dune lands and some left bank depressions towards the mouth of the river. Rainfed agriculture is rapidly developing in this SGU and a large smallholder irrigation project is being planned here.

On the western side of the Juba, SGU 7 has been defined, comprising two subdivisions. One is Deshek Waamo itself (SGU 7a), receiving its waters from the Juba through natural spillways located north of the Fanoole barrage and further south near Kaytoy and from seasonal streams originating in Kenya. Depending on the amount of water available, rainfed or flood recession farming systems are practiced. The other is the drainage area of the Far Shabeel which has been retained as a flood retention area. Crop production activities are not very common, but the area is an important location for livestock grazing.

The two livestock area, SGUs 8 and 9, are similar in their characteristics. Nomadic pastoralism is the dominant economic activity. The Juba separates the two area from each other, constituting a natural barrier limiting to inter-system movements to times of low river flows. As a consequence, the market orientation tends to be towards Kenya in the case of SGU 8 and towards Mogadishu for SGU 9.

Finally, SGU 10 is defined to comprise the only larger urban center within the Study Area, i.e. the greater Kismayo area.

Throughout the Masterplan, the subdivision of the Study Area into SGUs will be used as a primary tool for describing the spatial dimension of the analysis and planning undertaken. However, data is not always available on an SGU, but often only on a district basis. Therefore, both systems of subdivision will have to be utilized. As shown in Figure 2/2, this is not too serious a handicap, as the east-west boundaries between the four most important SGUs coincide reasonably well with the district boundaries. It should be noted that it will also be necessary to translate any of the proposed development actions into a regional framework following the administrative division into districts, as these constitute the local implementation units.

3. Natural and Human Resources

In the absence of discoveries of any substantial mineral deposits that could be exploited, the natural resources in the Juba Valley are largely determined by its climate, land and water (surface water and groundwater). These resources provide the base for the livelihood of the population in the Study Area, constituting the human resource potential of the Juba Valley.

3.1 Climate

The climate of the Juba Valley (ANNEX 2) is tropical and ranges from sub-humid in the South to arid/semi-arid in the North. The rainy seasons are determined by the periodic passing of the intertropical convergence as it follows the sun's annual cycle across the equator. Four distinct annual seasons are recognized:

- Jilaal: dry season from December through March.
- Gu : rainy season from April through June/July.
- Xagai : dry season with intermittent showers (particularly in the South) from July to September.
- Der : rainy season from October to November.

The beginning and end of these seasons vary from year to year. Recorded yearly precipitation varies between 350 and 750 mm (Figure 3/1) and is highest in the rainfall pocket between Jilib and Jamaame.

During the intense monsoon rainstorms most of the precipitation occurs within two to three hours. The effective rainfall is relatively low. In a dry year 0 to 25 mm and 40 to 60 mm during the Gu and Der season respectively, with the exception of the mentioned rainfall pocket, where it may amount to 165 mm in the Gu season.

Mean monthly temperatures are between 25 and 28°C in the South with maxima in March-April and minima in August. They increase inland and North and are on average 3°C higher at Luuq. Diurnal temperature variations are about 4 to 16°C.

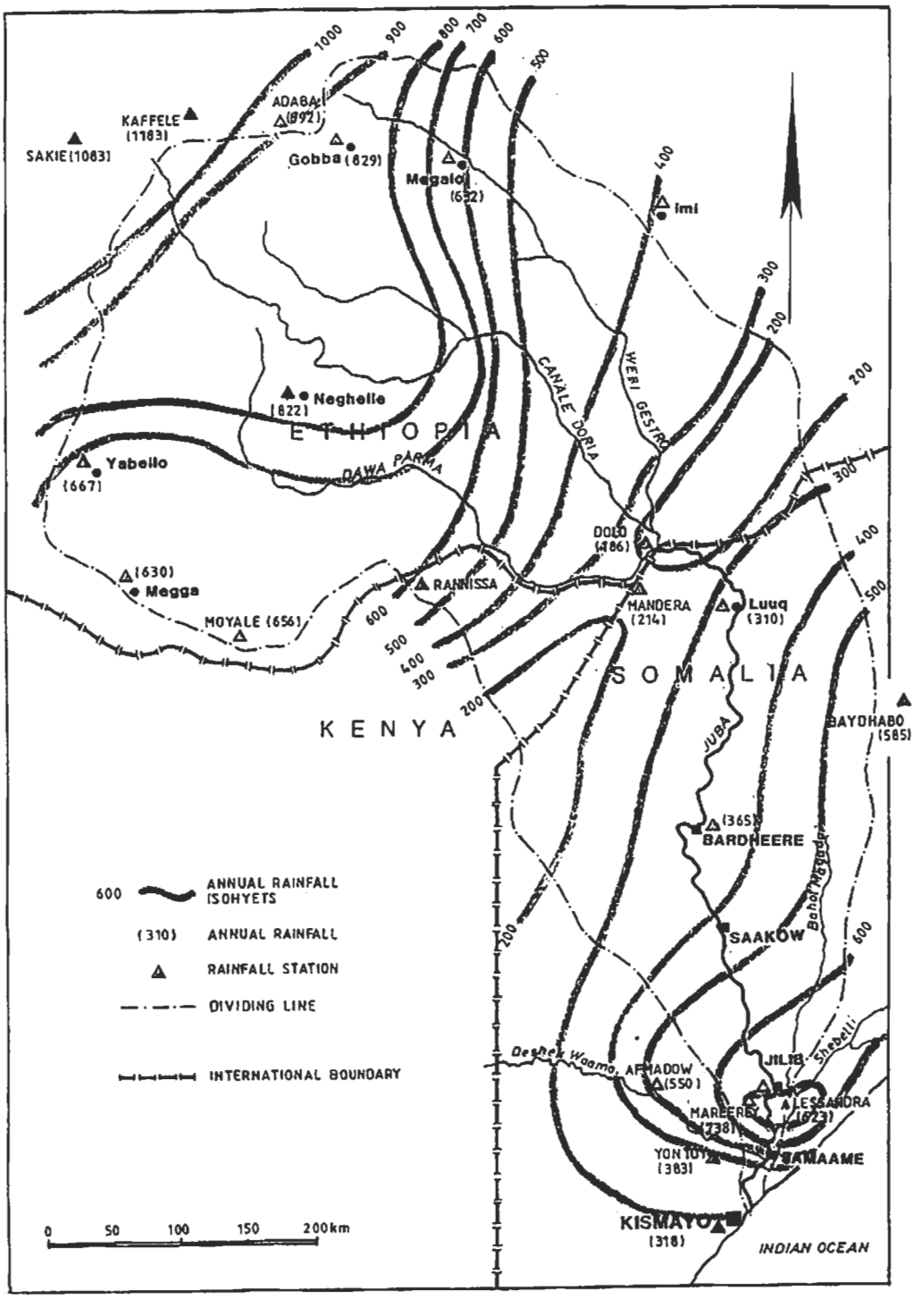
The average windspeed in the South reaches 48 km/day and is about five times as high during the day than at night. In the North it averages 240 km/day in Bardheere and 87 km/day at Luuq; inland, the maximum occurs at night.

Humidity averages about 70% in the South (Mareerey) and decreases with distance from the sea to an average of 50% at Luuq.

The ratio between daily actual and maximum possible sunshine duration is medium high (up to 80%) and incoming radiation is fairly constant over the valley, and throughout the year.

The resulting evaporation and evapotranspiration are high, especially at Bardheere and Luuq. Reference monthly evapotranspiration varies between 205 mm in December and January to 115 to 120 mm in June, with annual total of some 1,950 mm in the South. In the rest of the area the annual total is up to 25% higher and the monthly fluctuation is less pronounced.

Figure 3/1 Rainfall Isohyets (mm) for Juba Valley



Source: FAO Agroclimatological Data for Africa, Rome 1984 and own computations

The climatological data base is generally weak, owing to the small number and uneven distribution of observation stations and the scarce and fragmentary information available on record. Most crucially, this is the case for the rainfall data.

3.2 Land Resources

The development potential in the Juba Valley is to a very large extent determined by the quality of the soils (ANNEX 1), as crop and animal husbandry are the predominant economic activities, which is not likely to change in the foreseeable future.

3.2.1 Geology and Geomorphology

Towards the end of the Jurassic, the uplifting of the Precambrian basement complex has divided the broad geological basin, stretching into Kenya and Ethiopia, into two sub-basins:

- the northern Xuddur-Bardheere Basin, consisting of upper Jurassic to cretaceous sediments, and
- the coastal basin, consisting of Jurassic to quaternary series.

The coastal basin is separated from the basement by the Bandar-Jalalaqsi fault, which extends some 500 km in a north-east to south-west direction.

The uplifting of the basement was followed by active subsidence of the two sub-basins, with the deposition of thousands of meters of sediments during the Mesozoic. In the coastal basin subsidence continued during the tertiary and quaternary, which allowed the deposition of about 3 m of mainly clastic sediments.

The northern part of the Study Area between the dam site and Saakow is characterized by the exposed Jurassic rocks of limestone, marl, shale and sandstone. This geomorphologic unit is called the "mantled limestone plain".

Between Saakow and Bu'aale there are Precambrian gneiss and schist outcrops.

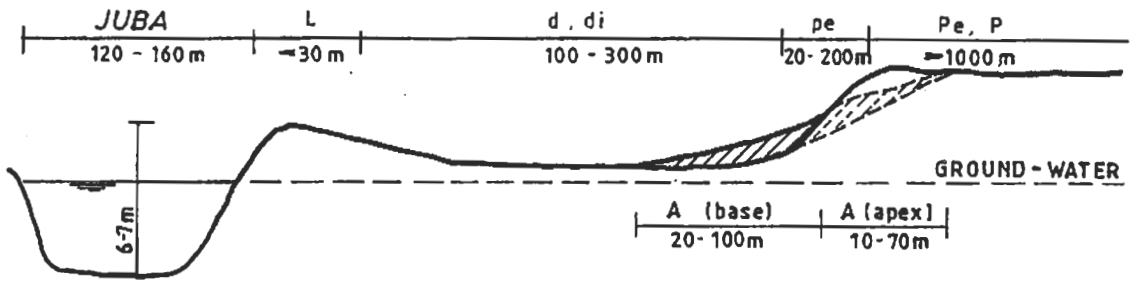
West of Saakow there is a residual upland consisting of apparently mixed marine and alluvial sediments. It is not clear if this is a quaternary or older deposit.

The area between Bu'aale and the coast is a marine plain. This featureless plain is believed to be a former lagoon of the Indian Ocean. Sediments are deposited (sub)horizontally, slightly dipping southwards. They are of alluvial origin and consist mainly of marl and shale with interbedded sand and gravel. The coastal area has sand dunes and coral rocks.

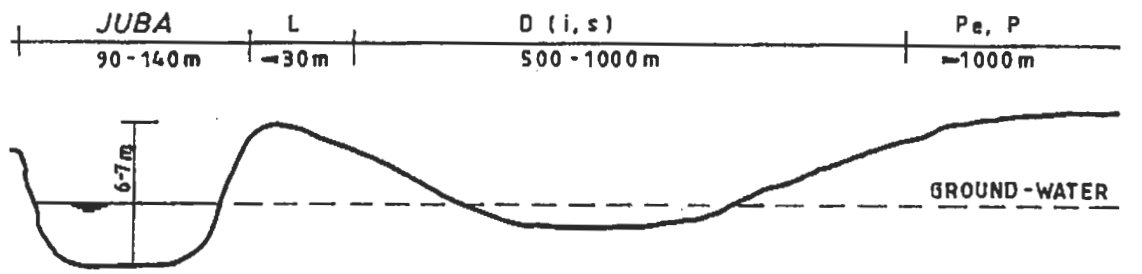
The floodplain of the Juba river is built up alternately of sand, clay and deposits of intermediate textures. A typical cross section of the northern stretch of the river and its main physiographic features is given in Figure 3/2.

Figure 3/2 Cross-Sections of River with Typical Physiographic Features

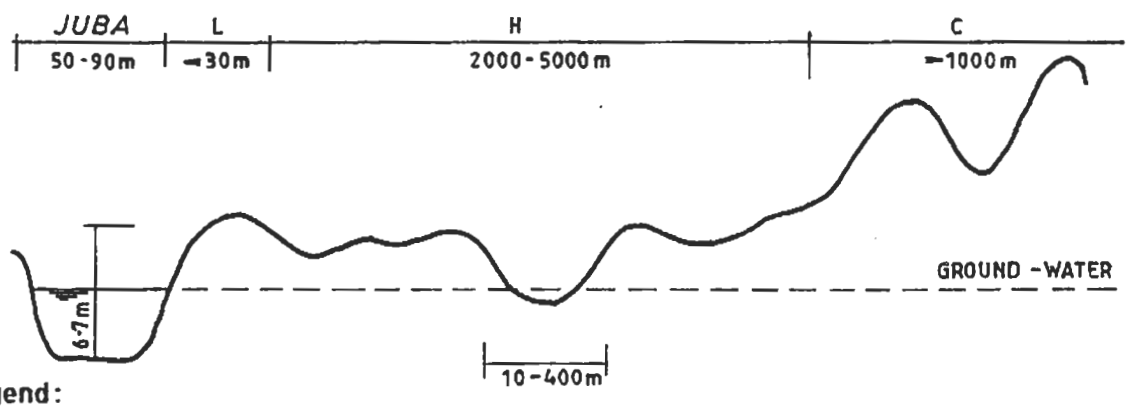
BARDHEERE - CANOOLE



CANOOLE - JILIB



JILIB - GOBWEYN



Legend:

L - Levee
d - Deshek with external drainage
D - Deshek without external drainage
pe - Escarpment
Pe - Slightly eroded pediplain
P - Pediplain
H - Heterogeneous alluvial sediments
C - Coral reefs
i - Irrigated agriculture
s - Rainfed agriculture

Away from the river there are, successively, a levee, consisting of coarse textured material, a depression (called 'Deshek'), with or without external drainage, an alluvial fan, built up by a 'togga' (usually dry streambed, flash flooding during rainstorms) having its outlet in the river. Next is a small pediplain escarpment preceding a peneplain, which can sometimes be slightly eroded. Other features in the floodplain are oxbow-lakes, cutoffs and old meander channels.

In the southwestern part there are alluvial deposits of the Shebelli river. This area is characterized by swamps where the Shebelli disappears. Deposits north and south of the swamps are distinctly different.

An important feature between Afmadow and Kismayo is the Deshek Waamo. This serves as a buffer for precipitation in the watershed of Deshek Waamo and for extreme high floods in the Juba river.

3.2.2 Land Capability Classification

Based on existing land capability classifications which exist at the reconnaissance level for the Study Area or parts thereof, ten land capability classes can be distinguished:

- Potential for rainfed cropping (rainfall exceeds 450 mm or concentrated in a single wet season):

  Class 1 very suitable or suitable. Land is very well suited to a wide range of crops. Neither the topography nor the soils pose any problems as to workability or depth. Some minor limitations, however, may occur such as locally impeded drainage or moderate salinity or alkalinity in the subsoil.
  Class 2 land suitable for traditional rainfed food crops but suffers from at least one major defect which will reduce crop yields significantly. Salinity nd alkalinity levels in the subsoils might be high.

- Potential for rangeland:

  Class 3 intermediate soil textures that would be suitable to the cultivation of traditional crops, but rainfall of less than 450 mm poses large risk of crop failure
  Class 4 coarser soil textures (sandy or gravelly) and/or dissected topography, including the inland lagoonal sands
  Class 5 mainly saline soils, including gypseous deposits
  Class 6 sand dunes
  Class 7 poorly drained, mostly alkaline soils

- Unsuitable for most productive purposes (other than poor seasonal grazing, browsing or charcoal production):

  Class 8 shallow soils and/or stony dissected land with rock outcrops
  Class 9 swamp or open water (permanent or semipermanent)
  Class 10 barren land (rocky, active dunes, or intense salinity).

In Figure 3/3 (Map 5) and Table 3/1 the results of the land capability classification are shown.

Figure 3/3 Land Use and Vegetation

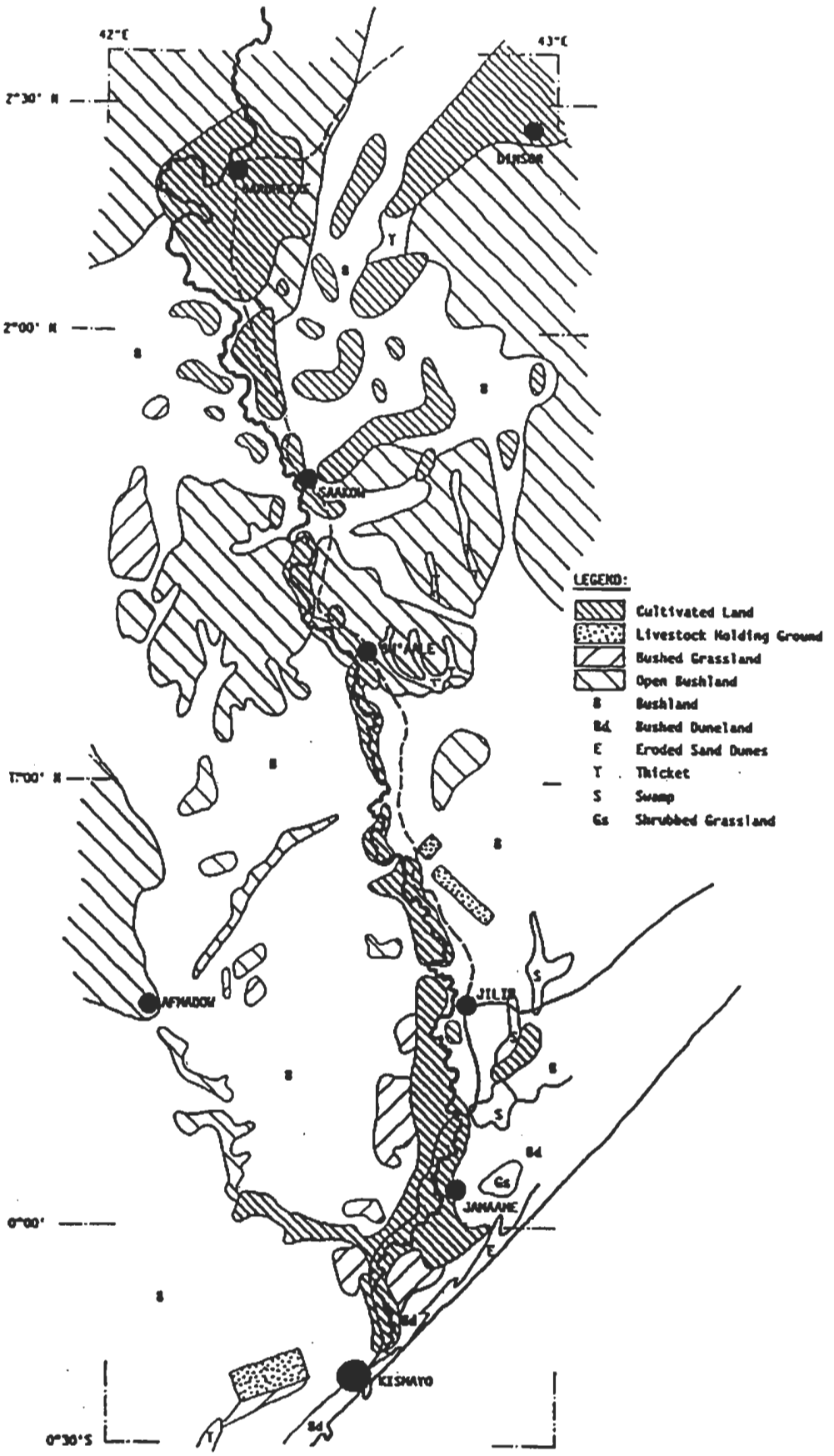


Table 3/1 Results of Land Capability Classification (in km^2)

District	Land Classes 1	2	3-7	8-10	Total
Bardheere	7	221	1,631	3,071	4,930
Saakow	0	685	3,995	930	5,610
Bu'aale	246	0	5,214	0	5,460
Jilib	574	683	3,688	105	5,050
Jamaame	519	142	1,490	149	2,300
Kismayo	43	1,496	1,716	425	3,680
Afmadow	0	235	5,295	150	5,680
Dinsor	7	842	1,507	644	3,000
Total	1,396	4,304	24,536	5,474	35,710

The occurrence of Class 1 land is restricted to the Juba river floodplain south of Dujuma and a small part of the Shebelli floodplain. The larger part of these soils is presently under irrigation while the rest is used for rainfed agriculture.

Class 2 land is mainly concentrated in a circle with a radius of 10 to 15 km around Dinsor and in the coastal hinterland north of Kismayo. In these areas there is a good potential for rainfed cropping.

West of the Juba river the potential of the rangelands is good: land classes 3 - 7 are strongly represented.

In overall terms it can be stated that the land resources in the Study Area are suitable to about 75% and 15% for livestock grazing and crop production respectively, while 10% are of no particular economic value.

3.2.3 Land Classification for Irrigated Agriculture

The above classification does not identify soils suitable for irrigation and a separate study has been prepared by the US Bureau of Reclamation (USBR), which has been used as a base. The analysis carried out was restricted to the lands situated below the 160 m contour line, the height of the outlet of the future dam at Bardheere. A total of 10,000 km^2 was surveyed, of which 360,400 ha were classified. Of this area, nearly 50% (170,500 ha) was found to be suitable for diversified cropping (Land Classes 1 and 2), while the remainder of 189,900 ha, is considered to be suitable for paddy rice production only and classified as R1 and R2 lands. Table 3/2 gives the areas of classified land by District and SGU (Map 6).

Table 3/2 Land Classification for Irrigation (in ha) per District and per Socio-Geographic Unit (SGU)

District/ SGU	Land Class 1,2 (ha)	(%)	Land Class R1,R2 (ha)	(%)	Total (ha)	(%)
Bardheere	7,050	4	103,300	54	110,350	31
Saakow	23,200	14	38,900	20	62,100	17
Bu'aale	70,050	41	18,100	10	88,150	25
Jilib	38,550	23	1,750	1	40,300	11
Jamaame	30,850	18	27,850	15	58,700	16
Kismayo	800	-	-	-	800	-
Floodplain						
SGU 1	7,350	4	87,950	46	95,300	27
SGU 2	92,700	54	36,900	19	129,600	36
SGU 3	40,900	24	1,750	1	42,650	12
SGU 4	28,850	17	18,700	10	47,550	13
Non-riverine						
SGU 5	-	-	12,600	7	12,600	3
SGU 6	400	-	7,200	4	7,600	2
SGU 7	-	-	2,000	1	2,000	1
SGU 8	300	-	11,550	6	11,850	3
SGU 9	-	-	11,250	6	11,250	3
SGU 10	-	-	-	-	-	-
Total	170,500	100	189,900	100	360,400	100

The soils suitable for irrigation are thus concentrated in the floodplain close to the river. The districts of Bu'aale and Jilib (SGU's 2 and 3) have most of the best soils (Land Class 1 and 2), while Bardheere and Saakow (SGU's 1 and part of 2) have most of the R1 and R2 soils only suitable for paddy cultivation. However, much of the latter is relatively far from the river and at considerable altitude so that exploitation of these soils will hardly be economic. As will be discussed below, the actual, potentially economic irrigation potential is much lower than the 360,400 ha given above.

3.3 Surface Water

The only surface water resource in the Study Area is the Juba river (ANNEX 2), which seasonally also fills the desheks in the floodplain, thus creating additional, but temporary surface water bodies forming the basis for flood recession agriculture.

3.3.1 Juba River Catchment and Morphology

The Juba originates in Ethiopia near the Somali border at the confluence of the Dava Parma, Canale Doria and Webi Gestro. The upper part of the catchment is at an altitude of 1,500 - 4,400 m with precipitation of about

1,000 - 1,300 mm per annum. A high runoff coefficient in this part of the catchment contributes to a substantial amount of river flow on entry of the Juba into Somalia. The total catchment covers some 220,000 km^2, of which 61% are in Ethiopia, 34% in Somali and 5% in Kenya.

On entering Somali territory, the Juba river flows through a plain and then through a relatively narrow valley to the future Bardheere Dam site at Markabley. From there to the coast, i.e. within the Study Area, four distinct reaches of the river can be distinguished, which is reflected in the definition of the SGU's 1 to 4 and shown in Figure 3/4.

In the reach from the Bardheere Dam site to approximately 10 km north of Saakow (SGU 1), the channel of the river is fairly well defined and the river overtops only about once in five years. From there, the floodplain widens and the existence of natural depressions or desheks, which allow the river to seasonally store its flood waters, is typical for this reach (SGU 2), which extends down to the Fanoole barrage. Some of these depressions are used for flood recession cultivation.

The largest man-made impact on the river to date came about by the construction of the Fanoole barrage, which has a capacity to pass 800 m3/s. This barrage, planned in the early 1970's and constructed between 1977 and 1980, has a power house with low-head turbines, and supplies a gravity diversion canal to the Fanoole Rice Project and to the planned Homboy Project.

Just before the Fanoole barrage, there is a natural overflow on the right bank into the Little Juba, which flows into the Far Shabeel and through Laaq Adre and Deshek Waamo back into the Juba.

About 40 to 70 km downstream of the Fanoole barrage, three large-scale irrigation projects are situated. On the right bank the Juba Sugar and the Mogambo Irrigation projects and on the left bank the Fanoole Rice Project. For all three projects, flood protection bunds up to a river flood discharge of around 800 to 900 m^3/s have been constructed.

The Fanoole barrage itself, levee construction of about 20 km upstream of the barrage, the Fanoole main canal constructed in 1979 and the (earlier) construction of the Jilib-Kamsuma-Kismayo road have created barriers to the free flow of flood waters, thus jeopardizing the drainage of this area and increasing the flood discharges which must be passed through the Kamsuma bridge. This reach of the river (SGU 3) is thus characterized by the existence of numerous man-made structures, the three large-scale irrigation projects and drainage and flood control problems, accentuated by large inflows of the poorly draining Shebelli river.

From Kamsuma onwards (SGU 4), the Juba enters its lower reach over approximately 100 km river length. Here its channel capacity has decreased to about 400 m^3/s. Drainage of rain water and floods from the adjoining Hara Naga, Kormajirto and Webi Shebelli catchments is often impeded by high water levels in the Juba river, by roads and bunds.

Downstream of the Kamsuma bridge the Kamsuma-Kismayo road effectively forms the right-bank levee of the river. This area is subject to frequent flooding (1981, 1985 and 1987). The mixed effect of the Juba and Shebelli floods affect the area which is some 8 to 18 km wide.

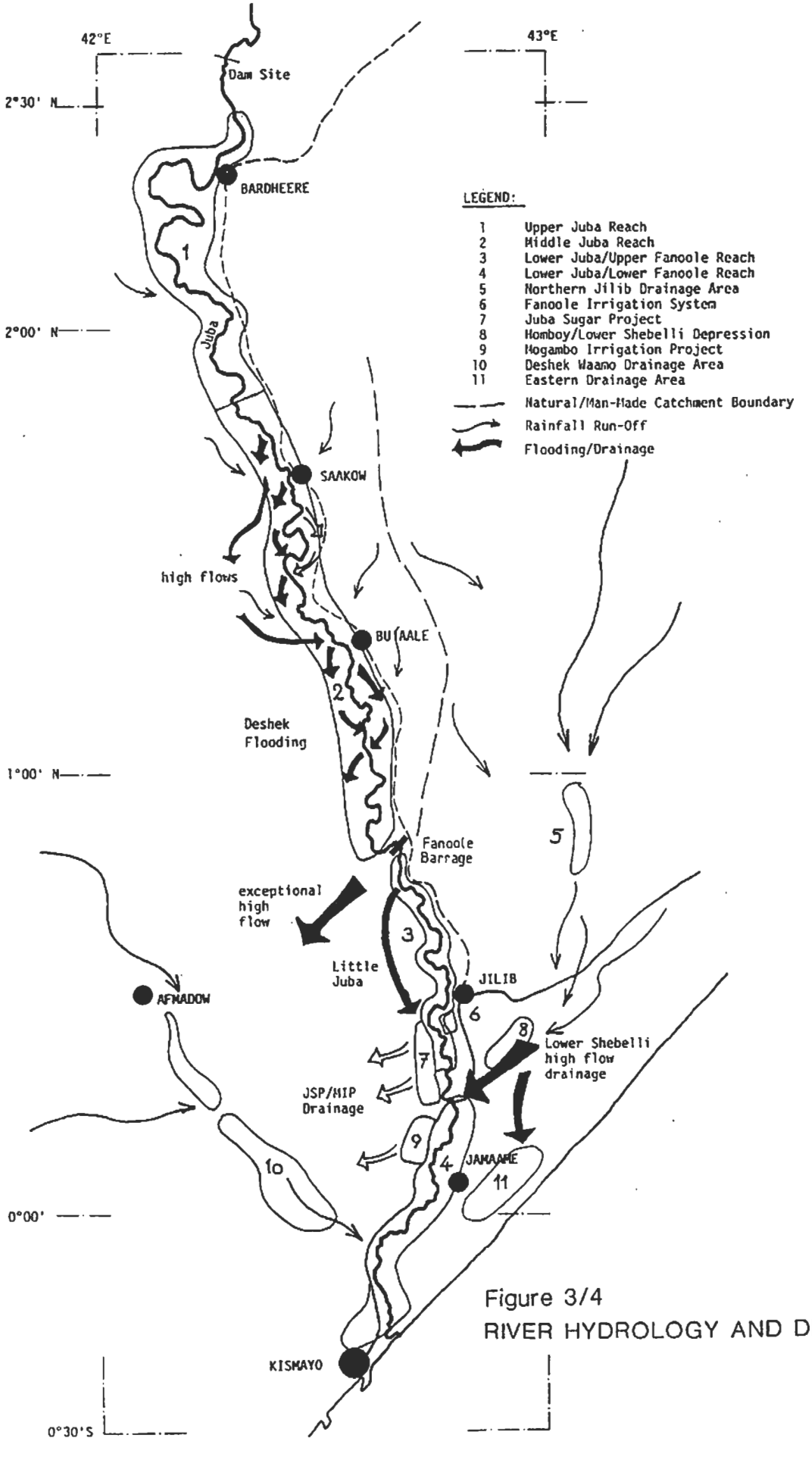


Figure 3/4
RIVER HYDROLOGY AND DRAINAGE

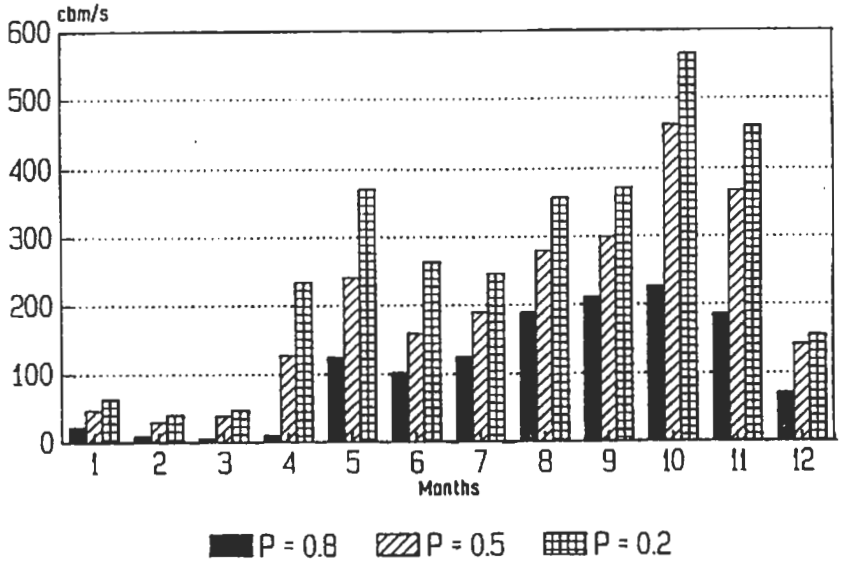
Downstream of the Araare bridge (connecting the Kamsuma-Kismayo road with Jamaame) at Bangeeni, the river flows over about 45 km towards Gobweyn and its estuary to discharge into the Indian ocean. This final stretch is often, and in recent time ever increasingly, subject to sea water intrusion, with adverse consequences on people, agriculture, and livestock.

3.3.2 River Flows

On entering Somalia just north of Luuq, the mean annual discharge of the Juba is about 200 m^3/s with a standard deviation of 50 m^3/s, indicating a high degree of variability. Therefore, the river seldom has an "average" year.

As shown in Figure 3/5, the seasonal variation is considerable. During the months of August to November, river flows are highest. Another pronounced, but lower peak flow takes place during April to June. During the months of January to mid-April (Jilaal), the flow of the river is extremely low, fundamentally limiting the possibilities for irrigation of perennial crops, as this is also a period of low rainfall.

Figure 3/5 Mean Monthly Discharges at Luuq
Probability of Exceedance P = 0.8, 0.5, 0.2



Data about riverflows has been collected at six rivergauging stations, with the earliest data being from the 1950s. Serious gaps in the data have been identified by hydrological studies preceding this Master Plan and complemented by simulation. The data base is thus not completely satisfactory.

The average annual discharge of the river decreases downstreams, as the evaporation and groundwater recharge exceed on average the inflow from the intermediate catchment. This does not apply for those short periods, when runoff from high rainfall in the intermediate catchment drains into the Juba at the time of high river flows originating in Ethiopia. As the capacity of the river channel decreases from north to south, extensive flooding regular-

ly takes place below Jilib, where the severity of floods has been further increased by the numerous man-made structures mentioned above. Floods above the 700 to 1,500 m^3/s discharge level have devastating effects, but they are also the floods which deposit significant amounts of sediment in the (now used and partially protected) floodplain, bringing about natural fertility and improved soil structure, as the available land capability and suitability maps confirm.

3.3.3 Floods

A regular, moderate flooding of the riverine area (Map 9) is desirable in terms of leaching the soils of excessive salinity and alkalinity, and for providing soil moisture for bush and pasture as well as for flood recession cultivation. At the same time, the floods are a threat to human and animal life and result in considerable damage to agricultural crops, and infrastructure estimated at an average of about US$ 3 million annually. At certain intervals, more serious floods occur causing considerably higher damage. In 1977 a superflood occurred, which was the highest in living memory of the local population in the upper reach of the Juba. Four years later an even higher flood occurred in the lower Juba reach, because of very high inflows from the intermediate catchment below Bardheere. Both these floods caused high losses in terms of lost agricultural production and livestock and damage to houses, roads and other infrastructure, estimated at US$ 8-10 million each.

Generally, floods in the Juba Valley result from one or a combination of any one of the following:

- heavy rainfall in the upper catchment and subsequent high discharges in the river at Luuq
- heavy rainfall and subsequent high discharges in the intermediate catchment of its seasonal tributaries, particularly of the Shebelli which has no clearly defined drainage channel
- impoundment of water by man-made structures like bunds (flood bunds protecting the Fanoole, Juba Sugar and Mogambo projects), irrigation canals (Fanoole conveyance canal) and roads (especially the Fanoole-Jilib-Kamsuma road) across natural drains without the provision of cross drainage structures.

The highest flow and worst flooding usually occur in October or November, when rainfall in the upper and intermediate catchment is highest. Flooding is also most severe, when two floods occur close together. The first fills local depressions and stores a considerable amount of water, while the second then causes widespread sheet flooding.

Due to a reduction of the floodplain because of man-made structures, especially below Fanoole, the return periods of damaging floods have become shorter.

Any attempt of providing effective flood protection, particularly in the lower reach of the Juba is presently frustrated by the fact that there are no detailed topographic maps and that therefore the drainage pattern, particularly at the confluence of the Juba and the Shebelli, is not really known.

3.3.4 Water Quality and Sediment Transport

The quantity of suspended matter and bedload transported as well as the chemical properties of the Juba river water depend on discharges and rainfall in the intermediate catchment. Calculations made for the design of the Bardheere Dam show that suspended matter and bedload at Luuq amount to between 1.8 and 18 million m^3 annually in dry and wet years respectively, corresponding to a medium concentration of solids varying between 670 and 1,750 ppm. In the lower catchment values varying between 140 and 4,100 ppm have been recorded. The amount of transported solids decreases downstream and is influenced also by the operation of the Fanoole barrage.

The chemical quality of the Juba river water can be considered as good for irrigation purposes as well as for raw water that is to be treated for drinking purposes according to international standards. The salinity varies throughout the year and is low from July through November, medium in May and June, December and January and high from February to April. Calcium and magnesium are the main cations, except during low flows or in the salt plugs, when sodium predominates. High salinities are caused mainly by chlorides; bicarbonate is the predominant anion during dry periods. Salt plugs have changing patterns approximating the quantity of suspended solids with peaks occurring in the October floods. There is a general tendency for salinity to increase around Jilib and then decrease downstream. The turbidity and the content of dissolved phosphates and nitrates decreases towards the ocean. Starting mid-March through the end of May usually one or two saline peaks occur and last no more than a few days. The sharp salinity increase is due to the fact that salts from the gypsiferous formations in the middle and upper catchment are flushed out by the first rains of the year. The salinity also increases during the dry season as the share of groundwater contribution increases.

Seawater intrusion in the river mouth depends on discharges and tidal range. In the dry season from March until April or May, the high tide (max. 3.5 m) drives water upstream to Yontoy (river km 30 to 40) where the intake for the Kismayo water supply system is located. During this time, drinking water in Kismayo is therefore highly saline. The sea water intrusion also poses problems to the banana farmers, who use river water for irrigation. With small but even river flows (15 m^3/s) the sea water inflow is prevented.

The sodium-adsorption ratio (SAR) generally ranges from 0.18 to 2.0. Higher values, up to 6, are exceptional. Based on the USDA classification system the sodium hazard of 97% of the samples is low; only 3% fall into the medium range. Yield decrements are to be expected for certain crops like stone fruit trees and vegetables during the months from February to April when the electric conductivity (EC) exceeds 0.75 mmhos/cm and SAR values increase correspondingly. The water then cannot be used on soils with restricted drainage and even on sandy soils.

Water quality is not monitored in any systematic manner and no data exist that would allow to identify any changes over time.

3.4 Groundwater

In comparison to river water, groundwater is much less abundant but plays an important role, as it is nearly exclusively used for domestic and animal drinking purposes. Knowledge about the hydrogeology of the Juba Valley has increased considerably during the past 30 years, but is still far from complete (ANNEX 2).

3.4.1 Hydrogeological Formations

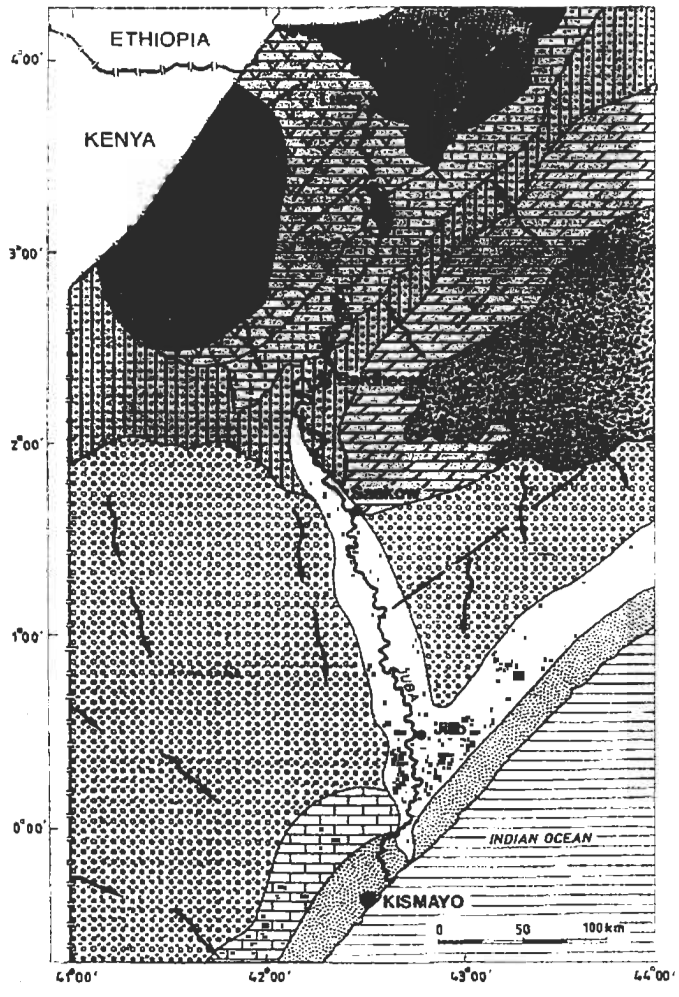
Groundwater occurrence in the Juba Valley can be differentiated according to three hydrogeological provinces Figure 3/6 (Map 4).

The Coastal Basin: Generally, there exists an upper aquifer yielding water of very poor quality and a deep aquifer below 150 m with water of fair to marginal quality, i.e. with EC values of 3 to 7 mmhos/cm. However, the confining layer sometimes is leaky or missing at all resulting in high salinities over the total aquifer thickness. South of Saakow, the former Juba river has deposited its sediments into a delta before the sea regressed further south. Probably, impermeable clay covers sand, gravel and interlaid clay. The hydrogeological conditions of these sediments are unknown. Coral limestone stretches in a narrow belt along the coast south-west of the Juba and land inwards of the dunes. This permeable limestone yields water of marginal to salty quality only due to its hydraulic connection with sea water. Numerous dug wells tap the freshwater lenses within the coastal sand dunes. Due to the variation in thickness and extent of these lenses, their groundwater potential is limited within the Study Area.

The alluvial deposits along the Juba river, downstream of Saakow, contain water, the quality of which varies considerably from place to place and with depth. The best water is found in a narrow riparian belt where the aquifer is recharged by the river. Especially in the Jilib-Kismayo area the aquifer is tapped as well by many hand-dug wells, as by drilled wells, with a maximum depth of 60 to 100 m. In some cases, water could be used for irrigation on a limited scale. Other minor alluvial deposits along "laaqs" yield small quantities of good quality water.

The Xuddur-Bardheere Basin: Apart from the escarpment, where several permanent and intermittent springs discharge east of Dinsor towards the South, within the alluvial clay covering large areas of this formation, there is no prospect of finding water. Wells drilled to a depth of 100 m and more to the north and south-west of Dinsor yield water of varying salinity, i.e. with EC values ranging from 0.9 to 6.5 mmhos/cm. The overlying "Canoole" formation acts as an aquiclude. Wells drilled in this formation were either dry or yielded little brackish or salty water. The few wells drilled in the "Waajid" formation indicate that only its lower part is waterbearing. Good prospects of finding water of good to fair quality only exist around Waajid, east of the Study Area. Like in the basement area, the most valuable groundwater sources are small alluvial deposits in depressions and togga beds. This groundwater is exploited by hand-dug wells. Along the Juba river, the thin alluvial deposits tend to contain saline water.

Figure 3/6 GENERALIZED GEOLOGICAL MAP OF THE JUBA VALLEY AREA



Source: C. Faillace, geology modified from Beltrandi & Pyrc.

LEGEND

COASTAL PLAIN

Quaternary

- Riverflow Alluvium Clay, Sand, Gravel
- Sand Dunes
- Coral Limestone
- Fluvio-Lagunal Deposits

XUDDUR - BARDHEERE BASIN

Tertiary

- Basalt

Lower Cretaceous

- MAIN GYPSUM
- CAMBAR Sandstone, Quartz Sands

Upper Jurassic

- GARBAHAREY Limestone, Gypsum, Sandstone
- WAAJID Limestone, Sandstone
- CANOOLE Marl, Shale, Sandstone
- BAYDHABO Marl, Shale, Limestone

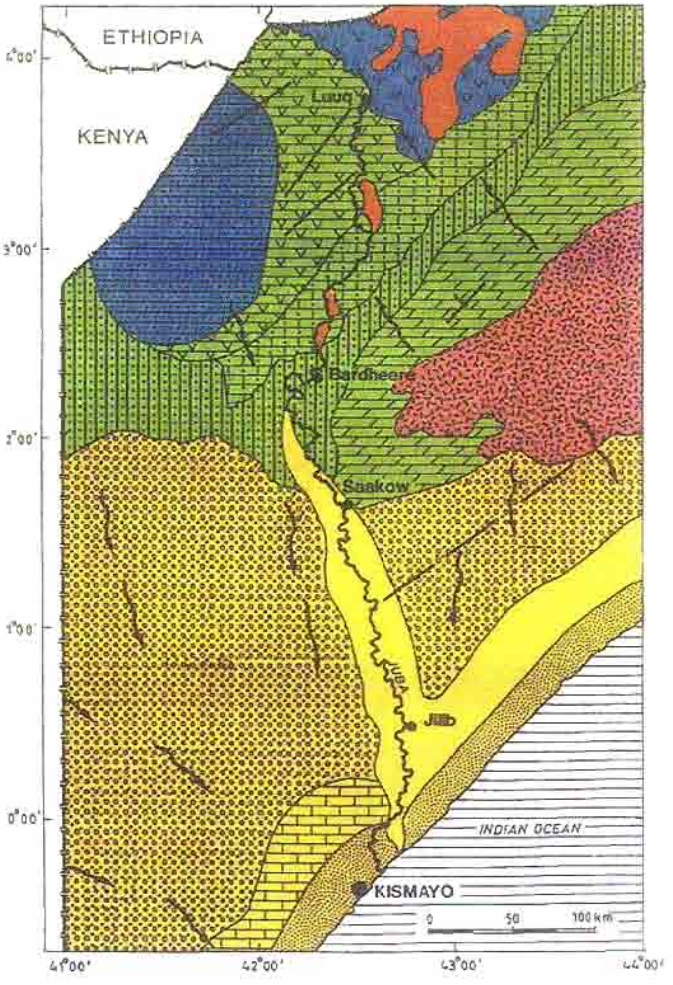
BASEMENT COMPLEX

Pre-cambrian

- Granite, Gneiss, Cryfstalline Shist

- Assumed general direction of underground flow
- Dip
- Fault

Figure 3/6 GENERALIZED GEOLOGICAL MAP OF THE JUBA VALLEY AREA



Source: C. Faillace, geology modified from Beltrandi & Pyrc.

LEGEND

COASTAL PLAIN

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- CANOOLE Marl, Shale, Sandstone
- BAYDHABO Marl, Shale, Limestone

BASEMENT COMPLEX

Pre-cambrian
- Granite, Gneiss, Cryistalline Shist

- Assumed general direction of underground flow
- Dip
- Fault

The Basement Complex: Small groundwater bodies exist along the major toggas and at the base of the granitic inselbergs, called "burs". These sources are tapped by hand-dug wells. The possibility of finding water in the fissured zones of the crystalline rocks is minimal as past drilling experience has shown. The water quality varies in general from 1 to 10 mmhos/cm, being better in the alluvium than in the fissured zones.

3.4.2 Groundwater Quality

In view of the limited aquifer recharge and the generally poor hydro-chemical and hydraulic aquifer properties, the areas where small groundwater quantities of good to fair quality can be found are rather restricted within the Study Area. Furthermore, the pollution of hand-dug wells, wars and in some drilled wells affects the health of people and livestock.

The best water with EC values around 1 mmhos/cm occurs at some locations within the Juba river alluvium close to the river bank (Saakow, Bu'aale, Fanoole and between Jilib and Jamaame), within freshwater lenses of the sand dunes along the coast and in isolated alluvial deposits in toggas and laaqs.

In the remaining area, the EC values range mainly from 1.5 to 5 mmhos/cm. However, values of up to 10 mmhos/cm and more are no exception in areas such as west of Jamaame or in Bardheere.

Although there is no law or Government guideline in Somalia concerning the limits of salinity for different uses, various proposals have been put forward. According to these, up to 3.5 mmhos/cm are marginally suitable for humans and up to about 10.0 mmhos/cm for livestock with camels having a higher and cattle a lower acceptance level. Apart from the total salinity, sometimes a high sulphate content makes the water unsuitable for human consumption.

In general terms, quantity as well as quality of groundwater is far from satisfactory in the Juba Valley. In addition, the aquifers and water lenses are difficult to locate. Therefore, careful investigations before construction of wells are a prerequisite at sites with no access to the Juba river water. Wherever groundwater of sufficient quantity and quality is not available, the construction of rainwater collection reservoirs, so called "wars", has and will remain the only solution for meeting human and livestock needs.

3.5 Human Resources

The assessment of human resources and the associated labour force potential in the Juba Valley is difficult. In addition to the lack of economic and labour statistics, reliable and up-to-date population statistics on regional and district level are generally not available, as data of the 1987 national census are not available yet. Finally, with a high percentage of highly mobile nomads, any population estimate for a given region must be considered a rough approximation of the actual numbers involved. Here, a number of sources were used as outlined in detail in ANNEX 3.

3.5.1 Population Groups and Distribution

On the basis of existing population and household data in combination with other sources, reports and aerial photographs, the population of the Study Area is estimated at about 510,000 in 1988 increasing at an annual growth rate in the Study Area of 2.8%.

In contrast, JESS quotes a population estimates for the three Regions Gedo, Middle Juba and Lower Juba of about one million inhabitants. However, this is for an area more than three times that of the Study Area and numbers are therefore not directly comparable. Both estimates indicate, however, a low population density of 8 - 13/km^2.

The breakdown of the total population into its urban, rural settled and nomadic parts on district level is shown in Table 3/3 (Map 2).

Table 3/3 Population in the Study Area 1988

District	Urban		Rural		Nomadic		Total	
	No.	%	No.	%	No.	%	No.	%
Bardheere	17,200	3.4	57,400	11.2	43,800	8.6	118,400	23.2
%	(13.0)		(25.8)		(28.2)		(23.2)	
Saakow	6,800	1.3	28,000	5.5	29,600	5.8	64,400	12.6
%	(5.1)		(12.6)		(19.1)		(12.6)	
Bu'aale	2,800	0.6	18,700	3.7	13,800	2.7	35,300	7.0
%	(2.1)		(8.4)		(8.9)		(6.9)	
Jilib	16,400	3.2	44,700	8.8	37,500	7.3	98,600	19.3
%	(12.3)		(20.1)		(24.1)		(19.3)	
Jamaame	9,400	1.8	53,100	10.4	8,500	1.7	71,000	13.9
%	(7.1)		(23.9)		(5.5)		(13.9)	
Kismayo	80,200	15.7	20,400	4.0	22,100	4.3	122,700	24.0
%	(60.4)		(9.2)		(14.2)		(24.0)	
Total	132,800	26.0	222,300	43.6	155,300	30.4	510,400	100.0

Of the total population, some 26% live in urban and 74% in rural areas, the latter consisting of 44% rural settled and 30% nomadic population. About 80% of the urban population is concentrated in the southern parts of the Study Area, the majority in Kismayo.

The population densities of the rural population is very much different for the riverine and the non-riverine areas, as shown in Table 3/4.

Table 3/4 Densities of Rural Settled Population in the Study Area

District	Area per district (1) (km^2)	Rural settled population (people)	Density per district (people/ km^2)	Population near river (people)	Density near river(2) (people/ km^2)	Population off river (people)	Density off river (people/ km^2)
Bardheere	10,410	57,400	5.5	33,300	27.5	24,100	2.6
Saakow	5,940	28,000	4.7	14,700	18.4	13,300	2.6
Bu'aale	6,400	18,700	2.9	18,600	18.7	100	-
Jilib	7,860	44,700	5.7	36,100	37.1	8,600	1.2
Jamaame	1,620	53,100	32.8	39,000	47.6	14,100	17.7
Kismayo	7,630	20,400	2.7	17,400	77.2	3,000	0.4
Total		222,300	11.6	159,100	44.3	63,200	1.8

1) Area of districts including their areas outside of the Study Area.
2) A 15 km stretch along the river has been taken as basis for the determination of population density in the area close to the river as against the overall density.

About 72% of the rural settled population live in the riverine area, i.e. in SGU's 1 to 4. In Bu'aale District practically no rural settled population lives outside this zone.

The lowest population densities are along the middle portion of the Juba between Saakow and Fanoole, where no all-weather road access exists. High population densities are associated with specific agricultural patterns, i.e. the large irrigation projects and the medium-scale banana farms in the Jilib/Jamaame area and the intensive rainfed and small-scale irrigation areas around Bardheere and between Bardheere and Dinsor.

3.5.2 Age and Sex Structure

The age and sex structure found in the Study Area is similar to figures reported for the national level.

Of the population in the Study Area, 31% are aged 10 or less and 14% are between 10 and 15 years old. 40% of the people are between 15 and 60 years old and only about 5% of the total population become older than 60 years.

With an overall ratio of 100.4 males to 100.0 females the sexes are rather balanced in the Study Area. The sex structure in the different age groups, however, shows two major imbalances. There are fewer older women than men and more women than men and in the 20 - 39 age group, seemingly because of the polygamous marriage system (in-migration of women), and the out-migration of young men.

3.5.3 Household Composition and Size

According to JESS, household sizes in the valley are quite uniform across socio-ecological sectors and range from 6.0 to 6.2 for urban and non-riverine agricultural households respectively. Using the data collected by JESS, an average household size of the settled population in the Study Area has been determined at 6.1 persons.

Although there is a clear network of ties between members of the larger extended family groups, households are dominated by nuclear family relationship. First-grade relations make up 97% of the average household. 14% of all household members are household heads, 19% wives, and 63% sons and daughters. Thus, an average household of six persons consists of a household head (in 93% of cases male persons), one or two wives, and three or four children.

The overall ratio between wives and husbands of 150 to 100 reflects the polygamous marriage system which is 130 to 100 in urban and 160 to 100 in rural settled households.

4. Present Use of Resources

The main resources in the Juba Valley are land, water and people. How these resources are utilized, what productive and supportive systems exist, what the environmental situation is and what the institutional arrangements are all factors that need to be analyzed to understand the potential and constraints for the future development in the Juba Valley and to design an appropriate development programme.

4.1 Land Use

The manner in which land is used (ANNEX 1), is a function of the characteristics of the land, as expressed by a land classification system, and, to a certain extent by the land tenure system.

4.1.1 Land Use Classification

Based on a number of land classification efforts for the Juba Valley in the mid-1980s, the present land use can be determined and is shown in Map 7 of the Atlas and the corresponding areas are summarized in Table 4/1 below. As there has been no systematic collection of land use data in the past, through, for example, remote sensing or other means, changes in the land use over time can practically not be determined.

Table 4/1 Present Land Use in the Study Area (km^2)

District	Cultivated Land			Uncultivated Land		Total Land	Flood Plain Area	Flood Plain %
	Rainfed	Flood Recess.	Irri-gated	Range& Forest	Other			
Bardheere	580	-	25	4,050	275	4,930	1,030	21
Dinsor	420	-	-	2,400	180	3,000	-	-
Saakow	350	15	10	4,950	285	5,610	595	11
Bu'aale	20	35	10	5,260	135	5,460	505	11
Jilib	70	20	75	4,350	535	5,050	510	10
Jamaame	190	-	45	1,600	465	2,300	1,020	44
Afmadow	20	-	-	5,550	110	5,680	-	-
Kismayo	15	-	5	3,380	280	3,680	90	2
Total	1,665	70	170	31,540	2,265	35,710	3,750	11

The data show that 93% of all the land in the Study Area falls under the uncultivated land use classification, including range and forests (88%) and other uses (5%), such as towns, villages, swamps, dunelands, etc.

Of the uncultivated range and forest lands extending over more than 3 million ha, most is suitable and actually used as rangeland for livestock. Forests and thickets are also used for grazing depending on the penetration possibilities for the animals. Areas covered by dense forests are scattered in relatively small patches, mainly as gallery forests along the rivers.

Cultivated lands include all crop production areas (rainfed, flood recession and irrigation) and account for only 5% of the total Study Area. Of these, rainfed crop production dominates, covering about 166,500 ha or 87% of all crop production areas. The largest geographic concentration of these areas is in the Bardheere-Saakow-Dinsor triangle (SGU's 1, 2 and 5). The second largest, but by far smaller area, is the one under irrigation, totalling 17,000 ha or 9% of the total area now under crop production. The large-scale projects in the districts of Jilib and Jamaame account for most of this area. Increasingly, however, small-scale irrigation in Bardheere District is becoming of significance. Flood recession is now practiced only on 7,000 ha or 4% of the total crop production area and is practically limited to the districts of Saakow, Bu'aale and Jilib (mainly SGU 2).

Finally, the table also shows that the floodplain, where most of the people of the Juba Valley live, covers only about 10% of the total Study Area, with the districts of Bardheere and Jamaame having the largest share (65%).

4.1.2 Land Tenure

There are two different systems on which land ownership is based in Somalia, the codified land use rights and the traditional land tenure system.

Since 1975, when the Land Reform Law No. 73 came into force, all land is state owned. The Government may grant concessions to individuals or groups, giving them the right to land use under certain conditions.

The law is generally ignored in the Juba Valley; it has only been applied to a limited extent in the irrigated areas. In other areas, however, land tenure practice is still based on the traditional system.

Observations in the field have shown evidence of a rapidly changing tenure system, at least in the areas adjacent to the river where the best soils are to be found. It appears that these changes are to the disadvantage of smallholders, individually as well as for their communities.

The great majority of the smallholders have never registered their lands since they relied on their traditional rights. Therefore they are in a legally weak position. Although individual land rights still seem to be respected, share cropping arrangements which are in breach of the law, are reducing the actual rights of smallholders. Lands, mainly located on the river levees, are increasingly being claimed and registered by outsiders who try to obtain land rights for the future, when the new Jilib - Bardheere road will provide all-weather access to a so far relatively little developed area and river flows will be regulated. The extent of this trend cannot be quantified but certainly requires immediate attention.

4.2 Water Use Systems

The most important water resource in the valley (ANNEX 2), is the Juba river, which determines the ecosystem of the riverine area. The river itself is a habitat for fish and wildlife and it interacts with the riparian lands through the regular seasonal floods. In addition it recharges the groundwater storage, although not much is known about these mechanisms in detail.

Man has always made use of the river as a source of water for meeting domestic and animal watering needs and for cultivating crops using flood recession techniques. More recently, the water of the Juba is being used for generating electricity through the Fanoole barrage and for providing the basis for modern irrigated agriculture.

It is the use of the river water for crop production that plays the most important role. This is discussed in the following by looking at the traditional flood recession cultivation, modern irrigation systems and present irrigation efficiencies. A summary of the water use by the existing irrigation systems is given in Table 4/2. From this an approximate water balance can be derived. Following this, some aspects of water rights are discussed before looking at the planned Bardheere Dam and its principal parameters.

4.2.1 Flood-Recession (Deshek) Cultivation

Deshek cultivation is a risky enterprise for the local farmers, in that they have to make decisions and take measures based on the unpredictable occurrence and magnitude of floods.

In the present situation, different desheks flood at various river water levels and associated discharges. Desheks in the middle Juba reach start flooding at a river discharge level of around 400 m^3/s, with all desheks being flooded when the discharge reaches around 700 m^3/s. This means that with increasing flood levels, an increasing number of desheks become flooded due to levee or embankment overtopping or due to water intake through man-made openings in bunds along the river.

In the desheks encountered below Fanoole, the river discharge level at which flooding starts is lower, and in the range of 350 to 450 m^3/s. This is due to the elevation of the flood inflow section of a deshek on the river embankment in respect to water levels and the degree of man-made protection already provided to minimize or control flooding.

The uncertainty about the timing and magnitude of the floods, has great socioeconomic consequences, in that deshek farmers are reluctant to invest time, effort and money beyond a certain level unless they are also successful in reducing the associated risk. It is for these reasons that farmers have increasingly constructed bunds to control the flow into and out of the desheks and have started to cultivate the higher levee areas by pumping, thus changing the uncontrolled into a controlled irrigation regime.

Table 4/2 Summary of Irrigation Water Use Systems

Planning unit or reach	Valley area	Principal irrigation system	Major crops	Start of operation	Planned spec. water requirement (l/s/ha)	Present irrigated area (ha) (net)	Planned (est.) capacity (m^3/s)	Estimated irrigation efficiency
Upper catchment	(no information/unknown)							
Upstream of reservoir	North of Luuq	small-scale pumps	vegetables sesame	1975	(3.0)	1,100 unplanned	(3.3)	0.2 (4)
Future reservoir	Luuq to dam site	small-scale pumps	vegetables sesame	1975	(3.0)	600 unplanned	(1.8)	0.2 (4)
1. Bardheere riverine area	dam site to 20 km north of Saakow	small-scale pumps	onions) tobacco) sesame)	1975	(3.0)	2,500 unplanned	(7.2)	0.2 (4)
2. Saakow Bu'aale area	20 km north of Saakow to Fanoole	flooding desheks & small-scale pumps	maize) sesame) sorghum) veg/fruit)	1980	(3.0)	(3,800) (1) 1,600	(2.7)	(5) 0.2 (4)
3. Fanoole/ Kamsuma area	Fanoole to Kamsuma	Juba Sugar Fanoole	sugar cane rice seasonals rice	1980 1982	1.89	7,000 (7,365) 800 (7,750) 200 600	13.6 20.7	0.4 (6) 0.15 (7)
4. Kamsuma/ Gobweyn area	Kamsuma via Yoontoy to Gobweyn	Estate (Mogambo) medium-scale pumps	seasonals bananas	1986 1925	1.68	1,000 (2,200) 3,400+	3.7	0.15 (7) 0.2
6. Homboy	Shebelle	gravity	seasonals bananas rice			(3,600)(2) (8,850)(3)	12.7	n.a.
Sub-total 1-5 (downstream Bardheere)						17,100 ha		0.33 (8)
Total (with area upstream Bardheere)						18,800 ha		

1) Flood recession.
2) Rainfed.
3) Potential net command area.
4) Expanding rapidly.
5) Changing towards controlled irrigation.
6) Stable.
7) Slow/behind schedule..
8) Determined in Chapter 5.1.

Source: Own survey

4.2.2 Modern Irrigation Systems

Modern irrigation systems exist in the Juba Valley at a large, medium and small scale (Map 9).

4.2.2.1 Large-Scale Schemes

At present, three large-scale irrigation schemes exist. These are the sugar cane scheme at Mareerey (Juba Sugar Project, JSP) and the rice growing schemes of Fanoole and Mogambo.

The Juba Sugar Project is the oldest of the three and started in 1980 and has about 7,000 ha under sugar cane, irrigated mainly by overhead sprinklers. Irrigation water is supplied by two major pumping stations with a joint capacity of 12 m^3/s and two minor stations together 1.6 m^3/s. The lack of water has been quite pronounced in recent years during February to April, resulting in a yield reduction of up to 40%. Information in early 1988 indicated that only 12 irrigations were being applied for a total of 10,000 m^3/ha, whereas 20,000 m^3/ha through 24 irrigations would have been required. Water use efficiency at Juba Sugar has been estimated at 45%, the highest in the valley.

The Fanoole irrigation system is served by the Fanoole barrage, constructed in 1977-1982, with four gated openings (capacity 800 m^3/s), a 56 km long conveyance canal and a provision for future diversion of river waters to the right side of the Juba. Under full development, the Fanoole system is designed to divert 33.4 m^3/s to irrigate 15,250 ha in two areas: the Fanoole command area, between the Juba River and the Fanoole conveyance canal and, in future, the Homboy area.

The Fanoole command area is about 8,200 ha and is designed for a supply capacity of 20.7 m^3/s. The area to be irrigated is not yet fully developed, with only about 1,800 ha cleared, and a cropped area in 1987 of about 800 ha rice and 200 ha seasonals. The water use efficiency of the scheme is estimated at about 24%.

The Mogambo Irrigation Project Phase I (2,200 ha) was completed in 1986 for 2,040 ha of surface and 160 ha of sprinkler irrigation. The latter, originally meant for cotton, has so far not been operated, because of poor economics. Water is provided through a 3.7 m^3/s pumping station. Irrigation is achieved with basins of 2 ha each, with individual inlets and outlets. The groundwater table is rising and an increase in soil salinity has been reported and is now under investigation. Water use efficiency is estimated at about 27%.

The Homboy area, the only area so far identified for large-scale irrigation development outside the existing schemes is located south-southeast of Jilib. The area is planned for 7,500 ha of irrigated area, but implementation of the project would only be meaningful after completion of the Bardheere Dam when sufficient water would be available for the perennial crops throughout the year.

At full development, the maximum water demand of the three large-scale schemes is thus about 50 m^3/s.

4.2.2.2 Medium-Scale Pump Schemes

Medium-scale pump schemes supply primarily banana estates of 30-70 ha on a total area of some 3,400 ha. Presently, about 140 pumps with an average capacity of 170 l/s, equivalent to approximately 25 m^3/s, are in operation, mainly located in the lower Juba reach, below Kamsuma. Water use efficiency is estimated at 32%.

Medium-scale irrigation for banana production requires a quality of both land preparation and irrigation practices comparable to large-scale schemes, as the crop is fixed on the field for at least 3 to 4 years, and the irrigation layout can only be changed at great costs. The relative success of this form of irrigated crop production system has only been possible because of the considerable support Somalfruit is extending the participating farmers.

Cultivating a perennial crop at the tail end of the river, banana farmers are most seriously affected by the combination of low river flow during the Jilaal and uncontrolled water abstraction by upstream farmers. Seawater intrusion constitutes an additional peril during this time.

4.2.2.3 Small-Scale Pump Schemes

Small-scale pump irrigation is rapidly increasing in the upper valley reach and is expanding from here into the middle valley reach. In Luuq district, an increase of 10 small pumps per month in the last two years has been recorded, with an average capacity of 20 l/s per pump, and operating time of 5 to 12 hours per day, supplying 3 to 12 ha each.

In the Bu'aale - Dujuma area, 50 new pumps (effective capacity ranges from 15 to 20 l/s for 5 to 7 meter head) have been distributed to farmer groups under a credit and cooperative arrangement. The number of small pumps was estimated to be 260 in 1984, 300 in 1986, 600 in 1987, downstream of the planned Bardheere Dam, and at 900 for the total river length in Somalia, the equivalent pumping capacity being approximately 15 m^3/s. This trend has resulted in a substantial decrease in river discharges and lack of water for medium and large schemes, in the area downstream of the Fanoole barrage.

Pumps are placed in a position in the embankment of the river, in a vertical height often between the water level and the fields to be irrigated. These small pumps are then difficult to remove when water rises rapidly. Problems of operating and maintaining these small-scale pumps include poor pump selection, shortages of fuel and spares and poor alignment. Smallholder irrigators also have only rudimentary knowledge on basic design principles for their small schemes and on crop water requirements. This leads to an erratic pattern of overirrigation, high water losses and a low efficiency, estimated at about 20%.

4.2.3 Irrigation Efficiencies

Estimates of current irrigation efficiencies based on prevailing irrigation practices and present operation and maintenance conditions in the Juba Valley have been mentioned above for the different types of schemes. On average, an efficiency of about 33% has been determined. In comparison to a desirable efficiency of 40-60%, this is low and represents a deficiency in water usage by a factor of 2 to 3.

