JAMHUURIYADDA DIMOQRAADIGA SOMAALIYA
WASAARADDA BEERAHA
SOMALI DEMOCRATIC REPUBLIC
MINISTRY OF AGRICULTURE

DARA SALAAM BUSLEY AGRICULTURAL DEVELOPMENT PROJECT

Main Report

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ABBREVIATIONS FREQUENTLY USED IN THE REPORTS

AFMET	Agriculture, Farm Management Extension and Training Project
API	Aerial photographic interpretation
CARS	Central Agricultural Research Station - Afgoi
CIF	Carriage, insurance and freight
CSB	Commercial and Savings Bank
DLF	Development Loan Fund
EAA	Euro Action Acord
EC	Electrical conductivity
ECU	European Currency Unit
EDF	European Development Fund
ENB	National Banana Board or Ente Banane
FAO	Food and Agriculture Organization, United Nations
FOB	Free on board
HASA	Hides and Skins Agency
HTS	Hunting Technical Services Limited
GOS	Government of Somalia
GTZ	German Technical Aid
id	Internal diameter
IRAS	Inter-Riverine Agricultural Study
IRR	Internal rate of return
JSP	Juba Sugar Project
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association (of the IBRD)
ILCA	International Livestock Centre for Africa
IMF	International Monetary Fund
ITCS	Inter-Tropical Convergence Zone
MLFR	Ministry of Livestock, Forestry and Range
MMP	Sir M. MacDonald & Partners
MOA	Ministry of Agriculture
NCA	Net cultivated area
NFMAS	National Farm Machinery and Agricultural Service
NTTCP	National Tsetse and Trypanosomiasis Control Project
ODA	Overseas Development Administration, British Government
ONAT	Former name of NFMAS
SACA	Societa Azionari Concessionari Agricoli de Genale
SAR	Sodium adsorption ratio
SC	Specific capacity
SDB	Somali Development Bank
SoSh	Somali Shilling
SY	Specific yield
TOR	Terms of Reference
UNCDF	United Nations Capital Development Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture

SPELLINGS OF PLACE NAMES

Throughout the report Somali spellings have been used for place names with the exception of Mogadishu and Afgoi where the English spelling has been used. To avoid misunderstanding, we give below a selected list of Somali, English and Italian spellings where these differ.

Somali	English	Italian
Afgooye	Afgoi	Afgoi
Aw Dheegle	-	Audegle
Balcad	Balad	Balad
Baraawe	Brava	Brava
Buulo Mareerta	Bulo Marerta	Bulo Mererta
Falkeerow	-	Falcheiro
Gayweerow	-	Gaivero
Golweyn	-	Goluen
Hawaay	Avai	Avai
Janaale	Genale	Genale
Jelib	Gelib	Gelib
Jowhar	Johar	Giohar
Kismaayo	Kisimaio	Chisimaio
Marka	Merca	Merca
Muqdisho	Mogadishu	Mogadiscio
Qoryooley	-	Coriolei
Shabeelle	Shebelli	Scebeli
Shalambood	Shalambot	Scialambot

GLOSSARY OF SOMALI TERMS

Cambuulo	-	Traditional dish of chopped boiled maize with cowpeas or green grams
Chiko	-	Chewing tobacco
Der	-	Rainy season from October to December
Dharab	-	Five jibals or approximately 0.31 ha
Gu	-	Rainy season in April and May
Hafir	-	Large reservoir on farms for storing water for use in dry periods
Haagai	-	Climatic season June to September characterised by light scattered showers
Jibal	-	Area of land approximately 25 m by 25 m or 0.0625 ha
Jilaal	-	Dry season from January to April
Kawawa	-	Two-man implement for forming irrigation borders
Quintal		Unit of weight measurement equivalent to 100 kg
Uar	-	A stock watering pond
Yambo	-	Small short-handled hoe
Zareebas	-	Thorn stock pen

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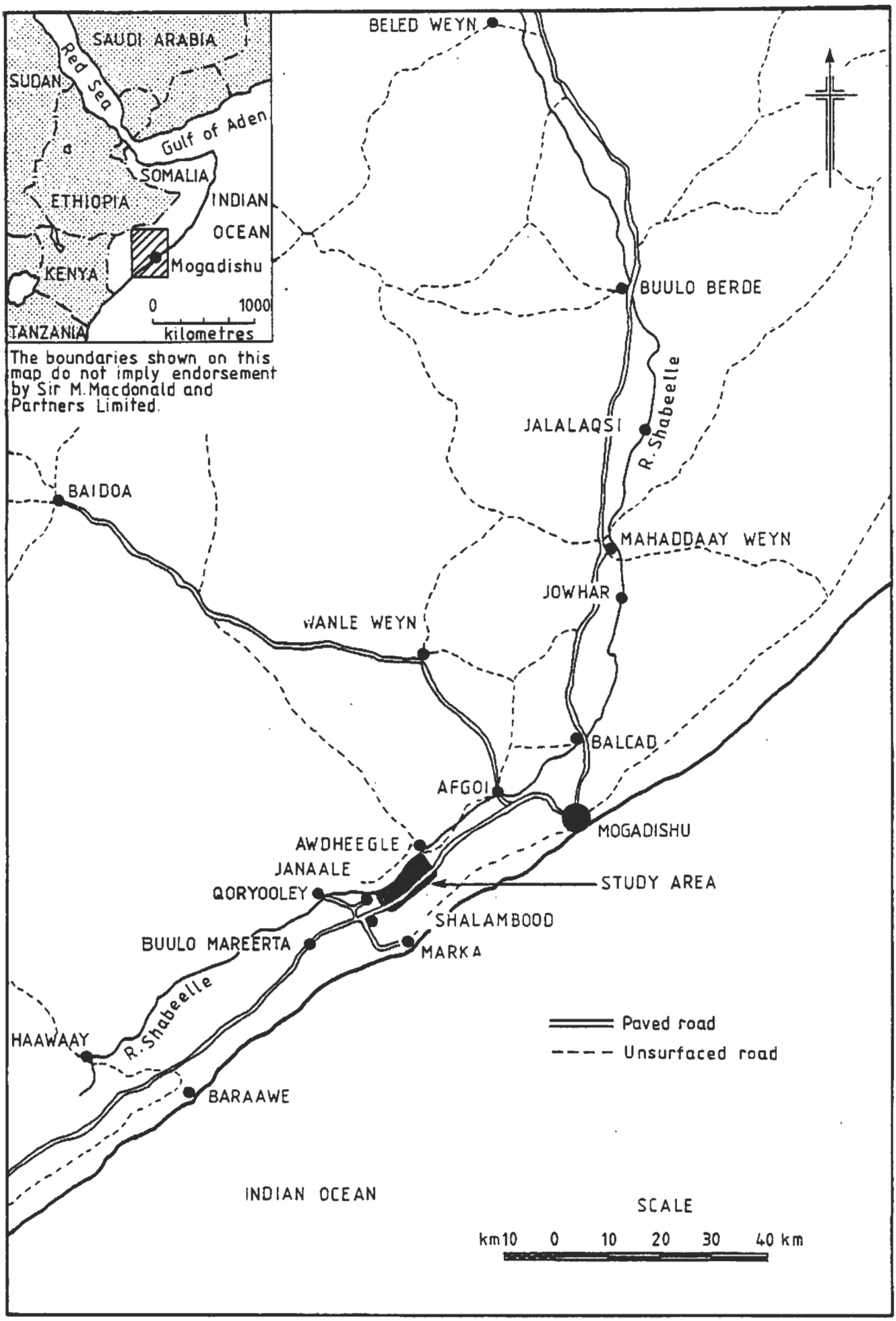
Location of the Study Area



EXECUTIVE SUMMARY

1. The Project's Place in the Sector

Somalia intends to increase its arable crop production, ultimately to attain self-sufficiency in cereals (except in wheat which cannot be grown in the country economically), decrease its import requirements of vegetable oils, become self-sufficient in cotton lint and exploit a potential export market in the Gulf and Saudi Arabia for water melons. The proposed project area has been found in the course of this study to be potentially suitable to further this overall objective: in most features it is similar, or better, than nearby areas where development projects have successfully increased agricultural production.

On the livestock side - the most important part of Somalia's agricultural sector - further increase in numbers may not be possible because the stocking rate on the ranges is most probably at, or in years of poor rainfall beyond, its limit. Therefore the only way to increase offtake rates is to reduce deaths of young and mature animals by appropriate disease control and other husbandry measures and to ensure that the survivors are economically utilised.

2. Other Donors' Relevant Activities

Major activities by other donors likely to have a significant impact on the stated objectives are the following:

(a) The World Bank, in many cases in association with the African Development Fund, in addressing major policy issues in the sector which hitherto have hindered smooth development. Its Agricultural Adjustment Programme is of particular relevance in this context. Several specific agricultural development projects supported by the Bank, and focussed specifically on institution building contribute towards policy changes perceived to be desirable.

(b) The German Technical Co-operation Agency (Gesellschaft fuer Technische Zusammenarbeit - GTZ) is strengthening the Ministry of Agriculture's project planning and monitoring and evaluation capability; it supports a project to train animal health and animal husbandry staff, and also several others.

(c) The United States' Agency for International Development (US AID) contributes to projects, investigations and institution building: the most significant in this connection is the recently approved Shabeelle Water Management Project.

(d) The British Government's Overseas Development Administration is assisting with tsetse fly and trypanosomiasis control and forestry research.

Under the proposed project it is intended to train animal husbandry staff at the GTZ facility; the tsetse control project will lessen, and eventually eliminate, trypanosomiasis in the project area. The policy adjustment programmes and institution-building schemes would further benefits to the project area's population.

3. Project Objectives

The project would increase the production of maize, sesame, cotton, tomatoes, water melons and other minor vegetable crops; it would increase the number of marketable livestock and the output of livestock products. It would preserve and assure the continued contribution of an important last-resort dry-season livestock grazing area used by nomadic stockowners.

The project is located on the left bank of the Shabeelle river in an area where no organised special development has taken place before. The primary target groups are the area's small farmers (operating on less than about 2 ha) who cannot themselves mobilise resources for development. Owners of the larger holdings, with similar natural resources, have attempted improvements without professional guidance; they, too, would benefit from the project by more readily available professional development advice. Farmers in the target group are aware of the need, and likely benefits, of some of the components; other components are concepts with which they are not familiar but are likely to take up and adopt once their benefits are demonstrated.

Post-implementation management is designed to rely on existing village and local government organisations, which have an established record of successful functioning.

4. Project Details

4.1 The Project Area

The project area is some 60 km south of Mogadishu. It extends to about 22 000 ha, of which 16 500 ha are rangeland, forest and swamp, 1 150 ha grow rainfed crops, 4 400 ha are seasonally flood irrigated. The farming population of 11 000, out of a total of about 16 000, lives in 40 villages in or near the project area. They own some 23 000 head of cattle, besides sheep, goats, donkeys and poultry. An additional large number of animals, belonging to kinsmen, enter the area in the dry, jilaal, season and rely heavily on the swampy part of the project area for their survival.

4.2 Project Details

The project would improve the irrigation system with provision of water control structures thus reducing conveyance losses; construct roads; provide stores for inputs and outputs; improve a school and build project headquarters and livestock treatment centres. It would increase tillage and canal clearing machinery available to farmers and canal committees, provide technical and material assistance successfully to grow high value crops; ensure the continued effectiveness of the last-resort dry season grazing area and provide stock watering points at several convenient locations to minimise the need to trek to the river. All farmers, but particularly those on rainfed lands and therefore not in a position to spend as much as the irrigators on weed control, would benefit from the introduction of animal traction for weeding. Shelterbelts and village fuelwood lots would be established and convenient, hygienic drinking water facilities would be created.

The project would be constructed by local contractors; it is not expected that internationally operating firms would be involved. Offshore purchases would be by normal CEC tendering procedures.

Final design, construction supervision and quality control would be with a project management organisation who would also operate a revolving credit fund to finance long-term investments. Project management, along with other regional institutions, would operate the technical support and assistance required for successful implementation and the realisation of project benefits.

4.3 Costs and Financing

Total project costs amount to about ECU 9.35 million, of which about ECU 0.79 million are provisions for inflationary price escalations. Implementation would be over five construction seasons (November to March); a 6-month final preparation period would precede the first season.

The CEC funding would be a non-repayable grant. It is, however, expected that once the project works are fully utilised by benefiting farmers, they would pay the project's operating and maintenance costs. These are estimated at about SoSh 335 per hectare for the total project area, or SoSh 1 300 per hectare of cultivated area. The upkeep and operation of field irrigation works is estimated at about SoSh 525 per hectare, or labour in lieu. Calculations show that once project benefits are realised, farmers can afford to pay these charges and still enjoy a substantially increased income.

The CEC have indicated that they propose to allocate 7 million ECUs for this project. Proposals are outlined in Section 4.6 of this report on how this target figure might be achieved.

4.4 Impact of the Project

Project benefits would be a sizeable yield increase on both irrigated and rainfed land, increase in cropping intensities and, through increase of water use efficiencies, in the area annually irrigable. When all project works and with-project development are completed the increase in irrigable area is expected to be about 600 ha. The main beneficiaries will be the small-scale operators whose income would, as a result of project impact, rise above the poverty level.

The economic rate of return is estimated to be about 12%. Since only 75% of project costs would be covered by the CEC grant, full implementation would require additional funding if the proposed project was to be fully implemented, this would have budgetary implication for GOS; post-implementation maintenance and operation would be either by direct labour contributions by the irrigators (as at present) or covered by a development charge which, in view of the beneficiaries' increased income can be covered without impairing their incentive to exploit the improved environment.

4.5 Environmental Impact

Any likely adverse environmental impact has been cushioned by planned operational and management procedures, at present only outlined but eventually to be defined in detail by the technical assistance personnel (see Section 4.7). Potential issues under consideration are malaria and bilharzia control, trypanosomiasis and the risk attached to uncontrolled pesticide usage.

4.6 Replicability

The personnel involved in execution management of the project would be trained to design and implement similar projects.

4.7 Technical Assistance

The project would require a total of about 87 man-months of outside expertise, to assist and train Somali technicians in project management, design, quality control and other aspects that may arise, for which a contingency resource of 10 man-months have been allocated. Independent financial control will require 5 man-months, which is included.

4.8 Terms of Reference

The Terms of Reference under which this study has been prepared are shown as Appendix I.

CHAPTER 1

COUNTRY AND SECTOR REVIEW

1.1 Country Background

Somalia is located in the north-eastern corner of Africa, bordered by Ethiopia and Kenya to the west and south, and the Gulf of Aden and the Indian Ocean to the north and east. The coastline is about 3 300 km, and the land area about 64 million ha. The topography is varied: it includes hot and arid coastal plains, rugged mountains and plateaux, and lowlands of varying fertility and rainfall. About 29.9 million ha (47% of the total) is classified as agricultural area, of which 28.8 million ha is devoted to permanent pasture and 1.1 million ha is used for crop production. Of the latter area, some 50 000 to 100 000 ha along the Shabeelle and, to a lesser extent, the Juba rivers benefit from largely seasonal flood irrigation with low water use efficiency. Of the remaining land area 8.6 million ha (13% of the total) comprises forests and woodlands; 25.5 million ha (40% of the total) is generally unsuitable for agricultural activities.

In 1985 the population was estimated by the Government of Somalia (GOS) to be 5.8 million, growing at 3.1% per annum, plus some 500 000 to 700 000 refugees. Per capita income in 1985 was estimated to be about US $260 equivalent, giving a total national income of about US$1.7 billion. About 60% of the labour force are nomads and semi-nomads who depend on livestock for their subsistence; about 20% are farmers cultivating land along the Shabeelle and Juba rivers and in the higher rainfall Bay, North-West and Awdal Regions; the remainder (20%) are urban dwellers.

Somalia is among the poorer countries of the world with a hostile physical environment and scattered population. It has poor communications; the physical and institutional infrastructure need considerable strengthening.

1.2 The Agriculture Sector

1.2.1 Performance

The agriculture sector - crops, livestock, forestry and fishing - contributed over 50% of total gross domestic product (GDP) during the period 1970 to 1985. Of this, in 1985, livestock accounted for 39%, crop production 12%, forestry 5% and fisheries less than 1%. During the 1970s, agricultural production stagnated and crop production declined, so that by 1979 annual production was some 15% less than in 1970. Production, especially of crops, improved dramatically in the 1980s, although not sufficiently to recoup the declines in per capita food production experienced in the 1970s. Crop production improvement was mainly due to area expansion, followed by deregulation of the grain market and the resulting significant increases in producer prices.

Primary commodities account for virtually all merchandise exports. In 1982, the peak export year, livestock products accounted for 82% of exports, bananas 10% and fish, frankincense and myrrh for the remainder. Livestock exports have since declined to about 70% of total due to a ban on cattle exports to Somalia's main market in Saudi Arabia. However, the value of banana exports has been maintained and new market prospects for cattle are appearing in Egypt.

1.3 Policy Issues

The main issues in the agricultural sector are:

(a) price policy and marketing;
(b) public investment and public enterprises;
(c) rural finance;
(d) input supply;
(e) research and extension.

The first four issues are being addressed by the Government with support, inter alia, from the Agricultural Sector Adjustment Program financed by the International Development Association (IDA) and the Special Facility for Africa. Research and extension are being addressed under projects financed by IDA and other donors.

The World Bank's Agricultural Sector Survey examines these issues and highlights the new directions in which Somalia's agriculture sector is moving. These include changes towards a more mixed economy, liberalization of internal marketing for many crops and of foreign exchange controls, major devaluations in real terms of the Somali Shilling which have brought many internal prices closer in line with world prices; and consideration by Government of divesting the public sector of some enterprises or of converting them to commercial or joint ventures. The results of the changes have been on balance very positive which, together with favourable weather until 1986/87, has led to sharp increases in food production, declines in food import requirements, and attraction of private individuals to production and service activities in agriculture. The 1987/88 gu (first crop) season, although the rains came late - disastrously late for some parts of the country - has nevertheless got off to a reasonable start and it seems that the momentum of progress will be maintained.

1.4 Resources for Agricultural Production

Although Somalia possesses abundant land relative to its small population, low and variable rainfall places considerable constraints on both livestock and crop production. Low rainfall also dictates that livestock production, mainly by nomads on rangelands, dominates the sector. The range areas are considered to be stocked at or near the limit of their carrying capacity. The number of nomads who leave the rangelands to take up settled agriculture or move into the growing towns is evidence of this pressure.

Only two areas have enough rain (400 to 600 mm per year, falling in two seasons) for rainfed agriculture to be at all reliable: a small area in the north-west and a larger area between the Juba and Shabeelle rivers in the south which also includes the proposed project area. Rainfed crop production has always been hazardous, with failure due to drought a constant threat. The most reliable crop production comes from the irrigated or seasonally flooded lands. There is considerable potential to be developed from irrigation rehabilitation on the Shabeelle river, and from the longer term development possibilities on the Juba river based on construction of the Bardheere dam.

Sorghum, mostly grown away from the river valleys under rainfed conditions, and maize, mostly irrigated and usually grown in the river valleys, are the main cereal crops, followed by sesame and pulses. Bananas are the main export

crop. Production and marketing are well organised by a joint Government/ Italian fruit company venture (Somalfruit). Other cropping enterprises of note are selected horticultural crops with expanding production for the local market and for export markets in the Gulf (notably water melons); two sugar estates and at present limited but potentially promising rice production. Growth of the agricultural sector will largely depend on growth of crop production. The crops subsector has benefited from extension work in the past and will require even better extension in the future.

1.5 Inputs and Credits

So far pesticides and fertilisers have played only a small role in smallholder crop production. However, due to good financial returns, demonstrated by extension work, there is increasing demand for seed dressing and stem borer control chemicals and a slightly slower growing, and to date not so well proven, demand for fertilisers, mostly in the irrigated areas. Stocks of chemicals are of low quality; some are time expired. Private traders are now making some progress in entering the inputs supply market. There have also been urea shortages, due to an import ban to protect the local factory, coupled with temporary production problems at the factory.

Of the main crops, to date there is a successful improved variety only for irrigated maize. An FAO sponsored seed production unit provides maize seed supplies but not enough to meet the full demand. Fortunately the improved variety is a synthetic which breeds true and therefore can be distributed from farmer to farmer with only minor reduction in yield potential.

Institutional credit for agriculture is provided through the Commercial and Savings Bank of Somalia (CSBS), which is responsible for seasonal credit, and the Somali Development Bank which is responsible for development credit. The latter bank, confined to the main urban centres, has done little agricultural business. Limited credit availability has not proved an important production constraint in the past, and the greater use of purchased inputs will most probably depend more on their ready availability than on farmers' access to credit. However, due to improved farming practices, some growth in demand for seasonal credit can be expected which is likely to be used for paying seasonal labour required for weeding as well as for purchased inputs. The CSBS is well placed to serve the farming community, but has been cautious about lending to farmers to date, particularly to smallholders, mainly because many farmers cannot produce title documents to their land; land being the only acceptable security. CSBC's own limited efforts have been reinforced by the Seasonal Credit for Small Farmers Project, funded by the United Nations Capital Development Fund. Coverage has reached 5 000 farmers with holdings less than 5 ha, who cultivate 14 000 ha in the Shabeelle valley, and is expanding. One of the project area's villages, Dara Salaam, is a major borrower, with an excellent repayment record. Results so far are encouraging, with the overall repayment rate better than 90%. Support is expected to continue beyond the 1989 closing date of the credit project.

