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Somali Democratic Republic
Settlement Development Agency

Homboy Irrigated Settlement Project

Volume 4 Main Report

February 1980

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England

Homboy Irrigated Settlement Project

Volume 4 Main Report

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CONSULTANTS IN LAND AND WATER RESOURCE AND ENVIRONMENTAL PLANNING

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The General Manager,
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P.O. Box 1407,
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Somali Democratic Republic.

Dear Sir,

Homboy Irrigated Settlement Project - Phase II

In accordance with the terms of reference attached to our agreement dated 31st July, 1978, and with instruction contained in the subsequent exchange of letters and also with the additional terms of reference for the supplementary study, we have pleasure in submitting our Final Report on the above project.

The report comprises four volumes as follows:

Volume 1 Soils Report (issued in September 1979)
Volume 2 Physical Planning
Volume 3 Agricultural Planning
Volume 4 Main Report

We would like to express our thanks to you and to the staff of the Settlement Development Agency who have helped us in our studies.

Yours faithfully,

H. Piper
Director
Regional Manager for Africa

ACKNOWLEDGEMENTS

We are gratefull to the following for their assistance and cooperation:-

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ONAT, Mogadishu, Jilib and Jamaame
Department of Agriculture, Jilib and Jamaame
ADC, Jilib
Veterinary Office, Jilib
Alessandria Research Station
Banana Board, Mogadishu
Kismaayo Water Board
Jubba Sugar Project, Mareerey
CARS, Afgooye
Dryland Research Station, Bonka Baidoa
Mogambo Irrigation Project
Veterinary Project, Kismaayo
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Somaltex
Ciba Giegy
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W.F.P. Mogadishu
Fiat - Mogadishu

Finally to our technical counterparts, Salaad Ahmed Ismail in Mogadishu and Mohamed Buwe Nur, Makamed Sheik, Muuse Yussud Muuse and Abdulahi Xaji Maxamed in the field, whose help was essential to the efficient completion of the Phase II studies.

Volume 1	Soils	
Volume 2	Physical Planning	
	Part 1	Villagisation
	Part 2	Relocation
	Part 3	Groundwater
	Part 4	Infrastructure
	Annex	Main Construction Works and Costs
Volume 3		Agricultural Planning
	Part 1	Agriculture
	Part 2	Organisation, Management and Implementation.
	Part 3	Operation and Maintenance of the Irrigation System.
	Part 4	Economic and Financial Studies

In addition to these Volumes, a number of supporting contract documents and an album of engineering drawings have already been submitted.

SPELLING OF SOMALI PLACE NAMES

There has been a great deal of inconsistency in the spelling of Somali place names in previous reports. The present report takes the spelling of place names from the most recent topographic maps, produced at 1:100,000 scale by Hogaanka Kartografiyada Wasaaradda Gaashaandhigga in 1967.

The one exception to this rule is Mogadishu, where the normal internationally accepted spelling has been used.

Towns and Villages:

Mogadishu
Kismaayo
Bouale
Dujuuma
Sablaale
Kurtun Waarey
Afgooye
Mareerey
Saakow
Bardheere
Mudun
Janaale
Buulo Mareerta
Qalaaliyow
Mogaambo
Jilib
Kamsuuma
Fanoole
Alessandra
Barwaaqo
Bodboode
Helashiid
Balley
Nasriib
Mashemba
Madhooka
Limoole
Maanyagaabo
Cumar Abooke
Dhey Tubaako
Arbey Cabdi
Homboy
Aminow
Sheekh Cabdi Muudey
Burgaan
Maqdas
Kaytooy
Deghadey
Iftin
Kulmis
Xaafadh Barka
Holwadaag
Bula Geduud
Dayax
Goorkha
Cumar Muuse
Kooskey
Bustuqam
Cabdi Lari
Xerer Mirsha
Xudda Saxalle
Cabdi Maama
Shalambood
Jowhar
Balcad
Jamaane

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Shabeelle
Harar Naga
Kormajirto
Tukuule

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	Annex	Main Construction Works and Costs
Volume 3.		Agriculture Planning
	Part 1	Agriculture
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	Part 4	Economic and Financial Studies
Volume 4.		Main Report

1 Introduction

The severe drought affecting the Sahel region of Africa in 1973 and 1974 had a particularly serious impact on northern Somalia. Livestock and crop losses were heavy and an estimated 600,000 to one million people were affected. The Somali Government took appropriate emergency measures and established relief camps where 245,000 people were fed and housed.

Recognising the need for a more permanent solution to the hazardous subsistence economy of these dominantly nomadic peoples and the largely untapped agricultural potential of southern Somalia, a decision was taken early in 1975 to relocate up to 120,000 dispossessed nomads on a voluntary basis in three agricultural settlements in the south of the country and in a number of fishing communities on the coast. By mid-August, 1975, a total of 105,000 nomads had been resettled. Agricultural settlements were established at Sablaalle and Kurtun Waarey in the Shabeelle valley and at Dujuuma in the Jubba valley. These sites were visited by two IBRD missions in May and July, 1975 to discuss financial and technical assistance in implementing development of the settlement schemes. Among their recommendations was that a regional study of the Jubba-Shabeelle inter-riverine area be carried out so that future programmes would be based on sound economic and technical data. This study was completed in 1977 (HTS 1977).

Dujuuma is the largest of the agricultural settlements and although the population has since declined, it had a recorded population (March, 1977) of 40,971. During the course of the Inter-Riverine study serious doubts were raised about the ability of soils of Dujuuma settlement area to support the planned development of irrigated and rainfed agriculture. As a result, IDA funded a reconnaissance soil survey of the Dujuuma Settlement Area (HTS, 1977a). This study was carried out in April-May, 1977, and confirmed that most of the land in the settlement area is only marginally suitable for irrigation development due to salinity and sodicity limitations and poor soil physical properties. An area of approximately 7,000 ha of land moderately suitable for irrigation was, however, provisionally identified. Development of rainfed agriculture is severely restricted by the low annual rainfall (414 mm average) in addition to the rather poor quality soils. The Dujuuma soil survey report concluded that, while development of irrigation was not impossible on the present site, the settlement should be relocated if a more suitable site could be found. The report stressed the need for soil investigations to at least semi-detailed level on any new site prior to resettlement and implementation of development.

Several studies had previously been carried out into the agricultural potential of the Jubba valley and in 1965 Selchozpromexport had identified a potential irrigable area of 24,000 ha on the left bank of the Jubba river and commandable from a proposed barrage at Fanoole. Although designs for the Fanoole barrage and a feeder canal to irrigate the State Farms project south of Jilib were prepared in 1972-73 (Giprovodhoz, 1973) it appears that the 24,000 ha identified in the 1965 study were not studied further at this time. Having received the rather unfavourable report on the resources of the existing Dujuuma settlement at this time, the Settlement Development Agency saw this remaining area of the Fanoole scheme as a possible solution to the relocation problem and commissioned a study of the Fanoole area. The terms of reference (ToR) for this study are given in full in Appendix A and the main components are summarised as follows:

- A reconnaissance survey of 60,000 hectares of land to identify 24,000 hectares suitable for irrigation.

- The selection of a priority area for Phase 1 development which would provide a net irrigable area of approximately 9,000 hectares.

- A series of studies on the Phase 1 area including topographic survey, semi-detailed soils survey, agricultural studies, and physical planning and relocation studies.

- Detailed engineering design on a priority Phase 1 development area of 9,000 hectares.

The reconnaissance report was submitted in December 1978. It achieved its principal objective of identification and delineation of just under 24,000 hectares of land suitable for irrigation development and concluded that priority should be given to the development of the Homboy-Burgaan area, which with a gross area of 15,500 hectares could yield the 9,000 net irrigable hectares required for the Phase 1 development.

Although it was originally intended that the semi-detailed soil surveys and the topographic surveys would be carried out over an area of 24,000 hectares, following completion of the reconnaissance survey these were confined to the 15,500 hectares of the Homboy-Burgaan area. It was subsequently agreed (November 1979) that the resultant saving in time should be utilised for additional study of specific aspects (Appendix B) of the projects not covered by the original terms of reference. These included: cost estimates for all engineering works, proposals for operation and maintenance of irrigation works, proposals and cost estimates for associated village and project infrastructure (houses, buildings, services, etc.), a note on organisation and management and implementation of the scheme, some additional agricultural studies, a review of the potential for livestock development and finally an economic and financial analysis would be undertaken.

In this Volume a summary of the findings of the various studies carried out under the original ToRs and under the ToRs for the additional studies is presented. Detailed descriptions of these studies are provided in the supporting Volumes as follows:

2

The Study Area

2.1 LOCATION AND DESCRIPTION

Figure 2.1 shows the location of the Homboy Irrigated Settlement Project Area, the pattern of settlement and its communications with adjacent areas. It lies within the Lower Jubba Region and is divided between the Jilib and Jamaame administrative districts. It extends over 15,100 ha comprising the entire floodplain of the Lower Shabeelle River between the Jilib-Golweyn road which is under construction and the northern limit of the banana plantations around Kamsuuma.

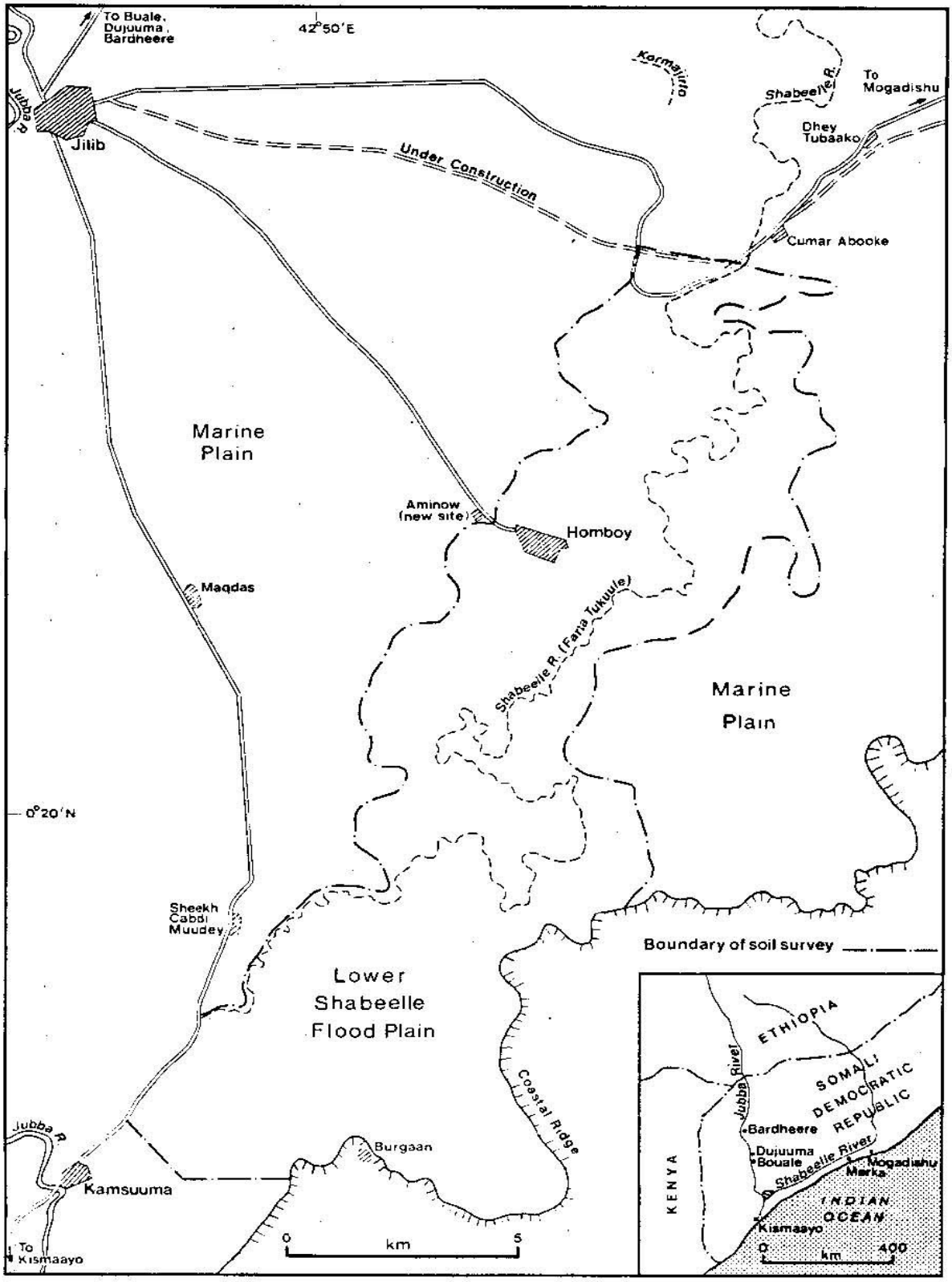
Since no flood protection measures are available, settlement within the area is restricted by the risk of flooding. Homboy with an estimated population of just over 4,000 is the only settlement of any size and is situated on an island of 'Beach Remnant' soils about 3 m above the surrounding floodplain. There are a few small settlements comprising less than ten families each, situated on the higher levels alongside the Farta Tukuule and some temporary camps are established on the floodplain by nomad graziers during the 'Haggai' and 'Gelal' seasons. A number of villages are situated around the perimeter of the floodplain, notably Burgaan (population 1,500) on the coastal ridge and Aminow (population 630) which has recently been resited on the Marine Plain close to Homboy. Villagers from these settlements farm the alluvial lands within the survey area.