Contributing to this low overall efficiency are factors such as

- insufficient knowledge of farmers about the best layout for their irrigated fields and the most appropriate motor and pump
- lack of farmers' knowledge on when and how much water to apply and of the consequences of overirrigation
- lack of information on what type of simple irrigation structures could be used to better control water flows
- use of too large basins for cultivation of rice at Fanoole and Mogambo
- unfavourable sharecropping arrangements to tenants as the actual water users, providing a disincentive to reduce water use
- weak public sector management of the large-scale schemes, particularly of Fanoole and Mogambo.

Many of the above factors are ultimately the result of irrigated agriculture having no tradition in the Juba Valley, the lack of any organization providing irrigation development support services and the fact that there are very few persons in the country with some training and background in irrigation engineering and soil water management. All the experience that has been made in irrigation over a longer period of time relates to the Shebelli valley and to small-scale systems. To what extent the knowledge gained there is transferable to the Juba Valley has so far not been explored.

4.2.4 Water Balance

A tentative water balance for average conditions along the river has been drawn up to assess water availability throughout the year. This balance is presented in Table 4/3 using the information of Table 4/2 for the area under irrigation with the actual supply for the river discharge Q_{80} (irrigation water supply in four out of five years) and for Q_{50} (average year).

Table 4/3 indicates that water scarcity can occur in average years in Jilaal, and it points to a possible seawater intrusion problem. It also shows that the Juba river in both "dry" and "average" years can supply water for seasonal crops for about 9 to 10 months (mid-April through January), and that the shortages are primarily related to the needs of perennial crops (bananas and cane).

Table 4/3

Juba River Water Balance for Present Stage of Development (m^3/s)
(17,100 ha under irrigation)

Month		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1a)	Q_{80} m^3/s	23	9	6	10	125	102	126	189	211	227	186	71
1b)	Q_{50}	47	30	39	128	241	159	189	279	299	462	368	142
2)	Contribution/recharge in interim basin	18	8	3	-16(15)	23	12	-1	-24	-12	-23	20	33
3)	Evaporation (m^3/s)	0.9	0.9	1.0	0.7	0.6	0.6	0.6	0.7	0.8	0.7	0.6	0.6
4)	Evapotranspiration (mm)	236	210	224	165	162	163	177	191	196	185	173	207
5)	Average coefficient	0.84	0.60	0.74	0.99	1.15	1.08	0.98	0.78	0.91	1.09	1.18	1.00
6)	Crop water requirements (mm)	198	126	166	163	186	176	173	149	178	202	204	207
7)	Effective rain (mm)	0	0	0	37	82	62	43	14	8	3	25	25
8)	Irrigation water requirement (mm)	198	126	166	126	104	114	130	135	170	199	179	182
9)	Diversion requirement (net) m^3/s	13.06	8.31	10.95	8.31	6.86	7.52	8.58	8.91	11.22	13.13	11.81	12.01
10)	Diversion requirement (gross) (m^3/s)	39.6	25.2	33.2	25.2	20.8	22.8	26.0	27.0	34.0	39.8	35.8	36.4
11)	Return flow (m^3/s)	5.1	3.3	4.3	3.3	2.7	3.0	3.4	3.5	4.4	5.2	4.7	4.7
12)	Rural water (m^3/s)	0.7	1.0	1.0	1.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.7
13)	Discharge in estuary dry year (m^3/s)	5	-7(16)	-22(16)	-24(16)	129	93	101	140	168	168	174	71
14)	Discharge in estuary av. year (m^3/s)	29	14	11	88	245	150	164	230	256	403	356	142
							passive water balance						

1) Average discharge Luuq/Bardheere: Q_{80} medium dry year, Q_{50} average year.
2) Bardheere-Kamsuma incl. evaporation losses (see Figure 4/2).
3) Kamsuma-estuary: length 96 km, width 80 m, evaporation data Alessandria: (A) x 96,000 x 80 : 30 : 24 : 3,600 = 2.96 x (A).
4) Average from Bardheere and Mareerey meteorological station.
5) See Table 6/3
6) (6) = (4) x (5)
7) Data Yontoy (coefficient 0.66-0.9), see Table 2/2.
8) (8) = (6) - (7).
9) (9) = (8) x 17,100 ha : 30 : 24 : 3,600 = 65,972 x (8).
10) Average irrigation operation efficiency 0.33 (see Table 6/2) (10) = (9) : 0.33.
11) 25% from banana and seasonals - Juba Sugar and Mogambo not drained into river, share related to the hectarage: 0.13 x (10).
12) See Table 6/6.
13) (13) = (1a) + (2) - (3) - (10) + (11) - (12).
14) (14) = (1b) + (2) - (3) - (10) + (11) - (12).

(15) 10 m^3/s for Q_{80}.
(16) Discharge = 0 m^3/s. These data and data ≤ 15 m^3/s signal sea water intrusion.

Source: Own computations

4.2.5 Water Rights

There is no effective legislation in Somalia governing the access to, allocation and use of the country's water resources. According to traditional local custom the right to use river water for irrigation in the Juba Valley depends only on access to land along the river. Anyone who purchases a pump and owns or has the right to use land along the river can pump from the Juba. No approval or registration are required and no charges are levied. Such a situation encourages water misuse and wastage that could also result in a degradation of the resource and of the ecosystem of which it is a part. In the dry season, the lack of a water allocation mechanism also results in water being pumped in the upper reaches for irrigating seasonal crops, while the same water is badly needed in the lower reaches for the perennial crops of sugar cane and bananas. Water stress and low yields are the inevitable result.

To overcome this unsatisfactory situation, a number of FAO missions visited Somalia and a draft National Water Resources Law was prepared in 1984. While the proposed Law appears to be comprehensive in terms of water rights, improvements should be considered in the following four areas:

- Sectoral water allocation - water allocation to perennial crop diversions being presently accorded a higher priority than water use efficiency and needs of annual/seasonal crops

- Water pricing policy - there is allowance for price differentiation but no adequate criteria for use of this mechanism to implement allocation policies, e.g. to favour efficient users. Also water fees could cover only recurrent costs for water delivery but not capital investment cost

- Water management administration - the law would stimulate administrative inefficiency and higher costs by creating a large administration without regulating the principles and process for its structuring

- Omissions - the proposed law does not contain several key issues, including the status of water user groups, and the body of law which will settle and enforce disputes and rulings.

So far, implementation of the Law has been slow and only the establishment of the National Water Centre, to complete a water inventory and a national water masterplan, has been achieved.

4.2.6 The Bardheere Dam Project

The Bardheere Dam was designed under two major constraints. The damsite is fixed at the only viable location already identified in 1924, while the height of the dam is limited by the town of Luuq, which should not be inundated at the maximum storage level. These two basic constraints and a large number of other factors have been taken into account in fixing the operation storage at about 2,500 million m^3.

The purpose of the dam is threefold. First it is designed to provide electricity of about 550 GWh per year by installing a generating capacity of 4 tur-

bines of 35 MW each. This compares to an estimated demand of Mogadishu and the Juba Valley in the year 2000 of about 560 GWh per year. The Bardheere Dam would thus make a very substantial contribution to the energy supply of the country.

The second purpose is the provision of irrigation water to meet demand throughout the year. At present, as shown above, river flows are too low during the dry season to allow the cultivation of the existing perennial crops and therefore considerably limit the realization of the valley's irrigation potential. The manner in which the dam can be expected to even out river flows is given in Table 4/4.

Table 4/4 Juba River Flows Without and With Dam

Flow range (m^3/sec)	Natural regime (without dam)	Regulated regime (with dam)	
	- % -	- % -	- days -
0 - 100	34	1	4
100 - 200	19	81	295
200 - 300	24	8	28
300 - 400	11	4	15
400 - 500	7	3	11
500 - 600	3	2	8
600 - 700+	2	1	4

For 99% of the time, river flow would thus be above 100 m^3/s, meeting existing and projected future irrigation demand.

The third purpose of the dam is to contribute to flood control in the valley, again by evening river flows and limiting releases from the dam to 700 m^3/s.

4.3 Human Resources and Labour Potential

An estimated 510,000 people live in the Study Area. To what extent and in what manner they could and actually do participate as productive labour is looked at in the following (ANNEX 3).

4.3.1 Labour Force Participation

For 1988, about 346,000 persons are considered to be economically active in the Study Area, consisting of 22% children below the age of 15 and 78% above. Labour force participation in rural areas (72%) is higher than in urban areas (57%); giving an overall average of 68%. This has been determined by assuming an equal participation rate in the labour force for males and females and by including the 7-to-14 years-age group.

Economically active children and elderly people, however, do not provide a full manpower unit. To establish a rough order of magnitude of the labour potential, supply has to be weighted according to the relative work performance of different age groups. Using 1.0 as the weighing factor for age groups between 15 and 39, 0.8 for those above 39, and 0.4 for those below 15 years, the present labour force supplies about 290,000 manpower units.

4.3.2 Sectoral Distribution of Labour Force

Since clear data about the nomadic population as well as studies of the urban secondary and tertiary sectors are not available, it is difficult to assess the labour force potential by economic sector. In addition, many people are engaged in more than one job, which makes the sectoral division somewhat arbitrary. Based on the JESS Baseline Survey, an approximate sectoral distribution has nonetheless been prepared, which is shown in Table 4/5.

Table 4/5 Sectoral Distribution of Labour Force

Labour force	Agricultural		Non-agricultural		Total	
	No.	%	No.	%	No.	%
Rural	143,000	41	15,900	5	158,900	46
Nomadic	108,800	31	2,200	1	111,000	32
Urban	19,700	6	56,100	16	75,800	22
Total	271,500	78	74,200	22	345,700	100

As shown, the great majority (78%) of the labour is engaged in the agricultural activities, with crop production accounting for about 60% and livestock for the remaining 40%. Non-agricultural activities then absorb only about 22% of the labour force, with most of them living in the urban areas.

In rural areas, more than 90% of the rural labour force is engaged in agricultural and subsistence activities. Some 58% are in farming, 25% in household work, and 11% in herding as their major occupation. Non-agricultural employment in the secondary and tertiary sector is less than 10% and therefore in the rural areas of only minor importance.

For the nomads, non-agricultural employment is of even lower significance and is estimated to apply to not even 2%.

In urban areas civil service employment plays a major role, particularly in regional centres. Not taking into account household work which is performed by about 53% of economically active people (usually females), some 28% of the remaining labour force was found to be employed as civil servants. A further 22% are engaged in trading and private business. Manufacturing and

crafts are not significant. About 11% are wage labourers, drivers and mechanics. Agricultural employment is still the most important field of activity in which some 32% of the urban labour force are engaged (Figures add up to over 100% due to multiple (subsistence) occupation patterns).

The geographic distribution of the settled labour force by district has been estimated as shown in Table 4/6.

Table 4/6 Sectoral Distribution of Settled Labour Force by District

District	Farm labour		Off-farm labour		Total	
	No.	%	No.	%	No.	%
Bardheere	41,800	25	9,000	13	50,800	22
Saakow	21,100	13	2,800	4	23,900	10
Bu'aale	13,100	8	1,800	2	14,900	6
Jilib	31,600	19	9,800	14	41,400	18
Jamaame	37,400	23	5,900	8	43,300	18
Kismayo	17,700	11	42,700	59	60,400	26
Total	162,700	100	72,000	100	234,700	100

Farm labour is concentrated in the districts of Bardheere, Jamaame and Jilib. Off-farm labour is highest in Kismayo, followed by Jilib and Bardheere.

4.3.3 Labour Allocation in the Rural Subsistence Economy

Most of the family labour is allocated to subsistence farming and allied activities. For 87% of the labour force it is their major, and 79% their second major occupation. However, to satisfy additional cash requirements and to achieve a certain economic security, they also have to engage in other activities. The more common are to combine farming and livestock keeping (more than 50% of farming households, mainly rainfed farmers, keep cattle), to farm more than one land type (about 20%, mainly deshek farmers) and to seek additional income opportunities (about 16% of farm households have a cash income from crafts activities, about 14% from business, and about 23% from wage labour). The wage labour market (mainly on large-scale projects) is particularly significant in the southern districts.

Subsistence households do not usually have spare labour. Agricultural activities at the subsistence level and other subsistence activities such as to fetch drinking water (up to one man-day permanently in rainfed areas) and collect firewood absorb most of the available family labour.

An average rural settled household of 5.9 persons has 4.2 persons economically active who supply 3.1 manpower units. Taking farm labour requirements as at least 2.1 manpower units per household, and additional labour requirements for subsistence and additional income-generating activities, the majority of rural settled households have only a limited amount of spare labour capacity and possibly none at all at peak demand times.

4.3.4 Wage Labour and Labour Shortage in Large-scale Projects

More than 10,000 labourers depend on employment opportunities offered by the Juba Sugar Project, the Fanoole State Farm, the Mogambo Irrigation Project, the banana estates and the few industrial units in the southern part of the Study Area. There are no similar employment opportunities north of the Fanoole barrage. In the southern areas, the casual labour force for the large and medium projects is mostly provided by subsistence farmers seeking employment when there is no work to be done on their farms. Even then, most of them are women and children.

Generally, employment conditions and wage levels are unattractive. The low wages for unskilled and casual labourers (in 1987 between SoSh 30 and SoSh 140 for daily workers; SoSh 1,500 per month for low-grade permanent employees) are largely set by Government policy, even though the industrial workers have a right to bargain collectively with the management for their wages, and patently insufficient to attract and keep qualified labour. Even managerial salaries (between SoSh 8,000 and SoSh 12,000 for lower grades) are low compared to Mogadishu pay rates. Accommodation and other living conditions are also not attractive. Therefore, these projects have, and always had, a chronic labour supply problem.

4.3.5 Female Labour

Women bear most of the work load of farming households and are additionally employed in the secondary and tertiary sector. Household work, almost exclusively performed by females, contributes considerably to subsistence production, encompassing time consuming subsistence activities, such as drinking water and firewood supply and home production for local markets.

Household work, however, does not dominate the occupational pattern of rural women. As many women as men are engaged in farming activities. More of them are engaged in farming than in household work as the primary occupation. Additionally, they perform more than one third of herding activities.

Within the very limited rural secondary and tertiary sector, employment of women is significant. Women indicated 50% of crafts, 75% of trading and 31% of private business activities as their major occupation. Furthermore, a great part of casual labour in large-scale projects is provided by women.

The polygamous marriage system has developed into a labour supply system based on female labour. Separate plots of farms are allocated to different wives who, additionally, have to work on the husband's plots. Bearing the multiple burden of household, agricultural and non-agricultural work, female labour constitutes a decisive element within the structure and functioning of subsistence households.

4.3.6 Present Farming Patterns and Farm Labour Availability

Based on population estimates, on labour force participation and labour allocation of rural households, a total of about 65,000 manpower units are presently available for farming activities. The currently cropped area of about 120,000 ha requires some 50,000 manpower units, implying a labour cushion of about 30% for meeting peak demands and emergencies.

Taking into account the necessary elasticity between labour requirements of the crop calendars and the amount of labour statistically available, labour requirements and availability are, by and large, balanced under present conditions.

Differentiations occur on the district level due to different population densities, available farmland and farming systems. Districts dominated by large areas of dryland cultivation have low elasticity between labour availability and requirements (a ratio of 1.1 in Bardheere and 1.0 in Saakow District) indicating labour stresses at least in times of peak requirements. In densely populated riverine areas the elasticity factor is higher: 1.4 in Bu'aale, 1.3 in Jilib and 1.5 in Jamaame districts. In Jilib and Jamaame districts, high demands for wage labour on the big projects and the banana plantations can only be met by in-migration and resettlement from outside the project areas.

Kismayo is the only district of the Study Area with a structural imbalance between agricultural employment opportunities and labour availability. The fairly high concentration of population has only limited farm areas which yields surplus labour available for adjacent areas and urban employment.

4.4 Production Systems

The resource base of the Juba Valley allows a number of production systems to function. These are most importantly the ones for crop production (ANNEX 4) and livestock (ANNEX 7). Of lesser importance are those related to range and forestry (ANNEX 8), fisheries (ANNEX 9) and industry (ANNEX 10).

4.4.1 Crop Production

Over the years, three main farming systems have developed in the Study Area, i.e. rainfed, flood recession and irrigation systems. Table 4/7 presents a summary of the main characteristics of these systems and their related subsystems, while Figure 4/1 (Map 8) shows their location in the Study Area. It should be noted that practically all farmers also keep livestock as an additional source of income. Details of livestock keeping, as far as it relates to nomadic husbandry practices will be discussed in Section 4.4.2.

4.4.1.1 Rainfed Crop Production

Two systems of rainfed crop production have developed because of differences in rainfall, soils and accessibility between the northern and the southern districts. Common to both is the priority given to staple food crop production and keeping of livestock. Cash requirements are partly met by cash crops and, particularly in the southern districts through off-farm activities. In the northern districts, livestock is kept as a risk reducing strategy to insure against crop failures. In the southern districts, rainfall is higher and farmers pursue more diverse cropping patterns and generally keep less livestock.

Table 4/7 Summary of Characteristics of Farming Systems

Farming System	Farmland (ha)	Location	Typification	Main crops grown	Annual production in t	Farm families involved	Development Tendency
Rainfed based farming system							
- Subsystem 1	95,000	between dam site and Fanoole; concentrations in West Bardheere District and West Saakow District small areas in Bu'aale District	traditional rainfed cultivation with low and erratic rainfalls; low standard of production techniques; lack of any support services	Sorghum Maize Sesame Beans	60,000 3,800 1,100 300	10,300	low expansion related to population growth; low expectations for future conversion into irrigation schemes
- Subsystem 2	27,500	between Fanoole and Yoontoy in Jilib, Jamaame and (little) Kismayo District; dispersed sub-units, i.e. Homboy area, Southeast Jamaame, North of and around Juba Sugar Project, South of Mogambo to Deshek Waamo	traditional rainfed cultivation with slightly better rainfall conditions; low standard of production techniques, (although somewhat higher than in subsystem 1) due to limited availability of support services	Maize Sesame Cotton Sorghum	8,400 2,600 350 700	11,000	low expansion as above; but strong expectations for future irrigation
Flood recession (deshek) based farming system	11,400	between 20 km North of Saakow town and Jilib	traditional flood irrigation on the floodplain combined with rainfed farming; low standard of production techniques; no support services	Maize Sesame Beans Vegetables/ fruits, etc.	6,700 3,000 500 1,100	5,450	tendency towards conversion into small-scale pump irrigation schemes; increased flood protection
Irrigation based farming systems							
- small scale	4,100	concentrated in Bardheere District; lately also in Saakow and Bu'aale Districts	low standard of pump irrigation and farming techniques; market oriented production; some access to farm inputs	Onions Tobacco Maize Sesame Vegetables/ fruits, etc.	19,300 460 3,200 800 1,700	1,000	expansion into Saakow and Bu'aale Districts
- medium scale (banana cultivation)	3,400	between Kamsuma and Yoontoy along the river in Jamaame District	private commercial market oriented big farms; advanced irrigation and farming techniques; strong support through SOMALFRUIT company	Bananas - exportable - non-exportable	 25,000 25,000	60	expansion through rehabilitation of existing schemes
- large scale							
Fanoole Project	1,000	between Jilib and Kamsuma, East bank of Jilib District	gravity irrigation of rice; large scale public enterprise	Rice, seasonals	5,400	300	low grade of inplementation with low expectations for improvement
Juba Sugar Project	7,000	between Fanoole and Kamsuma; west bank of Jilib District	pump-irrigated public enterprise; sprinkler irrigation	Sugarcane	278,250		implementation somewhat behind schedule
Mogambo Project	1,600	between Mogambo and Araare; West of banana plantations	pump-irrigated public enterprise; some smallholder participation	Rice	4,000		new scheme with some implementation delays

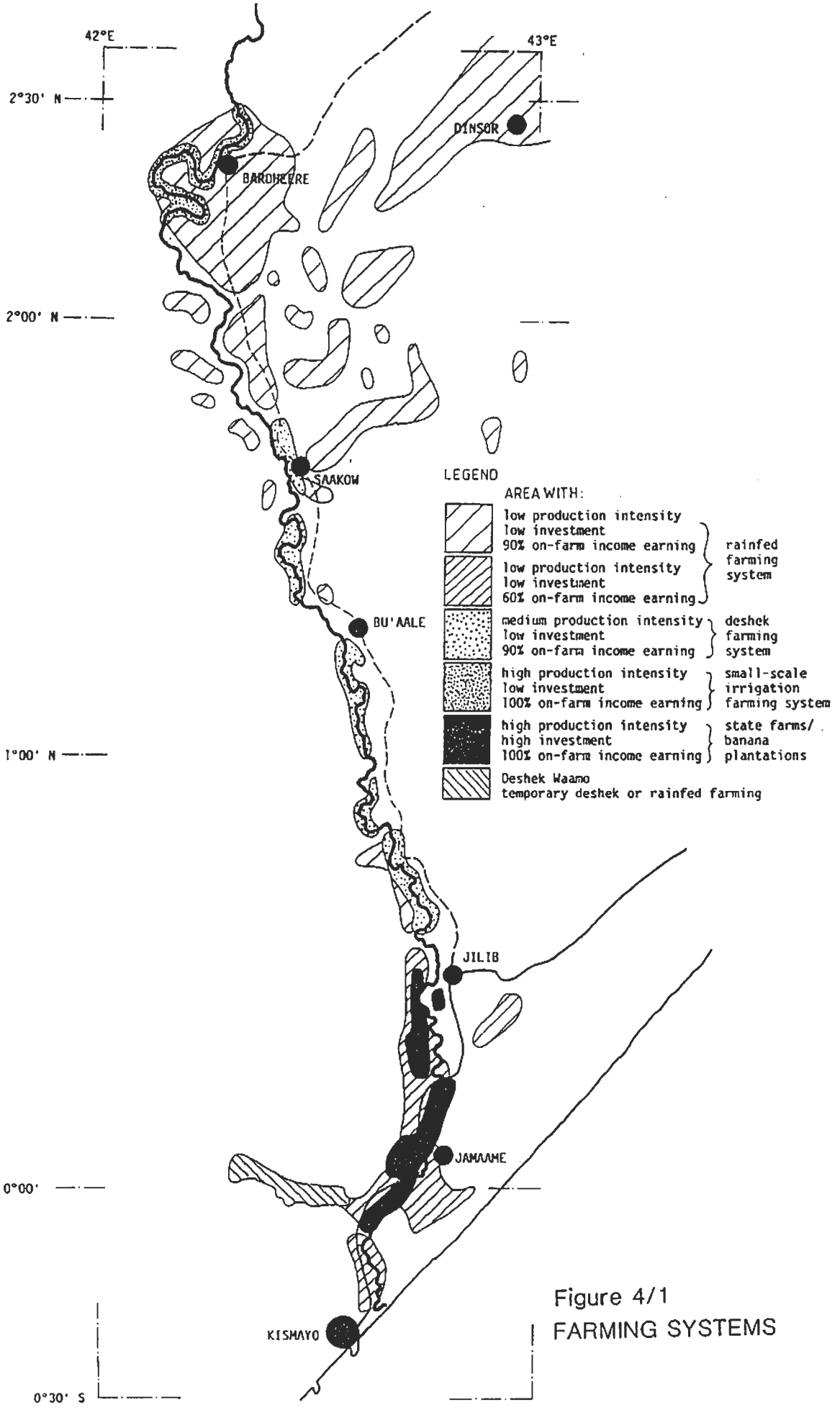


Figure 4/1
FARMING SYSTEMS

Table 4/8 presents an assessment of the distribution of the two subsystems.

Table 4/8 Rainfed Farming per District and Subsystem

Subsystem/ district	Farmland in ha	Annually cropped land in ha	Number of farm families	Average farm size in ha	Average cropping intensity
Subsystem 1					
Bardheere	58,000	82,000	6,400	9.0	140%
Saakow	35,000	44,100	3,500	10.0	125%
Bu'aale	2,000	3,900	400	5.0	195%
Subtotal	95,000	130,000	10,300	9.0	137%
Subsystem 2					
Jilib	7,000	6,500	2,500	2.8	93%
Jamaame	19,000	10,000	7,900	2.4	53%
Kismayo	1,500	500	600	2.5	33%
Subtotal	27,500	17,000	11,000	2.5	62%
Total	122,500	147,000	21,300	5.8	120%

The data also show that there are significant differences in the average size of the farms in the two subsystems. In the northern districts, farming takes place much more extensively than in the South, with also a much higher cropping intensity.

The cropping patterns shown in Table 4/9 are typical in the rainfed areas. In the northern districts, the cultivation of Sorghum dominates the cropping pattern, while the pattern is more diversified in the South. Intercropping is a common practice. In the North occasionally ratoon cropping of sorghum is practiced, when sorghum yield in the Gu season has been enough to supply the family's subsistence needs for the year.

Rainfed crop production is mostly without purchased inputs such as improved seeds, chemical fertilizers, pesticides, etc. Land preparation and in fact all farming activities are mostly done by hand: no more than 5-10% of the area under rainfed crop production is tractor ploughed (mostly in the lower Juba area). The yambo, a short-handled hoe, is the only tool in use. Draft animals are not used for land preparation.

Table 4/9 Typical Cropping Patterns for Rainfed Crop Production

District	Gu Season		Der Season	
Bardheere	Sorghum	86%	Sorghum	93%
	Maize	9%	Sesame	4%
	Sesame	4%	Maize	2%
	Beans	1%	Beans	1%
Saakow and Bu'aale	Sorghum	92%	Sorghum	96%
	Maize	5%	Maize	2%
	Sesame	2%	Sesame	2%
	Beans	1%		
Jilib (South), Jamaame and Kismayo	Maize	50%		
	Sesame	36%	No cropping because of flooding problems	
	Beans	10%		
	Groundnuts	3%		
	Cotton	1%		

Consequently, as shown in Table 4/10, crop yields are generally low.

Table 4/10 Total Production and Average Yields (1)

District	Crop	Cropped area in ha		Yields in t/ha		Production in t		Total production in t
		Gu	Der	Gu	Der	Gu	Der	
Bardheere	Sorghum	35,000	38,000	0.6	0.4	21,060	15,200	36,260
	Maize	3,700	800	0.7	0.4	2,590	320	2,910
	Sesame	1,600	1,600	0.3	0.2	480	320	800
	Beans	400	400	0.4	0.1	160	40	200
Saakow/ Bu'aale	Sorghum	22,600	23,600	0.6	0.4	13,560	9,440	23,000
	Maize	1,200	500	0.6	0.3	720	150	870
	Sesame	500	500	0.4	0.2	200	100	300
	Beans	250	-	0.4	-	100	-	100
Jilib/ Jamaame/ Kismayo	Maize	5,000	-	1.2	-	6,000	-	6.000
	Sesame	3,600	-	0.6	-	2,160	-	2,160
	Beans	1,000	-	0.5	-	500	-	500
	Groundnut	300	-	0.5	-	150	-	150
	Cotton	100	-	0.4	-	40	-	40

1) Not including Homboy area.

Other factors contributing to the low yields are the poor farming practices, the practically complete absence of production support services (extension, credit), the low degree of mechanization (including the absence of draft animals), flooding in the lower reach of the Juba and the climate, particularly the low rainfall in the North. Except for the latter, these factors could be improved upon. Probably most importantly, agricultural practices in dryland crop production could be better adjusted to the climate, through e.g. the introduction of water retention measures, better adapted crop varieties or planting of windbreaks to reduce evaporation.

The financial returns for the typical crops in the northern and southern district, is estimated in Table 4/11.

Table 4/11 Crop Budgets for Rainfed Farming (1987, SoSh)

District	Sorghum	Maize	Sesame	Beans	Groundnuts	Cotton
Bardheere/Saakow/Bu'aale (1)						
Gross margin (SoSh/ha)(2)	13,846	14,854	10,240	6,563	--	--
Return to labour (SoSh/md)(3)	257	266	205	221	--	--
Jilib/Jamaame/Kismayo						
Gross margin (SoSh/ha)	--	35,775	31,308	13,425	12,275	16,100
Return to labour (SoSh/md)	--	577	569	373	181	413

1) For sorghum, maize and beans, average values of Gu and Der Season have been applied.
2) Gross margin = Production value - Production costs (excl.labour)
3) Return to labour = Gross margin/Labour requirements in man-days (md)

The data show that the staple food items sorghum and maize are the most profitable to the farmers in terms of the return they achieve on their labour input. What the data also demonstrate are the substantially better returns in the climatically more favorably situated southern districts, allowing farmers there to concentrate their farming on smaller areas.

Applying the above crop budgets to typical farming households in the northern and southern districts, the farm budgets shown in Table 4/12 result.

Table 4/12 Farm Budgets for Rainfed Crop Production

Subsystem	Gross Margin (SoSh/farm)	Return to Labour (SoSh/md)	Management Income (SoSh/farm) (1)
Bardheere/Saakow/Bu'aale	145,883	258	69,676
Jilib/Jamaame/Kismayo	82,761	512	60,944

1) Management income = Production value - Production costs - Labour costs at market rate.

The analysis shows that in the southern districts the farm budget is substantially and management income is slightly lower, while the return on labour there is considerably higher than in the North, a result mainly of the better yields in the climatically more favourable South.

4.4.1.2 Flood Recession Crop Production

Flood recession (deshek) crop production, consists of two or three sub-units. Apart from the actual deshek land, which is usually the most productive farm area, rainfed crop production is also important. This may take place either on the levee soils, or on the marine plain. Most deshek farmers also keep a few cattle, goats, sheep or donkeys, and some poultry.

Table 4/13 presents details about the distribution of deshek farmland through the districts concerned.

Table 4/13 Deshek Farming per District

District	Farmland (ha) (1)	Annually cropped land (ha)	Number of farm families	Average farm size (ha)	Average cropping intensity
Saakow	1,800	3,600	1,500	1.2	200%
Bu'aale	5,900	11,800	2,185	2.7	200%
Jilib	3,700	7,400	1,762	2.1	200%
Total	11,400	22,800	5,447	2.1	200%

1) The figures given for farmland include about 7,000 ha of deshek land and about 4,400 of levee land. The deshek farmers in Saakow, on average, also have 3.5 ha of rainfed farmland on the marine plain, which is not included in this table.

Typical for this farming system is the highly productive deshek land, where a cropping intensity of 200% is achieved. However, in practice this is not the case. A high degree of risk is inherent in the system, as it is subject to droughts and major floodings from the river and, when excessive rains occur, also from the marine plain. Crop losses of 50% and above, due to flooding, are not uncommon. The risks of unexpected food shortages, inherent to this system, are reduced by the farmers also cultivating on the levees and the marine plain, under rainfed conditions.

During the past few years farmers have increasingly protected their lands from flooding. Up to 50% of the desheks have now some form of flood protection and this trend is continuing. In some desheks, water is channelled from the river through a gap in the bund or along a natural watercourse. The openings are made before the start of the irrigation season and are closed as soon as the desheks have been filled. In some cases, to prevent uncontrolled scouring of these gaps, gates have been installed. However, during

very high floods the river water may still overtop the flood bunds and cause damage to the fields. Attempts are also made to completely protect desheks from flooding by converting them to pump irrigated schemes. However under present conditions (uncontrolled river regime) complete protection against flooding is not feasible.

The following cropping patterns are representative for each different land type of the districts where deshek farming is practiced (Table 4/14).

Table 4/14 Typical Cropping Patterns of Deshek Farming System

District	Deshek Cultivation				Levee Cultivation			
	Gu season		Der season		Gu season		Der season	
Saakow	Maize	77%	Sesame	78%	Maize	76%	Sesame	60%
	Sesame	21%	Maize	16%	Sesame	20%	Maize	32%
	Vegetables	2%	Beans	6%	Beans	4%	Beans	8%
Bu'aale	Maize	98%	Sesame	77%	Maize	80%	Sesame	80%
	Sesame	2%	Maize	23%	Sesame	10%	Maize	16%
					Sorghum	7%	Beans	4%
					Beans	2%		
					Vegetables	1%		
Jilib	Maize	79%	Maize	48%	Maize	65%	Sesame	77%
	Beans	14%	Sesame	46%	Beans	22%	Maize	22%
	Vegetables	7%	Vegetables	6%	Vegetables	1%	Vegetables	1%

Maize and sesame are thus the main crops grown, the former mainly for the farming family's own needs, the latter also as a cash crop. In Jilib District, where there is a larger urban population, beans and vegetables play an increasing role.

Table 4/15 presents data on crop production and yields for the three districts. Differences in yield levels between the districts are due to differences in total rainfall and its distribution.

Farmers practicing flood recession crop production in the three districts like those in the rainfed areas also do not buy inputs like improved seeds, fertilizers or pesticides. Seeds are purchased only by tobacco, onion and vegetable growers. Land preparation is mainly by hand, only about 20% of the area is tilled by tractors and disc ploughs. Animal traction is not used. Crop losses due to pests and diseases are estimated at about 25% of expected yields.

Farm produce is used mostly for home consumption. A few farmers use maize stalks for fodder; others sell or give it to nomadic stockowners. Watermelon, tobacco and occasionally onions are cultivated as cash crops.

Table 4/15 Crop Production of Deshek Farming

District	Crop	Cropped area in ha		Yields in t/ha		Production in t		Total production in t
		Gu	Der	Gu	Der	Gu	Der	
Saakow	Maize	1,365	425	0.675	0.450	921	191	1,112
	Sesame	380	1,240	0.275	0.275	105	341	446
	Beans	35	125	0.400	0.350	14	44	58
	Vegetables/ others	20	--	4.250	--	85	--	85
Bu'aale	Maize	5,250	1,180	0.500	0.400	2,625	472	3,097
	Sesame	350	4,600	0.325	0.300	114	1,380	1,494
	Sorghum	180	--	0.180	--	32	--	32
	Beans	60	120	0.400	0.400	24	48	72
	Vegetables/ others	60	--	4.250	--	225	--	225
Jilib	Maize	2,660	1,295	0.780	0.675	2,075	874	2,949
	Sesame	220	2,295	0.450	0,400	99	918	1,017
	Beans	670	110	0.475	0.450	318	50	368
	Vegetables/ others	150	--	5.100	--	765	--	765

The limiting factors, negatively affecting yields, are the same as those mentioned for rainfed farming, with the mentioned risk of flooding being an additional factor.

Farming activities are mainly carried out by the family members themselves, the use of hired labour is only of marginal importance.

The crop budgets in this farming system are summarized in Table 4/16 and indicate a very high profitability for the cultivation of vegetables.

Table 4/16 Crop Budgets in Deshek Farming

Land type	Sorghum	Maize	Sesame	Beans	Vegetables
Deshek/levee					
Gross margin (SoSh/ha)	--	17,441	17,699	10,888	101,325
Return to labour (SoSh/md)	--	260	272	287	1,101
Rainfed land					
Gross margin (SoSh/ha)	13,846	14,854	10,248	--	--
Return to labour (SoSh/md)	256	270	205	--	--

Although deshek cultivation gives higher net returns than rainfed agriculture, returns to labour for the major crops do not differ because of higher labour requirements. Deshek farming, however, allows the cultivation of high-value cash crops showing the economic superiority of this farming system as a whole.

4.4.1.3 Irrigated Crop Production

Irrigated agriculture is practiced on a small, medium and large scale, with each type having its own, distinct characteristics.

(1) Small-Scale Irrigated Crop Production

Small-scale irrigated crop production has developed over the last 10 to 15 years along the Juba river and its importance is rapidly increasing. The majority of farmers practicing small-scale irrigation are still concentrated in Bardheere District, but there is a strong tendency to expand irrigation in Saakow and Bu'aale Districts. Table 4/17 shows some characteristics of small-scale irrigated farmland.

Table 4/17 Small-scale Irrigated Farming per District (1988)

District	Farmland (ha)	Annually cropped land (ha)	Number of farm families	Average farm size (ha)	Average cropping intensity
Bardheere	2,500	5,000	830	3.0	200%
Saakow	900	1,800	300	3,0	200%
Bu'aale	700	1,400	113	6,2	200%
Total	4,100	8,200	1,243	3.2	200%

Two management systems are recognized in small-scale irrigation farming. In the first system (particularly in Bardheere District) ownership of land and irrigation pump is combined and the farm is managed by one family with hired labour constituting a substantial part of the workforce. The second system is the sharecropping arrangement. Under one variant the farmer owns the land and the pump, but the actual cultivation is done by sharecroppers, particularly on larger units. A more recent arrangement is that ownership of pump and land are in different hands. Here the pump owner delivers irrigation water to a group of farms, under certain financial conditions.

Irrigation farmers usually also farm some land under rainfed conditions as an additional measure to spread risks.

The cropping pattern for a typical 3 ha irrigated farm would be as shown in Table 4/18.

Table 4/18 Cropping Pattern Irrigated Farm

Gu/Xagai Seasons		Der/Jilaal Seasons	
Onions	30%	Onions	35%
Sesame	25%	Tobacco	25%
Maize	35%	Maize	25%
Tobacco	10%	Sesame	10%
		Watermelons/ tomatoes and other	5%

The cropping pattern reveals a strong cash crop orientation, with onions and and tobacco being the main products. Nonetheless, first priority is always given to meeting the staple food requirements, i.e. maize.

The average yield and production data for the different crops grown under pump irrigation on smallholder farms are shown in Table 4/19.

Table 4/19 Total Production and Average Yields (based on 4,000 ha)

Crop	Cropped area in ha		Yields in t/ha	Production in t		Total production
	Gu/Xagai	Der/Jilaal		Gu/Xagai	Der/Jilaal	
Onion	1,200	1,400	9.0	10,800	12,600	23,400
Tobacco	400	1,000	0.4	160	400	560
Maize	1,400	1,000	1.6	2,240	1,600	3,840
Sesame	1,000	400	0.7	578	280	980
Vegetables/ fruits and others	--	200	10.0	--	2,000	2,000

Obviously, there is ample room for improvements in productivity, as irrigated small-scale farming also uses few external inputs such as improved seeds, fertilizers or pesticides. Land preparation is also mainly done by hand, no more than 30% of the land is prepared mechanically. In 1987 six work oxen were used for land preparation and many farmers expressed their readiness to use oxen if available. For onions and occasionally for maize commercial seed is purchased. For onions some plant protection measures are taken. The main constraints to achieving a higher productivity are considered to be an unreliable input supply (including spare parts for pumps), no facilities, low degree of mechanization and an inadequate extension service.

The typical financial returns achieved by the farmers practicing small-scale irrigation for the different crops are shown in Table 4/20.

Table 4/20 Crop Budgets in Irrigated Farming

Item	Maize	Sesame	Onions	Tobacco	Vegetables
Gross Margin (SoSh/ha)	37,095	26,943	310,820	7,220	113,000
Return to labour (SoSh/md)	522	396	2,527	67	876

The data show by far the highest gross margin for onions, followed by the one for vegetables. In all cases the financial returns to labour exceed those for the other farming systems.

Applying the above crop budgets to a typical farming household, the farm budget shown in Table 4/21 results.

Table 4/21 Farm Budget for Small-Scale Irrigated Crop Production

Gross Margin (SoSh/farm)	Return to Labour (SoSh/md)	Management Income (SoSh/farm)
757,345	1,273	677,040

Small-scale irrigated crop production is thus very profitable and financially significantly more attractive than rainfed or deshek agriculture. This attractiveness is, of course, the reason behind the tremendous expansion of this activity in SGU's 1 and 2 and the associated run on the irrigable land.

(2) Medium-Scale Irrigated Crop Production

Medium-scale irrigated crop producers are, with few exceptions, the banana growers between Kamsuma and Yontoy on both banks of the river. Commercial banana production was first introduced by Italian farmers in the mid-1920's. Of the total area, which reached 8,300 ha in the early 70's, only about 3,400 ha were actually under bananas in early 1987. The remaining nearly 5,000 ha are abandoned or used for seasonal cropping, but could be redeveloped for banana production.

This subsector is organized on the basis of a nucleus estate with outgrowers. The nucleus estate is in the hands of SOMALFRUIT, a joint venture between the Government and the private sector. SOMALFRUIT also organizes input supply, technical advice, marketing and medium- and short-term credit for the growers. In 1987 there were 61 banana farms and 54 producers, who had an

average area of banana plantation between 1 and 50 ha. Nearly all growers are private farmers, but four farms are owned by MoA, on which 55 ha are planted with bananas.

Two different management systems can be distinguished. One employs a high level of inputs and a medium level of farm technology, while the other uses few inputs and employs a lower level of technology. Farms belonging to the first group are generally well managed, following the example set by SOMALFRUIT on its own farm. On these farms, land preparation and weeding is mechanized, fertilizer is applied and some pest and disease control measures are taken. The majority of the farmers, however, belong to the second group.

Of the total crop, only about 50% meets export quality standards. The remainder is sold on local markets. In 1987, an estimated 25,300 t of exportable bananas were produced.

Presently, the gross margin of 1 ha of bananas is about SoSh 28,400. On the SOMALFRUIT farms, where the exportable banana percentage is much higher, the gross margins are about SoSh 120,000.

The main constraints to banana production are poor drainage, flooding, seasonal shortage of irrigation water and wind damage due to heavy storms. Furthermore the banana growers are permanently short of skilled and unskilled labour.

(3) Large-Scale Irrigated Crop Production

Large-scale irrigated crop production is practiced on three public enterprises: Juba Sugar Project, Fanoole State Farm and Mogambo Irrigation Project, all of which are located in the lower Juba area.

The Juba Sugar Project started in 1976 and is run as a state farm, with considerable foreign management and technical assistance provided by British and Arab aid. By 1987, the project had 7,000 ha under sugar cane, mostly with sprinkler irrigation. Although at the time of project design yields of 100 t/ha of cane were forecast, these were only achieved on trial plots. The highest average yields were achieved in 1982 (89.6 t/ha), but since then they have been declining to 61.4 t/ha. Many factors have contributed to this decline, with the more pronounced being water shortages due to insufficient supply of diesel and low river flows in the dry season, inadequate supply of spare parts due to insufficient local and foreign funds and problems in attracting and keeping the required skilled labour. Despite a decline in agricultural yields, progress has been made in improving the sugar extraction rate, which has risen from 6.5% in 1980 to 9.6% in 1987.

The profitability of the Juba Sugar Project is strongly influenced by the ex-factory price of sugar which is controlled and set by the Government. In 1987 the project employed 2,000 permanent staff. This staff is supplemented by 1,200 to 2.000 casual labourers. Apparently the project is facing problems in obtaining labour, because of unattractive living conditions, scarcity of skilled labour and rapid inflation, eroding the salary and wages base, despite the right of the industrial workers to bargain collectively with the management for their wages.

The Fanoole State Farm is a multipurpose project which includes infrastructure, hydropower generation and agricultural development by gravity irrigation. The farm area is between Jilib and Kamsuma on the left bank. The project is run as a state farm by MoA with assistance from the People's Republic of China.

Water is supplied from the Fanoole barrage by a 56 km long main canal. Of the net irrigable area of 7,500 ha, approx. 1,500 ha had been developed by 1988. Half the developed area is under rice in the Gu, the other half in the Der season. Average yields for the Gu and Der seasons of 1987 were 4.4 t/ha. Although double cropping was originally intended, this has not been achieved so far. As a rule, fertilizers are applied and weed control is with post-emergence herbicides. The only rice variety grown is IR 24, which is harvested 140 to 145 days after sowing. Sowing is done directly, harvesting is mechanized. The project has its own rice mill, which has been designed to handle the crop from 7,000 ha assuming double cropping.

In 1987 the project had 263 permanent Somali staff and additionally 400 Chinese engineers and technicians. There are also about 1,000 casual labourers.

The Mogambo Irrigation Project is further downstream, in Jamaame District. It was started in 1981 and has been originally supported by German and Arab aid. With the withdrawal of the latter, the project now receives financial and technical assistance only from Germany. It was originally designed as a state farm with a 10% smallholder component for rice cultivation under surface and possible future cotton growing under sprinkler irrigation. The first phase, completed in 1986, comprises 2,050 ha of surface irrigation and 160 ha of sprinkler irrigation. The smallholder component has meanwhile been increased to nearly 30%. About 300 farmers now each hold a 2 ha plot, so that by 600 ha of the total 2,200 ha of the project are cultivated by smallholders. Actual responsibility of the smallholders, however, is small, as the project provides all essential services, with the smallholder mainly being responsible for infield irrigation and bird scaring.

Mogambo's original concept of double cropping of rice has not been achieved, because of capacity constraints of the existing machinery and because of the threat of increasing soil salinity which is now being monitored. Trials have been carried out to identify alternative crops to be grown in the second season, but no really promising crops have been found so far.

Since 1988 the project has its own rice mill, which is considerably underutilized, as the yields actually achieved do not even reach 3 t/ha in one season, compared to the original design parameter of 4.5 t/ha twice a year. The reasons for the low yields are mainly due to organizational and management problems. Serious crop losses have also occurred as a result of flooding and attacks by Quelea quelea (weaver) birds.

4.4.1.4 Crop Production Support

Security of land tenure is probably the most important factor determining the farmer's willingness to invest into improvements on his land so that productivity would be increased. The already mentioned fact that in some areas of the Juba Valley the traditional land tenure security situation appears to be seriously eroded, must therefore have a negative impact on crop production.

To actually support the farmers in crop production endeavors, a number of systems have been set up for providing support services, most of them through MoA (ANNEX 5).

(1) Agricultural Research

Agricultural research has recently been given its own directorate, which is now responsible for managing the country's research activities at the three main centers. These are the Central Agricultural Research Station (CARS) at Afgoi near Mogadishu, the Bonka Dryland Research Station in the Bay Region near Baydhoba and Aburin in the Northwest, which concentrates on the specific needs of that region and is therefore not really relevant for the Juba Valley. At Bardheere, a new research station is now being built.

The Bonka station works on the introduction of animal traction to southern Somalia where traditionally oxen and donkey are used for haulage but not for tillage. The station has also begun to introduce some elements of farming systems research in their research planning and implementation. At Afgoi, which is the oldest agricultural research institute in Somalia, issues pertaining to irrigated crop production are supposed to be tackled on a priority basis.

Since 1983, Somalia has been working with the International Service for Agricultural Research (ISNAR) to formulate an appropriate national research programme. Many of the activities covered in the programme are also of relevance for the Juba Valley, but progress has been slow and no specific research activities have so far been undertaken in there. To enable agricultural research to make a more meaningful contribution to agricultural development in the Juba Valley, which at present is mainly geared towards the provision of subsistence needs, a greater understanding and appreciation of the area specific socioeconomic factors influencing the prevailing farming systems is required.

(2) Agricultural Extension

Agricultural extension is the responsibility of the Agricultural Farm Management and Extension Training Project (AFMET) operating under MoA's Director General for extension. The Project is based on the Training Visit (T&V) system and is supported by the World Bank, African Development Bank, EEC and USAID. Its headquarters and in-service training wing are in Afgoi. Since the resources allocated to AFMET would not allow for the simultaneous upgrading of the service throughout the country, it was decided to concentrate field staff in the three most productive regions, i.e. in the Middle and Lower Shebelli and in the Bay Region. Strengthening of the service in the Study Area has been of lesser importance and AFMET had therefore so far little effect in the Juba Valley. This is expected to change with the implementation of the second phase of the project, also covering parts of the Study Area.

Staff for the Study Area are stationed presently in Jilib, Badhaade, Bardheere, Jamaame and Saakow. Their mobility is impaired by lack of suitable transport and funds to operate such facilities that they have, and also by organizational issues which, however, are currently being resolved.

Morale of the service in the Development Area is low because of delays in implementing improvements in their terms of service and because they either do not have a message to tell or the message is inappropriate as it involves the use of improved seeds, fertilizer or agro-chemicals, which are not available in the markets.

SOMALTEX, the textile corporation based in Balacad, north of Mogadishu, is supports cotton growing to meet the needs of its spinning and weaving facilities. They provide specialized extension, a tractor hire service, free seed and credit for pesticides and spraying. In practice, they lack the trained personnel meaningfully to advise growers (AFMET does not advise on cotton) and also the equipment and material with which farmers would be able to benefit from the advice. SOMALTEX is almost the sole buyer of seed cotton; home industry users lack ginning facilities (Somalia has just one functioning ginnery in Balacad; the one in Jamaame has been inoperative for several years) and their markets are also shrinking. Yet Somalia at one time was Africa's fourth largest cotton producer after Egypt, Sudan and Uganda. In principle at least the crop has great potential, since it grows well in the Juba Valley.

In addition to the services provided by AFMET and SOMALTEX, SOMALFRUIT provide extension and other services to the banana. Finally, MIP supports the smallholders integrated in the Mogambo project.

(3) Input Supply

Agricultural inputs to farmers are supposed to be provided through the Agricultural Development Corporation (ADC). However, due to the severe shortage of foreign exchange in the country, ADC is practically not in a position to fulfill this role. At present, nearly all fertilizer, herbicides and pesticides used in the Juba Valley are imported by the the three large-scale projects, SOMALFRUIT and SOMALTEX directly for their own needs.

(4) Credit

In principle, short-term production credit to finance inputs and labour to grow crops (8-12 months) is available from the Commercial and Savings Bank of Somalia (CSBS), while longer-term (3-10 years) credit is provided by the Somali Development Bank (SDB). In practice, however, the former have insufficient funds to service more than a minor part of the demand in the more convenient, and more easily accessible middle and lower Shebelli regions, while the latter has been very cautious about lending to farmers, particularly as, according to current practice and legislation, land is not a negotiable commodity thus no security for betterments carried out on it. Detailed data about the actual credit given to the agricultural sector in the Juba Valley are not available, but the volume so far granted appears to be very small.

CSBS is being supported in procuring inputs and granting of credit through FAO and the United Nations Capital Development Fund, but lending activities have so far concentrated on the Shebelli valley.

SOMALFRUIT, SOMALTEX and MIP provide credit in kind to the farmers working with them for inputs and services provided.

(5) Farm Machinery Services

The service for land preparation is provided by ONAT (an autonomous agency of MoA), a limited number of private tractor owners and, for cotton growing, also by SOMALTEX. ONAT and the private tractor owners provide their services for cash, SOMALTEX deducts the cost from the seed cotton they buy. Demand for tractor hire services far exceeds supply even though its quality leaves much to be desired.

(6) Marketing

Until mid-1982, ADC had the monopoly in grain marketing and farmers were obliged to sell their produce surplus to ADC. Since the beginning of the liberalization of marketing in 1982, and particularly since the removal of ADC's monopoly, private traders have become more and more active in the Juba Valley and paid generally higher than the Government set prices paid by ADC. This development has generally led to a situation that producers of grains have no difficulty of selling their surplus at freely established market prices. At the same time, ADC's influence and role has diminished and it acts as a buyer of last resort, trying to maintain at least some strategic reserves in the region. ADC also operates some mills. One maize mill is located in Kismayo.

Marketing of bananas for export is handled by SOMALFRUIT and cotton is bought by SOMALTEX. Sugar is bought by the Government, while for rice the marketing has now been liberalized and is left to private traders.

4.4.1.5 Market Prospects for Crops

Conditions in the Juba Valley (soils, climate, water availability) allow the cultivation of a wide range of agricultural produce. Market prospects (ANNEX 6) are one of the criteria to be taken into account when determining future cropping patterns.

The main obstacle encountered in the analyses of market prospects is the lack of reasonably reliable data. At present, only little data are available and these are often conflicting. Therefore, projections mainly serve the purpose of identifying possible trends.

The demand for basic food items differs among the three sub-groups of Somalia's population (nomadic, settled rural, urban) according to their individual consumption patterns. On average, the desirable energy intake in Somalia has been estimated at about 2,200 kcal/cap/day.

This demand is partially met through internal production and and for the remainder through imports, largely in the form of food aid. Although local production is dependent on climatic conditions, economic incentives like the liberalization of market policies and the rise in producer prices between 1982 and 1986 have proved to be an efficient instrument to raise production and marketable surplus. In 1985, Somalia achieved near self-sufficiency in traditional cereals (sorghum and maize), while the supply deficits of sugar, legumes, edible oils and rice were slightly reduced.

In spite of increased domestic production, food imports continued. This had a number of negative effects such as fall of prices, changed consumption patterns and ultimately the weakening of farmers' incentives to produce beyond their domestic needs.

Comparing energy requirements as determined above and actual average food supply, an average food deficit of about 15% probably prevailed during the last number of years. Depending on rainfall and other climatic conditions, considerable variations from this average have been experienced.

Future demand for food will be influenced by population growth (3.1% p.a.), increases in income (4.1% p.a.) and by urbanization and sedentarization. It is assumed that the proportion of the nomadic population will decrease from 55% to 45% by 1995. Both quantitative and qualitative changes can be expected in the consumption pattern. Consumption of animal products is expected to decrease in relative terms, since rangelands are at their upper limit of carrying capacity, and increased offtake, if at all, will come about only slowly.

Income elasticity of demand for traditional cereals is estimated to be around one. For rice, wheat, fruits and vegetables a higher elasticity is expected. Therefore, future demand for agricultural products will grow faster than the population.

Agricultural price policy in the past was guided by the principle of benefiting the urban population by setting prices at low levels. Consequently, agricultural production declined. In 1982 trading was liberalized and prices could be determined by normal market forces, except for sugar, cotton and bananas. Comparing farmgate prices actually paid in 1986 with border parity prices, traditional cereals were still undervalued but prices for imported commodities like sugar, rice, cotton and vegetable oil were above border parity prices, to save foreign currency and to give incentives to domestic production.

For a number of groups of agricultural products, specific market prospects have been determined.

Cereals: The demand for traditional cereals is expected to grow at a rate of between 3% and 4% per annum. Surplus production is compensated by restricting the supply of wheat and rice. For rice, the deficit in 1995 is estimated at 90,000 t. Actual farmgate prices presently encourage rice cultivation.

Oil crops: Between 50% and 70% of vegetable oil requirements are imported. Since demand is expected to rise quicker than local production, the farmgate price for sesame will increase, setting high incentives to its cultivation. Alternative crops like soybeans could also find markets depending, however, on consumer acceptance.

Legumes: Increasing demand and higher producer prices have created a rising market potential for beans. Continuing urbanization and sedentarization will ensure a good future market.

Fruits and Vegetables: Generally, market prospects are good for fruits and vegetables. With the exception of onions, the marketing risk for any perishable product from the Juba Valley is high, given the long distance to the main consumption centre, Mogadishu. Competition from the Shebelli valley, where transport costs are lower, has to be taken into account.

Sugar: Market prospects for sugar are favourable, since about 50% of the national demand has to be imported. Supply deficit is estimated at 64,000 t of raw sugar by 1995. Production suffers from seasonal shortages of irrigation water and from occasional flooding. Price projections show rising trends, thereby making sugar production economical, even though world market prices have been at such a low level that investment into any new facilities will probably not be justifiable.

Cotton: There are no obstacles to promote cotton cultivation up to the limits set by internal demands. World market price forecasts show a clear upward trend.

Bananas: For bananas, one of the most important export crops, an export potential of 200,000 t to Italy and the Middle East is realistic. At present only 45,000 t are exported. Although price forecasts indicate a slight decrease by the year 2000, substantial improvements in productivity are expected after the construction of the Bardheere Dam. At least half of the exports will have to originate in the Juba Valley.

The market prospects for agricultural produce in Somalia are therefore generally quite good, provided agricultural policies continue to provide sufficient incentive to the producers.

4.4.2 Livestock

The nomadic and semi-nomadic livestock system is Somalia's main economic activity and provides the livelihood of 50-60% of the national population (ANNEX 7). Livestock also accounts for about 35% of GDP and more than 80% of the country's export earnings. There are three systems of livestock production:

- The traditional nomadic pastoralism, which requires a high degree of spatial mobility to avoid disease and mortality, and to derive maximum advantage from available water and grazing resources. Nomadic livestock producers generally have mixed herds, which allow them to make good use of grazing and browsing conditions, vegetation and seasonal changes. Livestock production satisfies the needs for milk, meat and transport and also provides cash income.

- The agro-pastoral system has been established more recently. Either former nomads keep livestock and carry out marginal cultivation, engaging only part of the family, or pure agriculturists keep a few animals by their homesteads but crop cultivation remains the main source of income. In both cases the new activity may be increased or decreased according to circumstances.

- In and near the bigger villages or towns a specialized urban and periurban dairy and poultry production system has developed. It operates on zero grazing and has little or no linkage to farmland or grazing grounds, i.e. all feed is purchased. In Mogadishu, about 30-40% of the fresh milk consumed is provided by these producers. Most producers are in the private sector, but a number of public sector units still exist. However, there is a tendency to privatise these units.

The national livestock population in 1987 was estimated at 6.3 million camels, 4.4 million cattle, 12 million sheep and 18.7 million goats. During the last 15 years numbers have increased at an average annual rate of a little over 1%. Future growth rates will depend on human population increase, export marketing opportunities, range conditions and on sectoral development performances.

Official export figures over the last 10-15 years show declining cattle export but good market opportunities for small ruminants. Camel export has increased from 7,000 in 1985 to about 20,000 in 1987.

4.4.2.1 Livestock in the Juba Valley

Livestock estimates of 1984 for the Gedo, Middle Juba and Lower Juba Region are presented in Table 4/22.

Table 4/22 Estimated Size of Livestock Herds in the Development Area

Region	Area km^2	Camel No.	Cattle No.	Sheep No.	Goats No.	TLU (1)
Gedo	38,592	329,000	231,000	183,000	723,000	670,000
Middle Juba	43,572	219,000	383,000	102,000	356,000	615,000
Lower Juba	35,114	163,000	823,000	52,000	209,000	880,000
3 Regions Using Juba Riverine Resources	117,278	711,000	1,437,000	337,000	1,288,000	2,165,000
		900,000	1,800,000	420,000	1,600,000	2,720,000

1) Tropical Livestock Unit = TLU = 250 kg
(1 camel = 1.2, 1 cattle = 0.8, 1 small ruminant = 0.1 TLUs).

As the Development Area includes five districts of the Bakool, Bay and Lower Shebelli Regions, these estimates have to be increased by 25-30%, as shown above, to give the total number of animals making permanent or seasonal use of Juba riverine resources.

4.4.2.2 Livestock Ownership

Findings from informal interviews indicate that nomadic livestock ownership in the Juba Valley shows different patterns:

Big camel owner	: 150 camels and 235 small ruminants
Big cattle owner	: 8 camels, 200 cattle and 125 small ruminants
Big owner, mixed	: 105 camels, 80 cattle and 130 small ruminants.
Small camel owner	: 25 camels and 55 small ruminants
Small owner, mixed	: 7 camels, 35 cattle and 50 small ruminants

Farmers practicing rainfed or irrigated agriculture, keep smaller numbers of livestock, mainly cattle and small ruminants. The average number of livestock per farmer is 5-10 heads of cattle and 5-12 goats and sheep. Those in the Dinsor/Baydhabo area and near the Kenyan border in Afmadow and Saakow District (rainfed Sorghum production) own rather more animals. Integration of crop and livestock production is actively pursued by the farmers. Nonetheless there appears to be room for improvement in this area.

Animal traction is confined to haulage in small carts. Donkeys are used in the tsetse-free North and oxen and bulls in the area south of Jilib.

4.4.2.3 Livestock Movements

At present, most of the livestock in the Juba Valley belongs to pastoralists whose homesteads are away from the tsetse-infested river valley, in open bush or grassland east and west of the river.

Based on numerous interviews and taking into account the main findings of recent studies by JESS, there seem to be three main pastoral movement patterns for camels and cattle (Map 12) according to seasonal water and soil conditions, threat of biting and sucking insects and clan or family meetings:

- a west-east movement from and to the river;
- a north-south movement between lower and higher rainfall areas and
- a movement between rainy season rangelands and dry season cropped areas.

Small ruminants, older lactating cows and their offspring commonly stay behind with part of the family. Traditional nomadic transhumance pattern can be totally disturbed or changed in case of severe drought. Under extreme drought conditions pastoralists usually gather near rivers, settlements and main roads awaiting eventual humanitarian relief actions.

During the rainy season there are generally good grazing and watering conditions outside the river valley. Stock sometimes go to distant locations in Kenya and Ethiopia.

Sedentary livestock also uses grazing resources outside the actual farming areas, in the open rangelands.

4.4.2.4 Livestock Productivity

Due to the stage of development of the Juba Valley, reliable data about animal husbandry practices are few and in some cases inconsistent.

Camels are the most important species for pastoralists in the northern and western part of the Juba Valley, although they are found within the whole Development Area. Camels are kept for milk, meat and transport of goods (exceptionally, for weak members of the family), they are not ridden. Lactating females yield at least twice as much milk as cattle: 900-1200 kg per lactation. Camel milk is highly appreciated. But only some of the females are in milk, because of long pregnancy periods and low fertility rates.

Camels are very sensitive to trypanosomiasis and fear certain sucking insects like Tabanidae. They can stay without drinking water for one to three weeks and can carry loads over long distances. They do not depend on grazing alone, they are browsers and can live on twigs and leaves of shrubs and trees. Calf mortality is high and its epidemiology is not well known.

Cattle are popular in the Juba Valley, with the largest concentration being in the southern part. Compared to camels, they are much higher overall meat producers, allowing an offtake rate of close to 10% per year.

In the tsetse-free areas north, west and east of Bardheere, the Surqa (or Jiddu) breed is predominant. In the southern part Boran breed is most commonly found. Cattle (specially Surqa) are sensitive to trypanosomiasis, for which they can be treated and protected with trypanocidal drugs.

Cattle are not browsers like camels and goats but can live on all sources of roughage and crop residues. Their watering interval should not exceed 2-3 days.

Sheep and goats can be discussed together because of usually mixed herding and similar productivity, except for milk production and grazing/browsing habits. In the Development Area, goats (ca. 80%) predominate over sheep (ca. 20%). Apparently, people prefer lean goat meat to fat sheep and pay much higher (50-100%) prices for the former. Goats yield more milk than the kids need. All sheep are of the Persian Blackhead breed. They have a strongly developed fat rump when well fed.

Two different goat breeds can be found in the Juba Valley, the all-white Galla breed and the colored, long haired Somali-Arabian Dairy Goat which yields considerably more milk (about 200-300 l/lactation).

Donkeys are mainly used in villages and towns, specially in tsetse-free areas. Because of their sensitivity to trypanosomiasis, general increase in their use can only be expected after total tsetse fly eradication.

Poultry kept in a scavenger-type production pattern are common in small settlements, villages and towns. They do not compete for human food since they usually live on household and grain harvest residues, and on insects, beetles and caterpillars. Near the bigger towns (i.e. Kismayo), specialized commercial poultry units exist which are highly dependent on protein concentrate and other essential inputs.

4.4.2.5 Livestock Nutrition

The majority of Juba Valley livestock stays continuously or seasonally on natural grazing and browsing resources. Apart from fodder, an increasing number of non-browsing animals (mainly cattle and sheep) makes use of by-products from crop cultivation. Crop production statistics show that about 550,000 t of crop residues are available for cattle and sheep. An estimated 1.8 million cattle and 0.4 million sheep probably make use of these resources during the later dry-season period. It can be assumed that cattle and sheep in the Juba Valley meet over 1/3 of their dry season feed requirements from available crop residues.

Rice bran from the mills in Fanoole und Mogambo is used by farmers but also by semi intensive dairy and poultry production units as animal feed.

Sugar cane by-products are not available for livestock feeding. Cane leaves and tops are totally destroyed by burning, bagasse is burnt in the boilers of the factory for the generation of process steam and power and molasses is sold.

Rice straw is partly burnt on the fields (Fanoole) or baled and sold at the Kismayo fodder market for relatively high prices (SoSh 5-10/kg).

There is practically no palatable by-product from the banana plantations.

4.4.2.6 Livestock Watering

The main source for livestock watering during the dry season is the Juba river. Water access is sometimes restrained or prevented by farms along the river banks. In future, with increased cultivation along the river, this will likely result in land use conflicts which can only be avoided by arranging for access corridors to the most important watering points.

The next most important watering possibility is in the bigger desheks, where thousands of animals can drink at the same time.

The third source of water are the "wars", artificial water reservoirs, where surface runoff water is collected. There are some 25 big Government built (mostly EEC-funded) wars of 20-50,000 m^3, east of the river in the Bay, Middle Juba and Lower Shebelli Regions (Map 13). In addition, there are thousands of small wars with a capacity of up to 2,000 m^3, built and owned by private livestock owners, many of which being situated in the western part between Afmadow, Diif and Badhaade. These usually have water during the rainy season and only part of the dry season. In most cases, livestock has to use river or deshek water during the crucial second half of the Jilaal.

Finally, groundwater is an important source for humans and livestock. In the northern plateau zone, in the numerous river beds (togga's) shallow wells are commonly dug into sand or gravel underground. Water is drawn by hand, since the water table is usually shallow. Further south, conditions are favourable for hand-dug shallow wells in the Juba and Shebelli river alluvial zone between Bu'aale and the river mouth and on the lowest stretch of Shebelli river (swamps and creeks).

A number of pump-equipped boreholes with mostly large watering capacities have been installed during the last 25 years by the Government in collaboration with donor organizations. These tubewells are mainly in Gedo, Bay and Lower Juba Regions. Many of the tubewells do not function because of insufficient water, high salinity, technical breakdowns of the pumps or insufficient operating budget.

Generally, man-made watering points west of the river are by now so numerous that there is a danger of the area becoming overstocked.

4.4.2.7 Animal Health

The animal disease situation in the Development Area is not quite clear, as exact data are not available. Based on reports of RVC's and DVO's and on informal interviews it is believed that because of high mobility and frequent contacts with other animals, changing soil and watering conditions, nomadic livestock is exposed to many diseases.

Some epizootical, contagious diseases like rinderpest are now under control. However, the vaccination coverage for other diseases is not extensive enough for sustained protection from outside contagion. But, Somalia participates in the OAU-sponsored Panafrican Rinderpest Campaign (PARC) and in all border areas, including the Development Area, national cattle stock will be repeatedly vaccinated against rinderpest and contagious bovine pleuropneumonia. Other contagious diseases of small ruminants like sheep pox and contagious caprine pleuropneumonia occur in the area requiring also regular vaccination over a certain period.

A wide range of parasites stock in the Juba Valley. Gastrointestinal endoparasites affect in particular young and underfed animals. Infection is promoted in big herds and through stagnant water bodies. Ectoparasites (i.e. ticks) weaken the organism and serve as vectors for the transmission of certain diseases.

Blood parasites are spread by biting and sucking insects. Probably the most important pathogenic agent in the main river valley and in the "Kenya Salient" is Trypanosoma (i.e. brucei, vivax, evansi). Due to the presence of tsetse flies in this area, most of the livestock using riverine grazing or watering resources is in permanent danger of trypanosomiasis, a chronic disease reducing productivity and leading to mortality under additional stress (i.e. drought, malnutrition etc.).

Soil-borne diseases, like Anthrax or Haemorrhagic Septicaemia usually break out after the first rains when the spores are washed out of the soil. Foci are limited and well known by livestock owners. In both cases vaccination would practically prevent the incidence of the disease.