1.6 Agricultural Extension

The Ministry of Agriculture (MOA) is responsible for extension. The Agricultural Farm Management Extension and Training (AFMET) projects, supported by two IDA credits, have established a service that covers eight of ten regions in which arable agriculture is important. The Training and Visit (T&V) extension system has been introduced. It encompasses regular advisory visits to farmers, widespread demonstration programmes and frequent intensive

staff training. In general, AFMET has succeeded in gaining the confidence of farmers in the project area and in demonstrating practices that result in profitable yield increases. Shortcomings include inadequate research and research/extension linkages, and the limited availability of trained manpower. The proposed Dara Salaam-Busley Agricultural Development project would augment ongoing efforts in the project area to assist with these problems.

1.7 Agricultural Research

The extension service depends on effective research to identify technology to convey to the farmers. Therefore, the status of research is of key relevance. The International Service for National Agricultural Research has conducted a detailed study of national research requirements in 1984. Plans for developing agricultural research in Somalia have been based on the recommendations of that study.

The Agricultural Research Institute (ARI) of the Ministry of Agriculture is responsible for crop production research: the Ministry of Livestock, Forestry and Range handles livestock research. The Agricultural Faculty of the Somali National University in Afgoi also conducts research. The Bonka Research Station near Baidoa, which is a component of the Bay Region Area Development Project (BRADP) conducts, inter alia, important research work on animal traction, which will be of particular relevance to the proposed Dara Salaam Busley Project.

The research programmes generally reflect correct priorities for improving crop production in the major arable areas: they concentrate on agronomy and plant protection work. The importance of water management and salinity control in irrigated areas, and of water conservation in rainfed areas, is now well understood. The most notable success, which is having a major impact on the economy, is the irrigated maize package, which consists of an improved variety and agricultural pratices developed by the Central Agricultural Research Station (CARS) and field tested and verified by extension. In rainfed areas, success has been confined to techniques of moisture conservation.

ARI is responsible for CARS (Afgoi) and for three regional stations. The stations adequately cover the main arable areas in Somalia. However, coordination is needed to ensure that adequate research/extension linkages are maintained; problems identified by the extension service are adequately addressed by research; and reports of results are freely available to other research workers and extension staff. It is expected that the Shabeelle Water Management Project, recently agreed between USAID and GOS, will go a long way to fill the need: it has a component for irrigated agricultural research and considerable technical support to develop it. The IDA-supported AFMET II project is also addressing the issue.

1.8 Other Donors' Relevant Activities

The World Bank, in many cases in association with the African Development Fund (ADF) is addressing major policy and organisational issues in its Agricultural Adjustment Programme. The Bank is also a lead agency in rationalising civil service staffing and renumerations, which are the key to motivated efficient project management. It is supporting or planning to support several rainfed and irrigated agricultural development projects, including the AFMET project. All these would have major direct and indirect impacts on the proposed project.

The United Nations Capital Development Fund (UNCDF) and the CEC's Agricultural Credit Projects, with their production credit support, fill the need for short-term credits.

The German Technical Cooperation Agency (GTZ) is strengthening the MOA's planning and monitoring and evaluation capability, both of which would materially assist direction and control of planned and on-going projects. It is also running a livestock assistants' training course as part of the Central Rangelands Project.

The British Overseas Development Administration (ODA) is financing a Forestry Research Project and a Trypanosomiasis Control Project, both of which have important technical implications to proposed development work in the project area.

Other agencies, notably USAID, are contributing significantly to projects, specific investigations and institution-building within MOA, all of which will contribute not only to increased food supplies but, perhaps more importantly, to institution building, staff training and the supply of vital production information, e.g. FAO's fertiliser trials on farmers' fields, conducted through AFMET.

CHAPTER 2

THE PROJECT AREA

2.1 Location

The project area is located between latitude 1°46' and 1°58' N and longitude 44°43' and 44°55' E (see frontispiece). Altitude is between 60 and 80 m above sea level. It is roughly rectangular in shape, about 26 km long and on average 10 km wide. Its boundaries are the Shabeelle river on the north-west and the coastal sand dunes on the south-east. The Mogadishu - Kismaayo road traverses the area roughly parallel with the line of the sand dunes, some 2 to 3 km away from them. Boundary points on the road are at km 59 and km 83. The north-eastern boundary is a line connecting km 59 with Aw Dheegle on the Shabeelle; the south-eastern boundary, at km 83, is the line marked by the end of the command of the controlled canals offtaking from the Janaale barrage.

Figure 2.1 shows the area and location of the principal settlements within and near the proposed project area. Administratively the project area lies in the Lower Shabeelle Region, divided about equally between Marka and Afgoi districts. Major towns of administrative importance to the area are Janaale and Shalambood, both just outside the project area. Shalambood is the headquarters of the Regional Governor as well as of ONAT, the tractor and machinery hire agency, Somalfruit, the export buyer for melons and bananas, and of the ADC.

The project area extends to a gross 27 500 ha. However, about 5 400 ha (gross) have been taken out for a plantation to provide firewood for Mogadishu, which was planned to be developed by the National Range Agency (NRA) of the Ministry of Livestock, Forest and Range (MLFR). However, by September 1987 there were some doubts whether NRA will proceed with its plans. The remaining area is approximately divided as follows (hectares).

Irrigated farmland :	perennial irrigation	115	
	flood irrigation	4 385	
	rainfed cultivation	1 150	
Total farmed area			5 650
Rangeland			14 010
Dense bush			900
Permanent swamp			1 310
Villages, roads, waste			265
Total			22 135

2.2 Physical Resources

2.2.1 Soils

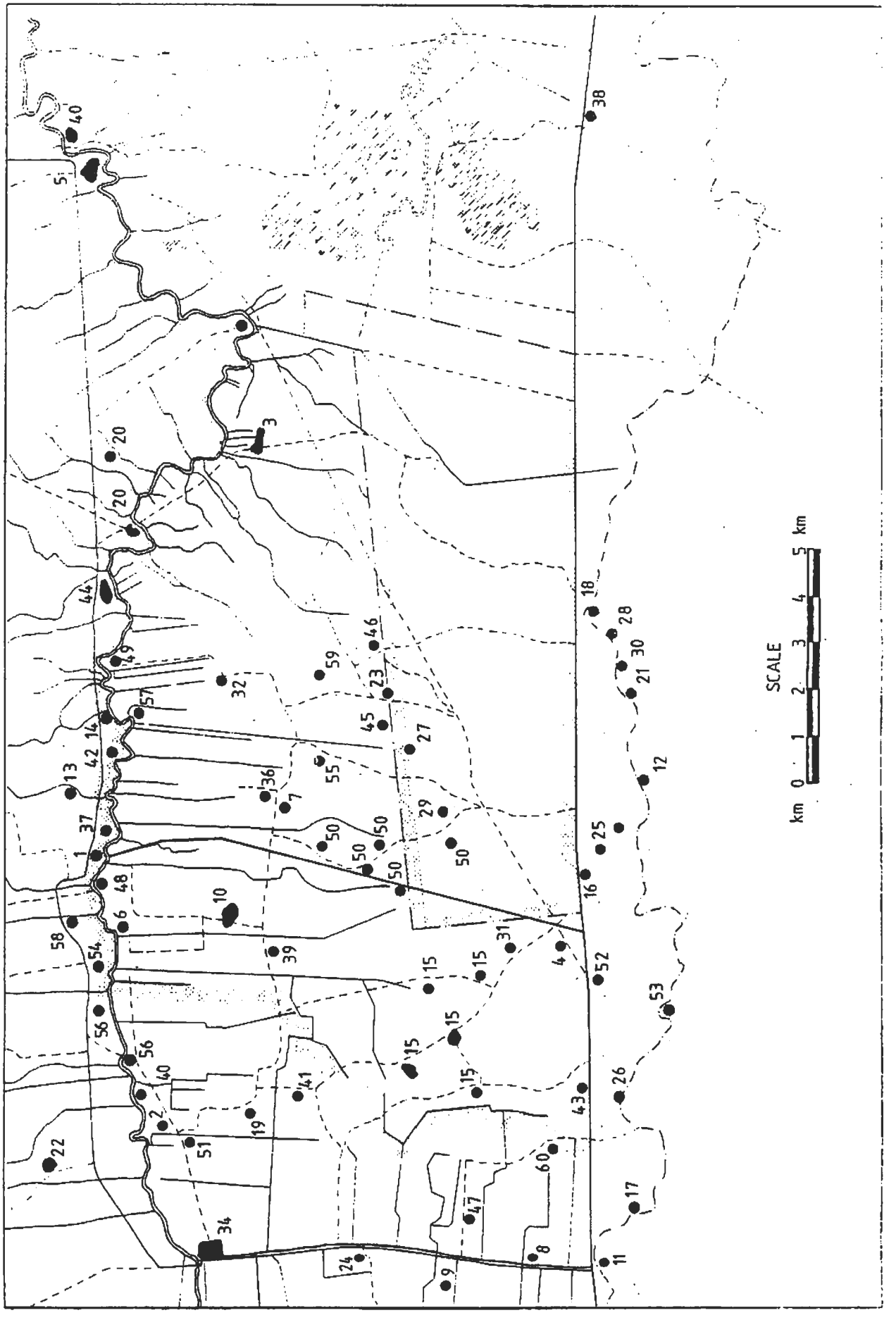
The soils are predominantly vertisols formed from deposits by the river. These consist of swelling/shrinking, self-mulching, montmorillonitic clays. While on the whole quite uniform, one can distinguish recent, semi-recent and old alluvia, differing in colour, clay content and to some extent in the salinity of the lower strata. A high proportion of the land (over 90%) is 'suitable' or

Key to Figure 2.1 - Village Location

Nr		Nr	
1	Abliko	31	Geelle
2	Alundi	32	Ismaaciil
3	Aybuutey	33	Jadiid
4	Ali usman	34	Janaale
5	Aw Dheegle	35	Jawhar
6	Bardiid	36	Jinni
7	Barrow	37	Khaliif
8	Barsame	38	Kilomitirka Lixdamaad
9	Bhuroow	39	Laabaas
10	Busley-Dawd	40	Malable
11	Buufow	41	Marsaan
12	Caaramadow	42	Moxamed Cumar
13	Cabdalle	43	Moxamed Nurow
14	Cali Caahir	44	Mubaarak
15	Cambanaani	45	Mude
16	Ceel Wareegow	46	Nagaadweyne
17	Cusmaan Ouilq	47	Raxmo
18	Cusmaan Xasan	48	Saalixiya
19	Dalooya	49	Sadiiq
20	Dara Salaam	50	Sagaaroole
21	Day Suufi	51	Sarcade
22	Deg Wariirow	52	Shaqadle
23	Diinle Maxaad	53	Sheik Xussain Shofac
24	Doon Dhere	54	Shuffeeri
25	Fed Guduud	55	Siidow
26	Fidlabey	56	Siiqaale
27	Fiilley	57	Tugaarrey
28	Garas Moqor	58	Ugunji
29	Garas Weyne	59	Yarrow
30	Garrun	60	Xamaali

Figure 2.1

Village Location



'moderately suitable' for irrigated agriculture and, with proper management of the soils and irrigation water, is unlikely to pose major constraints to development.

One interesting soil feature is the relative thinness of the riverine deposit over the pure micaceous, aeolian sand, often no more than 50 to 60 cm from the surface. Areas where this feature occurs would not appear to be extensive and are only expected to be of importance if deep-rooted crops like cotton are to be grown or if it is proposed to dig deep stock watering ponds (uars). These areas do not show on the aerial photographs, nor can they be identified from the indigenous vegetation. For more details of soils see Annex 1.

2.2.2 Topography

The topography of the area is gently undulating. The microrelief is the result of meanderings of the Shabeelle which now runs on a slight ridge. The land slopes gently towards the former river bed and then rises, at first gently and then more steeply, towards the sand dunes. The levees rise about 50 cm above the cover floodplain and provide well-drained sites for the settlements. For details of the topography see Annex 8. The off-taking canals have been constructed at right angles to the river, making use of this slight slope. Because the slope is slight, there is heavy siltation in the canals and the area that can be commanded by each canal is also restricted.

2.2.3 Climate

The climate is equatorial. The rainfall, averaging between 460 and 500 mm, is bi-modal. Temperatures rise before the first, principal rains (gu) which usually start in late April and last until June. A short rainy period is the haagai, between June and August. The der rains fall between September and November and are less than the gu rains. For monthly temperature, rainfall, humidity data and calculated pan evaporation rates see Annex 2.

2.2.4 Irrigation

The source of irrigation water is the Shabeelle river. The river usually begins to rise in early April and flows until November. Between the gu and the der, and again after November, flows are low so that water within the project area can only be abstracted by pumping. Until the construction of the Jowhar storage works, by late February, but occasionally as early as January, flows ceased altogether and water for stock was only available from pools in the river bed. Drinking water could only be obtained from holes dug in the river bed. However, with the proper operation of the Jowhar storage, most years it has been possible to maintain sufficient flows in the river to supply drinking needs. Irrigation out of tubewells, because of the variable quality of the water and its depth, is localised and expensive, and therefore used only on high-value crops.

Two types of irrigation can be identified: perennial irrigation, when water is provided roughly according to crop water requirements; and flood irrigation. Perennial irrigation, typically provided for high value orchard crops, is by gravity if the river is high enough; otherwise, by pumping. Maize only rarely receives pumped water: yield expectations justify cost only if the crop can be sold at a premium as certified seed.

In any given year there are two systems of flood irrigation, differing in the degree of reliability with which water reaches the farms. Only rarely can the entire commandable area be irrigated: this happens only in years of high and prolonged river flows. The areas receiving irrigation in any given year are determined by consensus: the canal committees allocate water according to agreed criteria. Flood irrigation is usually so regulated as to provide about 10 to 15 cm of water in the gu, to start off the crop either before the rains begin or to supplement rainfall when the crop is about 20 to 30 cm high. In the der, when there is usually ample water in the river but rainfall expectations are low, the basins are flooded to a depth of 30 to 40 cm. The crop is mostly sesame, planted as soon as one can enter the land. Der crops are mostly crops with strong, deep taproots, which are thus able to follow a receding moisture horizon and utilise the high water-holding capacity of the vertisols.

The irrigation distribution system consists of series of independent minor canal commands. Fifty-three canals of varying capacity take off from the river (Figure 2.2). The one feature they all have in common is that their invert levels are high and no water can enter until the river is approximately bank-full (Figure 2.3). The canals nearest to the Janaale barrage are to some extent influenced by the operation of the barrage and receive a more reliable supply. The high invert levels set a limit to the length of time and the quantity of water that can enter by gravity. River flow rates to some extent depend on the management of existing and proposed upstream storage schemes. The present river regime, its proposed management - particularly that of upstream storages - and implications on the time and quantity of future abstractions in the project area are described in Annex 2, which also contains estimates of the amount of water that the project area has been using in the past. The table attached for Figure 2.2 gives names and characteristics of the existing canals.

Irrigation development throughout the world has started in the manner described above; the initially installed systems have been progressively replaced by barrage or weir controlled interlocking systems, into which the flow of water is controlled according to agreed and carefully worked out regimes. The main canals serving such systems are either on the contour or on ridges; their location, unlike that of inundation canals, is determined by topography and not by farm boundaries. Such a conversion of the irrigation system in the project area would be expensive and disruptive to the farmers. It is not the intention of the present project to address this issue, although, undoubtedly, eventually it will be addressed. Therefore improvements contemplated under this project will focus on improving conveyance efficiencies, making the existing system more easily manageable and enable water distribution to be more equitable. These improvements, because of the possibility of an eventual complete modernisation and redesign of the system, would have to be amortised within 20 to 30 years.

The scope for improvements to the present irrigation system is limited. Deepening the invert levels would provide water for a longer period by extending the time water can enter the canals, but would alter canal regimes in that much of the now commanded area could not be served during these extended periods. Also, since GOS has decided that the area's water allocation at low flows is to be no more than at present, lowering the invert levels would mean introducing strict and elaborate control measures of the proposed head regulators.