Present communications to and from the study area are poor. Homboy is linked to Jilib by a relatively good dirt road and to the Jilib-Golweyn and Jilib-Kismaayo roads by poor quality tracks, all of which are frequently impassable during the rainy seasons. The extreme southwest of the study area has direct access to the metalled all-weather Jilib-Kamsuuma road and the extreme north is accessible to the Jilib-Mogadishu road which is also frequently impassable in the wet season. The smaller settlements within the area are linked to Homboy by dirt tracks which are only passable in the dry seasons. Completion of the Jilib-Golweyn road will mean a marked improvement in communications for the Jilib area with Mogadishu and with the port of Kismaayo.

2.2 CLIMATE

The climate of the project area is classified as tropical semi-arid. Rainfall is bimodally distributed with maxima occurring in the 'Gu' (April to May) and 'Der' (October to December) seasons respectively. The 'Gelal' season (January to March) is generally hot and dry, but showery weather is common in the 'Haggai' season (June to September). The average annual rainfall at Jilib which provides the best indication of rainfall in the project area is just under 600 mm with about 250 mm of this falling in the 'gu' and 180 mm in the 'der'. The most significant feature of the rainfall is the localised nature of falls and the wide variation within small distances. Average monthly temperatures range between around

2.1 Homboy Irrigated Settlement Area
Location, settlements and communications



26°C in July and 29°C in March. The hours of sunshine per day vary from a low of about 7 hours in June/July and 10 hours per day in March.

2.3 TOPOGRAPHY AND LANDFORMS

The study area is confined to the alluvial floodplain of the Lower Shabeelle River which merges into the more active Jubba floodplain in the south. The topography is very subdued except in the vicinity of channels or *fartas* and most of the area appears virtually flat to the naked eye. A typical cross-section of the Shabeelle floodplain in the vicinity of Homboy demonstrates a distinct topographic sequence typical of an aggrading river, with a central channel surrounded by elevated levees sloping onto flat areas of 'cover floodplain' and with backswamp depressions along the floodplain perimeters.

2.4 NATURAL VEGETATION

Natural vegetation within the study area is primarily dependent on the duration of flooding under the current hydrological regime. As flood duration is primarily dependent on elevation, vegetation associations are strongly related mainly to the landform units. The existing vegetation pattern has been affected by cultivation in some areas and this has resulted in changes in species distribution.

In the predominantly flooded deeper depression areas, swamp grasses and sedges predominate with relatively few emergent trees. The shallower depressions are characterised by dense growth of *Acacia nilotica* while the cover floodplains support a mixed *Acacia* and non-thorny shrubland in which species such as *A. nilotica, A. zanzibarica, A, bussei, Dobera glabra* and *Thespesia dariis* are well represented. On the higher levee areas, non-thorny species tend to dominate and often give rise to a more open cover. In the areas that have been under fallow or one or two years or more regrowth is dominated by such species as *Ficus populifolia, Dalbergia* spp. and *Therpesia dariis.*

2.5 POPULATION AND POTENTIAL SETTLERS

The population of the area is made up of townspeople, primarily from the Jilib and Kamsuuma, who cultivate land within the area, a settled rural population and ex-nomads who are now completely sedentary or who still lead a semi-nomadic way of life cultivating some land whilst retaining their livestock and close links with their nomadic relatives. The settled rural population is roughly estimated at around 1,220 families or 6,840 head, the ex-nomads (sedentary or semi-nomadic) at 220 families or 1,130 head whilst the townspeople amount to 770 families or 4,380 head.

Although the Homboy irrigation scheme is being planned primarily as a resettlement scheme for families from the Dujuuma settlement, participation of local families, particularly from the 'settled rural' and 'ex-nomadic groups' which together account for about 1,500 families, is expected. Neither the existing townspeople or nomadic population which amounts to about 2,000 head in the 'Gelal' season are likely to be interested in participation.

As mentioned in Chapter 1 the principal reason for establishing the Homboy irrigation project is to resettle families from the Dujuuma settlement scheme which, mainly because of soil problems, has so far failed. The degree of failure is reflected in: the fall in population at Dujuuma from an estimated 47,900 head in 1975 to about 25,000 or 53,000 families in 1979, agricultural activities being confined to 100 ha of irrigated cropping and 485 ha of rainfed crops and a continued dependance upon food aid from the World Food Programme.

Since about 8,500 families are eventually expected to be moved into the Homboy area, and only 5,000 to 6,000 of these will be available from Dujuuma, there will be capacity to recruit up to about 3,000 families from elsewhere. The growing number of refugees from Northern Somalia should provide these.

2.6 PRESENT AGRICULTURAL LAND USE

The present land use practices are well adapted to the environmental conditions of the Lower Shabeelle floodplain and to the main landform units. The two main types of agricultural land use which are found in the study area are:

(a) Cropping of cereals (sorghum and maize) on the cover floodplain and levees.

(b) Cropping of sesame, maize, sorghum and pulses in the depressions and channels.

Cropping on the levees and cover floodplain relies primarily on rainfall although some residual moisture is probably utilised from the relatively infrequent floods which cover these areas. The soils on these landforms generally have silty clay and silty clay loam surface horizons which made them more easily workable than the clays of the depressions. Crops frequently show uneven growth which may be due to moisture stress. Planting generally coincides with the onset of the 'Gu' and 'Der' rains and frequently two crops are grown in one year on each piece of cultivated land.

Cropping in the depressions, however, takes place mainly by utilising residual flood waters. The lower areas are progressively planted as the water recedes. Sesame is typically planted in the wetter sites. Cultivation is limited to preparation of small basins with a hand hoe or 'yambo'.

Crop husbandry is based on traditional practices with low levels of inputs and consequently low yields. Local varieties are grown and fertilisers are not used. Apart from 'seed dressing' pesticides are not used. More recently, however, villagers at Homboy have cooperated and hired ONAT tractors for primary cultivation operations. In the 'Der' season of 1978 a large area in the vicinity of Homboy was ploughed and subsequently planted to sorghum intercropped with green gram. These relatively progressive measures, together with the high rainfall in 1978, help to account for the sale of surplus crops amounting to 929 quintals of sesame, 560 quintals of maize and 854 quintals of sorghum to ADC, Jilib. The Homboy area is at least self-sufficient in grain in most years and surplus crops, not sold to ADC, are normally stored in pits. Government assistance was, however, required in the severe drought of 1973-4.

Although the Ministry of Agriculture provides an extension service staffed by a District Agricultural Officer with a team of 35 extension workers based on Jilib, private farmers such as those resident in the project area, are amongst the lowest priority group and receive little attention. The efforts of the extension service are directed mainly towards participants in 'Crash Programmes' and Producer Cooperative Groups. The extension staff comprise specialists in training and plant protection, cooperative advisers and surveyors.

Because pressure of population is not severe in the study area the overall density of agriculrural land use is not high. Most of the existing cultivation is concentrated around the main centres of population such as Homboy and Burgaan. A rough assessment of the present intensity of land use, carried out during the soil survey indicated that about 21 per cent of land in the study area, amounting to approximately 3,200 hectares is presently cultivated

and a further 20 per cent shows signs of previous cultivation. Of the cultivated land, 26 per cent is farmed mainly on residual flood water around the larger depressions, the other 74 per cent is mainly sorghum (Der season crop) grown on cover floodplain and levee areas.

2.7 LIVESTOCK

The Lower Shebeelle floodplain is an important grazing area for livestock. Cattle products, live animals, meat and hides are a major Somali export and a large proportion of the nation's cattle are concentrated in the lower Jubba region. Local sources estimate the resident cattle population in the Dhey Tubaako-Homboy area as 5,000. Field observations made during the present study during the 'Gelal' season when populations are increased by the influx of nomad graziers, suggested a cattle population far in excess of the resident 5,000 estimated. In addition there were large numbers of camels, sheep and goats.

Livestock are owned by both 'settled nomads', who also cultivate crops (Section 2.5), and by semi-nomads, who return to the villages of their settled kinsman on a bi-annual cycle, which coincides with the dry season harvesting of arable crops and the availability of crop residues. A proportion of livestock is retained in the villages to provide a source of meat and milk, and a very active trade is carried on with the resident agricultural population. This trade, together with the relatively high level of agricultural production has resulted in a balanced nutritive diet enjoyed by the population.

Irrigation development of the project area will undoubtedly have a major impact on the livestock population and on the local economy of the resident population. In a broader context, the planned development of the Jubba and Shabeelle floodplains could have a serious adverse effect on the regional livestock population and hence affect the volume of livestock exports, unless livestock are integrated into schemes or adequate provision is made for alternative grazing. The latter alternative would be difficult to realise, as the marine plain surrounding the floodplain area has a comparatively low carrying capacity due to poor soils and relative absence of flooding. Serious consideration should be given, therefore, to integrating livestock into the proposed irrigation scheme. Crop residues could be fed to livestock and the possibility of fodder production should be examined. With the present situation of cooperation between farmer and graziers within the project area, and the nomadic background of the Dujuuma settlers, integration of livestock into the scheme should have many socio-economic advantages.

2.8 OTHER ACTIVITIES: FISHING AND WOOD GATHERING

Fishing is currently practised in the depressional lakes and deeper depressions in the project area, particularly in the Far Sitay lake, which rarely completely dries out. Fish is sold either fresh or dried, and forms an addition to the protein content of the local diet. It is unlikely that the deeper depressions will be utilised for cropping under the proposed irrigation system, and fishing activities could be continued or perhaps extended following project implementation.