Numerous accidents (i.e. wounds, fractures) are traditionally treated by nomadic livestock owners themselves. The disease situation in intensively run urban or periurban dairy or poultry production units is different. In addition to some of the above-mentioned constraints problems with gynaecological and dairy related issues in the cross-bred cows and mastitis in all cows may occur. Poultry pathology in bigger units needs mainly preventive veterinary measures like the application of oral vaccines, coccidiostats and others.

4.4.2.8 Animal Health Services

The Ministry of Livestock, Forestry and Range (MLFR) is represented throughout the Juba Valley through Regional Veterinary Coordinators (RVC) in Kismayo, Bu'aale and Garbaharey and 10 District Veterinary Officers (DVO) throughout the Development Area (Map 13).

However, due to insufficient budgets, equipment and supplies, the system is weak. Most of the offices, clinics, stores and accommodations are in need of repair and rehabilitation.

Drugs are generally available in the District Offices but cannot be properly applied and/or distributed because of lack of transport and the necessary consumables (spare parts, fuel etc.). Due to employment conditions, the relatively well-trained staff is not equipped and motivated to carry out the necessary clinical and field work, including even meat inspection.

Besides the basic administrative infrastructure a few additional animal health facilities are of importance:

- The supra-regional Veterinary Laboratory at Kismayo is well equipped and staffed to carry out parasitological microbiological and serological diagnostic for nomadic, town and village dwellers and export traders etc. The Laboratory is supported by an ongoing donor follow-up programme (GTZ). Because of the weak veterinary care system, capacity is not well used.

- In Yaaq Brawe and Redille (near Bu'aale) an EEC-funded project has installed veterinary facilities consisting of a spray race, crush, dip, weighbridge, shady concrete yard, office and store buildings etc. The Redille Station has recently been rehabilitated.

- The quarantine station of Laheley has a partly fenced surface of 20,000 ha. The infrastructure comprises two boreholes, two cattle crushes, one dipping tank, offices, stores and labour quarters (in poor condition) and a double-fenced isolation corral. Transport and supply facilities are poor, and, due to overstocking by trade cattle during the last years, the holding ground is overgrazed. The Quarantine Station is part of the recently established Livestock Marketing and Health Project under the MLFR.

- In 1987 an animal health oriented Tsetse Control Project (GTZ-funded) in the so-called "Kenya Salient" (South and West of Kismayo) has been established. Besides the entomological component, the work programme also includes tick control and control of tick-borne diseases. The project has an office building and attached facilities in Kismayo and a Field Station near Bulo Haji (Badhaade District).

Generally, given the importance of livestock to the Somali economy, the animal health services are not at a satisfactory level.

4.4.2.9 Livestock Exports

Export marketing for the whole country as well as from Kismayo port has developed unfavorably during the last 8 years (Table 4/23).

Table 4/23 Livestock Exports from Kismayo (Heads)

Year	Camel	Cattle	Sheep	Goats
1980	5,944	29,374	5,151	4,371
1981	6,384	31,889	1,665	2,538
1982	5,262	51,011	4,500	4,516
1983	3,225	7,326	3,292	3,294
1985	1,650	22,265	-	-
1986	250	9,715	-	-
1987	2,095	4,168	1,050	1,050

Due to the 1983 Saudi Arabian import ban on African livestock, exports have drastically declined and a sustained recovery is not yet in sight. The unfavourable export marketing situation in southern Somalia is connected with the overall national marketing situation, which is not satisfactory due to

- lack of proper marketing intelligence at all levels
- weak communication linkages
- insufficient health control of export animals
- many individual, undercapitalized traders
- trade generating too little profit
- excessive taxation on trade stock
- difficulties in meeting letter of credit conditions in time
- use of unsuitable ships for livestock exports
- difficulties in reaching international standards (OIE/FAO)
- unfavourable exchange rates for part of the proceedings.

Due to deteriorating export market opportunities from Kismayo, livestock owners have found an unofficial/illegal outlet to Kenya to where an estimated 50,000 head of cattle have been smuggled in 1987. Consequently, Government foreign currency earnings are lost and the risk of spread of epizootic diseases to Kenya and East Africa is increased.

According to information from international marketing specialists, overall market opportunities for Somali export livestock are good, provided domestic supply conditions can be improved.

4.4.2.10 Income Derived from Livestock Production

Tentative calculations of nomadic income show that big and small nomadic livestock owners generate a production value of SoSh 1 million and SoSh 200,000 per year respectively.

Camels are mainly kept for their remarkable milk production, but they generate very little income from offtake. Cattle are less productive in milk but allow much better offtake rates. Small ruminants play an essential role in nomadic income due to their high reproduction and offtake rate.

The total production value of livestock kept by mixed farmers is estimated at about SoSh 30,000 per year, of which a small part is for home consumption.

One area, where the income generating potential has so far not fully been used, is beekeeping.

4.4.3 Range and Forestry

According to present land use characteristics, forest- and rangelands (ANNEX 8) can be divided into eight categories as shown in Table 4/24. Of these categories, bushland accounts for 65% of the Study Area, providing 42% of the biomass potential. The second largest area is open bushland with 28% of the total area, providing 52% of the Study Area's biomass potential. It is this category of rangeland which is thus of the greatest economic significance for livestock. The other categories total only 7% in area and 6% in biomass potential and are in comparison to the first two of minor importance.

In the past, no attempt has been made to collect basic data regarding the type and condition of Somali range and forestry lands on a systematic basis. Changes over time are therefore only recognized when they have become a problem, as, for example, in the case of accelerated erosion.

4.4.3.1 Rangeland Condition and Use

Since 1960 there has been a major increase in the cultivated area, particularly in the lower Juba, where it has doubled between 1960 and 1984. Associated with this increase is the decline in the area of rangeland along with small changes in the composition of its vegetation. The areas of open grassland appear to have declined, the proportion of bushland and shrubland has increased. In the lower and Trans-Juba areas there has been a substantial shift from dense to open bushland, partially due to cutting for fuel, building and for livestock enclosure fences, as well as heavy rainy season grazing, mainly by cattle. In some low rainfall areas close to settlements there is an increased risk of degradation and wind erosion. Areas of increasing bush encroachment are getting less suitable for cattle and sheep. It is therefore highly probable that the present trend of relative increase of cattle and sheep versus camels and goats will be reversed in future.

Most of the fodder for livestock is provided by natural pasture and range. Due to poor soils and low rainfall, the potential of natural range outside the floodplains is low. Higher rainfall in the southern part of the valley gives more fodder per unit area than in the northern parts. A survey conducted by JESS in October 1987 estimated the standing vegetation of herbaceous species at 1,900 kg/ha dry matter (DM) in the floodplain and 700 kg/ha outside.

Browse is an important component of livestock diet. It can be as much as 80% of the total diet for camels, 20% for cattle, 30% for sheep and 70% for goats.

Table 4/24 Forest and Range: Extent of Vegetation Categories (in km^2) and Estimated Biomass of Wood ('000 t) in the Study Area

Category	Wood Biomass (t/ha)	Districts																	
		Bardheere		Dinsor		Saakow		Bu'aale		Afmadow		Jilib		Jamaame		Kismayo		Total	
		Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass	Area	Wood Biomass
Forest: land with a closed or almost closed canopy of trees of 10-40 m high, with a more open understorey of smaller trees and shrubs, with little grass	30 - 200	1	11	-	-	1	12	16	184	-	-	1	11	1	12	-	-	20	230
Bushland: land carrying shrubs up to 6 m high, with a canopy cover over 20%, interspersed with open grassy areas	3 - 9	1,640	984	955	573	3,105	1,863	2,825	1,695	4,255	2,553	4,027	2,416	452	271	2,938	1,763	20,197	12,118
Open Bushland: land with over 20% canopy cover formed by trees or tall shrubs of 10-15 m high, with a variable amount of smaller shrubs and a ground cover of grasses and forbs	10 - 25	2,393	4,188	1,295	2,266	1,570	2,747	2,128	3,724	1,134	1,985	154	270	-	-	-	-	8,674	15,180
Grassland: Land dominated by grasses and herbacious species, with a canopy cover of trees and shrubs of < 2%	0 - 1	-	-	-	-	-	-	-	-	-	-	82	4	135	7	202	10	419	21
Bushed Grassland: grassland with shrubs, some trees, scattered or in groups with a canopy cover of up to 20%	1 - 5	-	-	-	-	133	40	86	26	106	32	64	19	319	96	189	57	897	270
Bushland Thicket: bushland in which shrubs form an almost full cover, difficult to penetrate, with few open grassy areas	6 - 12	-	-	63	57	3	3	83	75	16	14	18	16	-	-	41	37	224	202
Woodland Thicket: closed woodland in which the trees and shrubs together form a complete cover, difficult to penetrate, with few grasses	18 - 40	-	-	78	226	126	365	124	360	37	107	-	-	-	-	-	-	365	1,058
Bushed Duneland: confined to coastal dunelands	3 - 6	-	-	-	-	-	-	-	-	-	-	-	-	132	59	11	5	143	64
Total		4,034	5,183	2,391	3,122	4,938	5,030	5,262	6,064	5,548	4,691	4,346	2,736	1,039	445	3,381	1,871	30,939	29,143

The use of areas with poor vegetation cover tends to be more intensive in the wet than in the dry season. Conversely, areas with a good vegetation cover are used primarily as dry season rangelands. The combination of poor ground cover and a dense canopy may occur in relatively stable vegetation types, such as wooded and riverine thicket but also in shrublands and bushlands in which heavy grazing has reduced ground cover, thereby reducing the incidence of fire and allowing increased bush encroachment.

The use of riverine rangelands in the dry season is a vital component of the overall grazing system. The dry season stocking densities in these areas are very high, and generally much higher than in non-riverine rainy season rangelands. However, it appears that most of the riverine rangelands can accommodate present stocking densities without deterioration, provided the seasonal pattern of use, mainly in the dry season, is maintained. Thus, rangelands in the Juba Valley area cannot be considered as overstocked. It must be realized, however, that the data base for arriving at such a conclusion is rather weak, as only few data on the production of consumable herbage in southern Somalia are available.

4.4.3.2 Forestry Conditions and Use

Riverine forests in the Juba Valley have decreased from about 9,300 ha in 1960 to less than 1,000 ha in 1987. Only small patches of a few hectares each are still existing. The most important cause of this decline is clearing for crop production. The only sizeable remnants are in Bu'aale District in the Barako Madow and the Shoonto Forest Reserves (100 ha and 150 ha, respectively). Boundaries have been surveyed, mapped and marked by the National Range Agency (NRA) in the Barako Madow and Shoonto reserves and forest guards have been posted to improve protection. Still, effective control is difficult to achieve and some felling of trees and production of charcoal has been observed.

The remaining unreserved forest patches are already quite small and are likely to disappear in the coming years, unless they are immediately protected as forest reserves, which is not likely to happen.

The overwhelming majority of the residents in the Juba Valley use only firewood for cooking, which constitutes with about 1 m^3 per capita per year the largest demand of all the forest products. However, in most towns and villages only dead wood is used, with no harmful effects on the environment. Where there are larger concentrations of people, which is particularly true for the refugee camps in the North and the large-scale agricultural projects in the South, woody biomass has rapidly declined and people have to go further and further to meet their demand for firewood.

Charcoal producing is not a very important activity in the Juba Valley and only few town dwellers use it as a source of energy. Mogadishu is the main consumer of charcoal, which is mostly produced in the neighbouring Bay Region. With resources being more and more depleted there, the resources of the Juba Valley are likely to be exploited next, which would be facilitated by the construction of the Jilib - Bardheere road.

For the construction of houses, large quantities of sticks and poles are required. Since the houses can last for up to 30 years, the annual consumption is actually quite small and estimated at 0.1 m^3 per capita per year. Building poles have a higher market value than firewood and can more readily carry the cost of labour for transport over longer distances and therefore do not significantly affect forest resources.

Large trees are mainly used for the making of canoes, beehives, doors, chairs, tools, etc. A variety of trees are used, often from trees already cut for agricultural clearing. Demand is estimated to be small and not have any significant impact on forest resources.

Planting of shade and fruit trees is understood and practiced throughout the Juba Valley, although often only on a very small scale. To support this, the National Range Agency (NRA) operates nurseries in Luuq, Saakow, Bu'aale and Jamaame. However, their output is small and there is no systematic collection of data to identify the most suitable fast-growing tree species for the valley.

There is a rather successful but small agro-forestry programme ongoing in Luuq District where trees are planted for a number of purposes (soil stabilization, shade, income and nutrition diversification, fuelwood, etc.). In Kismayo District various forestry programmes have been initiated recently (forest plantation, community tree planting, sand-dune fixation) on a small scale with promising participation of local communities.

4.4.3.3 Existing Range and Forestry Organization

Range and forestry activities in Somalia are the responsibility of the NRA established under the Ministry of Livestock, Forestry and Range (MLFR) in 1976. To fulfill its duties, the NRA has operational departments for range and environment, forestry and anti-desertification, wildlife and planning and research and regional and district offices throughout Somalia. Initially, NRA was well supported through financial and technical assistance and substantial local budgets provided by the Government. Meanwhile, this support has dwindled and NRA suffers from far too small a budget. In addition, the level of education, experience and devotion to their duty of staff are generally low. At present, NRA is therefore not very effective in actually carrying out its duties in the vast areas it is supposed to administer.

Formal training in range management and forestry in southern Somalia commenced in 1976. Since then the location and organization of the training changed a number of times and is now at facilities between Afgoy and Lafoole and has been named Forestry, Range and Wildlife Institute (FRAWI). The main objectives are to train technicians and middle management staff for the needs of the NRA. The institute has been continually supported by various donors and appears to be doing reasonably well. In addition, the Faculty of Agriculture of the Somali National University also offers courses for graduation in range management.

4.4.4 Fisheries

The Study Area borders on the Indian Ocean, where a vast untapped fish potential has been determined. Attempts have been made to use this potential but this has not been too successful so far. Within the scope of this Master Plan, marine fisheries is excluded and therefore not dealt with here. Instead, only the much smaller potential of the Juba river is looked at in the following (ANNEX 9).

4.4.4.1 The Environment

To assess the fishery potential and its characteristics, the general environmental conditions, particularly the bimodal flow pattern of the Juba river, the limnological characteristics of the river, the ecology of its floodplain, and the climatic conditions of the Juba Valley are of major importance.

Out of the total 800 km river length within Somalia, the southern section between Saakow and Kismayo, where the floodplain is submerged by overbank flooding at least every second year, is of special interest to fisheries.

Desheks, pools and pool-like swampy areas may permanently or temporarily join through a network of channels and creeks, which during heavy rains penetrate the levees, thus directly flooding vast areas of the plain.

The total floodplain area of the Juba covers roughly 3,800 km^2, to which about 1,400 km^2 of temporary or permanent swamps can be added.

4.4.4.2 Limnology

The sequence of inundation and dry phases due to the river's bimodal nature results in the development of specific limnological characteristics of the floodplain and makes them outstanding among aquatic systems.

The floodplain contains many types of different water bodies. Some of them hold water throughout the inter-flood periods. Because of silt deposition these bodies show a sequence from open lagoon vegetation lined pools, vegetated swamps and dry land. Thus old water bodies may disappear and new ones come into existence. During flood seasons water invades the plain and organic and inorganic matter are dissolved. As a result, electrical conductivity increases and dissolved oxygen concentrations decrease, but as the flood persists the conductivity falls and dissolved oxygen concentrations rise again. During the dry season the oxygen content of the water in pools may come close to zero. At the same time, the water volume shrinks due to evaporation causing a rise in temperature and increase in electrical conductivity.

The Juba, however, remains relatively cool and well oxygenated, provided that a constant flow above a certain level is assured. Otherwise the river breaks down into a chain of pools whose behavior is similar to that of the floodplain pools.

As in other floodplains of the savannah type, primary fish production of the Juba Valley is in the floating or emerging macrophytes. By far the most luxuriant aquatic vegetation was observed in shallow water bodies of the pool and swamp types, whereas desheks were almost free of vegetation with the exception of the perennial ones.

The submerged root masses, stems and leaves of the higher elevations are covered with a complex plant and animal association. By contrast, bottom-living organisms remain scarce in the river as well as on the plain.

Electrical conductivity and the total amount of dissolved solids (TDS) are limnological components upon which an assessment of the fish productivity of floodplains can be based.

The EC_{25} data obtained for the Juba river include values ranging from 0.1 mmhos/cm (August 1977) to 4.7 mmhos/cm (May 1980), the latter being the peak for the period 1978-1984. The average EC_{25} is estimated to be close to 0.7 mmhos/cm with two salinity crests (less than 24 hours) at the beginning of the Gu and Der seasons.

Only a few TDS measurements are available, indicating maxima between 1,000 and 1,400 mg/l (March and April), minima of 400 mg/l (May) with an average of about 700 mg/l.

4.4.4.3 The Fish Species

Data about the number and the population sizes of the different fish species is hardly existing for the Juba, as the responsible Government organization, the Ministry of Fisheries and Marine Transport (MFMT) is hardly represented in the valley.

A list of fish species has therefore been compiled by JESS. It is similar to the species found in other East African rivers. During field surveys, 15 general species were identified.

Data on the distribution pattern of Juba species are not available. The composition of catches from both the river and the floodplain pools indicate that an active migration of fish between the river channel and the floodplain takes place. Migrations are often for breeding but are equally important for feeding. Movements may be associated with avoidance of unfavourable conditions such as decrease of oxygen or overcrowding.

Migration and breeding are closely related. Gonads begin to mature towards the end of the low-water season and as the river rises and reaches the bankful stage ripe fish move laterally onto newly inundated areas where spawning will commence. Breeding success is probably enhanced on the floodplain by shelter provided for larval and juvenile fish by grassy vegetation.

4.4.4.4 The Fishermen

Almost all the fishermen go out for fishing only when fish concentrate in pools and swamps and thus can be easily collected. Fishing is thus largely an occasional, part-time activity with the number of professional fishermen in the area estimated at less than 50.

An evaluation of the JESS baseline survey revealed that of the households interviewed, about 40% have some type of fishing gear, of which about one-third have more than one set of gear.

Fishing methods are generally simple and only a very limited number of fishermen own boats (dugouts). Hand lines and spears are most popular in the northern part of the valley. As one moves downstream, the fishing gear becomes more sophisticated as noted by the increased number of gill nets to which a much higher catch gradient is attributed.

MFMR provides some very limited extension to local fishermen, basically drawing on experience gained in the Shebelli.

4.4.4.5 Fish Processing and Marketing

Most of the catch is sold fresh. Only surplus catches arrive at markets as dried fish, the share of which is said to increase when the harvest of deshek fish approaches its peak.

Fish selected for drying are usually gutted, scaled (if necessary) and washed before being hung on branches of trees or spread out on simple racks close to fishing sites.

Somali Marine Products in Kismayo is reported to have accepted, on occasion, fish from valley fishermen for deep freezing, in the belief that the fish market at Mogadishu would readily accept the product. However, both the irregular supply of raw fish and the poor demand in Mogadishu were discouraging, resulting in the decision to exclude freshwater fish as long as continuous supply remains doubtful and marketing problems exist.

There are no indications that a fish distribution and marketing system is about to be established in the valley. This may be attributed to infra-structural shortcomings and the subsistence character of fisheries.

Retailing of fish remains primarily in the hands of fishermen who sell the catch either close to fishing grounds or at the door of their houses. Only the surplus is taken to local markets for which the supply is entirely left to chance.

4.4.4.6 Assessment of Fish Yield Potential

The estimated yield potential of the Juba Valley fisheries is about 2,000 t/year. Relating this yield potential to the total area of the river valley, about 3,500 km^2, the annual yield would be around 50 kg/ha.

The yield potential of 2,000 t/year refers to the raw fish weight, the edible part of which constitutes about 80% containing some 25% protein. Hence it follows that the potential would be good for 400 t of animal protein which would satisfy the annual requirements of 31,250 persons, equivalent to about 9% of the sedentary population now living in the Study Area.

The irrigation canals, particularly the long conveyance canal of the Fanoole project, constitute an additional, so far untapped fish potential, which could be utilized if aquacultural practices were introduced.

4.4.5 Industry

At independence, Somalia inherited a small industrial base (ANNEX 10). Even today, the contribution of manufacturing in the formal sector (all enterprises with five or more employees) probably does not add more than 5% to GDP. The informal sector, including people engaged in crafts and cottage industries, plays a significant role within the socioeconomic structure, but its contribution to GDP has never been quantified.

Industrial employment in Somalia is estimated at 10,000 people. Practically all larger enterprises are Government owned and 80% of value-added by industry comes from the public and 20% from the private sector. The private sector, with generally smaller units, mostly mixes, assembles or processes imported raw materials.

Geographically, industrial activities centre around Mogadishu, but sizeable units are also located in the Juba Valley.

4.4.5.1 Industrial Development in the Juba Valley

The formal sector consists of seven public and one private unit (a ninth, a cotton ginnery at Jamaame has stopped operating in 1983):

- Juba Sugar Mill
- Fanoole Rice Mill
- Mogambo Rice Mill
- Kismayo Meat Factory
- SLA Tannery, Kismayo
- ADC Maize Mill, Kismayo
- INCAS, Jamaame (cardboard boxes for banana exports, plastic bags)
- Somali Marine Products, Kismayo (private).

All eight enterprises are situated between Jilib and Kismayo. Location is largely determined by appropriate crop production activities and relatively better support services offered by Kismayo.

With respect to the supply of raw material, seven of the eight enterprises obtain it from the crop and livestock sector. Other inputs, including maintenance materials, are nearly all imported. Exceptions are locally produced salt, lime, oxygen, plastic bags (at three times the price of imports).

Three of the seven units produce for local consumption (sugar, rice, maize flour), three largely for export (processed meat, leather, fish) and one (packing material) for export packaging of bananas. Of the agro-industrial by-products, molasses and rice bran are sold, bagasse is used for fuel. Rice husks are not utilized at Fanoole, but used for fuel at Mogambo.

Total employment in the eight enterprises is only 1,260, small when compared to the original investment estimated to be over US$ 150 million. At an investment of US$ 120,000 per job, it is clear that the main objective of these industries has not been the generation of employment, but the efficient provision of essential processing services, employing capital-intensive technologies.

With changing socioeconomic and technological conditions many privately owned enterprises in the informal sector have emerged. They provide essential services to the community, are largely based on locally available resources and skills and are geared to satisfy demands in their immediate vicinity. In the South, where the regional economy is relatively more advanced, the number and type of enterprises is more diversified, but with this, dependence on raw material supply from outside the region (e.g. Mogadishu) increases. The level of technical skills is generally low and the quality of products and services could be much improved.

By far the most important informal, small-scale enterprises (less than five employees generally) are 60 maize/sorghum and 30 sesame oil mills. Both use simple technology, which is fully mastered by the personnel operating the mills and by the local mechanics.

Other types of enterprises include a wide variety of crafts, such as blacksmithery, carpentry, basketry, leather works and construction services.

4.5 Settlement and Infrastructure

The settlement pattern and its characteristics as well as the physical and social infrastructure play an important role in supporting the development in the Juba Valley (ANNEX 11).

4.5.1 Settlement and Housing

The basis for the assessment of the settlement structure (Map 3) are the population data outlined above. In addition, population data were established for Luuq (19,000), Dinsor (7,400) and Afmadow (5,400).

4.5.1.1 Classification of Settlements

Settlements have been classified in six categories according to their respective function in the regional context (Table 4/25).

Table 4/25 Classification of Settlements

District	Urban Centres			Rural Centres		
	Cities	Primary	Secondary	Primary	Secondary	Tertiary
Bardheere	-	1	-	1	7	20
Saakow	-	-	1	1	5	13
Bu'aale	-	-	1	1	7	14
Jilib	-	1	-	3	12	14
Jamaame	-	-	1	4	11	15
Kismayo	1	-	-	2	3	2
Study Area	1	2	3	12	45	78

Cities:
Urban centres with more than 50,000 inhabitants and facilities of regional and interregional level

Primary Urban Centres:
Urban centres with 15 to 50,000 inhabitants and facilities of regional or district level

Secondary Urban Centres:
Urban centres with 3 to 15,000 inhabitants and facilities of regional and district level

Primary Rural Centres:
Central villages with population over 1,000 people and predominantly rural character

Secondary Rural Centres:
Villages with more than 500 inhabitants; facilities qualify them as local centres of influence for tertiary or for unclassified villages

Tertiary Rural Centres:
Villages with less than 500 inhabitants, which are to some extent focal points for the surrounding unclassified villages.

The above classification of settlements is also shown in Figure 4/2, which clearly shows that the southern part of the Study Area has by far the largest number of settlements and also the highest concentration of people, as shown in Figure 4/3. The figures also underline the fact that the districts of Saakow and Bu'aale have the lowest number of settlements and population densities. In the following, some of the specific aspects and major problems of the main urban centres are highlighted:

Bardheere: is at a key location in the Region, being the main focus for the northern part of the Juba Valley and a traditional place of religous education and activities. Economic development is intensive. There is, however, no safe water supply. The Juba is the only source for drinking water and no treatment facilities exist.

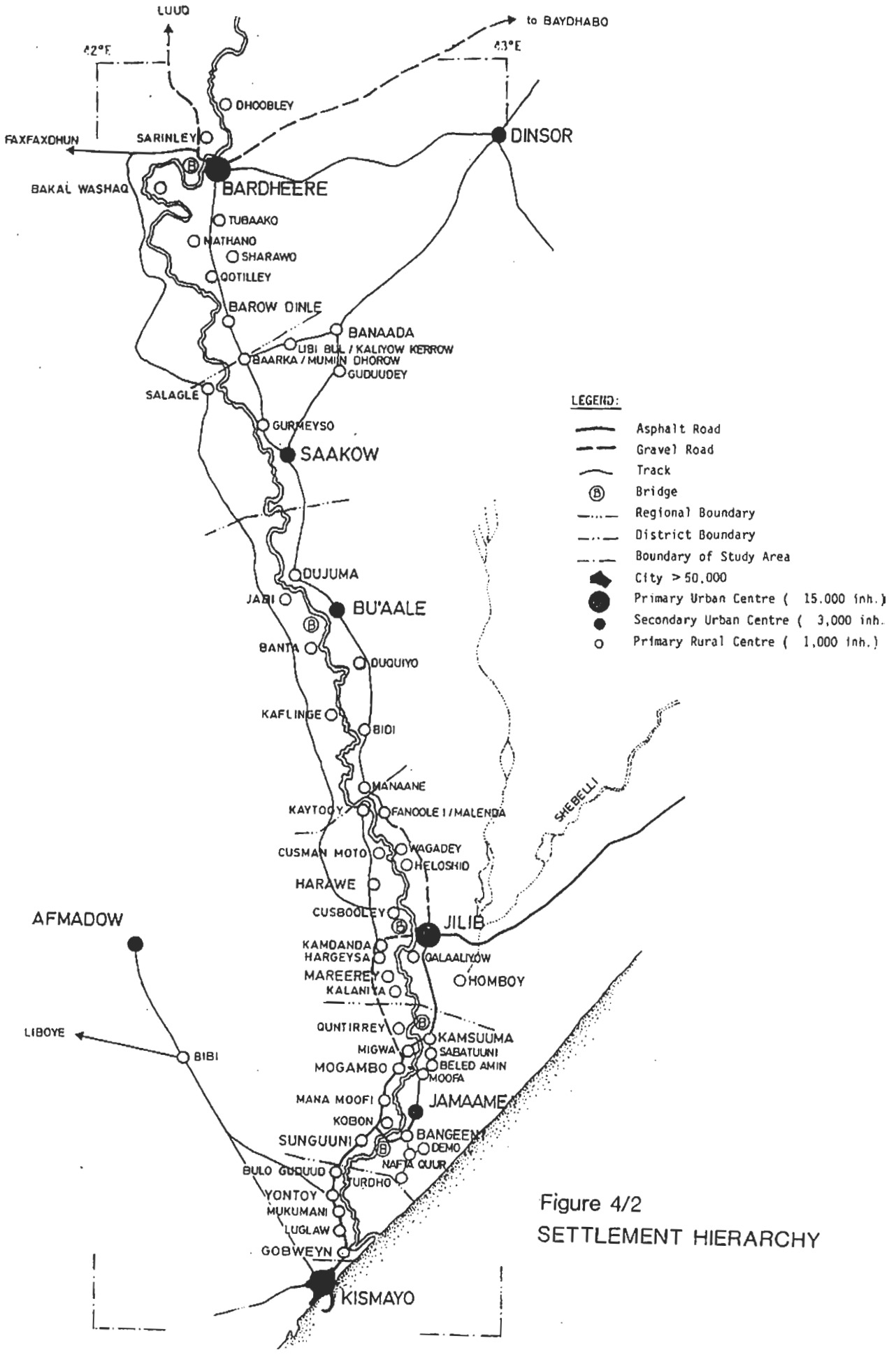


Figure 4/2
SETTLEMENT HIERARCHY

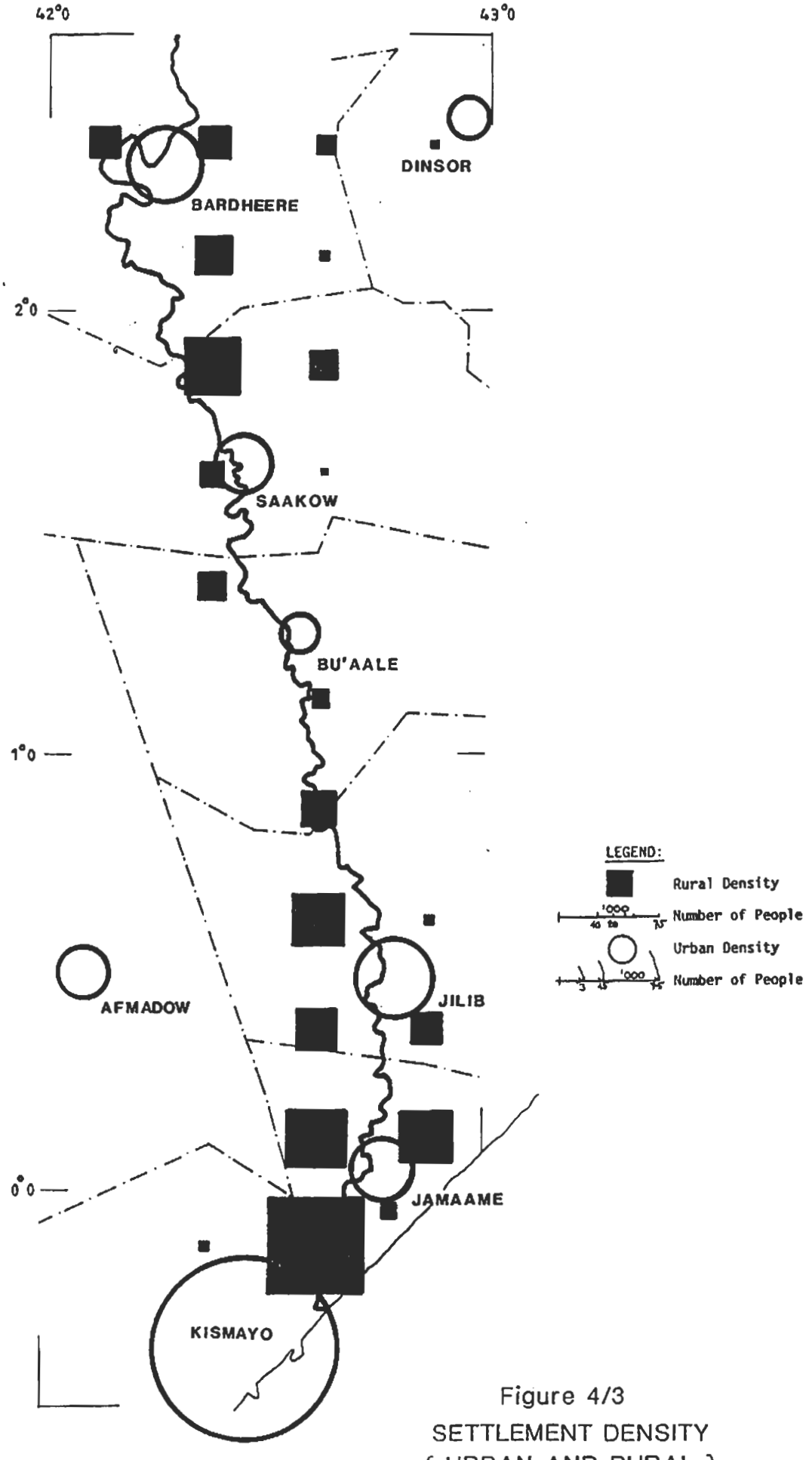


Figure 4/3
SETTLEMENT DENSITY
(URBAN AND RURAL)

Saakow: There is no all-weather road connection to Jilib and Bardheere.

Bu'aale: although a regional capital, Bu'aale is one of the smallest urban centres in the Study Area. There is no all-weather road connection to Jilib and Bardheere.

Jilib: due to its central location within the region, Jilib is a dynamic and rapidly developing town. However, the absence of a bridge to the western part of the district constituted a major shortcoming, which has been overcome in early 1989.

Jamaame: almost all the buildings in Jamaame have been constructed on difficult soils without adequate foundations resulting in high maintenance and replacement costs.

Kismayo: an ancient town with port and airport facilities is the main regional centre. Its acute problem is a precarious drinking water supply due to the treatment plant a Yontoy being out of service and seasonally saline water in the Juba river, its only source of potable water until a new tube-well scheme is completed.

Outside the Study but within the Development Area, three more urban centers exist.

Luuq: has a key position near the border between Somalia and Ethiopia and fair access. However, the water supply situation is similar to that of Bardheere. In addition, being located on a narrow saddle at the closed end of an oxbow of the Juba river, likely changes in the course of the river constitute a major threat to the town.

Dinsor: is a service centre for nomads and rainfed farmers. Water supply is a particularly serious problem, as neither potable groundwater nor permanent natural water sources exist. Drinking water is supplied by a stagnant collection basin without filter; during prolonged dry periods the town has to be supported by water tankers.

Afmadow: is an isolated, almost purely nomadic service centre. There is no all-weather road access.

The villages throughout the Study Area are generally well organized. Traditional socioeconomic and socio-cultural mechanisms are strong enough to guarantee their safe ecological integration into the natural environment. Satisfying basic needs, particularly water and firewood is the major preoccupation of the rural population. There is a serious general lack of health and education services.

Independent from the above functional classification, settlements are administratively classified at four levels:

- Regional Centre: location of the Governor and the regional administration
- District Centre: location of the District Commissioner and the district administration
- Municipality: location of the Mayor and the municipal administration
- Beel: headquarters of the beel council.

The manner in which the Study and the Development Area shares the involved regions and districts is shown in Figure 1/2.

4.5.1.2 Urban and Regional Planning

There is no comprehensive system established for urban development planning. Generally, town planning is the responsibility of the Ministry of Public Works and Housing; services can be requested against payment by the municipalities and local authorities. Because of budget constraints, such services are hardly used and no town and settlement planning capacity develops at the district level.

Town planning is generally confined to allocation of land for urban infrastructure, to a certain extent assisted by sectoral administrations. The "Town Development Plan" is legally binding for the development committees responsible for land allocation.

4.5.1.3 Housing

The typical urban house "Sar" or "Barako" can be of different shapes and is mostly found in the centre of urban places used for dwelling, commercial and office functions. Construction materials are stone, coral (near the ocean), cement blocks and timber, with corrugated iron/asbestos or concrete roofing.

In rural areas there are two typical house types:

- "Carish" with rectangular shape, dominant in the southern part of the valley, and
- "Mondul" of circular shape (up to 4 m diameter) mostly found in the northern parts.

In general, a group of houses form a small fenced compound. Both housetypes are constructed with wattle and daub technique, which means a light wooden frame is plastered with clay. The nomadic hut "Aqal" is hemispherical, and specially designed for easy dismounting and transport on camels. The house consists of a wooden frame of sticks (2.0 - 2.5 m) assembled with leather strips and covered with grass mats.

Building techniques are in general well developed and adapted to climatic and environmental conditions. However, houses to not last long and require extensive repairs due to termite attacks and damage to the walls by driving rain.

4.5.1.4 Non-Domestic Facilities

Markets in general are of low standards. There is no water, sanitation, drainage and electricity supply. Simple permanent structure (concrete floors and corrugated iron roofs without enclosures) can be found in most urban centres and some major villages (private) generators. However, basic amenities such as water, electricity and drainage/sanitation are lacking. Building with administrative and social service functions are in most cases scattered throughout the settlements.

4.5.2 Physical Infrastructure

Physical infrastructure comprises communication infrastructure as well as facilities for the supply of water and energy.

4.5.2.1 Roads, Transport and Telecommunication

The existing road network is shown in Figure 4/4 (Map 16) and the respective lengths of the roads are given in Table 4/26.

Table 4/26 Road Lengths by Type and District (km)

District	Paved road	Gravel road	Track
Kismayo	49	8	126
Jamaame	61	28	114
Jilib	46	58	172
Bu'aale	0	0	276
Saakow	0	0	186
Bardheere	0	115	290
Total Study Area	156	209	1,164

As shown in Figure 4/4, the Study Area is served by the national Kismayo-Jilib-Mogadishu main road (tarmac) in the South which needs rehabilitation/reconstruction on some sections, and the Bardheere/Luuq-Baydhabo-Mogadishu road (gravel/tarmac) in the North. The rest of the all-weather road system consists of access roads to Jamaame (paved) and to the large-scale agricultural projects such as Juba Sugar and Fanoole (gravel). The rest of the road network (regional and district) comprises unsurfaced tracks which are impassable after rains. One regional (Bu'aale) and two district centres (Saakow and Afmadow) are inaccessible during the rainy seasons.

An important part of the Study Area, the right bank of the Juba river between Bardheere and Jilib is connected to the national road network via the bridges at these two towns. The bridge at Bu'aale only provides access to the right bank in the dry season, as the roads are not passable in the rainy season. Besides the low road density, the practically complete lack of maintenance constitutes the most important problem of road transport.

Apart from some few access roads (e.g. port of Kismayo), there is no metalled primary urban road network throughout the Study Area except between Kismayo and Jilib where the national road passes through the towns and villages.

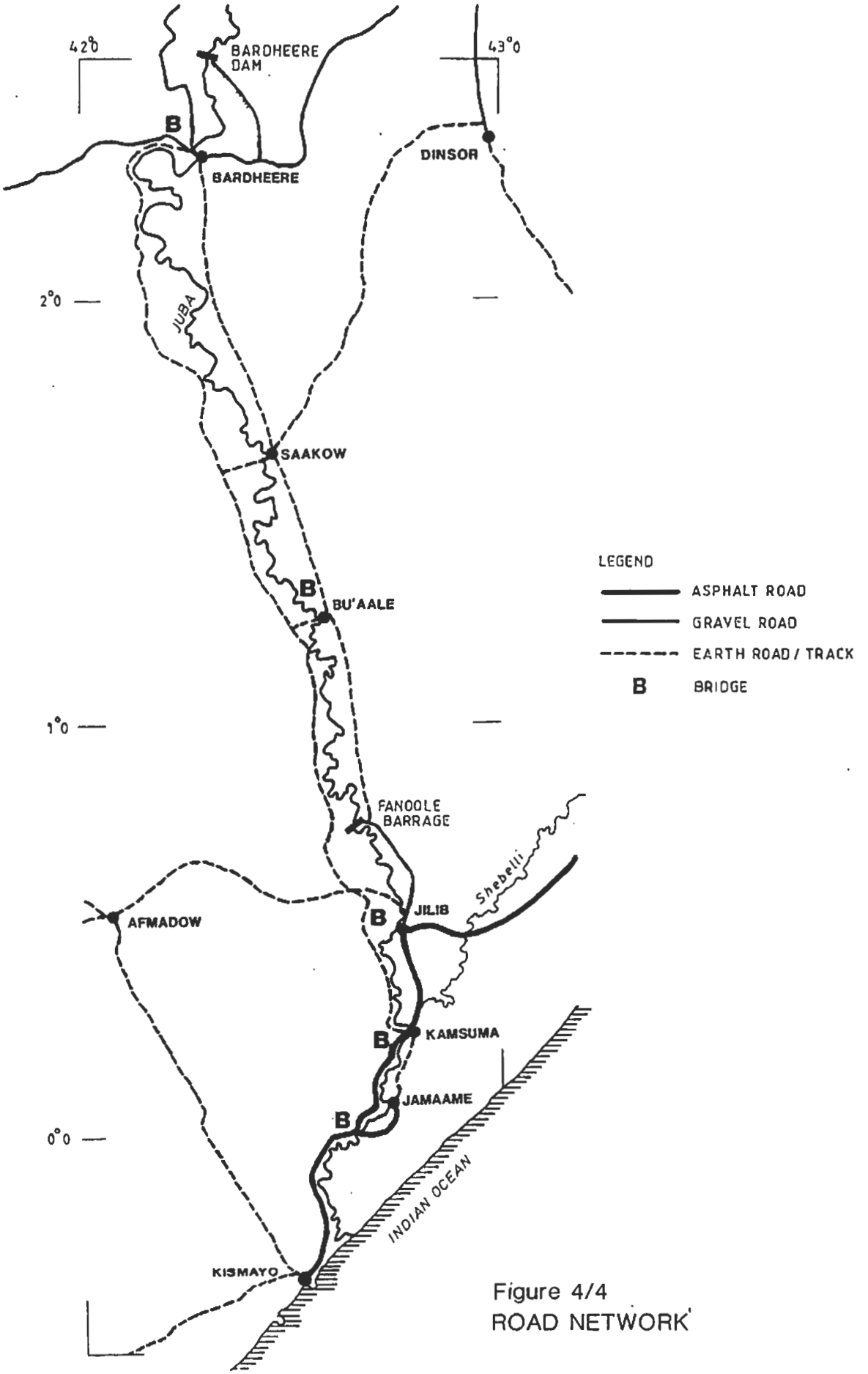


Figure 4/4
ROAD NETWORK

Passenger transport is limited to services to and from the main urban centres of Kismayo, Jilib and Bardheere and from there to Mogadishu. It is exclusively in the hands of private entrepreneurs with vans, taxis, small busses and trucks. Goods are transported by trucks for long distances depending on accessibility, and by camels and donkeys for local transport.

Kismayo has an international airport with rather high standards, which is used for internal flights only. The number of flights decreased from 280 in 1982 to 52 in 1987. Main reasons are the shortage of suitable planes resulting in unattractive flight frequencies. Besides Kismayo, there are five airstrips within the Development Area (Luuq, Bardheere, Saakow, Bu'aale and Jilib) which are of minor importance.

Kismayo has one of the three major ports of Somalia. It is used for the export of bananas and livestock. The number of ship arrivals in 1985 was 93 but declined thereafter due to lost markets for cattle exports. The port facilities are under rehabilitation, due to be completed by the end of 1988. In general, the port is underutilized. Coastal shipping between Somali ports is practically nonexistent.

River transport is confined to ferry services using old military boats or canoes. Transport along the river is nonexistent.

The telecommunication system is confined to regional and district headquarters. In general, the system is oriented towards Mogadishu. Linkages within the Juba Valley are nonexistent with the exception of the Lower Juba Region, where Jilib, Jamaame and Kismayo are directly connected. Emergency communication within the Juba Valley is by radio through police stations in the regional/district headquarters.

4.5.2.2 Water Supply, Sanitation and Drainage

Urban water supply facilities in the Development Area are rudimentary and those that do exist need rehabilitation mainly due to lack of maintenance. The actual supply situation is shown in Table 4/27 (Map 17).

Problem areas are Bardheere (untreated river water supply only), Kismayo (rehabilitation of existing treatment plant is under way, problem of sea water intrusion) and Dinsor, where during prolonged dry seasons water in the catchment basin (apart from high evaporation losses) becomes brackish and unsuitable for domestic use.

Rural water supply is far from satisfactory and the rural population depends on the following sources of supply:

- river and deshek watering points where the muddy and unhygienic water is shared by livestock and people
- water harvesting basins (wars), where hygienic conditions are even worse, as water is stagnant over long periods
- shallow and deep tube wells constructed for livestock watering, many of which are out of order due to lack of maintenance, others are not properly protected and therefore polluted

- shallow wells constructed by the Government and private individuals, many of which are also not properly protected and therefore also polluted.

The only significant rural water supply programme within the Study Area is a component of the Primary Health Care Programme of Swedish Church Relief (SCR) in the districts of Bu'aale and Saakow. Based on past experiences, only dug wells are constructed and the primary objective is to establish one safe source of drinking water in each beel.

Table 4/27 Urban Water Supply Systems

Urban Center	Source of Drinking Water	Length of Piped System	Additional Sources	Water Quality	Remarks
Bardheere	river	-	-	poor	no treatment
Saakow	1 DTW	1.5 km	STWs	fresh to fair	-
Bu'aale	1 DTW	1.5 km	STWs dug wells	fresh to fair	-
Jilib	1 DTW	3.5 km	dug wells	fair	-
Jamaame	3 DTWs	-	dug wells	fair	-
Kismayo	river	2,500 house connections	dug wells 20 standpipes	poor	water treatment plant out of order network under re-habilitat'n 3 DTWs under construction
Luuq	river	-	STWs	poor	STWs and dug wells out of order
Dinsor	harvesting	-	-	unsuitable	no suitable ground water (salinity)
Afmadow	dug wells		STW harvesting basins	fair/poor	-

DTW - Deep tube well
STW - Shallow tube well

Sanitary facilities are rudimentary being confined practically everywhere to simple pit latrines and drainage is completely lacking in all settlements causing serious erosion and other environmental problems. This also applies

to the urban centers, where stormwater drainage does not exist at all or does not function so that during the rainy season unsanitary conditions prevail in the urban centers.

Several Government institutions share the responsibility for water resources development, water supply and sanitation. Most importantly, it is the Ministry of Mineral and Water Resources (MMWR) with its four autonomous agencies (the Water Development Agency (WDA) and the water agencies for the urban water supply for Mogadishu, Hargeysa and Kismayo). However, as water is also of primary importance to other ministries, those for Health, the Interior, Livestock, Forestry and Range, Agriculture and Juba Valley Development are also involved with the coordination supposed to be through the National Water Committee, supported by the Technical Committee. However, this coordination could be very much improved.

4.5.2.3 Energy Supply

Domestic energy requirements are largely met by firewood and only to a very limited extent through the provision of electricity.

(1) Firewood and Charcoal

Firewood and some very limited amounts of charcoal are practically the only domestic energy sources in rural as well as in urban areas. The efficiency of using the energy potential of firewood is not very high, as no stoves or other facilities or equipment is used for this purpose. There is a national wood stove programme in Somalia, but this has not yet been active in the Juba Valley.

In the immediate vicinity of the larger concentration of refugee camps and urban centers, a serious to extreme pressure on vegetation and the lack of any effective control over firewood extraction, has led to a degradation of the natural environment. Otherwise, the regeneration capacity of the vegetation cover is generally still sufficient to support the population in the Juba Valley with the required firewood.

(2) Electricity

Within the Study Area, the total public and private generating capacity ranges, depending on the level of the river at the Fanoole power station, from a minimum of 3.4 to a maximum of 7.8 MW (Table 4/28) and is restricted to the urban areas. This does include the hydroelectric power station at the Fanoole barrage, which has a generating capacity of 4.6 MW, with a standby capacity of 0.2 MW, which is used to supply the towns of Jilib and Kamsuma when the turbines cannot be operated because of too high or too low river flows.

The power stations at the other large-scale projects are exclusively used for project purposes and for providing electricity to the attached housing schemes.

Table 4/28 Electricity Network in the Study Area

Location	Installed Capacity in MW	Year	Hrs of supply
Fanoole	0.2 - 4.6	1982	24 (seasonal)
Kismayo (1)	2 x 1.000	1986/87	12/24
Jamaame	0.030	n/a	irregular
	0.200		out of service
Jilib	0.200		not operating
Gobweyn	0.030	n/a	6
Yontoy	0.015	n/a	6
Bulo Guduud	0.100	n/a	6
Water treatment plant at Yontoy	0.250		not operating
Bu'aale	0.030	n/a	4
Dujuma	0.080	n/a	n/a
Saakow	0.050	1975	6
Bardheere	0.100	1976	6
Dinsor	0.050	n/a	6
Luuq	0.080	n/a	6
Afmadow	0.030	n/a	6
Total	3.445 - 7.845		

n/a - not available.

1) Actually the plant is operating on a 24-hour shift but until the distribution network is completed, electricity is supplied only for 12 hours.

Except for Kismayo, which operates on a permanent basis, all other public supplies are restricted to a limited number of hours in the evenings.

The supply of electricity within Somalia is organized by the National Agency for Electric Energy (ENEE) which is represented in Kismayo by a Regional Manager. ENEE provides technical and administrative support to local authorities, including the installation and maintenance of generating plant.

Operation of the public generating equipment is the responsibility of the Ministry of Local Government. Main problems in the supply of electricity are the lack of a regular supply of diesel, spare parts (compounded by the old equipment) and maintenance. In addition, the distribution networks are rudimentary and in a bad state of repair.

(3) Alternative Sources of Energy

Alternative energy, such as wind, solar energy and biomass could play a more important role in providing energy in the rural areas, but are used only in a few cases.

Positive examples in the Study Area are

- solar refrigerator in Dinsor
- solar lighting in Saakow and Bu'aale
- use of biomass by-product (bagasse in the Juba Sugar Mill, rice husks in the Mogambo Rice Mill) for power generation.

Some wind-driven water pumps have failed due to lack of maintenance after a short period of operation (e.g. Dinsor and Jamaame hospitals).

4.5.3 Health

The health conditions in Somalia and in the Study Area are very poor, which is partly the result of a high prevalence of disease vectors, low nutrition levels, dietary habits, a poor water supply and sanitary situation and little awareness about the disease transmitting mechanisms and partly also the result of a very poorly functioning public health system (ANNEX 12).

4.5.3.1 Health Status

The generally poor health conditions in Somalia are highlighted by the extent of three standard indicators:

- infant mortality rate: 15% (7th highest worldwide)
- child mortality rate: 26% (7th highest worldwide)
- maternal mortality rate: 1.1% (3rd highest worldwide).

For the Juba Valley, no comprehensive community surveys, supported by laboratory examinations about prevalence of diseases and disease vectors have been carried. Those laboratory-supported community surveys of the Juba Valley and other parts of Somalia that were carried out, concentrated on a narrow range of diseases and often come up with frightening figures (e.g. malaria, schistosomiasis). However, the data that is available, give an idea about the main diseases, which include

- Upper and lower respiratory diseases
- Diarrhoea and intestinal parasites
- Malaria
- Schistosomiasis (in some villages up to 100%)
- Skin diseases
- Malnutrition
- Measles and other communicable diseases
- Tuberculosis
- Poliomyelitis.

There are some variations in the occurrence of the above diseases between the northern and the southern part of the Study Area, but all of these do have been found throughout the Juba Valley.

Many of the diseases have high case fatality rates and contribute to the poor health condition of the country which ranges among the worst worldwide. Diseases closely related to water are mainly malaria, schistosomiasis and diarrhoeral diseases. With expansion of irrigated agriculture the density of vectors of malaria and schistosomiasis will increase. This will lead to higher incidence/prevalence of diseases and their spread to other areas, particularly through migrant labour.

4.5.3.2 Attitudes towards Health

The situation encountered is to a large extent caused by a lack of awareness concerning general hygiene, the proper treatment of water and dietetic requirements. Attitudes towards health are determined by dietetic traditions which conflict with health requirements. River water and water from stagnant pools are the main water sources. Even though people are aware of the health risks of using water polluted by human and animal excreta, they appear indifferent to the risks. Moreover, alternative safe sources are rarely available.

In addition to water-related problems, poor hygienic conditions within households as well as in and around villages constitute major health risk. According to the JESS Baseline Survey, only one fourth of rural households have pit latrines. Neither in villages nor in towns is there an organized waste disposal system. Considering the climatic conditions, it is clear that environmental conditions are predestined to spread infectious diseases, which is aggravated by poor nutritional standards. The people are caught in a vicious circle: their poor diet predisposes them to diseases which reduces their labour capacity, which, in turn, does not allow them to increase and diversify their food production.

4.5.3.3 Health Services

Public health facilities (Map 18) are under the Ministry of Health (MoH) which is represented in each region and district by Coordinators (Regional Medical Coordinators - RMC, and District Medical Officers - DMO).

In the past, health services were concentrated in urban areas and were based on a 'top-down' approach. Because of high investment and maintenance cost, the programme could not be sustained, the national budget allocation to the health sector has dropped drastically and amounted in 1987 to about 1.3%, and had therefore limited success.

Subsequently, a more appropriate approach developed, comprising three main elements, i.e. the Regular Health Care Programme, the Primary Health Care Programme and the specialized Health Facilities and Services.

(1) Regular Health Care Programme

In the Juba Valley, all district and regional centres have hospitals for outpatients including maternal and child health care (MCH) and inpatient treatment. Health Centers (HC) and Sub Health Centers (SHC) are rarely found. All hospital buildings are in poor condition. In Jilib, inpatient facilities are not usable. Equipment for in- and outpatient treatment is very poor or nonexistent. Laboratories are only partly functioning because

of lack of basic test solutions/colorants. Simple surgery can only be performed in Kismayo. Simple X-ray investigations can only be performed in Kismayo and Jilib, but these are rarely done because of shortage of films. A referral system does not exist because of lack of lower health and transport facilities (ambulances).

Bed occupancy rates are therefore below 10% and the outpatient workload for medical/paramedical staff is very low. Because of the low salaries, medical and paramedical staff are forced to increase their income by private activities, often in close cooperation with private pharmacies. The private sector probably offers better and more extensive curative services than the public health sector.

(2) Primary Health Care (PHC) Programme

This programme has started in 1982 and was intended to cover the whole of Somalia by 1991 except Mogadishu. PHC is an integrated system: other health programmes such as MCH would be included as soon as the PHC has achieved full coverage.

The intention of the programme is to implement PHC-Posts at village level, PHC-Units at beel level and District and Regional Health Centres at district/ regional level. The main objective is to establish a basic preventive and curative health care system, to train staff, especially Community Health Workers (CHW) and Traditional Birth Attendants (TBA), organize health education to create awareness to hygiene and proper nutrition and its influence on health, immunization against major infec- tious diseases, provision of essential drugs, and improvement of maternal and child care. Within the Study Area, PHC has been established in Bu'aale, Saakow and Jilib Districts. There are no plans for Bardheere, Dinsor and Afmadow districts, although the PHC programme has already had a considerable impact on the health sector. One of the most serious problems still to overcome is the lack of well functioning referral hospital.

For meeting the needs of the nomadic population, no specific provisions have been made in the PHC programme.

(3) Specialized Health Facilities and Services

A number of specialized facilities and services are aimed at maternal and child health care, leprosy, tuberculosis, malaria and schistosomiasis.

Maternal and Child Health Care (MHC): This is a national programme of the Ministry of Health, which is additionally supported by UNFPRA/WHO, with the intention to provide mother and child care, family planning education and vaccination campaigns. The MCH units are staffed by MoH staff as a complementary task using the existing infrastructure.

Leprosy Centre near Jilib: This center serves the whole country. It consists of self-help village communities, for resident patients and their families, treating also outpatients. It was founded at the turn of the century by a local chief and had been sponsored in the past by the Italian Maltese Aid. Presently it is assisted by World Concern with basic medical and supporting staff, equipment, food aid and drugs.

Tuberculosis Centres: The first centre was established in Kismayo with 80 beds and an outpatient service. The objective of the programme is to create additional centres for TB at the regional level and to integrate the programme into the PHC Programme at village level. This service is sponsored by Finland.

Malaria/Schistosomiasis Centres: There is only one malaria center in Jilib. In the past there were functional Malaria and Schistosomiasis programmes supported by WHO. At present these programmes are dormant, awaiting restructuring.

4.5.3.4 Disease and Disease Vector Control

At present, there is a broad range of limiting factors for better disease and disease vector control (ANNEX 13). The main ones are

- the complex origin of diseases and disease vectors demand an integrated approach where several methods have to be applied in close cooperation with the health sector, with other services and the communities, which is not being done
- there is no research into disease and vector control in the country
- appropriate community water supply and sanitary facilities are rare
- population ignorance of the causes of health problems is widespread
- in the past, little emphasis was put on disease prevention, concentrating on curative measures which are expensive and ineffective
- primary health care with its community-based component has just started and good coverage, necessary for its success, is still far away
- the health sector is given very low priority with respect to the budget allocation it receives. Consequently, personnel is poorly paid and motivated, health facilities have deteriorated and outreach facilities rarely exist
- poor road infrastructure make outreach activities very difficult
- a chloroquin-resistant strain of Plasmodium falciparum is spreading throughout the southern part of Somalia.

The general conclusion is that an integrated approach to disease and disease vector control is badly needed.

4.5.4 Education

The standard of education in Somalia and especially in the Juba Valley is very low and the generally weak education system is not likely to fundamentally change this unless a much more concentrated effort is made in this (ANNEX 12).

4.5.4.1 Educational Level

The two main indicators used for assessing the educational level within a country or region are the illiteracy and the school attendance rates. For Somalia, these demonstrate a very low standard of education:

- Illiteracy rate: Male: 82%, Female: 94%
  (highest in the world)

- School attendance rate:: Male: 28%, Female: 15%
  (lowest in Africa, second lowest worldwide).

As for the Study Area, only the data collected by the JESS Baseline Survey are available. These indicate that illiteracy for the settled population in the Juba Valley is about the same as for the whole nation. For school attendance, no data have been collected.

The very low literacy rate has also to be seen in light of the fact that the Somali language received its written form only in 1972.

4.5.4.2 The Schooling System

The responsibility for education lies with the Ministry of Education (MoE). Education coordinators of MoE are posted at regional and district level for general administration, organization and the collection of statistics (Map 19). The formal school system consists of an eight years primary course and either four years of secondary education or two years vocational training. In addition to the basic school system, further education is offered by the Faculty of Agriculture of the Somali National University located at Afgoi.

Curriculum development and examinations are centralized at national level. The main task of the Curriculum Development Centre (CDC), which is assisted by several foreign organizations, is to develop textbooks for the different school sections including environmental and health education. They are now ready for introduction into the schools. However, printing and distribution of this new material is one of the basic constraints to improving formal education throughout the country.

Attendance in primary schools is free apart from uniforms and consumables. Formal and non-formal education are affected by low budget allocations, which dropped drastically between 1975 and 1987. Extremely low salary levels for teaching staff (MoE) result, particularly in remote rural areas, in limited motivation and the need of the teachers to generate additional income.

Concerning non-formal education, women and adult education, several nation-wide programmes have been introduced since 1974. In addition to the secular system, there are about 5,000 Koranic schools with some 350,000 pupils. About a third of them are girls. Each school has a regular attendance of 50-60 pupils. Koranic and supplementary courses in Islamic studies are taught in a rote-learning-copying method.

(1) The Formal Education System

The primary education curriculum consists of general science, mathematics, geography, Somali language, Islamic studies, physical and environmental education. School attendance in rural areas is only 14% of which one third are female. There are not enough schools and school facilities in the Study Area, particularly in Bardheere and Saakow Districts, even for those wanting to attend school. Most school buildings are in poor condition and some are closed. There is almost no budget allocation for the rehabilitation and maintenance of primary school buildings. A lot of schools are isolated during the rains. Schools are too far apart. About half of the pupils have to walk 5 km or more to the nearest school. Demonstration equipment and other teaching aids are insufficient because of limited financial resources. The curriculum does not take the local environment sufficiently into account and subjects of immediate, urgent importance e.g. hygiene, health and agriculture are not addressed. There are few qualified teachers and the ones in position are not motivated because of low salaries. Families cannot afford to send their children to school because they need their labour force for subsistence activities on farms and elsewhere.

Secondary education is split into a general (80% of enrollment) and a technical (20%) branch. The curriculum of the general branch includes mathematics, geography, English, science (biology, chemistry, physics), Somali and Arabic languages. In addition to general courses on the same subjects as the general branch, be it at a lower level, the technical branch provides for training in crafts. Secondary schools get certain allocations from the Government and are additionally supported by community contributions. Secondary school attendance rate in the Study Area is about 4%, of which about one third are female. In general secondary school facilities have the same limitations as primary schools.

Vocational training is offered at a number of training institutes, of which the most important one is the Industrial Vocational Training Center (IVTC) in Mogadishu and within the Study Area the training centers at Luglow, just outside Kismayo, and at Mareerey, next to the Juba Sugar Project. A training needs assessment of the Juba Valley has recently been carried out under financing of the EEC, indicating that demand for skilled manpower by far exceeds supply and the need for additional training facilities.

(2) Non-Formal Education Systems

In 1974, a Department for Women Education (WED) was established within the Department of Non-Formal Education. The WED provides services with for research and planning, curriculum development, training and family education and field support. A network of Family Life Education Centres (FLEC) was set up in most of the 82 districts of the country. There, four years family life certificate courses and, lately also shorter courses, are provided for women and young girls. The subjects include food and nutrition, home management, textiles and clothing, health education, Somali language and mathematics, child care, arts and handicraft and political education. Based on earlier experiences in 1986 the WED started a new concept in five regions on a pilot basis, assisted by UNICEF and UNESCO. The main objective is to raise interest among rural and urban women, by addressing their specific needs,

particularly to enable them to generate additional family income. The first phase of comprehensive field survey aims at identifying the most appropriate means to achieve this objective. With the exception of the Lower Juba Region, which is one of the pilot regions, there are five FLEC's in the Study Area. However they are at present awaiting reorganization.

Adult Education was also established in 1974, to increase the literacy level of the population. It is combined with the normal school system on a voluntary basis for three years. The curriculum is composed of Somali and Arabic language, mathematics, science and geography. There are adult education programmes in every district. However, it appears that interest of the people has been decreasing over the last few years. In addition Regional Literacy and Skill Training Centres were established in seven regional headquarters.

4.5.4.3 General Aspects of Education

Analyzing the education sector, it has to be kept in mind that the conditions in the Juba Valley have so far been very unfavourable for achieving a higher educational standard.

First it must be realized that the people live under the difficult conditions of a subsistence economy, where all available family is, at east during some part of the year, needed to assist in the agricultural activities.

Secondly, a considerable proportion of the population in the Study Area are nomads who move around, making it impossible for children to attend school.

Third, the curricula so far applied have not been adapted to the local environment and the socioeconomic structure of the population. The subjects dealt within the schools, particularly in rural areas, have a bearing only for non-agricultural careers, thereby promoting rural-urban migration.

Finally, priority given by the Government to education, especially at the primary level has been very low.

4.6 Environmental Protection

Somalia's environment (ANNEX 14) is a harsh one. Temperatures and evaporation are high, rainfalls low but often devastating and irregularly distributed over space and time, surface and groundwater resources are limited and often too saline for consumption, disease vectors prevalent in many areas. Health and welfare of the people are severely affected by these environmental conditions and the people, in trying to carve out a better life for themselves, have to be careful not to upset the fragile ecological balance so much required for a sustained use of the available resource base.

According to internationally recognized definitions environment is the total surrounding of man, subdivided into the natural environment and the socioeconomic or social environment. Natural environmental management is subdivided into the management of the:

atmosphere (air)
hydrosphere (water)
land resources (soils, minerals)
biosphere (flora, fauna, biomass)

Atmosphere, hydrosphere and lands are considered the physical, flora and fauna the biological environment. The following overview is based on this subdivision.

4.6.1 Atmosphere

Air pollution is not considered a problem in the Juba Valley. There are only few industrial sources of air pollution and their emissions are limited and adverse effects have not been reported. Due to the limited vehicular traffic, emissions from motor cars are likewise low. Finally, emissions from domestic fireplaces are, in comparison to others, a very minor health risk.

Like in many other coastal areas, the air along Somalia's coastline is rather corrosive, caused by sea-spray generated by the surf and wind. Not properly protected structures are affected. No figures for damage caused by corrosion is known.

4.6.2 Hydrosphere

The Juba river is the most important water resource in the valley and provides for 9 months per year sufficient water of acceptable quality for all present irrigation, livestock and domestic demand. During the Jilaal, flows can be so low that seawater intrudes from the sea as far as 45 km upstream of the estuary, making the water in the affected reach unsuitable for agricultural or domestic use. This situation is made worse when farmers in the upper reaches continue pumping during the Jilaal, as it further lowers river flows. So far, no control is exercised to properly manage the river water in times of scarcity. Because of the very limited industrial activities in the valley and the low consumption of agro-chemicals, water quality of the river is hardly affected by man.

Groundwater resources are scarce and saline in many places. The standard of 0.350 mmhos/cm as an acceptable limit for potable water is often considerably exceeded but people are so accustomed to drinking saline water that they will classify water of 1.5 mmhos/cm as sweet water. As far as is known, there is no negative impact from human activities on the quantity and quality of groundwater resources.

Water also serves as a very important habitat for wildlife and acts as a disease vector. This dealt with below when looking at the biosphere.

4.6.3 Land Resources

The Juba Valley is, in comparison to other river valleys, sparsely populated and availability of land is not a major constraint. Land use conflicts, which are characteristic for densely populated river valleys are therefore largely unknown. The most serious one in this respect stems from the fact that the large- and small-scale irrigation development has affected traditional migration patterns and access to the river by nomads and wildlife. If this trend continues, access corridors and watering places might be endangered and conflicts between sedentary farmers and nomads might evolve.

With respect to conservation of soil fertility, it has to be recognized that the existing Land Law and the uncertainty about land tenure do not encourage ecologically sound farming practices. The Land Law does not allow registered leaseholds to be bought, sold, subleased, rented or mortgaged, thus discouraging farmers to improve their land. Uncleared forest land is regarded as idle, leading to wasteful clearing of woody vegetation.

Environmental implications of land tenure and land rights cannot be overemphasized. Experience in many developing countries has shown that the environmental implications of different agricultural systems are closely related to the corresponding land rights. Security of land tenure encourages farmers to employ sustainable farming practices and to avert soil degradation. Alienable land titles encourage owners to improve the land which will increase its value, while short-term tenures force farmers to exploiting and thus exhausting the soils.

Due to the generally low farming intensity, even in the lower Juba, there are no apparent signs of serious soil degradation or accumulation of pesticides yet. In the rainfed agricultural areas, there is always the danger of wind erosion, calling for proper agricultural practices and the planting of wind breaks. With increased irrigation development, proper irrigation and drainage methods have to be employed to avoid the very serious problems of salinisation. Finally, in Kismayo District, land is lost to wandering sand dunes, calling for a more intense effort to stabilize the dunes.

4.6.4 Biosphere

The Juba Valley is characterized by three distinct ecosystems:

- the river itself as a freshwater ecosystem which might be brackish in the lower reach during the Jilaal
- the alluvial floodplain on both banks, gradually widening from a few hundred meters at Luuq to several kilometers in the lower reaches
- the dry rangelands beyond the alluvial floodplain, not directly affected by the river system.