Figure 2.2

Project Flood Canals

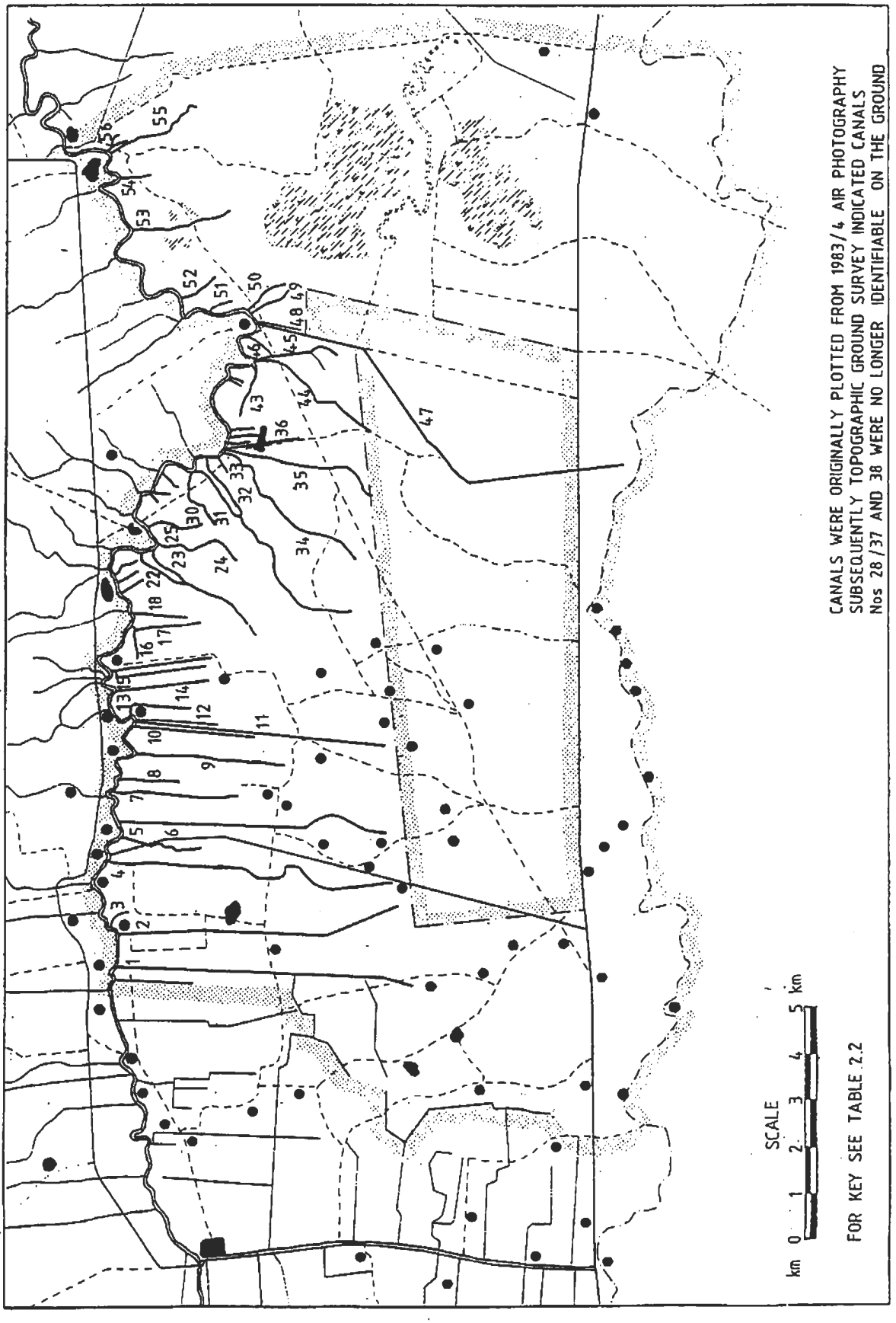


Figure 2.3

Invert Levels of Flood Irrigation Canals

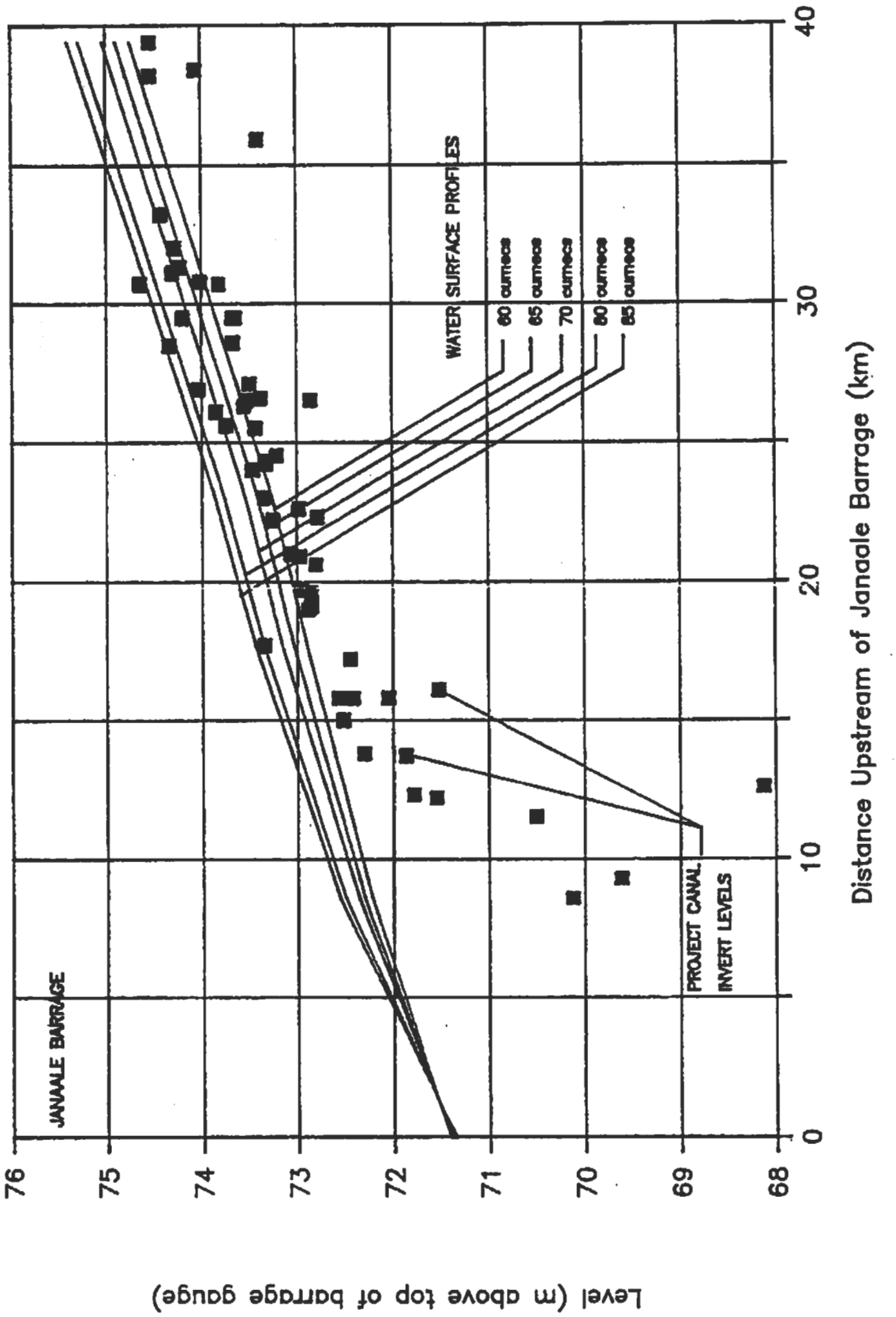


TABLE 2.2

Project Canals

Number	Canal name	Chainage[2] (km)	Length[3] (km) (5)	(6)	Area commanded[3]	Headworks	Pumping Capacity
1	Gure	8.6	6.3	6.3	970	Rehabilitation required	Mobile pump
2	Minow	9.3	6.7	6.7	735	Rehabilitation required	Mobile pump
3	Itole	-	-	0.6	100	No information	None
4	Gududu	11.5	6.9	7.2	855	Rehabilitation required	Pumping station
5	Matawani	12.2	1.8	0.45	20	Rehabilitation required	None
6	Barolerl/Bundo Cadde	12.6	6.2	6.2	490	New structure	None
7	Xassan Youssef[1]	13.7	2.5	2.6	135	No structure	None
8	Aoliko-Khalif[1]	13.8	1.4	1.4	45	No structure	None
9	Ebolen	15.0	2.3	2.3	200	Structure only - no gate	None
10	Deeq	15.8	3.2	2.6	60	No structure	Pumping station
11	Dhere	15.8	6.1	6.1	565	No structure	None
12	Suuu	15.8	2.0	2.0	165	No structure	Mobile pump
13	Guhaad	16.1	4.0	4.0	250	No structure	None
14	Domaay	17.2	2.4	2.4	75	No structure	None
15	Sulliman	17.7	2.6	(2.5& 1.1)	110	No structure	Pumping station None
16	Saadick	19.0	-	0.8	50	No structure	Pumping station
17	-	19.1	0.8	0.8	70	Pumped intake only	None
18	Garilen[1]	19.7	1.4	1.4	80	No structure	None
19	Dhequere[1]	20.6	0.4	0.4	40	No structure	None
20	Sheik Dhere[1]	20.9	0.4	0.4	10	No structure	None
21	Aw Gaboow[1]	21.0	0.2	0.4	10	No structure	None
22	Dhurey	22.2	1.2	1.2	500	No structure	None
23	Unqunji	22.3	3.8	3.8	-	No structure	None
24	Barwaaqo	22.6	2.4	2.4	69	No structure	None
25	Balambaley	23.0	0.9	0.9	60	No structure	None
26	Abdulle Bube[1]	24.0	0.2	0.2	10	No structure	None
27	Mohammed Ekow[1]	24.2	0.2	0.2	10	No structure	None
28	Aw Nuur[1][4]	24.3	(0.2)	-	-	No structure	None
29	Caaysinay[1]	24.5	0.7	0.3	10	No structure	None
30	Aw Wadae	25.5	1.7	1.7	35	No structure	None
31	Aw Barre	25.6	1.5	1.5	435	No structure	Mobile pump
32	Xanole	26.1	3.4	3.4	-	Rehabilitation required	Mobile pump
33	Muuno	26.3	0.4	0.4	15	No structure	Mobile pump
34	Dhuufe	26.5	4.3	4.3	400	No structure	Mobile pump
35	Dhere	26.5	1.6	1.6	335	No structure	Mobile pump
36	Hanre	26.6	1.7	1.7	80	No structure	Mobile pump
37	-[4]	-	(0.1)	-	-	No structure	Mobile pump
38	-[4]	-	(0.8)	-	-	No structure	Mobile pump
39	Baar	26.9	0.6	0.8	20	No structure	Mobile pump
40	Gaabo Yerro	27.1	1.6	1.6	50	No structure	Mobile pump
41	-	28.5	0.5	0.2	10	No structure	None
42	-	28.6	0.2	0.65	10	Rehabilitation required	None
43	Salhan	29.5	1.1	1.1	95	Rehabilitation required	Pumping station
44	Gaaoo	29.5	3.6	3.6	150	No structure	None
45	Bolay (new offtake)	29.5	2.8	2.8	230	No structure	None
46	Bolay (old offtake)	30.7	(0.8)	(0.8)	Disused	No structure	None
47	Casfimaad	30.7	(9.5)	(9.5)	Outside project		Pumping station
48	Abdi Nasin	30.8	2.6	1.6	30	Structure to be constructed	None
49	Camaan	31.1	1.8	1.8	35	No structure	Pumping station
50	Raxoole	31.3	1.0	1.0	40	No structure	None
51	Duuf	-	0.6	0.55	67	No structure	None
52	Modkadayo[1]	33.2	0.8	1.05	85	No structure	None
53	Jilaal Moogi	35.9	2.7	2.7	150	No structure	None
54	Xasan Nuur[1]	37.7	0.3	0.3	10	No structure	Mobile pump
55	Sied Barry[1]	38.2	0.7	0.7	275	New headworks	None
56	Tugaarrey	38.9	0.5	0.5	10	No structure	Mobile pump
Totals excluding ( )			102.9	102.6			

Notes:
(1) The name of the canal is uncertain
(2) The chainage is measured upstream of Janaale barrage.
(3) The length and area commanded by each canal has been estimated from the 1 : 30 000 aerial photography.
(4) Canals no longer operative and now not identifiable on ground.
(5) Measured on 1983/4 aerial photography.
(6) From ground survey 1988.

2.2.5 Population

The data source on the project area's population is the village listings dated 1983, the accuracy of which has been questioned. They indicate that households deriving their livelihoods directly or indirectly from the project area live in 40 villages. Seven of these villages are on the western bank of the river. It has been estimated that about 40% of their inhabitants farm in the project area. The population deriving its livelihood from the project area is estimated to live in about 3 500 households. About 500 of these reside in coastal villages; but they graze their animals, and farm, in the project area. Assuming an average of 4.75 persons per household, about 16 000 to 17 000 people depend for their living on the project area of whom 8 000 to 9 000 actually reside within its boundaries. Some 12 000 can be taken as wholly or partly productive economically. Allowing for adults not engaged directly in agriculture and animal husbandry, about 11 000 people, or two persons per hectare of land farmed today, would be the available labour force. The 1986/87 National Population Census, when its details are released, is expected to provide more accurate information.

2.2.6 Landholdings

Landholdings and farm size distribution are extrapolated from a survey carried out in Marka district in 1983. Based on this extrapolation about two-thirds of the households appear to own or rent farmland; the rest are landless, mostly involved in occupations not connected with agriculture or animal husbandry. Farm size distribution is approximately as follows:

Up to 1 ha	65%	2 - 5 ha	9%
1 - 2 ha	24%	Over 5 ha	2%
(Up to 2 ha	89%)	(Over 2 ha	11%)

There is a wide range of sizes in the over 5 ha group: the Consultant's investigations encountered a few farms in excess of 100 ha. No reliable figures could be found recording what percentage of the area was operated in the different farm size groups. For more details on population, their social organisations and on landholdings see Annex 3.

2.3 The Farming System

2.3.1 Crop Production

(a) The perennially, fairly reliably irrigated areas are devoted to orchard crops, mostly bananas, followed by grapefruit, papayas and mangoes. Most of the small area of maize grown under these conditions is either for seed, a break crop usually between two crops of bananas, or belongs to the tenants-cum-labourers working on the estates, who are given land as part of their wages.

(b) The flood-irrigated crops are maize and sesame which at present account for about 95% of all crops grown. The balance is devoted to tomatoes, water melons and cotton, which is once

again strongly fostered by the textile industry, after many years of neglect. Other crops are chillies, sweet peppers, marrows, gourds; all crops that are able to exploit the receding moisture table of the late der and jilaal seasons. Maize is almost the sole crop in the gu; in the der, the main crop is sesame but maize is also grown, mostly in areas where the irrigation is more reliable or if the der rains were good. Cotton is usually a succession crop in gu maize, planted in early June, when the maize is about 60 cm high. Tomatoes are mostly a der crop, transplanted when the land is dry enough after an inundation. All the other crops mentioned are planted or transplanted after the der flooding.

(c) The rainfed crops are maize and sesame, the latter usually grown after flooding which utilises runoff from local micro-catchments. Cultural practices are much the same as in the case of flood irrigation but yield levels are lower. The other crops grown under flood irrigation are only rarely grown on rainfall only.

Areas that are commandable for flood irrigation but did not receive any water because of inadequate supplies are, in those years, cropped as the rainfed areas.

Important by-products of arable cropping are the stover of maize and sesame and the irrigated natural pastures (fields flooded but not cropped). They play a vital role in the animal husbandry system of the area, whether feeding the farmers' own animals or sold or bartered for labour and services. Before the rains began in 1987, the market price per kg of maize stover exceeded that of the grain: by no means an unusual happening in a drought year. The utilisation of maize stover would be made more efficient and less wasteful under the proposed project.

2.3.2 Cultural Practices

While much of the primary land preparation of irrigated lands is now done by tractors, all secondary tillage, weeding, harvesting and threshing are hand operations. Animal traction, with the exception of haulage, is unknown; both donkeys and cattle are used to haul small, usually 200 litre (one barrel) water tankers and other light carts. Farmers with no access to tractors, either because they cannot afford the hire charge or, more frequently, because there are insufficient tractors available, do their primary land preparation by hand; most of the rainfed lands are so prepared. Weed control in particular sets the limit to production and the cultivable area: it is a critical operation, with very little room for delay if reasonable returns are to be assured.

2.3.3 Present Cropping Pattern and Yields

The present cropping patterns and yields have been determined partly by random questioning of farmers and partly by a survey of some 39 respondents. It must however, be borne in mind that the Consultant's interviews, which took place in March and April 1987, followed a good gu season but a very poor der.

With the considerable climatic variations experienced year by year, it is difficult to arrive at an 'average' regime. Table 2.1 gives the best estimates of the present cropping pattern and yields. Annex 8 gives details of the survey and Annex 4, of the agricultural background of the area.

TABLE 2.1

Present Cropping Patterns and Yields

Flood Irrigated Areas

	Gu		Der	
	area (%)	yield (t/ha)	area (%)	yield (t/ha)
maize	80	1.2	20	0.7
sesame	-	-	40	0.3
cotton		-	1	0.5
melons	-	-	1	10.0
tomatoes	-	-	3	5.0

Rainfed Areas

	Gu		Der	
	area (%)	yield (t/ha)	area (%)	yield (t/ha)
maize	85	0.7	10	0.6
sesame	-	-	50	0.3

Note: Cotton is a succession crop, interplanted in the gu maize.

2.3.4 Land Ownership

The main categories of farmer groups in the area are:

(a) absentee landlords and land speculators who engage a farm manager or let their land to smallholders;

(b) large farms run by resident landlords or institutions with strong incentives to maximise production;

(c) influential farmers and livestock keepers of pastoral background, with sufficient resources to sustain a commercial level of production and management system;

(d) medium- and small-scale farmers, agropastoralists and pastoralists who, subject to droughts, produce surplus and manage their enterprises on commercial lines while minimising risks;

(e) small-scale farmers, agropastoralists and pastoralists who produce mostly at subsistence level, except in years of good rainfall or ample irrigation supplies; however, their ability and resources to minimise risks is limited;

(f) the poor rural families without, or with limited, means of managing such resources as they may have;

(g) commercial operators, civil servants or artisans who are part-time farmers or not directly involved in farming or livestock keeping but who, none the less, invest or service the agricultural sector. Most members of this category reside in the larger villages or towns outside the project boundaries.

For more details see Annex 3.

2.3.5 Livestock

In order of numerical importance, the resident domestic animals are cattle, sheep, camels, goats and donkeys. In the jilaal many nomadic or semi-nomadic camel and cattle herds move into the area, the camels mainly to browse on the Acacia shrubs and the cattle to supplement their feed with stover. Some poultry is kept in the hamlets. Donkeys tend to be concentrated in settlements that need them for water carting, i.e. those at some distance from the river. The average resident livestock population per household is about 7 head of cattle, 1 or 2 goats and 6 head of poultry. The figures, which are of the same order of magnitude as those shown by other studies, indicate a stocking density of about 0.68 ha per livestock unit of 240 kg body weight. Stocking densities are higher in the jilaal when outside herds come in because they are forced to be near permanent water supplied by the river. During the gu animals not actually needed for their milk and meat production, or for sale to cover household expenses, move out of the area and are looked after by kinsmen and transhumant members of the family.

The principal problems perceived by stock owners are shortage of feed and the disease trypanosomiasis, spread by tsetse flies. Overgrazing encourages bush encroachment, a habitat favouring the flies, and presents additional problems for eventual fly eradication. Other disease problems, considered to be of less importance by stock owners, are stomach worms and liverfluke.

One outstanding feature of the cattle herds is the low number of males, and the virtual absence of castrates. Full details of the livestock situation are in Annex 5.

2.3.6 Jilaal Moogi

Some 5 000 ha of the project area, lying along the north-eastern boundary, is called the Jilaal Moogi; literally translated, the area that does not know the dry season. There are two major depressions which accumulate flood spills from the river and local runoff. The area consists of swamps that are fishing grounds and also produce reeds, an important roofing material; areas of Andropogon grass, of great importance for grazing as well as for the fodder markets of Mogadishu and to feed livestock shipped from Mogadishu port; and dense woodlots suitable for bush browsing. The area is used not only by the inhabitants of the project area, but also by seasonal migrants who come to the riverine areas from long distances during the jilaal. Under the present socio-economic conditions the Jilaal Moogi's importance, and the need to maintain or if possible to augment its production. cannot be over-estimated. For more details see Annex 7.

2.4 Supporting Services

2.4.1 Drinking Water

Supplies of drinking water on the cover floodplains are scarce. The majority of the population relies on the river, wells near the river bank, in the stream beds crossing the sand dunes outside the project area or, when running, the canals. There are few wells in the project area itself. In the jilaal most of the drinking water comes from releases from the Jowhar storage (Section 2.2.4). Before, the principal sources were shallow wells dug in the river bed. Not only are water sources insufficient in number and at an inconvenient distance from most of the habitations which implies much time spent carrying water or expense in buying it from the professional water carriers; they are also unhygienic and a source of disease.

2.4.2 Schools

There is only one primary school in the area, at Busley-Dawd. Children from other areas go to the village schools on the west bank of the river. Provision for schooling is on par with other areas of the Lower Shabeelle region. The school buildings are not substantial, and require frequent maintenance which is a burden on the local community.

2.4.3 Health Services

An on-going scheme, supported by World Health Organisation, is operating in the area and is in the process of installing, with much popular public support, a primary health care network.

2.4.4 Machinery for Hire

Agricultural machinery for hire for land preparation and excavators for canal clearance are available from private owners in and around the project area and from ONAT, MOA's tractor and machinery hire organisation. The service does not meet demand, forcing many farmers to prepare their land by hand. Others have to delay planting which, under the soil conditions of the area and with the unpredictable rainfall, may well mean not being able to plant a gu crop, which is the more reliable and therefore a potential risk if it has to be forgone.

2.4.5 Communications

The main Mogadishu-Kismaayo road traverses through the south-east of the project area. In addition there are two coral surfaced roads within the project. One links Ceel Wareegow on the main road to the village of Khaluf on the opposite bank of the river. The second coral road constructed in 1987 traverses the project area from the south-easterly boundary near Busley-Dawd/Laabaas to the north-west boundary near Aw Deegle. Many unsurfaced dirt tracks serve the area. However, during the rainy season these become impassable. Culverts on canal crossings are temporary and insubstantial making vehicular communications outside the jilaal season unreliable.

2.4.6 Input Supplies

Purchased inputs are available in Shalambood and Janaale. The supply pattern follows that of the national scene.

(a) Fertilisers

These are sold wholesale by the Agricultural Development Corporation (ADC) which also supplies it in kind to those who are able to get short-term credit (see (d) below). Others buy from retailers who in their turn buy mainly from the ADC.

(b) Pesticides.

These are principally used for stemborer control and sold by private traders as well as by the ADC.

(c) Seeds

Seeds of maize, about the only crop at present for which quality planting material is produced, (other than citrus plants), are available through the ADC and local traders. The FAO Seeds Project, now under active preparation, will further augment supplies and tighten and institutionalise quality control.

(d) Credit

Credit at present is available only for short-term production purposes; the two operating schemes are supported by FAO/UNCDF and the CEC and administered by the AFMET project. Arrangements for medium- and long-term institutional credit are dependent on adequate security which is almost synonymous with title to land. The obtaining of land titles is handicapped by the cumbersome, time-consuming process of registration. Consequently farmers have to rely either on their own resources, or informal credit sources, for longer-term investments.

2.4.7 Agricultural Support Services

(a) Agricultural Extension

Agricultural extension in the project area is administered as part of the Lower Shabeelle region under the control of the Regional Extension Officer in Janaale. He has Subject Matter Specialists (SMS) in agronomy and plant protection who provide the technical backing and support to the District Extension Officers (DEO) for Marka and Afgoi districts. One DEO supervises about 8 Field Extension Agents (FEA) each of whom, through contact farmers, advises about 800 farmers, visiting them on a rigid, predetermined schedule, thus ensuring reliable coverage of the whole area.

(b) Agricultural Research

Agricultural research support is described in Chapter 1. Both extension and research are focussed on the main crops of the country: sorghum, maize, rice and, recently, sesame. Little detailed technical support is available to growers of cotton, tomatoes and melons.

(c) The Agricultural Development Corporation

The ADC is the wholesaler of fertilisers, pesticides and certified seeds produced by and under the supervision of the Seeds Project. It is also buyer of last resort of maize, sorghum and in principle also sesame, although in practice it has not been buying any. It maintains strategic stores in various centres. The two of significance to the project area are in Shalambood (in the process of being considerably expanded) and in Aw Dheegle.

(d) ONAT

ONAT, the tractor and machinery hire service, along with private owners, rents heavy equipment and agricultural tractors to farmers or others requiring them. It has 34 agricultural tractors in working order in Shalambood, which, along with the many privately-owned machines do most of the primary land preparation.

CHAPTER 3

THE PROJECT

3.1 Project Objectives

The objective of the project is to increase crop and livestock production, and by these means, the prosperity of the area's inhabitants. The proposed project area's resources and potential have not, in the past, been subject to concentrated, systematic development, unlike those of other nearby similar areas. The Consultant's surveys have confirmed that, potentially, the natural resources of the area are similar to others that have been successfully improved and therefore there is every reason to believe that equal or better results can be achieved in the Dara Salaam Busley area.