The remaining woodland and shrubland in the project area is used as a source of timber for building poles and firewood. Most of this resource will disappear on project implementation. The ability of the surrounding marine plain to furnish alternative supplies is not known at present.

2.9 WILDLIFE

The Lower Jubba region harbours a rich and varied assemblage of wildlife and a number of mammal species such as elephant, hippopotamus, greater kudu, gerenuk, waterbuck, wart hog, caracal, civet, dik-dik and baboons, along with numerous bird species,

were observed during the course of the survey. Under present circumstances these animals compete for food and water with the resident farming population and with domestic livestock. We recognise that wild game will inevitably be excluded from the proposed irrigation area but efforts should be made to ensure minimum disturbance of surrounding areas such as the Shabeelle swamps upstream of the Jilib-Mogadishu road. This recommendation does not preclude the use of this area as flood storage area, as flooding would only be temporary during periods of high flow in the Shabeelle River or the Harar Naga.

3

Soil and Topography

3.1 INTRODUCTION

The Reconnaissance Survey (HTS, 1978) recommended that the Homboy-Burgaan area was the only area within the Fanoole command suitable for large scale irrigation development. In the present Phase II study, this area was renamed the Homboy Irrigated Settlement Area. Detailed topographic survey, semi-detailed soil survey and agricultural investigations were carried out over the Homboy Irrigated Settlement Area in the Haggai season of 1979.

3.2 TOPOGRAPHY

The topographic survey was carried out using trace lines 250 m apart. Final maps were plotted at 1:10,000 scale with a contour interval of 0.25 m and submitted in 1979.

Topographically the project area is generally well suited to surface irrigation with slopes on the dominant cover floodplain generally in the region of 0.1-0.3 per cent. The increasing costs of land levelling make topography an increasingly stringent factor in the classification of land in terms of suitability for irrigation development and the slopes of 0.5-2 per cent on the levees together with the irregular slope of the mapped units are sufficient to impose a minor but significant limitation to the development of a furrow or basin irrigation system. The upper terraces and meander complexes are similar and topography is a major limitation to developing 'fartas' or channels.

3.3 SOIL SURVEY

A detailed description of the soil survey methodology and analyses carried out is given in Volume 1. Soils submitted in September 1979. The survey covered a total of 15,100 hectares, comprising the entire lower Shabeelle floodplain between the proposed new Jilib-Golweyn road and the line joining the villages of Kamsuuma and Burgaan. Soil survey traverses were carried out on trace lines at 1 km intervals. A total of 596 soil profile pits and auger borings were examined, giving a density of observation of one site per 25 hectares. Field tests were carried out to measure surface infiltration and soil permeability at selected representative sites and laboratory analyses of physical and chemical properties were carried out on selected samples. Soils and Land Suitability maps were prepared at 1:20,000 scale, based on the data from soil investigations, and utilising the 1:10,000 scale topographic maps as a base.

The soils are mainly fine textured, and clay content increases from the levees of the virtually abandoned Farta Tukuule, through the flat cover floodplains, to the depressional areas. Soils on the lower cover floodplain and in the depressions typically have

a prismatic structure in the root zone and a massive/wedge structure in the subsoil. Levee soils are better structured, but appear more susceptible to erosion. Permeabilities are low in the subsoils of cover floodplain and depression soils, except where coarser layers occur. Salinities are generally high in the subsoil but chemical differences between the soil units are not significant.

Variations in the soils of the lower Shabeelle floodplain are not the only factor influencing land suitability or choice of cropping pattern. Most of the deeper depressions in the proposed project are excluded on the basis of flood hazard, and the levee soils are downgraded on the basis of their topography and irregular shape. The high clay content and poor soil structure in the depressions, however, makes them more suited to rice cultivation and the more irregular topography on the levees create problems of command. Table 3.1 summarises the land classes in the Project Area and shows that a gross area of 12,158 ha of land in the Project Area is suitable for irrigation development. Although not all of this area can be commanded by an irrigation scheme, it should be possible to design a system yielding a net area of the 9,000 ha required.

TABLE 3.1 DISTRIBUTION OF LAND CLASSES IN THE PROJECT AREA

Class	Suitability	Area (ha)	Area (%)
II	Suitable	6,456	42.7
III	Moderately suitable	5,702	37.8
IV	Very marginally suitable	776	5.2
VI	Unsuitable	2,151	14.3

4

Engineering

4.1 INTRODUCTION

The detailed basis for this chapter is given in Annex 2 Volume 2. This chapter summarises the engineering aspects of the scheme.

4.2 IRRIGATION AND DRAINAGE SYSTEM

The scheme will form the basis for the resettlement of nomads temporarily located in the Dujuuma area. The project consists of 8,850 ha of irrigated land supplemented by 2,675 ha of rainfed land at full development. The soils of the area are predominantly fine textured with development being restricted to the areas of Shabeelle alluvium plus areas of channel and beach remnant soils.

Mixed cropping is to be carried out over the majority of the irrigated area except in certain areas of low lying Shabeelle alluvium exhibiting poor drainage characteristics. These areas will be used to cultivate paddy rice and are predominantly in the south of the project; the last area programmed to be constructed.

Water for the project will be supplied from an enlarged Fanoole Main Canal which itself offtakes from the Jubba River at the Fanoole Barrage. The offtaking requirement has been calculated to be about 11.5 m^3/s and is discharged through a gated weir head regulator structure incorporating three vertical lift gates.

4.3 LAND PREPARATION

Approximately 25 per cent of the Project area has already been cleared of bush to produce land suitable for rainfed farming. The remaining bush will be removed by a root or multi-application rake with a root plough behind the tractor to bring up the roots in the same operation.

In addition to clearing the area and imposing an irrigation channel network and drainage system, landlevelling is of fundamental importance to the success of a surface irrigation scheme. Without efficient landlevelling, irrigation becomes difficult resulting in short furrow lengths, high labour inputs, small basin sizes and poor crop yields. It is recommended that laser controlled equipment be used to carry out the landlevelling, this being the most efficient and accurate method.

4.4 FIELD IRRIGATION SYSTEM

The Irrigation System has been based on a 12 hour maximum working day for the settler farmer. A 50 ha (net) cooperative unit has been adopted consisting of two watercourse units, each settler being allocated 1 ha (net) of irrigated land.

Field efficiencies of 60 per cent for mixed cropping and 70 per cent for paddy rice have been assumed yielding watercourse design capacities of 60 1/s and 100 1/s respectively. Mixed crops are to be irrigated by border strip or furrows with maximum slopes of 0.3 per cent and maximum lengths of 300 m. Paddy rice will be cultivated in level basins having a minimum dimension of 30 m. Typical watercourse units are shown in Section 2.2.1 of the Engineering Annex.

4.5 IRRIGATION WATER DISTRIBUTION SYSTEM

The watercourses are supplied from the distributary canals through gated pipes; the distributaries themselves operating for approximately twelve hours per day. At the head of each distributary canal is a gated pipe regulator offtaking from a night storage reservoir. The reservoirs have sufficient storage capacity to store half the maximum 12 hours requirements of the offtaking distributary canals.

Modifications in water requirements for the project will be made on approximately a fortnightly basis depending on the cropping patters and the rainfall. Such changes will be accommodated by adjustments to the gate settings on the Supply and Main Canals and a combination of alterations to gate settings and, variation in duration of irrigation and irrigation interval at field level.

The source of the irrigation supply is such that irrigation water will be available for all but two months of the year. If Bardheere Dam is constructed in the future, it is anticipated that irrigation supplies will be maintained continuously throughout the year.

In the event of the Fanoole Canal not being completed in time for the Homboy Scheme, an alternative pumped supply would be used. This temporary pumping station would abstract water from the River Jubba adjacent to the proposed junction between the Homboy Supply Canal and the Fanoole Main Canal.

The engineering design has incorporated seepage loss evaluation throughout the system, the effect of sedimentation, leaching and a study of the various alternative ways of night-time storage of the continuous Main Canal flows. A system of canal escapes have been provided which link in with the drainage system. Further details are given in Section 1.5 of the Engineering Annex.

4.6 DRAINAGE SYSTEM

Drainage water from within the project area is composed either of surface water from storm runoff or of excess irrigation supplies. A deep drainage system is not considered necessary at present. A system of shallow ditch field drains have been incorporated which link up to larger open ditch collector, main collector and branch drain systems. The channel designs have been based on a 1:5 year storm with a permitted maximum three day pending at field level. A drainable surplus figure of 1.5 litres/second/ha (gross) has been adopted. (See Section 1.4 of the Engineering Annex).

Water from the internal drainage system discharges into the Lower Outfall Drain. One third of the project area has a pumped drainage system based on four small pump stations. From the Lower Outfall Drain the water passes by gravity into the River Jubba when the relative levels are suitable. When the river level is high, water overtops the Lower Outfall Drain and is stored in the Southern Reservoir Area, which is later disposed of by gravity when the river level falls.

4.7 FLOOD PROTECTION WORKS

A comprehensive flood protection system is proposed. The system incorporates the construction of two large storage reservoirs and two outlet structures and will protect the project area from waters from the Shabeelle River and the Harar Naga depression.

Flood waters are diverted to the Northern Reservoir Area from which water passes through an integral outlet structure and main road underpass, through the Upper Outfall Drain to the Eastern Reservoir. The combination of these two storage reservoirs are capable of accommodating the 1 in 1,000 year flood. Waters are discharged from the Eastern Reservoirs through the Lower Outfall Drain to the River Jubba. The flood protection proposals although costing an estimated 15 per cent of the capital costs of the civil works will greatly benefit an area subject to relatively frequent flooding.

4.8 ROADS

Good road access within the project throughout the year is considered essential to ensure the movement of agricultural and maintenance machinery, farm inputs, produce and farm labour is unrestricted.

The proposed surfaced road system links all ten block villages to the spine road which itself is surfaced and linked to the road connecting Jilib to Mogadishu; a bitumen surfaced road due for completion in 1981. These feeder roads, surfaced in crushed coral, will provide the necessary access for the transportation of materials and machinery to the project area. A number of pipe and box culverts have been provided where the surfaced roads cross canal, drain and natural channels. The cost of the surfaced road network is approximately 17 per cent of the capital works of the irrigation and drainage system, this percentage does not account for road crossing structures.

The surfaced road system is supplemented by a network of earth roads consisting of access, inspection and field roads.