The most prominent ecosystem in terms of area as well as biomass is the dry savannah (rangelands), where the vegetation comprises thorny trees, shrubs and herbaceous growth. It is not an undisturbed wilderness, as large nomadic livestock herds have been exploiting it for centuries. The present stocking density is believed to be near the carrying capacity of the rangelands. Apparent signs of overbrowsing and overgrazing have been reported for some locations but it is difficult to assess whether this is the result of temporary overexploitation or the beginning of a more permanent degradation. It must be recognized that nomadic pastoralism is an extremely flexible, ecologically sound strategy to exploit the limited resources on a sustained basis. In addition, it appears that the regenerative capacity of the bushland vegetation is high.

Where soils and rainfall are favourable, land has been cleared for rainfed agriculture, particularly in the Bardheere-Dinsor-Saakow triangle. Individual plots are large and protective measures such as strip plantations of trees to reduce windspeed and to improve the microclimate are the exception. It is deplorable that despite its economic and social importance, rainfed agriculture has not been scrutinized with respect to its ecological implications.

The bushlands also serve as a source of firewood, the main energy source for the people in the Development Area. Denudation caused by overextraction of firewood is visible around major settlements, in particular around the refugee camps. Some hundred square kilometers have been affected, partly beyond recovery, but this is a small part of the total area. Nomads and wildlife are hardly affected by this, but collecting of firewood becomes more time consuming and expensive for the people living in such areas.

Wildlife in the bushlands comprises mainly smaller herbivores, as large mammals as well as large predators have largely been exterminated.

Biological productivity in the floodplain is substantially higher than that of the bushlands. At one time rich gallery forests covered the area, but most of these have been cleared for crop production. The remaining about 900 ha represent the northernmost extension of the East African lowland forest and contain wildlife species which are not found elsewhere. Two viable sites have been identified for protection (Barakow Madow, Shontoo) and declared as forest reserves. They still need to be gazetted, delineated and effectively protected.

Apart from the rapidly dwindling gallery forests, the floodplain ecosystem are still stable and coexistence between agriculture, livestock and natural fauna and flora seems balanced.

The third ecosystem comprises all waterbodies, including the river, ephemeral tributaries, swamps, wetlands, desheks, irrigation systems, etc. These waterbodies represent the most valuable resource in the Study Area, as they sustain human and animal life and allow more productive crop production. But they also serve as a habitat for disease vectors, thus contributing very substantially to the poor health situation, as waterborne diseases are the primary causes for morbidity and mortality in the Juba Valley. The envisaged extension of irrigated agriculture will further increase the potential for waterborne diseases and an integrated disease and disease vector control programme is called for.

The river and some of the desheks are also an important habitat for wildlife and fish. Hippo and crocodile populations flourish in the river and some wetlands. The local population considers hippos as a major crop pest and crocodiles as a threat to human and animal life. With increasing agricultural activities along the waterbodies, there will be less and less room for wildlife.

4.6.5 Environmental Management

Somalia has no specific environmental legislation nor declared environmental policy. Environmentally related responsibilities lie with the sectoral ministries and authorities, in particular with the Ministry of Health (environmental health, sanitation, disease vector control), the Ministry of Agriculture (land tenure, agricultural practices) and the NRA under the MFLR (forestry, range and wildlife management). So far, however, environmental management and setting up of the required institutional framework has not been given high priority by the Government.

4.7 Institutional Support

The sectoral activities described in the above sections are the responsibility of a number of line ministries and their specializes agencies. To achieve a coordinated development, their work is supposed to be guided by the Ministry of National Planning at the highest level, MJVD as the regionally specialized agency and by the Ministry of the Interior with its structure of regional, district and beel level.

4.7.1 Line Ministries

As shown in Table 4/29, numerous line ministries and their agencies are involved in the Juba Valley. Their effectiveness in bringing about a more accelerated development in the Juba Valley is frustrated by a large number of factors with the most important ones being the

- low educational standard and qualification of ministerial staff
- inadequate remuneration of ministerial staff
- shortage of foreign and local funds
- often an inadequate legal base and only poorly developed sectoral policies and development programmes.

While considerable technical and financial assistance has been extended to Somalia in the last years, most of this has been for specific projects with generally limited overall institution building effects. Line ministries are therefore not in a very strong position to initiate and carry out demanding development tasks unless assisted technically and financially.

Table 4/29 Sectoral Involvement of Line Ministries/Agencies

Sector/Activity	Line Ministry/Agency
Agriculture	Ministry of Agriculture (MoA)
Research	Central Agricultural Research Station (CARS)
Extension	Agricultural Farm Management, Extension and Training Project (AFMET)
Mech. Services	Farm Machinery and Agricultural Service Organization (ONAT)
Marketing	Agricultural Development Corporation (ADC)
Livestock	Ministry of Livestock, Forestry and Range (MLFR)
Range, Forestry	National Range Agency (NRA)
Tsetse Control	National Tsetse and Trypanosomiasis Control Project (NTTCP)
Water Resources	Ministry of Water and Mineral Resources (MWMR)
Water Supply	Water Development Agency (WDA)
Fisheries	Ministry of Fisheries and Marine Resources (MFMR)
Industry	Ministry of Industry (MoI)
Roads	Ministry of Public Works and Housing (MPWH)
Water Supply	Ministry of Water and Mineral Resources (MWMR)
Energy Supply	National Agency for Electricity Generation (ENEE)
Urban Development	Ministry of Public Works and Housing (MPWH)
Health	Ministry of Health (MoH)
Education	Ministry of Education (MoE)
Credit	Somalia Development Bank (SDB) Commercial and Savings Bank of Somalia (SCSB)

4.7.2 Ministry of National Planning (MNP)

MNP is the highest planning authority in the country, ensuring through annual and other plans that the Government's resources are allocated in accordance with national objectives and policies. This does not involve, however, the more detailed planning and coordination at the regional level. For the Juba Valley, this regional planning responsibility has been vested in a separate ministry, i.e. MJVD.

4.7.3 Ministry of Juba Valley Development (MJVD)

Until 1982, responsibility for Juba Valley development rested with the Juba Valley Authority, then a specialized agency of the Ministry of National Planning. In that year, MJVD was established, with wide ranging regional responsibilities.

In December 1987, the Ministry of National Planning and the Ministry of Juba Valley Development were merged into a Ministry of National Planning and Juba Valley Development (MNPJVD). Under the Minister, a State Minister was responsible for National Planning, and a Vice Minister for Juba Valley Development and the Bardheere Dam Project (BDP). The Juba Valley Development part was then headed by a Director General, the BDP by a General Manager. In early 1989 the merger was reversed again and MJVD is now again on its own.

Concerning the role of MJVD, Law No. 20 of May 1982, establishing the Ministry still applies. There it is stated that MJVD

> ... shall be responsible for the economic and social development, and the general management of the Juba Valley. It is also responsible for the management and the proper utilization of the Juba river waters.

The particular responsibilities of MJVD are then elaborated in Article 3, including

(a) carrying out survey and specification of the natural resources and preparation of studies concerning the new economic sources of the valley

(b) planning, implementation and the management of all the projects that are being realized in the valley, whether they are those already established, or those will be established in the future with the cooperation of the other concerned ministries

(c) to organize and find the necessary investments for the valley projects, with cooperation of the Ministry of Finance, Ministry of National Planning and the Ministry of Foreign Affairs

(d) development and encouragement of the state and private projects, that are being established in the valley, and

(e) supervision and control of smooth running of the valley projects.

The law thus provides the Ministry with far reaching authorities. To further define how this law should be translated into a workable institutional and organizational structure, a consultant (Price Waterhouse) undertook a World Bank financed study in 1987, recommending the establishment of a Juba River and Power Authority under MJVD. This Authority would have a Power Division for operating the reservoir and, presented in the study as further options, possibly also for generating and transmitting the electricity generated by the dam. A second division would be the River Management Division with responsibility for controlling water use downstream of the dam, possibly including the development of the irrigation potential. Finally, the Authority would have a Secretariat with the tasks of finance and administration, planning, internal audit and monitoring and evaluation.

The study has been discussed and a final report completed in March 1989. Consequences of the study and possible organizational changes or modifications will have yet to be decided. However, MJVD envisages presently to establish a new department of "River Management" which would be the nucleus of the River Management Division as proposed by Price Waterhouse.

Present practice follows the law of 1982, and MJVD is now engaged in planning and implementation of development projects. The present organizational structure of MJVD is shown in Figure 4/5. It shows four departments, including the new Department of River Management, each of them having two or more sections. The directors report to the Director General who is the chief executive of MJVD, reporting to the Minister. Next to the Ministry's organization is the autonomous Bardheere Dam Project with its own budget. Its General Manager reports also to the Minister.

From 1982 till now, MJVD carried out a number of studies, among which

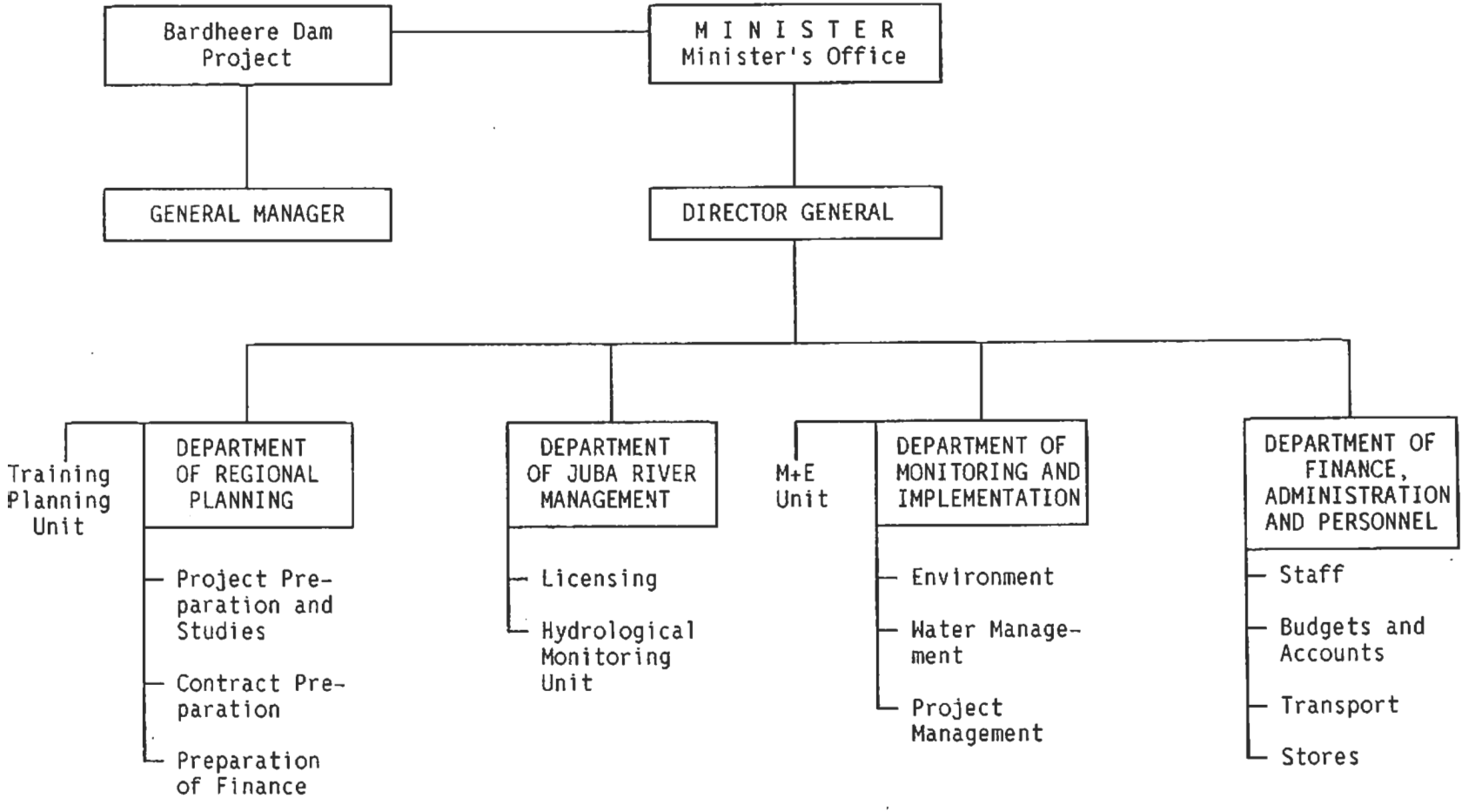
- those directly concerned with the preparation of the Bardheere Dam
- a series of studies carried out by MJVD with assistance from GTZ/AHT covering agriculture, hydrology, settlements, infrastructure and some parts of the tertiary sector
- the Juba Development Analytical Studies (JUDAS), a cooperative effort between MJVD and USAID, of which the environmental and sociological studies (JESS) were most prominent
- a number of studies concerning specific aspects, such as the Homboy project, rehabilitation of the Kismayo Meat Factory and others
- most recently studies on the possibilities for resettling those people now living in the future reservoir area of the Bardheere Dam.

Besides continuing the preparation of the Bardheere Dam project, MJVD is presently responsible for implementation of the Bardheere research station (EEC financed), the resettlement studies (IBRD financed) and the Deshek Pilot Project (GTZ financed), which is now under preparation. In addition, MJVD monitors the EEC financed projects for the construction of the Jilib Bridge and the Jilib - Bardheere Road.

Institutional support in terms of technical assistance financed by GTZ has been extended to MJVD since 1983 and is expected to continue at least until mid-1990.

As a consequence of the work carried out in connection with this Masterplan, MJVD has already begun to prepare a number of Project Identification Reports for the most urgently required projects. In this, MJVD is supported by GTZ/AHT.

Figure 4/5 ORGANIZATIONAL STRUCTURE OF MJVD



4.7.4 Local Government

The Somlia Democratic Republic is subdivided into Regions and Districts. Each Region is headed by a Governor, and each District is headed by a Commissioner. Governors and Commissioners are being nominated by the Ministry of Interior. They represent the central government in their Regions and Districts respectively in all administrative and political aspects. The Commissioners of the Districts are head of the Development Council where all coordinators come together and meet, and they are also head of the Security Council, where army, police and security officials come together.

Many of the line ministries and agencies have established coordination offices in the Districts, the office being headed by a coordinator who is member of the afore-mentioned Development Council. Administratively, the coordinators report to the Commissioners, in technical matters they report to the respective line ministries and line agencies who transferred them to the Districts and to whom they belong to.

The Study Area leads through the following regions:

- Gedo Region with the District Bardheere inside the Study Area
- Bay Region with the District Dinsor inside the Study Area
- Middle Juba Region with the Districts Saakow, Bu'aale and Jilib inside the Study Area
- Lower Juba Region with the Districts Jamaame and Kismayo inside the Study Area.

The highest authority in each District is consequently the Commissioner, and each District has among others

- an agricultural coordinator from the MoA
- a veterinary coordinator from the MLFR
- a health coordinator from the MoH
- an educational coordinator of the MoE.

To all of the agricultural coordination offices, AFMET attached a few agricultural field extenion agents who report directly to the AFMET headquarters, however, who have to cooperate with the agricultural coordinators. In some of the Districts, stores of ADC and stations of ONAT are being found.

Among the functions of the District (and also for the Regional) offices are those of interest which support the initiation, planning and/or implementation of rural development. In analyzing the present situation, the following can be stated:

- information on development programmes and projects come together at the Commissioner's office (at Regional Level: Governor's office). The information may not be complete due to a number of shortcomings, however, usually any planner get much information from there;

- for detailed information the Commissioner's office liaise with the coordinatiors;

- coordinators' offices are in many cases involved in active data collection or assist in data collection undertaken by planners. They report to the respective line agencies, they initiate occasionally action if required or corrective actions whenever necessary;

- under certain circumstances, coordinator's offices undertake activities on behalf of the respective line ministries which is particularly true for:

  . the agricultural coordination office (eg. land registration)
  . the veterinary coordination office (eg. animal vaccination)
  . the health coordination office (eg. med. treatment)

- of great importance for rural development is land registration which is handled by the MoA through the agricultural coordinators' offices. Upon request of an interested party, the coordinator initiates the registration procedure in cooperation with the respective village committees. Though the system is somehow deficient and requires much improvement, presently and in future the agricultural coordinator has his role to play in securing land tenureship;

- Commissioners' offices and coordinators' offices usually are not directly involved in the planning and implementation of development programmes and projects (an exception being the health coordination offices). For those, independent project units are being created by the line ministries and agencies, and these units report directly to the respective institutions.

Of great importance to the day-to-day life of the Juba Valley population are the village committees and the village chiefs. They upkeep tradition and the traditional way of decision, and they look back to a long history which is characterized by Islam and the nomadic social pattern. Though the settlement process continues, and part of the responsibilities being taken away by the central or local government organs, the village chiefs and the village committees are representations of the target group. There is no way of developing the rural area without involving the village hierarchy.

5. Impact of the Bardheere Dam and Summary of Constraints

Construction of the dam and the subsequent operation of the reservoir will have numerous effects throughout the Juba Valley, as discussed in the following. Some of these will clearly be of great benefit, others pose new problems and development constraints (Map 15). A summary of all the identified development constraints will then be presented in a structure which will facilitate the derivation of specific development proposals as part of an overall goal system.

5.1 Impact of the Bardheere Dam

The planned dam will have two overall effects on the water regime in the Juba Valley. First, a reservoir will be created between the dam and the town of Luuq, totally changing the present environment. Second, downstream of the dam, river flows will be regulated, drastically changing the river regime in that part of the Juba Valley. The consequences of these overall changes will be dealt with in the following. It should be noted that the future reservoir area is not part of the Study Area and has therefore not been studied in the same depths as the area downstream of the dam.

5.1.1 Upstream of Dam

The most significant consequence of creation of the reservoir will be the need for resettlement of the people now living in the area which will be flooded in future. It has been estimated that a maximum of 3,000 families, involving about 20,000 individuals would need to be resettled. These are settled farming families, most of Somali origin, but up to about one fifth would be refugees. Compared to other dam projects, these are relatively small numbers. Nonetheless, satisfactory solutions must be found and specific studies have already been carried out.

Filling of the reservoir will inundate about 425 km^2, of which about 7% (3,000 ha) are floodplain crop lands, which will be lost. Most of the remaining land consists of poor and stony soils which have not been suitable for crop production, especially as average rainfall is below 400 mm/year. Woody vegetation is not very pronounced, as most has already been removed.

It is estimated that the drawdown zone of the reservoir will in average years extend over about 10,000 ha. Depending on the quality of soils, about which little is known, but which are likely to improve over time, this area could be used for flood recession agriculture and as dry season grazing area for livestock, particularly if reservoir operating procedures would take this into account.

Water quality in the reservoir is expected to be good, with salinity being most of the time below an EC value of 0.5 mmhos/cm and no significant contamination through waste water from settlements or agro-chemicals. Initially, oxygen depletion caused by decomposing wood my create hydrogen sulphide but this condition is not expected to be serious, as woody vegetation is not substantial and should be removed before flooding in any case to meet firewood demand, particularly during dam construction.

The effect of the reservoir on the groundwater upstream of the dam is difficult to predict, as little is known about the hydrogeological formations in this area, but a rise in groundwater levels and possibly an improvement in quality are likely.

The reservoir will increase humidity and soil moisture and reduce soil temperature at its borders. This will change the vegetation and could become a breeding ground for tsetse, which has so far not been reported north of Bardheere. In turn, this could force changes in grazing patterns affecting a much larger area.

Apart from richer bird life and a likely increase in the crocodile population, resulting from the increased availability of fish, there will be no significant effect of the reservoir on the wildlife.

Fish resources in the reservoir are expected to increase rapidly in the first few years after closure of the dam and decline thereafter, coming in balance with nutrient inputs. No estimates exist about the variety and quantity of fish that could be expected, nor are there any plans for exploiting this future resource.

From a health point of view, the most threatening effect of the reservoir will be an increase in the incidence of malaria, as the reservoir will provide a suitable new habitat for mosquito vectors. From an analysis of reservoir margin depths, wave patterns, wind direction and drawdown rates, it appears unlikely that bilharzia will spread, as most of the reservoir area does not provide a suitable habitat for the snails.

Finally, the town of Luuq might in later years be affected by the reservoir, as it lies on an oxbow, where sediments might be deposited by the river, resulting in increased danger of flooding at times of high inflows.

5.1.2 Downstream of the Dam

Closure of the dam and operation of the reservoir will have an impact on the quality and the quantity of the water released from the dam, with most of the positive and negative effects stemming from the change in the quantity of the flows.

The quality of the water will change as the dam will act as a sand trap with the released water carrying fewer sediments than at present. River scouring will be the result with the possibility of the river significantly changing its course, damaging existing infrastructure and settlements and making access to the river waters for irrigation more difficult. To prevent this, river stabilization works might be required.

In terms of salinity, the reservoir will even out fluctuations and releases from the dam will be below 0.6 mmhos/cm for most of the time. In the lower reaches of the Juba, salinity levels will increasingly be affected by return flows from irrigation and seasonal inflow from the intermediate catchment will continue as in the before-dam situation. Higher salinity levels can therefore be expected for much of the lower Juba Valley, which might eventually be unsafe for irrigation of bananas. In addition, increasing use of fertilizers and other agro-chemicals and a fast growing population, particularly in the lower Juba Valley pose a threat to water quality. Safeguarding the quality of water and close monitoring are therefore of great importance.

The quality of the water will also change, as operation of the reservoir would allow to maintain a minimum flow of at least 15 m^3/s, preventing sea water intrusion in the lower reach of the Juba, with considerable benefits to domestic and irrigation water supply in that region. Along the Juba, the minimum flow would also overcome a present health hazard, where villagers resort to stagnant pools in the river for meeting their water needs during the dry season, when flows are very low.

The most immediate effect of regulating the flow of the river will be a considerably reduced flooding of desheks, particularly in SGU's 1 and 2 where the inflow from the intermediate catchment is much smaller than further south. This will mean the end to flood recession crop production. It will also mean that certain areas, now more or less regularly flooded and later used as dry season grazing area, such as Deshek Waamo for example, will produce much less biomass, which would have to be compensated for in other regions or through the production of fodder crops. One way of overcoming these drastic changes would be to release artificial floods from the reservoir. It is likely that this should be possible without sacrificing electricity generation, particularly in the earlier years when supply for electricity will exceed demand. However, such considerations have not yet been included in the operations studies carried out for the reservoir.

Regulated river flows also allow the reduction of flood damage. However, as the damage is highest in the lower reaches of the Juba, where the inflow from the intermediate catchment and the Shebelli is substantial, the possibilities for effecting a reduction in flood damage are limited. It should also be noted that the maximum flow of 700 m^3/s to be released from the dam is well above the bankfull capacity of the river channel in the lower reaches. Abstraction and losses on the way will somewhat reduce the flow and thus the danger of flooding. However, depending on the manner in which the reservoir is operated, the severity of some floods could be reduced, particularly if it can be avoided that peak river flows will coincide with peak inflows from the reservoir. An improvement of the situation will also be achieved by the implementation of the Homboy Project, which provides for substantial intermediate storage of Shebelli waters.

The most substantial benefit potential to be derived from the regulated flow will be the increased agricultural production, brought about by extending irrigated crop production from the present 17,000 to a possible 120,000 ha at some future time. Realizing this potential, however, will be far from easy, as experience has shown all over the world. Most easily, the benefits will accrue to the existing irrigation schemes of Juba Sugar, Mogambo and the banana farmers, which will not any longer suffer any water shortages during the dry season. However, even for the large irrigation systems, programmes for physical rehabilitation, extension and possible reorganization will have to be drawn up and carried out to fully reap the benefits of the better availability of water.

Expansion of the area under irrigation will in comparison require a much larger effort to overcome present weaknesses in irrigation system development, the lack of support services to the small- and medium-scale operators, the scarcity in irrigation engineering and water management skills and the poor irrigation practices resulting in the discussed low water use efficiency. Without such efforts, irrigated agriculture might develop exclusively in a narrow strip along the river, making future extension to the areas more distant from the river difficult and denying access to the river

to the nomads for watering their animals. Furthermore, the substantially improved supply of water, which will initially by far exceed demand, could lead to a further lowering of the water use efficiency with the danger of rapid water logging and salinisation.

Related to the expected regulation of the river is the issue of increased land speculation in some parts of the valley and the insecure land tenure situation of the traditional farmers who have never registered their land. To prevent further escalation, the Government has imposed a temporary stop on all land registration in the districts of Bu'aale and Saakow. While this should be helpful, more permanent solutions have to be found to provide the crucial land tenure security.

The effects of the dam on the groundwater are again difficult to predict as knowledge about the hydrogeological formation is scant. In addition, groundwater levels and quality will also be affected by the expected increase in irrigated agriculture.

Nomads and their livestock will be affected in two ways. First, the reduced floodplain brought about by less extensive flooding and an increase in cultivated area will provide less dry season grazing. The extent to which this will affect livestock has not been quantified, but it is expected that the demand for fodder crops will increase in future. Second, increased cultivation along the river could lead to traditional access corridors to the river being not any longer available to the nomads for watering their animals, calling for better land use planning and irrigation system development.

Wildlife in the downstream areas will be affected by the reduction of the floodplain and the increased agricultural activities pursued by a growing population. However, as long as there is some access to the river, the negative effects will not be significant, as the dryland habitat further away from the river is very large. In the long term, with slowly increasing population pressure along the river, it will be more and more difficult for hippos and crocodiles to find sufficient space to survive.

The changing water quality and the different flow regime, particularly with respect to the desheks will result in some fish species disappearing, while others might increase in numbers, especially because there will be no more losses of fish during the dry season. Whether overall fish biomass in the river will increase or decrease is difficult to predict. The regulated flow will, however, make an end to the seasonal instability of the fish population in the river.

Regulation of river flows and less extensive flooding will improve accessibility in some areas of the valley, particularly in SGU's 1 and 2. Construction of the Jilib - Bardheere road, however, will have a much larger impact in this respect.

For the energy balance of the Juba river, the dam will be of great benefit as far as electricity supply to the larger towns, the irrigation projects and industry is concerned, provided that, as planned, a supply line is built through the valley down to Kismayo. For the rural population, electricity from the dam will be of no direct benefit, but they would indirectly profit from possibly more effective urban services brought about by electrification.

For meeting the energy requirements for cooking, now met by firewood, electricity would only make a minor contribution, as even urban households will not all be able to afford the initial and operating costs of electrical appliances. In the long term, firewood is likely to become more and more expensive in the urban centers and electricity could then play a more important role.

The settlement pattern in the Juba Valley will experience a substantial change during the construction phase of the dam, when a large labour force will be required and will need to be accommodated. It has been planned to establish for this purpose a new settlement directly at the dam site. In addition, the town of Bardheere would also be affected, as many people will venture into the region in hope of finding employment and because of the emergence of support services. After completion of the dam, the required labour force for operating and maintaining the reservoir and the dam will be comparatively small and is not expected to have a significant effect on the settlement pattern of the valley.The final and quite serious effect of the dam and the associated expansion of irrigated agriculture will be the further health hazards that will inevitably accompany such a development. With desheks not any longer being flushed and more irrigation canals and drains, favourable habitats for harboring bilharzia snails will be created and a further spreading of bilharzia is very likely. With regular river flows and additional irrigation, mosquitos will have more breeding grounds and malaria is certain to spread further. This is exacerbated by the fact that there is a recent, but increasing appearance of a chloroquine-resistant strain of malaria in the Juba Valley. The mentioned need for an integrated disease vector and disease control programme will thus be of even greater importance after closure of the dam.

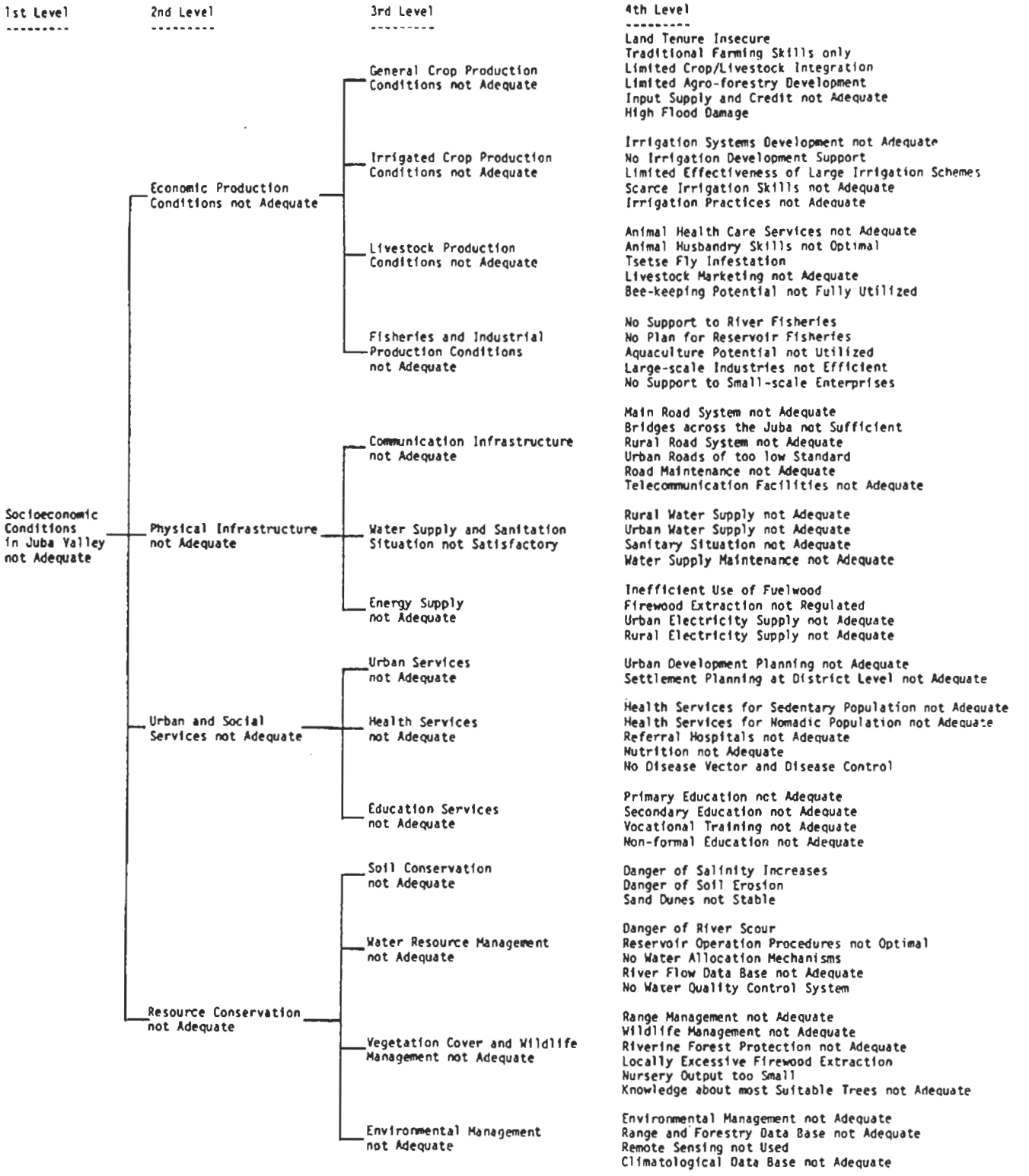
5.2 Summary of Constraints

Throughout the previous and this chapter, numerous constraints have been identified which need to be overcome, if the Juba Valley is to make progress towards a higher standard of living for its people and a larger contribution to national development. To allow a better overview of all the constraints, they have been classified into a hierarchical structure, as shown in Figure 5/1.

As shown, the hierarchy of constraints consists of four levels. On the lowest level, the constraints identified in the preceding analysis are grouped under the headings given at the next higher level. These in turn are grouped according to four main areas shown at the second level covering the economic production conditions, physical infrastructure, urban and social services and resource conservation. The overall result of all the constraints is the low standard of living of the people in the Juba Valley, as shown at the highest level of the hierarchy.

It should clearly be understood that this hierarchy does not portray the numerous linkages and thus the cause and effect relationships that exist between all the constraints, but only serves the purpose of structuring the large number of individual constraints and to form the basis for the derivation of a goal system for defining specific development proposals for the valley and assigning priorities to them.

Figure 5/1 Summary Hierarchy of Identified Constraints



6. General Approach to Regional Planning

Dealing with the constraints identified in the previous chapter by identifying appropriate development proposals, ranking them in terms of their importance and derivation of a regional development programme should ideally be done in conformity with a generally agreed theory for regional development. In the past, a number of theories have been defined on which regional planning was to be based. At present, the consensus of development planners appears to be that there is no overall, comprehensive theory which could serve as a prescription to detailed development planning. Instead, agreement seems to exist that there are a number of important elements which should be taken into account by the regional planner when tackling the problems of a specific region. It is the purpose of this chapter to outline these key elements and to indicate their importance in the context of this Masterplan for development of the Juba Valley.

6.1 The Need for a Regional Development Plan

The region is the geographical unit where national development objectives and plans have to be harmonized with local development potential, needs and constraints. A regional development plan is therefore the result of planning from above, i.e. the national level as well as from below, i.e. the local level. It is the basic instrument linking the nation with the region, it thus performs the vertical coordination of planning activities.

In addition, regional planning has the function of also coordinating the sectoral planning activities horizontally, i.e. within the region, to ensure that the required inter-sectoral linkages are considered and established, making best use of the regional potential.

The product of this vertical and horizontal coordination of planning activities, is a regional development plan, which serves as a guide for local, regional and national decision makers having to translate general policy into concrete development measures, projects or programmes.

6.2 Concepts of Regional Development

In performing his function, the regional planner should be able to work according to a well established and generally acceptable theory. Such a theory should be able to explain ongoing development processes and provide the basis for formulating specific recommendations and programmes. Up to now, three basic concepts have been developed which are generally described as the growth pole, decentralized territorial and functional-spatial integration approaches [139].

The growth pole approach implies that regional development is triggered by locating highly capital intensive industries into the largest urban centers, from where economic and social development will then spread. This approach was tried in a number of countries during the 1950s and 60s with the general result that the negative polarization effects by far outweighed the hoped for trickle down effects, limiting economic growth to a few isolated urban areas. As a consequence, the growth pole approach is not any longer advocated as a suitable theoretical base. In the case of Somalia, this approach has not really been tried as a matter of conscious development planning.

However, an example of the very limited trickle down effects of large, capital intensive investments is provided by the Juba Sugar Project, which has very few linkages to the immediate vicinity and does therefore not serve as a growth pole for the rest of the region.

The opposite to the very centralized growth pole approach is the decentralized territorial approach, sometimes also referred to as agropolitan or selective regional closure approach. The basic argument put forward by proponents of this approach is that urban centers are generally parasitic by their nature, exploiting the rural areas, draining their resources. Investments should therefore be widely dispersed throughout the rural areas, where the rural population will be largely autonomous in planning and decision-making. While this approach has a certain appeal as it promotes social equity and local participation, it is generally regarded as too radical a model to be useful for practical implementation. As far as is known, this approach to regional planning has not been tried in Somalia.

The third approach, the functional-spatial one, could be considered a compromise between the highly centralized growth pole and the highly decentralized territorial concepts. The functional-spatial approach suggests that overcoming regional disparities requires investments not in a single growth pole but in a number of growth centers providing the essential supporting functions to their hinterlands. Agriculture is seen as the prime mover for development, which needs to be supported by appropriate agricultural technology, agricultural research and extension, input supply, credit and functioning marketing systems. To provide such services, rural service centers are required which form the basis for the hierarchical settlement pattern. At that level, basic needs support and establishment of self-help organizations are also located. What is propagated is a hierarchy of settlement centers linked to each other, where each level of the hierarchy performs the functions that can be justified on economic grounds. Although experience with this approach towards regional planning is generally limited and non-existent in Somalia, academics and practitioners seem to largely agree that it constitutes the most promising of the three approaches briefly presented here. In actual fact, the existing hierarchy of settlements as presently found in the Juba Valley would also tend to support this approach.

Within the context of this Masterplan, this very general concept of functional-spatial integration, together with the key elements described in the following section, has therefore been adopted as the theoretical basis on which the specific development programme for the Juba Valley is established.

6.3 Key Elements of Regional Development Planning

In addition to accepting the functional-spatial integration as a basis for development planning, a number of principles appear to have also been accepted by development planners of being of general relevance.

First, economic growth is generally seen as the driving force behind any socioeconomic development. Better utilization of the region's potential resulting in increasing productivity of production factors and income are therefore of paramount importance. Agricultural development normally plays the key role with achieving self-sufficiency in food being the basic objective. To do so requires not only investments into infrastructure and ser-

vices, traditionally associated with development activities, but also strenghtening and enforcing inter-sectoral linkages. At the same time, a general orientation towards meeting basic needs is pursued, assisting the poor in satisfying such needs on a long term basis through their own efforts and local resources.

While development efforts have often been successful in the short term, the general experience has been that maintaining a development momentum over the longer term is much more difficult and very much prone to failure. Today, sustainability is therefore given much more attention. Specifically, this means an orientation towards reliance on and conservation of local resources including human, natural, financial and institutional resources, basically reducing the dependence on the outside, as far as this is possible. Improved sustainability is also achieved by having a more target group oriented approach in determining the needs, potential and constraints of the different groups of people living in a region and by promoting a higher degree of participation of the target groups in shaping their own future. Putting more emphasis on locally available resources and on the active participation of the target groups requires generally a higher degree of decentralization of administrative and planning structures.

Development is recognized to be a very complex process for which no overall theory exists which would describe actual and forecast future developments in a comprehensive manner. At the same time, availability of human, institutional and financial resources is constrained. Both these factors demand an approach to planning and implementation of a regional development programme which is characterized by an iterative process of reduced planning, an identification and structuring of the most important core problems and a bias for action, i.e. a tendency to act quickly on overcoming the most pressing problems. This Masterplan can therefore only be regarded as a first step in a long iterative process of adding and subtracting development proposals from the programme and reviewing and revising their priorities and scope in light of actual developments and experience. However, being the first effort of defining a development programme for the Juba Valley, this Masterplan is rather comprehensive in analyzing the present situation and in presenting possible development proposals to provide a broad base for decision making. Subsequent, periodic reviews will then be much less comprehensive.

6.4 Establishment of a Goal System for Juba Valley Development

To be of assistance to decision makers, a regional development plan has to specify the objectives it pursues and identify which of the proposed measures, projects and programmes should be undertaken as a matter of priority. This requires the establishment of a system of goals to which specific development proposals can be assigned and a manner in which priorities can be determined.

It is understood from the analysis presented above that the low standard of living is the core problem of Somalia as a whole as well as of the Juba Valley specifically. Improving the standard of living of the Somali people including the people of the Juba Valley, can therefore be considered the overall development objective for the national as well as for the regional level.

Improving the standard of living of the people in the Juba Valley can, of course, not be done in isolation of the overall economic situation of the country and national policy. Concerning the overall economic situation of the country, constraints are particularly felt with respect to the availability of foreign and local funds and the scarcity of technical as well as administrative skills. Of the national policies, those for marketing and pricing of agricultural inputs and products, including livestock, renumeration in the public service and the funding of operating and maintenance costs on a sustained basis are probably the most significant ones. Unless these policies encourage and support the development process, regional development initiative and activity will only partially be successful. To improve the standard of living of the people in the Juba Valley therefore requires, like any regional development effort, a two-pronged approach, i.e. appropriate national policies and implementation of a specific regional development programme aimed at improving the socioeconomic conditions in the Juba Valley.

While the development of the Juba Valley is seen in the first instance as a process to improve the standard of living of its people, it should also contribute to overcoming the country's national constraints. Specifically, it should make a contribution towards

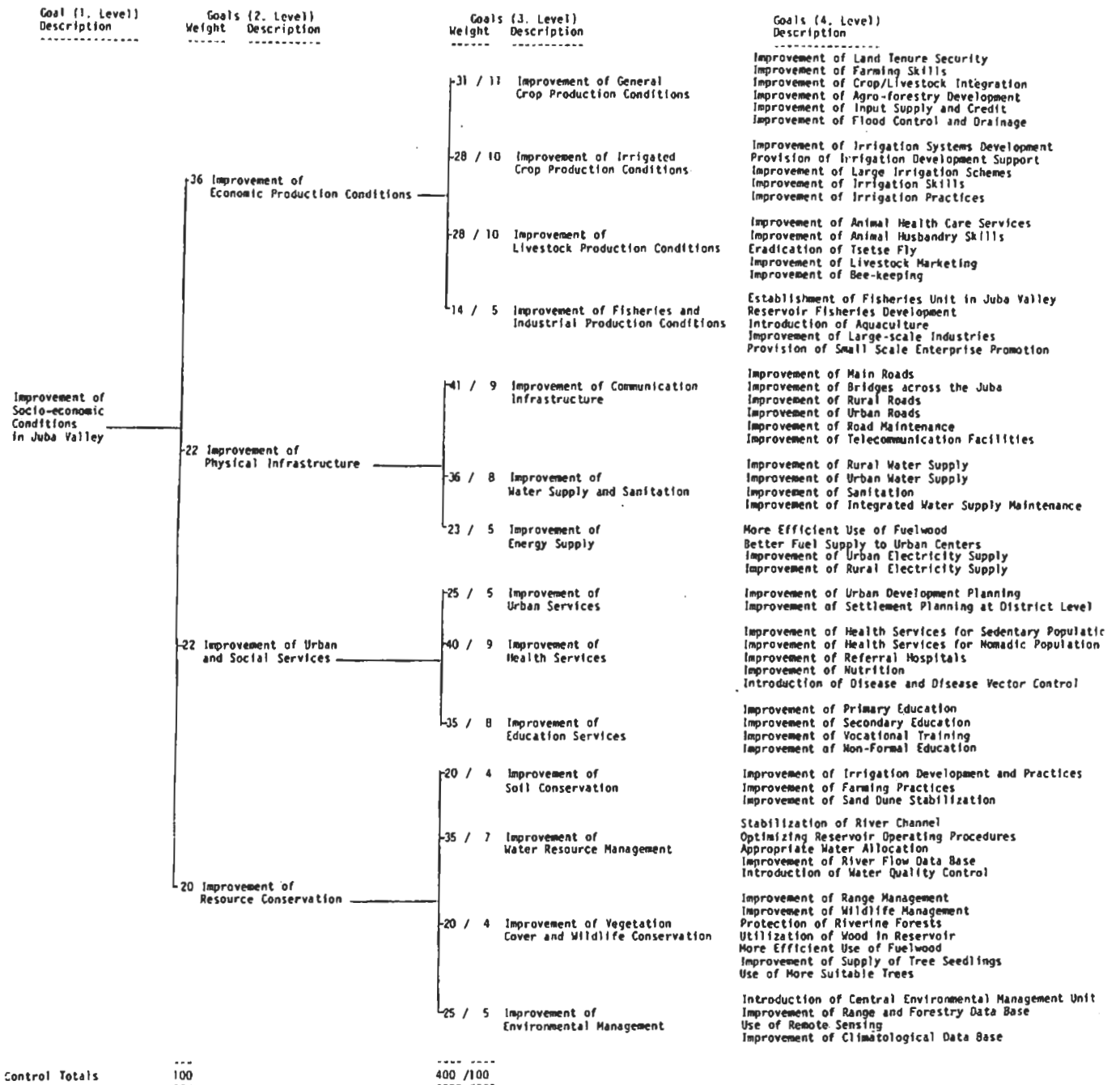
- achieving self-sufficiency in food production
- improving the country's foreign exchange balance
- increasing the availability of local funds
- improving the quality of public services
- protecting the country's unique ecological resource.

These national objectives will be taken into account when defining the specific development proposals and in setting priorities.

For the Juba Valley specifically, a hierarchy of goals as presented in Figure 6/1 has been established, which has the same structure as the hierarchy of problems derived in Chapter 5 and is the direct result of it. This goal system (the numbers refer to weights, as described in Section 6.5.2 below) will form the basis for deriving the specific development proposals in Chapter 7 and for assigning priorities in Chapter 8. It thus provides a consistent link between the analysis of the existing problems with the specific development activities recommended for implementation.

It should be understood that the goal system as presented here is a very rough approximation of the actual cause and effect relationships that can be expected during the actual development process. However, following the principle of reduced planning, emphasizing the need for identifying development proposals aiming at alleviating the core problems and understanding this Masterplan only as a first step in a long iterative process, such a simplification is deemed to be justified and will help the involved decision-makers to get a good understanding of the basic development options they have to decide on.

Figure 6/1 Goal System for Juba Valley Development



Note: Weights at the third level are given in the format
a/b where a = assigned weight and b = calculated compound weight.

It should further be noted that a number of development activities essential for the development of the Juba Valley have not been formally included in the goal system. These are the Bardheere Dam itself with its related projects, most importantly resettlement of the people now living in the future reservoir area, and the organization and management activities which need to be undertaken to implement the here derived development programme. While these activities are not included in the goal system, profiles describing the respective development proposals have been prepared and are included in the Juba Valley Development Programme.

Concerning resettlement, studies have been undertaken for this and it is the proposal of the World Bank to formulate a separate project for the resettlement to be executed in parallel with the implementation of the dam. This is considered a good approach, as the experience of dam projects has often been that resettlement is neglected when it is part of the dam construction project. At present, a total of about 20,000 people have been identified for resettlement and it is proposed that a pilot resettlement project is carried out to gain practical experience in coping with the many problems that will be encountered when people are resettled and have to begin a new life in a new environment.

With respect to the organizational and management aspects of Masterplan implementation, a number of steps need to be taken, which are derived in Chapter 8.

6.5 Development Priorities

To effect the desired improvement of the standard of living of the Juba Valley population, it would be ideal if those development proposals which could be meaningfully implemented now, were actually started immediately. This is clearly not possible, as there are very real institutional and financial constraints making a phasing of implementation necessary.

Phasing of the implementation of the development proposals, on the other hand, requires the assigning of priorities, which can be done in a number of different ways, which are described in the following.

6.5.1 General Possibilities for Assigning Priorities

Priorities can be assigned to the different development proposals on the basis of

- the target groups they affect, or
- their geographical location, or
- their functional (sectoral) contribution to the goal system, or
- a combination of the above.

These general possibilities are discussed and a recommendation developed.

(1) Priorities by Target Group

Throughout the Masterplan, four broad target groups have been used, which are the farmers practicing rainfed crop production (31%), those practicing irrigated crop production (12%), the nomads (21%) and the urban population (36%), with the percentages referring to the estimated share of the groups by the year 2005.

If size of the group would be used as a criteria, the urban population should be given the highest priority, followed by the farmers practicing rainfed agriculture, the nomads and to a considerably lesser extent to the farmers practicing irrigated agriculture.

If, as has also been postulated above, it is considered of primary importance to ensure that the basic needs of all people in the Juba Valley are met, then priority should be given to all the poorest members of the four target groups.

Finally, if economic growth is considered the primary objective, priority should be given to those groups with the most immediate development potential, such as the farmers and organizations practicing irrigated crop production, the most progressive farmers practicing rainfed farming, or entrepreneurs willing to invest in small or medium scale industries.

Taking into account the experience made by developing countries, it would appear that all three criteria, i.e. size, need and economic production potential have to be taken into account when assigning priorities.

(2) Priorities by Geographical Region

For planning purposes, the Study Area has been divided into SGUs, representing more or less homogenous zones of potential and type of activity. However, for administrative reasons, the SGUs are not a suitable basis for undertaking development activities. Instead, districts are recommended to form the basic geographical unit for implementation and operation of the development proposals.

As it will not be possible to start development activities in all districts at the same time in all sectors, geographical priorities have to be defined. This will be done in Chapter 3 for each development proposal by first of all identifying those proposals for which no geographical priority can be assigned because they

- refer by their very nature to a specified location (Homboy Project, Urban Development Plan for Bardheere, etc.);
- relate to all of the Study or Development Area (environmental monitoring, extension of raingauge network, etc.), and
- concern necessarily more than one district (Jilib - Bardheere road, river stabilization works, etc.).

For those development proposals to which geographical priorities can be assigned, three criteria will be utilized:

- to development proposals aiming at a better utilization of natural resources, geographical priority will be assigned on economic grounds, i.e. those regions with a high development potential will be given priority (extension service, animal health care, etc.);

- to development proposals resulting in better infrastructure or social services, geographical priority will be assigned on equity and economic grounds (health, education, etc.), and

- to development proposals primarily concerned with the conservation of resources, economic considerations will be decisive in assigning geographical priorities.

The result of this geographic allocation of priorities for all the development proposals will then be taken into account when formulating the administrative requirements and assessing the spatial impact.

(3) Priorities by Sector

The third possibility for assigning priorities is by estimating the contribution the individual development proposals make to the achievement of the overall goal. Those development proposal making the greatest contribution would then receive the highest priority and the remaining ones would be ranked in accordance with their relative contribution.

For estimating the contribution the individual development proposals would make, a comprehensive economic analysis would be the ideal procedure. However, the goal system includes sectors such as health, education and environment for which such a comprehensive analysis is practically impossible.

Therefore, if a ranking of the development proposals is desired as a method for determining development priorities, only a subjective method, such as the assigning of relative weights by those familiar with the specific problems of the Juba Valley and the decision makers, remains. In fact, as will be detailed below, this has been the approach adopted here.

6.5.2 Combined Approach for Assigning Priorities

Following the above analysis, a combined approach for assigning priorities has been adopted, consisting of a ranking of the development proposals by their sectoral contribution to the goal of improving the socioeconomic conditions in the Juba Valley and a subsequent identification of the geographical and target group priorities, where this is required. The latter is necessary, as many of the development proposals apply to a number of districts, while implementation cannot possibly start in all of them at the same time.

Basis for the ranking of the development proposals is the goal system given in Figure 6/1 to which weights were assigned in two steps.

First, weights were given by 14 staff members of MJVD and 5 members of the consultants' team to the goals at the second and third level according to the urgency they saw for implementation of development activities within the different functional areas. The result of this weighing is included in Figure 6/1 up to the third level. The assigned weights at the second level, give greatest importance (36 points) to the improvement of the economic production conditions, basically demonstrating the opinion of the participants that economic growth has to be the basis for regional development. Improvements in the other four areas, i.e. physical infrastructure, social services and resource conservation were given about equal weights with 20 to 22 points each.

At the third level, the compounded weights give the largest number of points (10 and 11) to improvement of rainfed and irrigated crop and livestock production conditions. This is followed by 8 and 9 points given to improvement in communication infrastructure, water supply and sanitation and health and education services, while management of water resources has been given 7 points. The remaining 6 groups, including fisheries and industry, energy supply, urban development services, soil conservation, vegetation cover conservation and environmental monitoring were given 5 and 4 points and ranked lowest.

The second step involves allocation of priorities to the goals at the fourth level, which has been done by the technical experts of the consultant's team, as this is largely based on technical judgment. This is done together with the formulation of the development proposals in Chapter 7.

The combination of the weights for all levels of the goal system will then form the basis for determining the priorities of the development proposals and of the phased development programme, which will be established in Chapter 8.

7. Derivation of Specific Development Proposals

7.1 Approach

To operationalize the general development objective as presented by the goal system in the previous chapter (Figure 6/1), specific development proposals for meeting the goals at the fourth level need to be identified, taking into account the existing potential and constraints as well as expected future needs. For each one of the development proposals a "profile" has been prepared which summarizes the basic data of the proposal, including the purpose, short description, outputs, linkages, target population, timing and implementing agency. In total, 72 development proposals are made and their respective profiles are included in APPENDIX 1.

References to these profiles are made in the following by using their identification code consisting of three letters defining the sector (WAT = Water resources, CRO = Crop production, etc.) and a sequential number. EDU 3, for example refers to the profile for development proposal number three of the education sector.

To indicate the relative scope of the individual development proposals, the profiles also define each one as being a measure, project or programme, which is defined as follows:

- measure defines a specific and limited action which is either preparatory, such as a study, or has to be integrated into ongoing or proposed projects or programmes

- project is an action for which time and required inputs can be clearly defined

- programme may be composed of one or several measures and/or projects and constitutes a longer term development effort for which a clear time horizon and input requirements can only be approximately defined. In some cases, programmes are open-ended approaches to solve complex problems.

For deriving these development proposals, assumptions are made concerning their timing, funding and the institutional responsibilities for their implementation.

With respect to the timing of implementation of the development proposals it is assumed in the following that, unless implementation of a proposal is dependent on completion of another activity, which is explicitly stated, all proposals should start as soon as possible. However, scarcity of local as well as foreign funds, particularly for sustaining long-term operating and maintenance costs, and limited institutional implementation capacity are the most important factors determining if and when development proposals can actually be implemented. This will be considered in Chapter 8, when deriving an overall, phased development programme from the proposals.

All of the development proposals require funding of their capital and recurrent components. Under present public finance conditions, where the generation of local funds and their allocation to the Government's economic and social activities is very limited, this is probably the most serious constraint for implementation of development activities in the Juba Valley.

While donors have traditionally financed most of the capital costs of development, it is the Government and where possible the directly affected target groups that should cover the recurrent costs to sustain operations. However, the mobilization and allocation of funds for covering the recurrent costs is by far not sufficient and will have to substantially increase in future to safeguard the proposed investments. Most of the development proposals derived in the following cannot be directly funded and sustained by the beneficiaries, but do depend on the Government. Where specific scope exists for the beneficiaries in financing, this is spelled out.

Implementation responsibility for the development proposals is dependent on the overall institutional division of responsibility for development of the Juba Valley. This is an issue which is being investigated by another consultant (Price Waterhouse) in connection with the Bardheere Dam Project. In the following, in accordance with current practice, and as further detailed in Chapter 8, it has been assumed that MJVD will be the central management organization with operating responsibility for the dam and the river. In addition, MJVD will be responsible for all regional planning and will coordinate and monitor the projects undertaken by the respective line ministries in the Juba Valley and for implementing those proposals for which no suitable other agency exists.

The derivation of the development proposals is presented in the following in accordance with the structure of the goal system as given in Figure 6/1. To determine the relative priority of the development proposals related to the fourth level of goals, weights are assigned, which will later be utilized for determining overall priorities leading to the phased development programme. For each of the development proposals, the geographic priority and the potential and need for participation of the target groups are also discussed.

7.2 Improvement of Economic Production Conditions

The second level goal of improving economic production conditions can be further detailed into the goals of improving the general conditions for crop production and the specific ones for irrigated crop, livestock, fisheries and industrial production.

7.2.1 Improvement of General Crop Production Conditions

To permit the projected developments of rainfed, flood recession and irrigated crop production, several of the conditions influencing these farming systems will have to be improved or strengthened.

Rainfed crop production activities are by far the most dominant within the Study Area, providing food and income for most of the sedentary rural population. At present about 120,000 hectares are farmed this way by about 20,000 families.

Construction and operation of the Bardheere Dam will not result in any direct benefits to the farmers practicing rainfed agriculture.

Assuming a continued natural annual population growth of above 3% and some out-migration, the population depending on rainfed agriculture will grow at about 3% annually. Nearly 170,000 hectares and about 28,000 families can then be projected for the year 2005. This constitutes a considerable extension of the area under cultivation. However, because of the substantial land reserves suitable for rainfed agriculture, availability of land should not be a limiting factor.

What has become a problem recently, is a massive increase of land registration with respect to irrigable land, close to the river and at present under rainfed agriculture. This has led to insecurity about land tenure, where no real system of protecting the small-scale farmer exists.

Crop yields presently realized are low but could be improved by better farming practices if supported by appropriate research and extension programmes. It is estimated that until 1995, yields of the main crops (sorghum, maize, sesame) could possibly increase by about 20-25%. In the longer term, yields could be further increased by 40-100% of the present levels, if more advanced farming practices are adopted.

The cropping pattern in rainfed farming has always been determined by putting strong emphasis on assuring that subsistence and animal feeding requirements are fully met. This is not expected to change, but increased yields should make it possible to plant more cash crops and to introduce Leucaena as windbreaks and year-round suppliers of green fodder. Vegetable production will only be significant in the Lower Juba, as rainfall is too erratic in the North for this.

Crop production, particularly in the Lower Juba, is at present subject to flood damage leading to considerable losses of agricultural production. During the last two decades the danger of flood damage has increased due to a reduction of the floodplain caused by man-made structures, such as the Fanoole irrigation canal, roads and the large irrigation projects protected by flood bunds.

The second and very special farming system in the Juba Valley is the one of flood recession practiced in the desheks along the river.

At present, about 7,000 ha are cultivated using flood recession as a method for the application of water. The potential is estimated to be about three times this area, i.e. 21,000 ha. However, construction of the dam and thus regulation of the river will result in most desheks not any longer being flooded seasonally, so that this traditional farming system will practically cease to exist in its present form unless the reservoir is operated in such a way that artificial floods can be generated.

The process of conversion of this farming system has already started, with farmers constructing bunds to control flooding of their desheks or to prevent them from flooding, while using pump irrigation for watering.

In the long term, irrigation will therefore be practiced (on part of the land) where previously flood recession was employed.

The third farming system is the one of irrigated crop production. This will be, in accordance with the goal system, dealt with in the following section.

The manner in which the general conditions for the three crop production systems can be improved is specified in the goal system at the fourth level, identifying four areas for which development proposals will be derived in the following.

(1) Land Tenure Security

Irrigable land has become of prime interest to many individuals, often not inhabitants of the Juba Valley, who are not genuine farmers but have the necessary resources to make use of the existing procedures to acquire large areas of land, which may well preempt the smallholder farmers obtaining their fair share of the land that will become potentially valuable with the construction of the Bardheere Dam and the better access provided by the Jilib - Bardheere road, now being implemented. As a consequence of this development, farmers also loose land which they were cultivating under the traditional land tenure rights.

The result is uncertainty about land rights and it must be feared that this eventually will have a negative effect on agricultural production since this will reduce farmers' willingness to invest in irrigation infrastructure, land levelling or other types of farm improvement.

Land registration will therefore have to be encouraged and facilitated. To provide a basis for the issuing of land certificates to the farmers, a programme of cadastral mapping and land registration (CRO 1) is proposed. The mapping will be based on aerial photography supported by maps and ground surveys. The organization responsible for land registration will then investigate farmers' individual claims and issue land certificates when these are found justified.

To allow such a programme, the 1975 Agricultural Land Law and registration procedure will have to be reviewed and, where found necessary, adapted, especially with regard to

- multiple plot registrations
- requiring any applicants to prove that they are the long-term occupants of the land, or that it is currently unoccupied and not used, or that compensation for improvements has been paid to the person presently occupying or using the land
- decentralization of the registration procedure so that all administrative requirements can be met at the district or regional level
- clearance of vegetation, which should not any longer be considered a land improvement, as it results in soil erosion and recognition of forest management as a legitimate land use to retain leasehold.

Such a revision of the Land Law and the registration procedure has been commenced and it will be one of the tasks of MJVD (ORG 1) to monitor progress on this.

The beneficiaries of this effort will be the farmers in the floodplain, i.e. in SGUs 1 to 5. They will have to participate in the programme to a considerable extent to ensure that the registration will be carried out fairly.

Regionally, the greatest need is in the districts of Saakow and Bu'aale, where the irrigable land reserves not presently farmed are the largest.

The implementing agency will be the Ministry of Agriculture, with most of the work being done at the district level. The initial effort will require considerable funds, which need to be provided probably with donor assistance. Once the system is established, recurrent costs are much lower and have to be provided by Government.

It must be recognized that implementation of this development proposal will require a long-term commitment by the Government and particularly the local authorities.

(2) Farming Skills

An analysis of present farming practices indicates that improvements could be achieved in particular through

- introduction of water retention measures such as small basins to increase the soil moisture content, in rainfed farming
- construction of flood protection bunds
- improvement of seedbed preparation and weed control through the use of animal-drawn equipment
- improvement of seed quality and viability
- control of the most important pests and diseases, particularly in cotton and of stemborers in sorghum and maize
- establishment of wind breaks to reduce soil erosion and prevent drying out of soils in rainfed farming
- improved cultural practices such as crop rotation, higher plant populations and the use of fertilizers at a low rate
- more intensive integration of crop production with livestock keeping (mixed farming)
- improvement of on-farm irrigation practices, and
- better selection of the most suitable cropping pattern as a function of the actual water availability in irrigated farming.

To assist farmers in accepting such improved practices, an effective extension service backed up by appropriate research is required. The present situation is that neither extension nor research are strong enough to provide such assistance effectively. Both therefore need strengthening.

Agricultural Research

At present, little or no locally tested, reliable research information and recommendations are available. Relevant research, which had also been carried out in the valley at the now defunct station at Alessandria, is presently undertaken at the Bonka Station for rainfed farming and at the Afgoi Station for irrigated farming, but the findings of these stations have not been confirmed for the Juba Valley. Furthermore, these stations do not cover all the area specific research needs of the Juba Valley. Practically all of the above identified areas with scope for improved practices require therefore additional research work to develop reliable recommendations.

Because of this need for research and the potential importance of the Study Area to the total agricultural production of the country, a research station is now being financed by the EEC and built at Bardheere to undertake applied crop and mixed farming production research, relevant to the Juba Valley. While the project includes most of the required facilities, an appropriate research programme still needs to be established and implemented and a corresponding development proposal is included in CRO 2.

The Bardheere Research Station will be responsible for the identification of research needs, defining priorities and programmes, implementation of research and elaborating extension recommendations and messages.

The farmers practicing crop production in the floodplain (SGUs 1 to 4) and the Bardheere/Dinsor/Saakow triangle (SGU 5) are the beneficiaries of the research activities, the results of which will be disseminated to them by the extension service.

To properly function, the research programme needs to be linked to the extension service and the other research stations in the country.

To increase the level of participation of the local population and to ensure that the research is actually geared to meeting local needs, a farming systems research approach should be pursued which puts special emphasis on carrying out a considerable amount of data collection and research on the actual farms in cooperation with the farm families.

It has already been decided that responsibility for operating the Station will be with MJVD.

Agricultural Extension Service

The approach in Somalia towards providing extension services to the farmers is based on the Training and Visit System. Actual operation of the extension service is hampered by insufficient numbers of particularly Field Extension Agents (FEAs), lack of facilities and an insufficient operational budget. These are national problems which are partly overcome by a World Bank/ African Development Bank assisted project which is designed to include some parts of the Juba Valley. To achieve adequate coverage of the main agricultural areas in the Juba Valley, a corresponding programme is proposed (CRO 3).

The target group will be all farmers practicing crop production in SGUs 1 to 5. The geographical priorities would be in the districts of Bardheere, Dinsor, Saakow and Jamaame, where crop production by small and medium scale farmers is concentrated.

The main links will have to be with the contact farmers as defined by the Training and Visit System, with the Bardheere Research Station and with other agricultural production support services which operate in the valley, especially for agricultural input supply and credit, deshek conversion, irrigation development, animal health care and agro-forestry.

Participation by the target group in the extension activities is one of the cornerstones of the Training and Visit System and therefore assured, as long as the system is actually followed.

Ideally, financing of extension should be by the beneficiaries, the farmers. For a considerable time to come, this is, however, not realistic to expect and assurances will have to be provided by the Government that funds will be made available on a sustained basis.

Institutional responsibility for this programme will be with the Agriculture, Farm Management, Training and Extension Service (AFMET) within the Ministry of Agriculture, which is generally responsible for extension in Somalia.

(3) Crop/Livestock Integration

For the sedentary farmers keeping livestock, it will be of considerable benefit to intensify and improve the integration of livestock with crop production. This will involve more efficient use of crop residues and by-products, animal traction, manure for improving soil fertility, animal protein to diversify and enrich the daily diet and accumulation of capital, i.e. increased savings. Furthermore, as a consequence of the establishment of the Bardheere Dam, the floodplain vegetation will most probably be reduced resulting in an increased need for cultivation of fodder crops, such as Leucaena, alfalfa and fodder maize and the preservation of crop residues.

To effect a more efficient integration of crop and livestock production, the proposed Bardheere Research Station will have to carry out the necessary field work, including pilot projects and demonstration units (CRO 2). From the experience gained, appropriate recommendations will be formulated which the FEAs need to disseminate among the farmers (CRO 3). Also, a better use of crop residues as livestock fodder within the large-scale irrigation projects should be considered (IRR 6).

The target group and the geographical priority would be the same as defined for research and extension.

To properly function, a strong link by the extension service to the Ministry of Livestock, Forestry and Range, responsible for range management and animal health and husbandry, is required.

(4) Agro-forestry Development

Development of agro-forestry is recommended as a multipurpose activity generating income, providing fuelwood, allowing diet diversification, producing fodder, stabilizing small irrigation canals, helping in erosion control and affecting positively the microclimate at the farm level, through reduced evaporation. The agro-forestry programme in Luuq District has been quite successful and should be further supported, extended and introduced in other districts.

The further formulation of a development concept and programme should be one of the tasks of the Bardheere Research Station (CRO 2) in close cooperation with the National Range Agency (NRA), which has already experience in this field. Following this, appropriate extension messages need to be formulated and disseminated through the extension service (CRO 3).

However, this effort can only be successful if suitable trees have been identified and are available to the farmers. This is to be achieved by two other development proposals, i.e. RAN 7 for multipurpose tree species trials and RAN 8 for upgrading of the nursery network, as described below.

The beneficiaries will again be the farmers in SGUs 1 to 5, who will participate by undertaking the planting and looking after the trees on their farm.

The regional priority would be the same as defined for extension, i.e. the districts of Bardheere, Saakow, Dinsor and Jamaame.

(5) Input Supply and Credit

Achieving the projected productivity increases in the different farming systems, particularly for irrigated crop production, will depend to a large extent on a timely and sufficient supply of mostly imported inputs. While an input supply and distribution system exists, foreign exchange allocations have in the past been far from sufficient to meet demand. An assessment of its effectiveness is therefore not possible at this stage.

With more dependence on production inputs, demand for credit is expected to increase. To meet the demand for seasonal credit, the funds now provided by the United Nations Capital Development Fund will have to be increased and the necessary credit infrastructure and systems established, to facilitate access for farmers (CRO 4).

Granting of medium- and long-term credit depends mainly on the provision of a collateral. While land cannot be accepted as such under the present land law, the alternative, the security of a stone-built house, cannot be met by the majority of the farmers. It is therefore proposed to secure the credit against the item purchased. In case of credit for land levelling, the only security would be the land itself or peer pressure. To allow land as collateral, revision of the land law should be considered and it will be one of the tasks of MJVD to pursue this (ORG 1).

Interest rates used to be negative in real terms, but this has been corrected, as this reduced the overall availability of credit.

The beneficiaries of increased availability of credit will initially mainly be the more progressive farmers, most of them practicing irrigated crop production in SGUs 1 to 4, with the highest priority in the districts of Bardheere, Saakow and Jamaame.

The main linkage for credit is with research and extension, as the recommendations for the farmers have to be formulated by also taking into account the actual availability of the recommended inputs and credit in their areas.

(6) Flood Control and Drainage

Flood hazards in the Juba Valley result from periodic monsoon rainfalls occurring in the Gu (April-July) and Der (October-November) seasons. In 1981, for example, nearly 150,000 ha of land, of which about 50,000 ha were cropped, had been flooded, resulting in an estimated loss of agricultural production of about US$ 3 million. In general, the flooding frequency and flooded area increase towards the lower reaches of the Juba River due to the decreasing capacity of its channel and larger width of the floodplain. As the land in the natural depressions along the river slopes away from the river banks, the flood and rainfall waters in the deep areas cannot be drained by surface and stand from 3 to 6 and occasionally up to 9 months.