It is proposed to achieve the stated objective by two routes: investment in directly productive and utilisable works, e.g. improvements of the water delivery system in the irrigable areas and enabling improved crop husbandry practices to be introduced in both irrigable and rainfed areas; and in improvements to the socio-economic environment of the farming population, which, by increasing their ability to work and enabling them to spend their time more productively, would further improve crop and livestock production. The best example is improved domestic water supplies: more accessible and hygienic supplies would reduce the time taken by the family to fetch water and also eliminate the debilitating effects of water-borne diseases.

3.2 Projects Components - Summary

The proposed project would have the following principal components:

(i) Flood protection.
(ii) Irrigation improvements.
(iii) Land development.
(iv) Agricultural development.
(v) Sustaining the 'Jilaal Moogi' area.
(vi) Developing drinking water resources and facilities.
(vii) Providing shelterbelts and village fuelwood lots.
(viii) Animal husbandry support.
(ix) Developing an internal feeder road network.
(x) Support services assisting land registration, easing access to medium- and long-term credit, agricultural machinery, marketing outlets and facilities.
(xi) Organisation, management, operation and maintenance support.
(xii) Social services support.
(xiii) Monitoring and evaluation.

3.3 Project Components - Detailed Features

3.3.1 Flood Protection Improvements

Because all the canal offtakes are at a high level, it is essential during the irrigation season to keep river levels high. Overtopping of the river banks has occurred in the past, and no matter how carefully the upstream storages are

operated, a sharp unexpected rainstorm between Jowhar and Aw Dheegle, occurring at a time when the river level is high, is likely to cause the river to overflow. To contain such spills, flood protection levees have been constructed at some distance from the river bank. On the left bank, financed by the project, these would be rehabilitated and reinforced as necessary, to ensure that they do not break and to reduce future maintenance costs.

3.3.2 Improvements to the Irrigation System

Three major activities come under this heading.

(a) Head Regulators

Fifty-three canals take off from the river within the project area (see Figure 2.2). All the inverts are at a level where water can enter the canals only when the river is high. Often this period coincides with the peak of the rainy season when water may not be required and may in fact cause damage to growing crops. Therefore it is necessary to provide head regulator gates to the intakes that do not have them at present: only 9 of the 53 have head regulators, but 6 of these need to be rehabilitated. The rehabilitation of the 6 gates and the provision of the additional 44 would be part of the project works. Technical parameters and sample designs for the regulators are in Annex 6.

(b) Resectioning the Canals

In conjunction with the installation of canal head regulators it is proposed that canals will be remodelled by the project with the exception that those canals less than 300 m in length will be remodelled by the beneficiaries. For these short canals, the project staff will arrange for control sections to be excavated free of charge as a guide for the work.

(c) Improvements to the Distribution System

Improvements would consist of flow regulating structures in the canals where required. Canal checks in conjunction with field outlet pipes would be used to regulate flow to the branch canals and field channels off-taking directly from the main canal. The structures would be installed on one canal, their operation monitored over at least one gu and one der season to determine whether they improve water distribution and make the management of the system easier. If the benefit of these turnouts is established, they would be installed on a further 13 canals in the project area. These canals would be canals operated by smallholders. Design details are in Annex 6.

3.3.3 Land Development

Land Development is essential not only to achieve a desirable degree of field irrigation efficiency and water utilisation but also to prevent crop damage through either prolonged waterlogging or under-irrigation. The criteria for land development: levelling, smoothing, selecting suitable machines and determining the most suitable size of the irrigation units are described in Annex 4. Since

land levelling represents a permanent improvement of the farm, with consequent greatly enhanced land values, the cost should be borne by farmers who would be assisted by appropriate credit facilities. The cost borne by the project would be confined to engineering support which would:

(a) prepare land development maps for each canal command, using a suitable computer program;

(b) provide the necessary support service for individual farmers, farmers' groups or canal committees wishing to level their land, by marking cut and fill levels in the field, checking the completed work and certifying it as suitable for credit disbursement;

(c) having available for hire a number of leveller blades suitable for mounting on agricultural tractors.

It is expected that up to 600 ha may be levelled during the project implementation period, or about 13% of the total.

3.3.4 Drainage

The soil survey (Annex 1) has shown that there have not been drainage-induced soil problems in the area, even in parts near the river that have been irrigated for the last 50 years or more. The natural surface drainage is adequate to protect all potentially cultivable lands from the effects of surface flooding caused by heavy rainstorms. The proposed improvements to the irrigation system which will enable easier and quicker control of water deliveries would prevent over-irrigation; the proposed land development would reduce the effects of water accumulation in the fields by spreading it more evenly and keeping water at depths that crops can tolerate without damage. Since the watertable in all potentially cultivable areas is deeper than 5 m, often considerably deeper, given reasonable water management waterlogging is not expected to be a problem in the future either.

3.3.5 Agricultural Development

Agricultural development would have the following components:

(a) Production Support for Cotton, Tomato and Water Melon Growing

It is estimated that up to 15% of the cropped area may eventually grow cotton, tomatoes and water melons. All of these, especially cotton, require extensive support for pest control, without which cotton growing is certain not to be successful. One desirable action would be the reintroduction and enforcement of the Cotton Control Act now in abeyance; the crop has not been of economic significance for some years and therefore the Act was not needed. Another would be to organise a pest scouting service by the farmers and the FEAs. This would be the task of the SMS (see (b) below). Further, the project would provide suitable sprayers which would be hired out or lent free of charge to farmers. Initially more than one type of machine would be bought to determine the most suitable one under the operating conditions of the project area but after about two years' trial only one type would be selected. The subject is further discussed in Annex 4.

(b) Technical Support for Cotton, Tomato and Water Melon Growing

This would consist of training and paying the salary and field costs of an agricultural graduate during the project implementation period; he would become a Subject Matter Specialist (SMS) for these crops. His functions, tasks, terms of reference and reporting responsibilities are described in Annexes 4 and 9 which also describe how his function would be supported after project completion.

(c) Introducing Animal Traction

Animal traction would be introduced to speed up the planting and weeding of maize and sesame. The time taken, and the labour demands of weeding is one of the major bottlenecks to yield improvements, area expansion with a given labour force and the cause of many crop failures when uncontrollable weed growth chokes the crop. Two suitable individuals would be trained at existing AFMET facilities in Bonka, the Bay Region research station addressing animal traction. They would be provided with animals to train, and the right planting and weeding implements. They would demonstrate their use throughout the project area, train interested farmers in the use of the animals and the implements and either assist with the training of the farmers' own animals or exchange trained for untrained animals. They would be guided and technically supervised by appropriate AFMET staff and specialists but would work only in the project area. Details of their work, the animals they would use and the care necessary to maintain these animals is described in Annexes 4 and 5. Implements and work animals that the farmers would buy would be financed out of the revolving credit fund.

(d) Agricultural Research

Under the AFMET II project, agricultural research will be the ultimate responsibility of the Director-General, Agricultural Research, a post and function created under the project. The extension service is covers six regions (including the Lower Shabeelle) and therefore, necessarily, has to concentrate on problems and issues that affect large numbers of farmers. Thus, problems deemed important in the project area may not be so regarded either by agricultural research or extension. Therefore, the propbsed Project Coordinator (see Chapter 5) would be an agriculturist qualified to identify such problems which he would then bring to the attention of the research and extension authorities to find solutions. The Project Coordinator's functions, terms of reference and qualifications are described in Annex 9.

(e) Land Preparation

While not a project component it will nevertheless be necessary to conceptualise land preparation under the soil and climatic conditions of the region. Having done so, appropriate land preparation practices and the appropriate tractor and animal-drawn implements that would achieve the desired objectives for the least cost to the farmer would

have to be identified. Annex 10 describes the concept and the details of a possible investigation. Because of its wide applicability, it is understood that at least one bilateral donor agency would be interested to follow up on the matter.

3.3.6 Sustaining the Jilaal Moogi Area

Its importance to the project area and the wider region whose inhabitants use it at critical times of the year when they have no other sustenance for their livestock, is described in Annex 7. To ensure continued water supply to the area, it would be necessary to install a head regulator of 5 m^3/s capacity near Aw Dheegle, construct a channel through the area, to keep the low areas flooded for most of the dry season and to take this channel to the main Mogadishu - Kismaayo road where it would feed three stock watering points see Figure 3.1.

3.3.7 Developing Drinking Water Resources and Facilities

Present supplies of drinking water are mostly unsafe and the sources are far from many of the habitations. Water is available in the river bed, from deep wells near the main road, from shallow wells on the fringes of the dunes and the coast or, at certain times of the year, from unhygienic stock watering ponds and canals. To remedy the situation, the project would support an investigational programme to find suitable well sites. The objective would be to provide about 20 wells near the major villages (Figure 3.2). The quality and the depth of the aquifer would determine whether these would be shallow or deep wells. Currently available information would indicate that shallow wells, producing potable water, can be developed near the river, but at greater distances the shallow aquifer is too saline. The areas away from the river are the ones where distance to source of potable water is causing the greatest hardship to villagers, especially the women who traditionally carry the domestically used water. Therefore it will be necessary to find aquifers containing potable water in these more distant areas and subsequently to develop wells to utilise them. While it is not impossible that lenses of potable water can be found at relatively shallow depths, present indications are that such aquifers will be deep ones (of the order 60 to 70 m), which will have to be developed through tubewells. The depth of the aquifer will determine the type of pump to be installed; whether it needs to be an engine-driven one or whether a handpump would be suitable.

The possibility of installing windmill pumps on the deep wells was reviewed and has been rejected. Windmill-driven pumps have not been a success in Somalia; the windmill still seemingly operating in the project area ceased pumping water less than two years after it was installed. Experience in other countries, notably Pakistan, has been exactly the same. The reason is that while the actual time spent on operating and maintaining a windmill pump is minor, someone must be constantly at hand to make the necessary adjustments demanded by varying wind conditions and the actual demand for water.

Details of the programme to develop drinking water sources and plans for its implementation are given in Annex 6.

3.3.8 Shelterbelts and Village Fuelwood Lots

The area, with the exception of the river bank and the Jilaal Moogi, is largely devoid of substantial trees and therefore much exposed to the hot winds and dust that are particularly harmful during the jilaal. Also, the search for fuelwood is becoming a growing burden on the area's inhabitants. It is therefore proposed to encourage the planting of shelterbelts and village fuelwood lots. Shelterbelts along the proposed stock routes across the area, leading to river watering points, would be planted and maintained by the project. In addition, it is expected that up to 70 km may be planted by farmers along field and farm boundaries. The farmers would be provided with free seedlings that are readily available from NRA nurseries in Janaale and Argoi and with advice on their care. They would be paid a bounty of SoSh 50 each year for four years for trees that have survived.

Village fuelwood lots would be encouraged near the settlements. Most of these are on the higher levee soils of lower agricultural value than the rest of the area but still suitable, with appropriate care, for growing trees of the right species. Seedlings and advice on their growing would be provided by the project. The villagers would be paid an annual bounty of SoSh 50 on surviving trees for each of four years and encouraged not to exploit the plantation for ten years. The species selected would also be suitable for gum production. The extent of the programme would be modest, because of past rather unfavourable experience with similar schemes in Somalia and elsewhere under climatic conditions similar to the project area. Details of shelterbelts and fuelwood plantations are in Annex 4.

3.3.9 Support to Pastoralists

Livestock, whether owned by residents or by their kinsmen who are forced to come near the river during the dry season, is an important contributor to the economy of the project area. The livestock situation, its problems and suggested betterment are described in Annex 5. Briefly, the ultimate objective is not to increase the number of animals that utilise the area: it is already over-stocked and short of fodder; on the contrary, by increasing offtake rates through reduced mortality, and milk production through better feeding, the objective is to convert present non-utilisable outputs (i.e. deaths from disease and starvation) to a cash return. Significant contributions to this aim would be the provision of more readily available watering facilities, thereby saving energy and time to reach water, and better health care, principally the control of trypanosomiasis and internal parasites. These measures would reduce stock losses; the animals thus surviving should be sold to maintain - and not allowed to increase - stock numbers, and thereby contribute to family income. Reducing stock mortality rates would open the way to encourage the more rigorous culling of older females. This will require the organising of regular livestock saleyards which would bring the buyers to the area on a regular basis and possibly also a review of regulations governing the sale of mature females.

A further contribution would be the better utilisation of maize and sesame stover. At present the stover is given to the animals as it is; they pick it over, eat the leaves and the thinner stems and largely waste the rest which consists of the thicker, less palatable stems amounting to almost 50% of the total. (For details see Annex 5.) Although not as palatable, the nutritive value of the thicker stems is almost as good as that of the thinner ones. The project would obtain hand operated, guillotine-type forage choppers from India, test them and arrange for their fabrication by the Mogadishu foundry. If found successful the animal training instructors would demonstrate and popularise the chopping

Figure 3.1

Jilaal Moogi Zone

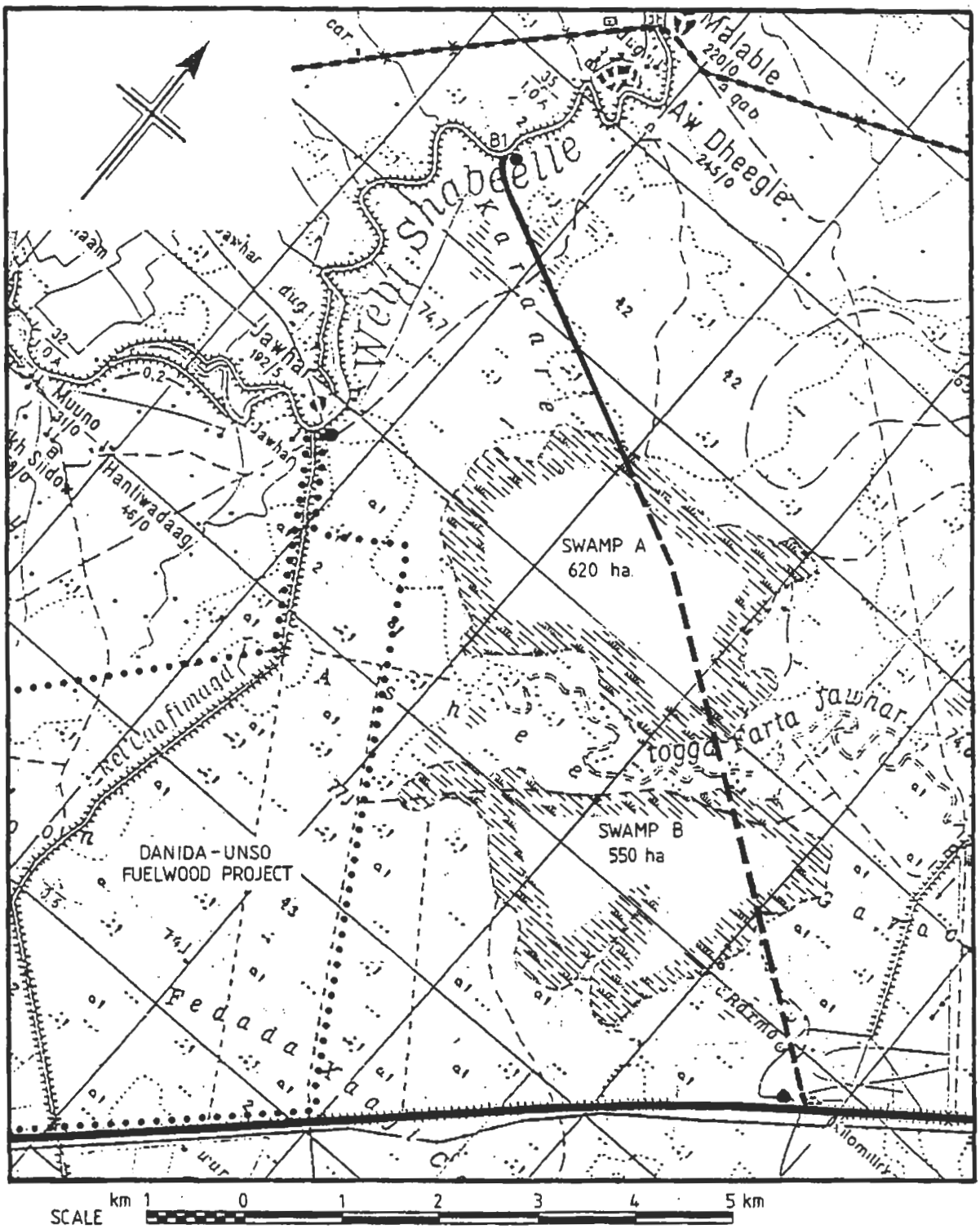
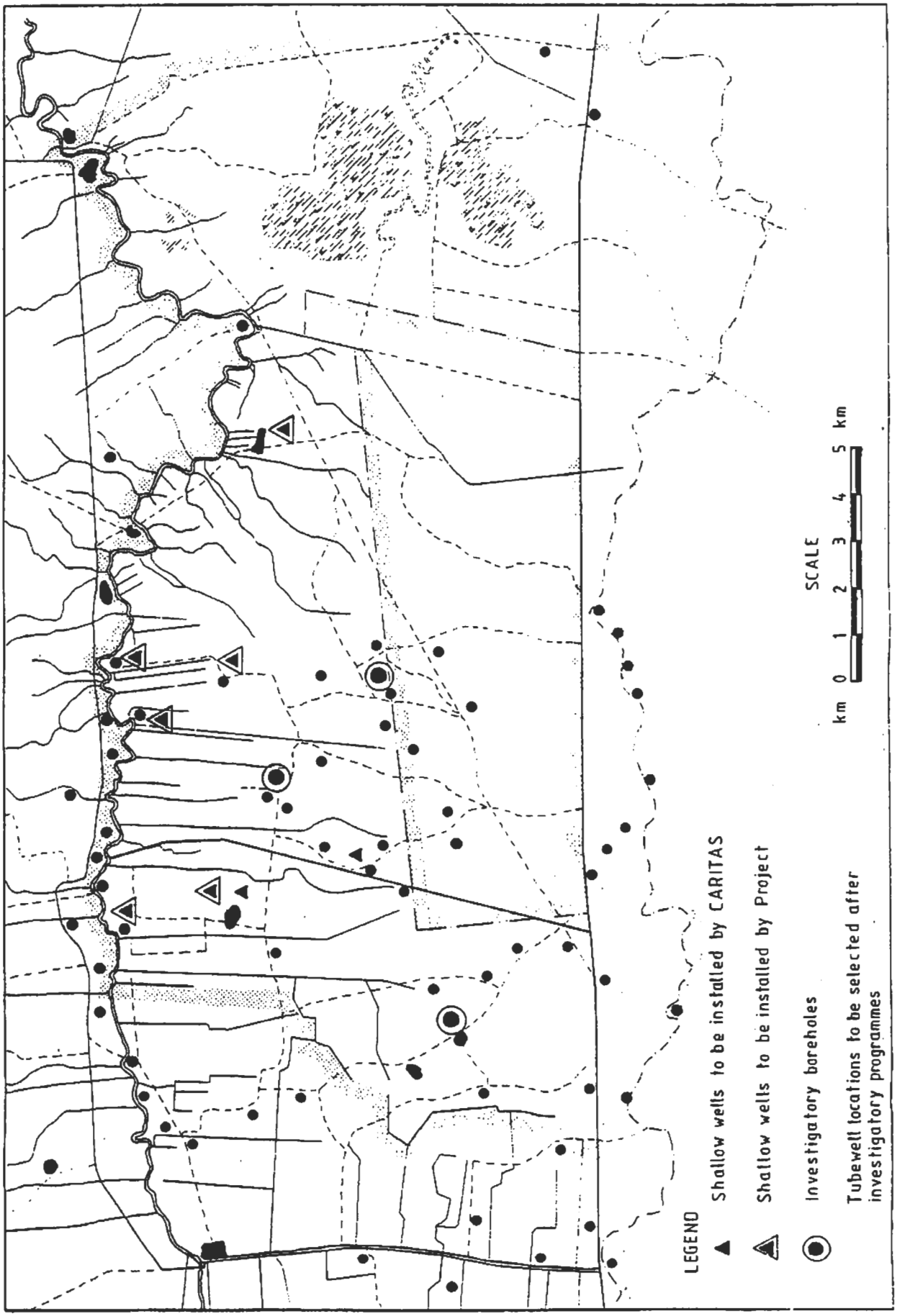


Figure 3.2

Shallow Well and Borehole Programme



and teach the way to feed the chopped material; choppers would be available under the proposed credit scheme. An additional benefit of this improvement would be the complete disposal of maize stalks, thereby eliminating a major overwintering facility for the stemborers which are the major maize pest.

The project would provide portable lightweight butyl rubber drinking troughs at eight river watering points which could be easily moved near to water sources, thus doing away with construction of earthen troughs that have to be rebuilt almost daily. Subject to identifying suitable soil conditions and the availability of canal or local runoff water sources, nine stock watering ponds (uar) would be built, including provision of three stock water points at the tail of the Jilaal Moogi canal. The stock routes would be lined with a shelterbelt of Casuarina trees, to trap dust stirred up by the animals.