4.9 CONSTRUCTION OF THE CIVIL WORKS

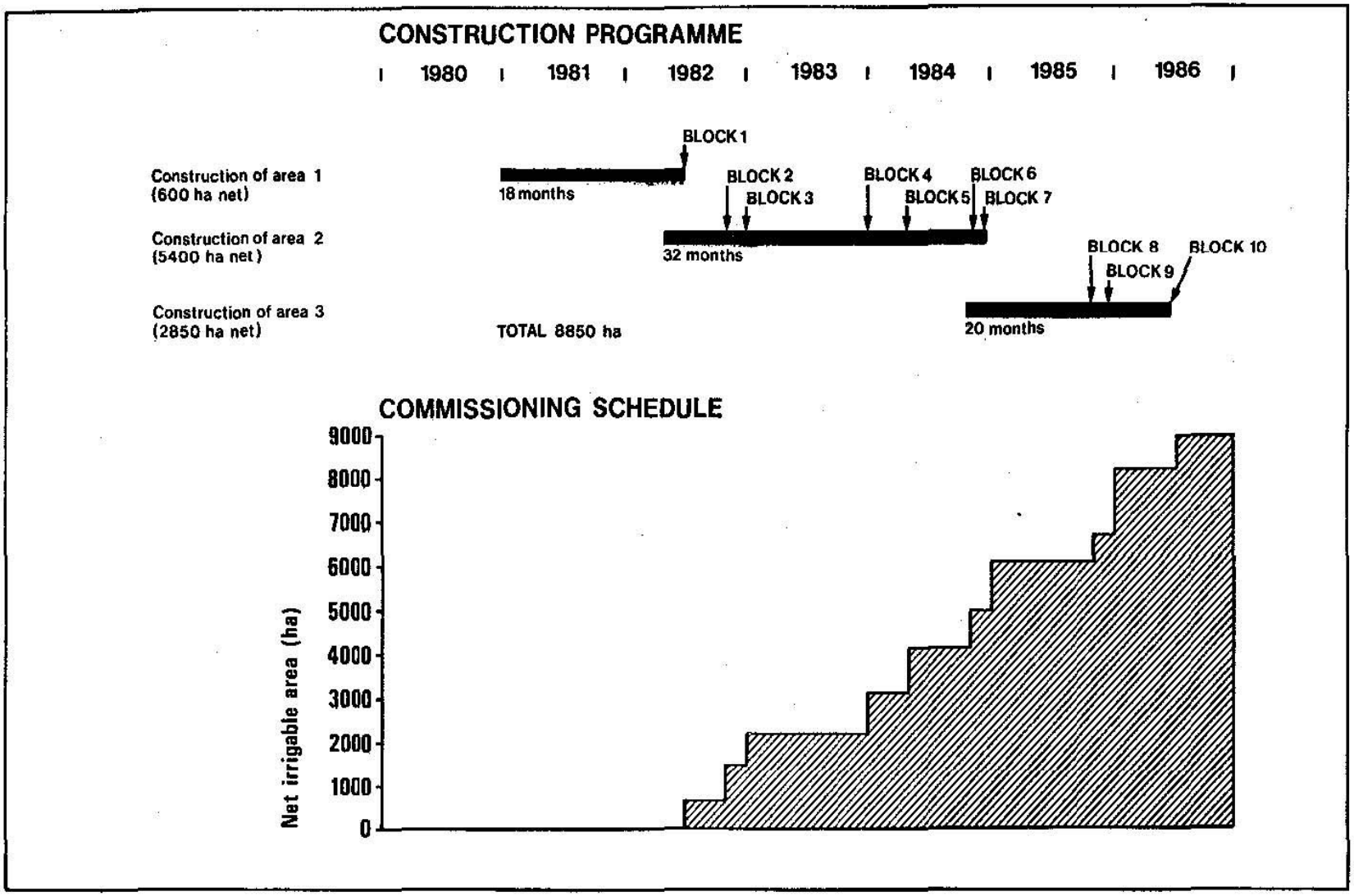
The civil works associated with the scheme include the construction of the flood protection works, surfaced road network, the irrigation and drainage system and all associated hydraulic structures and water control equipment.

The total cost of the works covered by the civils contract is estimated at 424.3 million SoSh. This estimate assumes a direct labour force employed by the S.D.A. with an expatriate management construction team supplied either by an International Contractor or other suitable organisation.

Table 4.1 summarises the overall cost of the scheme including the cost of the major construction works, infrastructural, agricultural and management costs. All costs included in the estimate are based on December 1979 prices and, in terms of evaluating the costs for each item of work, it has been assumed that the Project will be exempt from import taxes, custom's and other duties. The financial costs have also been estimated for the scheme and have been used in the financial studies in Volume 3 Annex III.

The construction programme has assumed a commencing date in late 1980 with a 66 month construction period, and is illustrated at Figure 4.1. An annual inflation rate of 15 per cent on materials and equipment has been used. A lower rate of increase in wages has been assumed. A provisional sum item has been incorporated to allow for price increases.

4.1 Construction programme and commissioning schedule



The construction of the scheme has been divided into three sections, the first section including the construction of the supply canal the major part of the flood protection works and the irrigation and drainage system associated with 600 ha net of irrigated land. (See Section 1.12 of the Engineering Annex).

The average cost per hectare irrigated, assuming the full development of the 8,850 ha is approximately SoSh 48,000 this figure only incorporates the capital works of the engineering scheme. If the total costs of the project, as per Table 4.1 are considered then the cost per hectare irrigated is SoSh 81,000 whilst the cost per hectare developed is SoSh 62,000.

Labour, materials and plant requirements associated with the major engineering works are all summarised in Volume 2 Annex. 2.

TABLE 4.1 SUMMARY OF PROJECT COSTS

HOMBOY IRRIGATED SETTLEMENT PROJECT

Item	Economic Costs SoSh x 10^6
1. Irrigation and Drainage Works	210.6
2. Surfaced Roads	51.2
3. Flood Protection Works	44.1
4. Engineers Requirements	8.5
5. Day Works	9.2
6. Provisional sums (included physical and price contingencies for items 1 to 5 inclusive)	100.7
7. Settlers Housing	49.3
8. Protect Buidlings	18.1
9. Project Water Supply and Distribution	19.4
10. Project Electricity Supply and Distribution	4.5
11. Village Roads and Drainage	4.7
12. Project Staff Housing	23.3
13. Social Service Buildings	13.0
14. Operation and Maintenance - Equipment and Vehicles	14.1
15. Farm Inputs	23.8
16. Engineering Design and Supervision Costs - Engineering Infrastructure	29.7 11.1
17. Training Costs (unspecified estimate)	2.0
18. Communications - Radio	0.3
19. Project Consultants and Expatriate Project Staff	40.0
20. Facilities for Senior and Expatriate Staff (unspecified estimate)	0.5
21. Physical and Price Contingencies (20% of items 7 to inclusive)	50.8
Total	**718.9**

* Costs all December 1979.
Operation and Maintenance Costs are approximately SoSh 10 million per annum.

5
Agriculture

5.1 INTRODUCTION

The detailed basis for this chapter is given in Annex I Volume 3. This chapter summarises the main arguments for the form of development which is proposed, the selection of crops, the cropping patterns proposed, the agronomic practices and farming systems recommended and discusses the utilisation of inputs such as labour and machinery.

5.2 THE PROPOSED FORM OF DEVELOPMENT

The principle objective of the Homboy Irrigation Scheme is to provide all participants with a permanent abode and the resources to sustain a reasonable standard of living. Since the potential participants, (i.e. the existing farmers, sedentary and semi sedentary families of nomadic origin, ex nomads from Dujuuma and possibly refugees from northern Somalia) represent a wide range of ability, experience and aptitude for irrigated arable farming, determining a farm organisation settlement suited to everyone and achieving this objective will not be easy. In proposing a form of development we have taken into account the human resources involved, the need for time to adapt and acclimatise to a more disciplined way of life and the policies of the Government towards the disposition of these human resources. Three mainforms of development, a state farm, village collectives and cooperatives within village blocks, have been considered.

The development of the project as a state farm was initially favoured by the Settlement Development Agency (SDA) because of possible advantages in maintaining better control and in economies arising from the scale of operation. The disadvantages however are numerous and are mainly related to the attitude of the prospective settlers towards the status of hired labourers on such a scheme. They are unlikely to accept the discipline necessary in a productive labour force and would probably have a natural inclination to reject regular paid employment unless their efforts could be identified with a particular area to which they have some personal commitment.

The village collective system would attempt to involve all settlers in each village production process. In theory members of the collective would receive a share of the production or profits based on their contribution in terms of labour. However a system of incentives in which rewards were related to effort would be difficult to implement particularly when dealing with people who are unaccustomed to accepting orders and to working regular hours. Major difficulties would almost certainly arise in carrying out the administration involved in operating such a system of incentives. There are also serious doubts about the acceptability of such a system to prospective settlers who put considerable value on individual or family independence. Smaller grouping within the village unit would have a much greater likelihood of success in stimulating cooperative effort amongst the settlers.

The organisation of small cooperatives therefore, within the village block, is considered the most favourable of the basic development strategies. It would have the advantages of eventually leading to settlers involvment in decision making and would allow them to identify with a particular area of land or group of people. Although a period during which strong centralised management would be required to enable settlers from a nomadic or semi nomadic background to become acclimatised to a wholly sedentary way of life and to acquire a knowledge of arable farming, settlers would be organised into small groups or cooperatives immediately. Central control would be gradually relaxed and would be accompanied by a continuous devolution of decision-making to the cooperative members and committees.

It is proposed that the size of the cooperative should be determined by the size of currently recognised social groupings. The Udud is the smaller of these and comprises 50 families. Since the SDA policy is to allocate land on the basis of 1.0 ha of irrigated land per family, it is proposed that each cooperative unit would comprise 50 families and 50 ha of irrigated land and that each village block would be divided into a number of 50 ha units. The villages would be largely self sufficient in terms of management, machinery services and physical infrastructural requirements. Services such as machinery repair, operation of the irrigation system and general project administration would be centralised and be carried out by the respective department within the overall project management authority (Chapter 7).

Although individual holdings were not seriously considered because of SDA policy and the difficulties of organising mechanised operations and water distribution on such small areas, it may eventually be possible for members of cooperatives to farm individually 1 ha strips within the cooperative unit. Even then individuals would still be dependent upon cooperative decisions and general aggreement with the group.

5.3 CROP SELECTION

The first step leading to the definition of the proposed cropping pattern was the identification of a range of crops, based on soil and climatic conditions. Apart from the heavier textured depression soils which are best suited to paddy rice, the soils impose no important limitations on crop selection. Only in Blocks 9 and 10 is the proportion of depression silts large enough to warrant separate consideration. Throughout the remainder of the project area therefore a uniform cropping pattern can be adopted.

Climatically low rainfall represents the main restraint on crop production. The development of an irrigation scheme will remove this constraint and cultivation of a wider range of crops will be possible, cropping possibilities however, will be limited to annual crops since the river flows in Jubba are negligable between late January and mid April.

Selection from the range of agronomically suitable crops was then determined by whether they were already being cultivated successfully in either Jubba or Shabeelle valleys and the need to provide the settlers on the Homboy Scheme with a combination of subsistance crops and crops which would provide a cash income.

The selected crops are rice (upland and paddy), maize, sesame, groundnuts and cotton. Besides these, the settlers will undoubtedly plant a range of annual fruits and vegetables to meet their own needs. Tomatoes have been taken as representative of these. The main features of the selected crops are as follows:

(a) Maize

Variety - recently developed Somali composite with growing period of 105 days which is easily double cropped. This variety is yellow seeded but because of higher yield potential is preferred to local white seeded types. Yield projections in kg per ha are:

	Year 1	5	10
'GU' Season	2,000	3,000	4,000
DER Season	1,800	2,800	3,500

(b) Upland Rice

The recommended variety is the recently released variety Vista which with a growing season of 105 days is higher yielding than the 120 day varieties Dawn and Saturn. Field projections kg per ha are:

	Year 1	5	10
'GU' and DER Season	2,400	3,000	3,500

(c) Paddy Rice

Kendo and Shendo, both 120 day maturing varieties are well suited to paddy production whilst Vista is equally suitable for dryland and paddy cultivation. All three varieties can be recommended to allow scope for spreading the harvest period. Yield projection in kg per ha are:

	Year 1	5	10
'GU' and DER Seasons	2,400	3,000	3,500

(d) Cotton

Medium staple cotton suitable for local market and spinning facilities would be grown. At the present time the variety Acala 4-42 is widely grown and is well adapted to local conditions. The growing period is approimately 180 days with the following stages:

Growth Stage	Days from Planting
First square	40
First flower	50-55
Full crop cover	70
First boll open	110-115
First pick	130-135
Final (third) pick	170-180

Yield projections are:

Years following project implementation	1	5	10
Yield of seed cotton in kg/ha	1,250	1,750	2,500

(e) Sesame

The current local variety which has a growing period of 90 days from planting to harvest is recommended.