The flood protection effect of the dam will reduce flood discharges and the frequency of flooding especially in SGUs 1 and 2, while the beneficial effect on SGUs 3, 4 and 6 may be significantly less. This is due to the additional flood discharges from the intermediate catchment and the decreasing river channel capacity in the Lower Juba. Even if, through an optimal operation of the reservoir, the river could be prevented from overtopping its banks and bunds, land in SGUs 3, 4 and 6 will still be subject to prolonged flooding by runoff from adjoining catchments, particularly from the Shebelli.

A drainage and flood control study (WAT 9) is therefore proposed to investigate the problem in more detail and to recommend possible immediate and long-term measures for reducing future flood damage (Map 10). While the long-term measures can only be defined after implementation of the River Morphology Study (WAT 3), which will evaluate the effects of increased river scour and the possibly required riverbed stabilization works, immediate measures could be defined for the Lower Juba, which is relatively independent of dam operations and changes in river morphology. The study will include hydrological and especially topographic surveys, as far as this is not done by the River Morphology Study, planning and design activities at prefeasibility level. To facilitate the analysis of the existing flooding patterns, which are not known in detail at present, use of satellite images should be made. As remote sensing is anyway proposed to be utilized for environmental monitoring, the requirements for flood control and drainage analysis should be taken into account when defining the overall remote sensing needs.

The selection of the most appropriate combination of flood protection and drainage measures will take into account different reservoir operating schedules and economic flood protection standards corresponding to expected benefits, such as flood protection bunds, increasing the discharge capacity

of the river channel, flood relief structures and bypassing of flood waters, storage in suitable depressions of adjoining catchments, resettling of the most severely affected population, as well as a flood warning and rescue service. The requirements of wildlife protection, particularly with respect to the swamps in the Lower Juba and the possibilities for using flood waters to be diverted to bush- and grassland needed for livestock, especially in the area of Deshek Waamo, will also be taken into account.

Based on the recommendations of this study, execution of the flood control and drainage works and implementation of an improved flood warning and rescue system is then proposed (WAT 10).

The beneficiaries of improved flood control and drainage will be farmers mainly in SGUs 3, 4 and 6, i.e. in the districts of Jilib and Jamaame. Since flooding now also damages houses, roads and other infrastructure the total settled population in these two districts will to a certain extent also benefit. Possibilities for their direct participation in this are limited, but will be identified during the study.

The most important linkages of the study will be to the Bardheere Reservoir Multipurpose Operation Study (WAT 2), River Morphology Study (WAT 3), Irrigation Development (IRR 3, 4), Remote Sensing (ENV 3) and to Wildlife Management (RAN 3). Operation of the flood control and drainage works and of an improved flood warning system will require a well established telecommunication system along the Juba, which does not exist at present.

MJVD would be responsible for carrying out the study and for implementing the recommended reservoir operating procedures and flood control and drainage works.

(7) Relative Priorities of Development Proposals

To indicate the relative urgency of the different development proposals, the goals at the fourth level have been weighted by the Masterplan team, as shown in Table 7/1.

Table 7/1 General Crop Production Conditions - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Land Tenure Security	CRO 1: Land Registration	25
Farming Skills	CRO 2/3: Research, Extension	25
Crop/Livestock Integration	CRO 2/3: Research, Extension	10
Agro-forestry Development	CRO 2/3: Research, Extension	10
Input Supply and Credit	CRO 4: Agricultural Credit	5
Flood Control and Drainage	WAT 9/10: Flood Control, Drainage	25
Total		100

Table 7/1 shows that equal priority is given to dealing with the problems of land tenure, farming skills and flood control and drainage and the associated development proposals. However, as agricultural research and extension is also proposed to deal with the crop/livestock integration and agro-forestry development, the two development proposals CRO 2 and 3 for research and extension are considered to be of highest priority. Input supply and credit is considered to be least urgent, as emphasis will initially have to be in improving farming practices without substantially increasing the dependence on largely imported inputs, which can possibly not made available on a sustained basis due to shortage of funds.

7.2.2 Improvement of Conditions for Irrigated Crop Production

At present, irrigated crop production is only practiced on about 17,000 ha providing an economic base for about 6% of the population in the Study Area. The irrigation potential of the non-regulated flow of the Juba during a normal dry year is some 50,000 ha. This would allow irrigation of about 40,000 ha of seasonal crops in addition to the 10,000 ha of perennial crops (bananas, sugar cane). The periodic dry season from mid December to mid-April, however, results in water scarcity for the perennial crops if seasonal crops are irrigated during this time. The low flow of the Juba also causes intrusion of sea water limiting the use of the river water for irrigation.

The multipurpose operation of the dam will allow to regulate the discharges of the Juba in a manner that no water scarcity during the dry periods will occur. Irrigation water will then be available for about 120,000 ha of land, assuming an improved irrigation efficiency of 40%, which is about equal to that part of irrigable land whose irrigation is considered to be economically viable. For the year 2005, irrigated crop production is projected to be practiced on about 50,000 ha, providing an economic base for about 12% of the population in the Study Area. This is an average annual growth of nearly 6.5%, about double the expected natural population growth rate. In other words, a large number of farmers, not coming from families with experience in irrigated agriculture can be expected to start this farming practice in the years to come.

An analysis of the yields of the main agricultural products of irrigated farming shows that it should be possible to increase them by 10-30% mainly through better land preparation and weeding and by a further 40-80% by the introduction of pesticides and fertilizer. The first increase should be possible within the next seven years, the second in the following ten.

The cropping pattern, as is the case for rainfed farming, is dominated by the need to meet subsistence requirements, mainly maize, but there is more room for the production of cash crops, particularly onions, sesame and other vegetables. In future, when the floodplains will provide less fodder for livestock, it will most probably be necessary to introduce fodder crops, i.e. alfalfa and fodder maize. Higher yields should make it also possible to further increase the share of cash crops, particularly of vegetables, groundnuts and cotton.

It is one of the main challenges for the development of the Juba Valley to actually utilize the irrigation potential made possible by construction of the dam. This requires, in addition to the general improvement of the conditions for crop production and as shown in the goal system (Figure 6/1), development of irrigation systems, providing support to irrigation development, improving the performance of the large irrigation systems and development of irrigation skills.

(1) Irrigation Systems Development

The present expansion of irrigation in SGUs 1 and 2 is spontaneous and largely based on small-scale systems depending on one pump with an average capacity of 20 l/s, supplying 3 to 12 ha of land. Part of this development is aimed at changing from uncontrolled flood recession to controlled irrigation by building small dams in combination with pumps. Irrigation efficiencies of these small systems are low, estimated not to exceed 20%. Development takes place along a narrow strip of land along the river, limiting access to the river to those requiring irrigation water for land further inland. The potential for the continuation of irrigation development in this manner is therefore limited by the amount of land available and needs to be supported and guided to increase water use efficiency and reduce water abstraction costs.

In the longer term, it is necessary and desirable to go beyond these small systems and to develop irrigation schemes on a larger scale. Given the poor experience in Somalia and elsewhere with large-scale irrigation projects (more than about 500 ha), it is recommended to base irrigation development to the largest extent possible on small- (to 50 ha) and medium-scale (50 to 500 ha) schemes. At present, there is practically no experience with such schemes in the Juba Valley and it will be one of the main challenges to assist the farmers in forming preferably family- or village-based water user groups (WUGs) for developing, maintaining and operating such medium-scale, smallholder schemes. This will be one of the tasks of the proposed irrigation development support services defined below.

To gain experience with the development of such smallholder schemes, the Saakow Deshek Pilot Project has been defined by earlier studies and is now ready for implementation (IRR 1), as financing has already been secured from the Federal Republic of Germany. This pilot project is to be followed by a conversion programme (IRR 2) in which the experiences from the pilot effort with respect to irrigation as well as agricultural development will be applied throughout SGUs 1, 2 and 3.

While the location of the irrigable areas is generally known, details about their topography and specific soil characteristics are not. It will therefore be necessary to determine in more detail in which manner the overall irrigation potential of 120,000 ha should be developed. For this, execution of an Irrigation Development Study (IRR 3) is recommended, which would define the location of suitable small- and medium-scale irrigation areas and the most economic manner for their development. For fully utilizing the available water to irrigate the projected 120,000 ha, water diversion structures, which may also be required for riverbed stabilization (WAT 3,4), would also be considered so that water can be supplied by gravity, thus re-

ducing operating and foreign exchange costs. At present, the only diversion dam is the one at Fanoole for supplying water to the Fanoole project. For providing irrigation water to the irrigable land on the right side of the Juba downstream of the Fanoole dam, a canal is likely to be technically feasible and economically viable. Other possibilities for such diversion structures appear to exist at Saakow, Bu'aale and south of Kamsuma. Detailed analysis is therefore required to determine the technical feasibility and economic viability of the various irrigation development alternatives.

One area deserving special attention in the Irrigation Development Study is the drainage of irrigated areas. As detailed above, salinity levels in the river are likely to rise with increased irrigation, calling for a thorough analysis of the potential salinization hazard, careful monitoring of river water quality and a design whereby drains do possibly not return water to the river.

One large-scale, smallholder project has already been studied and prepared in detail for the Homboy area (IRR 7). The project would bring 7,500 ha of land under irrigation to be cropped by smallholders with bananas, rice and seasonals. Included would be also the required infrastructure for flood construction and drainage. Implementation, however, has to await completion of the dam, as irrigation water supply will not be sufficient at present.

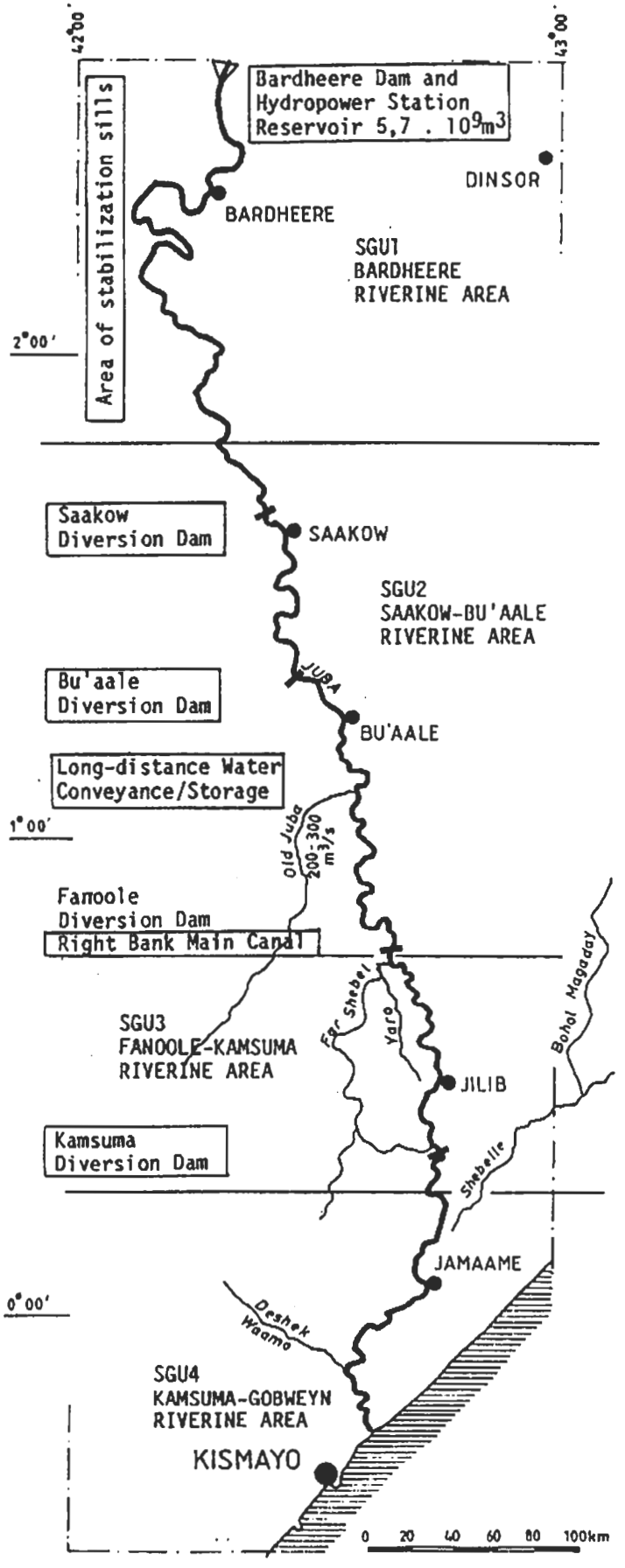
The overall irrigation development alternatives and main flood protection measures for the individual SGUs are schematically presented in Figure 7/1 (Map 11).

Responsibility for implementing the irrigation development study and works will be with MJVD in close cooperation with the Ministry of Agriculture. The beneficiaries will be the farmers of SGUs 2, 3 and 4 and, for the Homboy project, those in SGU 6. The greatest need for the identification of areas suitable for economic irrigation development on a medium scale is in SGUs 2 and 4, i.e. in the districts of Saakow, Bu'aale, Jilib and Jamaame.

Participation by the farmers in developing, maintaining and operating their irrigation facilities will be vital for realizing the irrigation potential. It is for this reason that preference should be given to small- and medium-scale schemes, where groups of farmers have a much better chance of actually assuming control over irrigation water supply and distribution.

Successful irrigation development requires numerous additional support from other development proposals. For teaching farmers appropriate soil-water management, research and extension is vital (CRO 2, 3), to slowly adopt higher levels of crop production technologies, the input supply and credit has to be improved (CRO 4) and to raise the standard of irrigation development and management the proposed development support services (IRR 5) are important. In addition, management of the reservoir (WAT 2) and stabilization of the river (WAT 3, 4), a rational water allocation strategy (WAT 5) and water quality monitoring and control (WAT 7) are also required. The number and diversity of linkages demonstrate that irrigation development requires a coordinated input in a number of areas to be successful. Given the very limited experience the people in the Juba Valley have with irrigation, considerable long term support will be required.

Figure 7/1 Overview of Water Development Alternatives



SGU 1
Class 1,2 7,375 ha; R2 87,937 ha
Irrigation Development:
1988 - 2,500 ha
1995 - 6,000 ha 2005 - 7,500 ha
2015 - 7,500 ha 2015+- 10,000 ha

Development Alternatives:
1. Small-scale pumping (actual)
2. Medium-scale pumping (20 pump.s)
Protection against the 5 to 10 years floods: local small bunds

SGU 2
Class 1,2 92,694 ha;R1,2 36,928 ha
Irrigation Development:
1988 - 1,600 ha
1995 - 5,000 ha 2005 - 10,000 ha
2015 - 25,000 ha 2015+ -25,000 ha

Development Alternatives:
Deshek conversion (controlled flooding) and:
1. Small-scale pumping
2. Medium-scale pumping
3. Gravity Diversion (Saakow, Bu'aale Diversion Dams)
Protection against 10 year floods: Long- distance Water Conveyance to Afmadow / storage.

SGU 3
Class 1,2 40,988 ha;R1,2 1,722 ha
Irrigation Development:
1988 - 8,000 ha
1995 - 10,000 ha 2005 - 13,000 ha
2015 - 20,000 ha 2015+- 40,000 ha

Development Alternatives:
1. Right Bank Canal and pumping
2. Right Bank Canal without pumping
Protection against 20 year floods: Bunds. Headworks for Far Shabeele and Yaro. Homboy Flood Protection.

SGU 4
Class 1,2 28,858 ha;R1,2 18,659 ha
Irrigation Development:
1988 - 5,000 ha
1995 - 6,000 ha 2005 - 12,000 ha
2015 - 12,000 ha 2015+- 37,500 ha

Development Alternatives:
1. Small and medium scale pumping
2. Gravity Diversion (Kamsuma Diversion Dam)
Protection against the 10 to 20 years floods: bunds, river training

(2) Irrigation Development Support

To improve small- and medium-scale irrigation development, an effective support service is needed which will advise farmers on the suitability of their land for irrigation, basic layout of fields and canals, forming of water user groups, selection of pumps and design and construction of canals and drains. The establishment of such an irrigation development support service is therefore proposed (IRR 5).

One of the important tasks of this support service will be assistance to farmers for forming Water User Groups (WUGs), which are essential to ensure that small-scale, and at a later date, particularly medium-scale irrigation schemes develop and continue to function on an equitable basis. Given the experience in many countries, such WUGs should preferably be based on existing social structures of villages or families, so that conflict resolution can take place along established lines. In the Shebelli, a long tradition of WUGs exists and it needs to be determined to what extent the experience there can be transferred or otherwise utilized in the Juba Valley.

The support services should not be restricted to the initial development of irrigation and drainage systems, but also to their subsequent operation and maintenance phase. This support should be aimed at increasing the irrigation efficiency, so that an average rate of at least 40% is achieved. Improving the efficiency is desirable, even though water will be amply available at least until about 2015, so that farmers understand the importance of correct irrigation and drainage techniques to avoid waterlogging, salinization and leaching problems and to reduce pumping costs. To achieve a higher efficiency, operating and maintenance guidelines have to be developed to form the basis for the work of the support services during the operation phase. Also, on-farm water management practices will have to be improved, which will be one of the important tasks of the strengthened extension service (CRO 3).

Institutional responsibility for this would be with MJVD. Such support services can only be provided effectively by an organization with staff, offices and other facilities within the Study Area. MJVD will therefore have to establish such facilities within the Juba Valley, initially working out of the most centrally towns of Bardheere and Jilib. In effect, these services should become part of the still to be agreed upon Juba river management authority, which would be responsible for managing the water resources in the Juba Valley.

The beneficiaries should initially be the farmers in SGUs 1, 2 and 4 (districts of Bardheere, Saakow and Jamaame), where the largest concentration of smallholder irrigation is located. Subsequently, the service should cover also SGU 3 (Bu'aale and Jilib District).

The most important linkage of the support services is with the irrigation development studies and works (IRR 3, 4), as these will form the basis for guiding the development work in the districts. The manner in which this service is linked to the other development proposals on water management and irrigation development has already been described above.

(3) Large Irrigation Schemes

The three large scale irrigation projects (Juba Sugar, Fanoole, Mogambo), are not operating at their design capacity. This is due to water shortage during the dry season as well as organizational and management shortcomings. As the irrigation infrastructure for these projects would allow a considerable extension of the area under irrigation at low incremental cost, efforts need to be made to improve the performance of these schemes, particularly after construction of the dam when there will be no more water shortage. However, even before this, efforts need to be made to increase water use efficiency in line with proper irrigation and agricultural practices. A programme of rehabilitation and extension, including the possible conversion of Fanoole and Mogambo into smallholder schemes, is therefore proposed (IRR 6) so that the full potential of these schemes is realized. Making best use of the crop residues as livestock fodder should also be a consideration of this development proposal.

Responsibility for this programme will be with the Ministry of Agriculture for Fanoole and Mogambo and the Ministry of Industry for Juba Sugar.

The beneficiaries of improving the performance of the large irrigation schemes will be the participating smallholders and, through increased and more efficient production, the population at large, depending on the manner in which the surplus is being distributed.

Participation of the concerned smallholders and farm labour is essential in this, as is the involvement and strenghtening of the management of the schemes.

(4) Irrigation Skills

To properly guide and plan irrigation development in the Study Area, well qualified staff are required. At present, water and irrigation development and management skills are rare in Somalia and it is necessary to upgrade the knowledge and skills of the national irrigation personnel. A training programme is therefore proposed for selected personnel in irrigation water management, flood control and drainage, at recognized overseas institutions (IRR 8).

(5) Irrigation Practices

Irrigation practices at the farm level will need special attention and will require that research and extension play an effective role. Therefore, the development proposals concerning the Bardheere Research Station (CRO 2) and strengthening of the extension service (CRO 3), as presented above, will also have to include those topics particularly required by the smallholder. This applies especially to on-farm water management, where it is proposed to carry out a special training programme for extension staff. This measure will train the required number of Subject Matter Specialists and all Field Extension Agents working in the Study Area in appropriate on-farm water management techniques and to enable them to train farmers accordingly.

One further area which is particularly important for irrigated crop production is land levelling, which reduces water wastage and soil erosion. Appropriate land levelling criteria and techniques will have to be determined by the Bardheere Research Station. The results obtained will then determine the messages to be disseminated by the extension service.

(6) Relative Priorities of Development Proposals

The relative priorities given by the Masterplan team to the development proposals relating to the improvement of the conditions for irrigated crop production are given in Table 7/2.

Table 7/2 Irrigated Crop Production - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Irrigation Systems Development	IRR 1/2/3/4/7: Desheks, Abstraction, Homboy	25
Irrigation Development Support	IRR 5: Irrigation Development Support	30
Large Irrigation Schemes	IRR 6: Existing Schemes	20
Irrigation Skills	IRR 8: Irrigation Training	20
Irrigation Practices	CRO 2/3: Research, Extension	5
Total		100

Highest priority is given to the provision of irrigation development support services, as this is an immediate need. This is followed by the development of irrigation through the deshek conversion programme, study and implementation of the most appropriate abstraction systems and execution of the Homboy project. Improvement of the existing large irrigation schemes and meeting long term training needs are also seen to be nearly as urgent. It is only the improvement of the agricultural practices, which are seen to be of less importance at this point in time.

7.2.3 Improvement of Conditions for Livestock Production

Livestock is kept by the majority of the people in the Juba Valley and plays an important role in the daily diet, as a source of income and foreign exchange and a capital investment. In total, approximately 900,000 camels, 1,800,000 cattle, 420,000 sheep and 1,600,000 goats are estimated to be kept within the Development Area. However, the data base concerning the number of livestock holders and animals kept under the various production systems in the different geographic units is weak. This is to be expected in a situation which is characterized by open boundaries and a very mobile population.

It is nonetheless estimated that most of the animals are kept by traditional nomads who more or less fully utilize the Development Area's carrying capacity. During the dry season they make use of the vegetation in the flood-

plains of the Juba and of the crop residues. The growth potential for increasing the number of animals kept in this production system is therefore limited and it is the Government's general policy not to seek increases in numbers, but rather improved performance of the herd by increased productivity brought about by better husbandry and improved feeding and animal health.

The remaining animals are mainly kept under the agro-pastoral or mixed farming system, where they are more or less well integrated with crop production. The main limiting factor here is also the supply of animal feed, for which seasonal shortages occur particularly for cattle, goats and sheep. Better integration with crop production, the cultivation of animal fodder, such as leucaena or alfalfa and also improved animal health are the main elements which should allow higher productivity in this category.

The third and smallest production system refers to specialized urban and peri-urban dairy and poultry producers having no linkage with farm or grazing land. The animals depend entirely on purchased forage and agricultural by-products (sesame cake, rice bran) throughout the year. The system is mainly practiced in Kismayo and Jilib. Its future will depend largely on the increased availability of fodder and high protein feed and other imported items.

Exports of live animals have traditionally been the main source of foreign exchange to Somalia. However, during the last decade, official exports have drastically declined as a consequence of inappropriate Government policies, inability to maintain reliable supplies and satisfactory health standards and inadequate exporting facilities and services. Due to these unfavourable conditions, livestock owners take increasingly resort to smuggling their cattle to Kenya. For 1987, an estimated 50,000 cattle were exported this way. Consequently, foreign exchange earnings are largely lost to the Government and the risk of spreading epizootic diseases is increased.

The animal disease situation in the Development Area is characterized by a number of different diseases caused by insufficient vaccination coverage, lack of drugs, unhygienic watering conditions and malnutrition. However, reliable data is not available. The Ministry of Livestock, Forestry and Range is responsible for providing animal health care services. Generally, due to inadequate low budgets and lack of equipment and supplies, performance of the veterinary services is not satisfactory.

Beekeeping should also be mentioned as an activity which has a tradition in the Study Area, the wax mainly being used for the waterproofing of vessels. Even though no detailed study has been made of this, it appears that there is considerable room for a more extensive and intensive practices.

The development proposals derived in the following concentrate, in accordance with the goal system given in Figure 6/1, on increasing productivity by improving animal health care services, animal husbandry skills and eradication of the tsetse fly, on promotion of livestock marketing for exports and on beekeeping.

(1) Animal Health Care Services

An improvement in the animal health care services is proposed to be effected through strenghtening of veterinary services and the introduction of primary animal health care.

To improve the existing unsatisfactory veterinary services, a production oriented development concept should focus on establishment of proper physical facilities, organization of properly trained health extension staff, assured supply of drugs, provision of adequate operating budgets and campaigns for combating specific diseases.

Concerning the physical infrastructure for providing veterinary services, it is essential that the District Veterinary Offices in the Development Area are rehabilitated and furnished with refrigerators, veterinary instruments and basic laboratory equipment. In addition, vehicles need to be provided for the staff. The need for dips and handling crushes has to be assessed and where necessary such facilities will have to be rehabilitated or newly constructed (LIV 1). This applies to the six districts in the Study Area and to the four additional districts of Dinsor, Afmadow, Luuq and Garbaharey, with the greatest need being in Luuq, Bardheere and Afmadow.

Provision of animal health care services is the responsibility of MLFR but needs to be organized separately for the nomadic and sedentary livestock holders. The latter will be served by the staff of the District Veterinary Offices who will be supported by the FEAs of the agricultural extension service in calling upon them when the need arises. Therefore, FEAs need to be trained in this mobilization of health services (CRO 3).

For providing animal health care services to the nomadic livestock owners, it is proposed to introduce Nomadic Animal Health Auxiliaries (NAHA's) as practiced already in the Central Rangeland Development Project (LIV 2). The NAHA's are typically selected from among the clansmen of a nomadic group and move with them. They have a supply of drugs and medicines and are trained in their use. Payment of services provided by the NAHA's is arranged by the group. Furthermore, they know the available District Veterinary Offices along their traditional routes and are therefore in a position to obtain their assistance whenever the need arises.

To work effectively, the animal health care service needs a reliable supply of drugs down to the grass-root level. At present, the drug supply system is weak, but donor assisted improvements are under way or in the pipeline so that it can realistically be expected for the supply of drugs to become more dependable. One specific measure already taken is the possibility for the private sector to trade in non-prescriptive drugs. This mobilizes foreign exchange sources not necessarily available to the Government and is therefore expected to increase the availability of drugs independent of donor assistance.

In addition to facilities and drugs, the animal health care services need adequate operational budgets, which is not the case at present. While this is a national problem practically applicable to all sectors, one long-term possibility of lessening the dependence on the Government is the privatization of some of the veterinary services. A start has already been made by

allowing private drug trading. Privatization will be further strengthened by the introduction of the NAHA system and it is conceivable that the Government will also allow that private veterinarians provide services to livestock holders.

The main beneficiaries of the improved animal health care services are the nomads mainly present in SGUs 7, 8 and 9 and outside the Study Area. The strengthened veterinary services will, through the extension service, also support the sedentary livestock holders of SGUs 1 to 5.

With improved animal health, the danger exists of nomads increasing their herds, resulting in overgrazing. To avoid this, improved animal husbandry skills and range management measures, as proposed below, are important complementary activities (RAN 1, 2).

By adopting the introduction of NAHA's into the animal health care system, participation of the target group is considerably increased. At the same time, this approach also reduces financial dependence from Government and thus improves the chances of sustained operation of the system. This would be further supported by a policy of allowing a higher degree of privatization in these activities.

Responsibility for these development proposals will be with the Ministry of Livestock, Forestry and Range.

(2) Animal Husbandry Skills

Productivity of livestock can also be increased by improved animal husbandry practices for the three production systems. Being traditional livestock holders, the scope for such improved practices is limited, particularly for the nomadic livestock.

For ensuring the long term carrying capacity of the grazing areas utilized by nomads, range conservation measures have to be taken, as described below. For such measures to be effective, it is essential that the nomads actively participate and understand their basic rationale (RAN 1, 2). This will be particularly important in those isolated areas where overgrazing takes place already, i.e. around Garbaharey, Jilib, Afmadow and Kismayo.

Responsibility for this activity will be with the National Range Agency of the Ministry of Livestock, Forestry and Range. For securing the cooperation of the nomads it will be necessary to also involve the NAHA's in conveying the range conservation messages.

For the sedentary livestock holders, the need to improve crop and livestock integration has already been incorporated in the development proposals for agricultural research and extension (CRO 2, 3).

The urban and peri-urban poultry and dairy units depend on specific inputs which have to be mostly imported. The liberalization of the drug supplies is expected to ease the supply problems, particularly as the private sector will initially concentrate on the easy to reach urban areas.

(3) Eradication of Tsetse Fly

The problem of animal trypanosomiasis in the Development Area has been identified and included in the masterplan for tsetse eradication prepared by the National Tsetse and Trypanosomiasis Control Project (NTTCP). As part of that masterplan, a tsetse eradication project, financed by the Federal Republic of Germany, is now being carried out in the southern most part of the valley, with the most northern point being Kamsuma (Map 13). According to NTTCP, there is a realistic chance that the riverine Glossina species of both river systems (Juba and Shebelli) will be eradicated within the next ten years (LIV 3). In the meantime, livestock making use of riverine resources, even seasonally, will depend on the application of appropriate trypanocidal drugs to control infection.

The non-riverine tsetse belt in the so-called Kenya Salient (south and west of Kismayo) is separated from the riverine tsetse infested areas by a Glossina free corridor.

Because of their negative effect on other animals, only the least harmful methods for tsetse eradication should be used. The riverine forests proposed for protection (RAN 4) should be treated last and with particular caution.

The beneficiaries of the tsetse eradication programme will be all livestock holders in the Development Area. The highest priority would be in SGUs 3 and 4, i.e. the districts of Bu'aale and Jilib, where the tsetse fly is most prominent.

(4) Livestock Marketing

To increase the country's livestock exports again, a number of steps need to be taken.

At the national level, Government policies need to be revised with respect to the exchange rate for export earnings and the heavy taxation of export. Both leave at present little incentive to livestock owners and traders to export officially. Also, active exploration of international marketing opportunities for livestock has to be considered a task of the central Government.

In addition, a programme (LIV 4) of promoting livestock marketing is proposed which includes:

- improvement of the loading and shipping facilities in Kismayo
- improvement of the holding grounds and quarantine stations in Jilib and Laheley (Kismayo)
- establishment of a marketing intelligence system
- ensuring that international health standards are achieved
- establishment of export facilities and services to Kenya
- structuring of livestock production into range fed and fattening production zones.

The beneficiaries will be the nomads in the Development Area and the Government receiving the foreign exchange for the livestock exports which are now at a reduced and largely unrecorded level.

The programme, for which the Ministry of Livestock, Forestry and Range will be the responsible agency, can only be successful if the nomads are participating, which is basically a question of Government set prices being attractive enough for them to do so.

To ensure that the programme will not falter due to insufficient operational budget, a certain share of the export earnings should be utilized for operating the necessary facilities.

(5) Beekeeping

To better use the potential for honey and wax production, a project for improved beekeeping is proposed (LIV 5). The programme will make an assessment of beekeeping practices and botanical resources in the Study Area, introduce better practices and improve the marketing of honey.

The beneficiaries would be the sedentary farmers in SGUs 1 to 4, who will have to do adopt and operate the improved practices. The largest potential is probably in the districts of Saakow and Bu'aale where floodplain vegetation is most prominent. Possibly, there will be an opportunity to establish new small scale industries for processing of honey and wax. This should be entirely on the basis of private entrepreneurs or cooperatives.

(6) Priorities for Development Proposals

The weights given to the goals at the fourth level related to improving the conditions for livestock production are shown in Table 7/3.

Table 7/3 Livestock Production - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Animal Health Care Services	LIV 1/2: Veterinary Serv., NAHA's	35
Animal Husbandry Skills	CRO 2/3: Research, Extension	10
Eradication of Tsetse Fly	LIV 3: Eradication of Tsetse Fly	15
Livestock Marketing	LIV 4: Livestock Marketing	30
Beekeeping	LIV 5: Beekeeping	10
Total		100

Highest priority is given to the improvement of animal health care and livestock marketing, as these are expected to make the largest contribution to an improvement in livestock production.

7.2.4 Improvement of Conditions for Fisheries and Industrial Production

The Juba represents at present a limited fishery potential, with most of the fish actually being caught in the desheks. Apart from the approximate composition of the stock of fish, not much else is known and the Government has not developed any specific policy for freshwater fishery development.

In future, two major changes will occur as a result of the dam. One is the establishment of the reservoir representing a completely new ecosystem with its particular fishery potential. The other is the almost complete disappearance of deshek flooding. While the consequences of these changes can be globally assessed, considerable uncertainty exists with respect to the details of the likely future development of the fisheries sub-sector in the Juba Valley.

One potential so far not utilized is aquaculture, for which the irrigation canals of the large schemes provide a suitable base. This represents possibly the most significant potential and could lead to fisheries playing a more important role.

The industrial sector plays a minor role in the country's economy as well as in the Juba Valley. Nonetheless, industry makes an important contribution, as it processes many of the agricultural raw materials into consumable products, provides basic tools and implements, increases local value added to some of the country's exports, adds to the diversity of the regional economy and generates employment in the rural as well as the urban areas.

Further development of the formal industrial sector is most promising with respect to processing the additionally projected output from crop and livestock production, particularly for the substitution of imports. Some possibility exists for generating more foreign exchange through increased processing of hides and skins and, in the longer term, also of meat.

With incomes, although slowly growing, demand for consumer products and services will diversify and provide a basis for future growth to the industrial sector in Mogadishu, from where the more sophisticated products and services will be delivered for some time to come, and in the Juba Valley, where there is growth potential especially for the private informal sector.

The most challenging task for the industrial sector will be to overcome the generally low level of technical and managerial skills, to compete with a limited number of products in the world market and to formulate industrial policies conducive to the optimal use of the country's resources.

Fisheries and industrial production thus do not play a major role at present in the economy of the Juba Valley. Nonetheless, a limited number of development proposals are presented, concerning establishment of a fisheries unit in the Juba Valley, setting up a management scheme for reservoir fishing, carrying out a pilot project for aquaculture in the Lower Juba, the need for carrying out some agro-industrial studies and promoting small scale enterprises.

(1) Establishment of Fisheries Unit in Juba Valley

Establishment of the dam will significantly alter the present situation with respect to fisheries. In the reservoir, a rapid increase of the fish population can be expected in the early years, as nutrients will be abundant. Thereafter, however, the number of fish will decline to an equilibrium which cannot be predicted at this time, because much depends on the limnological conditions in the reservoir after a settling period of several years. Downstream of the dam, conditions in the river will be much different as the flow will be steadier, the water quality with respect to chemical composition and physical properties different and flooding of desheks much less frequent and less intense.

To formulate appropriate policies for making best use of the potential under these changing conditions requires a reliable data base and studies including the following components:

- compiling an inventory of fish species
- investigating seasonal changes in fish population, structure and biomass and responses of the fish population to current exploitation modes
- studying feeding and reproductive patterns
- collecting information about the number and type of fishermen, kind and types of fishing gear used, extent of the catches, catch effort per unit, processing techniques, distribution and marketing of fish, consumption of fish and the role of fish in relation to the food requirements of the local population, and
- determining the attitude of fishermen towards the intensification of exploitation, relevant training and promotional aid.

A prerequisite for such activities is the establishment of a permanent field station of the Ministry of Fisheries and Marine Resources (MFMR) in the area and the recruitment of a small number of scientists (FIS 1). This unit should then also serve as base for providing a limited extension service to those farmers fishing on a regular basis. Such extension, which should in the long term be provided by the agriculture extension agents, has proven valuable in the Shebelli valley and is already being tried with good results in the Study Area. The most central location for this unit would initially be Jilib with the need for a second unit at Bardheere, once the dam is closed.

(2) Reservoir Fisheries Development

Based on the improved data bank and studies proposed above, a fisheries management scheme needs to be defined and implemented for the Bardheere reservoir (FIS 2). The objective of the scheme is to promote and organize the rational use of the fisheries potential in the reservoir. This requires also an analysis of the market prospects and the most appropriate organizational form the exploitation should take. The possibility for issuing fishing concessions to private national or international firms needs to be considered.

The direct beneficiaries of this programme will be those people involved in reservoir fishing. In addition, consumers will be benefitting from a larger supply of fish. To what extent fish could be exported would still have to be determined.

As mentioned, the management scheme will have to rely on the data and studies generated by the fisheries unit proposed above and is therefore linked to it. The most suitable location for the scheme would be Bardheere, with branches along the reservoir. For effective marketing of any reservoir fish, the reservoir needs to be connected to the national road grid by an all-weather road and to the national telephone system.

(3) Aquaculture

Fish husbandry is not practiced at present, despite the potential which exists for doing so. To assess and test the opportunities for aquaculture development, a pilot project (FIS 3) is proposed which will

- test the feasibility of introducing available aquacultural technology from outside
- develop and test appropriate techniques for using irrigation structures (canals, reservoirs) for fish husbandry
- test the feasibility of fish ponds within irrigation schemes, taking into account land and water requirements of pond culture
- undertake in-depth studies to determine the most economical aquacultural practices under existing social conditions, and
- identify the need for aquacultural research and extension services.

Initially, the introduction of cage culture of fish will be considered, as this technique can easily be employed in existing irrigation structures without interfering with their operation and does not require any additional water. The main irrigation canal of the Fanoole Rice Project, close to the main road and the rice mill, would be a suitable location for starting such a pilot project. The species of fish most suitable for cage culture is probably Tilapia.

The beneficiaries of this pilot project, for which responsibility will be with the Ministry of Fisheries and Marine Transport, will initially be the Government. Undertaking aquaculture then on a larger scale would directly benefit the operators of the large irrigation systems (SGUs 3 and 4), who could give fishing rights to the people working there. Indirectly, the consumers would benefit from an additional supply of fish.

(4) Large-Scale Industries

Lacking a substantial resource base other than raw materials from crops and livestock, it is the foremost task of industry to process these raw materials efficiently so that they can be consumed, used as inputs by industries or exported to obtain foreign exchange.

The industrial sectors' priority should be the efficiency of the transformation process. To be efficient, industry has to

- make the best use of existing, particularly large production facilities
- utilize available raw materials and by-products as economically as possible, thus maximizing value added
- make investment decisions for the rehabilitation or new establishment of larger industrial facilities in a national context
- be supported by Government policies conducive to increasing efficiency of industrial operations.

In the Juba Valley, the large existing and future industrial units will process staple food items such as sugar, rice, maize/sorghum and edible oils. For these, the processing capacities of the large-scale facilities are at present far in excess of available raw materials, i.e. capacity expansion projects will only come in the longer term. It should also be noted that it is only sugar and rice that have to be processed as close as possible to the production sites, as transport costs would otherwise be prohibitive. For other cereals and oilseeds the industrial facility could be located elsewhere, if that were to be more economical.

However, it is of major importance that existing capacities be properly operated and maintained so that full use is made of their potential. In the past this has not been the case and for three of the existing large industrial units in the Study Area, rehabilitation would have to be carried out before they could be used efficiently again.

Cotton was ginned at Jamaame, but the equipment of the Somaltex ginnery is not in working condition any more and actually too old and worn out to be rehabilitated. At present, Somaltex is ginning all of its cotton at Balacad, where there is sufficient capacity to meet all the mill's ginning requirements. Under these circumstances it would at present not seem justified to establish new ginning facilities in the Juba Valley. However, if cotton production increases beyond existing national ginning capacities or a rehabilitation is required at Balacad, this question would have to be reviewed.

To make use of the hardly utilized Kismayo Meat Factory, different concepts have been proposed by numerous studies. In the short and medium term, priority should be on making full use of the already rehabilitated corned beef line by aggressively pursuing all possible marketing opportunities. In the long term it might be possible to export more processed or even frozen meat, but this will require a reliable supply of cattle and that Somalia should be able to enter the world market for processed meat products. A joint venture with a foreign partner securing the market might be the best route for increasing exports of processed meat. Any rehabilitation of the factory will therefore have to take these factors into account.

For the Somalia Leather Agency Tannery in Kismayo, different rehabilitation concepts have been proposed concerning the leather sector as a whole. Donors have shown an interest to assist Somalia in rehabilitating and further developing this sector. A condition for such assistance has been, however, that considerable liberalization takes place. As this issue now appears to

be resolved, it can be expected that the leather sector will receive substantial support on a national level, including the possible rehabilitation of the facilities in Kismayo. As a priority item, such assistance would then also include efforts to increase the collection rate of hides and skins and to improve the quality of flaying and curing.

Rehabilitation of the above described facilities is thus meaningful only with an assured supply of cotton and livestock. At present, this is not the case and it will take a considerable period of time until such an assurance can be made. Therefore, no specific rehabilitation proposals are made within this Masterplan but it will be one of the tasks of MJVD to monitor this development and to see to it that rehabilitation or new construction takes place when the raw material and policy situation warrants this.

One raw material from the livestock sector is milk, which is a staple diet in the rural areas and produced in considerable quantities. Despite the fact that supply of milk is seasonally and geographically widely dispersed, it should be explored whether it would not be possible to establish small dairies for producing cheese and other milk products to sell in the urban markets. The beneficiaries of such dairies would be farmers and possibly nomads and the urban population. To be successful, considerable participation by the milk suppliers is required, which will be largely determined by the prices paid for raw milk.

Apart from the raw materials provided by the crop and livestock sectors, the by-products from industrial processing of these constitute again a raw material base for further processing:

- Bagasse is at present used at the Juba Sugar Project as fuel for the mill. About 2% dry fibre is not used and wasted. This could be utilized to make charcoal, which would find a ready market and may marginally slow down deforestation. Alternatively, the surplus bagasse and possibly molasses could be used as input for animal feed. The beneficiaries would in both cases be the sedentary farmers and possibly the urban population in Jilib District.

- Rice husks from Fanoole are at present wasted. It should be explored whether the Mogambo mill could utilize this for steam generation. Alternatively, husk might also be used for the production of charcoal. In the first case the beneficiary would be the Government operating the Mogambo mill, in the second case it would be the sedentary farmers and possibly the urban population in Jilib District.

From the discussion it follows that the scope for specific development proposals concerning the improvement or expansion of large-scale industrial facilities is rather limited. Included are (IND 1) the proposals to look into the possibilities of establishing dairies and better utilization of the surplus bagasse from the Juba Sugar Project and the rice husks of Fanoole.

(5) Small-Scale Enterprise Promotion

The second task of industry is, as far as economically possible, to satisfy local demand for consumer and household goods, tools, implements and industrial services. The resource base for these activities is limited not only in the Juba Valley, but generally in Somalia. Imports are therefore unavoidable.

Market opportunities and project possibilities in the industrial sector are varied and can quickly develop with changing socioeconomic conditions. The enterprises best capable of realizing such opportunities are those in the private sector, most often starting at a very small scale, if the technology allows such an approach. The projected increase in pump irrigation by smallholders, for example, will lead to a considerable increase in demand for pump repair services, which is ideally suited for the small-scale sector.

Because of these characteristics, such activities are best supported by establishing institutional support services which can give technical guidance and access to credit to private, small entrepreneurs. A start has been made by having an Industrial Promotion Office and an Industrial Consultancy Unit within the Ministry of Commerce and Industry. A potential danger, however, is that these will concentrate most of their resources on the pressing problems of public and larger private sector enterprises, with small-scale enterprise promotion and support not receiving sufficient attention. It has been the experience in many countries that this problem is best tackled by establishing a separate organization for small-scale enterprise development. This needs to be done in a national context, but the Juba Valley could possibly be one of the country's more promising regions in this respect and should therefore be considered as one of the first ones to receive such support.

It is recommended (IND 2) to undertake a pilot project for giving technical and financial support to small-scale enterprises in the Lower Juba, operating out of Jilib. The beneficiaries will therefore be the artisans and small entrepreneurs in the districts of Jilib, Jamaame and Kismayo.

(6) Priorities for Development Proposals

Table 7/4 give the weights assigned to the goals related to fisheries and industry.

Table 7/4 Fisheries and Industry - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Fisheries Unit in Juba Valley	FIS 1: Fisheries Unit	23
Reservoir Fisheries	FIS 2: Reservoir Fisheries Scheme	7
Aquaculture	FIS 3: Aquaculture Pilot Project	12
Large-scale Industries	IND 1: Agro-industrial Studies	33
Small-scale Enterprises	IND 2: SSE Promotion	25
Total		100

For fisheries, establishment of a unit in the Juba Valley is considered to be of greatest relative urgency, out of which a pilot project for aquaculture and the proposed scheme for management of fisheries in the future reservoir would develop. For industrial development, undertaking of the proposed studies is seen as most pressing.

7.3 Improvement of Physical Infrastructure

Improvements in physical infrastructure are grouped at the third level of the goal system under the three headings communication (roads, telecommunication), water supply and sanitation and energy.

7.3.1 Improvement of Communication Infrastructure

Roads and telecommunication represent the most important physical links connecting the Juba Valley to the rest of the country and the different regions within it. At present, accessibility and communication in the Study Area are severely curtailed by the very limited all-weather road network and the lack of even a basic telecommunication system.

Most severely affected by the poor roads is the area between Bardheere and Jilib, which is barely accessible during the dry season and almost completely cut off during the rains. Access to the Lower Juba from Mogadishu is made difficult by the very poor condition of the asphalt road between Brava and Jilib, where actual construction did not meet design specifications.

Road transport is practically all in the hands of the private sector, which generally provides the required services when the road conditions allow this.

The single most important problem of the road system is the close to complete lack of road maintenance, mainly a result of totally inadequate budget allocations by the Government for this purpose.

Telecommunication linkages exist only in the Lower Juba. Otherwise, only emergency communication is possible by using the radio of the police stations in the regional and district headquarters.

For roads, in accordance with the goal system (Figure 6/1), improvements are recommended for the main, rural and urban roads and an integrated road maintenance system. However, it should be noted, that the need for better and additional roads and proper maintenance is so large within the Development Area that it can only be met in the very long term. The emphasis has therefore to be on identifying priorities for the various projects envisaged, obtaining more resources for the construction and, particularly the maintenance of roads and allocating the scarce available funds accordingly.

For telecommunications, the possibilities for an improvement are assessed.

(1) Main Roads

So far, two road projects (Map 16) are in an advanced stage of preparation. One is the construction of the Jilib - Bardheere road to be financed by the EEC (SET 3) for which the construction is expected to begin in early 1990. The other is the upgrading of the Baydhabo - Bardheere road, for which the detailed engineering has been completed and which would be financed and implemented as part of the Bardheere Dam Project.

For all other road projects, planning and financing are less advanced and their implementation will mainly depend on the availability of funds. These are in order of their priority

- rehabilitation of the Jilib - Kismayo road
- rehabilitation of the Jilib - Brava road (as part of the Jilib - Mogadishu rehabilitation)
- upgrading of the Baydhabo - Luuq road
- rehabilitation of the Bardheere - Garbaharey road
- upgrading of the access road to Dinsor from the Baydhabo - Bardheere road
- new construction of the Dinsor - Saakow road
- new construction of the Jilib - Afmadow (- Liboye) road
- new construction of an all-weather road along the right bank of the Juba river between Bardheere and Jilib.

In determining the above ranking, the relative economic and social merits of the various roads have been taken into account as well as the necessity to promote regionally balanced development.

Even though numerous road projects have been carried out in the country, no binding national road standards exist. To facilitate planning and to save costs, road construction standards appropriate to the local requirements such standards should be established.

The beneficiaries of a road programme including the above main roads and the development of standards (SET 4) would practically be the total population in the Study Area and the northern Development Area, where access to the reservoir and the towns of Luuq and Garbaharey would be improved. The benefit of better and additional roads would materialize in the form of lower transport costs, provided there is sufficient competition of transporters, and in increased mobility, which is also of particular importance for all those agencies providing services to the people in the Juba Valley.

For new construction and upgrading of the main roads, for which the Ministry of Public Works and Housing (MPWH) would be responsible, little scope for local participation exists apart from involvement in planning the road alignments. Because of the low population density in the Study Area, labour intensive road construction will not be possible.

For realizing the benefits of more and better roads, road maintenance is crucial. The most important link of this development proposal is therefore with the one on road maintenance, as discussed below.

(2) Bridges Across the Juba

At present there are five bridges across the Juba downstream of the proposed dam (Bardheere, Bu'aale, Jilib, Kamsuma, Araare). An important additional link across the Juba would be a bridge at Saakow, particularly when the Bardheere - Jilib road will be completed. In connection with the Bardheere Dam Project, it will need to be determined whether the bridge at Bardheere needs strengthening. For the bridges at Luuq, Bu'aale, Kamsuma and Araare, rehabilitation studies need to be carried out to determine the scope of any required work, particularly with the expected change in the river regime and increased river scour after completion of the dam (SET 5).

The main beneficiaries of the additional and improved bridges would be the people living west of the Juba. The benefits would accrue in the same manner as described for the main roads above.

Responsibility for carrying out the work related to bridges would be with the Ministry of Public Works and Housing. Apart from being included in the planning process for the location of new bridges, there is practically no scope for local participation in this activity.

(3) Rural Roads

Rural roads play an important economic and social role in opening up agricultural areas for more advanced farming practices, better access to markets and increased social mobility. A rural roads programme is therefore proposed (SET 6) which should take into account the experiences gained under the on-going rehabilitation programme, carried out by MoA under financing from UNCDF. The programme will have to establish an appropriate development concept including planning and selection criteria and road standards. These will then need to be applied in close collaboration with the local authorities, particularly the district administration and extension service. The result would be a phased rural roads development programme, which should then be implemented.

Regional priorities for the construction of rural roads should be given to those areas with the highest population densities, i.e. SGUs 1 to 5. In the riverine areas, the rural roads will be mostly feeder roads to the main Bardheere - Kismayo road. It is mainly in SGU 5, i.e. the districts of Bardheere and Dinsor, where a more elaborate road network will be required in the long term.

The beneficiaries will be primarily the sedentary farmers in SGUs 1 to 5 with benefits accruing in the same manner as described above for the main roads.

In constructing rural roads, little scope exists for local participation. Responsibility for planning and implementing the rural roads programme would be with the Ministry of Public Works and Housing. The most important linkage is with the development proposal dealing with road maintenance, as discussed below.

(4) Urban Roads

The primary roads in the urban centers are partly of very low standard and in a bad state of repair resulting in rough riding surfaces, dust generation and drainage problems. It is therefore proposed to upgrade some of these roads, including the provision of appropriate stormwater drainage, in the eight largest urban centers (SET 7). Priority should be given to Jilib and Bardheere, as these are the least developed in this respect but, after Kismayo, the most important centers.

The beneficiaries would be the urban population of the eight centers, the main benefit being a more agreeable urban environment, conducive to further development of the towns. Furthermore, this would add to the attractiveness of the urban centers in the Juba Valley, making migration to Mogadishu somewhat less desirable.

Responsibility for planning and implementation would be with the Ministry of Public Works and Housing. Local participation would have to be sought during the planning stage, particularly when deciding on priorities.

The most important linkage of this development proposal is to road maintenance, as discussed below.

(5) Road Maintenance

To safeguard the overall investment in roads, an integrated road maintenance programme for main, rural and urban roads is proposed as a separate development proposal to give this activity the attention it deserves (SET 8).

This involves the setting of appropriate road maintenance standards for all types of roads, design and implementation of an institutional and organizational framework, establishment of facilities and equipment in all regions and districts and provision of adequate funds for the capital and recurrent costs of undertaking road maintenance. Basic facilities responding to the most urgent needs should be set up at the centrally located towns of Jilib and Bardheere and from there successively to Saakow, Bu'aale, Jamaame and Kismayo.

The success of a road maintenance programme depends on numerous factors, of which the awareness about the importance of maintenance and the funds being made available are probably the two most important ones. In the Juba Valley, the track record on both has not been encouraging and it must be one of the main aims of the road maintenance programme to significantly increase the awareness and the funding.

Ideally, local participation in undertaking road maintenance should be vigorously encouraged, particularly with respect to the routine maintenance of cleaning ditches and drains. However, because of the relatively low population density, the scope for a substantial contribution through local participation is limited. It needs to be explored to what extent funds could be raised locally, say at the district level to lessen the dependence on the Government's central budget.

The beneficiaries would be the total population in the Study Area, principally the sedentary farmers and urban people. Institutionally the Ministry of Public Works and Housing would have the main responsibility and it would still need to be established in which manner the district and municipal authorities could be tied into the proposed integrated programme.

(6) Telecommunication Facilities

The poor standard of telecommunication services within the Study Area is a reflection of the national situation. It must be feared that a specific project for improving telecommunications in the Juba Valley will not be successful as long as it is not backed up by an improvement of the overall, national facilities and services. Therefore, it is proposed that MJVD lobbies actively for better facilities and services for the Juba Valley whenever funding has been secured for upgrading and extending the existing system (ORG 1).

It is important to note in this context that telecommunication plays an important role in river management, particularly concerning flood warning and reservoir operations, where quick communication is of essence. The need for telecommunication will therefore be analyzed in conjunction with the development proposals dealing with reservoir operations (WAT 2) and flood control (WAT 9).

(7) Priorities of Development Proposals

The relative weight given to the goals at the fourth level are given in Table 7/5.

Table 7/5 Communication Infrastructure - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Main Roads	SET 3/4: Upgrading Main Roads	30
Bridges across the Juba	SET 5: Constr./Rehab. of Bridges	15
Rural Roads	SET 6: Rural Roads	18
Urban Roads	SET 7: Urban Roads	5
Road Maintenance	SET 8: Road Maintenance	25
Telecommunication Facilities	WAT 2/9: Reservoir Operating,Flood Warning	7
Total		100

Of greatest urgency is the upgrading of the main roads, specifically of the Bardheere - Jilib road, considered to be most important for the integration of all of the Middle Juba Region into the development of the valley. Road maintenance for all types of roads and the improvement of the rural road network are also given high priority. Least priority is attached to the improvement of the urban roads and of the telecommunication services.

7.3.2 Improvement of Water Supply and Sanitation

Water availability within the riverine part of the Study Area is generally more than sufficient to meet domestic water demand. This situation is completely different in all areas, which are situated at more than walking distance from the Juba river, where mostly neither reliable groundwater nor permanent surface water sources can be found.

Apart from this precarious supply situation, also the quality of water supply in urban and rural areas is far from being satisfactory. Only minimal facilities exist and these are often not working because of lack of maintenance and regular supply of fuel for pumps. Among other aspects, the poor water supply is one of the main reasons of the generally poor health conditions of the people in the Juba Valley. The water supply situation of some towns has to be considered as dramatic, particularly in Dinsor, where water harvesting is the only supply system available and in Kismayo, where seawater is supplied during the months of Jilaal.

Poor sanitation is another major environmental and health risk. Apart from pit latrines in both rural and urban areas, no sanitary facilities exist at all. Septic tanks are used only in Kismayo and this to a very limited extent and there are no efficient drainage and waste disposal systems.

Following the structure of the goal system, the water supply and sanitation situation is to be improved by implementing development proposals for rural and urban water supply, sanitation and maintenance of the related facilities.

(1) Rural Water Supply

For extending the rural water supply facilities, a corresponding programme is proposed (SET 9) aiming primarily at the rehabilitation and new construction of shallow wells, which should be given preference, wherever this is possible, to the more trouble prone deep tubewells. The programme will also include the specification of proper standards for the design of rural water supply facilities.

Responsibility for carrying out the proposed programmes and projects will be with the Water Development Agency (WDA) of the Ministry of Mineral and Water Resources (MMWR), whereby considerable local participation should be mobilized for the siting, construction, operation and maintenance of any facilities. Maintenance is crucial in this respect and a separate development proposal is recommended for this.

Much of the success of these proposals will depend on the increased awareness of the population about the interrelationship between water use and health. The active support by the ministries of health and education and the linkage to the corresponding development proposals is therefore essential.

The target group for the rural water supply programme would be the settled farmers in SGUs 1 to 5, with the greatest need being in the districts of Bardheere and Dinsor.

(2) Urban Water Supply

The only ongoing urban water supply project is the USAID funded Kismayo rehabilitation project aimed at restoring the treatment plant at Yontoy including the main supply pipeline and a possible extension of the distribution system (SET 10). Even with the rehabilitation, water supply for Kismayo will continue to suffer from seawater intrusion at the pump inlet. This will only improve after construction of the Bardheere Dam and regulation of the flow of the Juba.

At Dinsor, the water supply situation is precarious due to the lack of suitable ground water, high evaporation losses of the existing reservoir and the very poor quality of the collected surface water. Emergency measures are therefore proposed in combination with a more thorough study of determining the best long term water supply system (SET 11).

For upgrading and extending the urban water supply systems (Map 17), a programme is proposed where priority is given to the new construction of water supply facilities for Bardheere and Luuq (SET 12). In addition, rehabilitation and extension of the existing facilities in the other urban centers is included. Maintenance of the urban supply facilities is crucial and included in the development proposal for integrated water supply maintenance discussed below.

The beneficiaries would be the urban population. There is, however, no real scope for their direct active involvement in providing this service. The most important contribution they can make is by not evading payment of water charges so that the local organizations can eventually be financially self-sufficient.

(3) Sanitation

For human waste disposal, numerous low-cost systems exist, but none have been tried out in Somalia on a larger scale and no national standards or recommendations have been developed. Before undertaking a large-scale programme of improving the human waste disposal systems in the rural and urban areas, a pilot project is therefore recommended (SET 14), which should be undertaken by MJVD in close cooperation with municipalities and local development committees. The most central location for such a pilot project would be Jilib.

(4) Integrated Water Supply Maintenance

Maintenance of the rural as well as the urban water supply facilities needs to be considerably improved and a corresponding programme is proposed to cover both needs (SET 13). The emphasis here must be on self-sufficiency at the local level to ensure sustainability. In the rural areas many of the installed water pumps have failed because no adequate maintenance support exists. Initially, maintenance of the rural facilities might have to be organized at the district level, but it will be of prime importance to encourage the rural communities in taking on more responsibility in this. Given the difficulties experienced in the past, selection of the most appropriate technology must be done with great care and the proliferation of different pump types has to be stopped.

The integrated maintenance system should initially be set up to operate out of the two most centrally located districts of Bardheere and Jilib and spread from there into the other districts (Map 17). The units at Bardheere and Jilib are proposed to assume a central character, providing technical and equip- ment backup services not available at the district level.

The beneficiaries of improved water supply maintenance will be the sedentary population in SGUs 1 to 5. Initially mainly those in the districts of Bardheere, Dinsor, Jilib and Jamaame.

(5) Priorities of Development Proposals

The weights assigned to the goals related to water supply and sanitation are given in Table 7/6.

Table 7/6 Water Supply/Sanitation - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Rural Water Supply	SET 9: Rural Water Supply	25
Urban Water Supply	SET 10/11/12: Kismayo, Dinsor, Other	20
Sanitation	SET 14: Sanitation Pilot Project	20
Water Supply Maintenance	SET 13: Water Supply Maintenance	35
Total		100

Maintenance is given the greatest urgency at this point in time, followed by rural water supply improvements. Urban water supply and sanitation are seen as slightly less important. It should be noted, however, that the urban water supply goal includes emergency measures for Dinsor and Kismayo. This needs to be considered when determining the ranking of these development proposals in the overall phased development programme.

7.3.3 Improvement of Energy Supply

Firewood is the main domestic energy source in Somalia and the Juba Valley. The supply potential and constraints will be discussed below in connection with the forestry and range sector. Other energy sources for domestic use are hydropower, presently only produced at the Fanoole barrage with limited supply to Jilib and Kamsuma, and bagasse, which is, however, used exclusively for the generation of power for the Juba Sugar Project.

Electricity is generated in most urban centers by diesel generators using imported fuel, which is also used for stationary irrigation pumps and small-scale machinery and equipment. The supply of fuel to and distribution within the Study Area is unreliable. Distribution networks are rudimentary and in a poor state of repair.

Except for some very limited applications, solar or wind energy is practically not used, although there is a considerable potential for particularly these energy sources.

In future, provision of electricity by the Bardheere Dam creates a considerable supply potential of which about 40% have been earmarked for supply to the Study Area and transmission of power down to Kismayo has now been included in the Bardheere Dam Project.

Based on available demand estimates, power generation by the dam will only be sufficient to meet the needs of urban centers and irrigation pumping stations until about 2005. Rural electrification, probably not meaningful in any case, is therefore ruled out because of the limited supply potential. For cooking, firewood will remain the main energy source in the urban centers as well as in the rural areas.

The goal system identifies four areas in which an improvement of the energy supply situation is to be achieved. These are the more efficient use of fuelwood, an improved fuelwood supply to the urban centers and improvements in the urban and rural electricity supply.

(1) More Efficient Use of Fuelwood

Fuelwood, mostly used for preparation of food, is not very efficiently used. To promote better utilization of wood being a scarce resource particularly in urban areas, a programme of introducing fuel efficient cooking stoves is being implemented by the National Woodstove Development Project. It is proposed to extend this programme also to the Juba Valley, including the refugee camps (RAN 6). Implementation should be initiated by MJVD but would largely be carried out by relief organizations and NGOs.

This propagation effort would eventually benefit the total sedentary population of the Study Area and should be initiated from Bardheere and Jilib, being the most centrally located places.

(2) Better Fuel Supply to Urban Centers

Demand for fuelwood is most concentrated around the urban centers and the danger of deforestation and irrestorable damage to the vegetation cover is greatest in their direct environment. So far, there does not appear to be any acute danger of this happening, but with the projected increase in urban population, this might well happen in future and needs to be carefully monitored by the proposed Central Environmental Management Unit proposed below (ENV 1). Eventually, a system of limiting the areas for cutting fuelwood and granting licences, as practiced in other parts of Somalia, will have to be established. The latter applies particularly for the so far little utilized forest reserves between Bardheere and Jilib, which would become accessible to large-scale commercial exploitation after completion of the Jilib - Bardheere road.

A possibility for increasing the supply of fuel to the urban centers is also the utilization of surplus bagasse from Juba Sugar and of rice husks from Fanoole for the production of charcoal, as proposed above (IND 1).

(3) Urban Electricity Supply

To fully utilize the electricity generated by the dam, the main power supply line will have to be constructed from Bardheere to Kismayo, the large irrigation schemes connected and the urban distribution networks upgraded and extended (SET 15). For the latter, detailed plans have to be drawn up. It will be of particular importance to serve the smaller urban centers in order to reduce regional disparity (Map 17).

The local organizations of the National Agency for Electricity Generation (ENEE) will be responsible for operating and maintaining the urban systems and need to be strengthened to function in a more decentralized manner.

As for urban water supply, there is practically no scope for the direct participation of the local population in implementing, operating and maintaining the urban supply systems other than reliably meeting their financial obligations.

The beneficiaries of the increased availability of electricity in the urban centers will be in the first instance the commercial, industrial and institutional sector and through them the total urban population. In addition, the large scale irrigation projects would benefit. The greatest need exists in the towns of Bardheere, Saakow and Jamaame.

(4) Rural Electricity Supply

As the potential of alternative energy sources is high, serious efforts should be made to utilize it. This is particularly important as the supply of electricity by the dam is limited and will not meet the total demand in the Juba Valley in the long term. However, the knowledge of selecting the most appropriate technology, the skills of operating and maintaining the equipment, the economics and the best manner of promoting the increased use of alternative energy sources are only rudimentary available in Somalia. A rural energy pilot project is therefore proposed to evaluate and promote the use of alternative energy (SET 16). Implementation responsibility of this pilot project will be with ENEE. As location, Bardheere is proposed as the most central place to the area with the highest solar energy potential.

(5) Priorities of Development Measures

The relative priorities assigned to the goals related to the improvement of the energy supply situation are given in Table 7/7.

Highest priority is given to the propagation of stoves and the rural energy pilot project, which will require a long-term effort and should be started as soon as possible. Exploring the possibilities for charcoal production from agro-industrial by-products and environmental monitoring are seen as nearly as important, while the improvement of the urban electricity supply systems has less priority, as a real improvement will only come after completion of the dam.

Table 7/7 Energy Supply - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
More efficient Use of Fuelwood	RAN 6: Propagation of Stoves	30
Fuel Supply to Urban Centers	ENV 1/IND 1: Env. Monitg./Ind. Studies	25
Urban Electricity Supply	SET 15: Urban Electricity Supply	15
Rural Electricity Supply	SET 16: Rural Energy Pilot Project	30
Total		100

7.4 Improvement of Urban and Social Services

Improvement of the urban and social services is proposed to be strengthened by defining development proposals for the settlements planning and implementation capacity of the Government and for health and education services.

7.4.1 Improvement of Urban Services

An expected annual natural population growth of nearly 3%, construction of the Bardheere Dam, a shift to more irrigated agriculture and generally a more dynamic development process are factors which will tend to accelerate urban growth in the Study Area.

To limit the negative effects of too rapid an expansion and to provide the important urban services for the hinterland of the towns, urban planning needs to be undertaken to serve as a guide for allocating scarce resources for the provision of infrastructure and social services for the different types of settlements throughout the Study Area. This is particularly important because of the adoption of the spatial-functional concept of regional planning where the dispersed provision of urban functions is seen as an essential element for fostering growth.

To promote settlement planning and urban development, two areas are identified in the goal system. One is the preparation of development plans and the other the introduction of settlement planning and development at the district level.

(1) Urban Development Planning

Of the urban centers in the Juba Valley, Bardheere and Jilib are projected to experience the most significant growth in the years to come and the preparation of urban development plans for these two towns is considered to be of great urgency to prevent an uncontrolled development (Map 3). Following this, Kismayo also needs to be covered and thereafter Saakow and Bu'aale (SET 17).

It should be noted in this context that the future development of Bardheere will be significantly affected by the decision on where to locate the camp for the personnel required during the construction of the dam. This has been studies as part of the Bardheere Dam Project and it is understood that the camp will be located close to the dam, i.e. at a considerable distance from Bardheere. Part of the camp would be built for permanent occupation, while most of it would be for only temporary use.

The decision to establish the camp close to the dam and not in Bardheere appears to be the most sensible solution, as it avoids the problems that Bardheere would face in having to cope with a very considerable, but temporary influx of people. In the long term, the dam will provide for only limited employment and the opportunities for economic activities are limited in Bardheere and its immediate surroundings.

During the dam construction period, there will nonetheless be a considerable immigration also into Bardheere and the proposed urban development plan for Bardheere is for this reason especially important.

Responsibility for carrying out these urban development plans would be with the Ministry of Public Works and Housing which needs to be assisted in this technically and financially. Participation of the local authorities in preparation of the plans is essential, as they will form the basis for actual urban development.

(2) Settlement Planning at District Level

In the longer term, urban and general settlement planning and development, also for the smaller, rural centers should be initiated and implemented by the the local administration. Initially, this could be done out of the larger centers, but eventually it should be done by the administration of the districts themselves, as they are most familiar with the specific needs of the various communities. Implementation of the corresponding development proposal (SET 18) should be viewed as a long-term objective, in line with the generally proposed objective of working towards a more decentralized planning function, as will be discussed in Chapter 4.