Facilities would be established for small veterinary centres where drugs would be available for sale, together with advice on their use. At the same location there would be mustering pens and cattle crushes, where prophylactic treatments could be routinely administered and the animals easily handled. Obviously the risk exists that the drugs would be diverted to stock not actually associated with the project area. However, the risk of this happening is small, because the stock requiring the medicines would in most cases actually be driven to the mustering pens. Further, since the drugs would be sold and the proceeds used to buy further supplies, there would in the end be no loss to the intended beneficiaries.

Unlike with fertilisers and pesticides, of which the project does not propose to provide designated supplies (Section 3.3.11) use by others than the intended beneficiaries implies no substantial additional procurement problems because of the high value-to-bulk ratio of drugs compared with fertilisers and even pesticides.

Herders would be trained in facilities established by GTZ's veterinary programme; the cost of the training would be defrayed by the project.

3.3.10 Internal Feeder Roads

The project area is well served by tracks that are motorable only when dry and become impassable for several days to all but pedestrian traffic after only a slight rainfall. It is therefore proposed to construct an internal feeder road network, in addition to the road across the project area, parallel to the river, constructed by ONAT late in 1987. The total road construction programme would be about 19 km. Specifications of the upgraded roads, their aligments, the rationale for their selection are described in Annex 6. The proposed road network (Figure 3.3) would serve villages having an aggregate of over 880 households and would place the entire population within 3 km of roads that are motorable within a few hours of all but the heaviest rainstorms.

3.3.11 Production Support Services

Support services required to enhance farm production would consist of short-, medium- and long-term credit; increasing the farm machinery currently available whether for hire or privately owned, and the provision of some marketing assistance. Physical production inputs like fertilisers and pesticides, are available and the supply is likely to improve further with the increasing privatisation of the trade (Section 1.5). Therefore it is not considered

necessary to provide designated supplies of fertilisers and pesticides for the project area: firstly, there can be no assurance that they would not in fact be used elsewhere and, secondly, there would not seem to be a manifest need to do so. However, there is a major need to improve access to credit facilities. A pre-requisite to a functioning credit scheme is to establish a form of security to the lender: the most obvious is the borrower's title to land.

3.3.12 Land Registration

According to Somali law land cannot be privately owned, only leased from the state. The lease lapses if the land is not cultivated for two years; if cultivated, it can be passed on and inherited but not rented, sold or share-cropped. However, renting has recently been tacitly permitted. There is also an understanding that leases will be extended to the family as long as the land is farmed. A further relaxation is that GOS may no longer request that only single plots be registered for each owner: they recognise the need to spread risks, for a farmer to have plots in the command of different canals and to have both rainfed and irrigated fields. The problem at present is that the land registration procedure is time-consuming, complicated, involves several trips to distant Government offices and dealings with many officials of various ranks. All these contribute to a disincentive to large scale registration by small landowners (Annex 3).

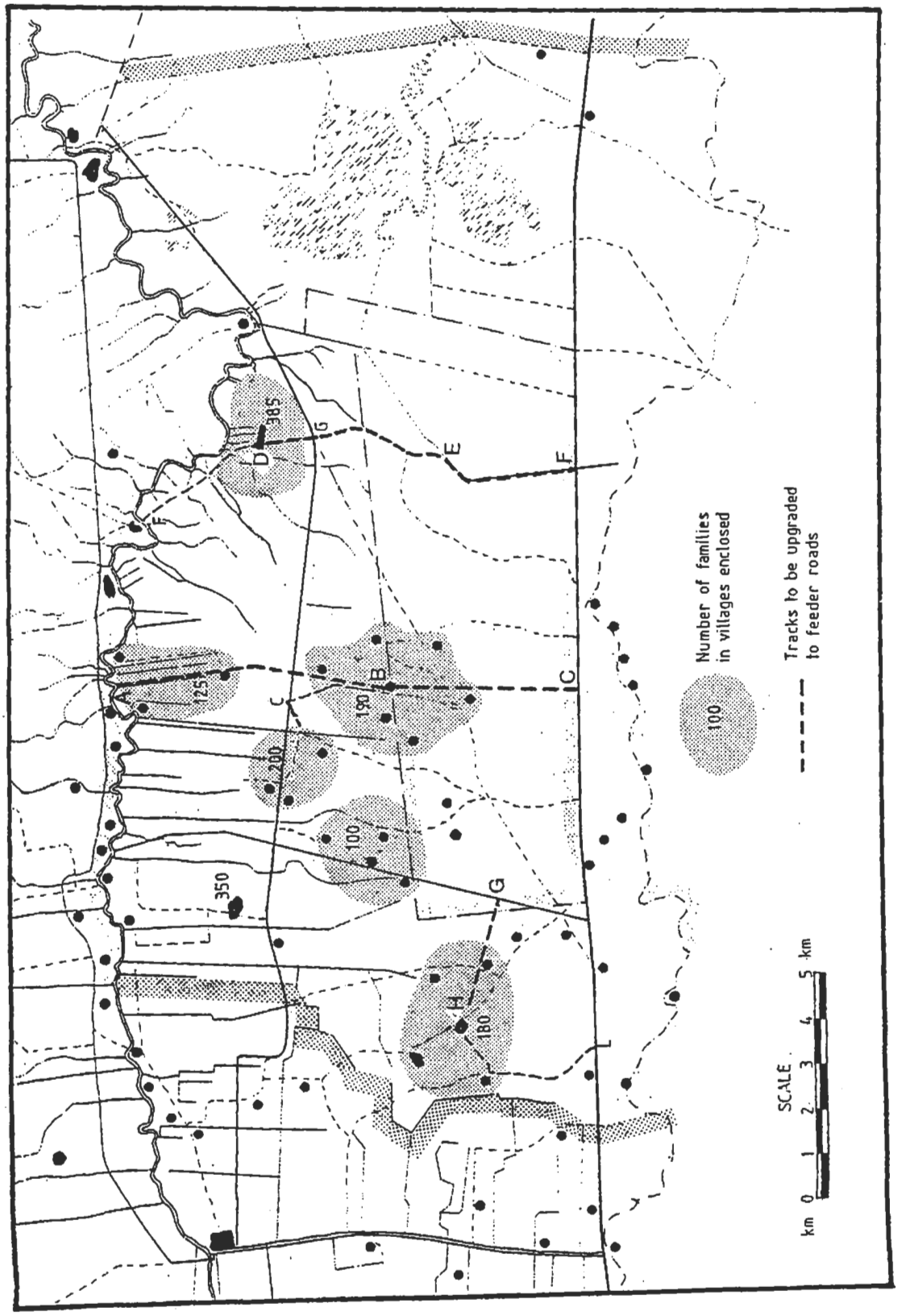
The need to ensure that landowners especially smallholders have indisputable title to their holdings was also recognised by USAID while preparing its Shabeelle Water Management Project. It commissioned the Land Tenure Center of the University of Wisconsin to study in depth the situation in the project area, which borders on the Dara Salam Busley area, to the south where the Land Tenure Center's findings have been found equally applicable. Since the Shabeelle Water Management Project is likely to become effective at about the same time as the proposed project, it would appear best to make financial provisions to supplement the work of the Land Tenure Center, with the caveat that all such funds, and the personnel and equipment procured with them, will be devoted exclusively to the Dara Salam Busley Agricultural Development Project Area.

3.3.13 Long-term Credit

As noted, full benefits from irrigation can only be obtained if the land is level and water distribution on the fields even. The project will provide the necessary technical backup to plan land levelling in a systematic and integrated manner and assure the availability of equipment. However, apart from relatively small demonstrations done as part of the project, it has been decided by MOA that the cost must be borne by the landowners. Under the soil conditions of the project area it is expected that any disturbance to the soil and consequent possible yield reductions would take only a short time to be rectified. Benefits from levelling would thus accrue from the second crop season onwards. Estimated benefits from land levelling are developed in Annex 4. To ensure that the farmer is left with sufficient incentive to invest, it is proposed to grant the loan for a 7-year period at the standard interest rate at the time of borrowing and to start repayments in year 2. Consideration may usefully be given to charge different interest rates to different groups of farmers. One suggestion would be to charge farmers owning less than 1 ha 2%; those who have 1 to 5 ha of land 5%, between 5 and 10 ha, 8%; and the going rate for farmers owing more than 10 ha.

Figure 3.3

Feeder Road Programme



3.3.14 Medium-term Credit

Medium-term credit is required to support the purchase of draught animals, suitable animal-drawn implements and manually operated forage choppers (repayment period possibly 3 years), for tractors and tractor-drawn machinery (repayment period possibly 5 years). The project would set aside a sum as revolving fund to cover all the proposed credit schemes. There would be no fixed allocation between the items deemed eligible to be supported by the revolving credit fund. The suggested procedures for obtaining the credit and its administration, during and after the project implementation period, are described in Annex 4.

3.3.15 Short-term Credit

Credit needs for annual production costs are at present adequately covered by the on-going UNCDF and EDF supported schemes. The project's task would be merely to ensure that short-term credit funds are made available to the project area.

3.3.16 Tillage Machinery

At present, despite the 34 tractor units that ONAT has available at its Shalambood Depot, there is a shortage of tractors for primary land preparation and a perhaps even greater hidden shortage manifest in delays experienced by many farmers to obtain the machines at the right time. It is expected that this will be gradually alleviated by an increase in the number of private tractors, purchased either through the proposed medium-term credit or through private means. As a further step the project would provide three tractor units, to be placed under the control of the Project Coordinator's office and be available for hire only within the project area. The terms and conditions of the hiring would be identical to ONAT's, so as not to appear to be in competition with an established specialist organisation. The tractor operators would be trained by the Project Coordinator or his staff, and would also be conversant with the proper operation of land levelling equipment (Section 3.3.3).

3.3.17 Marketing and Commercial Support

Marketing and commercial support would provide six stores, each with 20 tonne capacity. The stores would be part of the complex proposed for supporting the animal health component and would serve primarily as purchasing points for ADC when they are called upon to fulfil their role of residual buyers. When not so needed, they would be transit stores for fertilisers, pesticides and veterinary drugs from where the retailers could replenish their stock at short notice, thus saving them the cost of carrying large inventories. The centres would also be purchasing points for Somaltex to buy cotton and collect it prior to transit to the ginnery in Balcad and for ITOP for tomatoes if a sufficient number of farmers enter into contract with them for the growing of the pearshaped canning tomatoes. Their proposed management, and more details of their operation and functions are described in Annex 9.

3.3.18 Support for Organisation and Management

The proposed organisation and management of the project, during and after the implementation period, is described in Chapter 5. It will require an office building, staff housing and other facilities, and vehicles. All its operation costs, including salaries and allowances, would be a project cost during the implementation period.

3.3.19 Social Services Development Support

This would be the provision of a school building at Busley-Dawd that requires less maintenance than the type at present provided by the community. It would consist of eight class rooms, a staff room and one-room accommodation for the headmaster and two teachers. Should there be need for one more school, possibly at a suitable location in the north-east of the project area, funds may be allocated for it.

The health authorities advised that they have a smoothly running integrated programme and did not require any direct assistance from the project. However, they note with concern that nutritional standards of some income groups are inadequate and suggest that if possible the project should endeavour to address this problem by targeting some of its proposed impovements, e.g. the introduction of animal traction, which would improve weed control and thereby save much manual labour, to these groups. The proposed baseline survey (see Section 3.3.20) would identify these groups and thereby give a focus to appropriate project activities.

3.3.20 Monitoring and Evaluation

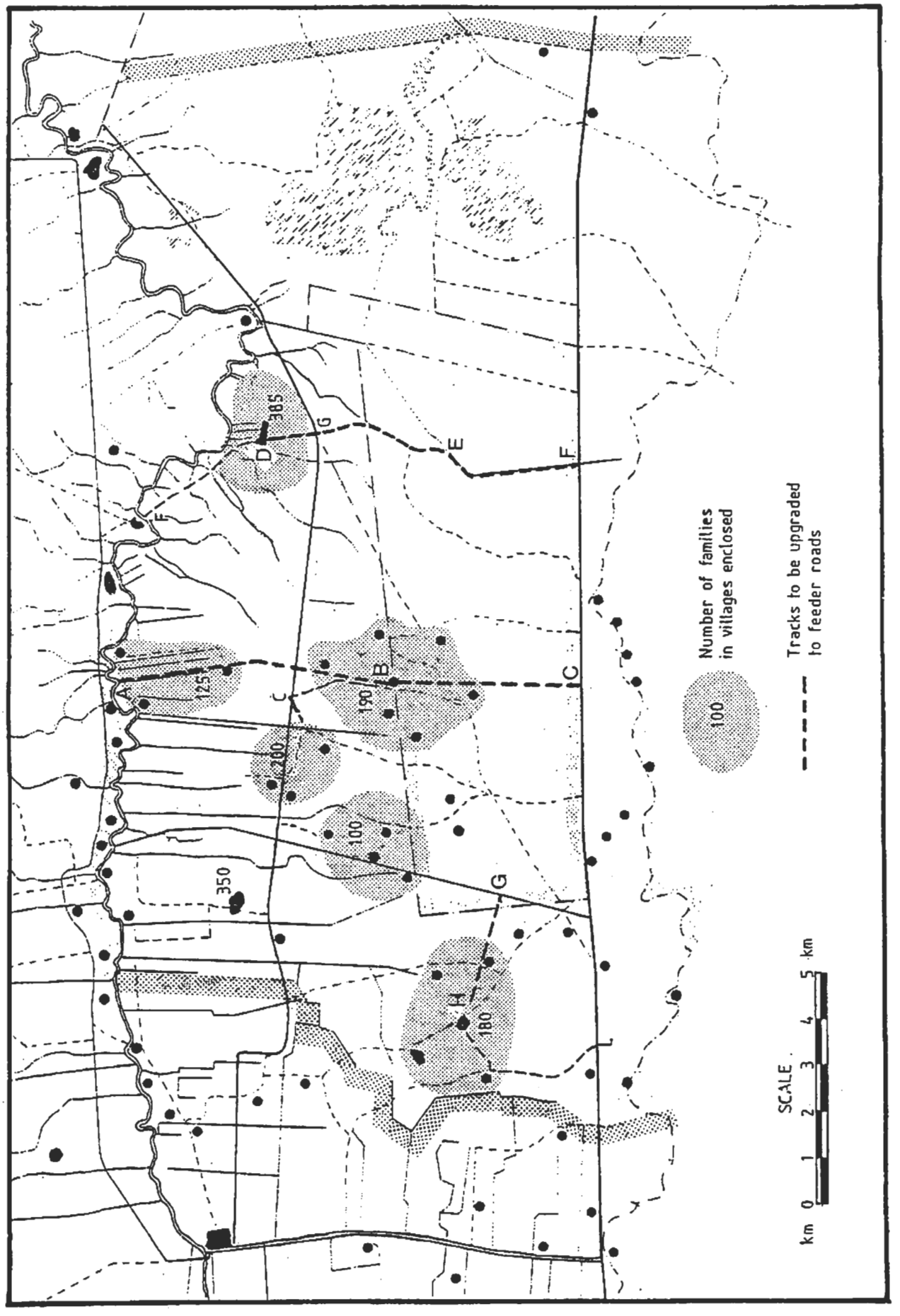
Progress of project implementation would be monitored by the Project Coordinator's office; it would also oversee the periodic evaluation of the project's impact. To enable such evaluation to be meaningful, it would be necessary to conduct a baseline survey as soon as possible. Then, after 3 years and again in year 5, interview the same respondents to determine any changes in their performance brought about by the project. These surveys would be conducted by the Planning Department of the Ministry of Agriculture, which would seek guidance from the Monitoring and Evaluation Section of the Ministry of National Planning. A sample questionnaire, to serve as a discussion paper, and a description of the points requiring determination from the respondents is in Annex 8.

3.3.21 Technical Assistance

It is expected that the Project Coordinator and the Project Engineer would require support and training by Consultants through the implementation period, after which they would be expected to work without such assistance. A total of 72 man-months is deemed necesary for this purpose to cover the first 3 years of the 5½ year implementation period (Section 3.6). Provision would be made for about 10 man-months additional consultant time to address issues that may arise. Determining the discipline to be invited, and the length of time for which it would be required, would be the task of the Project Coordinator and his counterpart. In addition, to meet the CEC's audit requirements, 1 man-month at the end of each financial year during the project implementation period would be required for an independent outside

Figure 3.3

Feeder Road Programme



auditor to review the project accounts and to certify them. Thus, a total of about 87 man-months consultancy would be required. Terms of reference for the consultants are in Annex 9.

The proposed technical assistance component is contingent on the contractor(s) meeting the implementation schedule shown in Figure 3.2 (Section 3.6). If they do not, then the task of supervising and providing the day-to-day support that contractors require would be more than one engineer could effectively handle. The nature of the work, and to ensure effective quality control, would then make it necessary for the Project Engineer to remain until all major construction work, i.e. other than the completion of the canal distribution structures, is completed. Therefore, it is proposed to increase the physical contingency factor to technical assistance from 10% to 20% (Section 4.1).

3.4 Water Supply, Demand and Quality

3.4.1 Supply

The GOS has decided that at low river stages, when water has to be pumped, present abstraction rates may not be exceeded. Since MOA controls the licensing of the pumps as well as the days of the week they may be operated, enforcing this ruling should be relatively easy.

When river flows are high and water enters the canals by gravity, no restrictions to the time when water may enter the canals are contemplated; the only caveat is that the total capacity of the 56 canals at present offtaking within the project area may not be increased. Water begins to enter the canals, mostly the ones nearest to the Janaale barrage, when river flows are about 40 m^3/s. However, the 'average' canal will only receive water when river flows are about 60 to 65 m^3/s which corresponds to a flow rate of 70 to 75 m^3/s at Aw Dheegle. Based on records for the last 10 years the period when river flows are at or above this level with 75% reliability extend to 40 to 50 days in the gu and 55 to 65 days in the der, or say about 110 days in 3 years out of 4 years.

3.4.2 Demand

Water demand calculations for the design cropping pattern (Chapter 6) are shown in Annex 2. They are based on the following criteria: the conveyance efficiency improving from 50% to 75% and field efficiency improving from 40% to 60% due to proposed project works and actions. Crop water requirements, in addition to the 75% reliable effective rainfall, in the following calculations are assumed to be about 300 mm at the root zone which is a rounded average for maize in the gu (267 mm), in the der (421 mm) and sesame (317 mm). Cropping intensity is taken, at full development, to be 180%. Assuming an overall irrigation water efficiency of 45% (see above) this means an abstraction of 667 mm depth over the irrigated area at canal inlets or between 52 and 53 million m^3. In 110 days this is equivalent to a flow of between 5 and 6 m^3/s. River flow data show that this figure can be met.

The foregoing assumes that land levelling will increase field efficiencies from 40% to 60%. However, only 600 ha are assumed to be levelled during the 5 years of project implementation although it is hoped that the work will continue after project completion. But assuming there will be no land levelling at all, water use efficiency would be only about 30%, equivalent to an

abstraction of about 1 000 mm per cropped hectare. This assumption would require about 79 million m^3 to be abstracted over 110 days or a flow rate of 8 m^3/s, which may also be possible.

If it is assumed that abstraction can take place only for 85 days (40 in the gu and 45 in the der) then the aggregated flow rate required would be about 7 m^3/s with land levelling and about 11 m^3/s without it. The 11 m^3/s abstraction rate may not be possible over the full 85-day period. Thus, the implications are that, assuming an 85-day abstraction period, the irrigated area could only be extended if it goes hand-in-hand with properly levelling all areas at present irrigated as well as the ones to be bought under irrigation.

It is possible to supplement irrigation water by pumping at times when river flows are adequate to support such additional abstractions. However, the economics of using pumped water for growing field crops is likely to discourage all but the most efficient farmers who are able to obtain above-average yields. It is therefore proposed that any farmer wishing to purchase pumps should, first of all, seek permission from MOA to install a pump; the permission also to state the times when the pump may be used (Section 3.4.1). If the farmer then wishes to purchase a pump he may apply to the Project Coordinator for credit out of the revolving fund (Sections 3.3.13 to 3.3.14).

The more enterprising farmers, especially those growing horticultural crops, may consider installing closed distribution systems, which are far more efficient than the open system is likely to be. Such enterprise would require some carefully conducted testing of suitable equipment, and the training of operators. This function should devolve on the Directorate-General of Irrigation and Land Use (Section 5.2).

3.4.3 Quality

Except for about 15 days at the start of the flood in April when the quality of the water is poor, the river water is classed by USBR quality standards as 'moderately suitable' for sustained irrigation. Therefore it will be essential to adopt appropriate soil and irrigation water management techniques to prevent the build-up of soil salinity and thereby enable the proposed cropping system to be sustained and the projected yields to be attained. Thus, for example, care must be taken not to over-irrigate and thereby raise groundwater levels and increase the salinity of the topsoil. Similarly, irrigation that would not provide a sufficient leaching factor out of the root zone must be avoided. The indication that special care is required is manifest in the present management of the banana plantations. These, in theory, should last for many years; in practice, in the lower Shabeelle they last only for about 3 years, after which the soil has to be leached by growing other crops before bananas can be replanted. While bananas are particularly sensitive to salinity and waterlogging, the need to replant relatively frequently is certainly an indication that the quality of the water is not good and that great care is needed in irrigation management.