Yield projections are:

Years following project implementation	1	5	10
Yield of seed in kg per ha	500	650	800

(f) Groundnuts

Three varieties have been released following a varietal testing programme at Afgooye. Two of these varieties, Florigiant and Sudan 1 have given good results in the field and are recommended. The two varieties have similar growth characteristics as follows.

Growth Stage	Days after Planting
Onset of flowering	40
Onset of pegging	50
Full cover	60-65
Final flowering	90-95
Maturity	115-120

Yield projections are:

Year following project implementations	1	5	10
Yields of unshelled nuts in kg/ha	1,500	1,800	2,500

(g) Tomatoes

Tomatoes are selected as an indicator of the likely return from small areas of fruit or vegetables. The Roma variety has consistently outyielded other varieties in trials at Afgooye. This variety is plum-type normally used only for processing but is apparently acceptable on the fresh market in Somalia. It can be recommended for the short term.

5.4 CROPPING PATTERNS

The proposed cropping pattern was then devised taking into account the following factors;

(a) the restricted cropping season due to the availability of irrigation water

(b) rotational constraints

(c) seasonal adaptation of crops

(d) machinery and labour constraints

(e) relative profitability of selected crops

(f) future markets

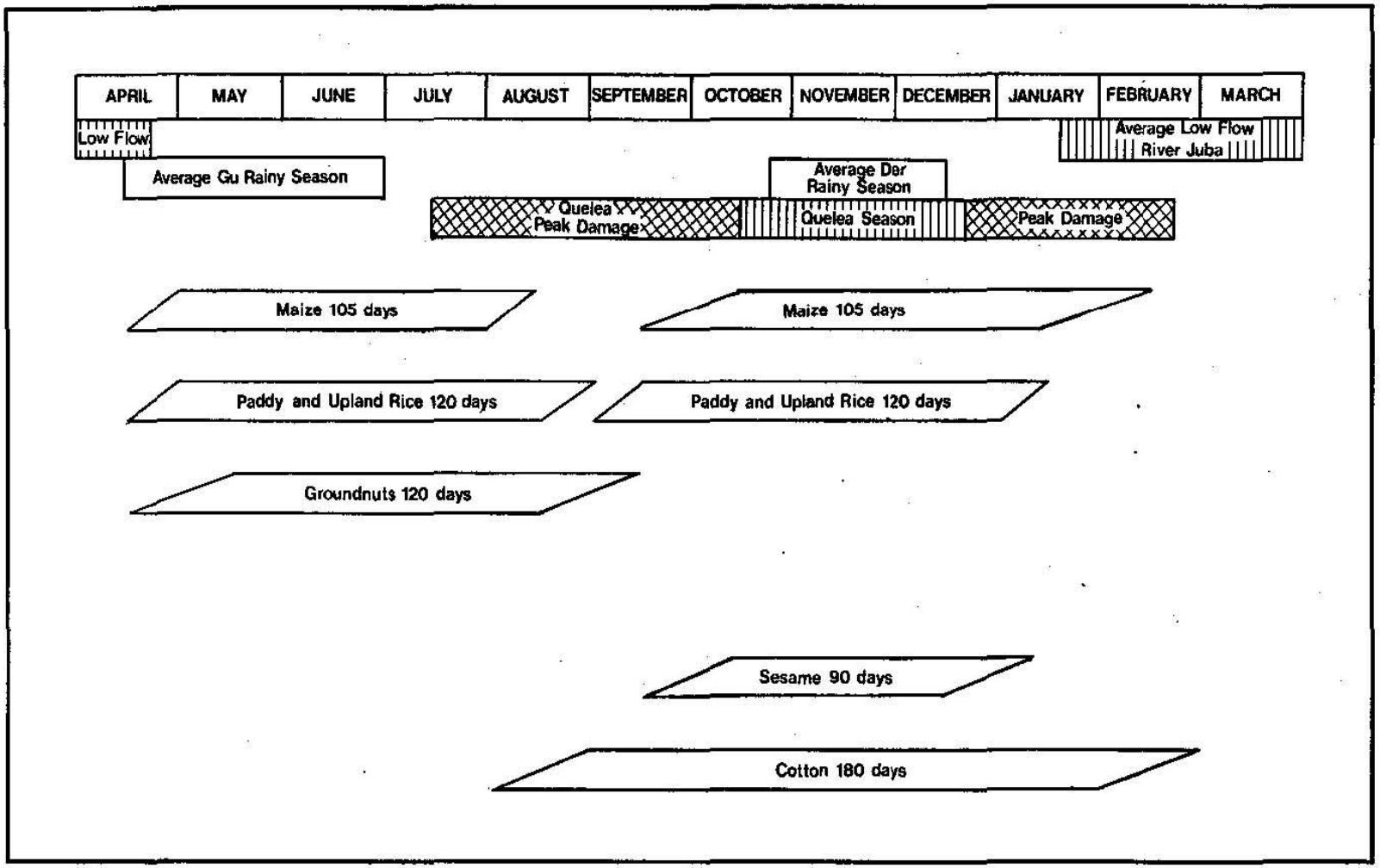
Although rotational constraints (apart from vegetables) do not impose any major limitations on the cropping patterns, it is recommended that a crop rotation is followed as a routine agronomic process. The crop growing periods are shown in Figure 5.1 which also illustrates the time of low river flow, the main rainy seasons and months where there is a high risk of bird damage. Markets will provide few limitations since all the crops recommended are major import commodities. In terms of relative profitability upland and paddy rice are by far the most attractive and should occupy a significant proportion of the overall cropping pattern. The upland rice however will be limited because of potential weed problems and need to fallow whilst paddy rice will be limited by the area suitable for basin construction (blocks 9 and 10). The pattern proposed for all upland areas and the rotation sequence is shown in Figure 5.1. The basin depression areas in blocks 9 and 10 will be monocropped with paddy rice at 60 per cent in 'gu' season when water availability is a limiting factor, and 100 per cent in 'der' season, giving an overall cropping intensity of 160 per cent.

The agricultural development programme is presented in table form (Table 5.1) which shows cumulative build of areas of crops over the development period to full production.

TABLE 5.1 AGRICULTURAL DEVELOPMENT PROGRAMME

Year	Season	Block	Area	Cumulative Total
1982	der	1	600	600
1983	gu	2 & 3	1,525	2,125
1984	gu	4	925	3,050
1984	der	5	1,025	4,075
1985	gu	6 & 7	1,925	6,000
1986	gu	8 & 9	2,100	8,100
1986	der	10	750	8,850

5.1 Cropping Calendars



6

Physical Planning

6.1 INTRODUCTION

The Homboy scheme is a large and complex development. In addition to extensive civil works the lives of more than 25,000 settlers presently residing at Dujuuma and over 8,000 local residents within the project area will be deeply affected. The physical planning necessary to ensure a smooth yet rapid development, while at the same time, minimising hardship and unnecessary disturbance, has been studied in detail, and our proposals are presented in Volume 2.

The overall planning concept is one of a series of complementary programmes, based upon the civil works construction programme. They are designed to provide:

(a) the bringing into production of irrigated land as soon as in field works are complete and water available;

(b) sufficient labour to meet the needs of civil works construction, village building, infrastructure and irrigated agriculture;

(c) the timely provision of staff and settler housing.

In order to minimise the drift of the resettled nomads away from the project, all infrastructure components of a village should be operational prior to the arrival of the nomadic community from Dujuuma.

In order to achieve these objectives it is necessary to consider village structure and settler housing, the orderly transfer of people from Dujuuma to Homboy, project holdings and management housing, project utility and social services.

A summary of the costs associated with the infrastructure aspects of the Homboy Irrigated Settlement Project is presented. Costs for infrastructure allowing for contingencies are SoSh 18,000 per family, assuming 8,850 resettled families.

6.2 VILLAGE STRUCTURE AND SETTLER HOUSING FORMS

The project is based on ten blocks, each block possessing a village of between six and fifteen hundred families. Each village is designed as a separate unit which will be a self contained and self sufficient community. In the initial years, considerable direction and assistance will be necessary from the project headquarters.

Costs of village structure have been kept to a minimum compatible with a satisfactory and efficient organisation. The village plan has been kept simple to facilitate modular repetition necessary for its adaption to different sites and village sizes.

Apart from the importance of social services, it is also desirable to make adequate provision for well planted green areas and parks which will serve as social gathering points and neighbourhood recreation areas.

Two alternative village layouts have been proposed. They are described in Volume 2 Annex I. The two 'udud' designs on which they are based are shown at Figures 6.1 and 6.2. Each settler is to be allocated a 220 m^2 plot, including house, kitchen and courtyard as outlined in the Villagisation Report. The main objective in the choice of housing is to optimise the provision of basic shelter and comfort with minimum cost.

It is proposed at Homboy to provide the settlers with an improved Arish type house constructed of wattle and daub. The cost of such a building is far less than the houses being provided at Sablaale and Kurtun Waarey, the other two settlement projects under the SDA. However, in the other two projects, some housing is being provided under separate foreign aid agreements.

The foundations of the structure are to be crushed coral footings whilst the floors throughout are to be of compacted clay. The wattle and daub walls will incorporate a chopped straw binder, wattle cross bracing will also be provided to improve the stability of the structure. The roofs of all buildings will consist of thatched panels. This improved wattle wall building has been costed at SoSh 5,622 per family.