(3) Priorities of Development Proposals

The weights assigned to the development proposals pertaining to an improvement of settlement planning and development are given in Table 7/8.

Table 7/8 Settlement Planning and Development - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Urban Development Planning	SET 17: Urban Development Plans	65
Planning at District Level	SET 18: District Planning and Development	35
Total		100

By far the highest priority is accorded to the urban development plans, particularly for Bardheere and Jilib, while the introduction of settlement planning at the local level is seen more as a long-term goal.

7.4.2 Improvement of Health Services

The health condition of the people in the Juba Valley is generally characterized by poor resistance against diseases, mainly due to poor nutrition and sanitation. Prevalent diseases are mostly waterborne or water related. Infant, child and maternal mortality rates are among the highest in the world.

To improve this situation, the Government relied initially on the classical curative oriented health care system of a network of district and regional hospitals. This system has proved to be too expensive and inefficient. Therefore, the Government adopted (as from 1982) the concept of a preventive, community-based "Primary Health Care (PHC)" system. The principle of PHC is to build up a network of basic services from village level upwards. However, implementation of this programme throughout Somalia still is severely hampered by lack of funds and trained manpower.

At national level, the PHC Department of the Ministry of Health (MoH) requires strengthening and will have to take up the coordinating role for all PHC programmes in Somalia. Therefore training for high and medium level staff should be implemented at this level.

The Health Education Department in the MoH, and also the Curriculum Development Center of the Ministry of Education (MoE) should develop teaching and training material and audiovisual aids for primary health care. However, both need advisory assistance, as well as financial and material support.

Community participation at village level as a major element of the development concept will have to be raised through increased awareness and motivation of the village population. Community health workers and traditional birth attendants will be recruited from local communities and work after their training on a voluntary basis, supported by the respective communities.

In the Juba Valley, the PHC programme has been started only in some districts. Specialized programmes such as maternal and child health care are being organized using the still existing (however insufficient) regional and district hospital facilities. Leprosy, tuberculosis, malaria and schistosomiasis programmes are also being undertaken but suffer from inadequate facilities and lack of operating budgets.

In future, following the construction of the Bardheere Dam and accelerated irrigation development, it has to be expected that waterborne and water related diseases will significantly increase, underlining the importance of improving the health care system.

Improvements in the provision of health services are proposed for the sedentary population as well as for nomads. Supportive proposals concern the provision/improvement of referral hospitals, a pilot project for nutrition and the introduction of an integrated disease vector control programme.

(1) Health Services for the Sedentary Population

The existing concept of the national PHC programme is sound and implementation is largely a matter of securing the necessary financial, staff and organizational resources. JESS proposes in addition, that the Government should initiate or support a health education programme on causes and treatment of anemia, aimed primarily at pregnant women. Based on the very valuable experiences of the Swedish Church Relief in the districts of Bu'aale and Saakow, and considering that similar PHC programmes are being started in Jilib, Jamaame and Kismayo districts, emphasis is laid on the introduction of PHC in those districts, which are not yet covered (Bardheere, Dinsor and Afmadow), as well as sustained support to and consolidation in those with ongoing activities (HEA 1). Beneficiaries will be all settled people in the Study and, to a lesser extent, in the Development Area.

The following service standards are proposed to be adopted, which are somewhat less ambitious than the ones presently existing:

- Primary Health Care Posts at village level, serving a population of about 1,000 - 2,000 each

- Primary Health Care Units at Beel level, each serving a population of about 10,000 - 20,000

- District Health Centres, with outpatient and inpatient facilities (max. 15 beds), serving the population in the respective district (30,000 - 50,000).

Close cooperation between these services is the first condition of a well functioning PHC system. District and regional PHC coordinators have to fulfill organizational and supervisory functions (Map 18).

The existing district hospital facilities in Jamaame, Saakow, Afmadow, Bu'aale, Dinsor, and Luuq should be transformed in district health centres with inpatient facilities (15 beds),. In Jilib a new construction is necessary because the existing hospital building is unsafe. Considering the particularly high population growth rate in Jilib, the inpatient facility here should be equipped with 25 beds.

(2) Health Services for Nomadic Population

As an innovative element and considering the important number of nomadic people in the Development Area, it is proposed to implement on a pilot basis a primary health care project for nomads (HEA 2). Upon successful completion, this could then be extended to an enlarged programme. The concept of this component is to provide services through health workers (similar to the "NAHA's" of the livestock sector), which are supported by staff of district and village PHC posts.

Any new programme of such kind will require particularly careful preparation in order to respond to the mobile nomadic way of life and to overcome resulting difficulties for the provision of a reliable health care service. Initially, a survey should be undertaken to evaluate the socioeconomic

structure, the health attitudes and the pattern of prevalence of diseases of the nomadic society. According to the survey results, a concept for the introduction of PHC should then be developed.

The concept would be introduced to the pilot community and it's (newly elected) health committee. The latter will then select Community Health Workers and Traditional Birth Attendants from within the community, which would be trained by the next district primary health care centre in short-term courses.

The personnel will be supplied with essential drugs and equipment for simple treatment of the most common diseases.

All activities would be supported by the nomadic community and regularly supervised by the regional PHC staff. Geographically, the priority would be in the districts of Afmadow and Luuq.

(3) Referral Hospitals

For the proper functioning of the PHC system, the availability of referral hospitals are an important condition to provide specialized services in such fields as surgery, gynaecology/maternity, internal medicine and pediatrics.

The Ministry of Health now considers a project for implementation under financing of the African Development Bank for strengthening the health services in the Middle Juba. The planned project would include rehabilitation of the hospital in Kismayo, replacement of the hospitals in Jilib and Bu'aale, strenghtening of the planning unit of the Ministry of Health and provision of technical and financial assistance to the Ministry's project implementation unit. Implementation of this project would make a considerable contribution to the improvement of health services and is therefore included as development proposal HEA 3.

However, mainly for equity reasons and taking into account staffing and operating cost coverage capacities, an important modification of these projects is proposed.

Whereas the rehabilitation and extension of the Kismayo hospital is considered justified and necessary, the locations of Jilib and Bu´aale should be reconsidered in favor of Bardheere. In this case, each would serve as a referral unit for either the southern (Kismayo), or the northern (Jilib) part of the Study Area.

In Bardheere, as the capacity and quality of the existing facilities will not be sufficient a new hospital with a capacity of not less than 60 beds is proposed. Apart from the generally marginal service supply situation in the North, the improvement of the hospital capacity there is additionally important because of the expected inflow of people due to the construction of the dam.

Also, the design of the now foreseen hospital facilities appears not to be sufficiently adapted to local conditions (concerning both aspects of tropical design standards and specific requirements of the context of Somalia).

The hospitals have to be understood as an integral link to the PHC approach, and, consequently they have to be developed in parallel with this programme.

The proper functioning of the two referral hospitals will depend upon the availability of qualified staff and regular supply of material and equipment, particularly drugs and laboratory reagents.

Most probably, long term financial support and advisory assistance will be necessary to assure sustained functioning of the hospitals.

(4) Nutrition

Closely related to the general PHC programme, a special nutrition pilot project (HEA 4) is proposed for implementation. It should be based on a concept, that would gradually be developed to improve the nutritional status of particularly children and women in the reproduction age and increase the latter's awareness about the importance of nutrition for general health.

The first step of such a project would be a survey about nutritional habits and food availability which determine the nutritional status of the population. Based on the survey results, strategies for promotion of better nutrition have to evaluated and tested within the context of the PHC programme.

Teaching material for education in nutrition should be developed for application by PHC personnel, which would require specialized additional training for this task.

Implementation of the pilot project by the Ministry of Health would be monitored, in order to identify the most appropriate concept for further integration in the PHC programme. As location, the districts of Bardheere and Jilib are proposed. A direct link should also be established to agricultural research and extension activities.

(5) Disease and Disease Vector Control Programme

With the existence of the Bardheere Dam and reservoir and the expected expansion of irrigated agriculture, the already high incidence of mainly malaria, schistosomiasis and intestinal diseases as well as the density and species composition of disease vectors are likely to further and substantially increase. Therefore an integrated disease and disease vector control programme is proposed (HEA 5) to mitigate adverse effects of major environmental changes. Present programmes are dormant. The schistosomiasis control programme has recently stopped and resources of the Ministry of Health are far too small to produce results. There is no experience with an integrated approach employing all physical, biological and chemical means as well as community mobilization and participation. Environmental implications of certain control measures have not been considered in the past.

Preparation of an efficient disease and disease vector control programme includes a more in-depth analysis with respect to existing policies and available facilities, formulation of possible strategies, such as assuring that health components are built into every development project, testing of these strategies in close collaboration with other sectors active in the

Juba Valley (agriculture, irrigation, fisheries, education, etc.) and integration of the most promising approach into the PHC and other suitable programmes.

To be able to control potential new disease vectors (black flies and intermediate snail hosts for intestinal schistosomiasis) regular inspection of suitable vector habitats for these vectors should be part of the control programme.

The beneficiaries would be the sedentary farmers in the floodplain, i.e. in SGUs 1 to 5, as well as the population living in the vicinity of the Bardheere reservoir. Increasing their awareness of the cause and effect relationships of the main diseases is essential for the programme to have any effect at all. The link to education and extension services is therefore of vital importance.

Responsibility for setting up a special unit for undertaking this programme should be with the Ministry of Health.

(6) Priorities of Development Proposals

The weights given to the goals at the fourth level are shown in Table 7/9.

Table 7/9 Health - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Sedentary Population	HEA 1: PHC for Sedentary Population	25
Nomadic Population	HEA 2: PHC for Nomadic Population	15
Referral Hospitals	HEA 3: Constr. of Referral Hospitals	15
Nutrition	HEA 4: Nutrition Pilot Project	15
Disease/Disease Vector Contr.	HEA 5: Integr. Disease/D.Vector Control	30
Total		100

With the pending construction of the Bardheere Dam and considering its important effects on the environment resulting in additional public health risks, it is obvious that the preventative programme of integrated disease and disease vector control is of paramount importance. However, it is directly followed by the issue of the primary health care. This programme is to be considered of top priority for the improvement of living conditions of local people. The introduction of PHC into nomadic societies is a long term issue, which still needs some preparation before a start could be considered. Referral hospitals being rather specialized facilities demanding highly skilled and scarce personnel are considered of lesser priority in the local context with its overwhelming need for basic health care for the most common diseases. The nutrition pilot project, although an important aspect of development, too, should be regarded as of lesser priority, mainly because overall development of the valley will already generate a certain improvement of food availability.

7.4.3 Improvement of Education Services

The standard of education of the people in the Juba Valley is extremely low. The illiteracy rate is the highest in the world and school attendance is the lowest in Africa and second lowest worldwide (it requires mentioning, however, that Somalia has a written language only since little more than 15 years). While sound concepts have been developed by the Government to improve education, implementation on a national level has been far from satisfactory basically because of insufficient budget allocation and lacking logistical means, resulting in low motivation of particularly rural teachers.

In the formal education system (primary and secondary schools), the situation of primary education (97 schools) in the Study Area is characterized by insufficient and inadequate physical facilities, limited access to some schools during the rainy seasons, long walking distances, practically complete lack of school supplies and equipment, the applied curriculum not being sufficiently adapted to local needs, unqualified and poorly motivated teachers and low, irregular attendance as children are required to work.

At the secondary level (general and technical branch - 10 schools), the system suffers from basically the same limitations as the primary schools. Technical branches are not sufficiently well represented in the Study Area.

The non-formal education system comprises women and adult education. Women education has been introduced in Somalia in 1974, and Family Life Education Centers (FLECs) were set up in almost all districts in the country. In the Study Area, five FLECs exist, but these are at present dormant. A new approach is being formulated and introduced (Kismayo) under the responsibility of the Women Education Department of the Ministry of Education, assisted by UNICEF and UNESCO.

Parallel to women education, adult education programmes exist since 1974 to increase literacy levels. However, interest has decreased, as the programmes did not sufficiently respond to people's needs.

It becomes obvious, that the formal and non-formal education system in the Study Area suffers from many limitations, which are comparable with the constraints of the education system throughout Somalia.

In drawing up any recommendations for the improvement of the educational situation in the Study Area it has to be kept in mind that the population lives under difficult economic and geographical conditions where often a serious labour conflict exists at household level, as the children are needed to work on farms (including the problem of continuity in school attendance due to the seasonal migration), animal herding and transport as well as for firewood and water collection. Children are also engaged in small-scale trading, industrial and manufacturing activities, particularly in urban areas for additional family cash income. These constraints also apply for adults, particularly women in relation with non-formal education.

Improvements of the educational standard of the people in the Juba Valley are proposed to be achieved through implementation of development proposals for primary and secondary education, technical skills and non-formal education.

(1) Primary Education

The concept of the Ministry of Education for primary education is aimed at bringing education closer to the people and adjusting it according to the social needs so that the people can more effectively utilize the services. This is a sound approach which needs to be supported so that it can actually be implemented throughout the Study Area (Map 19). The required support (EDU 1) will have to include

- new construction and particularly rehabilitation of schools in each beel (first phase), and in each primary and secondary village (second phase)
- re-orientation of the curriculum to include health, hygiene, environmental and agricultural subjects
- training of teachers in accordance with the new curriculum and promotion of community support to teachers for better motivation
- provision of sufficient and appropriate equipment, teaching materials (textbooks) and aids
- monitoring.

Concerning the teaching materials, they have already been developed, but the Curriculum Development Center of the Ministry of Education needs support in printing and distributing the material. As the distribution of textbooks to all primary schools cannot be executed in one step, availability in schools could be built up gradually. A staff unit should be established in the Curriculum Development Center to be responsible for the distribution.

The prevailing traditional building techniques are characterized by low durability and high maintenance requirements. The introduction of improved, environmentally suitable building techniques in school construction is necessary and can additionally serve as demonstration, while also reducing maintenance requirements. In cooperation with the Ministry of Public Works and Housing, standard designs should be developed and tested in the field.

To reduce costs and to better sustain primary education services, local participation should be actively sought for rehabilitation, construction and maintenance of any facilities to be provided. In addition, maximum use should be made of combining the facilities of different education systems, wherever this is possible. Also, it needs to be explored to what extent the local population can directly contribute to the payment of the teachers to lessen the dependence on the Government's budget.

The beneficiaries of a strengthened primary education service would be the settled population of SGUs 1 to 5 and 10 (Kismayo), with priority for the districts of Bardheere and Saakow.

Primary education, as mentioned earlier, is an important vehicle for conveying information to the general population also with respect to hygiene, disease transmitting mechanisms, nutrition and general environmental issues. Linkages to the work carried out by the health system and particularly the PHC programme are therefore important.

(2) Secondary Education

The number of secondary schools existing in the Juba Valley is sufficient in principle. However, performance is extremely poor, and comprehensive physical and organizational rehabilitation is required. It is proposed to lay particular emphasis on strengthening the technical branches, to be more in line with actual demand.

Development of secondary education includes the same tasks as primary education, but the following tasks are additionally required (EDU 2):

- elaboration of an inventory of existing facilities and determination of development requirements
- development of specific curricula for the technical branches
- provision of equipment for technical branches
- specialized teacher training.

Concerning the aspect of teaching material and textbooks, similar to the proposal on primary education, support is needed to Curriculum Development Centre of the Ministry of Education in printing and distributing textbooks.

In carrying out the rehabilitation and later new construction, standard designs and improved construction techniques should be developed to reduce initial and recurrent costs.

Mobilization of local participation in constructing and maintaining facilities for secondary education will be more difficult to achieve, as the schools do serve a much larger area. Nonetheless, an effort needs to be made in this.

The beneficiaries of an improved secondary education service in the Juba Valley would be the children from the population in the Development Area, mostly of the urban and settled farming population.

Priority should be given to the rehabilitation (including the provision of boarding and lodging) of secondary schools in each major center (Bardheere, Jilib, Kismayo), followed by improvements in Jamaame, Dujuma, Dinsor, Luuq and Afmadow.

(3) Vocational Training

The technical skills of artisans and craftsmen could be improved and it is proposed to establish, in close cooperation with the programme for assisting small-scale enterprises, a skill upgrading and training center (EDU 3). This will aim at offering short- and medium-term courses to upgrade the technical skills of experienced artisans and giving technical training in those fields which are in particular demand in the Study Area, such as in pump and engine maintenance and repair. The possibility of utilizing the workshop and training facilities of the Juba Sugar Project as a base for such a Center should be taken into account.

The direct beneficiaries of the Center would be artisans and craftsmen in the Lower Juba and those desiring to learn a technical trade. Most of the people qualifying for this training will come from the urban areas and will later work in the small-scale enterprises mainly in the districts of Jilib, Jamaame and Kismayo.

(4) Non-Formal Education

Non-formal education aims at adults in general and women in particular (EDU 4).

Adult education programmes have the basic objective to improve the general literacy of the population in a wider sense. They should be started at village level to make communities aware of environmental issues, to offer training courses for simple technical skills and to enable people to make optimal use of existing social infrastructure and services.

The existing adult evening courses, which offer three years basic education roughly equivalent to primary education and the Regional Adult Literacy and Skill Training Centers should be strengthened in all districts, however, with priority for Bardheere District, where so far no adult education programmes had been implemented.

To improve women education, it is necessary to assess the needs of women in their specific environment. Appropriate courses should be developed to help them to reduce their occupational overburden and to make better use of their labour force as well as to provide women with skills that would allow additional family income generation.

These aspects are applied in the national Family Life Education Programme being implemented presently in five regions of Somalia. In the Study Area, only the Lower Juba Region is included. It is proposed to strengthen this ongoing programme, including assistance to the Women Education Department (WED) in Mogadishu to achieve full coverage of all regions in the Study Area.

Within this programme, buildings and equipment would be provided in regional and district centers, and courses organized at village level. In the Study Area those districts should have priority, which are not yet included in the programme (Bardheere, Saakow, Bu'aale and Jilib).

(6) Priorities of Development Proposals

The weights given to the goals at the fourth level are shown in Table 7/10.

In the educational subsector, the improvement of primary education is the most important aspect of development by far. If a general improvement of educational levels of the population would not start effectively in an adequate primary education system with young children, long-term socioeconomic development would remain severely hampered. The marginal structure of the educational system leads to a relative downgrading of the importance of secondary education, although the general lack of skills and know-how calls for any type of educational services beyond primary education. The same applies for non-formal education and for training in technical skills.

Table 7/10 Education - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Primary Education	EDU 1: Primary Education	40
Secondary Education	EDU 2: Secondary Education	20
Vocational Training	EDU 3: Skills Upgrading & Trg. Centre	20
Non-Formal Education	EDU 4: Non-Formal Education	20
Total		100

7.5 Improvement of Resource Conservation

The natural resources in the Juba Valley are its land, water, fauna and flora. Improvements in resource conservation therefore deal with these and the general aspect of environmental management, which is of particular importance because the dam constitutes a significant change to the environment in the Juba Valley.

7.5.1 Improvement of Soil Conservation

To conserve productivity of the soil, improvements need to be made in irrigation development and practices, crop husbandry practices and in sand dune stabilization around Kismayo.

(1) Irrigation Development and Practices

Irrigated agriculture is projected to considerably increase along the Juba. However, the benefits of this can be reaped in the long term only when concrete steps are taken to avoid the problems of waterlogging and salinization which can drastically reduce soil fertility and even lead to the complete loss of arable land.

The manner in which this is to be tackled in the Juba Valley is by providing the farmers with assistance in the field of irrigation development and soil-water management. The first will be the responsibility of the proposed Irrigation Development Support Services (IRR 5), putting particular emphasis on providing drainage, while agricultural extension (CRO 3) has the task of teaching farmers proper on-farm water management so as to conserve the soil's fertility over the long term.

(2) Farming Practices

Soil fertility is fundamentally affected by the manner in which the land is farmed. Maintaining soil fertility is therefore one of the main tasks of the proposed strengthened agricultural research and extension service (CRO 2/3). Introduction of proper crop rotations, the use of animal manure or chemical

fertilizer, appropriate land preparation techniques, the establishment of wind breaks to reduce soil erosion and the general promotion of agro-forestry development, will be part of the work of the strengthened extension service and contribute to the conservation of soil fertility.

There is also the danger that soil erosion takes place due to the practice of clearing all woody vegetation for claiming ownership. To stop this, the Agricultural Land Law of 1975 needs to be changed.

(3) Sand Dune Stabilization

The community supported programme of tree planting and dune stabilization around Kismayo is proposed to be strengthened mainly by providing additional financing, as an organization exists for this already (RAN 9).

(4) Priorities of Development Proposals

The priorities assigned to the goals relating to conservation of soil fertility are given in Table 7/11.

Table 7/11 Soil Conservation - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Irr. Development and Practices	CRO 2/3,IRR 5: Research, Ext., Irr. Supt.	60
Farming Practices	CRO 2/3: Research, Extension	30
Sand Dune Stabilization	RAN 9: Community Tree Planting	10
Total		100

The danger of loss of soil fertility due to inappropriate irrigation development and practices is seen as the most severe threat to soil fertility and the corresponding development proposals are therefore given highest priority. General farming practices are also seen as important for conserving soil fertility, while the community tree planting around Kismayo is given a low weight because it applies to a small area only and thus makes a very limited contribution to meeting the overall goal.

7.5.2 Improving the Management of Water Resources

Water resources management is the organization and performance of all activities in the Juba Valley leading to rational water resources allocation and utilization in the before- as well as the after-dam situation. Improved management of the water resources in the Juba Valley is to be achieved by stabilization of the river channel, optimal reservoir operation, appropriate water allocation, improvement of the river flow data base and control over water quality.

(1) Stabilization of River Channel

The changed flow and sediment load after construction of the dam might significantly affect the natural process of channel formation, cause deep river scour, deepen the longitudinal profile of the river and possibly require stabilization works. To investigate this, a River Morphology Study is proposed (WAT 3). The study would include the cross sectional and longitudinal survey of the river and the adjacent floodplain, also preparing an important input into the proposed Drainage and Flood Control Study (WAT 9), analyze the riverbed stability by modelling and identify any required stabilization works. Recommendations for the future monitoring of the river's morphology will also be made. The timing of the study has to be such that the necessary stabilization works (WAT 4), which could also be utilized for abstraction of irrigation water from the river, can be undertaken before the dam starts operating. Responsibility for this study will be with MJVD.

(2) Reservoir Operating Procedure

Operating of the reservoir requires a tradeoff between the partly conflicting goals of power generation, irrigation, health, flood protection, avoidance of sea water intrusion and environmental protection. It appears that the long term implications of this tradeoff, particularly with respect to irrigation and flood control, have not yet been properly taken into account in designing reservoir operating procedures. Also, the possibility for releasing temporary floods from the reservoir to allow a continuation of flood recession agriculture as long as the conversion from uncontrolled to controlled irrigation is not completed, needs to be seriously considered in determining reservoir operating procedures.

It is therefore proposed to undertake a multipurpose operation study for the Bardheere reservoir (WAT 2). The study will analyze and optimize the operational requirements of the different needs and establish appropriate reservoir operating rules. Since conditions will change over time, the study will also indicate in which manner it can be ensured that operational requirements will be reviewed and modified when and where necessary.

The benefits would accrue to all people along the reservoir and river, but mainly to farmers practicing irrigated agriculture and the settled population in the floodplain, whose flood risk is reduced. In addition, the urban population of Kismayo would benefit because there would be no more intrusion of salt water into the Juba from where the water is taken for the water supply of this town.

(3) Water Allocation

Passing of the National Water Resources Law is a precondition for any activity aiming at regulating the access to and use of the Juba water. While progress has been made in so far as the National Water Center has been established, the process of instituting the law is slow. A review of the draft revealed a number of issues and omissions which need to be clarified. It is of utmost importance that MJVD actively works on accelerating this legislative process (ORG 1).

To avoid inequities and economic losses to the country, water downstream of the dam needs to be allocated among the users according to their needs and relative importance. It is therefore proposed to establish a Water Allocation Committee consisting of the representatives of the affected groups and to formulate a water allocation strategy, which will form the basis for controlling the use of water (WAT 5). The Committee will also be responsible for representing water users when reservoir operations are determined. Institutional backing for this will have to be provided by MJVD.

Enforcement of an agreed water allocation is a complex task, as there will be a large number of water users who are not easily controlled. As a first step, a pump registration programme is proposed to be included as one of the tasks of the proposed Irrigation Development Support Services (IRR 5). This would involve registration of all pump owners and the development of appropriate pump licensing procedures, defining duration, timing and maximum quantities of pumping, lockout periods, definition of the legal, institutional and administrative requirements and their implementation. Recommendations also need to be worked out on what other appropriate control measures, such as the introduction of water user charges, could be implemented.

(4) River Flow Data Base

To ensure that flow levels of the river are properly monitored, the river gauging stations need to be rehabilitated, extended and reliably operated (WAT 6). Also, control measurements need to be performed on a regular basis.

At present, responsibility for this is with the Ministry of Agriculture. In future, based on the premise that MJVD will be responsible for all matters concerning the management of the Juba, this should become the responsibility of MJVD. However, it is even then conceivable that this activity would be delegated to others, wherever MJVD is not locally represented.

The data collection and evaluation system for the hydrological data will, together with the one proposed for monitoring rainfall (ENV 4), form the basis for a proposed flood warning system included in the drainage and flood control study and works proposed under WAT 9/10.

(5) Water Quality Control

The quality of water needs to be monitored so that corrective action can be taken, if and when required. This applies in particular to the sediment load the river carries and salinity levels, which could have adverse effects on irrigated agriculture. The monitoring system would comprise standardized methods of monitoring between Luuq and Kismayo and of ensuring that MJVD as the central organization responsible for river management will receive the data, analyze and act on it (WAT 7). Responsibility for this monitoring effort will also be with MJVD. This needs to be closely coordinated with the measurement of river flows, as water quality is always strongly corre- lated to the magnitude of flows. Where MJVD is not locally represented, this task will have to be delegated to a permanently present agency, such as the Ministry of Agriculture, or the data collected on a visiting basis.

To improve the quality of water released by the planned reservoir, the wood in the area to be inundated should be cleared, which will also provide valuable firewood, particularly during the dam construction period (RAN 5).

The effect of the future reservoir on groundwater levels and quality is not really known. Because of the precarious groundwater situation in the Study Area, groundwater levels and quality should also be monitored and is included in WAT 7.

Finally, to keep seawater out of the Juba estuary so that the problem of saline water for irrigation as well as for domestic supply, particularly to Kismayo is avoided, a basic river flow of about 15 m^3/sec needs to be maintained. This constitutes an additional point to be considered when optimizing reservoir operating procedures (WAT 2). In the more distant future, it is conceivable that, because of high water consumption for irrigation, a basic river flow of 15 m^3/s cannot be maintained at all times. In such a case, construction of a seawater barrier might be needed and a corresponding study is proposed (WAT 8).

The beneficiaries of monitoring and controlling the quality of the Study Area's water resources will mainly be the settled population in the floodplain.

(6) Priorities of Development Proposals

Table 7/12 gives the priorities of the development proposals related to the management of the water resources in the Juba Valley.

Table 7/12 Water Resources Management - Relative Priorities

Fourth Level Goal	Development Proposal	Weight
Stabilization of River Channel	WAT 3/4: Morphology Study, Stab. Works	33
Reservoir Operating Procedure	WAT 2: Multipurpose Operating Study	22
Water Allocation	WAT 5: Water Allocation Strategy	18
River Flow Data Base	WAT 6: River Gauging Stations	12
Water Quality Control	WAT 7: Water Quality Control	15
Total		100

As shown, undertaking the river morphology study and the subsequent possibly required stabilization works for the river channel are seen as most urgent, as this will have to be done before completion of the dam. Of second highest priority is the multipurpose dam operation study, defining the manner in which the conflicting goals of the dam can be balanced. In comparison to these two main activities, improving the river flow data base and introducing water quality control are seen as less urgent.

7.5.3 Improvement of Vegetation Cover and Wildlife Conservation

To improve the conservation of vegetation cover and wildlife, development proposals need to be defined for improving range and wildlife management, protection of riverine forests, promoting the efficient use of fuelwood, harvesting of the trees in the reservoir, increasing the supply of tree seedlings and undertaking research for more suitable tree species.

JESS identified a unique species of sedge in the reservoir zone for which every effort of saving it should be made. This should be part of the Bardheere Dam Project and no specific profile is formulated here.

(1) Range Management

Management of the large forestry and range lands in the Development Area and implementation of the proposed development activities requires an efficient organization. At present, the NRA is not sufficiently well staffed and lacks the necessary support facilities and operating budget. It is therefore proposed to establish a Southern Rangelands Development Project (RAN 1) as part of the NRA to be specifically responsible for implementation of the development proposals defined below. In setting up such a project, great care should be taken not to simply copy the organization, policies and procedures of the Northern and Central Rangelands Projects, but to establish it in such a way that it meets the specific needs of the Development Area.

For ensuring the long term carrying capacity of the grazing areas it is essential that some immediate measures are taken to protect the particularly sensitive areas. Some of the overgrazing might actually stem from the increased provision of water supply for livestock, particularly in SGU 9. The danger there appears to be now that water is not any longer the limiting factor but the carrying capacity of the area. It is therefore recommended to provide more watering points only in those cases where this danger does not exist. Finally, access by the nomads to the river is becoming more difficult with the increased development of irrigation along its shores. There is therefore also an urgent need to identify access corridors to the river in which crop production should not take place.

A project is therefore proposed involving the identification and mapping of overgrazed areas and required access corridors to the river, testing of alternative range management measures, implementation and continued evaluation of suitable measures (RAN 2). As mentioned earlier, this needs to be carried out in close cooperation with livestock holders, i.e. mainly nomads, who would also be the main beneficiaries of an improved range and forestry management. For the access corridors, the participation of the sedentary farmers is also vital.

Geographically, the greatest need for the proposed range management programme would be around the urban centers of Luuq, Bardheere and Jilib, from where the whole of the Juba Valley can be covered

(2) Wildlife Management

Conservation of wildlife plays practically no institutionalized role in the Juba Valley and there is no formulated policy for defining the objectives and possibilities for this. However, there is still considerable diversity in the existing wildlife for which the establishment of a conservation policy and programme would make emminent sense. Therefore, a Wildlife Conservation Programme (RAN 3) is proposed, which will have to deal mainly with planning for future land use in the valley, but also with present day issues of isolated overpopulations of crocodiles, hippos, wart hogs and other animals being a threat to human life, livestock and crops.

Geographically, the programme would have to cover the whole of the Development Area with particular emphasis of the floodplain and the Lower Juba with the best administrative location being Jilib.

The benefits of the proposed programme would partly accrue directly to the population in the floodplain, as far as damage to people, livestock and crops is reduced. The main benefits, however, will be the long-term contribution this will make in maintaining the traditionally diverse ecology of the Development Area.

Wildlife conservation can, of course, not be done in isolation of the vegetation cover conservation measures defined in this section. The linkage of this development proposal to range management, protection of riverine forests, land use planning and general river management is therefore essential.

(3) Protection of Riverine Forests

The few remaining riverine forests in the Juba Valley constitute a unique ecosystem which has been called "a national monument for Somalia" by the Somalia Research Project. Immediate action is required to achieve their conservation (RAN 4) under the responsibility of NRA.

So far, two blocks of forests have been identified, i.e. the forests at Shoonto and Barako Madow in Bu'aale District. Some effort has been expanded for their demarcation and protection. However, additional efforts are required for their effective protection. It needs to be considered to not only protect the immediate forest area but also the larger surrounding areas, at least with respect to hunting.

One additional area has been identified at Shauri, close to Bu'aale, where a stand of rare trees should be considered for protection.

These protection measures can only be successful if they are developed and implemented in very close cooperation with the local population, taking into account their needs.

In addition, the Agricultural Land Law of 1975 needs to be amended to ensure that forest management is recognized as a legitimate land use to retain leasehold.

(4) Utilization of Wood in Reservoir

It must be realized that the increased planting of trees as proposed by stepped up agro-forestry activities will improve wood supply only in the longer term. In the meantime, further degradation of some areas must be expected. One possibility of somewhat relieving the pressure is to harvest the wood in the Bardheere reservoir in a controlled manner, making the wood available to the population in the most severely affected areas (RAN 5). Part of it could also be used as building material and fuelwood for the dam construction workers.

It is recommended to undertake this development proposal as part of the Bardheere Dam Project so that it can be timed in line with the needs of the construction workers and flooding of the reservoir. As the cost for harvesting, transporting and distributing the wood might exceed the market value, appropriate cost provisions should be made.

(5) More Efficient Use of Fuelwood

Using fuelwood more efficiently would reduce demand and thus pressure on the vegetation cover. As discussed above (Section 7.3.3), it is proposed to propagate the use of cooking stoves for this purpose (RAN 6).

(6) Supply of Tree Seedlings

The proposed agro-forestry development, which is to be promoted by the strengthened agricultural extension service, requires an increased availability of tree seedlings throughout the Study Area by an expansion and improvement of the nursery network (RAN 8). The location of the nurseries should take the expected future settlement pattern into account and should initially concentrate on the districts of Bardheere and Jilib.

(7) Use of More Suitable Trees

Increased planting of trees as part of the proposed agro-forestry development needs to be supported by undertaking multipurpose tree species trials to identify those species and varieties that are best suited to local conditions (RAN 7). This research needs to be undertaken by NRA in Bardheere and Jilib District, as climatic conditions there are reasonably representative for most of the Juba Valley, because of their centrality and, in the case of Bardheere, closeness to the Bardheere Research Station.

(8) Priorities of Development Proposals

The weights given to the seven goals related to improving vegetation and wildlife conservation are shown in Table 7/13.

Table 7/13 Vegetation and Wildlife Conservation - Priorities

Fourth Level Goal	Development Proposal	Weight
Range Management	RAN 1/2: Development Programme,Management	25
Wildlife Management	RAN 3: Wildlife Management	10
Riverine Forests	RAN 4: Forest Conservation	15
Wood in Reservoir	RAN 5: Wood Harvesting in Reservoir	5
Efficient Use of Fuelwood	RAN 6: Propagation of Stoves	20
Supply of Tree Seedlings	RAN 8: Upgrading of Nursery Network	15
More Suitable Trees	RAN 7: Tree Species Trials	10
Total		100

Highest priority is given to the improvement of range management to ensure that no irreversible damage is done to this very important and delicate natural resource. Propagation of stoves is given second priority, as this could potentially significantly reduce demand for fuelwood. Upgrading of the nursery network and protection of the riverine forests are seen as more urgent than wildlife management and tree species trials. Least priority is given at this point in time to the proposed wood harvesting in the reservoir, as this will apply only to the time during construction of the dam.

7.5.4 Improvement of Environmental Management

Environmental management is to be improved by implementing development proposals with respect to the introduction of a Juba Valley Environmental Management Unit, introducing remote sensing as an analytical tool and by improvement of the range, forestry and rainfall data base.

(1) Juba Valley Environmental Management Unit

The weak data base combined with considerable uncertainty about the future environmental development in the Juba Valley points to the need of an effective environmental monitoring and control system. To this end, a Juba Valley Environmental Management Unit is proposed (ENV 1), which will be responsible for

- ensuring the formulation of detailed, sector-specific guidelines to provide a basis for environmentally sound development
- acting as the central place for the collection and analysis of all environmental data pertaining to the Juba Valley
- setting, monitoring and enforcing environmental standards
- identifying, initiating, funding, implementing and monitoring projects and programmes for ecologically sound resource management and enhancement of environmental quality

- coordinating the environmental monitoring and control activities of other agencies

- initiating, coordinating or implementing needed environmental investigations or research

- initiating and coordinating training of personnel for environmental management.

As Somalia has no specific environmental legislation nor declared environmental policy, respective responsibility rests with the line ministries. The proposed Juba Valley Environmental Management Unit will therefore be mainly engaged in guiding and controlling the work done by the line ministries and will to that extent be the first effort in Somalia of a more central character.

Responsibility for this should be with MJVD, being the coordinating body for development in the Juba Valley. In addition to the coordinating function of the activities of the line ministries, MJVD is also expected to have line responsibility for managing the Juba water resources and would therefore also be directly responsible for all environmental matters related to this.

The benefits of this programme will eventually accrue to all the people in the Development Area by ensuring that the natural resources are wisely utilized. The activities of the Unit will have to take place throughout the Development Area, with Bardheere and Jilib being the most centrally located places for its administration.

(2) Range and Forestry Data Base

One of the most important areas for which environmental monitoring and control needs to be undertaken is for the vast range and forestry resources of the Development Area. However, analysis of changes in land use or in rangeland vegetation types and conditions, for determining productivity and carrying capacity, requires repeated studies and monitoring using standardized methods over long time periods at the same sites. Such monitoring sites have now been established (Map 14), but this will only be of benefit, if there is a permanent and efficient institutional framework. Therefore it is proposed to create a Rangeland Monitoring Center within the NRA (ENV 2).

The Monitoring Center will be responsible for the following main tasks:

- setting up a permanent field network of monitoring sites
- inventorize present resources
- establish monitoring procedures
- identify priority areas of intervention
- develop guidelines for proper resource management
- follow up the effects of management measures
- identify specific fields for research and investigation
- liaise with other institutions concerned.

Included in the above tasks is the collection of basic agro-meteorological data which will be needed for a better understanding of the relationship

between climate and biomass production and to investigate the possibilities of setting up an early warning system on the vegetation situation and fodder availability.

Surveys should not be limited to vegetation and land use aspects, but will have to include a detailed analysis and monitoring of size, composition and seasonal movement patterns of livestock. This could be of paramount importance taking into account that the Bardheere Dam will lead not only to a reduction of riverine rangelands but will also force modification of access to river water. Moreover, although it is expected that tsetse eradication will have but small effect on riverine livestock population growth, there could be some changes in the seasonal patterns of use of the riverine rangelands with an increase in rainy season grazing pressure.

A number of important long-term planning issues may be addressed once better carrying capacity and forage production data are available, including the balance between dry and wet season feed resources, and the effects of agricultural development and changes in rangeland condition on future range resources and carrying capacities. These studies may then be combined with observations on crop residue and by-product production in different farming systems to gain a better understanding of the Study Area's feeding potential.

While the Range Monitoring Center would be managed by the NRA, it needs to establish very close ties to the proposed Juba Valley Environmental Management Unit.

(3) Use of Remote Sensing Data

As an elementary tool for environmental management of such a large area, it is proposed to introduce remote sensing analysis using aerial video imaging, as used for a number of JESS surveys, multispectral Landsat or other satellite images on a periodic basis (ENV 3).

(4) Climatological Data Base

For the collection of rainfall data, also in connection with monitoring sites, the network of raingauge stations needs to be expanded (ENV 4) Responsibility for this will be with the Ministry of Agriculture which is presently responsible for this on a country-wide basis. This should be supported by other agencies, projects or ministries involved at locations in the Development Area where the Ministry cannot collect rainfall data.

(5) Priorities of Development Proposals

The relative priorities for the goals relating to environmental management are shown in Table 7/14.

The most immediate need for improving environmental management is seen for establishing the Juba Valley Environmental Management Unit within MJVD and to commence with the use of remote sensing data, as the most efficient method to obtain an overall picture of environmental development. The other two development proposals are comparatively of less importance.

Table 7/14 Environmental Management - Priorities

Fourth Level Goal	Development Proposal	Weight
Environmental Management Unit	ENV 1: JV Env. Management Unit	50
Range and Forestry Data Base	ENV 2: Range/Forestry Monitoring Center	10
Use of Remote Sensing	ENV 3: Introduction of Remote Sensing	30
Climatological Data Base	ENV 4: Extension Raingauge Network	10
Total		100

7.6 Summary of Weighted Goal System

Combining the relative priorities determined in this chapter for the goals at the fourth level with those of the second and third level (Chapter 2), the overall weighted goal system, as shown in Figure 7/2, results.

Priorities for the different development proposals can now be determined by using the calculated compound weight as given in Figure 7/2 at the fourth level of the goal system as basis. The calculated compound weight is determined by multiplying the weights assigned to the second, third and fourth level of the goal system with each other. The results, calibrated to give a total of 100 points to the 65 goals at the fourth level, show a range of zero to three points for each fourth level goal, where zero corresponds to the lowest and three to the highest priority.

Analyzing the weighted goal system it can be seen that a total of 12 goals received 3 points, the highest compound weight and thus the highest priority, relating to 16 development proposals from 10 different sectors. Not represented in this group of high priority development proposals are the sectors of fisheries and industry and those aimed at the conservation of resources, except for establishment of the Environmental Management Unit. Very generally, this underlines the assessment that fisheries and industry will only make a limited contribution to economic development at this point in time and that there is not yet any real urgency for undertaking environmental control measures.

The next group of goals at the fourth level having received 2 points, comprises 18 goals and development proposals. Not represented in this are proposals for the improving the general crop and livestock production conditions, for energy supply and conservation of the vegetation cover.

Finally, 28 goals have received one point and the remaining 7 no points. The latter group includes the improvement of irrigation practices, reservoir fishery, urban roads, sand dune stabilization around Kismayo, wildlife management, utilizing the wood in the reservoir and tree species trials.

The results of this weighted goal system will be utilized for formulating the Juba Valley Development Programme as discussed in the following chapter.

Figure 7/2

Weighted Goal System

Goal (1. Level) Description	Goals (2. Level) Weight	Goals (2. Level) Description	Goals (3. Level) Weight	Goals (3. Level) Description	Goals (4. Level) Weight	Goals (4. Level) Description	Development Proposals
Improvement of Socio-economic Conditions in Juba Valley	36	Improvement of Economic Production Conditions	31 / 11	Improvement of General Crop Production Conditions	25 / 3	Improvement of Land Tenure Security	CRO 1: Land Registration
					25 / 3	Improvement of Farming Skills	CRO 2/3: Research, Extension
					10 / 1	Improvement of Crop/Livestock Integration	CRO 2/3: Research, Extension
					10 / 1	Improvement of Agro-forestry Development	CRO 2/3: Research, Extension
					5 / 1	Improvement of Input Supply and Credit	CRO 4: Agricultural Credit
					25 / 3	Improvement of Flood Control and Drainage	WAT 9/10: Flood Control, Drainage
			28 / 10	Improvement of Irrigated Crop Production Conditions	25 / 2	Improvement of Irrigation Systems Development	IRR 1/2/3/4/7: Desheks, Abstraction, Homboy
					30 / 3	Provision of Irrigation Development Support	IRR 5: Irrigation Development Support
					20 / 2	Improvement of Large Irrigation Schemes	IRR 6: Existing Schemes
					20 / 2	Improvement of Irrigation Skills	IRR 8: Irrigation Training
					5 / 0	Improvement of Irrigation Practices	CRO 2/3: Research, Extension
			28 / 10	Improvement of Livestock Production Conditions	35 / 3	Improvement of Animal Health Care Services	LIV 1/2: Veterinary Services, Animal Health Care
					10 / 1	Improvement of Animal Husbandry Skills	CRO 2/3: Research, Extension
					15 / 1	Eradication of Tsetse Fly	LIV 3: Eradication of Tsetse Flies
					30 / 3	Improvement of Livestock Marketing	LIV 4: Livestock Marketing
					10 / 1	Improvement of Bee-keeping	LIV 5: Promotion of Bee-keeping
			14 / 5	Improvement of Fisheries and Industrial Production Conditions	23 / 1	Establishment of Fisheries Unit in Juba Valley	FIS 1: Fisheries Unit
					7 / 0	Reservoir Fisheries Development	FIS 2: Reservoir Fisheries Scheme
					12 / 1	Introduction of Aquaculture	FIS 3: Aquaculture Pilot Project
					33 / 2	Improvement of Large-scale Industries	IND 1: Agro-industrial Studies
					25 / 1	Provision of Small Scale Enterprise Promotion	IND 2: SSE Promotion
	22	Improvement of Physical Infrastructure	41 / 9	Improvement of Communication Infrastructure	30 / 3	Improvement of Main Roads	SET 3/4: Upgrading Main Roads
					15 / 1	Improvement of Bridges across the Juba	SET 5: Constr./Rehab. of Bridges
					18 / 2	Improvement of Rural Roads	SET 6: Rural Roads
					5 / 0	Improvement of Urban Roads	SET 7: Urban Roads
					25 / 2	Improvement of Road Maintenance	SET 8: Road Maintenance
					7 / 1	Improvement of Telecommunication Facilities	WAT 2/9: Reservoir Operating, Flood Warning
			36 / 8	Improvement of Water Supply and Sanitation	25 / 2	Improvement of Rural Water Supply	SET 9: Rural Water Supply
					20 / 2	Improvement of Urban Water Supply	SET 10/11/12: Kisanyo, Diasor, Other
					20 / 2	Improvement of Sanitation	SET 14: Sanitation Pilot Project
					35 / 3	Improvement of Integrated Water Supply Maintenance	SET 13: Water Supply Maintenance
			23 / 5	Improvement of Energy Supply	30 / 1	More Efficient Use of Fuelwood	RAN 6: Propagation of Stoves
					25 / 1	Better Fuel Supply to Urban Centers	ENV 1/IND 1: Env. Monitoring/Industrial Studies
					15 / 1	Improvement of Urban Electricity Supply	SET 15: Urban Electricity Supply
					30 / 1	Improvement of Rural Electricity Supply	SET 16: Rural Energy Pilot Project
	22	Improvement of Urban and Social Services	25 / 5	Improvement of Urban Services	65 / 3	Improvement of Urban Development Planning	SET 17: Urban Development Plans
					35 / 2	Improvement of Settlement Planning at District Level	SET 18: Settlement Planning and Development
			40 / 9	Improvement of Health Services	25 / 2	Improvement of Health Services for Sedentary Population	HEA 1: PHC for Sedentary Population
					15 / 1	Improvement of Health Services for Nomadic Population	HEA 2: PHC for Nomadic Population
					15 / 1	Improvement of Referral Hospitals	HEA 3: Referral Hospitals
					15 / 1	Improvement of Nutrition	HEA 4: Nutrition Pilot Project
					30 / 3	Introduction of Disease and Disease Vector Control	HEA 5: Integrated Disease Control
			35 / 8	Improvement of Education Services	40 / 3	Improvement of Primary Education	EDU 1: Primary Education
					20 / 2	Improvement of Secondary Education	EDU 2: Secondary Education
					20 / 2	Improvement of Vocational Training	EDU 3: Skills Upgrading and Training Centre
					20 / 2	Improvement of Non-Formal Education	EDU 4: Non-formal Education
	20	Improvement of Resource Conservation	20 / 4	Improvement of Soil Conservation	60 / 2	Improvement of Irrigation Development and Practices	CRO 2/3,IRR 5: Research, Extension, Irr. Support
					30 / 1	Improvement of Farming Practices	CRO 2/3: Research, Extension
					10 / 0	Improvement of Sand Dune Stabilization	RAN 9: Community Tree Planting
			35 / 7	Improvement of Water Resource Management	33 / 2	Stabilization of River Channel	WAT 3/4: Morphology Study, Stab. Works
					22 / 2	Optimizing Reservoir Operating Procedures	WAT 2: Multipurpose Operating Study
					18 / 1	Appropriate Water Allocation	WAT 5: Water Allocation Strategy
					12 / 1	Improvement of River Flow Data Base	WAT 6: River Gauging Stations
					15 / 1	Introduction of Water Quality Control	WAT 7: Water Quality Control
			20 / 4	Improvement of Vegetation Cover and Wildlife Conservation	25 / 1	Improvement of Range Management	RAN 1/2: Development Programme, Management
					10 / 0	Improvement of Wildlife Management	RAN 3: Wildlife Management
					15 / 1	Protection of Riverine Forests	RAN 4: Conservation of Riverine Forests
					5 / 0	Utilization of Wood in Reservoir	RAN 5: Wood Harvesting in Reservoir
					20 / 1	More Efficient Use of Fuelwood	RAN 6: Propagation of Stoves
					15 / 1	Improvement of Supply of Tree Seedlings	RAN 8: Upgrading of Nursery Network
					10 / 0	Use of More Suitable Trees	RAN 7: Tree Species Trials
			25 / 5	Improvement of Environmental Management	50 / 3	Introduction of Central Environmental Management Unit	ENV 1: Central Environmental Management
					30 / 2	Improvement of Range and Forestry Data Base	ENV 2: Range/Forestry Monitoring Center
					10 / 1	Use of Remote Sensing Data	ENV 3: Use of Remote Sensing
					10 / 1	Improvement of Climatological Data Base	ENV 4: Extension Raingauge Network
Control Totals	100		400 /100		1400 /100		

Note: Weights at the third and fourth level are given in the format a/b where a = assigned weight and b = calculated compound weight.

8. Juba Valley Development Programme

The derivation of the development proposals together with their sectoral and geographic priorities allows the structuring and phasing of a Juba Development Programme and determination of its administrative requirements.

8.1 Structure and Phasing of Programme

The structure of the proposed Development Programme is determined by the sectoral classification of the development proposals and their scope. The phasing is the result of the weighting procedure applied to the goal system as derived in Chapters 6 and 7.

8.1.1 Sectoral Structure of Development Programme

In spite of the fact that the individual development proposals are very different in their scope and eventual costs and benefits, an idea about the diversity and the emphasis of the proposed Development Programme can be obtained by their classification according to their sector, as summarized in Table 8/1.

Table 8/1 Summary of Development Proposals by Sector

Sector	Number
Productive Sectors	
General Crop Production	5 (6 %)
Water Resources Management	10 (14 %)
Irrigated Crop Production	8 (11 %)
Livestock	5 (7 %)
Range and Forestry	9 (12 %)
Fisheries	3 (4 %)
Industry	2 (3 %)
Subtotal	42 (57 %)
Social Sectors	
Roads	6 (8 %)
Water and Sanitation	6 (8 %)
Energy	2 (3 %)
Urban Development	3 (4 %)
Health	5 (7 %)
Education	4 (7 %)
Environment	4 (6 %)
Subtotal	30 (43 %)
Total	72 (100 %)

The sectoral breakdown shows that the largest number (18) of development proposals refer to water resources management in combination with irrigated crop production, as it is in these sectors that the largest untapped potential will be realized in future. This indicates that a considerable number of diverse activities have to be undertaken in order to reap the benefits of increased water availability though construction of the dam. On the other hand, for generally improving crop production, which applies largely to rainfed agriculture, only four proposals have been made, even though the target group is considerably larger. The risk of this is that in a situation of scarce resources, priority will be given to water resources and irrigation development to such an extent that little funding and attention will be given to the other sectors. This will have to be taken into account when ultimately determining priorities.

Livestock, range and forestry are closely related to each other and show with 14 proposals (19 per cent) the second largest group. The remaining two productive sectors, fisheries and industry, play only a minor role.

For the social sectors, a total of 30 proposals (43 per cent) are made, distributed over eight different sectors. The differences in numbers are not really of significance here, as there are very substantial differences in scope so that they are not directly comparable.

Generally, it is worth mentioning that development proposals have been made for all sectors. This supports the view that development in the Juba Valley is now constrained by numerous factors for which diverse activities must be undertaken to overcome them and it will, for example, not be sufficient to only invest into water resource and irrigation development even though this represents the single largest untapped potential.

8.1.2 Scope of Development Proposals

In terms of scope, it can be noted that only about 15% of the proposals concern measures, 25% Projects and 60% Programmes. This signifies that the majority of the proposals concern activities of considerable scope and duration. This should be expected, as the integrated development of such a large region requires a long-term approach.

Classification of the development proposals into five broad groups indicating their characteristics (study, pilot project, institution building, construction, training etc.) gives the results shown in Table 8/2.

Table 8/2 Summary of Development Proposal Characteristics

Type	Number
Studies, pilot projects, research	14 (19 %)
Introduction of new systems	11 (15 %)
New organizational units	14 (19 %)
Strengthening of existing structures, systems	15 (22 %)
Other construction and maintenance proposals	18 (25 %)
Total	72 (100 %)

The above classification shows that 75 per cent of all development proposals are primarily for "software", i.e. studies, pilot projects, data collection, new systems, institution building and training. The remaining 25 per cent refer to construction proposals ("hardware"), of which only five are ready for implementation right away, the others requiring preparatory studies of different extent and duration.

The large number of proposals of the first type, i.e. those aimed at collecting additional data and carrying out various studies, indicates that the data base in the Development Area is still rather weak requiring preparatory work (investigations, studies, etc.) before specific proposals can be implemented.

The largest group of proposals pertains to activities closely connected to institution building and training, including the introduction of new systems. Together, they account for 40% of all proposals, which is not surprising, as the required long-term development effort can only be sustained by strong institutions applying effective procedures.

8.1.3 Phasing of Development Programme

The relative priorities determined for the development proposals by giving weights to the goal system, as summarized in Figure 7/2, form the basis for a phased Juba Valley Development Programme. However, for a number of reasons explained in the following, the results of the weighting cannot be taken directly, but need to be reviewed for consistency and plausibility.

First it can be noted that a number of development proposals refer to more than one fourth level goal, most notably agricultural research and extension (CRO 2,3), which needs to be taken into account when determining the priority of these development proposals. In addition, the goals at the fourth level sometimes refer to a group of development proposals of different priorities, some of these being follow-up projects to studies and pilot projects. Finally, it must be recognized that the goal system presents a great simplification of the real cause and effect relationships, resulting in inconsistencies and possibly a systematic bias against long term activities not immediately resulting in visible improvements. The priorities determined by the weighted goal system have therefore been reviewed and the results are reflected in the phased Development Programme.

While the ranking of the development proposals provides the basis for a phased Development Programme, i.e. establishment of an approximate time schedule for implementation, the pace at which the development proposals can be implemented depends to a very large extent on the institutional capacity of MJVD and the line ministries to prepare the projects, secure the required financing and take all the necessary steps for their implementation.

MJVD's capacity for project preparation and implementation other than for the dam has so far been very limited and it is the primary objective of the organizational and management proposals, as described below, to strengthen this capacity together with the one of the local administration.

At present, MJVD monitors the resettlement studies, completion of this Masterplan and construction of the Bardheere Research Station. In addition, MJVD has commenced to prepare Project Identification Reports (PIRs) for those development proposals considered of high priority. So far, four such PIRs are being prepared with technical assistance financed by GTZ and provided by AHT, which will be completed in early 1989. They refer to the establishment of a research programme for the Bardheere Research Station (CRO 2), strengthening of the extension services in the Juba Valley (CRO 3), establishment of irrigation development support services (IRR 5) and undertaking of a flood control and drainage study (CRO 9). For 1989 and the following years it should be possible to annually prepare another eight to ten PIRs.

The speed at which it will be possible to move from the project identification stage to implementation is difficult to estimate and will very much depend on the type and scope of project and the extent to which the Government and donors are responding. The minimum time period for this is probably one year, the normal delay one to two years, with some projects requiring even more time to get started. To minimize delays, MJVD needs to carry out an intensive dialogue with the Government and potential donors to identify which projects could expect some financing at what time. The dialogue should be particularly sought with those donors already involved in the development of the Juba Valley such as those from Germany, the United States of America, China and Saudi Arabia as well as multilateral agencies (World Bank, African Development Bank, Arab Funds) and non-governmental organizations (Swedish Church Relief, World Concern).

Taking the above points into account, a phasing of the Development Programme as given in Table 8/3 has been prepared, giving the dates at which project preparation should commence, with project implementation starting one to two years later. It should be clearly understood that the timing shown, can only be regarded as a very approximate guide and that it should be reviewed and revised in light of actual developments and needs.

The table shows first of all the ongoing projects, i.e. the dam, resettlement studies and construction of the Bardheere Research Station. Two proposals are proposed to be implemented as part of the dam project, i.e. Resettlement and Wood Harvesting in the Reservoir and are also included in this category. For two further projects (Deshek Pilot Project, Jilib - Bardheere Road), preparation has been done, and negotiations with donors completed. Finally, the development proposals for strengthening the organization and management of MJVD and the local administration, as discussed below, are also included here.

In 1988, four PIRs have been commenced, which will be completed in early 1989. It is proposed to complete the preparation of a further 12 proposals in the next to years. This is a large number, but it appears achievable, as there are five all dealing with environmental monitoring, which should be looked at together. Also, some of them (extension and rehabilitation of rain- and rivergauges) are quite small in scope and could be relatively quickly implemented, which will give MJVD staff valuable experience. The two proposals for wildlife management and forest conservation are already seriously considered by Ministry of Livestock, Forestry and Range and should therefore also not require too large a preparation effort. The urban water

Table 8/3 Phased Development Programme

Timing of Preparation	Development Proposal
Before 1988, Dam Project and Institutional	WAT 1: Bardheere Dam Project
	IRR 1: Deshek Pilot Project
	RAN 5: Wood Harvesting in Reservoir
	SET 1: Resettlement Studies
	SET 2: Resettlement Project
	SET 3: Jilib - Bardheere Road
	ORG 1: Strengthening MNPJVD
	ORG 2: MNPJVD Training
	ORG 3: Introducing District Planning
1988 - 1989	CRO 2: Bardheere Research Station
	CRO 3: Extension Service
	WAT 9: Flood Control and Drainage Study
	IRR 5: Irrigation Development Support
1990 - 1991	CRO 1: Land Registration
	WAT 6: River Gauging Stations
	IRR 8: Training in Irrigation
	RAN 3: Wildlife Management
	RAN 4: Conservation of Riverine Forests
	SET 10: Urban Water Supply Kismayo
	SET 11: Urban Water Supply Dinsor
	HEA 5: Integrated Disease Control
	ENV 1: Central Environmental Monitoring
	ENV 2: Range/Forestry Monitoring Centre
	ENV 3: Remote Sensing
	ENV 4: Extension Raingauge Network
1992 - 1994	WAT 3: River Morphology Study
	LIV 1: Veterinary Services
	LIV 2: Primary Animal Health Care
	LIV 4: Livestock Marketing
	RAN 2: Range Management Measures
	RAN 7: Tree Species Trials
	RAN 8: Upgrading of Nursery Network
	RAN 9: Community Tree Planting
	SET 13: Integrated Water Supply Maintenance
	SET 17: Urban Development Plans
	EDU 1: Primary Education
1994 - 1996	WAT 2: Reservoir Operational Study
	IRR 3: Irrigation Development Study
	IRR 6: Existing Irrigation Schemes
	IRR 7: Homboy Smallholder Project
	RAN 6: Propagation of Stoves
	IND 1: Agro-industrial Studies
	SET 4: Improving Main Roads
	SET 6: Rural Roads
	SET 8: Integrated Road Maintenance
	SET 9: Rural Water Supply
	SET 12: Urban Water Supply
	SET 14: Sanitation Pilot Project
	SET 18: Settlement Planning and Development
	HEA 1: PHC for Sedentary Population
	HEA 2: PHC for Nomadic Population
	HEA 3: Hospitals
	EDU 4: Non-formal Education
1996 - 1998	CRO 4: Agricultural Credit
	WAT 5: Water Allocation Strategy
	WAT 7: Water Quality Control
	LIV 3: Eradication of Tsetse Flies
	LIV 5: Promotion of Bee-keeping
	RAN 1: Rangelands Development Project
	FIS 1: Fisheries Unit
	FIS 2: Reservoir Management
	FIS 3: Aquaculture Pilot Project
	IND 2: SSE Promotion Pilot Project
	SET 5: Upgrading Bridges
	SET 7: Urban Roads
	SET 15: Urban Electricity Supply
	SET 16: Rural Energy Pilot Project
	HEA 4: Nutrition Pilot Project
	EDU 2: Secondary Education
	EDU 3: Skills Upgrading and Training
Not scheduled	WAT 4: Riverbed Stabilization Works
	WAT 8: Seawater Intrusion Barrier Study
	WAT 10: Flood Control and Drainage Works
	IRR 2: Deshek Conversion Programme
	IRR 4: Irrigation Infrastructure

supply to Kismayo is also included, as it is hoped that the present project could be extended. Finally, training in irrigation engineering and management is an activity which has already been commenced by identifying training courses and sources of funding.

In addition to these, it is recommended to start with the pressing issue of land registration, as this will require a long term effort and is likely to become more serious once the construction of the dam commences. Also considered of highest importance is the establishment of facilities and systems to achieve integrated disease and disease vector control so that the health risks of the increasing irrigation activities can be mitigated. Finally, some emergency measures should be undertaken to improve the basic water supply in Dinsor.

The remaining development proposals assigned highest priority are then scheduled to be prepared in 1990.

For the other development proposals, the priority grouping is used for identifying two-year periods during which the proposals could be prepared, as annual breakdowns are not too meaningful at this point in time. At the proposed periodic review of the Development Programme, the timing should then be revised where necessary and detailed for the following two years.

If the proposed time schedule can actually be followed, project preparation would have been completed for nearly all development proposals by the time the dam would start operations.

8.2 Spatial Dimension of Development Proposals

The development proposals differ in their spatial impact within the Study and Development Area. The development proposals have been derived on the basis of a regional analysis based on a subdivision of the Study Area into SGU's, which are quite different in their area and location from the administrative boundaries of the regions and districts. As shown in Figure 1/3 and Table 8/4 below, the Development Area comprises all or part of ten administrative districts in four regions covering the ten SGU's. Two districts (Garbaharey, Luuq) are completely outside the Study Area and therefore not covered by any SGU.

In implementing the development proposals, SGU's cannot be used as planning units as there is no administrative structure for this. Instead, the existing regional and district administrative structures need to be utilized.

Table 8/4 Socio-Geographic Units, Districts and Regions

Region/District	Socio Geographic Units 1	2	3	4	5	6	7	8	9	10
Gedo Region										
Bardheere District	X	-	-	-	X	-	-	X	-	-
Garbaharey District	-	-	-	-	-	-	-	-	-	-
Luuq District	-	-	-	-	-	-	-	-	-	-
Bay Region										
Dinsor District	-	-	-	-	X	-	-	-	X	-
Middle Juba Region										
Saakow District	-	X	-	-	-	-	-	X	X	-
Bu'aale District	-	X	-	-	-	-	-	X	X	-
Jilib District	-	-	X	-	-	X	X	X	X	-
Lower Juba Region										
Jamaame District	-	-	-	X	-	X	X	-	-	-
Kismayo District	-	-	-	X	-	-	X	-	-	X
Afmadow District	-	-	-	-	-	-	X	X	-	-

In which districts the development proposals should be implemented on a regional priority basis and which ones are affected by this is shown in Table 8/5.

The data show that the six districts covering the Juba from the dam to the ocean are most prominently and the districts of Luuq, Garbaharey and Afmadow least affected by the development proposals. This reflects the fact that the Masterplan concentrated on the development of the Study Area largely made up of those six districts. Dinsor District, with its substantial rainfed crop production, constitutes a transitional zone not getting as much attention as the districts along the Juba, but more than those outside the Study Area.

From the table it is also clear that the districts of Bardheere and Jilib will take the most central place in implementation of the development proposals. This is not only the result of the greatest development potential and need being there, but also due to the fact that these have been selected as the most central locations for administrative reasons when the whole Study or Development Area needs to be covered by a specific development proposal.

Finally, the general approach of providing assistance for the productive sectors where the potential is located and for the social sectors, including environmental management, throughout all ten districts of the Development Area, is also reflected.