3.5 Status of Project Preparation

No design or survey work has taken place in the project area except what has been recorded in Annex 6 and Annex 11 and its attached Tender Documents. These latter are adequate to secure bids from contractors on a unit-cost basis, but they need to be supplemented by detailed final designs which must be

sufficiently advanced not to cause holdups in the contractors' work. Since it is not expected that construction will in fact start until the 1988/89 dry season (Chapter 4) there is enough time both to award the contracts and to prepare sufficient final designs for work to proceed uninterruptedly once it starts. This final design phase would be part of the project implementation period.

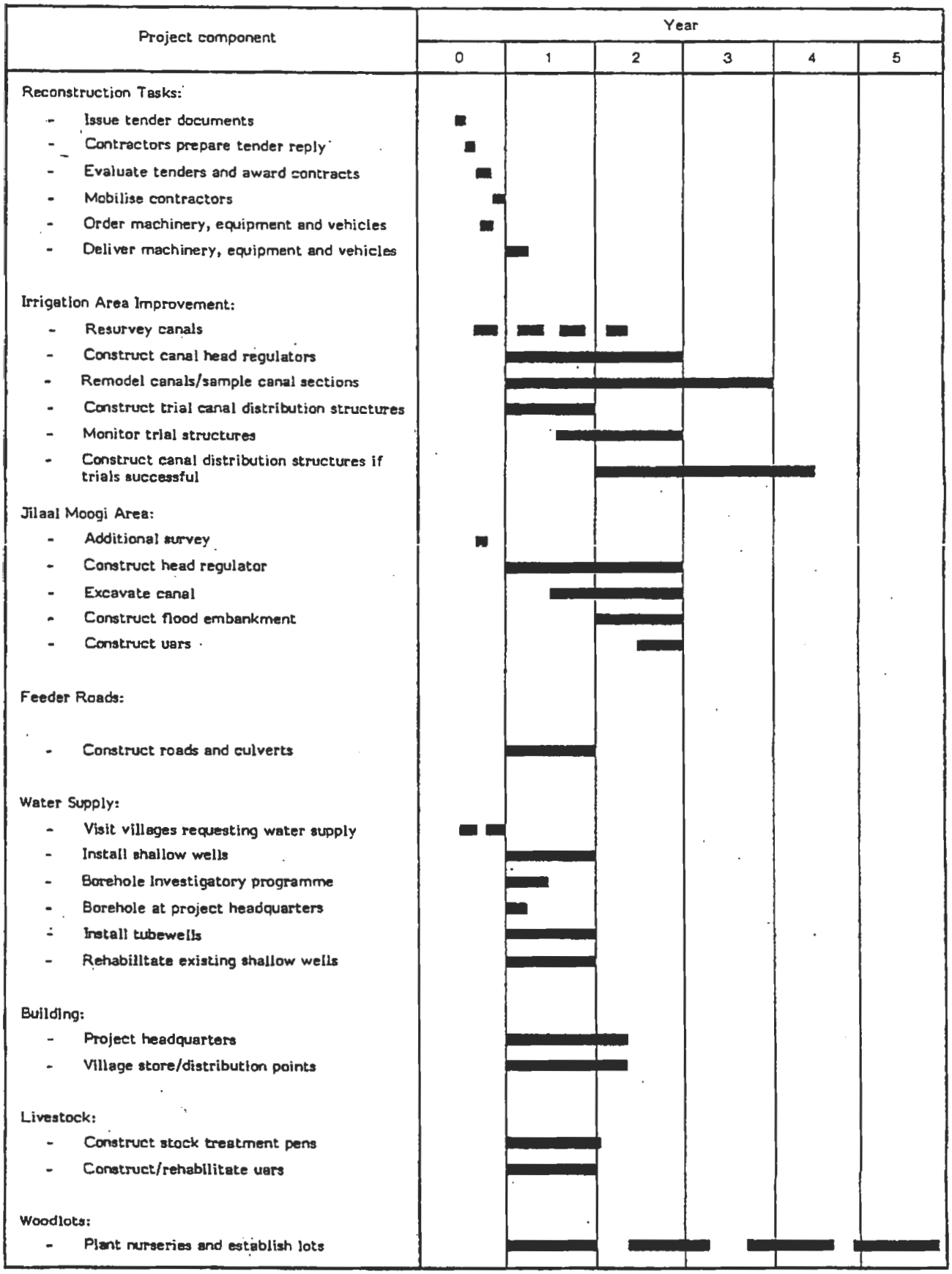
3.6 Project Implementation

The proposed implementation schedule, shown in Figure 3.4, is proposed with some hesitation. While it is possible to complete the major part of the works in three years as shown, the exception being the installation of the outlet structures, since the implementation of this component depends on experience gained with the canal where it would be installed on a pilot basis (Section 3.3.2), historic project implementation profiles in Somalia would indicate that the chart could be optimistic. Since slippages have a serious impact on overall project costs because of the expected cost escalation (Section 4.1), it would be the duty of project management to ensure that contractors strictly adhere to the timetable agreed and formulate the contracts in such a manner that penalty clauses for unjustifiable delays become a real deterrent.

Civil works would be contracted out after local competitive bidding. Contractors would be required to utilise local labour to the fullest possible extent. While preference would be given to large contractors, thereby making supervision and quality control by project management easier, the contractors would be expected to give preference to locally based sub- contractors wherever possible. It should also be a contracting condition that wherever possible and reasonable, the local population will have preference in employment. For details and timing see Annex 9.

Figure 3.4

Proposed Implementation Programme



CHAPTER 4

COST ESTIMATES

4.1 Project Costs

The estimated project costs (see Table 4.1) cover an approximate 5.5 year period, including about 6 months of prefinanced start-up operations, and are estimated to total ECU 9.35 million (including price escalation), of which some 59% would be foreign exchange. The assumption on timing was based on the premise that the project would get off to a formal start about March 1988; substantial construction work cannot be organised until the 1988/89 construction season. It is expected that the last of the works, completing the field irrigation structures, would not be completed until Year 3.5, i.e. 4 years after the grant has been approved, or until about April 1992. Costs have been calculated on 1987 prices which have been adjusted for expected future cost escalation and changes in the value of the Somali Shilling to the ECU. The CEC advised that their assumed cost escalation rates for Somalia are as follows:

(a) offshore foreign exchange costs: increasing at a compound annual rate of 5%;

(b) local component in-country costs:

(i) in terms of Somali Shillings, costs are expected to increase at a compounded annual rate of 25%,

(ii) in terms of the ECU, the exchange rate of the Somali Shilling is expected to depreciate as follows:

1988 and 1989	30% per year
1990 and 1991	20% per year
1992	10%

In other words, 1 ECU will buy the following amount of Somali Shillings:

1987	101.9
1988	132.5
1989	172.2
1990	206.7
1991	248.0
1992	272.8
1993	300.1

Since the disbursement period is likely to extend into 1993, it has been assumed that the depreciation of the Somali Shilling for that year will be the same as for 1992, i.e. 10%.

(c) a physical contingency of 10% has been added to each item except technical assistance, where 20% was taken (Section 3.3.21).

The value of the ECU was derived from the US dollar rate of May 1987 (SoSh 90 = US$ 1) and a US$/ECU conversion factor of 1.13, which was the rate in May 1987.

TABLE 4.1

Summary of Project Costs at Current Prices (million)

	Total		% of	Foreign exchange	
	SoSh	ECU	base cost	SoSh	ECU
Jilaal Moogi	42.7	0.42	5	24.6	0.24
Irrigation and flood control	311.0	3.06	40	173.5	1.71
Infrastructure	151.4	1.49	19	86.3	0.85
Agriculture and forestry	33.0	0.32	4	17.9	0.18
Livestock	59.3	0.58	8	39.8	0.39
Project management	35.0	0.34	4	6.4	0.06
Technical assistance	64.4	0.63	8	58.0	0.57
Buildings and vehicles	88.4	0.87	11	59.6	0.59
Sub-total	785.2	7.72	100	467.1	4.59
Physical contingencies	85.0	0.84	10.8	52.5	0.52
Price Escalation					
Local	(1)	0.01	-	-	-
FE	(1)	0.78	9.9	(1)	0.78
TOTAL		9.35	121	(1)	5.89

However, during the Consultant's discussion in September 1987 the SoSh/US$ rate was of the order of 140, i.e. even in excess of the rate assumed by the CEC for calendar year 1988. It was impossible to check escalation of local costs: the sharp rise in the SoSh/US$ rate is too recent for new forecasts to be made. Therefore the ECU value of the local cost component is to be treated as an indicative figure.

There are no indications at present that the ECU/US$ rate will alter.

The detailed cost tables in Annex 3 assume that some expenditure will be incurred before project implementation actually starts: certain facilities would have to be created, vehicles purchased and staff engaged for final detailed design works, enabling the contractors to commence construction at the stated time. It is expected that the CEC appraisal team would give authority to commence activities and commit funds from immediately after appraisal i.e six months before signing the loan agreement and retroactively reimburse expenses after formal signing of the loan agreement.

The project costs include all the operating costs during the project implementation period except for maintaining and operating the canals from which water is taken directly to the farmers' fields. This would, from the beginning, be done by the Canal Committees. The base cost of the Canal Committees' commitment during the project implementation period is estimated at SoSh 16.1 million. Thus, about SoSh 182 million, or 24% of the total, are operation and maintenance costs during implementation (for details see Annex 3). About two-thirds of the operating costs go for project management and technical assistance; maintaining parts of the irrigation system which will not be operated and managed by the Canal Committees; road and other infrastructure maintenance. Agricultural support services take up a total of 23% of the annual operation and maintenance costs; the balance of about 10% pays for the operating costs of the other six items in the cost estimates table.

4.2 Financing

It is understood that the GOS would contribute 5% of total project costs, which would be in SoSh and is proposed to be used towards staff salaries and allowances. Thus, external financing is only sought for about ECU 9.3 million, ranging between ECU 7.9 million and 9.5 million, depending on the assumptions made on SoSh/ECU exchange rates and local cost escalation (Section 4.1).

4.3 Post-implementation Costs

Once the project is completed, the annual operating costs not attributable to the Canal Committees and therefore to be covered out of GOS budget are expected to be as shown in Table 4.2:

TABLE 4.2

Annual Project Operating Costs after Completion
(Constant 1987 prices, SoSh '000)

Jilaal Moogi	1 473
Roads, etc.	3 932
Agricultural support	2 515
Livestock support	6 471
Project management	6 724
Sub-total	21 115
Physical contingency 10%	2 112
Total	23 227

This is equivalent to just over SoSh 1 000 per hectare of the project area. However, in other areas the agricultural and livestock support costs and the costs of roads, wells, etc. are not charged directly to the beneficiaries: they are covered by GOS general revenue. Moreover, the Jilaal Moogi area benefits mainly others than the project area's population. Therefore, a sum of SoSh 14.4 million plus 10% physical contingency, i.e. SoSh 15.8 million should be deducted from the figure shown in Table 4.2, leaving SoSh 7.4 million which is the estimated annual cost of maintaining works directly attributable to the project. This is equivalent to about SoSh 340 per ha over the entire project area or about SoSh 1 300 per hectare of the area growing crops. Its recovery is further discussed in Chapter 5. In addition to the foregoing, Annex 3, Table B8.5 shows the diminishing cost of the tree planting bounty of about SoSh 1.9 million over 4 years, which would have to be met out of GOS budgetary allocation.

4.4 Procurement

4.4.1 Purchases

All offshore purchases would be by competitive tendering within CEC member countries. However, a degree of standardisation would have to be built into the invitations to avoid obtaining equipment for which there is no repair and maintenance support within Somalia: the project would not purchase any item in sufficiently large numbers to warrant building up its own repair organisation for other than minor works. Local fabricators, e.g. the Mogadishu Foundry, would be given preference to making animal-drawn and other simple equipment if they are competitive with quoted CIF Mogadishu prices.

A minor exception to CEC procurement rules should be obtained for the purchase of leveller blades for local copying from India or Pakistan, and guillotine fodder choppers from India. The two countries mentioned are neither CEC nor APC (Asia-Pacific-Caribbean) member countries. Since the total sum involved is less than US$ 2 000 equivalent, it is believed that the exemption may be granted.

4.4.2 Contracts

Contracts for construction works would be grouped into two major items: civil works and road construction, and building construction. Contractors may bid for single items but preference will be given to those who bid for an entire

package. While bidding would be open to all CEC member countries and to companies registered in Somalia, it is not expected that a foreign contractor would be interested.

4.5 Accounts and Audit

The Project Coordinator's office would have an appropriately staffed Accounts Department which would prepare detailed accounts and requests for reimbursements. To enable smooth operation and minimal delay in paying contractors, the project would have a revolving fund of SoSh 10 million which would be 'topped up' by GOS as soon as reimbursements have been received from the CEC. Offshore costs, like payment for vehicles and other directly imported items, as well as the offshore costs of approved consultancy services would be paid directly by the CEC to suppliers/contractors, upon receiving the request from the Project Accountant.

Project accounts would be audited once a year by an independent chartered auditor organisation, acceptable to both GOS and CEC. The auditors would be appointed for the entire implementation period; it is expected that the task will take 1 man-month per year.

4.6 Proposals for an ECU 7 million Project

It is understood that the CEC is only prepared to allocate the ECU 7 million to the project. While of course the decision of how to spend this money must finally rest with GOS and the CEC, the Consultant suggests considering one, or a combination of, the following alternatives:

(a) Phase the project, i.e. reduce all components proportionately to expect to complete works in a Phase II project after 1993;

(b) Reduce the irrigation rehabilitation component by putting more of the rehabilitation task on to Canal Committees and only provide them with appropriate designs;

(c) Reduce the infrastructure component - probably the least desirable alternative because it would also impair improvement of the quality of life;

(d) Eliminate all livestock development components except constructing stock watering ponds and include the omitted components into the proposed Phase II of the Bay Region Agricultural Development Project;

(e) Do not build project headquarters: base staff in existing or slightly augmented facilities in Janaale.

CHAPTER 5

ORGANISATION AND MANAGEMENT

5.1 Introduction

The organisation and management of the project must be viewed in two distinct phases: the project implementation period during which donor funding is available substantially to cover management costs, and the post-implementation period, during which any sums expended to provide services specific to the project area must be recoverable from the beneficiaries.

5.2 Organisation and Management During Implementation

The project would be implemented under the overall control of the Land and Water Use Department of the Ministry of Agriculture. The department is at present headed by a director who reports to the Director General, Agricultural Production. However, the reorganisation of the higher levels of MOA is under active consideration, in response to the recently approved World Bank-supported agricultural extension project, and by the USAID-supported Shabeelle Water Management Project. The organisation chart nearing final approval by MOA is shown in Figure 5.1. Figure 5.2 shows the proposed organisation of the Directorate of Irrigation and Land Use. The Shabeelle Water Management Unit would control the operation of the storages and eventually the regional and project-by-project allocation of the river waters. The Land Use Unit would be in charge of ownership registrations, record and register transactions covering leaseholds and would record land use: areas of perennial high-value orchard crops, perennially irrigated field crops, flood irrigated and rainfed areas. The regional offices, headed by Directors would administer the project-by-project distribution of water reaching them, organise and oversee the maintenance and operation of all public canals (i.e. the ones too big to be controlled by a single traditional villagers' canal committee) and keep a watching brief on the maintenance and operation of channels under the control of the Canal Committees. They are also expected to be the entity to whom the project managers would report.

At the project level, the official in direct charge of all project-related activities during implementation would be the Project Coordinator (PC). By training he would be an agriculturist with an extensive background and experience of leading multi-disciplinary teams. He would have under him an engineering and an accounting department for which he would be administratively responsible. The Subject Matter Specialist assigned to the project area would also report to the PC. Since by qualification the PC would not be an engineer or an accountant, he would, in case of doubt, refer technical issues in these fields to the Regional Office. While the concerned technicians in the Regional Office would exercise an overall technical supervisory function, the PC must have the authority to decide, and refer issues to the Regional Office and the DG only ex-post. His organisation is shown in Figure 5.3; further details and job descriptions are in Annex 9.

In addition to administrative, accounting and engineering matters under his direct control, the PC would also keep a watching brief on project-financed activities not directly implemented by the project authority, like the well-digging programme and school buildings, have charge of the medium- and long-term agricultural credit programme, the activities of the functionaries charged with

introducing animal traction and ensure that the agricultural extension service, including the SMS for cotton, tomatoes and melons, provides an adequate service to the project area. He would also have a part-time Forest Ranger to help implement the shelterbelt and fuelwood plantation programme and a part-time Animal Husbandry Assistant, both seconded by MLFR but paid out of project funds. Through the Regional Director in Janaale he would have access to the Director-General, Directorate of Irrigation and Land Use.

The Project Engineer (PE) would be responsible for the work done by the contractor(s). His office would prepare the final drawings from which the contractors would work, certify the quantity and quality of the work done and the progress on which payment authorisations would be prepared by the project accountant for submission to the Finance and Administration Department in the DG's office, who would request CEC reimbursements. He would take technical charge of the work done by the engineer preparing the land levelling plans, supervise and certify for credit disbursement land levelling works done on farmers' land. Administratively the PE would report to the PC but technically he would be in full charge, with the caveat that the Regional Coordinator, if so advised by the PC, may seek professional corroboration of his work.

The Project Accountant would prepare payment requests for the contractors; check the invoices submitted and ensure that the certifications of quality and quantities meet CEC and GOS requirements. He would supervise the movement of pesticides, fertilisers and veterinary drugs from project stores and keep the record for medium- and long-term credit revolving funds.

It is expected that the PC and PE would require expatriate support during the project implementation period, partly as a training function and partly to divide the expected workload. The Consultants' job descriptions would each be identical to that of their counterpart with the exception that strong emphasis would be placed on the training aspect of their function (Annex 9).

5.3 The Post-Implementation Period

Once the project is completed, Project Management's function would lessen substantially, and with time and the development of support services in the project area, might diminish even further.

The PC would continue as the chief agricultural adviser of the project area. He would maintain close contact with the farmers and alert the Regional Extension Officer to any specific extension and research needs. The SMS and the staff involved with animal traction would be absorbed by AFMET; the Forest Ranger would continue with the project management unit until the last of the bounties for surviving trees is paid out, after which his job would be abolished; the Animal Husbandry Assistant would revert to MLFR as soon as the project has been implemented and the grant disbursed. Credit administration and the operation of the revolving fund would remain with the PC, since repayments would not be significant until after project completion. The PC's office would arrange for its re-lending. Consideration should be given at a later date to augmenting the revolving fund to meet the, hopefully increasing, demands on it. Eventually the function may well pass on to commercial banks within the framework of a medium- and long-term agricultural credit scheme.

The PE's office would be absorbed into the Janaale Regional Office from where it would continue to control staff charged with supervising water use and canal operation and maintenance. The PE would continue to advise the Canal Committees on maintenance of their canals and continue to provide the necessary back-up services to land levelling.