6.3 RELOCATION

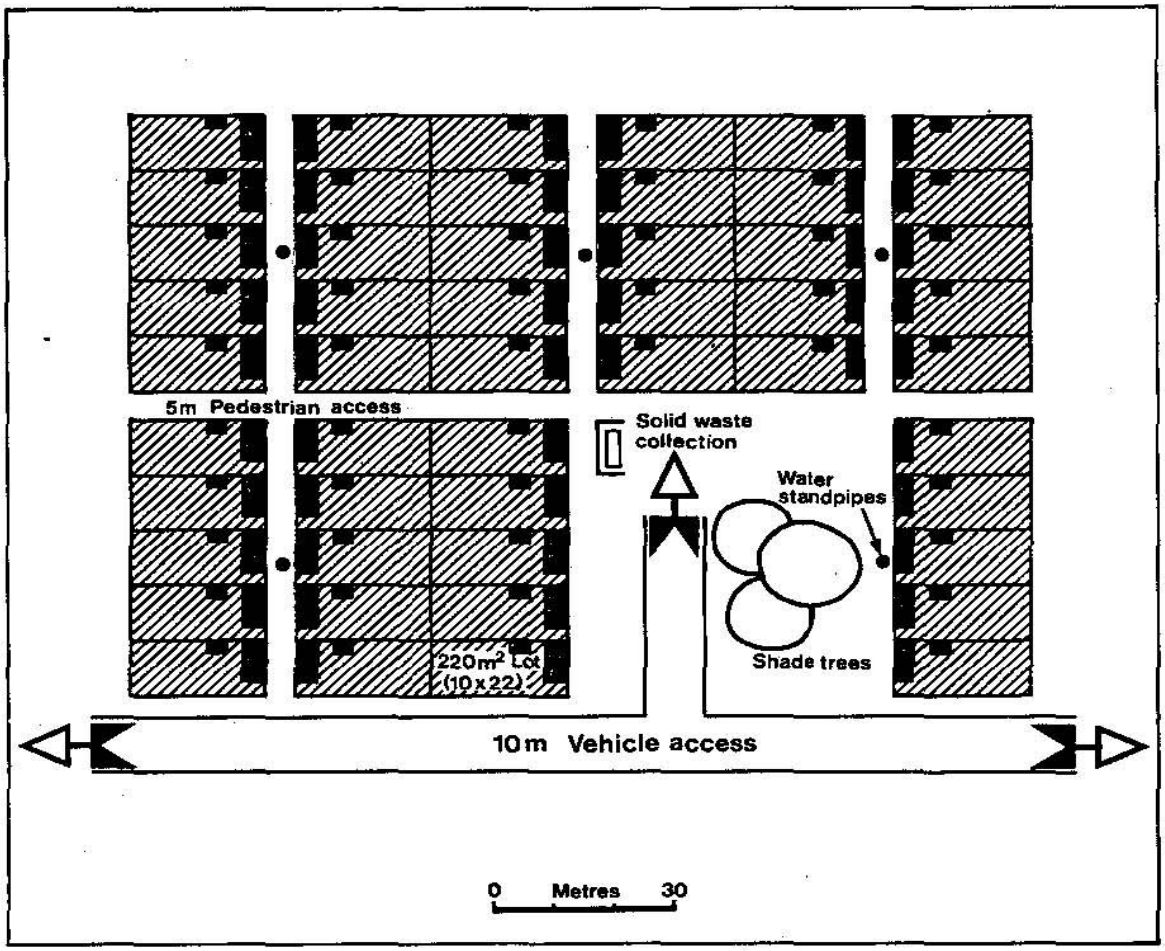
The transfer of families and the construction of the villages are geared to the progress of the engineering work. It is planned to bring the fields under cultivation as soon as the irrigation work is ready and to ensure that permanent housing is available for families immediately on arrival. In order to accomplish this it is essential to draw on the existing resources of Homboy to supply both labour for the construction programme and the necessary farming experience for the agricultural development.

Initially the present Homboy residents will construct a number of houses in Homboy (150 houses if housing alternative 7 is chosen, and 288 houses if alternative 6 is chosen) to accommodate an initial movement of people from Dujuuma to Homboy known as the 'Homboy infill'. This will then form the initial core labour force, some of which will undergo a period of training in building techniques. This labour force will initiate the construction of housing and infrastructure at villages 1 and 2 which would be finished by June 1982, in time for the completion of irrigation block 1.

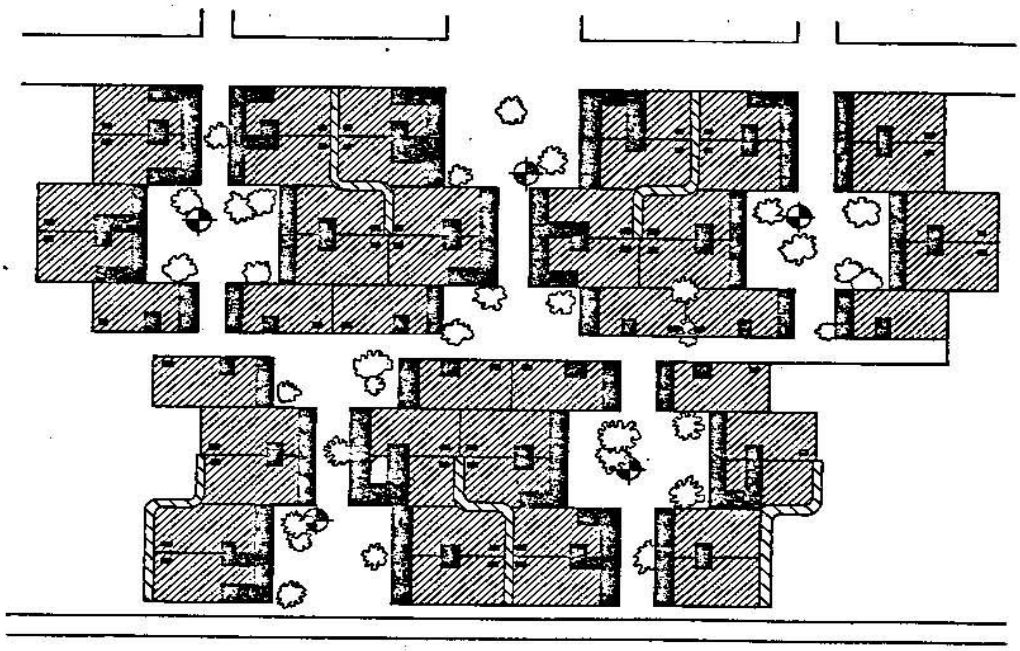
A simplified cropping programme would then be initiated in block 1 requiring 66 per cent of the normal farm labour while the incoming population of villages 1 and 2, with the assistance of some fo the skilled labour from Homboy, will proceed to build villages 3 and 4. This pattern will continue with the incoming population of completed villages supplying the labour force to construct subsequent villages. When completed each new irrigation block will initially be farmed under a simplified cropping programme which will allow part of the labour to be released to continue construction of other villages.

The rate of actual resettlement depends initially on the housing alternative chosen, as the different construction methods result in diffferent village completion dates. If

6.1 Udud Design (50 families)



6.2 Alternative Udud design



housing alternative 7 is chosen all Dujuuma families will be resettled by January 1985, whereas with alternative 6 resettlement would be completed by January 1986. This is based on one of 4 population assumptions, namely that all Dujuuma families are willing to move to Homboy and that outmigration will not reduce the interim population below the 1979 level.

The resettlement programmes are summarised in Table 6.1 and 6.2.

TABLE 6.1 SETTLEMENT PROGRAMME FOR HOUSING ALTERNATIVE 7

	No. of Families	Location
January 1981	150)	
	150)	Homboy refill
January 1982	300	Village 1
July 1982	700	Villages 1-2
January 1983	1,125	Villages 2-3
July 1983	925	Village 4
January 1984	125	Village 5
July 1984	1,925	Villages 6-7
January 1985	447	Village 8
Total	5,847	

TABLE 6.2 SETTLEMENT PROGRAMME FOR HOUSING ALTERNATIVE 8

	No. of Families	Location
January 1981	288	Homboy refill
July 1981	288	Village 1
January 1982		Village 1
	384	Village 2
July 1982	441	Village 2
	672	Village 3
January 1983	28	Village 3
July 1983	925	Village 4
January 1984	137	Village 5 at the same time 600 Homboy families will be integrated into the scheme and settled in new houses in Village 5.
July 1984	768	Village 6
January 1985	32	Village 6
	1,056	Village 7
July 1985	69	Village 7
January 1986	447	Village 8

Estimates have been made of the labour force required to build the houses and various community buildings and care has been taken to ensure that during each stage of development there are sufficient people in the project area to undertake both construction and agricultural activities.

Transportation of settlers from Dujuuma to Homboy presents no real problem and is scheduled to take place during June/July and December/January when road conditions should be reasonably good. The plan assumes that 20 trucks will be available from SDA and that each truck can transport 3 families each trip and that under favaourable conditions two round trips/day/truck can be made thereby transporting 120 families/day. Should this prove impractical the families can still be transported within the period at only one round-trip per day.

6.4 PROJECT BUILDINGS AND MANAGEMENT HOUSING

All project buildings are to be constructed to the best structure form outlined in the Villagisation Report, (Alternative 1).

To enable a high degree of control to be established in the organisation and management at block level, each village is to be provided with storage compounds, stores and office. The floor area of the office will be at least 100 m^2.

The management staff of each block will live in the block village in permanent housing of a high standard. Each house is to be provided with in-house services to encourage high calibre and dedicated staff to undertake the responsibilities of running the organisational requirements at block level.

The project headquarters comprises a central office of 545 m^2 floor area to accommodate all the expatriate staff and the organisational and managerial staff associated with the project together with stores, training centre; central workshop and other smaller components such as the fuel station, generator house, and meteorological station.

The villagisation report proposes that other services should be provided at the project headquarters including a fire station, police headquarters, orientation centre, hospital and secondary school. Provision has been made in the area around Aminow for all these facilities, but no cost estimate has been included for the structures for these additional services.

By drying and storing the majority of farm produce at block level, the stores compound and buildings at project headquarters can be kept to a minimum. It is also proposed to carry out routine maintenance of agricultural machinery at block level thus reducing the load on the central workshop.

In order to attract suitable senior staff, both Somali and expatriate during the implementation stage of the project, it is essential to provide good housing and facilities. A number of prefabricated housing units have been included in the costs. Such units will be shipped to Somalia and arrive at Animow complete with furnishings at the start of the project ready for immediate occupation.

During the initial period of implementation, the permanent management housing will be constructed together with any additional facilities which are considered necessary for the operational and managerial staff.

6.5 PROJECT UTILITY SERVICE

The three main services being provided are electricity, water supply and sanitation. The sanitation will comprise the supply to each settler family of a privy whilst all offices and management housing will have systems of septic tanks.

The provision of an adequate, reliable and clean water supply system will be made one of the priorities of the project. Such a supply will play a major role in reducing health and welfare problems within the resettled community. Of the two basic supply sources, groundwater and irrigation water, the latter has been adopted for cost estimating purposes. However it is advised that trial borings should be carried out within the project area to assess the availability and quality of groundwater in the region. (see Groundwater report Volume 2 Annex 1). If such water is found to have low salinity levels then its use will have the considerable advantage of probably not requiring treatment to make it potable.

The water supply system proposed uses, as the source of supply, irrigation water from the night storage reservoirs. This water is then treated by small package treatment plants and stored in 36 hour storage reservoirs to be pumped when required into elevated tanks having sufficient capacity for 4 hours storage. The elevated tanks will give sufficient water pressure at the standpipes provided within the block villages and project headquarters. Standpipes have been provided at a density of one per ten families (Xubin unit).

The distribution systems within the villages have been designed to permit future upgrading of the supply. It is illustrated at Figure 6.3.

Although electricity will eventually be generated by hydropower at Fanoole, the Fanoole projects demand for electricity is such that Homboy would not receive its requirements throughout the year. During periods of low flow in the River Jubba, the Homboy Project and the associated villages would require standby capacity in the form of a single large generator. For this reason and because of the added cost of pylons and power lines to bring the power to the project area, it has been considered preferable to supply each village with diesel generators to meet their individual needs.