Table 8/5 Intraregional Implementation of Development Programme

Timing of Preparation		Development Proposal	Districts BAR	SAA	BUA	JIL	JAM	KIS	DIN	AFM	LUU	GAR
Before 1988, Dam Project and Institutional	WAT	1: Bardheere Dam Project	XXX	-X-	-X-	-X-	-X-	-X-	---	---	-X-	-X-
	IRR	1: Deshek Pilot Project	---	XXX	---	---	---	---	---	---	---	---
	RAN	5: Wood Harvesting in Reservoir	XXX	---	---	---	---	---	---	---	XXX	XXX
	SET	1: Resettlement Studies	---	---	---	---	---	---	---	---	---	---
	SET	2: Resettlement Project	XXX	XXX	XXX	---	---	---	---	---	XXX	XXX
	SET	3: Jilib - Bardheere Road	XXX	XXX	XXX	XXX	---	---	---	---	---	---
	ORG	1: Strengthening MNPJVD	---	---	---	---	---	---	---	---	---	---
	ORG	2: MNPJVD Training	---	---	---	---	---	---	---	---	---	---
	ORG	3: Introducing District Planning	XXX	-X-	-X-	XXX	-X-	XXX	-X-	-X-	-X-	-X-
1988 - 1989	CRO	2: Bardheere Research Station	XXX	---	---	---	---	---	---	---	---	---
	CRO	3: Extension Service	XXX	XXX	-X-	-X-	XXX	-X-	XXX	---	---	---
	WAT	9: Flood Control and Drainage Study	---	---	---	---	---	---	---	---	---	---
	IRR	5: Irrigation Development Support	XXX	XXX	-X-	-X-	XXX	---	---	---	---	---
			---	---	---	---	---	---	---	---	---	---
1990 - 1991	CRO	1: Land Registration	-X-	XXX	XXX	-X-	-X-	-X-	-X-	---	---	---
	WAT	6: River Gauging Stations	-X-	-X-	-X-	-X-	-X-	-X-	---	---	---	---
	IRR	8: Training in Irrigation	---	---	---	---	---	---	---	---	---	---
	RAN	3: Wildlife Management	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	RAN	4: Conservation of Riverine Forests	---	---	XXX	---	---	---	---	---	---	---
	SET	10: Urban Water Supply Kismayo	---	---	---	---	---	XXX	---	---	---	---
	SET	11: Urban Water Supply Dinsor	---	---	---	---	---	---	XXX	---	---	---
	HEA	5: Integrated Disease Control	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	ENV	1: Central Environmental Monitoring	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	ENV	2: Range/Forestry Monitoring Centre	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	ENV	3: Remote Sensing	---	---	---	---	---	---	---	---	---	---
	ENV	4: Extension Raingauge Network	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-	-X-
			---	---	---	---	---					
1992 - 1994	WAT	3: River Morphology Study	---	---	---	---	---	---	---	---	---	---
	LIV	1: Veterinary Services	XXX	-X-	-X-	XXX	-X-	-X-	XXX	XXX	-X-	XXX
	LIV	2: Primary Animal Health Care	XXX	-X-	-X-	XXX	-X-	-X-	XXX	XXX	-X-	XXX
	LIV	4: Livestock Marketing	---	---	---	XXX	---	XXX	---	XXX	---	---
	RAN	2: Range Management Measures	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	RAN	7: Tree Species Trials	XXX	---	---	XXX	---	---	---	---	---	---
	RAN	8: Upgrading of Nursery Network	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	RAN	9: Community Tree Planting	---	---	---	---	---	XXX	---	---	---	---
	SET	13: Integrated Water Supply Maintenance	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	SET	17: Urban Development Plans	XXX	---	---	XXX	---	---	---	---	---	---
	EDU	1: Primary Education	XXX	XXX	---	---	---	---	XXX	---	---	---
1994 - 1996	WAT	2: Reservoir Operational Study	---	---	---	---	---	---	---	---	---	---
	IRR	3: Irrigation Development Study	---	---	---	---	---	---	---	---	---	---
	IRR	6: Existing Irrigation Schemes	---	---	---	XXX	XXX	---	---	---	---	---
	IRR	7: Homboy Smallholder Project	---	---	---	XXX	---	---	---	---	---	---
	RAN	6: Propagation of Stoves	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	IND	1: Agro-industrial Studies	---	---	---	---	---	---	---	---	---	---
	SET	4: Upgrading Main Roads	---	---	---	XXX	XXX	XXX	---	---	---	---
	SET	6: Rural Roads	XXX	-X-	-X-	-X-	-X-	-X-	XXX	---	---	---
	SET	8: Integrated Road Maintenance	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	SET	9: Rural Water Supply	XXX	-X-	-X-	-X-	-X-	-X-	XXX	-X-	-X-	-X-
	SET	12: Urban Water Supply	XXX	-X-	-X-	-X-	-X-	XXX	XXX	-X-	XXX	-X-
	SET	14: Sanitation Pilot Project	XXX	---	---	---	---	---	---	---	---	---
	SET	18: Settlement Planning and Development	XXX	-X-	-X-	XXX	-X-	XXX	-X-	-X-	-X-	-X-
	HEA	1: PHC for Sedentary Population	XXX	-X-	-X-	-X-	-X-	-X-	XXX	XXX	XXX	-X-
	HEA	2: PHC for Nomadic Population	---	---	---	---	---	---	---	XXX	XXX	---
	HEA	3: Hospitals	XXX	---	---	---	---	XXX	---	---	---	---
	EDU	5: Non-formal Education	XXX	-X-	-X-	XXX	-X-	-X-	---	---	---	---
1996 - 1998	CRO	4: Agricultural Credit	XXX	XXX	-X-	-X-	XXX	-X-	-X-	---	---	---
	WAT	5: Water Allocation Strategy	---	---	---	---	---	---	---	---	---	---
	WAT	7: Water Quality Control	---	---	---	---	---	---	---	---	---	---
	LIV	3: Eradication of Tsetse Flies	-X-	-X-	XXX	XXX	-X-	-X-	---	---	---	---
	LIV	5: Promotion of Bee-keeping	XXX	-X-	-X-	XXX	-X-	-X-	-X-	---	---	---
	RAN	1: Rangelands Development Project	XXX	-X-	-X-	XXX	-X-	-X-	-X-	-X-	-X-	-X-
	FIS	1: Fisheries Unit	XXX	-X-	-X-	XXX	-X-	-X-	---	---	---	---
	FIS	2: Reservoir Management	XXX	---	---	---	---	---	---	---	XXX	XXX
	FIS	3: Aquaculture Pilot Project	---	---	---	XXX	---	---	---	---	---	---
	IND	2: SSE Promotion Pilot Project	---	---	---	XXX	---	---	---	---	---	---
	SET	5: Upgrading Bridges	---	XXX	-X-	XXX	-X-	---	---	---	---	---
	SET	7: Urban Roads	XXX	-X-	-X-	XXX	-X-	-X-	---	---	---	---
	SET	15: Urban Electricity Supply	XXX	XXX	XXX	XXX	XXX	XXX	---	---	---	---
	SET	16: Rural Energy Pilot Project	XXX	---	---	---	---	---	---	---	---	---
	HEA	4: Nutrition Pilot Project	XXX	---	---	XXX	---	---	---	---	---	---
	EDU	2: Secondary Education	XXX	-X-	-X-	XXX	-X-	-X-	---	---	---	---
	EDU	4: Skills Upgrading and Training	---	---	---	XXX	---	---	---	---	---	---
			---									
Not scheduled	WAT	4: Riverbed Stabilization Works	-X-	-X-	-X-	-X-	-X-	-X-	---	---	---	---
	WAT	8: Seawater Intrusion Barrier Study	---	---	---	---	---	---	---	---	---	---
	WAT	10: Flood Control and Drainage Works	---	-X-	-X-	XXX	XXX	-X-	---	---	---	---
	IRR	2: Deshek Conversion Programme	---	XXX	XXX	---	---	---	---	---	---	---
	IRR	4: Irrigation Infrastructure	-X-	XXX	XXX	-X-	XXX	-X-	---	---	---	---
Frequency of XXX (Priority Areas)			40	12	8	34	8	9	9	5	6	5
XXX and -X- (Affected)			46	41	40	47	38	40	25	20	23	22

Legend: XXX = Priority District for Implementation
-X- = District Affected by Development Proposal

8.3 Administrative Responsibilities for Programme Implementation

Administrative responsibilities for implementation of the development proposals have been defined in Chapter 7 and are summarized in Table 8/6.

This shows that MJVD will have by far the largest number (25) of development proposals to implement. This is due to the fact that MJVD will have to carry out quite a number of preparatory studies and its responsibility for water resources and irrigation development and environmental monitoring.

MLFR together with the NRA will be responsible for implementing 12 development proposals, the second largest group, which relate to livestock, forestry and range.

The ministries responsible for agriculture, water supply, roads, education and health all have four to six development proposals to implement. The other agencies play in accordance with the goal system and the structure of the Development Programme a minor role.

Particularly noteworthy is the fact that the regional and district administrations have practically no implementation responsibility. This is to be expected, as the capacity of the local administration to assume such responsibility is even more limited than the one of the line ministries.

By combining the administrative responsibilities as shown in Table 8/6 with the intraregional distribution of the development proposals as given in Table 8/5, the geographically required presence of the implementation agencies can be determined, as shown in Table 8/7.

It should be understood that the above only indicates the priority requirements, as determined by the geographical priorities defined for implementation of the development proposals. It also does not reflect the fact that many of the agencies involved are already present not only in the priority, but also in the other districts.

Table 8/6 Administrative Responsibilities for Programme Implementation

Timing of Preparation	Development Proposal			Responsible Agency MNP JVD	REG DIS	MoA AFMET	MLFR NRA	MWMR WDA	MFMR	MoI	MPWH	ENEE	MoH	MoE
Before 1988, Dam Project and Institutional	WAT	1:	Bardheere Dam Project	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	1:	Deshek Pilot Project	XXX	---	---	---	---	---	---	---	---	---	---
	RAN	5:	Wood Harvesting in Reservoir	---	---	---	XXX	---	---	---	---	---	---	---
	SET	1:	Resettlement Studies	XXX	---	---	---	---	---	---	---	---	---	---
	SET	2:	Resettlement Project	XXX	---	---	---	---	---	---	---	---	---	---
	SET	3:	Jilib - Bardheere Road	---	---	---	---	---	---	---	XXX	---	---	---
	ORG	1:	Strengthening MNPJVD	XXX	---	---	---	---	---	---	---	---	---	---
	ORG	2:	MNPJVD Training	XXX	---	---	---	---	---	---	---	---	---	---
	ORG	3:	Introducing District Planning	XXX	---	---	---	---	---	---	---	---	---	---
1988 - 1989	CRO	2:	Bardheere Research Station	XXX	---	---	---	---	---	---	---	---	---	---
	CRO	3:	Extension Service	---	---	XXX	---	---	---	---	---	---	---	---
	WAT	9:	Flood Control and Drainage Study	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	5:	Irrigation Development Support	XXX	---	---	---	---	---	---	---	---	---	---
1990 - 1991	CRO	1:	Land Registration	---	---	XXX	---	---	---	---	---	---	---	---
	WAT	6:	River Gauging Stations	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	8:	Training in Irrigation	XXX	---	---	---	---	---	---	---	---	---	---
	RAN	3:	Wildlife Management	---	---	---	XXX	---	---	---	---	---	---	---
	RAN	4:	Conservation of Riverine Forests	---	---	---	XXX	---	---	---	---	---	---	---
	SET	10:	Urban Water Supply Kismayo	---	---	---	---	XXX	---	---	---	---	---	---
	SET	11:	Urban Water Supply Dinsor	---	---	---	---	XXX	---	---	---	---	---	---
	HEA	5:	Integrated Disease Control	---	---	---	---	---	---	---	---	---	XXX	---
	ENV	1:	Central Environmental Monitoring	XXX	---	---	---	---	---	---	---	---	---	---
	ENV	2:	Range/Forestry Monitoring Centre	---	---	---	XXX	---	---	---	---	---	---	---
	ENV	3:	Remote Sensing	XXX	---	---	---	---	---	---	---	---	---	---
	ENV	4:	Extension Raingauge Network	---	---	XXX	---	---	---	---	---	---	---	---
1992 - 1994	WAT	3:	River Morphology Study	XXX	---	---	---	---	---	---	---	---	---	---
	LIV	1:	Veterinary Services	---	---	---	XXX	---	---	---	---	---	---	---
	LIV	2:	Primary Animal Health Care	---	---	---	XXX	---	---	---	---	---	---	---
	LIV	4:	Livestock Marketing	---	---	---	XXX	---	---	---	---	---	---	---
	RAN	2:	Range Management Measures	---	---	---	XXX	---	---	---	---	---	---	---
	RAN	7:	Tree Species Trials	---	---	---	XXX	---	---	---	---	---	---	---
	RAN	8:	Upgrading of Nursery Network	---	---	---	XXX	---	---	---	---	---	---	---
	RAN	9:	Community Tree Planting	---	XXX	---	---	---	---	---	---	---	---	---
	SET	13:	Integrated Water Supply Maintenance	---	---	---	---	XXX	---	---	---	---	---	---
	SET	17:	Urban Development Plans	XXX	---	---	---	---	---	---	---	---	---	---
	EDU	1:	Primary Education	---	---	---	---	---	---	---	---	---	---	XXX
1994 - 1996	WAT	2:	Reservoir Operational Study	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	3:	Irrigation Development Study	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	6:	Existing Irrigation Schemes	---	---	XXX	---	---	---	XXX	---	---	---	---
	IRR	7:	Homboy Smallholder Project	---	---	XXX	---	---	---	---	---	---	---	---
	RAN	6:	Propagation of Stoves	XXX	---	---	---	---	---	---	---	---	---	---
	IND	1:	Agro-industrial Studies	---	---	---	---	---	---	XXX	---	---	---	---
	SET	4:	Improving Main Roads	---	---	---	---	---	---	---	XXX	---	---	---
	SET	6:	Rural Roads	---	---	---	---	---	---	---	XXX	---	---	---
	SET	8:	Integrated Road Maintenance	---	---	---	---	---	---	---	XXX	---	---	---
	SET	9:	Rural Water Supply	---	---	---	---	XXX	---	---	---	---	---	---
	SET	12:	Urban Water Supply	---	---	---	---	XXX	---	---	---	---	---	---
	SET	14:	Sanitation Pilot Project	---	---	---	---	XXX	---	---	---	---	---	---
	SET	18:	Settlement Planning and Development	---	XXX	---	---	---	---	---	---	---	---	---
	HEA	1:	PHC for Sedentary Population	---	---	---	---	---	---	---	---	---	XXX	---
	HEA	2:	PHC for Nomadic Population	---	---	---	---	---	---	---	---	---	XXX	---
	HEA	3:	Hospitals	---	---	---	---	---	---	---	---	---	XXX	---
	EDU	5:	Non-formal Education	---	---	---	---	---	---	---	---	---	---	XXX
1996 - 1998	CRO	4:	Agricultural Credit	---	---	XXX	---	---	---	---	---	---	---	---
	WAT	5:	Water Allocation Strategy	XXX	---	---	---	---	---	---	---	---	---	---
	WAT	7:	Water Quality Control	XXX	---	---	---	---	---	---	---	---	---	---
	LIV	3:	Eradication of Tsetse Flies	---	---	---	XXX	---	---	---	---	---	---	---
	LIV	5:	Promotion of Bee-keeping	---	---	XXX	---	---	---	---	---	---	---	---
	RAN	1:	Rangelands Development Project	---	---	---	XXX	---	---	---	---	---	---	---
	FIS	1:	Fisheries Unit	---	---	---	---	---	XXX	---	---	---	---	---
	FIS	2:	Reservoir Management	---	---	---	---	---	XXX	---	---	---	---	---
	FIS	3:	Aquaculture Pilot Project	---	---	---	---	---	XXX	---	---	---	---	---
	IND	2:	SSE Promotion Pilot Project	---	---	---	---	---	---	XXX	---	---	---	---
	SET	5:	Upgrading Bridges	---	---	---	---	---	---	---	XXX	---	---	---
	SET	7:	Urban Roads	---	---	---	---	---	---	---	XXX	---	---	---
	SET	15:	Urban Electricity Supply	---	---	---	---	---	---	---	---	XXX	---	---
	SET	16:	Rural Energy Pilot Project	XXX	---	---	---	---	---	---	---	---	---	---
	HEA	4:	Nutrition Pilot Project	---	---	---	---	---	---	---	---	---	XXX	---
	EDU	2:	Secondary Education	---	---	---	---	---	---	---	---	---	---	XXX
	EDU	4:	Skills Upgrading and Training	---	---	---	---	---	---	---	---	---	---	XXX
Not scheduled	WAT	4:	Riverbed Stabilization Works	XXX	---	---	---	---	---	---	---	---	---	---
	WAT	8:	Seawater Intrusion Barrier Study	XXX	---	---	---	---	---	---	---	---	---	---
	WAT	10:	Flood Control and Drainage Works	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	2:	Deshek Conversion Programme	XXX	---	---	---	---	---	---	---	---	---	---
	IRR	4:	Irrigation Infrastructure	XXX	---	---	---	---	---	---	---	---	---	---
Total				25	2	7	12	6	3	2	6	1	5	4

Table 8/7 Administrative Requirements by District

Region / District	Responsible Agency									
	MJVD	MoA AFMET	MLFR NRA	MWMR WDA	MFMT	MoI	MPWH	ENEE	MoH	MoE
Gedo										
Bardheere	X	X	X	X	X	-	X	X	X	X
Garbaharey	-	-	X	-	-	-	-	-	-	-
Luuq	-	-	X	X	-	-	-	-	X	-
Bay										
Dinsor	-	X	X	X	-	-	X	-	X	X
Middle Juba										
Saakow	X	X	-	-	-	-	X	X	-	X
Bu'aale	X	X	X	-	-	-	X	X	-	-
Jilib	X	X	X	X	X	X	X	X	X	X
Lower Juba										
Jamaame	X	X	-	-	-	-	X	X	-	-
Kismayo	-	-	X	X	-	-	X	X	X	-
Afmadow	-	-	X	-	-	-	-	-	X	-

Legend:
- MJVD - Ministry of National Planning and Juba Valley Development
- MoA - Ministry of Agriculture
- AFMET - Agricultural Farm Management Extension and Training Project
- MLFR - Ministry of Livestock, Forestry and Range
- NRA - National Range Agency
- MWMR - Ministry of Water and Mineral Resources
- WDA - Water Development Agency
- MFMT - Ministry of Fisheries and Marine Transport
- MoI - Ministry of Industry
- MPWH - Ministry of Public Works and Housing
- ENEE - National Agency for Electricity Generation
- MoH - Ministry of Health
- MoE - Ministry of Education

What the analysis presented in the above table shows is that all implementing agencies will have to be active in Jilib District and, with the exception of the Ministry of Industry, also in Bardheere District. The towns of Jilib and Bardheere will therefore have to assume the role of the main regional development centers for the Juba Valley. Following the already discussed pattern, implementing agencies will have to be furthermore mainly present in the floodplain districts and Dinsor, and to a lesser extent in the districts of Luuq, Garbaharey and Afmadow, where activities are less diversified and center largely around livestock and social services.

8.4 Administrative Requirements for Programme Implementation

To carry out the proposed Juba Valley Development Programme through implementation of the development proposals, administrative responsibilities and structures need to be defined for planning, implementing and operating the proposed facilities and systems and for ensuring that national policy decisions take the needs of the Juba Valley into account. This is looked at in the following with respect to the overall allocation of responsibility between the organizations involved in the Juba Valley and specifically the roles of MJVD and the local administrative structures.

8.4.1 Overall Allocation of Responsibility

As analyzed above, there are three main parties involved in supporting development in the Juba Valley. These are MJVD, the line ministries and the local administration from the regional down to the district level. In addition, the political party is represented at all levels and can influence decision-making processes.

MJVD is involved in planning the dam and, through the Masterplan, other development projects. Judging from the existing legal base and present practice and thinking, as assumed in the analysis presented so far, it will also implement and operate some of these projects, most notably the dam itself. For other projects, where expertise and capacity exists within the established line ministries, MJVD will have a coordinating and monitoring function, representing the interests of the people of the Juba Valley at the central level.

The line ministries are presently involved in carrying out numerous activities in the Juba Valley, more or less coordinating these with the local administration and so far only to a very limited extent in coordination with MJVD.

The local administration at the regional, district, beel and village level is responsible for coordinating all activities in their area of jurisdiction and for stimulating and supporting initiatives generated from below.

While this division of responsibility is generally typical for many countries and should be workable, there is room for improvement by better formally defining the role of MJVD and by strengthening the local administration to achieve a higher degree of participation. These two aspects are discussed in the following.

8.4.2 The Role of MJVD

As outlined in Section 4.7.3, MJVD present practice follows the law of 1972 and MJVD is now engaged in planning and implementation of development projects. As it is understood, for management of the reservoir and the river downstream of the dam, including irrigation development, MJVD is supposed to have direct line responsibility as there is no appropriate expertise for this available in any of the existing line ministries. Furthermore, establishment of a river water management authority, as proposed by the Price

Waterhouse Study, would make eminent sense in this context and should urgently be considered. Similarly, environmental monitoring of the Development Area is best carried out by MJVD, as there is no line ministry which is in general responsible for environmental aspects. Finally, where multi-sectoral projects, particularly those of a pilot character, need to be implemented, it might also be most appropriate for MJVD to take on responsibility for these. However, this has to be determined on a case by case basis.

To properly carry out these line responsibilities, MJVD needs to establish offices in each of the districts, executing the main functions of river water management, irrigation development and environmental monitoring and control. At the same time, this will allow MJVD to be in closer touch with the actual developments and problems in the valley and with the local administration, whose input and support is vital for actually effecting change.

Concerning the projects not implemented and operated by MJVD but by the line ministries, the understanding is that MJVD will be responsible for overall development planning and getting projects started, while delegating the detailed planning, implementation and operation to the respective line ministries, so that the existing expertise and administrative structure can be used. Where these are weak, they need to be strengthened so that they can implement the development proposals and take on long-term operating responsibility.

The role of coordinating the different sectoral activities within the Development Area is clearly the mandate of MJVD. In this role, MJVD will initial, monitor and guide the work of the line ministries to ensure an integrated development effort within the Development Area.

The final task, also clearly one of MJVD, is the one of lobbying for appropriate Government policies and changes in the country's legislation. Specifically for the Juba Valley this involves:

- amendment of the land registration law to allow improved land tenure security, use of land as collateral and legalizing the subletting of land

- codification of transit rights across riparian lands to enable water conveyance structures to reach irrigable non-riparian land

- institutionalization of the regional and urban planning as an important tool for guidance

- provision of a legislative and administrative basis for allocating and enforcing river water allocation.

In addition, MJVD will have to lobby for making progress with respect to the more general policies of the country, particularly with respect to:

- agricultural input and product marketing and pricing policies conducive for increasing output and improving the economic situation of the farming families

- overcoming the low motivation of civil servants, particularly those being posted in outstations

- assuring that operating and maintenance costs of Government services are funded on a sustained basis, including the required foreign exchange allocations

- assuring that input supplies, especially pesticides, veterinary drugs, spare parts, fuel and other important consumables are available

- passing of environmental legislation to protect the country's natural resources and to provide a basis for taking specific measures

- encouragement of the private sector to take on an increasing role to relieve the Government of some of its burden and to assist in making the provision of services generally more efficient.

The above are national policies of great significance which are not easily influenced. Nonetheless, unless some progress is made in these, development will continue to be very slow.

The inherent difficulty with this basic division of responsibility sketched above is that MJVD will have to direct the work of the various line ministries which have ultimate control over the required human and financial resources. To overcome this difficulty, MJVD needs to be given authority to influence the plans, budgets and implementation of the development activities as far as they concern the Development Area. The exact manner in which this can be assured still needs to be determined.

To carry out these functions, MJVD needs to be strengthened by providing an appropriate organizational structure, policies and procedures and trained staff. For this, two development proposals are defined. ORG 1 would be for generally strengthening the ministry and ORG 2 for staff training.

The first development proposal (ORG 1) aims at strengthening MJVD, so that it can actually assume responsibility for implementing the Juba Valley Development Programme defined above. While this function is presently already carried out by MJVD, the longer term responsibilities will require probably a different organizational structure, reflecting the line and coordinating responsibilities as, for example, proposed in the Price Waterhouse Study. As mentioned, proposals for this have been made, but decisions not yet taken. As many of the specific institution building measures required to strengthen MJVD depend on the definition of its overall structure, which is particularly true for training, this should be overcome as soon as possible.

Once the basic internal structure is set up to meet the long-term requirements, more detailed organizational structuring can be undertaken and job descriptions prepared. This will then form the basis for developing a long-term training programme (ORG 2). At present, training has already commenced and a number of staff are being sent overseas for training in various fields. It is important that this effort will be more formally geared to the long-term requirements, for which the future organizational structure will have to serve as basis.

8.4.3 Local Administration

In Chapter 2, participation of the target groups in planning, implementing and operating facilities and systems was identified as one of the key elements for regional development. In this context, participation is understood to comprise contribution by the affected target group in terms of their time, labour and/or money. Therefore, in deriving the development proposals, the potential and possibilities for participation of the target groups in carrying out the proposed activities was discussed.

What this discussion has shown is that the greatest potential and need for participation of the target groups lies in planning of the facilities and systems to be provided through implementation of the development proposals, mainly requiring an input of their time. In most cases, the development proposals are aimed at rather large target groups so that the participation will have to be by representatives of the target groups. This in turn requires local organizational structures which ensure that such representatives actually do represent their target groups.

The potential for participation of the target groups in implementing and operating the facilities and systems proposed is, in comparison, much more limited but nonetheless vital in those fields where it is possible, such as in agricultural extension, animal health, rural water supply, primary health care and education. Again, this requires structures which support the formation of local interest groups so that the contribution to implementation and operation can and will actually be made.

The present situation with respect to the presence of such structures to promote the active participation of the different groups, including the mobilization of financial resources, is not very encouraging and leaves considerable room for improvement. This, in combination with the generally weak institutions in Somalia and the scarcity of funds, makes sustainability a particularly difficult objective to achieve.

It is for these reasons that strengthening of the local administration from the regional down to the village level is of particular importance. The other reason for this is, of course, that the local administration is often the decisive political decision maker and therefore needs to understand and support the development activities proposed for implementation.

This requires that the regional and district authorities and below them the beel and village leaders are integrated into the planning and decision making process and that their role in the overall division of responsibility is defined.

This is to be achieved by introducing a more active planning function at the district level with the objective to

- encourage and support local development initiatives so that as many activities as possible can be handled by the people in the district themselves

- ensure that requests for development assistance voiced by the district population are technically evaluated by a competent authority and subsequently formally dealt with by the District Development Committee

- ensure that requests for assistance which have passed the screening of the district authorities are included in the District Development Plan

- ensure that the projects formulated in the District Development Plans are integrated into the Juba Valley, Regional and National Development Plans so that their funding can be considered

- ensure that projects planned by the various line ministries and other organizations within the district are planned, implemented and operated by taking the needs of the affected target groups into account

- initiate and support development activities where required, and

- monitor actual development in the district by undertaking regular surveys and specific studies.

As the present planning capability at the district level is practically nonexistent, establishing the planning function at the district level has to be seen as a long-term effort.

In the short term, MJVD should take responsibility for this from Mogadishu on a visiting basis. Emphasis during this phase will be on establishing a dialogue between MJVD's planners and the regional and district authorities to make them aware of any planned development proposals and obtaining their input and that of the affected beel and village leaders at an early time in the planning process.

In the medium term, the planning function should be introduced in the larger districts of Kismayo, Jilib and Bardheere by having MJVD planners assigned to assist the district administration in establishing planning as a permanent function, staffed by a District Development Officer directly responsible to the District Commissioner and politically supported by the already existing District Development Committees.

In the long term, the same process would also apply to the smaller districts until the planning function will be established throughout the Study Area. By introducing such a planning function at the district level, for which a separate development proposal is formulated (ORG 3), consideration needs also to be given to what extent the district can mobilize more resources either directly from the people or from the Government's budget so that development can actually take place in a more decentralized manner, which would increase the chances of sustaining development activities over the long term.

As far as MJVD is concerned, it would interact in two basically different ways with the district planning function. When carrying out the functions of a line ministry, MJVD would have to coordinate its activities with the district in the same manner as all other organizations carrying out development activities. When acting as the planning authority for the Juba Valley, it will have to carry out a dialogue with the district planner to ensure that District Plans and the Masterplan are consistent with each other.

9. Expected Results

Implementation of the Juba Valley Development Programme as outlined in the previous chapter could result in increased production and better meeting the basic needs of the people in the Development Area. Whether or not these improvements will actually materialize depends on numerous factors, most importantly on Government policies and the overall economic situation of the country. As mentioned, it will be one of the most important functions of MJVD to monitor Government policies and to vigorously lobby for policies in support of the people in the Juba Valley. In the following analysis, the assumption has been made that Government policies will be supportive to the Development Programme so that the results described will actually be achieved.

To indicate the order of magnitude of the changes one can realistically expect, some projections have been made for the productive sectors which are discussed below. In addition, the impact of implementing the Development Programme with respect to basic needs satisfaction, resource conservation, the target groups and spatial development is looked at.

9.1 Increase in Production

Production increases are projected for crop production, livestock, fisheries and industry, the most important being by far the first two.

9.1.1 Crop Production

A large number of development proposals have been formulated for improving crop production conditions. To allow some quantitative assessment, it has been assumed that the price relationships prevailing in late 1987 would be maintained throughout the Masterplan planning period, i.e. until 2005. Costs and revenues of the projections are therefore expressed in constant 1987 terms.

To get an idea of the potential for improving the economic situation of the farmer practicing rainfed agriculture, farm budget calculations have been done for typical farm sizes in the North and South of the Study Area, for which the results are given in Table 9/1. These show that in the present situation gross margins are at an estimated poverty line for rural areas of SoSh 150,000 per household per year in the North and substantially below it in the South, where off-farm employment plays a much larger role. For the year 2005, gross margins are projected to increase by 85% in the North and 127% in the South. The relative larger increases in the South are potentially feasible because of the larger market for vegetables there.

It is interesting to note that livestock will contribute around 50% to the gross margin in the North, assuming that all crop residues are used as animal fodder. In the South, livestock plays already a less important role and this is expected to further decline in future. The return to labour is considerably in excess of the average wage rate of SoSh 135 per day.

Table 9/1 Summary of Annual Farm Budget Analysis for Rainfed Agriculture (in constant 1987 prices)

District/Farm Type	Unit	Present	1995	2005
Bardheere/Saakow/Bu'aale (5 ha farm)				
- Gross margin/farm (1)	SoSh	146,000	187,000	270,000
- Livestock share	%	46	46	52
- Gross margin/ha	SoSh	29,000	37,000	54,000
- Return to labour	SoSh	260	330	460
Jilib/Jamaame/Kismayo (2.5 ha farm)				
- Gross margin/farm	SoSh	83,000	129,000	188,000
- Livestock share	%	34	26	26
- Gross margin/ha	SoSh	33,000	52,000	75,000
- Return to labour	SoSh	510	590	710

1) Gross margin = Gross farm income - Costs (except family labour)

In summary, there is considerable potential for an increase in production and an improvement of the economic situation of the farmers as long as Government policies provide sufficient incentive for the farmers to do so. The above has been calculated using mid-1987 prices which provided such incentives. With these incentives, the number of farmers who will practice rainfed farming in future is projected to grow at the rate of natural population growth. This takes into account that some farmers will take up irrigation or migrate to the urban centers and a continued sedentarization process for the nomadic population in the Development Area.

For the farmer practicing irrigated crop production, the present and projected future economic situation is presented in a farm budget analysis summarized in Table 9/2.

Table 9/2 Summary of Annual Farm Budget Analysis for Irrigated Agriculture (in constant 1987 prices)

District/Farm Type	Unit	Present	1995	2005
Levee Soils (3 ha farm)				
- Gross margin/farm	SoSh	760,000	840,000	960,000
- Livestock share	%	6	7	9
- Gross margin/ha	SoSh	250,000	280,000	320,000
- Return to labour	SoSh	1,270	1,650	1,770
Alluvial Soils (3 ha farm)				
- Gross margin/farm	SoSh	-	220,000	340,000
- Livestock share	%	-	40	36
- Gross margin/ha	SoSh	-	74,000	113,000
- Return to labour	SoSh	-	680	900

The data show that irrigation of a 3 ha plot on levee soils returns nearly five times as much as a 5 hectare rainfed plot. It must be realized, however, that such a 3 ha farm on levee soils, as can be observed in the North of the Study Area, is not operated only by family labour but also requires hired labour. Because of the high income on these soils, family worked plots of one hectare would actually provide sufficient income. In future, the gross margin for this type of farm is projected to increase by about 25%, while the return to labour would be nearly 40% higher. In comparison to the projections done for rainfed farming, these are modest increases but the absolute level of income will still nearly be four times higher. While this is the case for levee soils, the data also show that the returns of irrigation are considerably lower on the alluvial soils, expected to account for about 80% of the total small- and medium-scale irrigation area.

While the potential gain in income will therefore not be very substantial for the farmer already practicing irrigated crop production, the improvement will be significant for all those who switch from rainfed to irrigated agriculture. The main benefit will therefore be in the extension of the area under irrigation and not so much in the increase of yields.

How fast the irrigated area will expand is not determined by the availability of water, which would allow a much more rapid growth in the production of seasonal crops, but by the technical and other constraints the farmers face in bringing additional land under irrigation. As it will take time to establish effective irrigation development support services, it is estimated that the present rate of expansion of about 1,250 ha/year will continue until about 1995. Thereafter, expansion will be more rapid, reaching about 3,000 ha/year. With these assumptions, the expected increase in irrigated area will be as shown in Table 9/3.

Table 9/3 Estimated Development of Irrigated Area (ha)

SGU (District)	1987	1995	2005	2015	Ult. Dev.
SGU 1 (Bardheere)	2,500	6,000	7,500	7,500	10,000
SGU 2 (Saakow, Bu'aale)	1,600	5,000	10,000	25,000	25,000
SGU 3 (Jilib)	8,000	10,000	13,000	20,000	40,000
SGU 4 (Jamaame, Kismayo)	5,000	6,000	12,000	20,000	37,500
SGU 6 (Jilib/Homboy)	0	0	7,500	7,500	7,500
Total	17,100	27,000	50,000	80,000	120,000

To arrive at the above geographic distribution of irrigated areas, proximity to the river as well as topographic and soil conditions were taken into account. At the end of the planning period for this Masterplan, 50,000 ha are thus projected to be under irrigation.

As discussed in Chapter 7, realization of the irrigation potential is proposed to take place by largely relying on small- and medium-scale schemes. At present, only one new large scheme has been proposed for implementation after completion of the dam, i.e. the Homboy project. Nonetheless, emphasis will also be placed on improving the existing large-scale schemes to make better use of their facilities.

The combined effect of the projected future situation for rainfed and irrigated crop production will change the agricultural land use pattern in the manner shown in Table 9/4.

Table 9/4 Agricultural Land Use Development in Study Area (ha)

Item	1988	1995	2005	Ultimate Devlop.
Arable Land				
Irrigable	360,000	360,000	360,000	360,000
Other	210,000	210,000	210,000	210,000
Subtotal	570,000	570,000	570,000	570,000
Land Use				
Irrigation	17,100	27,000	50,000	120,000
Rainfed	122,500	143,500	192,900	449,000 (1)
Flood Recession (2)	11,400	11,400	-	-
Permanently Flooded	-	-	1,000	1,000
Subtotal	151,000	179,900	243,900	570,000
Net Balance	423,400	399,500	326,100	-

1) Rainfed cropping area determined as balancing item.
2) Excluding the 4,400 ha levee land usually included in the deshek crop production.

The land use balance shows that sufficient land is available for easily accommodating the expected increases in rainfed and irrigated agriculture at least until 2005, when a net balance of about 326,000 ha is calculated. Beyond this, no detailed projections have been made but it is roughly estimated that the available land would be totally utilized about 30 years later, i.e. in 2035.

In determining the potential for production and income increases, assumptions were made about possible future yield increases and changes in cropping patterns. The summary effect of these assumptions on the overall crop production is given in Table 9/5.

Table 9/5 Development of Annual Crop Production Output in the Study Area (Production in 1,000 tons)

Crop	1987	1995 (1)	2005
Alfalfa	--	10.0	45.0
Bananas (2)	25.0	31.0	85.0
Beans	n.a. (3)	13.8	29.6
Seed cotton	0.7	5.7	31.4
Groundnuts	n.a.	2.0	6.0
Maize (grain)	22.0	70.1	135.0
Maize (fodder)	--	0.7	8.0
Leucaena	--	19.0	97.6
Onions	n.a.	36.0	56.0
Rice (4)	7.0	8.0	35.0
Sesame	8.0	13.6	29.3
Sorghum	87.4	124.6	230.5
Sugar cane (5)	48.0	53.0	60.0
Tobacco	n.a	0.5	1.8
Vegetables	2.4	23.4	71.1
Watermelons	2.0	17.4	49.5
Total production	202.5	428.8	970.8
rainfed	55%	47%	47%
Estimated value (6)			
(SoSh million)	4,511	10,029	20,368
rainfed	47%	37%	39%

1) For 1995, production figures for desheks are still included.
2) Following average exportable yields have been assumed per ha;1987: 10t; 1995: 12t and 2005: 16t.
3) n.a. = data not available.
4) Following average yields have been assumed per ha; 1987: 3t; 1995: 3.5t and 2005: 4.4t.
5) Following average yields have been assumed per ha; 1987: 70t: 1995: 75t and 2005: 85t.
6) 1987 constant product prices.

The data shown indicate that the potential for crop production increases is high, projecting a more than fourfold increase between now and 2005. It should be noted that this is an estimate of the actual future production under assumptions of moderate area and yield increases, based on present product and factor price relationships, assuming that all agriculturally related development proposals are implemented and not taking into account any market saturation effects for specific crops.

While there will be some reduction in its relative share, rainfed crop production will continue to play a very important role in the Juba Valley and will in future produce about 47% and 38% of all crops in terms of quantity and value respectively.

The only significant export crop would continue to be bananas and, to the extent that it is not utilized by the local industry, cotton. The main import substitution crop will be rice and sugar, while the other crops will be for local human consumption and fodder. The supply of food will therefore be significantly improved for the Juba Valley, as well as for other parts of Somalia.

Increasingly, as discussed in more detail below, the Juba Valley will be in a position to produce a regional surplus and reduce the country's need of food imports and contribute to reducing the balance of payments deficit.

9.1.2 Livestock

The proposed improvements in animal health care, additionally available crop residues and the recommended introduction of fodder production in mixed farming systems, which are characterized by an increased integration of crop and livestock production, will lead to an increase of livestock productivity and production, as shown in Table 9/6.

Table 9/6 Expected Increase in Livestock Production in Study Area

Item	1987	1995	2000	2005	Total Increase
Herd development (TLU) (1)	2,720,000	2,764,000	2,811,000	2,855,000	5%
Offtake (TLU)					
Domestic consumption	166,000	176,000	185,000	193,000	16%
Exports	51,000	60,000	70,000	80,000	57%
Total	217,000	236,000	255,000	273,000	26%
Meat production (t)	33,600	37,300	40,800	44,500	32%
Milk production (t) (2)	260,000	328,000	370,000	413,000	58%

1) TLU = Tropical livestock unit = 250 kg
2) Milk for sale, excluding calf/kid requirement.

Compared to the projected increase in crop production, the increase in livestock production is small. In line with the fact that range carrying capacity does not allow any substantial increase in herd sizes, additional meat production must come from productivity gains. These are reflected in the above data in higher calf/kidding rates as a combined effect of reduced mortality and improved fertility, allowing for higher offtake rates and increased meat production. In addition, improved dry season feeding will result in higher live and carcass weight and milk productivity.

The scope for increased meat production, however, is rather limited, showing a total increase of 32%, equivalent to an annual growth of only 1.6%, while population growth in the Juba Valley will be nearly 3% throughout the Masterplan planning period. Despite the proposed development measures, meat production will thus decrease in relative terms.

Exports of live animals are projected to grow relatively faster, namely by about 2.5% per year, with the main emphasis being on making these exports through official, improved marketing channels so that the foreign exchange is not lost to the Government.

Tentative calculations of nomadic income show that big nomadic owners generate a production value of SoSh 1.1 million per year, while small nomadic owners make only about SoSh 210,000 per year. Estimates about the potential for increasing these income levels indicate, in line with the above determined productivity gains, an increase of about 50% for small and big nomadic owners by the year 2005.

9.1.3 Fisheries

The fish potential in the Juba is now estimated to provide sufficient animal protein for 30,000 people, which is only partly utilized. In comparison to the total population of 510,000, this is only a limited potential but it provides nonetheless a valuable possibility for diet diversification.

With the closure of the Bardheere Dam, the fish population depending so far on the desheks for feeding and possibly spawning, will probably decline. At the same time, river flow will be more constant and reduce fish mortality now high during the dry season. The overall effect on the fish population is not known and difficult to estimate as very little data and research has been done on fisheries in the Juba. However, it is probably realistic to assume that the potential in the river will not substantially increase after the dam so that fisheries in the Juba will continue to play a minor role. To utilize this potential as best as possible, the Ministry of Fish and Marine Resources will establish a unit in the Juba Valley for providing extension services and undertaking limited data collection and research.

In the reservoir, following the experience of other dam projects, the fish population is expected to increase very rapidly after completion of the dam due to the abundant supply of nutrients. However, this will be of short duration and a lower fish population will establish itself in line with available nutrients. Even though no estimates of the short- or long-term fishing potential has been made for the future reservoir, this is believed to be sufficiently large to warrant the establishment of a fisheries management scheme, as proposed.

Aquaculture, proposed to be introduced into the Juba Valley, does not have any tradition there and has to be regarded as a long-term, so far largely unknown potential.

9.1.4 Industry

At present, no new large-scale industrial units have been identified for the Juba Valley. Instead, emphasis will be on making better use of the existing industrial facilities, especially at Juba Sugar, Fanoole and Mogambo. While this will provide much needed import substitution for sugar and rice and, in the case of leather and processed meat, possibly also foreign exchange earnings, additional employment and any linkages to the immediate economic environment will be relatively small.

With the projected growth in the urban centers and slowly increasing incomes, opportunities for small-scale enterprises producing for the local market will arise and can provide employment and income and will therefore be supported by a programme of technical and financial assistance to local entrepreneurs.

9.2 Meeting Basic Needs

The overall objective of devising and implementing the Development Programme is to improve the standard of living of the people in the Juba Valley. As a minimum, their basic needs satisfaction should therefore be improved. In the following, it is therefore discussed to what extent the future development will accomplish this with respect to food, health, education, water supply and sanitation and energy.

9.2.1 Food

As outlined above, very considerable increases in food production will be achieved by extending the area, particularly for irrigated crop production and assisting farmers in obtaining higher yields. To what extent this higher food production keeps pace with the projected population growth and where it is likely to be consumed is analyzed in the following, using the data given in Table 9/7.

The total food production on a per capita basis is projected to increase by over 200%, thus more than compensating for the expected population growth of annually nearly 3%, amounting to an increase in the population in the Study Area of 65%.

For the two most important staple foods, cereals and oilseeds, the projections show that local demand is presently met and that considerable surplus production can be expected in future. Adding to these two crops the projected production of beans, onions, tobacco and the non-exportable bananas, about 228,000 t will be consumed in the Juba Valley, while 472,000 t will be available as regional surplus, of which an estimated 64,000 t will be banana exports.

Crop production in the Juba Valley will thus be more than enough to meet the needs of its people and produce considerable surplus for meeting the deficits of other regions.

Table 9/7 Crop and Meat Production and Food Supply

Item	1987	1995	2005	Increase
Crop Production				
Total Production ('000 t)	203	429	971	478%
Production without Fodder	202	393	787	390%
Production per Capita (kg/capita)	396	634	937	237%
Cereals Production ('000 t)	116	203	401	337%
Juba Valley Consumption (1)	65	79	107	165%
To other Regions	51	124	294	576%
Oilseeds Production ('000 t)	8	15	34	425%
Juba Valley Consumption (2)	7	9	12	171%
To other Regions	1	6	22	2200%
Overall Regional Balance ('000 t) (excl. fodder, vegetables)				
Juba Valley	84	151	228	271%
Other Regions and Exports	114	208	472	414%
Meat Production				
Meat Production ('000 t)	34	41	45	32%
Exports	8	11	13	57%
Juba Valley (3)	14	17	23	164%
Other Regions	12	13	9	-25%

1) Assumed per capita consumption of 127 kg/head.
2) Assumed per capita consumption of 13.7 kg of oil per head at extraction rate of 30%.
3) Assumed per capita consumption of 27.7 kg/head.

As marketing of the main items (maize, sorghum, sesame, groundnuts) is quite effectively handled by the Agricultural Development Corporation in competition with private traders, marketing of the projected surplus should not be any problem, as long as national demand supports high enough prices. With implementation of the proposed road improvements, better linking the Juba Valley with the rest of the country and providing better access to the rural areas where the surplus is produced, transport costs should also come down, further facilitating production and marketing.

For meat, production is projected to increase only slightly, not keeping pace with population growth. However, for the Juba Valley, meat production will be more than sufficient to cover the needs of the local people, leaving a considerable surplus for export and other regions in Somalia. Over time, this surplus will become smaller, as consumption grows with the increase in population.

The future food supply situation in the Juba Valley, assisted by implementation of the Development Programme, will therefore see a considerable improvement for the people in the Juba Valley and the rest of the country in general.

9.2.2 Health

An improvement of the health of the people in the Juba Valley will be achieved by improved quantity and quality of the health care delivery system, better potable water supply, undertaking specific measures to fight the spreading of water borne diseases and an increased awareness of disease transmitting mechanisms.

Concerning the health care system, a considerable expansion of the facilities will take place, as shown in Table 9/8.

While the standards proposed are already somewhat lower than the ones propagated by the Ministry of Health, the number of PHC Posts and Units will be drastically increased to provide basic services. With the present low budget allocation to health, this will not be possible. Success or failure of improving health services will therefore largely depend on the funding made available for sustaining recurrent costs. To keep operating costs as low as possible, only two hospitals are proposed instead of the six envisaged by the Ministry. This is possible because the PHC Units are equipped with basic inpatient facilities, requiring only that more difficult cases are referred to the hospitals at Kismayo and Bardheere.

Table 9/8 Health Care Standards and Targets

Item	1987	1995	2005
Standards			
PHC Posts	-	1 unit for 2,000 people	1 unit for 1,000 people
PHC Units	-	1 unit for 20,000 people	1 unit for 10,000 people
Actual/Targets			
PHC Posts	72	162	455
PHC Units	2	19	48
Hospitals	6 (1)	2	2

1) Inadequate facilities, staffing and supplies.

While the expansion of the health care system should have a considerable impact on public health in the Juba Valley, improved water supply will probably make the largest contribution in reducing gastro-enteric diseases. The more regular flow of the river after closure of the dam will also provide river

water of somewhat better quality during the dry months, where people now often resort to stagnant pools of water for meeting their potable water needs.

Regulation of the river will, however, also increase the risk of a spreading of water borne diseases, particularly of malaria and bilharzia. The Integrated Disease Vector and Disease Control Programme will aim at reducing this risk and this Programme needs to be seen as an integral part of the dam project.

Malnutrition, another cause of disease, will be less of a problem, as food availability and diversity will increase. In addition, the pilot project to improve nutrition should lead in the long term to more awareness about the cause and effect relationship between food consumption and health.

While all of the above measures will reduce the incidence of disease and infant mortality and increase life expectancy, quantitative targets still need to be determined when further preparing the projects proposed by the various development proposals.

9.2.3 Education

For the long-term improvement of the standard of living in the Juba Valley, better education is of paramount importance. This will be achieved by implementing the development proposals for the education sector, which are aimed at the targets set out in Table 9/9.

Table 9/9 Targets for Education within Study Area

Item	1987	1995	2005
Attendance Rate	18%	40%	60%
Pupils per Classroom	119	45	40
Primary School Classrooms	654	727	1450
Secondary Schools	10	10 (1)	10 (1)
Adult Education Centers	1	3	6
Family Life Education Centers	1	6	6

1) To be rehabilitated.

To achieve the above targets, considerable additional funding will have to be made available by the Government to cover recurrent costs. As was true for health services, success or failure of implementing the development proposals for the education sector depends to a very large extent on the funding available for this. Since the scope for local financial participation in this is limited, the main financial burden will be with the Government, which will have to substantially increase the respective budget allocation.

Besides the quantitative improvements envisaged for the education sector, the development proposals put particular emphasis on the development and application of appropriate curricula.

In addition to strengthening the formal education system, adult and women education will also be given considerable attention to generally assist people in the Juba Valley to master and improve their daily lives.

9.2.4 Water Supply and Sanitation

Improvement of urban and rural water supply and sanitation is the objective of six development proposals, with the main aim of contributing to a better health situation in the Juba Valley.

In the Masterplan period, all urban centers, including Luuq, Garbaharey, Dinsor and Afmadow will be equipped with basic water supply facilities for meeting a basic needs demand of about 20 liters per capita and day with a maximum walking distance to a standpipe of 300 m.

For the rural areas, the objective is to have at least one well with safe water at each beel using the procedure and technology applied in the districts of Bu'aale and Saakow by the Swedish Church Relief. Subsequently, additional wells will be provided so that the distance people have to walk to obtain safe water is progressively reduced. Because of the precarious groundwater situation in the Study Area, some locations will require installations for collecting and treating surface water. It is part of the proposed rural water supply programme to investigate the situation in the Study Area in detail and to formulate realistic, achievable targets.

For sanitation, the pilot project will identify low cost systems which would be appropriate for the urban and rural centers, where the need for proper human waste disposal is largest. This pilot effort will then formulate a sanitation project for implementation.

Besides improving the physical facilities, where donor assistance can be of considerable help, linkages will be established to the education and health activities to increase the awareness of people about the role of water and sanitation in transmitting diseases.

Finally, maintenance will be approached in an integrated manner by establishing district and regional maintenance units, capable of handling the maintenance and repair problems of urban as well as rural supply facilities. To minimize dependence on the Government budget, local participation, especially for the rural systems will be increased and technology selected which is appropriate to the conditions of the Juba Valley. In the longer term, every effort will be made to make water supply financially totally independent of the Government, at least for meeting cash operating costs.

9.2.5 Energy

Bardheere Dam will generate electricity of which about 40% are intended to be supplied to the Juba Valley through a supply line down to Kismayo. Estimates indicate that this will only be sufficient to provide the urban centers and the irrigation projects with electricity, i.e. a maximum of 40% of the population in the Study Area will benefit from this. Nonetheless, this will be a considerable improvement over the present situation and will be an important step in making the towns in the Juba Valley more attractive.

For cooking, wood will continue to be the most important source of energy. At the farm level, agro-forestry development will be encouraged by the strengthened extension service and a better network for the supply of seedlings. The ultimate objective will be that the energy demand for cooking can to a considerable extent be met from the shrubs and trees on the farm.

For the urban centers, the supply will in future be more difficult as the bushland and forests surrounding the more densely populated areas will not be able to sustain the required extraction rates over the long term. Monitoring will therefore be undertaken and eventually a system of limiting the areas for fuelwood cutting through licencing will have to be established. Management of the forestry resources will thus be the most important activity in securing long-term energy supply for the Juba Valley.

Besides securing the supply of firewood, fuel-efficient cooking stoves will be propagated to make better use of the energy potential of the wood. This will initially require subsidies by the Government. Furthermore, research investigating the possibility of using alternative energy sources in the rural areas will be undertaken.

9.3 Resource Conservation

The sustained production of crops and livestock and meeting the basic needs of a growing population in the Juba Valley is only possible if the available resources are prudently utilized and managed. The proposed Development Programme therefore contains numerous activities aiming at the conservation of resources with respect to water, land, vegetation and wildlife.

Water is in the center of attention, as the Development Area's main feature is the Juba and because the proposed damming of the river north of Bardheere will drastically change the water regime. On the one hand, the dam will significantly increase the irrigation potential and thus crop production, allow the reduction of flood damage, stop salt water intrusion into the river and provide a stable flow of river water for domestic and livestock use. Water as a resource is in this respect improved through the dam and the Development Programme is designed to reap the benefits of this increased potential.

On the other hand, the river might require costly stabilization works because of the danger of river scour, seasonal flooding will stop and with it flood recession agriculture and deshek fishing, rapidly expanding irrigation could result in serious waterlogging and salinization problems also affecting water quality and water borne diseases will spread. These are potentially serious problems and the Development Programme includes the necessary activities to mitigate their negative effects.

Land resources in general are still ample in the Juba Valley and this is expected to remain this way for probably another 40-50 years. Nonetheless, irrigable land has become the object of land speculation with the danger of displacing people who traditionally farmed the land without registering it. A programme of land registration, together with proposed changes to the land law will therefore be implemented, protecting the interests of the local people.

Land use conflicts will increasingly arise, as more and more of the riverine and deshek areas will be brought under irrigation, limiting access to the water for the nomads. Access corridors to livestock watering places will therefore be planned and have to be excluded from crop production.

As mentioned, increased irrigation bears the risk of waterlogging and salinization, resulting in reduced or totally lost soil fertility. Support services to assist farmers in properly developing and operating their irrigation and drainage systems have therefore been included in the Development Programme. Generally, more intensive crop production as projected for the Juba Valley will make higher demands on the skills of the farmers and on the supply of inputs to conserve soil fertility. This will be achieved mostly by a strengthened system of agricultural research, extension and input supply.

The biosphere of the Juba Valley is characterized by the three distinct ecosystems of the freshwater system of the river, the alluvial floodplain and the dry lands not directly affected by the river. As a result of the dam, the freshwater system will change quite significantly, affecting the fish, crocodile, hippopotamus and other river water dependent wildlife. What the effect of the changed water regime will be cannot be predicted. Monitoring of this will be one of the activities of the wildlife management policy and scheme to be established not only for the river itself but for all of the three ecosystems.

In the floodplain the greatest threat to the vegetation comes from the projected increased agricultural activities and the extraction of firewood to meet domestic energy requirements.

In the dry lands, it could be an unplanned increase in livestock herds that could cause a degradation of the vegetation below the regenerative capacity. To monitor and manage the range and forestry resources, the Development Programme includes specific activities which are aimed at preventing this from happening. In addition, three riverine gallery forests will be protected as they constitute the last examples of a unique ecosystem.

While many of the activities for resource conservation will be carried out by the different line ministries as part of their responsibility, overall environmental management will be coordinated by an Environmental Management Unit of MJVD. This unit will formulate an environmental policy and guidelines, undertake long-term monitoring also utilizing remote sensing data on a regular basis, coordinate and supervise all environmental activities in the Juba Valley and initiate specific measures where these are required.

9.4 Effect on Beneficiaries

The Development Programme is proposed for implementation to improve the socioeconomic conditions of the people living in the Juba Valley. The manner in which the Programme will affect the different groups within the population is discussed in the following, starting with a general review of expected population development.

Estimated population growth and its geographical distribution have been estimated and the results are summarized in Table 9/10 in terms of the broad target groups used throughout the Masterplan.

Table 9/10 Development of Target Group Populations

Target Group	1988		1995		2005		Annual Growth
Farmers							
- Rainfed	190,000	37%	220,000	36%	260,000	31%	1.8%
- Irrigated	30,000	6%	50,000	8%	100,000	12%	6.9%
Subtotal	220,000	43%	270,000	44%	360,000	43%	2.8%
Nomads	155,000	30%	170,000	27%	180,000	21%	0,8%
Urban	135,000	27%	180,000	29%	300,000	36%	4.5%
Total	510,000	100%	620,000	100%	840,000	100%	2.8%

Source: Own estimates

Development of the target groups in the Juba Valley is thus characterized by a considerable general increase in the population of annually nearly 3%, a significant increase in the number of farmers practicing irrigation, a reduction in the relative number of nomads while their absolute numbers will increase slightly and more than doubling of the urban population.

Rainfed crop and livestock production activities will thus also in future dominate the economy of the Juba Valley. Although the growth rate for people taking up irrigation is with nearly 7% the highest of all groups, only about 12% of the population in the Study Area will earn their livelihood in this sub-sector by the year 2005. Urbanization, already assumed to increase significantly, would grow at an even more rapid pace if living and production conditions in the rural areas are not made more attractive, as would be the case through implementation of the Development Programme (agricultural extension, roads, water supply, sanitation, education, health).

At the same time it must be realized that the urban centers of the Juba Valley will also have to be improved to avoid a large migration of people to Mogadishu. This will be achieved through a number of development proposals included in the Development Programme (water supply, sanitation, electricity, roads, urban development plans).

The general shifts that can be expected is that nomads will more and more settle in the rural and urban areas, while the increase of farmers practicing irrigation will come largely from the rainfed sub-sector.

9.4.1 Farmers

The emphasis of the Development Programme for rainfed as well as irrigated crop production is to support the small- and medium-scale farmers. The main measures for directly supporting these farmers are the strengthened extension service, backed up by relevant research, the introduction of irrigation

development support services with particular emphasis on assisting farmers to form Water User Groups (WUGs) preferably on a family, kin or village basis and an improvement in the supply of inputs and credits. Indirectly, the improvement of the national and rural roads network will lower transport costs and increase mobility, also facilitating access by the different agencies providing services to the rural areas. Rural water supply and health services are directed at improving the living conditions for the farmers, as are the formal and informal education services.

Estimates of the future per capita income of farmers indicate that the economic situation will improve moderately by 40-80% in real terms, depending on the farming system.

Large farms are at present run by the Government and a development proposal has been formulated to improve their performance and to look into the possibilities of reducing the role of the Government at Mogambo and Fanoole and increasing the one of smallholders farming within these projects. The only large-scale project planned is the one at Homboy where the farming will be undertaken by smallholders, while a central governmental organization will be responsible for providing the essential services. The challenge in this field will be to ensure that the benefits of these projects will be equitably shared among the farm labour, smallholders, administrative personnel and the Government.

9.4.2 Nomads

The nomadic population is expected to increase only very slightly, with many settling in the urban areas or taking up farming to which traditional linkages exist in the case of agro-pastoralists. Direct production support to the nomads will center around animal health care services, improving marketing for export, better range management, including the assurance of access to river and deshek watering places by planning and enforcing access corridors and eradication of the tsetse fly.

For improving the animal health care services, the introduction of NAHAs, as practiced already in other parts of Somalia and the increased reliance on the private sector will be particularly important elements in effecting an improvement on a sustained basis.

In addition to this direct production support, implementation of the Development Programme will also introduce health care services aimed at improving the health of the nomads, which will be an innovative approach along the lines of the NAHA concept already developed for animal health.

More generally, improvements of the living conditions in the rural areas described above for the farmers will also be of benefit to those nomads practicing the agro-pastoral system, whereby part of the family is sedentary, carrying out crop production activities.

The income situation of the nomads will improve with incomes being about 50% higher in real terms by the year 2005.

9.4.3 Urban

Living conditions in the urban centers will be improved by better planning for urban development and by providing more adequate services. In addition, the urban centers will also benefit from a considerable increase in the number and extent of services which will establish themselves there.

The preparation of urban development plans is seen as particularly urgent for the towns of Bardheere and Jilib and these are included in the Development Programme as high priority items. Subsequently, the other towns, especially Luuq, will be covered. The benefits of better urban planning will accrue to the urban population in terms of better zoning, resulting in less conflict over use of urban land and more cost-effective provision of services.

Urban services will be improved for water supply, sanitation, electricity supply and roads together with stormwater drainage. Of these, water supply is by far the most important and is given high priority in the Development Programme. In the case of Kismayo, the problem of seawater intrusion into the Juba and to the pumping station of the water supply system will only be solved after construction of the dam, when a minimum flow of water can be maintained in the river also during the dry season. Improvement of the electricity supply is also dependent on completion of the dam and together with a distribution line along the Juba to Kismayo.

To provide employment to an increasing urban population and to generate additional regional income, the small-scale enterprises processing local materials and producing for the local markets will be supported by technical and financial assistance. The provision of a reliable supply of electricity will further promote the development of these enterprises as it will reduce investment costs.

9.4.4 Women

In the rural areas, women provide a very large part of the labour required for farming and running of the household. Much of the progress to be achieved in improving the living conditions in the rural areas depends therefore on the degree to which women can be reached by the different services and on the reduction of time required for household chores, specifically for water and firewood collection.

Concerning the services, three are of particular importance and included in the Development Programme, i.e. family life education, adult education and agricultural extension.

The national Family Life Education Programme will be strengthened and extended to all districts of the Juba Valley. The Programme aims directly at reducing the workload of women and to assist them in diversifying their activities and income.

Adult education is the second service being of particular importance for women. The objectives of the adult education courses established in Somalia are mainly to make people more aware of environmental issues, to offer training in simple technical skills and to enable people to make optimal use

of the existing social infrastructure and services. These courses are thus covering many facets of the daily life of women and are therefore very valuable in assisting them to better cope with their work.

The extension service concept adopted for Somalia is the training and visit system, which puts particular emphasis on the selection and training of contact farmers. The selection process is designed in such a way that women will be selected as contact farmers whenever they perform most of the farming work in a given area. Women are thus specifically included as a target group, which is an important condition for the extension service to be effective and for women actually being reached.

In addition to improving their skill of better managing their time, the most important contribution to easing their workload will be by reducing the time required for collecting water and firewood. For water, the rural water supply programme will make safe water available to all people initially at the beel and subsequently at the village level, reducing the time required for walking to and from the wells.

To reduce the time needed for meeting domestic energy requirements, i.e. at present the collection of firewood, a number of activities will be carried out. In the short to medium term, the utilization of fuel-efficient cooking stoves which will be propagated could have the most immediate effect, if adopted by the population. In the longer term the benefits of agro-forestry development should make a large part of the fuelwood requirements available on the farm itself. Finally, also only a long-term perspective, there could be labour saving devices resulting from the rural energy pilot project.

9.5 Spatial Impact

Implementation of the Development Programme will have an impact on all of the districts in the Juba Valley. Most affected will be the six floodplain districts below the future dam and of these most significantly Bardheere and Jilib districts. An assessment of the spatial impact is provided in the following by first looking at the development of the roads network, the most important physical measure to improve inter- and intraregional linkages. Subsequently the expected development of the settlement pattern and finally the planning function is analyzed. The spatial distribution of the physical development and provision of the main services is shown in Figure 9/1.

9.5.1 Roads

Roads serve an important support function for nearly all productive and social sectors. Implementation of the Development Programme will have five main effects.

First, through the construction of the Jilib - Bardheere road, a very large part of the Juba Valley will be opened up for more intensive development, connecting the more developed South with the North. In the long term, this will result in a more even development pattern throughout the Juba Valley. This will be brought about basically by providing an all-weather road access to the districts of Saakow and Bu'aale, which are now for part of the year not accessible by road.

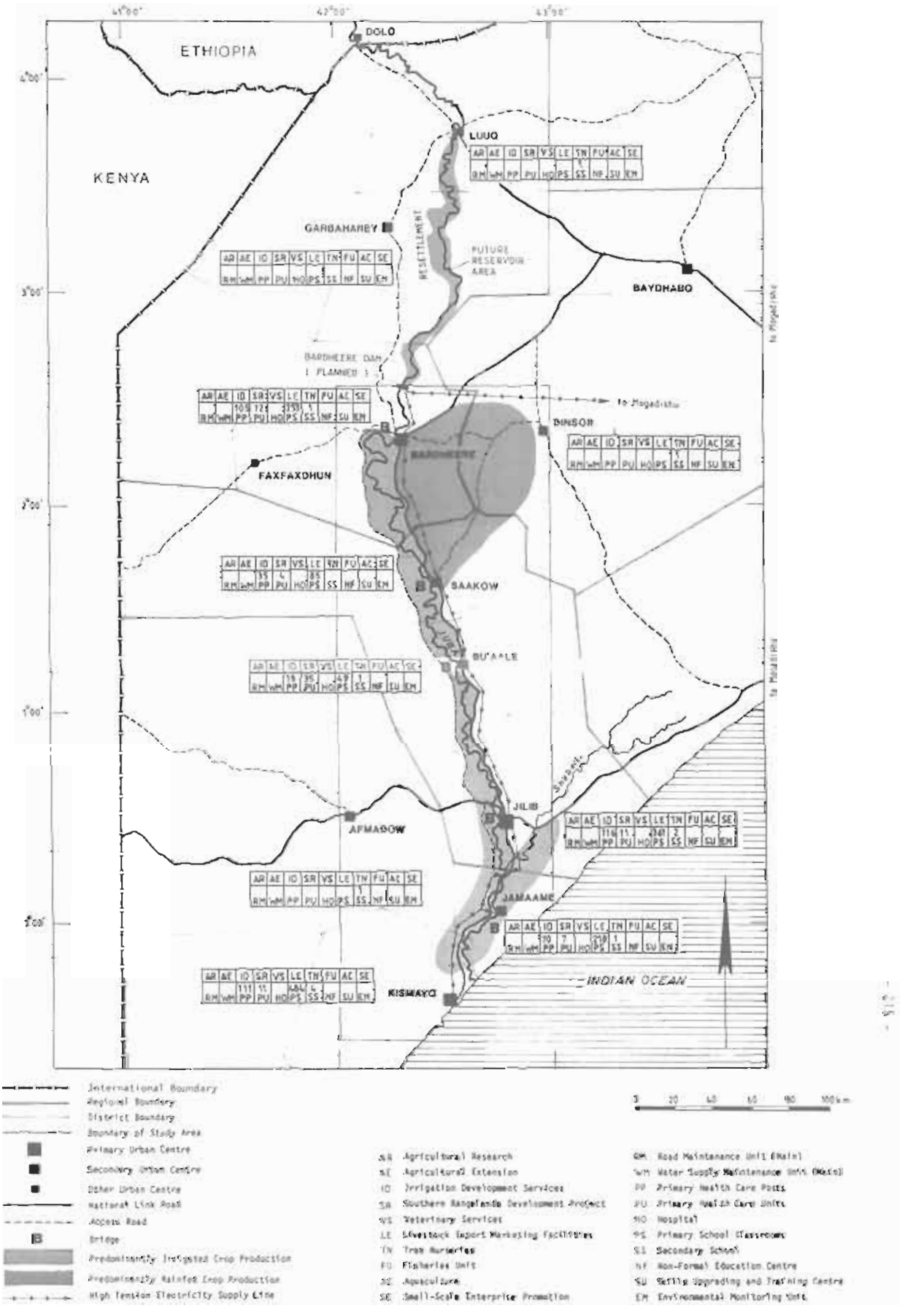


Figure 9/1 PHYSICAL DEVELOPMENT AND SERVICES IN THE JUBA VALLEY BY 2005

Second, additional bridges at Jilib and Saakow will connect the western side of the river to the national road network and thus lower transport costs to and from the influence areas of these bridges. This will facilitate increased agricultural production and mobility.

Third, improvement of the road network connecting the Juba Valley to the rest of the country and of the main existing roads will facilitate the marketing of regionally produced surplusses and access to social and other services.

Fourth, rural roads will increasingly be required for transporting agricultural inputs and products, as productivity and production increases. The objective is to provide a rural roads network in such a manner that most of the people live and farm not more than a certain threshold distance from an all-weather road. This threshold distance, which still needs to be determined as part of the rural roads programme, is the longest distance within a given area which people are prepared to transport their goods by means other than road transport. Beyond this threshold distance, people have no real access to larger markets and are therefore mainly subsistence farmers with very limited scope for improving their standard of living.

Fifth and finally, road maintenance activities will be organized in an integrated manner establishing district and regional units capable of handling all technical problems. As there is little scope for direct local participation in undertaking the maintenance or financing it, the burden of funding this activity will be on the Government, which needs to increase its budget allocation for this.

9.5.2 Settlement Pattern

The most central places will in future be Bardheere for the northern and Jilib for the southern part of the Juba Valley (Map 3). These two towns are strategically located at the cross roads connecting the Juba Valley to Mogadishu and also serve large agricultural areas. In the North, Bardheere is part of the Bardheere - Dinsor - Saakow rainfed crop production triangle (SGU 5), close to the irrigable areas of the Saakow and Bu'aale districts and not far from the dam and the future reservoir. In the South, Jilib is close to the existing large irrigation schemes and also not far from the main banana growing areas. Future irrigation development will further increase the centrality of Jilib. The central role for administration and services in the Juba Valley will therefore be more and more taken by Bardheere and Jilib.

While Jilib has already started to assume this role, basically at the expense of Kismayo, Bardheere will rapidly grow into this during the construction period of the dam and after completion of the Jilib - Bardheere road, when access to Saakow and Bu'aale will be possible throughout the year.

Despite the projected increase in importance of Bardheere and Jilib, Kismayo will remain the largest town for quite some time to come, but it will loose influence because of its location at the periphery of the Juba Valley. Kismayo is therefore expected to grow only at about 4% per year, while for Jilib 10% and Bardheere 6% are projected. However, with Jilib and Kismayo both being in the southern part of the Juba Valley, population densities will continue to be largest there.

The most important urban centers in the Juba Valley will therefore be Bardheere, Jilib and Kismayo, which is basically an extrapolation of already noticeable trends.

Of great significance for reducing regional disparities within the Juba Valley will be the construction of the Jilib - Bardheere road, as this will open up the districts of Saakow and Bu'aale. This will lead in the longer term to a more evenly distribution of socioeconomic development along the Juba and boost the importance of the towns of Saakow and Bu'aale. At the same time this will also improve the access to the large rainfed agricultural area in the Bardheere - Dinsor - Saakow triangle and give more importance to Dinsor.

In the South, Jamaame will continue to be at the centre of the banana growing area, where considerable extension is projected to take place. Its location off the main road and its proximity to Jilib will, however, limit its role.

The towns of Dinsor, Saakow, Bu'aale and Jamaame will therefore assume the role of secondary urban centers within the Study Area.

The other towns in the Development Area, i.e. Luuq, Garbaharey and Afmadow will not be as diversified in their development, as they serve basically the needs of nomadic livestock, where only limited growth rates are projected. Of these centers, Luuq will benefit from its location, as it will be at the end of the reservoir, serving both sides of the river.

Other settlements will follow and reinforce the existing pattern. Population densities will increase most notably along the river in the districts with high irrigation potential (Saakow, Bu'aale, Jilib, Jamaame). Further away from the river, people will settle in line with the availability of arable land and sufficient rainfall, which is mainly the case in the Bardheere - Dinsor - Saakow triangle and along the Juba south of Bu'aale.

The relative importance of the urban centers reflects the one of the districts and their expected development. The most important districts will therefore be Bardheere, Jilib and Kismayo, followed by Dinsor, Saakow, Bu'aale and Jamaame. All of these districts, with the exception of Dinsor, will experience development in irrigated and rainfed crop production as well as livestock production and have therefore a diversified economic base. In the other districts (Luuq, Garbaharey, Afmadow), this is not the case, as livestock production is the main activity and source of income, besides trading.