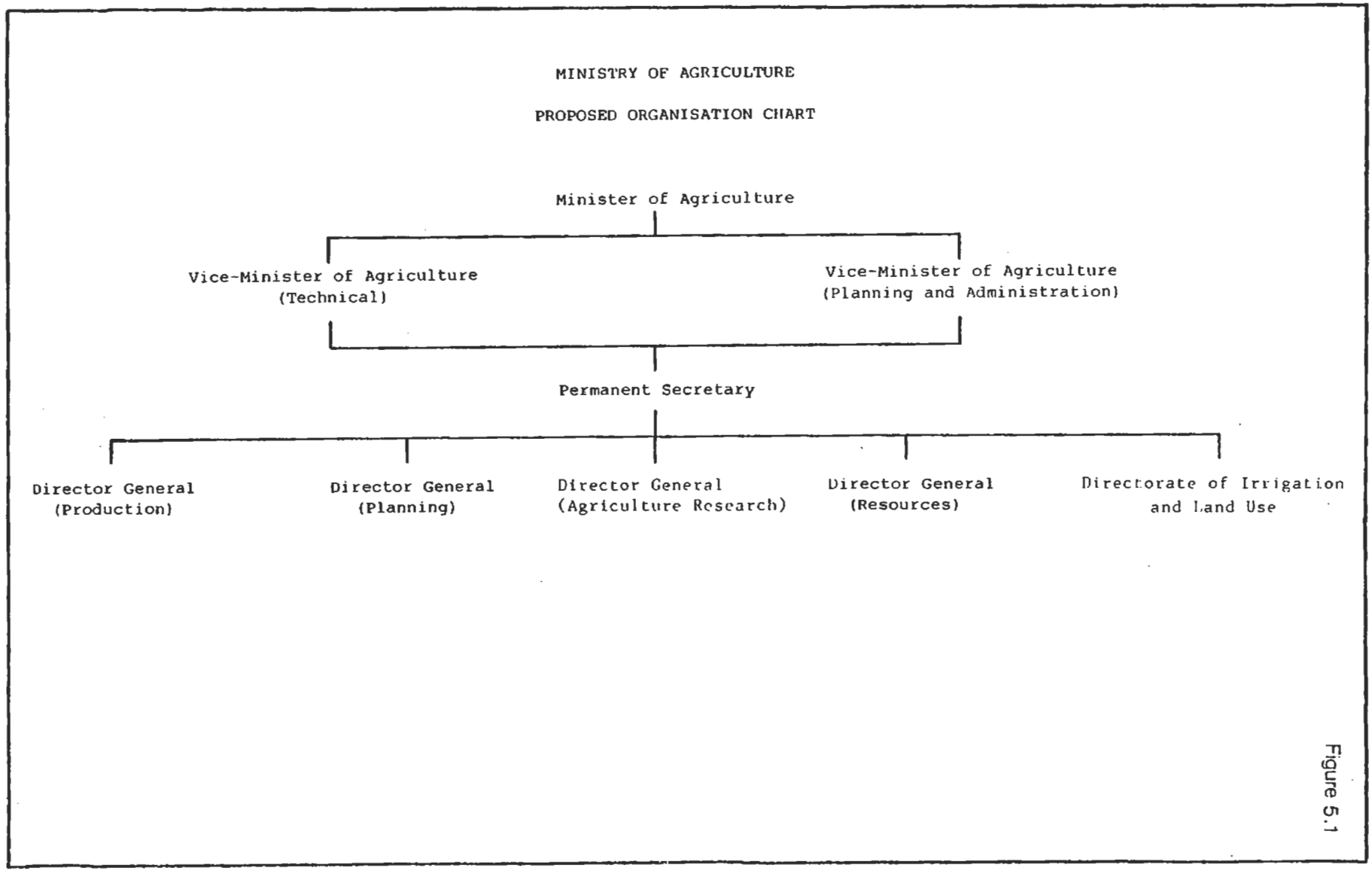

MINISTRY OF AGRICULTURE
PROPOSED ORGANISATION CHART
Minister of Agriculture
Vice-Minister of Agriculture (Technical)
Vice-Minister of Agriculture (Planning and Administration)
Permanent Secretary
Director General (Production)
Director General (Planning)
Director General (Agriculture Research)
Director General (Resources)
Directorate of Irrigation and Land Use

Figure 5.1

DIRECTORATE OF IRRIGATION AND LAND USE

PROPOSED ORGANISATION CHART

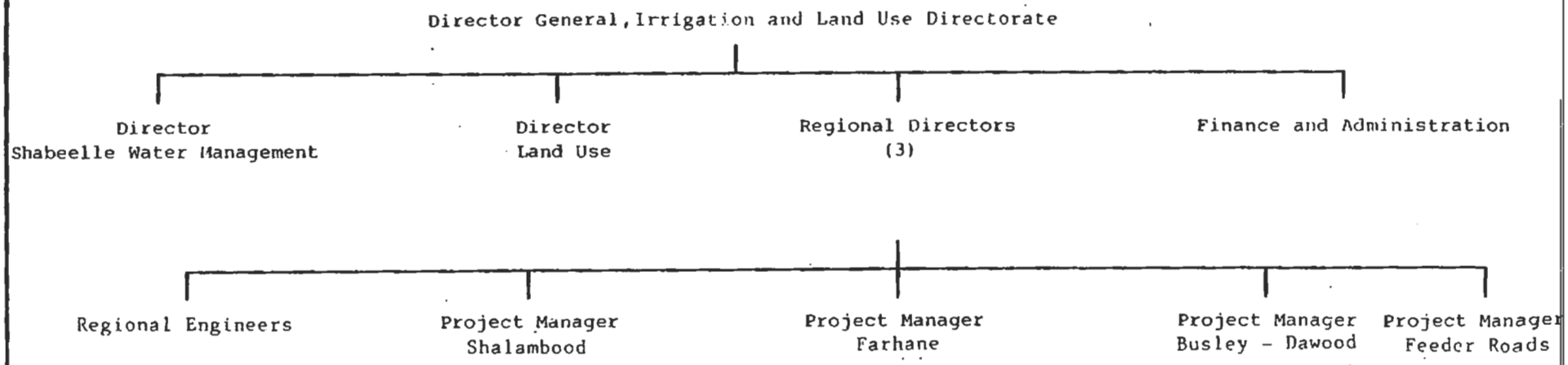


Figure 5.2

PROJECT HEADQUARTERS

PROPOSED ORGANISATION CHART

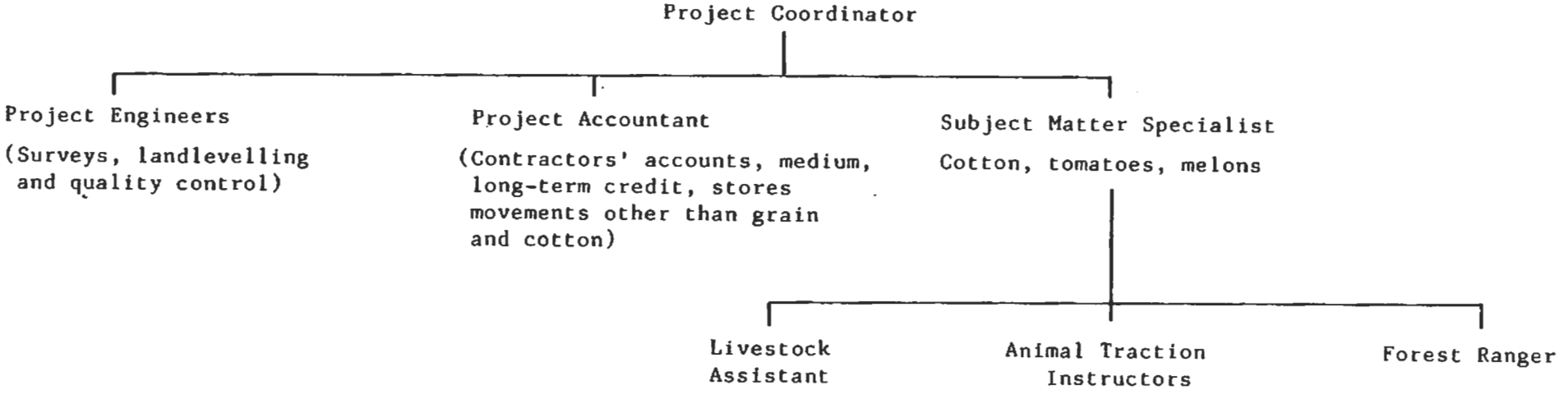


Figure 5.3

The Project Accountant's work would be to manage the accounts of the revolving credit fund, record the movements of fertilisers, pesticides and veterinary medicines in and out of the stores, and to control the finances of these movements. Since this may become a part-time routine job after project completion, the Project Accountant may well move to the Janaale Regional Office and take on other regional duties as well.

During project implementation the PC's office would ensure the proper maintenance of infrastructure built by the project, much of it as part of the normal construction contracts which include one or two year's post-construction maintenance. After project completion the maintenance of the infrastructure and facilities built by the project must be ensured. The canals delivering water to the farms would be maintained and operated by the Canal Committees at no cost to project administration except in the form of technical advice and assistance, much on the lines and principles on which the agricultural extension service is working. However, the maintenance and operation of two major canals, the roads and buildings provided must be assured. Administratively this would be the task of the PC; the actual work would be done either by maintenance staff of the Janaale Regional Office and the local authorities responsible for roads, or by contractors supervised by them. The cost of doing the work would have to be recovered from the beneficiaries. The school buildings would be maintained by the village committees, as at present.

5.4 Managing the Distribution System

Two canal systems have been identifed: the ones apparently professionally designed, now serving the successors of the former Italian estates, and those built by individuals or groups of farmers, without any apparent engineering input. These latter vary in length between less than 0.5 km (25%) 0.5 to 1.0 km (35%) and 1 to 15 km (40%). Only two out of the total of 56 canals are operated by MOA; the others are operated by their users who are either individuals or small or large farmer groups. Some 40% of the canals serve a unit of small and large farmers; 35% serve small private farmers and the remaining 25% feed individual farms, including the Military Farm (see Chapter 3).

Almost all the shared canals are efficiently and competently managed and maintained by their users; operation and maintenance is overseen by the Canal Committees. The committee chairman and members are either elected or function with the tacit agreement and support of the users, an arrangement that would continue. All the beneficiaries contribute to maintenance. Water allocation by time and frequency is done by the committee. Details are in Annex 6. Intervention by the project would be confined to engineering advice on timely and appropriate maintenance, which may be done by manual labour or machines that the Canal Committees would be able to rent. The project would purchase two excavators, for the specific purpose of renting them out for canal maintenance; when not so required, they would, of course, be available for other work. These machines would be passed on to ONAT after project completion. Other machines are available for hire from ONAT and private sources; the Canal Committees would be free to negotiate the most favourable terms. Project management would provide advice and guidance to maintain a hydraulically efficient cross-section. There would be training in the most efficient operation of water division structures and turnouts and technical advice and guidance for their maintenance and repair. During project implementation this would be the task of the Project Engineer's Department. Project completion is expected to coincide with the substantial completion of training of the Canal Committees; subsequent work would be confined to supervision and advice by the Regional Coordinator's Office in Janaale.

5.5 Agricultural Supporting Services

5.5.1 Agricultural Extension

Agricultural Extension in the project area will continue to be the responsibility of the World Bank-supported AFMET project. The second stage of this project is designed to follow on the now ending Stage I, thereby ensuring continuity. Under the Phase II project there will be a Field Extension Agent (FEA) for about 800 farmers, which is deemed sufficient. AFMET intends to supplement the present scope of technical backstopping by a water management specialist. In addition, AFMET proposes to extend its activities to livestock development, particularly to improve the utilisation of crop residues.

While on the whole AFMET's proposed structuring and staff levels would appear to meet the needs of the project, it would seem advisable further to strengthen some of the support provided. Therefore, the project would provide:

(a) a SMS for cotton, melon and tomato agronomy, with special emphasis on cotton pest control. The SMS would work primarily in the project area but would be available for the region as a whole, especially to assist with the training of FEAs working in areas where cotton is grown;

(b) trainers for draught animals who would also work on better by-product fodder utilisation; they would work exclusively in the project area.

Technically, both these functions would be supervised by the REO's office. During the project implementation period they would be under the administrative control of the PC who would pay their salaries and field costs out of project funds; after the project is completed, these functionaries would be fully integrated into the staff of the REO Lower Shabeelle.

5.5.2 Agricultural Research

Under the AFMET II project the newly created Director-General, Agricultural Research will have an overall co-ordinating function for all research activities in Somalia. Problems requiring resolution are fed to the research station and to the DG's office. Research priorities and programmes will be ultimately determined by the DG's office. This procedure is designed to ensure that problems affecting large areas, and many farmers, get due attention. However, it is not geared to ensure that problems of considerable importance within small areas, but, in the larger context of lesser importance, also get taken up. Examples are cotton-growing problems: cotton is likely to cover 10% of the project area's irrigable land but a much smaller proportion of the Shabeelle and Juba valleys. Melons and tomatoes present a similar conflict betwen their overall importance and their relevance to the well-being of project area farmers. It would be the PC's continuing work to ensure that the agricultural research organisations pay due attention to issues of importance within the project area, irrespective of their regional importance.

5.6 Project Coordination

It is essential that during project implementation, and afterwards in the post-implementation period, all concerned entities are aware of on-going activities and are given the opportunity to contribute to likely improvements and smoother

operation. It would be one of the PC's functions to ensure this flow of information. One likely mechanism to ensure coordination and an exchange of information would be through the setting-up and periodic exchange of views taking place in an appropriately constructed Project Coordination Committee.

The Project Coordination Committee would be chaired by MOA's Regional Co-ordinator; its secretary would be the PC. The administration of the Lower Shabeelle Region, and that of the two project districts, Marka and Afgoi, would be represented. There would also be representatives of the benefiting farmers, preferably individuals elected or nominated by the Chairmen of the Canal Committees, and others representing farmers who do not have irrigation facilities. A useful number would be 10 to 12 members besides the Chairman and the Secretary. The committee would meet twice a year, when the PC would give an account of progress during the previous 6 months and plans for the following period. Members would comment on the effects of works performed, on management decisions affecting the day-to-day activities and raise other farm-related issues. The meeting would endeavour to solve problems that may have arisen and take note of suggestions made to improve impact and make operation and administration easier. While the ultimate decision necessarily rests with the PC and the officers to whom he reports, such meetings would ensure a general awareness of both sides to problems and could become a strong link in fostering mutual understanding and coordination over project issues.

CHAPTER 6

AGRICULTURAL PRODUCTION, FARM INCOMES AND COST RECOVERY

6.1 Introduction

In the project area, present and future farming patterns and production levels are only partly under the influence of the present and with-project production environment. The farmers' resource base, security of tenure, access to labour and other production inputs, whether environmental or physical, will all exert a considerable influence. The first part of this chapter thus attempts to analyse not individual, but overall, average likely developments with and without the project, recognising that deviations from this notional average are very great indeed. It will be one of the AFMET project personnel's major tasks to identify not only the physical but also the management constraints of specific farmers and farmer groups and to attempt to overcome them by target-oriented advice. Let it be recalled that the acronym stands for Agricultural Farm Management, Extension and Training, of which, in the context of this project, the farm management aspect will be at least as important as the agricultural aspects.

6.2 Expected Farm Production

6.2.1 Orchard Crops and Perennial Irrigation

Expected project works would not extend directly to areas at present growing bananas and other orchard crops and the relatively small area of field crops perennially irrigated, although other project works, notably the hygienic water supplies, the roads and the upgraded school building would benefit them as well. Farmers who own perennially irrigated land are on the whole efficient producers, and while improvements can undoubtedly be made, they will not happen as a direct result of project investments. Moreover, since water abstractions during low river-flow stages may not be increased, it is not expected that the area devoted to these crops will alter significantly. Therefore the area devoted to these crops will be excluded from the consideration of production changes.

6.2.2 Flood Irrigation

The area at present receiving flood irrigation would benefit from an improved, more responsive delivery system, from more water being available because of lower conveyance losses and from greater field efficiencies brought about by land levelling. The expected percentage increase in conveyance efficiency would result in a larger area being irrigated, although possibly not all the gain in water would be used to increase the irrigated area. It is expected that on completion of the conveyance improvements the irrigable area may increase by about 12 to 14%; land levelling could bring about a further 10 to 12% increase although not all of the savings would convert into additional irrigated land. Thus, the eventual total increase in the irrigable area, assuming abstractions from the river remain at approximately the present level, would be about 600 ha.

The improved system, coupled with the effects of improved and more extensive agricultural extension work - which would not produce the indicated improvements in yield and intensities without project investments - is expected to affect cropping intensities as shown in Table 6.1.

TABLE 6.1

Present and Future Cropping Intensities (%) - Flood Irrigation

	P		W-		W	
	gu	der	gu	der	gu	der
Maize	80	20	80	20	95	25
Sesame	-	40	-	40	-	45
Cotton	-	1	-	5	-	10
Melons	-	1	-	1	-	2
Tomatoes	-	3	-	3	-	3

Notes: P = present situation
W- = future without project
W = future with project.

Present and expected future yields are shown in Table 6.2. Future yields are shown without and with land levelling. As noted in Chapter 3 it is not expected that substantial areas would be levelled during the project implementation period. Expected future yields take into consideration the proposed improved weed control regime, be it by better hand weeding or the use of animal traction. The benefits of the latter, as well as those from improved land preparation techniques will show in reduced cost of production (in terms of fewer tractor-hours and man-days required) more than in improved yields. In the case of cotton, an allowance has also been made for the time taken fully to adopt a meaningful pest control regime.

TABLE 6.2

Present and Expected Future Yields (t/ha) - Flood Irrigation

	P		W-		W		W+	
	gu	der	gu	der	gu	der	gu	der
Maize	1.1	0.7	1.3	0.8	1.8	1.4	2.6	1.9
Sesame	-	0.3	-	0.4	-	0.6	-	0.9
Cotton	0.5	-	0.7	-	1.0	-	1.4	-
Melons	-	10	-	12	-	17	-	20
Tomatoes	-	5	-	6	-	10	-	13

Notes: P = present situation
W- = future without project
W = future with project; no land levelling
W+ = future with project, including land levelling.

Table 6.2 is a weighted average between hand and tractor cultivation for land preparation. Fully detailed crop budgets are in Annex 4.

6.2.3 Rainfed Agriculture

Improvements in rainfed agricultural production would be the effect of better extension work, better weed control through the introduction of animal traction and eventually land levelling, which would make the rainfall more effective by

spreading rainwater and runoff from the micro-catchments more evenly over the fields. Land preparation would be speeded up by the improved availability of farm tractors, by enabling more private individuals to buy tractors and by introducing speedier land preparation techniques. All these, besides enabling area increases (which was not taken into consideration), would ensure more timely planting; timeliness under the conditions of the project area is a major contributor to yields. Increases in cropping intensity would be minor: whereas in a year of good rainfall the der cropping intensity may be higher, poor der rains would depress the planted area. The figures in Table 6.3 are the best estimates of present and future cropping intensities in an average year. It is not likely that crops other than maize and sesame would be grown although, as also in case of flood irrigation, pulses may be interplanted with maize. Tables 6.3 and 6.4 show, respectively, the expected cropping patterns and yield changes under rainfed conditions.

TABLE 6.3

Present and Future Cropping Intensities (%) - Rainfed Cropping

	P & W-		W	
	gu	der	gu	der
Maize	85	10	95	15
Sesame	-	50	-	55

Notes: P = present situation
W- = future without project
W = future with project

TABLE 6.4

Present and Future Crop Yields (t/ha) - Rainfed Cropping

	P		W-		W		W+	
	gu	der	gu	der	gu	der	gu	der
Maize	0.7	0.5	0.8	0.6	1.2	0.8	1.5	1.1
Sesame	-	0.3	-	0.3	-	0.5	-	0.8

Notes: P = present situation
W- = future without project
W = future with project
W+ = future with project including land levelling

6.3 Production Build-up

The time taken to reach the expected increases in cropping intensity and yields is shown in Table 6.5. The figures apply equally to irrigated farm output and rainfed production. The yield build-up on irrigated farms depends on whether the improvements arise from improved conveyance efficiencies alone, or better conveyance efficiencies plus land levelling. The benefits accruing from improved conveyance efficiencies would, as shown, increase linearly, in fairly large steps.

Benefits attributable to land levelling, which would be incremental to those due to improved extension work and a better conveyance system would come slowly at first and then more rapidly, as farmers learn better ways to use their much improved environment. A further factor in measuring benefits is that they will only start to flow after the physical works in any given area, i.e. on any one canal and its command, are completed. Thus, Year 1 in Table 6.5 may coincide with Year 1 of the project implementation period only over a small area; part of the project area will not experience the Year 1 scenario of Table 6.5 until the last year of the expected 5-year project implementation period.

Project benefits in the rainfed areas are expected to build up in a similar manner, as better tillage practices, increased availability of tractors and the introduction of animal weeding show their effect.

TABLE 6.5

Time Taken to Reach Expected Project Benefits

Year	1	2	3	4	5	6	7	8	9	10
Intensity increases (%)	15	30	45	60	75	90	100	100	100	100
Yield increases without land levelling (%)	20	40	60	80	100	100	100	100	100	100
Yield increases with land levelling (%)	2	6	10	16	24	34	46	60	80	100

6.4 Labour Requirements

One critical factor to increase agricultural production is labour availability. The crop budgets (see Annex 4), give present and future labour requirements per hectare of crop. Details of labour requirements on typical model farms: irrigated and rainfed; mechanical and hand cultivated, are shown in Annex 3, Appendix D. Roughly averaged figures, aimed to show orders of magnitude more than exact details, are given in Table 6.6 below.

TABLE 6.6

Expected Increase in Manual Labour Requirements (present situation 100)

	P	W-	W1	W2
Irrigated	100	112	151	137
Rainfed	100	109	139	116

Notes: P = present situation
W- = future without project
W1 = future with project, no animal traction
W2 = future with project plus animal traction

The issue of labour availability is discussed and analysed in Annex 3. In general, it can be concluded that farmwork for hire may well be a last-resort employment, to be taken up only when no alternative work is on offer, especially in the irrigated plantations. This makes the role of animal traction, a major potential labour saver, an important component.

6.5 Market Prospects

6.5.1 Maize

In good years, Somalia is by now almost self-sufficient in the home-grown cereals, the bulk of which is maize and sorghum. An up-market demand for rice exists which indigenous sources cannot meet; similarly, there is a stable market for wheat products, mainly in the towns. However, if substitution of wheat and rice with sorghum and maize is taken into account, cereal self-sufficiency, and a depressed maize market in good years, is by now an established fact. The project area's production is, however, likely to find a market in most years: since most of it comes from flood irrigated areas, its production is safeguarded by the flows of the Shabeelle, i.e. rain falling not in Somalia but in parts of Ethiopia where the rainfall is more reliable: the Shabeelle catchment is in a different rainfall zone from that of the project area. The stabilising effect of ADC as residual buyer was important in 1985 and the trend is likely to continue. Maize stalks will always be an important commodity; in drought years even more valuable and marketable than the grain.