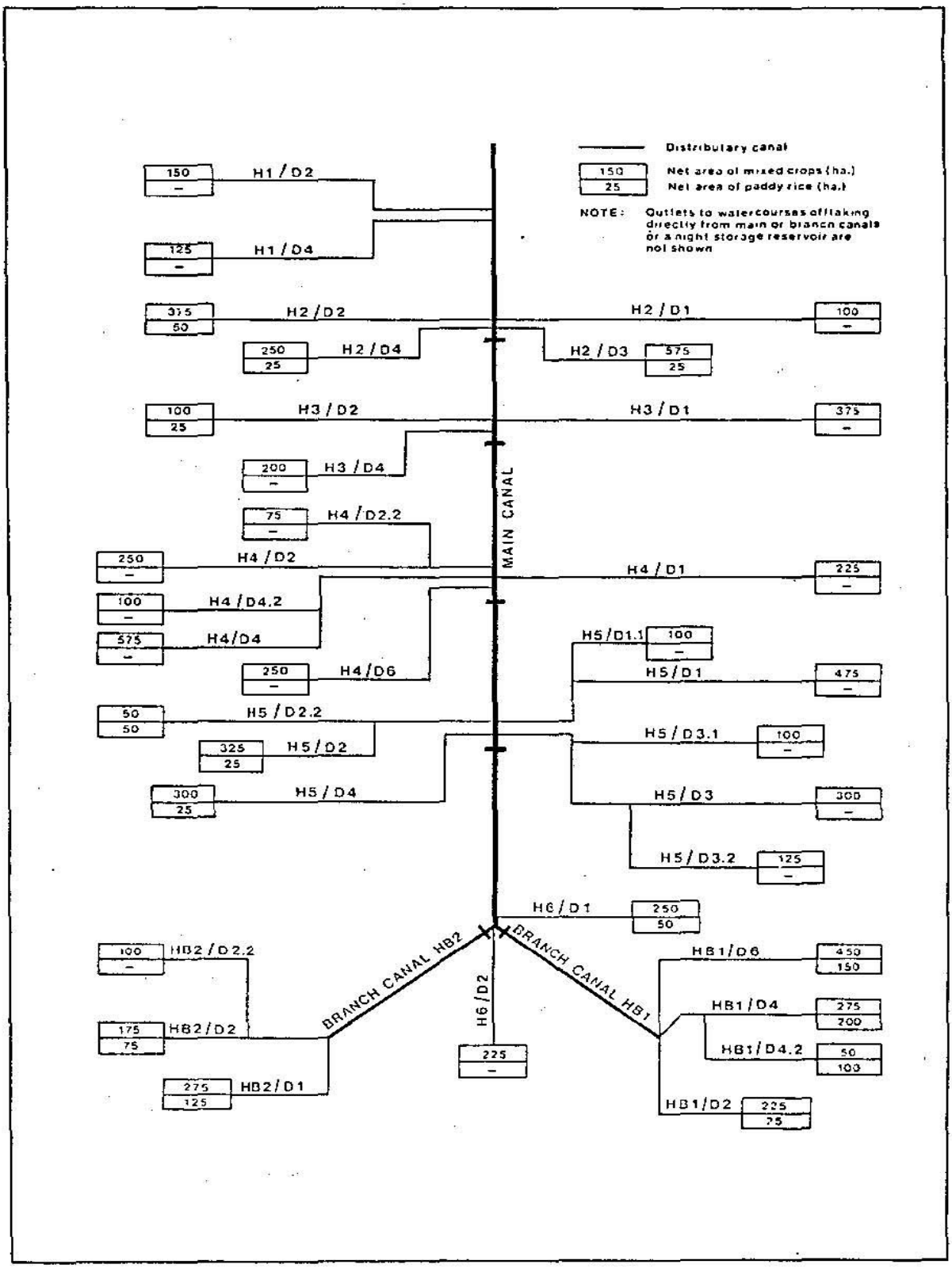
Each village has been provided with main street lighting. In addition, it is proposed that project buildings and management housing be furnished with an in-house supply to proivde lighting and where appropriate air conditioning. The project headquarters has been provided with a comprehensive distribution system which will supply the training centre, project headquarters office, the secondary school, the store and all management housing.

Separate generator units will be provided for the main workshop at Aminow, the water treatment plants and also the hospital if located at Aminow. The latter should be supplied at the same time as the hospital is constructed, and funded under the same agreement that covers the construction costs.

The proposed privies for settler sanitation consist of a vented dry pit, partially lined with concrete, a squat plate, and a lightweight wattle and daub enclosure. The cost of this element of the family buildings has been incorporated into the house construction costs evaluated in the Villagisation Report.

Consideration has also been given to the problem of solid waste. The majority of waste will be recycled, but that which cannot should be burnt as a fuel source. The remainder can be collected within each Udud unit for transportation to a preselected disposal area.

6.3 Water supply network



Fuel sources on the other hand will be a problem in the future as the travel distance to obtain firewood from the surrounding bush will increase. During the period of implementation of the project use will be made of the bush cleared prior to the construction work. This bush will be stockpiled adjacent to the respective block villages and used as a fuel source and a building material for the wattle and daub houses.

Several alternative fuel sources are available for the future and it will be the responsibility of the project authority to prepare and make provisions for developing the selected source.

6.6 SOCIAL SERVICES

Two very important aspects of a settlement project are the health and education of the settlers. Although both of these will be the direct responsibility of separate ministries, it is important for the SDA also to be involved. The health of the settlers will be improved by the provision of a continuous supply of potable water and the good sanitary facilties however, the SDA must not only educate the settlers in the use of these services, but also maintain the services to a high standard.

The SDA must liaise with the Education Authority with regard to coordinating the primary and secondary education systems with the training centre and orientation centre requirements. The primary and secondary systems must incorporate agricultural aspects into the curriculum as well as the basics of reading, writing and mathematics.

A high proportion of the settled Dujuuma community will be under the age of fifteen, hence it is vital to provide adequate schooling facilities. One of the most popular aspects of the other two settlement projects has been that of education and it is therefore necessary for the project management organisation to accept the significance of education to the settlement as a whole.

6.7 COSTS

Costs of summary of capital costs for the infrastructure is shown in Table 6.3.

TABLE 6.3 CAPITAL COST FOR INFRASTRUCTURE (So.Sh.'000)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total (economic)		Total (financial)	
1. Homboy to Mogadishu radio transcievers	25	-	-	-	-	25	x 1.425	35.6	Provisional Programme
2. Internal radio transciever sets	18	.108	72	54	-	252	x 1.425	359.1	of Works
3. Potable water supply abstraction and treatment	730	3,097.2	2,335.2	1,787.5	765	8,715	x 1.17	10,196.6	Yr. 1 block village V1
4. Potable water supply trunk mains	473	1,089	3,371	2,310	222	7,465	x 1.17	8,734	Yr. 2 PHQ V2, 3, 4,
5. Potable water supply stand-by pipes and fittings	210	1,002.6	1,032.6	735.1	262.5	3,242.8	x 1.17	3,794.1	Yr. 3 V5, 6, 7,
6. Generators for PHQ, workshop and block villages	115	1,355	345	230	115	2,160	x 1.085	2,343.6	Yr. 4 V8, 9
7. Electrical distribution and main road lighting	57	384	281	201	72	995	x 1.425	1,418	
8. Settlers housing (Alternative 6)	3,363.2	13,023.1	16,585	11,806.3	4,216.5	49,004.1	x 1.0	49,004.1	
9. Additional cost for concrete foundations	-	174	150	-	-	324	x 1.165	377.5	
10. Earth roads with block villages and PHQ	285	1,191.8	1,401.3	997.5	356.3	4,231.9	x 1.055	4,464.6	
11. Disposal of drainage water from blocks and PHQ	2.4	28.9	9.9	2.7	1.0	44.9	x 1.195	47.4	
12. Project staff housing	1,315	13,918	3,945	2,885	1,315	23,378	x 1.195	27,937	
13. Social services	882	3,601.6	1,336.6	3,087.1	1,102.5	13,009.8	x 1.195	15,546.7	
14. Project buildings	803	9,755	3,310	3,260	1,005	18,133	x 1.195	21,669	
15. Electrical fittings and air conditioners for housing	73	809	219	153	73	1,327	x 1.425	1,891	
16. Physical contingencies	836	4,954	3,739	2,751	951	13,231	x 1.1	14,554	
17. Price contingencies	836	4,954	3,739	2,751	951	13,231	x 1.1	14,554	
Total economic So.Sh. x 1,000	10,034	59,445	44,872	33,011	11,408	158,770			
Totals financial So.Sh. x 1,000	11,181	66,243	50,003	36,786	12,713			176,926	

Note: 10 per cent physical contingencies and 10 per cent price contingencies allowed.

7

Organisation, Management and Implementation

7.1 INTRODUCTION

The principal objective of the project is to establish a settlement scheme with a stable community participating in and benefiting from agriculture and social activities of the scheme.

There is no doubt that success in achieving this on the Homboy Scheme will depend to a large extent on an effective management structure which must be established at the start of the project. There is no substitute for good management and previous experience on large schemes has shown that failure often results from lack of experience in this field. In Somalia there is a shortage of people with the relevant experience and, with the proposed development of other irrigated agriculture projects (Mogambo, Sablaale, Kurtun Waarey, Janaale) in the country, this situation is unlikely to improve in the near future.

Before making proposals for a management structure for Homboy, it is essential to examine the existing structure of SDA, management and socio-political structures on the other two settlements, and problems experienced during the past few years. Any changes in the structure which are considered essential to the successful development of Homboy are discussed in detail. Emphasis must also be placed on the quality of management, so that destabilising and demoralising effects of the move from Dujuuma may be minimised. Given the existing demands for experienced managerial staff on projects throughout Somalia and the need for rapid development at Homboy, it is anticipated that assistance from expatriates with appropriate experience will be necessary.

Two distinct phases with differing needs and objectives are evident during the development of an irrigation scheme such as Homboy, a transitional implementation stage and an operational stage. Initially a structure providing tight central control is anticipated to ensure adequate coordination and this will gradually give way to a much more devolved system with many decisions being made at the 50 ha cooperative unit level.

7.2 EXISTING ORGANISATION

The SDA was established in 1975 on the recommendation of a World Bank mission, to organise and manage the settlement of nomads evacuated from the northern drought stricken areas of Somalia. Three settlements were proposed, Kurtun Waarey and Sablaale on the Lower Shabeelle and Dujuuma on the Jubba River. The SDA management structure was established and settlement management and socio-political structures devised to effect the formidable resettlement programme.

Shortage of suitably qualified staff at all levels has led to poor performance at Kurtun Waarey and Sablaale, where only 30 per cent development has been achieved. The Homboy Scheme, which replaces the defunct Dujuuma Settlement has an enhanced chance of success, provided present weaknesses in management are identified and remedial action taken.

The Homboy Scheme at 8,850 ha net irrigable area, is three times larger than either of the other schemes. In addition it requires extensive flood protection measures and a long feed canal. The morale of the settlers who will populate the scheme is low, because of their association with the failure of agricultural production at Dujuuma calling for tactful and sympathetic handling.

7.3 PROPOSED ORGANISATION

It is proposed that the Homboy Scheme be divided into ten self-contained blocks, each operated on a semi-autonomous basis. Each block will have a village to accommodate the settlers who will farm the land on one hectare per family basis, and land will be allocated at the 50 hectare level to a social group (Udud) of families which will eventually become cooperative units. Each block will have a management team comprising a Block Manager/Agriculturalist, a Mechanisation Supervisor and an Irrigation Supervisor, supported by junior staff. They will be housed adjacent to the block village, where agricultural buildings will also be situated. The ten blocks will be coordinated and supported by a Project Headquarters, which will be situated at New Aminow, adjacent to Homboy (village 5). A general Manager will head the team, which will have four functional departments; Agriculture, Administration and Finance, Engineering and Settlement and Training. A counterpart system will operate to train and replace expatriate staff.