The future development in the Juba Valley, supported by construction of the dam and implementation of the Development Programme, will therefore tend to reinforce present trends which will also tend to reduce existing regional disparities within the Study Area, especially through the opening up of the districts of Saakow and Bu'aale through the construction of the Jilib - Bardheere road.

9.5.3 Planning

To implement the proposed Juba Valley Development Programme, the planning function will be strengthened at the central as well as at the regional and district level.

At the central level, MJVD will develop into the main planning agency for the Juba Valley with also having line responsibility for all aspects of water management.

However, the manner in which the proposed Juba Valley Development Programme is to be implemented stresses the importance of local participation, particularly with respect to the planning of specific development proposals. This is based on the general experience that development projects need to be formulated, accepted and supported by the people directly affected and by the local decision makers if they are to be successful.

Therefore, planning will progressively be decentralized and should, at the end of the Masterplan period largely be accomplished by district and regional level staff with MJVD coordinating activities. Considering that practically no planning is done at the district level at this point in time, this has to be understood as a long-term effort, but involvement of district staff, particularly of the District Commissioner and members of the District Council, will be encouraged and sought right away.

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Profiles of Development Proposals

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Profile of Proposed PROGRAMME PROJECT MEASURE CODE: CRO 1

Title:	INTRODUCTION OF CADASTRAL MAPPING AND LAND REGISTRATION
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Agriculture
Target Population:	All Riverine Farmers of the Development Area
Purpose:	Crop Production Increased
Description:	Based on Available Aerial Photography, Maps are Prepared of the Development Area, showing Identifiable Farm Holding Boundaries. Ground Control Marks are Established. Individual Farmers' Land Claims will be Investigated and when found Justified a Certificate of Registration will be Issued
Outputs:	A 1:5,000 Maps of Potential Development Areas Prepared B Mark Ground Control Points Established C Individual Farm Holdings Plotted D Individual Farm Land Claims Investigated E Individual Land Rights Registrated F Certificate of Registration Issued to Farmers G Detailed Location Maps of Farms Issued to Farmers
Linkages:	to Revision of Land Tenure Legislation (ORG 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: CRO 2

Title:	ESTABLISHMENT OF A RESEARCH SYSTEM AT THE BARDHEERE RESEARCH STATION
Prepare in:	1988 - 1989
Implementing Agency:	MJVD
Target Population:	All Farmers of the Development Area
Purpose:	Crop Production Increased
Description:	Establishment of a Research System at the Bardheere Research Station to Undertake Applied Crop Production Research relevant to the Development Area
Outputs:	A Appropriate Organizational Structure of the Research System Established B Trained Staff Available C Physical Facilities of the Research Station fully Operational D Linkages to Extension Service Established E Research Needs and Priorities Identified F Research Programme Developed and Implemented G Research Results Documented H Research Results Translated into Extension Messages
Linkages:	to Extension Service (CRO 3) and Directorate of Agricultural Research

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: CRO 3

Title:	STRENGTHENING OF AGRICULTURAL EXTENSION
Prepare in:	1988 - 1989
Implementing Agency:	Ministry of Agriculture/Agricultural Farm Management, Extension and Training Project (AFMET)
Target Population:	Farmers of the Development Area
Purpose:	Crop Productivity/Production Increased
Description:	Provision of Adequate Extension Coverage to Farmers in the Different Farming Systems
Outputs:	A Suitable Organizational Structure for the Extension Service in the Juba Valley Established B Area-specific Extension Needs and Priorities for the Juba Valley Identified C Required Extension Staff Available and Trained D Required Subject Matter Specialists Available and Trained E Housing for Extension Staff Available F Adequate Office Accommodation Available G Transport Available and Operational H Equipment Available I Regional Training Courses in Soil-water Management for Extension Field Staff Executed J Pilot Activities for the Implementation of an Animal Production and Health Oriented Extension Service, Operated within the Framework of AFMET, Completed. Proposal for full-scale Implementation Presented K Extension-research Linkage Strenghtened L Extension Messages Prepared and Programme Implemented
Linkages:	to Research Programme (CRO 2), Agricultural Credit (CRO 4), Deshek Conversion (WAT 1,2), Irrigation Development (IRR 1,2, 3),Animal Health Care (LIV 1,2), Tree Supply (RAN 7,8)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: CRO 4

Title:	IMPROVEMENT OF AGRICULTURAL CREDIT
Prepare in:	1996 - 1998
Implementing Agency:	Somali Development Bank/Commercial and Savings Bank of Somalia
Target Population:	Farmers of the Development Area
Purpose:	Crop Production Increased
Description:	Establishment of a Network of Credit Facilities Working on the Basis of an Appropriate Credit Supply Procedure, and Allowing Farmers to Buy Production Inputs and Hire Labourers
Output:	A Procedures for Loan Application Established B Staff Trained C Priority Areas to Start Programme Selected D Farmers Informed about Procedure E Experiences in Priority Areas Evaluated F Programme Expanded to all Farmers in the Development Area (follow-up)
Linkages:	to Extension Service (CRO 3), Research Programme (CRO 2) and Input Supply

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 1

Title:	BARDHEERE DAM PROJECT
Prepare in:	Ongoing
Implementing Agency:	MJVD
Target Population:	Population of the Development Area (and Population of Baydhabo and Mogadishu for Power Supply)
Purpose:	National Income Increased, Foreign Exchange Saved, Agricultural Production in Juba Valley Increased and Living Conditions Improved
Description:	Construction of a Multipurpose Dam for Water Storage, Power Supply, Regulated Irrigation Water Supply and Flood Protection
Output:	A Bardheere Dam Constructed B Bardheere Power Plant Completed C Switchyard, Transmission System and Substations Constructed D Management and Remote Sensing System Completed
Linkages:	to all River Related Projects and Electrification

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 2

Title:	BARDHEERE RESERVOIR MULTIPURPOSE OPERATION STUDY
Prepare in:	1994 - 1996
Implementing Agency:	MJVD
Target Population:	Population in Riverine Study Area
Purpose:	Operation of Reservoir Optimized
Description:	Analysis of Operational Requirements and Preparation of Guidelines for Optimal Reservoir Operation for the Different Purposes Served by the Dam, with Emphasis on the Supply of Irrigation Water and Flood Control
Output:	A Operational Requirements for Different Purposes of Dam Analysed B Optimum Operation for Irrigation Water Supply Determined C Optimum Operation for Power Generation Determined D Flood Control Operation Defined within the Framework of the Complex Flood Control Measures E Environmental, Sanitary and other Requirements on Reservoir Operation Specified F Optimal Operation Schedule Selected for Different Time Horizons
Linkages:	to all River Related Projects and Electrification

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 3

Title:	RIVER MORPHOLOGY STUDY
Prepare in:	1992 - 1994
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas of the Study Area
Purpose:	Negative Impact of Possible River Scour Avoided
Description:	Investigation of River Morphology to Determine the Need for Riverbed Stabilization Works or other Measures Ensuring that the Water of the Juba can be Rationally Managed and Damage to Land or Structures is Prevented
Output:	A Cross-Sectional and Longitudinal Surveys of Juba River and Adjacent Floodplain Undertaken B Topography of Riverbed Surveyed C Stability of Riverbed Investigated in Hydraulic Model D If Needed, Recommended Stabililization Measures Specified E Recommendations for River Morphology Monitoring in After-Dam Situation Prepared
Linkages:	to Reservoir Operation Study (WAT 2), Water Quality Control (WAT 7), Drainage and Flood Control (WAT 9,10) and Irrigation Develpment (IRR 3,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 4

Title:	RIVERBED STABILIZATION WORKS
Prepare in:	Not Scheduled, Depends on WAT 3
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas of the Study Area
Purpose:	Negative Impact of Possible River Scour Avoided
Description:	Based on Study Results of WAT 3, Appropriate Riverbed Stabilization Structures and other Measures are Implemented as Required in Order to Reduce the Effects of River Scour after Construction of the Bardheere Dam
Output:	A Riverbed Downstream Bardheere Stabilized B Other Required Measures to Avoid Negative Effects of River Scour Undertaken
Linkages:	to River Morphology Study (WAT 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 5

Title:	ESTABLISHMENT OF A WATER ALLOCATION STRATEGY
Prepare in:	1996 - 1998
Implementing Agency:	MJVD
Target Population:	Population in the Riverine Areas of the Study Area
Purpose:	Rational Use of Juba Water Resources Assured
Description:	Definition of a Water Allocation Strategy Satisfying the Needs of the Different Water Users
Output:	A Economic Losses in Individual Projects Arising from Insufficient Irrigation Water Availability Assessed B Irrigation Regimes for Different Scenarios (Time and Production Systems) Determined C Cropping Calendars Adapted Where Necessary D Water Allocation Committee Functions, on the Basis of the Guidelines which have been Prepared
Linkages:	to Reservoir Operation Study (WAT 2), Water Quality Control (WAT 7), Flood Control and Drainage Study (WAT 9), Deshek Conversion (IRR 1, 2) and Irrigation Development (IRR 3, 4)

Profile of the Proposed PROGRAMME PROJECT MEASURE CODE: WAT 6

Title:	REHABILITATION AND EXTENSION OF RIVER GAUGING STATIONS
Prepare in:	1990 - 1991
Implementing Agency:	MJVD/Ministry of Agriculture
Target Population:	Population of the Riverine Areas of the Development Area
Purpose:	Rational Management of Juba River Water Resources Assured
Description:	Installation, Relocation and Improvement of Operation of Stations; Establishment of a Base for Correlating Present Flows at Luuq and Jamaame, needed in the With-Dam Situation for Reservoir Inflow, Water Use and River Dynamics Monitoring
Output:	A Three new Gauging Stations (Doolow, Saakow and Araare) Installed, Calibrated and Operational B Control Measurements on Main Gauging Stations (Luuq, Bardheere, Mareerey, Kamsuma and Jamaame) Performed Regularly C Gauging Station at Luuq Relocated Upstream - if Needed D Standards for Collection and Processing of Hydrological Data Defined, Approved and Implemented
Linkages:	to Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Water Allocation Strategy (WAT 5), Water Quality Control (WAT 7) and Flood Control and Drainage Study (WAT 9), Including Flood Warning System

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 7

Title:	INTRODUCTION OF A WATER QUALITY CONTROL SYSTEM
Prepare in:	1996 - 1998
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas of the Development Area
Purpose:	Rational Management of Juba River Water Resources Assured
Description:	Installation of a System of Water Quality and Sediment Transport Monitoring to Allow for River Bed Erosion and Irrigation Water Quality Control
Output:	A Water Quality Indicators and Monitoring Methods Standardized B Measuring Points in Luuq, Bardheere, Mareerey and Kamsuma Determined C Laboratory for Analysing Water Quality is Operational D Water Samples are Collected and Analysed Regularly, Data are Processed E Suspended and Bed Load Measured in Relation to River Discharge, Data are processed F Seawater Intrusion Phenomena Observed and Analysed (in the Before-Dam Situation)
Linkages:	to Reservoir Operating Study (WAT 2), River Morphology Study (WAT 3), River Gauging Stations (WAT 6) and Seawater Intrusion Barrier Study (WAT 8) and Rural and Urban Water Supply (SET 9,10,11,12,13)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 8

Title:	GOBWEYN SEAWATER INTRUSION BARRIER STUDY
Prepare in:	Not Scheduled, Depends on Extent of Seawater Intrusion after Closure of Dam
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas in Kismayo District
Purpose:	Seawater Intrusion into Juba Avoided
Description:	Survey and Design Work to Establish the Feasibility of a Barrier across the Juba River to Prevent Seawater Intrusion in the Ultimate Development Stage
Output:	A Topographic and Geotechnic Survey Completed B Feasibility of Seawater Intrusion Barrier Established
Linkages:	to Reservoir Operation Study (WAT 2), Water Quality Control (WAT 7), Irrigation Development (IRR 3, 4) and Water Supply to Kismayo (SET 10)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 9

Title:	DRAINAGE AND FLOOD CONTROL STUDY
Prepare in:	1988 - 1989
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas of the Study Area
Purpose:	Flood Damage Reduced
Description:	Topographical Survey, Hydraulic Computations and Feasibility Study for Integrated Flood Protection and River Training Measures, (Cross-)Drainage of Roads and Bunds, Flooded and Waterlogged Land, Utilization of Small Streams. Identification of Immediate Measures to Reduce Flood Damage in Lower Juba
Output:	A Topographical Survey with Emphasis on the Surrounding Areas of the Large-Scale Projects (Mogambo, Fanoole and Juba Sugar and Homboy) Undertaken. B Regional Flood Patterns Along River Course Assessed in Conjunction with Remote Sensing Data and River Morphology Study C Flood Levels Determined by Flood Routing, for Different Scenarios D Location, Lay-out and Alignment of Flood Protection Bunds Optimized E Locations for Resectionning, Removal of Sandbanks, Bypassing of Oxbows and relevant Allignments Determined F Topography of Potential Bypass Canals Surveyd in 1m Contours G Layout and Alignment of Bypass Canals and Associated Reservoirs, etc. Determined H Dwelling Units for Relocation to Areas with Less Flood Hazards Identified I Need for (Cross-)Drainage Structures for Existing Engineering Works (roads, canals, bunds, etc.) Identified J Need for Drainage of Agricultural Land and Dwelling Areas Identified K Need for Development of Intermittent Streams (Lac Badana, Deshek Wamo, Wadi Damer) Identified L Flood Warning and Rescue Service Specified
Linkages:	to Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Drainage and Flood Control System (WAT 9) and Irrigation Development (IRR 3,4), Wildlife Management (RAN 2) and Remote Sensing (ENV 2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: WAT 10

Title:	ESTABLISHMENT OF DRAINAGE AND FLOOD CONTROL SYSTEM
Prepare in:	Not Scheduled, Depends on WAT 9
Implementing Agency:	MJVD
Target Population:	Population of the Riverine Areas of the Study Area
Purpose:	Flood Damage Reduced
Description:	Depending on the Outcome of WAT 9, Establishment of Cross-Drainage Structures, Gates, Canals, Reservoirs and any other Measures that are Required to Effectively and Economically Provide an Improved Flood Control and Drainage and Flood Warning System
Output:	A Flood Protection Bunds Constructed B River Training Works Completed C By-pass Canals incl. Associated Reservoirs and Other Required Works are Functioning D Endangered Housing Units Relocated E Existing Engineering Works (roads, conveyance and supply canals, etc) Equipped with Adequate Cross-Drainge Structures F Adequate Drainage of Agricultural Land and Housing Areas Provided G Small Streams (Lac Badana, Deshek Waamo, Wadi Damer, etc.) Adequately Developed for Small-Scale Water Supply H Operation and Management System for Flood Control and Drainage Works Implemented I Improved Flood Warning System Operational
Linkages:	to Drainage and Flood Control Study (WAT 9)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 1

Title:	SAAKOW DESHEK PILOT PROJECT
Prepare in:	Already Prepared
Implementing Agency:	MJVD
Target Population:	All Riverine Farmers of Saakow and Bu'aale Districts
Purpose:	Irrigated Crop Production Increased
Description:	Development of Systems and Procedures to Guide the Change from the Present Traditional Deshek System to Small- or Medium-scale Irrigation Systems
Output:	A Project Approach (Re-)Defined B Guidelines for Environmentally Sound Agriculture Integrated C Priorities and Activities Defined D Staff Trained E Farmers for Participation Selected F Pilot Project Activities Executed G Recommendations and Extension Messages to Deshek Farmers Elaborated
Linkages:	to Extension Service (CRO 3), Research (CRO 2) and Irrigation Development (IRR 3,4,5), Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Flood Control and Drainage (WAT 9,10)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 2

Title:	DESHEK CONVERSION PROGRAMME
Prepare in:	Not Scheduled (Follow-up of IRR 1)
Implementing Agency:	MJVD
Target Population:	All Riverine Farmers in Saakow and Bu'aale Districts
Purpose:	Crop Production Increased
Description:	Based on the Findings of the Saakow Deshek Pilot Project (IRR 1) the Planning and Implementation of the Programme for the Gradual Conversion of Desheks in Saakow and Bu'aale Districts into Irrigated and Rainfed Cropping Systems Will be Undertaken
Outputs:	A Development Concept Elaborated B Priorities, Programme and Implementation Schedule Defined C Staff is Recruited and Trained D Feasibility of Small- and/or Medium-scale Development per Deshek Established E Farmers are Organized into Groups F Farmers are Assisted in Obtaining Ownership and Operation of Small Pump Units for Medium-Scale Pump Schemes G Farmers are Trained H Conversion Programme Gradually Implemented I Seasonal Deshek Area Monitoring Programme Established
Linkages:	to Saakow Deshek Pilot Project (IRR 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 3

Title:	IRRIGATION AND DRAINAGE DEVELOPMENT STUDY
Prepare in:	1994 - 1996
Implementing Agency:	MJVD
Target Population:	Farming Population of the Riverine Areas of the Study Area
Purpose:	Increased, Environmentally Sound Irrigated Crop Production
Description:	Identification of Areas Suitable for Small- and Medium-scale Irrigation Development and of Best Water Abstraction and Drainage in the Medium as well as Short Term, Including the Construction of Diversion Dams, which Might also be Required for Riverbed Stabilization
Output:	A Irrigable Areas and Alternative Abstraction Methods Identified B Potential Salinity Hazard Analyzed and Design Requirements for Keeping Salinity Levels within Acceptable Limits Defined C Irrigation and Drainage Development Alternatives Technically and Economically Evaluated D Phased Irrigation and Drainage Development Programme Established E Implementation Concept Elaborated
Linkages:	to Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Water Allocation Strategy (WAT 5), Flood Control and Drainage Study (WAT 9), Irrigation Infrastructure (IRR 4) and Irrigation Development Support (IRR 5)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 4

Title:	CONSTRUCTION OF IRRIGATION INFRASTRUCTURE
Prepare in:	Not Scheduled, Depends on IRR 3
Implementing Agency:	MJVD
Target Population:	Farming Population in the Riverine Areas of the Study Area
Purpose:	Irrigated Crop Production Increased
Description:	Based on Study Results of IRR 3, Irrigation Infrastructure Constructed to Assure the Most Economic Supply of Irrigation Water
Output:	A Detailed Design Carried Out B Tender Documents Prepared C Contractor Selected D Infrastructure Constructed E Operation and Maintenance Manuals Prepared F Operating Personnel Trained
Linkages	to Irrigation Development Study (IRR 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 5

Title:	ESTABLISHMENT OF IRRIGATION DEVELOPMENT SUPPORT SERVICES
Prepare in:	1988 - 1989
Implementing Agency:	MJVD
Target Population:	Farmers Practicing Irrigated Crop Production
Purpose:	Irrigated Crop Production Increased
Description:	Establishment of Irrigation Development Support Services to Assist Farmers in Developing, Operating and Maintaining Small- and Medium-scale Irrigation Systems
Output:	A Suitable Organizational Structure of Irrigation Development Support Organization Established and Approved B Physical Establishment of Irrigation Development Support Offices Completed and Operational C Staff Appointed and Trained D Standard Designs for Small-scale Irrigation and Drainage Systems and their Components Developed E Standard Selection Criteria for Irrigation Pumps and Motors Established F Standards for Manuals for Operation and Maintenance of Irrigation Schemes Provided G Support to Farmers in Establishing Small- and Medium-scale scale Irrigation Schemes Provided H Support to Farmers for the Efficient Operation and Maintenance of Irrigation Systems Provided I Assitance to Farmers in Establishing Water User Groups Provided J Irrigation Efficiencies Monitored and Measures Designed to Increase Efficiency of Water Use K Ongoing Irrigation Development, Including Registration of Irrigation Pumps and Land Brought Under Irrigation, Monitored L District Irrigation Development Plans Elaborated
Linkages:	to Bardheere Research Station (CRO 2), Extension Service (CRO 3), Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Water Allocation Strategy (WAT 5), Flood Control and Drainage (WAT 9,10) and Irrigation Development (IRR 3,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 6

Title:	IMPROVEMENT AND EXTENSION OF EXISTING LARGE IRRIGATION SCHEMES
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Agriculture/Ministry of Industry
Target Population:	Population in Jilib and Jamaame Districts
Purpose:	Irrigated Crop Production Increased
Description:	Based on Multidisciplinary Studies, the Completion and Possible Reorganization of the Large-Scale Irrigation Projects Juba Sugar, Fanoole Project and Mogambo Rice Project will be undertaken
Output:	A Existing Technical and Organizational Operation of the three Projects Evaluated B Possibilities for Integration of Livestock into the Schemes Assessed C Organization and Management Structure of Projects Modified, Role of Smallholders Established D Requirements for Irrigation Water Distribution Systems and On-Field Application Systems Defined E Irrigation Water Distribution Systems and On-Field Application Systems Upgraded F Drainage System Requirements Defined G Water Measuring Devices Installed H Water Delivery and On-Field Losses Reduced I Infrastructure Completed J Remaining Project Areas Developed
Linkages :	to Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Water Allocation Strategy (WAT 5), Flood Control and Drainage (WAT 9,10), Irrigation Development (IRR 3,4) and Urban Electrification (SET 15)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 7

Title:	HOMBOY IRRIGATION PROJECT
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Agriculture
Target Population:	Present and Potential Future Rural Population in the Homboy Area
Purpose:	Income of Target Population and Foreign Exchange Earnings Increased
Description:	Development of 7,500 ha of Irrigated Farmland with Introduction of Flood Protection and Drainage Works and Improvement of Infrastructure
Output:	A Project Management Unit Established B Flood Control, Drainage and Irrigation Works Constructed C Three New Villages Established D Five Banana Packing Stations Established E Extension and Training Services to Settlers Provided F Project Staff Trained G Input Supply Service For Settlers Established
Linkages :	to Reservoir Operation Study (WAT 2), River Morphology Study (WAT 3), Water Allocation Strategy (WAT 5), Flood Control and Drainage (WAT 9,10), Irrigation Development (IRR 3,4) and Urban Electrification (SET 15)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IRR 8

Title:	TRAINING IN IRRIGATION SYSTEMS MANAGEMENT AND IRRIGATION ENGINEERING
Prepare in:	1990 - 1991
Implementing Agency:	MJVD
Target Population:	Staff of MJVD, Ministry of Agriculture, Ministry of Industry
Purpose:	Rational Use of Juba Water Resources Assured
Description:	Training will be Provided to 30 Professionals at Recognized Overseas Institutions, in the Fields of Irrigation Water Management, incl. Flood Control and Irrigation Engineering to Upgrade their Knowledge and Experience
Output:	A Candidates for Training Selected B Fellowships Arranged C Overseas Training Undertaken D Trainees Posted to Appropriate Positions E Subsequent On-The-Job Training Undertaken
Linkages:	to Deshek Conversion (IRR 1, 2), Irrigation Development (IRR 3, 4), Irrigation Development Support Services (IRR 5), Existing Irrigation Schemes (IRR 6) and Homboy Project (IRR 7)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: LIV 1

Title:	STRENGTHENING OF VETERINARY SERVICE
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range
Target Population:	Livestock Owners in the Development Area
Purpose:	Meat Production Increased
Description:	Strengthening of 10 District Veterinary Centers and Related Veterinary Facilities, Including Enforcement of Vaccination Coverage
Outputs:	A Animal Disease Survey and Investigation Carried Out B Intervention Calendar Established C Vaccination Campaign Carried Out D Staff Trained E Existing Buildings and Facilities Rehabilitated F Equipment and Supplies Available G Contact between Veterinary Service and Livestock Owners Through Collaboration with Nomadic Animal Health Auxiliaries (NAHA's) Improved
Linkage:	to Introduction of Primary Animal Health Care (LIV 2) and Range Management (RAN 1,2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: LIV 2

Title:	INTRODUCTION OF PRIMARY ANIMAL HEALTH CARE SERVICES
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range
Target Population:	Nomadic Livestock Owners of the Development Area
Purpose:	Meat Production Increased
Description:	Introduction of Nomadic Animal Health Auxiliaries (NAHA) as an Intermediate Structure Linking Government Veterinary Service with (Local) Production Level incl. Privatization of Veterinarians
Outputs:	A Development Concept Elaborated B Concept Introduced to and Accepted by Target Population C NAHA Candidates Presented by Nomadic Elders D Training Programme Implemented E Drug Supply on Production Level Improved F NAHA's Equipped and Operational G Disease Knowledge of Vet. Service Improved through NAHA Feed back H Surveillance System Established I Sustained Follow up Support to NAHA's Established
Linkage:	to Veterinary Services (LIV 1) and Range Management (RAN 1,2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: LIV 3

Title:	ERADICATION OF RIVERINE TSETSE-FLIES
Prepare in:	Ongoing, Remaining in 1996 - 1998
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Tsetse and Trypanosomiasis Project
Target Population:	Livestock Owners of the Development Area
Purpose:	Meat Production Increased
Description:	Control of Tsetse-Flies of Juba and Southern Shebelli Riverine System, Including Lower Shebelli Swamps, in Using Classical and/or Alternative Control Methods, in the Context of a National Eradication Programme
Outputs:	A Entomological Survey Completed B Control/Eradication Concept Elaborated C Staff Trained D Physical Infrastructure in Place E Control/Eradication Measures Implemented F Additional Riverine Pasture Available G Requirements of Trypanocidal Drugs Reduced H Preconditions for Introduction of Genetically Improved Breeds are Established
Linkages:	to Animal Health (LIV 1,2), Promotion of Bee-keeping, Agricultural Research and Extension (CRO 2,3), Range Management (RAN 1,2), Wildlife Management (RAN 3) and Conservation of Riverine Forests (RAN 4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: LIV 4

Title:	PROMOTION OF LIVESTOCK MARKETING
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range/Livestock Marketing and Health Project
Target Population:	Livestock Owners of the Development Area
Purpose:	Income of Livestock Owners and Export Earnings Increased
Description:	Marketing Facilities and Systems, Including Market Intelligence, Established or Improved
Outputs:	A Potential Cattle and Camel Markets for JV Livestock Explored B Loading and Shipping Conditions of Kismayo Port Improved C Holding Ground and Quarantine Infrastructure at Jilib and Laheley Improved D Marketing Intelligence Improved E Marketing Health Standard Achieved F Feed For Export Animals at Kismayo Available G Export Potential to Kenya Assessed H Export Facilities and Procedures to Kenya Created I Livestock Production Structured Into Range-fed and Finishing/Fattening Production Zones
Linkages:	to Animal Health Care (LIV 1,2) and Range Management (RAN 1,2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: LIV 5

Title:	PROMOTION OF BEE-KEEPING
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Agriculture
Target Population:	Farmers in the Development Area
Purpose:	Income of Rural Population Increased and Seasonally Balanced
Description:	Assessment of Bee-keeping Practices and Botanical Resources of the Development Area; Introduction of Improved Beekeeping Practices; Training of Potential Farmers, Improvement of Honey Marketing
Outputs:	A Present Bee-keeping Practices Assessed B Improvement Concept Elaborated and Tested C Concept Introduced to Extension Service D Target Population Trained by Extension Service E Marketing Services Improved
Linkages:	to Extension (CRO 3) and Tsetse Fly Eradication (LIV 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 1

Title:	ESTABLISHMENT OF A SOUTHERN RANGELANDS DEVELOPMENT PROJECT
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Population of the Development Area
Purpose:	Improved and Sustained Use of Range and Forest Resources
Description:	Establishment of a Southern Rangelands Development Project to Undertake all Required Activities to Ensure Environmentally Sound Development of the Forestry and Range Resources in the Development Area
Output:	A Concept for Range/Forestry Development Elaborated and Adopted B Responsibilities Determined with Particular Reference to the Livestock Sector C Training Programme Defined and Implemented D Field Level Organizations Established E Development Concept Executed
Linkages:	to Introduction of Range Management Measures (RAN 2), Animal Health (LIV 1,2), Eradication of Tsetse Fly (LIV 3), Livestock Marketing (LIV 4), Wildlife Management (RAN 3) and Creation of a Monitoring Center for Juba Valley Forest and Rangeland (ENV 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 2

Title:	INTRODUCTION OF RANGE MANAGEMENT MEASURES
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Nomads and Agro-Pastoralist of the Development Area
Purpose:	Range Resources in Development Area Increased
Description:	Protection of Overgrazed Areas, Border and Enrichment Afforestation with Legume Trees, Controlled Grazing/Browsing of Recovered Pasture, Establishment of Dry Season and Drought Grazing Reserves
Outputs:	A Overgrazed Areas Identified and Mapped B Pilot Areas Identified; Range Management Measures Tested and Present Situation Evaluated in Quantitative/ Qualitative Terms C Range Management Measures Implemented in Agreement with the Local Population D First Impact of Proposed Measures Assessed and Extension Messages Defined E Measures to other Areas Extended in Cooperation with Self-supporting Groups of Livestock Owners
Linkages:	to Southern Rangelands Development Project (RAN 1), Animal Health (LIV 1,2), Eradication of Tsetse Fly (LIV 3), Livestock Marketing (LIV 4), Wildlife Management (RAN 3) and Creation of a Monitoring Center for Juba Valley Forest and Rangeland (ENV 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 3

Title:	INTRODUCTION OF WILDLIFE MANAGEMENT
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Livestock, Forestry and Range
Target Population:	Total Population of the Development Area
Purpose:	Diversity of Wildlife Maintained, Damage to Human and Animal Life and Crop Production Reduced
Description:	Formulation and Implementation of a Wildlife Conservation and Management Policy
Outputs:	A Policy for Wildlife Management in Juba Valley Formulated B Strategy for Implementing Policy Determined C Organizational Requirements and Structure Approved D Personnel Available and Trained E Juba Valley Population Involved in Wildlife Management F Operating Policies and Procedures Defined and Implemented
Linkages:	to Southern Rangelands Development Project (RAN 1), Animal Health (LIV 1,2), Eradication of Tsetse Fly (LIV 3) and Creation of a Monitoring Center for Juba Valley Forest and Rangeland (ENV 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 4

Title:	STRENGHTENING OF CONSERVATION EFFORT FOR REMAINING RIVERINE FORESTS
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Riverine Population in Bu'aale District
Purpose:	Unique National Resources Conserved
Description:	Conservation of the few Remaining Riverine Forest Areas in the Juba Valley (Shoonto, Barako Madow, Shauri) by Elaboration and Implementation of an Appropriate and Effective Conservation Concept
Output:	A Existing Documentation Reviewed and Need for Further Study Determined B Conservation Concept Elaborated C Organizational Responsibilities incl. Coordination with Other Relevant Institutions Defined D Conservation Procedures Defined E Personnel Trained F Conservation Procedures Operational
Linkages:	to Eradication of Tsetse Fly (LIV 3), Range Management (RAN 1,2), Wildlife Management (RAN 3), Environmental Management (ENV 1,3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 5

Title:	WOOD HARVESTING IN THE BARDHEERE RESERVOIR AREA
Prepare in:	To be Carried out together with Dam Construction
Implementing Agency:	Ministry of Livestock, Forestry and Range
Target Population:	Urban, Rural and Refugee Population of the Wider Reservoir Area
Purpose:	Improve Energy Supply to Target Population and Initial Water Quality in Reservoir
Description:	Cutting and Distributing of an Estimated Quantity of 300,000 t of Wood and Timber along the Juba River between Bardheere and Luuq (future Reservoir Area) for Different Immediate Uses as Well as for Improved Water Quality after Reservoir Filling
Output:	A Standing Crop Assessed B Optimal Harvesting Techniques Identified C Optimal Use of Products Found D Organizational Procedures for Sale/Distribution Established E Cutting and Follow-up Activities Implemented
Linkages:	to Bardheere Dam (WAT 1), Water Quality Control (WAT 7), Range Management (RAN 1,2) and Environmental Management (ENV 1,3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 6

Title:	PROPAGATION OF FUEL-EFFICIENT COOKING STOVES
Prepare in:	1994 - 1996
Implementing Agency:	MJVD
Target Population:	Population of Development Area
Purpose:	Degradation of Vegatation and Cost of Energy Reduced
Description:	Expansion of the 'National Woodstove Development' Programme to Reduce Degradation of Vegetation around Settlements in Development Area and to Lower Energy Costs
Output:	A Appropriate Technical Concept Developed B Acceptance by Population Tested and Promotion Concept Determined C Organizational Responsibilities Defined D Production and Distribution Organized
Linkages:	to Range Management (RAN 1,2) and Central Environmental Management Unit (ENV 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 7

Title:	INTRODUCTION OF MULTIPURPOSE TREE SPECIES TRIALS
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Population in the Development Area
Purpose:	Range/Forestry Resources of Juba Valley Improved
Description:	Trials will be Conducted in Order to Identify those Species and Varieties that are best Adapted to Local Conditions
Output:	A Trial Concept Elaborated B Possible Species/Varieties Identified for Testing C Seeds Procured D Trial Sites Identified E Required Equipment Specified F Personnel Trained G Trials Implemented and Follow-up Assured
Linkages:	to Upgrading of Nursery Network (RAN 8), Bardheere Research Station (CRO 2), Extension Service (CRO 3) and Range Management (RAN 1,2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 8

Title:	UPGRADING OF NURSERY NETWORK
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Farmers of the Development Area
Purpose:	Range/Forestry Resources of Juba Valley Improved
Description:	Expansion and Improvement of the Existing Nursery Network
Output:	A Present Situation Surveyed B Future Needs Estimated C Requirements for Rehabilitation and Creation of Nurseries Identified D Seed Availability Secured E Resources Provided F Personnel Trained G Newly Created and Rehabilitated Nurseries Operational
Linkages:	to Extension Service (CRO 3), Range Management (RAN 1,2) and Tree Species Trials (RAN 7)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: RAN 9

Title:	SUPPORT TO THE COMMUNITY TREE PLANTING AND DUNE STABILISATION PROGRAMME IN KISMAYO DISTRICT
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Population of Participating Communities in Kismayo District
Purpose:	Wood Production Increased and Duneland Areas Stabilized
Description:	Provision of Additional Physical and Financial Resources to Ongoing Activities in the Fields of Tree Planting and Dune Stabilization in Order to Raise Levels of Performance
Output:	A Requirements for Equipment, Funding and Technical Assistance Assessed B Resources Provided
Linkages:	to Extension Service (CRO 3), Range Management (RAN 1,2), Tree Supply (RAN 7,8) and Environmental Management (ENV 1,3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: FIS 1

Title:	ESTABLISHMENT OF A FISHERIES UNIT
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Fisheries and Marine Resources
Target Population:	Present and Future Fishermen in the Developement Area
Purpose:	Fish Production Increased
Description:	Establishment of a Staff Unit in the Ministry of Fisheries and a Field Station in the Juba Valley for Data Collection/Monitoring of Fisheries Potential along the Total River Course and Provision of Extension Services
Output:	A Data Requirements are Identified B Data Collection Programme Defined C Extension Concept Elaborated D Needs for Organizational Support Determined E Organizational Changes Implemented F Staff Trained G Data Collection and Analysis Carried Out Regularly H Extension Services Provided Regularly
Linkages:	to Fisheries Management Scheme for the Bardheere Reservoir (FIS 2) and Aquaculture Pilot Project (FIS 3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: FIS 2

Title:	ESTABLISHEMENT OF A FISHERIES MANAGEMENT SCHEME FOR THE BARDHEERE RESERVOIR
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Fisheries and Marine Resources
Target Population:	Potential Full or Part-time Fishermen at the Bardheere Reservoir
Purpose:	Fish Production Increased
Description:	Establishment of a Management Scheme to Promote and Organize Rational Use of the Fisheries Potential of the Future Bardheere Reservoir
Output:	A Fish Stock Assessment for the Reservoir Made B Development Concept for Fisheries Elaborated C Requirements for Fisheries Management Identified D Organizational Structure Adapted E Staff Trained
Linkages:	to Establishment of a Fisheries Unit (FIS 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: FIS 3

Title:	AQUACULTURE DEVELOPMENT PILOT PROJECT
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Fisheries and Marine Resources
Target Population:	Population in the Riverine Area
Purpose:	Fish Production Increased
Description:	Implementation of a Pilot Project to Assess and Test Opportunities for Aquaculture Development within Irrigation Schemes and Permanently Flooded Desheks
Output:	A Development Concept for Aquaculture Elaborated B Potential of Transfer of Available Technology Assessed C Acceptable Techniques for the Use of Irrigation Structures (Supply Canals, Water Storage Installations) for Fish Husbandry Developed D Possibilities to Install Fish Ponds within Irrigation Schemes and Permanently Flooded Desheks Assessed E Rural Families for Participation Selected F Pilot Activities Implemented G Staff Trained
Linkages:	to Saakow Deshek Pilot Project (IRR 1), Irrigation Development Planning (IRR 3) and Establishment of a Fisheries Unit (FIS 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IND 1

Title:	AGRO-INDUSTRIAL STUDIES
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Industry
Target Population:	Population of the Study Area
Purpose:	Industrial Output, Employment and Income Increased
Description:	Evaluation of Possibilities for Establishing Small Dairies and Using Surplus Bagasse and Rice Husks
Outputs:	A Feasibility Study for Establishing Small Dairies within the Study Area B Feasibility Study for Utilizing Surplus Bagasse from the Juba Sugar Project for the Production of Charcoal C Feasibility Study for Utilizing Surplus Rice Husks from the Fanoole Rice Mill for the Production of Charcoal or Steam Generation at Mogambo
Linkages:	to Improvement of Existing Irrigation Schemes (IRR 6)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: IND 2

Title:	SMALL-SCALE ENTERPRISE PROMOTION PILOT PROJECT
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Industry
Target Population:	Entrepreneurs and Artisans
Purpose:	Industrial Output, Employment and Income Increased
Description:	Pilot Project in Lower Juba Providing Small Scale Enterprises with Technical and Financial Assistance
Outputs:	A Demand for Technical and Financial Assistance in Lower Juba Determined B Programme for Providing Assistance to those Enterprises with the Greatest Need Designed C Staff Recruited and Trained D Facilities and Operating Budgets Secured E Programme Implemented F Results Evaluated and Recommendations for Follow-up Formulated
Linkages:	to Urban Development Planning (SET 17)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 1

Title:	RESETTLEMENT STUDY
Prepare in:	Ongoing
Implementing Agency:	MJVD
Target Population:	Population Directly Affected by the Creation of the Bardheere Reservoir
Purpose:	Adverse Effects of the Creation of the Bardheere Reservoir on Local Population Mitigated and their Standard of Living in the Long Term Improved
Description:	Preparation of a Study Concerning Resettlement of Local Farmers and Refugees from the Future Reservoir Area to Alternative Sites
Output:	A Extent of Future Water Surface Known B Present Situation Analysed C Resettlement Sites Identified D Resettlement Concept Elaborated E Resettlement Concept Accepted by Relevant Authorities and the Population Concerned
Linkages:	to Bardheere Dam (WAT 1) and Settlement Planning Function (SET 18)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 2

Title:	RESETTLEMENT PROJECT
Prepare in:	Now being Prepared (SET 1)
Implementing Agency:	MJVD
Target Population:	Population Directly Affected by the Creation of the Bardheere Reservoir
Purpose:	Adverse Effects of the Creation of the Bardheere Reservoir on Local Population Mitigated and their Standard of Living in the Long Term Improved
Description:	Resettlement of Local Farmers and Refugees from the Future Reservoir Area to Alternative Sites
Output:	A Resettlement Sites Prepared B Basic Infrastructure Implemented C Population Re-settled D Support Services Set up to Operate on Sustained Basis
Linkages:	to Bardheere Dam (WAT 1) and Resettlement Study (SET 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 3

Title:	CONSTRUCTION OF JILIB - BARDHEERE ROAD
Prepare in:	Preparation Complete, Awaiting Finalization of Financing
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Population of the Development Area
Purpose:	Transport Costs for Target Population Reduced
Description:	Construction of an All-weather Road from Jilib to Bardheere
Output:	A Feasibility Study Prepared (Done) B Tender Documents Prepared (Done) C Construction Works Tendered (Done) D Jilib - Bardheere Road Constructed
Linkages:	to Flood Control and Drainage (WAT 9,10) and Integrated Road Maintenance (SET 8)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 4

Title:	IMPROVEMENT OF MAIN ROADS
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Population of the Development Area
Purpose:	Transport Costs for Target Population Reduced
Description:	Upgrading, Rehabilitation and Construction of National, Regional and District Roads
Output:	A Jilib - Kismayo Road Rehabilitated/Reconstructed B Jilib - Brava Junction as Part of the Jilib - Mogadishu Road Rehabilitated/Reconstructed C Baydhabo - Luuq Road Upgraded D Bardheere - Garbaharey Road Rehabilitated/Reconstructed E Access Road to Dinsor Between Baydhabo - Bardheere Road and Dinsor Upgraded F Dinsor - Saakow Road Constructed G Jilib - Afmadow (- Liboye) Road Constructed H Construction of All-weather Road along the Right Bank of the Juba between Bardheere and Jilib
Linkages:	to Flood Control and Drainage (WAT 9,10) and Integrated Road Maintenance (SET 8)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 5

Title:	CONSTRUCTION/REHABILITATION OF JUBA RIVER BRIDGES
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Population of the Development Area
Purpose:	Transport Costs for Target Population Improved
Description:	Construction and Rehabilitation of Bridges in Connection with the Road Development Programme
Output:	A Bardheere Bridge as Part of the Dam Construction Implemented B Rehabilitation Studies for the Existing Bridges of Luuq, Bardheere, Bu'aale, Kamsuma and Araare Executed C Saakow Bridge Constructed D Based on Recommendations of Studies Bridges Rehabilitated
Linkages:	to River Morphology Study (WAT 3), Flood Control and Drainage (WAT 9,10) and Integrated Road Maintenance (SET 8)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 6

Title:	IMPROVEMENT OF RURAL ROADS
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Rural Population of the Development Area
Purpose:	Transport Costs for Target Population Reduced
Description:	Construction of a Basic All-weather Rural Road Network to Provide Access to Densely Populated Rural Areas with Emphasis on Beneficiaries' Participation in Construction and Maintenance
Output:	A Appropriate Development Concept Known B Implementation Requirements Specified C System Standards Set (incl. Quality Control) D Relevant Organizations/Institutions Strengthened E Development Concept Implemented F Personnel Trained G Maintenance of Works Assured
Linkages:	to Extension (CRO 3), Irrigation Development (IRR 3,4,5), Flood Control and Drainage (WAT 9,10) and Integrated Road Maintenance (SET 8)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 7

Title:	UPGRADING OF PRIMARY ROADS IN URBAN CENTERS
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Urban Population of the Development Area
Purpose:	Living Conditions of Target Population Improved
Description:	Upgrading of Primary Road Networks in Urban Centers
Output:	Approximately 30 km of Additional Primary Roads in Kismayo, Jamaame, Jilib, Bu'aale, Saakow, Bardheere, Luuq, Dinsor and Afmadow Constructed
Linkages:	to Integrated Road Maintenance (SET 8) and Urban Development Planning (SET 17)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 8

Title:	ESTABLISHMENT OF AN INTEGRATED ROAD MAINTENANCE SYSTEM
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Population of the Development Area
Puprose:	Transport Costs for Target Population Reduced
Description:	Establishment of an Integrated Road Maintenance System with Regional and District Maintenance Units for Main, Rural and Urban Roads
Output:	A Appropriate Maintenance Standards for Main, Rural and Urban Roads Developed B Maintenance Programme for each Region and District Elaborated C Organizational Structure Established D Staff Available and Trained E Central Unit in Kismayo Implemented, Equipped for Heavy Repairwork and Periodic Maintenance F Central Unit in Bardheere Implemented, Equipped for Heavy Repairwork and Periodic Maintenance G Sub Units in Each Regional/District Headquarter Implemented, Equipped for Minor Repairwork
Linkages:	to all Road Projects (SET 3,4,5,6,7)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 9

Title:	IMPROVEMENT OF RURAL WATER SUPPLY
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Mineral and Water Resources/Water Development Agency
Target Population:	Rural Settled Population of the Development Area
Purpose:	Health and Living Conditions of Target Population Improved
Description:	Rehabilitation and Extension of Wars and Construction of Dug Wells
Output:	A Existing Wars for Domestic Consumption Equipped with Sandfilters B Wars Partially Covered if Necessary C Dug Wells Constructed D Standard Design for Rural Water Supply Facilities Elaborated Follow-up: E Deep Tubewells Constructed where necessary F Additional Shallow Tubewells in large Beels Constructed G Dug Wells in Secondary Villages Constructed
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 10

Title:	IMPROVEMENT OF KISMAYO URBAN WATER SUPPLY
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Mineral and Water Resources/Water Development Agency
Target Population:	Population of Kismayo
Purpose:	Health and Living Conditions of Target Population Improved
Description:	Rehabilitation and Extension of Existing Water Treatment Facilities and Distribution Network
Output:	A Existing Water Treatment Plant Rehabilitated B Main Supply Pipeline from Yontoy to Kismayo (36 km) Rehabilitated C Distribution Network Rehabilitated (Pipeline Project) D Standard Design for Urban Water Supply Facilities Elaborated
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 11

Title:	IMMEDIATE ACTION FOR DINSOR WATER SUPPLY
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Mineral and Water Resources/Water Development Agency
Target Population:	Population of Dinsor
Purpose:	Health and Living Conditions of Target Population Improved
Description:	The Precarious Supply Situation of Dinsor (high Water Losses through Evaporation and Lack of Filtering) is Improved through Simple and Easily Implementable Techniques (Tempory Measure Awaiting Replacement by Permanent Solution)
Output:	A Evaporation Losses in the Reservoir Reduced through Partial Surface Covering B Existing Concrete Basin Transformed into a Simple Sand Filter C Water Quality Monitored (short term) and Corrective Action (Change of Surface Coverage) taken, if Required D Water Users Instructed Concerning Maintenance E Study for Water Supply of Dinsor Elaborated
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 12

Title:	IMPROVEMENT OF WATER SUPPLY FOR URBAN CENTERS
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Mineral and Water Resources/Water Development Agency
Target Population:	Urban Population of the Development Area
Purpose:	Health and Living Conditions of Target Population Improved
Description:	Construction of Water Supply Facilities for Bardheere and Luuq; Rehabilitation and Extension of Water Supply Facilities in all Other Urban Centers (follow-up)
Output:	A Treatment Plant and Distribution Network in Bardheere Constructed B Tubewells in Luuq Constructed/Rehabilitated C Water Facilities and Distribution Network in all Other Urban Centers Rehabilitated and Extended
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 13

Title:	ESTABLISHMENT OF AN INTEGRATED MAINTENANCE SYSTEM FOR URBAN AND RURAL WATER SUPPLY
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Mineral and Water Resources/Water Development Agency
Target Population:	Settled Population of the Development Area
Purpose:	Health and Living Condition of Target Population Improved
Description:	Establishment of Regional and District Based Maintenance System at Adapted Standards
Output:	A One Central Maintenance Unit in Jilib Implemented and Equipped for Major Repairwork, Replacement of Water Facilities and Periodic Maintenance B Maintenance Units in Each Regional Headquarter Implemented to Execute Minor Repairwork and Replace Typical Spareparts Follow-Up C Central Maintenance Units Implemented in Kismayo and Bardheere, Equipped for Major Repairwork, Replacement of Water Facilities and Periodic Maintenance D Maintenance Units Implemented in all District Headquarters to Execute Minor Repairwork and Replace Typical Spareparts E Mechanics Trained in Simple Maintenance Techniques in Each Beel to Execute Minor Maintenance
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 14

Title:	URBAN AND RURAL SANITATION PILOT PROJECT
Prepare in:	1994 - 1996
Implementing Agency:	MJVD
Target Population:	Settled Population of the Development Area
Purpose:	Health of Target Population Improved
Description:	Implementation of a Study and Pilot Project to Determine the Most Appropriate Techniques and Procedures for Improving Urban and Rural Sanitation
Output:	A Different Low Cost Sanitation Facilities Implemented B Acceptability to Users Tested C Most Suitable Sanitation Facilities Known D System Standards Set E Urban and Rural Sanitation Programme Defined
Linkages:	to Primary Health Care (HEA 1,2), Water Quality Control (WAT 7) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 15

Title:	IMPROVEMENT OF URBAN ELECTRICITY SUPPLY
Prepare in:	1996 - 1998
Implementing Agency:	National Agency for Electric Energy
Target Population:	Urban Population of the Study Area and Large Irrigation Projects
Purpose:	Living Conditions of Urban Population and Production of Large Irrigation Schemes Improved
Description:	Repair, Rehabilitation and Extension of Electricity Distribution Networks and Facilities in the towns of Bardheere, Saakow, Bu'aale, Jilib, Jamaame and Kismayo and Electricity Supply to the Large Irrigation Schemes (Juba Sugar, Mogambo and Homboy)
Output:	A Development Concept Exists - Implementation Requirements Specified - System Standards Set B Organizational Structure Adapted - Job Descriptions and Organigrammes Exist - Resources are Available C Development Concept Implemented - Dev't Concept Adminstratively and Politically Accepted - Implementation Procedures Function D Maintenance of Networks Assured
Linkages:	to Construction of Bardheere Dam including High Tension Distribution Line through Juba Valley (WAT 1), Improvement of Large Irrigation Projects (IRR 6) and Urban Development Planning (SET 17)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 16

Title:	RURAL ENERGY PILOT PROJECT
Prepare in:	1996 - 1998
Implementing Agency:	National Agency for Electric Energy
Target Population:	Population of the Development Area
Purpose:	Energy Supply from Alternative Sources Increased and Costs Reduced
Description:	Implementation of a Programme based on a Pilot Project to Evaluate and Promote Possibilities for Efficient Use of Alternative Energy Sources Supplementing the Limited Power Capacity for Regional Supply from the Bardheere Power Plant (40 MW) with particular Reference to Remote Areas
Output:	A Development Concept Exists - Implementation Requirements Specified - System Standards Set B Organizational Structure Adapted C Development Concept Implemented - Dev't Concept Adminstratively and Politically Accepted - Implementation Procedures Function D Maintenance of Networks Assured
Linkages:	to Range Management (RAN 1,2), Propagation of Stoves (RAN 6) and Environmental Management (ENV 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 17

Title:	PREPARATION OF URBAN DEVELOPMENT PLANS
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Urban Population of the Development Area
Purpose:	Urban Living Conditions Improved
Description:	Preparation of Development Plans for All Primary and Secondary Urban Centers with Highest Priority for Bardheere and Jilib
Output:	A Town Planning Agency Created and Operational B Personnel Available and Trained C Standard Planning Parameters Developed D Legislation Adapted E Development Concept Elaborated F Urban Development Plans Prepared
Linkages:	to Urban Water Supply (SET 10), Urban Roads (SET 7), Urban Electricity Supply (SET 15) and Small-Scale Enterprise Promotion (IND 2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: SET 18

Title:	INTRODUCTION OF SETTLEMENT PLANNING AND DEVELOPMENT AT THE DISTRICT LEVEL
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Public Works and Housing
Target Population:	Settled Population in the Development Area
Purpose:	Settlement Living Conditions Improved
Description:	Introduction of a Planning and Development Function at the District Level
Output:	A Concept of Settlement Planning and Development Introduced at District Level B Organizational Requirements Determined and Approved C Planning and Development Function Established at Bardheere and Jilib D Required Staff Available and Trained E Working Policies and Procedures Defined and Operational F District and Local Decisionmakers Integrated into Planning and Development Function G Plan for Introducing Function in all Districts Prepared and Approved
Linkages:	to Resettlement (SET 1,2), Rural Roads (SET 6), Rural Water Supply (SET 9), Primary Health Care (HEA 1,2), Education (EDU 1,4) and Flood Control and Drainage (WAT 9,10)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: HEA 1

Title:	STRENGHTENING OF THE PRIMARY HEALTH CARE SYSTEM FOR THE SEDENTARY POPULATION
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Health
Target Population:	Settled Population of the Development Area
Purpose:	Health of Sedentary Population Improved
Description:	Implementation of a 'Root Level' Primary Health Care System covering all Settlements in the Juba Valley
Outputs:	A Local/Regional Health Situation Known B Appropriate Service Standards Set C Physical/Organizational Structure Adapted D Appropriate Dev't Concept Known E Physical Facilities Exist F Sufficient and Trained Staff Available G Facilities are Equipped H Facilities are Regularly Supported
Linkages:	to PHC System for Nomadic Population (HEA 2), Referral Hospitals (HEA 3), Nutrition Pilot Project (HEA 4), Integrated Disease and Disease Vector Control (HEA 5), Education (EDU 1,4), Water Supply (SET 9,10,11,12) and Sanitation Pilot Project (SET 14)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: HEA 2

Title:	ESTABLISHMENT OF A PRIMARY HEALTH CARE SYSTEM FOR THE NOMADIC POPULATION
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Health
Target Population:	Nomadic Population of the Development Area
Purpose:	Health of Target Population Improved
Description:	Implementation of a 'Root Level' (Mobile) Primary Health Care System covering Locations/Areas of Concentration of Nomads (Watering Points, Veterinary Stations, Markets etc.) on a Pilot Basis in Middle Juba Region (to be Extended later to all Regions)
Outputs:	A Survey about Socio-Economic Status, Health Attitudes and Diseases of Nomadic Population Planned and Carried out B Based on Survey Results, Concept for Community Based PHC Programme Elaborated and Implemented Including the Following Features: . Contact with Nomadic Tribes and Introduction of the Concept to the Community . Selection of Community PHC Workers, Possibly TBA's and Health Councils . Training of Community Health Workers, TBA's and Health Councils . Essential Drugs and Equipment for Simple Treatment of the Most Common Diseases Handed over to the Community Health Workers . Regular Supervision and Evaluation of the Community Activities Carried out by Health Care Staff . Regular Procurement of Drugs and Equipment for Community PHC Workers assured
Linkages:	to PHC System for Sedentary Population (HEA 3), Referral Hospitals (HEA 3), Nutrition Pilot Project (HEA 4), Integrated Disease and Disease Vector Control (HEA 5) and Education (EDU 1,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: HEA 3

Title:	CONSTRUCTION/REHABILITATION OF REFERRAL HOSPITALS
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Health
Target Population:	Population of the Development Area
Purpose:	Improved Health of Target Population
Description:	Implementation of a Basic Network of Referral Hospitals as specialized Health Care Facilities on Regional Level
Outputs:	A Planning and Construction of a new Hospital in Bardheere (60 beds) Carried out B Planning and Rehabilitation of the Existing Hospital in Kismayo (80 beds) including Outpatient Facilities for Ophtalmology and Dentistry Implemented C Planning and Installation of Equipment Carried out D Personnel Trained E Regular Procurement of Drugs and Laboratory Reagents assured F Referral Facilities (Ambulances) Available G Facilities Regularly Supported
Linkages:	to Primary Health Care System (HEA 1,2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: HEA 4

Title:	NUTRITION PILOT PROJECT
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Health
Target Population:	Population of the Development Area
Purpose:	Nutrition of the Target Population Improved
Description:	Development of a Concept to Improve the Nutritional Status of Children and Women in the Reproduction Age and Integration of Concept into PHC and Education Systems
Outputs:	A Field Organization Set up B Surveys about Food Habits, Food Availability assessment of Nutritional Status of Children and Pregnant Women planned and Carried out C Based on Survey Results, Strategies for Promotion of better Nutrition Worked out and Tested within the Context of the PHC Programme D PHC Personnel Trained in Strategies; Material for Education in Nutrition Designed and Made Available E Continuous Monitoring of Different Concepts with Regular Assessment of Nutritional Status Carried out F Identification of Best Concepts Carried out and Proposed for Further Integration in the PHC Programme
Linkages:	to Primary Health Care (HEA 1,2) and Education (EDU 1,2,4)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: HEA 5

Title:	ESTABLISHMENT OF AN INTEGRATED DISEASE AND DISEASE VECTOR CONTROL PROGRAMME
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Health
Target Population:	Population in the Riverine Area
Purpose:	Health of the Target Population Improved
Description:	Establishment of a Disease and Disease Vector Control Programme Against Malaria, Schistosomiasis and Diarrhoeal Diseases with an Integrated Multisectoral Approach. Regular Inspection of Suitable Habitats for Blackflies and Biomphalaria Pfeifferi
Outputs:	A Field Organisation in Pilot Project Area Set up B Training Material Designed and Available C Personnel Trained D Equipment Obtained and Operational E Surveys Abaout Incidence/Prevalence of Diseases, Socio-Economic Situation and Habits Influencing Health Planned and Carried Out in Pilot Area F Based on Surveys Design of an Integrated Pilot Disease and Vector Control Programme in Close Cooperation with Services and the Communities Involved Completed G Integrated Pilot Disease Vector Control Programme Implemented H Different Combinations of Control Measures Evaluated and, if Necessary, Replanned and Tried out Again I Ongoing Monitoring of Vector Density, Vector Habitats, Prevalence of Diseases Carried out J Surveys in Districts Outside the Pilot Project Area About Incidence/Prevalence of Diseases, Vectors and Vector Habitats for Collection of Baseline Data which are Necessary for Expansion of the Programme to Other Areas Implemented K Extension of the Most Cost Effective Control Combinations, Identified in the Pilot Project, to Other Areas of the Juba Valley Carried out L Regular Inspection of Spillway of Fanoole and Bardheere Dam for Blackflies and Suitable Habitats for Biomphalaria Pfeifferi Done
Linkages:	to PHC System (HEA 1,2), Referral Hospitals (HEA 3), Flood Control and Drainage (WAT 9,10) and Irrigation Development (IRR 3,4,5,6,7)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: EDU 1

Title:	STRENGTHENING OF PRIMARY EDUCATION
Prepare in:	1992 - 1994
Implementing Agency:	Ministry of Education
Target Population:	School Age Sedentary Population of the Development Area
Purpose:	Educational Standard of Target Population Improved
Description:	Strengthening of a "root-level" Programme of Primary Education
Outputs:	A Educational Situation Analysed B Appropriate Development Concept Known C Implementation Requirements Specified D System Standards Set E Primary Educ. Dept. of MoE Strengthened F Standard Design Criteria for Physical Facilities Developed G Facilities Constructed/Rehabilitated H Curriculum Development Center of MoE Supported for Producing and Distributing Text Books I Equipment and Teaching Material Supplied Regularly J Teachers Trained and Supported
Linkages:	to Primary Health Care (HEA 1), Nutrition Pilot Project (HEA 4) and Integrated Disease and Disease Vector Control (HEA 5)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: EDU 2

Title:	STRENGTHENING OF SECONDARY EDUCATION
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Education
Target Population:	Actual and Future School Age Population of the Development Area
Purpose:	Educational Standard of Target Population Improved
Description:	Existing Secondary Schools in Development Area Rehabilitated, Concepts Elaborated, Ministry Strengthened and Improvements Implemented
Outputs:	A Requirements for Secondary Education Updated B Development Concept Adapted C System Standards Set D Implementation Requirements Specified E Department for Sec. Education of MoE Strengthened F Curriculum and Teaching Aids Developed/Adapted G Equipment and Teaching Material Regularly Supplied H Teachers Trained and Supported
Linkages:	to Primary Health Care (HEA 1), Nutrition Pilot Project (HEA 4) and Integrated Disease and Disease Vector Control (HEA 5)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: EDU 3

Title:	ESTABLISHMENT OF SKILL UPGRADING AND TRAINING CENTER
Prepare in:	1996 - 1998
Implementing Agency:	Ministry of Education
Target Population:	Persons already Engaged or Intending to Engage in Manufacturing/Crafts in the Development Area
Purpose:	Technical Skills of Target Population Improved
Description:	Establishment of a Vocational Training Center in Jilib as an Interregional Facility for the Improvement of Technical Skills
Outputs:	A Requirements for Vocational Training Defined B Development Concept Elaborated C System Standards Set D Implementation Requirements Specified E Department for Vocational Training of Ministry of Industries Strengthened F Teaching Programme and Teaching Aids Developed G Facilities Constructed and Equipped H Equipment and Teaching Material Regularly Supplied I Teachers Trained and Supported
Linkages:	to Large Irrigation Schemes (IRR 6) and SSE Promotion (IND 2)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: EDU 4

Title:	IMPROVEMENT OF NON-FORMAL EDUCATION
Prepare in:	1994 - 1996
Implementing Agency:	Ministry of Education
Target Population:	Adult Population of the Development Area
Purpose:	Educational Standard of Target Population Improved
Description:	Extension and Strenghtening of the (existing) Family Life Education Programme and Adult Education Courses (Evening Classes) on Village Level and Implementation of Regional Adult Literacy and Skill Training Centres
Outputs:	A Requirements for Non-Formal Education Updated B Development Concept Adapted C System Standards Set D Implementation Requirements Specified E Department for Non-Formal Education of MoE Strengthened F Curriculum and Teaching Aids Developed/Adapted G Equipment and Teaching Material Regularly Supplied H Teachers Trained and Supported
Linkages:	to Primary Health Care (HEA 1), Nutrition Pilot Project (HEA 4), Integrated Disease and Disease Vector Control (HEA 5), Education (EDU 1,2,3)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ENV 1

Title:	ESTABLISHMENT OF A JUBA VALLEY ENVIRONMENTAL MANAGEMENT UNIT
Prepare in:	1990 - 1991
Implementing Agency:	MJVD
Target Population:	Population of the Development Area
Purpose:	Environmentally Sound Development Assured
Description:	Establishment of an Environmental Management Unit to Formulate Policy, Collect and Collate Relevant Data and Information on Environmental Issues and Enforce Environmentally Sound Development Standards
Outputs:	A Requirements for Monitoring Identified B Monitoring Parameters defined C Monitoring Methods Identified D Monitoring Sites Identified E Coordination Links Established F Monitoring Procedure Established G Personnel Trained
Linkages:	to all Relevant Institutions and Programmes

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ENV 2

Title:	CREATION OF A MONITORING CENTER FOR JUBA VALLEY FOREST AND RANGELAND
Prepare in:	1990 - 1991
Implementing Agency:	Ministry of Livestock, Forestry and Range/National Range Agency
Target Population:	Population of the Development Area
Purpose:	Environmentally Sound Development Assured
Description:	Establishment of a Monitoring Center for the Provision of Reliable Information on Trends and Constraints as a Basis for the Formulation of Guidelines for Improved Range/Forestry Management
Output:	A Permanent Monitoring Sites Selected and Marked B Monitoring Procedure Identified C Appropriate Organizational Structure Defined D Personnel Trained E Monitoring Center Operational
Linkages:	to Central Environmental Management Unit (ENV 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ENV 3

Title:	INTRODUCTION OF REMOTE SENSING ANALYSIS FOR ENVIRONMENTAL MONITORING
Prepare in:	1990 - 1991
Implementing Agency:	MJVD
Target Population:	Population in the Development Area
Purpose:	Environmentally Sound Development Assured
Description:	Introducing the Analysis of Computerised Landsat MSS Multispectral Satellite Images as an Elementary Tool for Environmental (and Land Use and Vegetation) Monitoring
Outputs:	A Requirements for Analysis and Monitoring Identified B Computerised Images Procured and Processed C Ground Control Executed D Data Bank Structure Identified E Long Term Monitoring Procedures Identified F Coordination Links Established G Personnel Trained
Linkages:	to Central Environmental Manangement Unit (ENV 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ENV 4

Title:	EXTENSION OF RAINGAUGE NETWORK
Prepare in:	1990 - 1991
Implementing Agency:	MJVD
Target Population:	Population of the Development Area
Purpose:	Environmentally Sound Development and Improved Flood Warning Assured
Description:	Extension of the Existing Raingauge Network to Improve Knowledge about Climate in Development Area and Flood Warning System
Output:	A Existing Raingauge Network Assessed B Future Needs Estimated - Required Equipment Specified - Additional Sites Identified C Equipment Provided and Set Up D Personnel Trained E Rainfall Data Regularly Collected and Processed F Link to Flood Warning System Institutionalized
Linkages:	to Central Environmental Management Unit (ENV 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ORG 2

Title:	STAFF DEVELOPMENT AND MANAGEMENT LEVEL STAFF TRAINING
Prepare in:	Ongoing
Implementing Agency:	MJVD
Target Population:	Staff of MJVD
Purpose:	Institutional Coordination of Juba Valley Development Improved
Description:	A Training Programme is Executed for High and Medium Level Technical and Managerial Staff of MJVD
Output:	A According to Job Descriptions and Responsibilities and Considering Qualification of Staff, Necessary Training Measures are Identified B A Comprehensive Training Programme is Formulated C Training Programme is Implemented Continously D Trainees are on the Job According to Schedule
Linkages:	to Strengthening of MJVD (ORG 1)

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ORG 1

Title:	STRENGHTENING OF MINISTRY OF JUBA VALLEY DEVELOPMENT
Prepare in:	Ongoing
Implementing Agency:	MJVD
Target Population:	Staff of MJVD
Purpose:	Institutional Coordination of Juba Valley Development Improved
Description:	Strenghtening of MJVD so that it is Sufficiently Equipped to Effectively Initiate, Control, Negotiate, Finance, Administer and Monitor Juba Valley Development
Output:	A Functions and Responsibilities are Defined and Politically Accepted B A Structure is Defined with Job Descriptions, Lines of Command and Reporting Lines C The Organisation is Appropriately Staffed D The Organisation Disposes of the Necessary Authorities for: . Definition of Functions, Checking Duplications . Establishment of Structure with Involvement of Admin./Political Level . Staff Requirements, Staff Allocation, Definition of Power Requirements E The Organisation Develops Field Level Organisations F Necessary Legislative Modifications (e.g. Equitable Land- and Water Rights) are Prepared and Implemented under MJVD Guidance G Law Enforcement Mechanisms are Established and Function H Private Initiative is actively Encouraged in those Fields, where it is Considered Important I Marketing Support, Pricing, Credit and Input Supply Mechanisms are Reviewed and Modified for Improved Impact on Development Including Sustained (recurrent) - Foreign and Local Budget Allocations J Active International Market Exploration is Undertaken Continously and Results are Followed up for Effective and Reliable Export Marketing K Target Group Participation is Actively Sought and Encouraged, Particularly the Creation of Water User Groups L Environmental Management and Monitoring is Structurally Integrated in the CMO M Particular Emphasis is Given to the Aspect of Sustained Operation and Maintenance Management at all Levels and in all Sectors
Linkages:	to all Implementing Agencies and Development Proposals

Profile of Proposed PROGRAMME PROJECT MEASURE CODE: ORG 3

Title:	INTRODUCTION OF DISTRICT PLANNING
Prepare in:	1990 - 1991
Implementing Agency:	MJVD
Target Population:	Central (MJVD), Regional and District Administrative Government Staff
Purpose:	Coordinated Juba Valley Development
Description:	Introduction of District Planning initially by Central, then Regional and finally by District Staff
Output:	A Concept of Planning and Development Introduced at District Level B Organizational Requirements Determined and Approved C Planning Function Established at MJVD D Required Staff Available and Trained E Working Policies and Procedures Defined and Operational F District and Local Decisionmakers Integrated into Planning Function G Plan for Introducing Function to Regions and Districts Prepared and Approved
Linkages:	to Strengthening of MJVD (ORG 1)