6.5.2 Sesame

Supplies of sesame will always find a ready market. The country is short of vegetable oil and the demand for it is also elastic. The country today imports about half its needs; import substitution, and increasing per capita consumption, will continue to ensure the long-term prospects of this crop. Furthermore, Somalia is an efficient producer of sesame and has little to fear from competition.

6.5.3 Cotton

The world market at present has an over-supply of cotton lint; therefore, its production can only be justified as import substitution and foreign exchange saving. The total demand is for about 4 000 tons of lint, only increasing slowly, with population growth and increasing per capita consumption. It is not intended to encourage cotton growing in the project area for the unreliable open market, only on contract to Somaltex which would be obliged to take the production from the entire contracted area. It is not expected that more than 10% of the irrigable area, or some 600 ha at the most, will be devoted to cotton.

6.5.4 Tomatoes

The market for the round, thin-skinned culinary tomato, the cherry type, is almost fully satisfied: tomatoes are a relatively easy crop to grow. Prospects of expansion lie with production outside the main growing season (February-April harvest) which requires better and more sophisticated agronomic practices.

The canning, pear-shaped tomato market at present lies entirely with ITOP, the canning factory in Afgoi. It has difficulties in obtaining containers, although market prospects for its paste are good. At present it seems difficult to predict how successfully these problems can be solved and therefore an overall tomato area of about 3% of the irrigated lands, or about 200 ha at most, is forecast. This is only a minor increase on the area already grown.

6.5.5 Water Melons

Internal demand for water melons seems fairly steady but competition is also great. It is the only crop proposed for the project area that has an export potential, mainly to Saudi Arabia and the Gulf countries. However, it faces considerable competition from other would-be producing and exporting countries in the region. On present prospects it seems unlikely that more than about 100 ha would be grown in any one year.

6.5.6 Other Crops

Other crops grown are pumpkins, chillies, gourds and field vegetables. The area devoted to them is small and it is unlikely to increase substantially. However, with the expected improvement in growing conditions there is every likelihood that farmers in the area will at least retain, and hopefully improve somewhat, their market share.

6.5.7 Livestock

It was noted (Chapter 3) that it is not the aim of the project to increase livestock numbers, but by reducing losses of young and old animals, to increase the numbers of animals that can be sold instead of dying from a preventable cause. Since additional numbers on offer from this source will be relatively small, it is not expected that they will adversely influence the market.

6.6 Farm Incomes

Annex 3 gives the detailed analysis of incomes of the different assumed development situations, methods of cultivations and types of farmers. Summarised briefly, expected changes in farm incomes are shown in Table 6.7.

TABLE 6.7

Expected Changes in Disposable Incomes
(SoSh '000)

		W-	W
Irrigated farms			
Mechanised	1 ha	29.9	84.5
	10 ha	250.8	792.3
Hand cultivated	1 ha	28.3	62.1
Rainfed farms			
Mechanised	1 ha	7.3	36.2
	10 ha	46.7	327.8
Hand cultivated	1 ha	16.2	29.9

Note: W- expected future situation without the project.
W expected future situation with the project.

The figures, inter alia, show that to prepare land by tractor in a 1 ha rainfed farm is not an economic proposition under present and expected future without-project conditions. The Consultant found that it is only done if the farmer needs to save time to enable him to undertake more lucrative off-farm employment.

No hand-cultivated 10 ha farm was encountered.

Calculations show that the estimated annual cash requirements of the average family are about SoSh 97 000. The difference at present is made up either from earnings from livestock and/or livestock product sales, or from off-farm employment. The latter was the less common. It is expected that income generated by livestock will, under the project, be at least maintained and possibly increased. Therefore, most of the increase shown in disposable income will, in fact, add to the farming families' prosperity.

6.7 Cost Recovery

It is a GOS and CEC decision not to attempt recovery of the capital cost of the project from the beneficiaries. However, they wish to ensure that the project works will continue to function for their economic life and that operating costs, after external funding ceases, impose the least possible burden on the Treasury. Therefore, a mechanism must be devised to recover the cost of continued maintenance and operation of shared facilities and services. Concerning the final distribution system, the present organisation and management procedures adopted by the majority of the successful canal committees for the day-by-day operation and maintenance of the system are satisfactory, and the task of project management would be to ensure that all committees organise themselves on the lines of the successful ones. Thus, only the cost of other services, plus the cost of the staff administering and controlling them would have to be recovered. The principles and mechanism of doing so are understood to be under active consideration by GOS. Alternatives considered are a form of land tax on the cultivated area and a water charge on irrigated lands. The water charge would be either volumetric or determined by the extent of the irrigated area and the method of irrigation. It is understood that while assessments would be made by MOA, actual collection would be the task of the appropriate department of the Ministry of Finance.

Experience in other countries where irrigated and non-irrigated farms and fields occur in the same area, as they do in the project area, indicates that the most appropriate method would be to assess a land tax on all cultivated areas at a level that would cover the cost of all civic services provided, including the maintenance of the roads. Therefore the assessment and collection procedures of land taxes in specially developed areas may have to be reviewed. The cost of maintaining and operating shared irrigation works is usually covered by a water charge. Experience shows that making this charge volumetric is only practicable in piped distribution systems. The commonly used method, adapted to conditions in the project area, would be to make a charge per hectare of the crop and the method of irrigation. Thus, areas that have access to water most of the year, (in this context it is irrelevant whether the water is supplied by gravity or whether it is pumped), would pay a higher rate than areas that only have access to floodwaters, when the river is full. Current calculations would indicate that the cost of maintaining the shared irrigation works, i.e. upstream of the point where the canal committees take over, plus the salaries and operating costs of the necessary control personnel, amounts to about SoSh 340 per hectare of the project area and SoSh 1 300 per hectare over the farmed area (Chapter 4). In addition, costs borne, in cash or kind, by the Canal Committees, would be about SoSh 2.3 million, or about SoSh 525 per hectare. For details see Annex 3.

Table 6.7, taken along with the assumption concerning income generated by livestock and/or off-farm employment, would appear to indicate that the payment of the proposed charges for other than irrigation works will be possible for all farmers operating 1 ha or more of irrigated land, and for those operating more than 2 or 3 ha of rainfed land. The exact limit would have to be determined by surveys on farms that will first benefit from project works. This would be one of the major tasks of the proposed baseline survey (see Annex 8).

A further consideration would be to introduce different water charges on different crops. The crop financial budgets in Annex 3 show that cotton, water melons and tomatoes are, as expected, more profitable in cash terms than maize and sesame. Therefore, charging more per hectare for these crops would seem reasonable, but again with the caveat that the farmer must be left with a sufficient incentive to incur the extra work, and risk, to grow these crops.

The farm budgets also show that the cost of land levelling appears recoverable from irrigated and the larger rainfed farms. However, the proposed sliding scale of interest rates also appears justified.

6.8 Environmental Effects

The effects of the project on the environment would be relatively minor, but may require further study.

(a) The Jilaal Moogi Area - It is the aim of the project to maintain the present conditions in the Jilaal Moogi area by ensuring its continued, regulated water supply. This will unfortunately mean that the area will remain as suitable for tsetse flies and trypanosomiasis as at present, but at least there will be no worsening of the situation. For details see Annex 7.

(b) Malaria - The proposed stock watering points do present a potential malaria hazard by increasing open stagnant water surfaces where mosquitoes can breed. However, it is possible to introduce larva-eating fish species, which are being bred under WHO auspices for just such a purpose. The PC's office would ensure that as soon as sufficient water accumulated in the uars the appropriate fish species would be introduced.

(c) Bilharzia - The risk of bilharzia infection from the irrigation canals is affected by the velocity at which water passes down the canal: higher velocities reduce the snail population. It would therefore be a design principle for canal resectioning to maximise flow rates, without affecting the area commanded by the canal. However, the additional water in the uars does provide a new breeding ground for the snails that spread the disease. Control would be effected, firstly, by education: persuading people not to enter the water after the cattle. Supplementary measures would be to treat the water with molluscicides that would not affect the larva-eating fish (see (b) above). It must be realised however, that the creation of the uars, even if no precautions are taken, would have only a marginal effect on the total infestation source: the same people now water their animals in stagnant pools in the riverbed, which are also infested. For details see Annex 6.

(d) Trypanosomiasis - In livestock, especially cattle because of their large numbers, this is a major problem. A scheme to control and if possible eradicate the tsetse fly which spreads the disease has been supported for several years now by the Government of the UK, as has a programme to treat affected animals. The project would not undertake any activity that would further spread the habitat of the tsetse fly: the small village woodlots proposed would be at a sufficient distance from existing sources and habitats for the fly not to become established in them. The proposed curative measures for trypanosomiasis would be of great benefit to stock owners.

(e) The promotion of the use of agro-chemicals on maize and sesame would not have adverse environmental effects. Use on sesame would be low, only in cases of severe infestation which occur rarely. Treatment of maize for stemborers should be practised extensively: this is a project objective. However, since the recommended treatment is to place diazinon (Basudin) granules down the funnel of the plant where they would remain and eventually decompose, it would not be an environmental hazard.

(f) Cotton pest control would be more extensive: up to six complete spray treatments may be required. However, each treatment would be preceded by pest scouting, thereby ensuring it is only given when the level of infestation warrants it. As far as possible, bio-degradable chemicals would be used.

(g) It is not expected that recommended fertiliser levels would reach the groundwater and thereby present a hazard.

However, one environmental hazard needs to be mentioned although it does not arise out of a project component: the fact that the proposed Mogadishu fuelwood lot would be an ideal tsetse fly breeding ground, adjacent to an area that already carries a quite large fly population. Parts are near enough to areas by the river that are known to be infested, and the flies are virtually certain to spread across the area as soon as a sufficiently dense forest canopy is established. The tree species proposed for planting were not finalised when the Consultant was in the field. However, because of the climatic conditions the choice is limited and the species that are practicable to plant would allow flies to spread into the area. Therefore, for environmental reasons, and mainly because of the effect on the tsetse population, recently expressed doubts about proceeding with the establishment of the fuelwood resource must be welcomed.

CHAPTER 7

BENEFITS AND JUSTIFICATION

7.1 Project Impact

The expected benefits of the project would be twofold: a quantifiable increase in farming intensity, yields and irrigable area, and the less easily measured benefits of roads, water supplies, schooling facilities and improvements to the quality of life by easing some of the numerous burdens now encountered daily, e.g. the long trek for water.

Cropping intensities are expected to increase by 35% in irrigated and 20% in rainfed areas. The irrigable area is expected to increase, eventually, by about 660 ha. Increase in livestock output would perhaps be only marginal, as the project objective is to maintain present output levels from smaller herds and flocks, i.e. to increase the offtake rates and qualities through disease control measures and better management. Average crop yields are expected to increase at full development as shown in Table 7.1.

TABLE 7.1

Expected Rate of Increase in Crop Yields (%)

	Irrigated	Rainfed
Maize - gu	100	114
- der	137	83
Sesame	125	166
Cotton	100	na
Melons	100	na
Tomatoes	116	na

The financial productivity of the farmers, based on their disposable income, would increase, as shown in Table 7.2.

TABLE 7.2

Expected Productivity Increase with the Project

	Without project		With project	
	Input	Return	Input	Return
Returns for labour (SoSh/man-day)	196		575	
Returns on capital:				
- irrigated mechanised	1	2	1	3.5
- rainfed mechanised	1	0.4	1	1.9

7.2 Economic Analysis

7.2.1 The Rate of Return

The parameters taken for the economic analysis are set out in Annex 3. The rate of build-up of project benefits is discussed in Chapter 6 and Annex 3, which also discusses a wide variety of alternatives as regards expected future price projections (in 1987 constant prices) with and without a notional drought risk factor added and an expected project life, i.e. before project investments, despite regular maintenance, finally disintegrate or are overtaken by subsequent developments, of 20 or 50 years. Considering all parameters and likely future development trends in Somalia, the most likely rate of return is as follows:

50 year project life	11% (range 6% to 17%)
20 year project life	8% (range 1% to 16%)

The possibility of the lower end of the calculated range occurring is less likely because of the country's expected future food balance, the probable effect of recent policy changes in food-crop pricing and the consensus developing between GOS and its major donors concerning the need to maintain realistic farmgate prices, to prevent a recurrence of the food production slump of the late 1970s and early 1980s. Moreover, the projected rate of return is based only on the tangible, measurable project investments and do not take into consideration the improvements in the quality of life in the project area that would be created. The 10% opportunity cost taken for investment capital assumes that there are alternative, non-agricultural projects in which money can be invested productively. It is outside the scope of this study to examine and evaluate this issue; it is however certain that the proposed project is as good, or better, an investment in agricultural development than any currently proposed alternative of a comparable scale.

Taking all the above factors into consideration, assuming that the likelihood of the lowest price assumptions for project produce have a relatively small chance of coming to pass, and assuming a project life of about 30 years (before modernisations, indicated in Chapter 2, are likely to make most of the proposed project works redundant) the most likely rate of return for the project is 13%. It is to be noted that the cost stream of the project includes all costs, not only those from which direct production increases are expected. If those were taken out, the rate of return would rise to around 15% to 16% depending on the assumptions made. Therefore, taking the most likely case of costs and benefits, the project can be regarded as an economically sound one.

7.2.2 Sensitivity Analysis

Sensitivity analyses considered a 10% rate of return, i.e. the opportunity cost of capital in Somalia's economy as a threshold for project viability. For this to happen, project costs would have to increase by 25% or the value of produce decrease about the same. However, the rate of return is about twice as sensitive to changes in output prices as to cost increases. Details are in Annex 3.

7.3 Project Risks

The major risk to the success of the project is the issue of water availability. This has two facets: the timing and extent of flows actually reaching Somalia, and allocation of flows reaching Somalia between present and future irrigation projects in the country.

7.3.1 Inter-Country Riparian Agreement

The issue of the timing, and the amount of water arriving at Beled Weyn has been discussed and highlighted by many authorities involved in preparing irrigation project plans relying on the Shabeelle. The most recent of these is the document describing the Shabeelle Water Management Project, a 10-year, two-phase development plan supported by USAID. Therefore, little, if anything, would be gained in further dwelling on this subject, to which the Consultant cannot make any significant contribution.

7.3.2 Water Allocation Between Projects

One of the major objectives of the Shabeelle Water Management Project is to work out a project-wise water allocation between all the approved irrigation projects drawing water from the Shabeelle river. Once this allocation is determined, and the method of its enforcement developed, the Dara Salaam Busley project's water supplies should be as reliable as those of any other project.

7.3.3 Improved On-Farm Agricultural Practices

A possible project risk would be that farmers would be slow, or reluctant, to undertake land levelling, which to them at present is a new concept. The rate of uptake can only be estimated from survey responses in similar environments, notably the Sudan and some parts of Peninsular India. The rate considered was based on these precedents and is considered realistic.

Probably the most doubtful introduction is that of animal power. However, past failures were always with introducing animal traction for primary cultivation and centreing it on oxen. The present project, and indeed AFMET's efforts in Bonka, concentrate on planting and after-cultivations, and the use of donkeys, an animal already extensively used for work, unlike the ox. Therefore, it is expected that the introduction will be successful.

APPENDIX 1

TERMS OF REFERENCE FOR THE FEASIBILITY STUDY

DARA SALAAM-BUSLEY AGRICULTURAL DEVELOPMENT PROJECT

TERMS OF REFERENCE FOR THE FEASIBILITY STUDY*

A. Generalities

The project surface area is about 30 000 ha on the left bank of the Shabelli and is located between Malable and Maxamed Kumar Villages. The Mogadishu-Afgoi-Merca road goes through the project area which is about 80 km from Mogadishu.

The area is fairly populated, with about 30 small villages of traditional habitation (TUCULS) with a total population of about 12 000 inhabitants.

Mostly unwooded, the area is flat and relatively fertile. The natives devote themselves to traditional cultivation of maize, sorghum and sesame, and recently to vegetable cropping, specially tomato.

Irrigation canals from Shabelli run through the area and satisfy water needs for a period of 2 months. The area is deprived of wells or boreholes.

B. Objectives

The objective of the project is to contribute to the development of the area with an integrated action whose goal is:

- To increase traditional agriculture production through area extension, improvement of yields and varieties as well as for vegetables and fruits by using more efficient irrigation methods by gravity or pumping.

- To settle population in the villages by increasing their income from agricultural and livestock resources, providing drinking water for them and their herds by the construction of wells and boreholes.

- To train farmers in more efficient cultivation and animal husbandry techniques (fertilisers, storage, disease detection, etc.).

- To improve life standard through development of basic health and education facilities.

C. Modalities

The administration, supported by other donors, is carrying out actions in the area concerning agricultural extension, fuelwood supply, and basic health and education. The EDF project, which will be implemented over a five-year period, should complement these and aim to achieve the objectives noted above, specially by:

Note: * Source: EEC Invitation to Consultants.

- Rehabilitation, improvement and development of irrigation canals in cultivated and, if possible, in uncultivated areas.

- Extension of gravity irrigation periods.

- Improving availability and quality of extension services, inputs and appropriate mechanisation (if possible traction ox yoking) enabling a less arduous work and more productive one.

- Basic veterinary assistance for protection and improvement of livestock (dairy and beef breed - cattle yoking) and small animals.

- Strengthening of coordination between field operators (state companies, donors, etc.) improving extension work impact, economical and land use strategy by way of price of production, storage strategy, transportation, meteorology, land and water use policy and management in the Lower Shabelli.

- Creation of village and pastoral wells in the appropriate areas.

D. The Study will Have to

- Mark, precisely, the boundaries of the project's intervention area and locate in this are the most suitable area for irrigation, dry-farming and eventually for reafforestation.

- Indicate the physicochemical characteristics of the soils and their aptitudes.

- Bench marks will have to be established during topographic survey.

- Describe the existing irrigation scheme with appropriate mapping including the levelling of primary and secondary canals.

- On the basis of already available data concerning the Shabelli river regime and national policy for river water use, to determine topographically, at an appropriate scale, the area suitable for irrigation, the period and the duration.

- Propose on this basis the crops to be developed (vegetables) considering also the agro-industrial needs.

- Considering the selected irrigation (retained) system, to establish detailed design of execution for the rehabilitation, the improvement and the extension of irrigation scheme relating to the quantity of water needed for the irrigation on the selected area. Cost estimations have to be included.

- Examine the possibility of cattle yoking introduction or lightly mechanised, etc., indicating modalities, technology and the organisation of cattle yoking centre.

E. Drinking Water Supply

On the basis of population's needs, to define the number of wells or boreholes required and their location on the basis of existing hydrogeologic data and additional investigations, if necessary.

- To establish detailed scheme, execution design and processing (hand pumping - windmill).

F. Buildings and Infrastructure

To propose the improvement of farm roads within the area in order to allow traffic during the rainy season.

To establish a detailed road network scheme, the topography, the executive design, terms and conditons of the contract document including cost estimation.

To determine the most appropriate site for construction of the project's base. To propose the infrastructures and project's buildings like: offices, workshop for maintenance, warehouse, etc. The utilisation of local traditional construction materials for economy reasons has to be taken into account. To define the execution's design and costs estimations.

G. Inputs Supply

In waiting for the private sector to be able to fulfil his role concerning the agricultural inputs supply, this gap should be filled by the project. The study should therefore propsoe the creation of a simple and efficient structure for the farmers allowing them to find, on the spot, the production's inputs 'fertilisers, insecticides, seeds, etc.).

To determine the quantities and type of inputs required, the means of distribution and sale (including appropriate arrangements for sale on credit) and the method of storage.

Phased estimates of quantities and costs will be provided.

H. Economic and Financial Viability

Project proposals will be subjected to financial analysis at farm level (including projected returns to farmer's land and labour) to ensure that adequate incentives are available. Economic analysis will be carried out at project level with economic rates of return being calculated plus appropriate sensitivity tests. All project costs presented will be broken down into their local and foreign components and include details of unit costs, quantities, and phasing over five years.

I. Preparation of Invitation to Tender Documents

Every work or material necessary for project execution must be described in detail and tender dossiers will be prepared accordingly taking into consideration the rules and conditions applicable to projects financed by EEC.

J. Sociological Aspects

The study must be placed in the social context by evaluating: existing population, level of technical knowledges, receptivity of innovations relating to the extension services existing in the region.

K. Personnel

The project executing might require the intervention of one or more technical assistants; the job description and the duration should be defined. The technical assistance tasks will be to assist the Ministry of Agriculture for management organisation and extension work. The number and the function of the Ministry of Agriculture's specialists responsible for project follow-up as well as the costs of governmental participation to project execution, should be estimated.

L. Management Structure

The intervention of one specialised consulting engineer bureau integrated rural development will be needed to complete the feasibility study. The consultant work will take no more than 25 men/month. The experts in the following fields would be required: agronomy, irrigation, civil engineering, pedology, hydrology, agro-economic, zootechnics.

The study must be executed within the five months following the signature of the contract.

The Ministry of Agriculture and the delegation of the Commission in Mogadishu will be the interlocutors of the consultants during the realisation of the study.