The socio-political structure established at the other settlements will be retained, headed by a District/Settlement Chairman. Project management will work closely with the settler committees at all levels, and the 'Udud' committees are seen as being particularly important, as they should form the basis of the 50 family cooperative units.

Full details of levels of responsibility are discussed in Volume 3, Annex II, and the proposed structure is illustrated in Figure 7.1.

7.4 IMPLEMENTATION STAGE

During the transitional implementation stage, expatriate management support is proposed at three levels. A Project Consultant should be appointed to provide: a Detailed Planning Team at SDA headquarters, who will later move to Homboy to form the basis of the Project Headquarters Management Team, and a Block Management Team who will establish and train the block management staff as blocks are commissioned. They will start at Block 1 and follow the development programme to Block 10 when they will no longer be required.

A separate construction organisation is also proposed as part of the overall consultant's package. It would he headed by a Project Coordinator based in Mogadishu, with a team of engineers on site at Homboy to supervise construction and to manage the SDA plant and labour force.

The proposed expatriate management staffing is shown in Table 7.1, and the construction team at Table 7.2.

Figure 7.2 shows the relationship of the project consultants and expatriate staff to the management structure during implementation.

7.5 OPERATION AND MAINTENANCE OF THE IRRIGATION AND DRAINAGE SYSTEM

The importance of good operation and maintenance cannot be over-emphasised. Without closely controlled operation of the irrigation system, it becomes impossible to get sufficient water on to the fields in the time available. The resulting delays cannot easily be made up and the effect becomes cumulative causing overall loss of yield, increased costs and reduced income. Likewise poor maintenance of the drainage system over a period can cause waterlogging and a build-up of salinity which can also have a serious effect on crop yields.

With particular importance in the case of the Homboy Scheme is the correct operation of the flood protection system, this is vital to the safety of the settlers and the protection of the work.

Operation of the surface irrigation system involves conveying water from the Supply Canal headworks to the fields in the most efficient and economical manner. The quantity of flow required at the headworks is based on the crop water requirements with allowance for seepage losses, wastage and uneven distribution. With well constructed canals and efficient land-levelling, losses due to seepage and uneven distribution can be kept to a minimum, but it is the operation of the system which will determine the losses due to wastage. It is important to realise that there are time lags between the various stages in the distribution system, from the headworks through the Supply and Main Canal, storage reservoirs, distributary canals and watercourses. If sequential operations are not well timed, there is a danger not only that water will be lost but also that time will be wasted for water levels to reach the required value.

For example, at the end of the day, it is important to reduce the flow through the distributary head regulator in the storage reservoir before shutting off the outlets to the watercourses. Otherwise, the excess flow will pass to the end of the distributary canal to discharge through the tail escape to waste.

The Homboy Supply Canal offtakes from the Fanoole Main Canal via a gated structure by which the discharge may be controlled by raising or lowering the gate. The gate will require weekly setting. The canal will be manned at all times. Main and branch canals are designed to run continuously for 10 months of the year, and weekly adjustments to flow will normally suffice. Night flow will be stored at night storage reservoirs, allowing a 12 hour field irrigation regime to operate. All regulatory structures will be manned, and tail escapes are provided to ensure the safety of the system. The system will be centrally controlled.

Furrow, border strip and basins are used in the field and these are fed via 'Kontro Kanale' by either breaching the bank or by siphon. An irrigation cycle of ten days is recommended to meet soil and crop requirements. Irrigation at field level is the responsibility of the block management and the settler farmers.

The drainage system requires little operation as such for 70 per cent of the area, but for the remaining 30 per cent pumps are required. Four pump stations are provided to pump drainage water into the Lower Outfall Drain, and they will need to operate

7.1 Organisational chart - Resettlement Committees

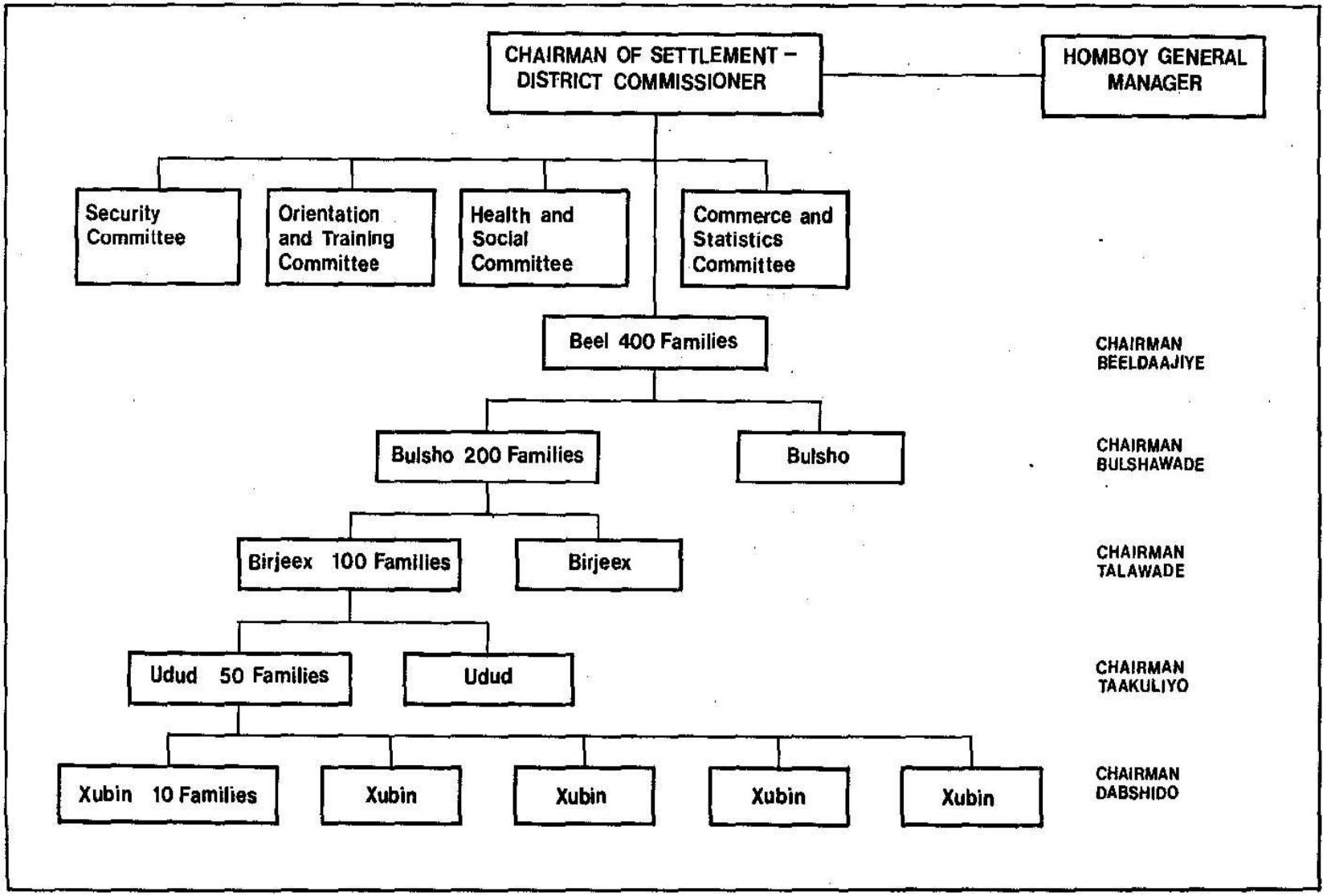


TABLE 7.2 (Continued)

Homboy Project Field Staff

	No.	Grade	Year 1	2	3	4	5	6	7	8
Assistant Irrigation & Drainage Engineer	2	JE	1	2	2	2	2	2	2	2
Infrastructure Engineer	1	SE	-	1	1	1	1	1	1	1
Workshop Manager	1	SE	1	1	1	1	1	1	1	1
Settlement Officer	1	SE	1	1	1	1	1	1	1	-
Assistant Settlement Officer	4	JE	1	2	3	4	4	4	2	1
Assistant Accountant	3	JE	1	1	2	2	2	2	2	2
Office Manager	1	JE	-	1	1	1	1	1	1	1
Surveyor	1	JE	-	1	1	1	1	1	1	1
Assistant Surveyor	2	T	-	1	1	2	2	2	2	2
Storemen	6	T	2	4	6	6	6	6	6	6
Mechanics, Fitters & Electricians	10	T	5	5	10	10	10	10	10	10
Workshop Assistants	20	L	5	10	15	20	20	20	20	20
Secretary/Typist	6	PA	1	2	4	6	6	6	6	6
Accounts Clerks	6	C	1	2	4	6	6	6	6	6
General Clerks	6	C	1	2	4	6	6	6	6	6
Building & Service Operation and Maintenance	20	SL	-	4	8	16	20	20	20	20
Building & Services Maintenance Labour	20	L	-	4	8	16	20	20	20	20
Irrigation & Drainage Operators	112	SL	-	14	28	56	84	112	112	112
Irrigation Maintenance Foremen	5	SL	-	1	2	3	5	5	5	5
Maintenance Plant Operators	17	SL	-	3	6	9	17	17	17	17
Irrigation System Maintenance Labour	30	L	-	6	12	15	30	30	30	30
Drivers	25	SL	10	20	25	25	25	25	25	25
Cleaners/Messengers	6	L	-	2	4	6	6	6	6	6
Watchman	4	L	-	2	4	4	4	4	4	4

Designation	No.	Grade	Year 1	2	3	4	5	6	7	8
Agriculturalist	1	EXP	-	1	1	1	1	1	-	-
Accountant	1	EXP	-	1	1	1	1	1	-	-
Mechanisation Supervisor	1	EXP	1	1	1	1	1	1	-	-
Block Manager	10	SE	1	3	5	7	9	10	10	10
Accountants	10	SE	1	3	5	7	9	10	10	10
Mechanisation Supervisor	10	SE	1	3	5	7	9	10	10	10
Irrigation Supervisors	11	SE	1	3	5	7	10	11	11	11
Field Officers (Agriculture)	30	T	2	7	14	21	28	30	30	30
Field Assistants (Agriculture)	90	JT	6	21	42	63	84	90	90	90
Irrigation Foremen	176	JT	12	41	82	123	164	176	176	176
Tractor Drivers	164	SL	12	40	77	113	151	164	164	164
Vehicle Drivers	25	SL	1	8	14	21	25	25	25	25
Secretary/Typist	20	C	-	2	6	14	18	20	20	20
Clerks/Storemen	80	C	-	8	24	56	72	80	80	80
Cleaner/Watchmen	30	L	-	3	9	21	27	30	30	30

TABLE 7.2 (Continued)

Homboy Project Field Staff

			Year							
	No.	Grade	1	2	3	4	5	6	7	8
Assistant Irrigation & Drainage Engineer	2	JE	1	2	2	2	2	2	2	2
Infrastructure Engineer	1	SE	-	1	1	1	1	1	1	1
Workshop Manager	1	SE	1	1	1	1	1	1	1	1
Settlement Officer	1	SE	1	1	1	1	1	1	1	-
Assistant Settlement Officer	4	JE	1	2	3	4	4	4	2	1
Assistant Accountant	3	JE	1	1	2	2	2	2	2	2
Office Manager	1	JE	-	1	1	1	1	1	1	1
Surveyor	1	JE	-	1	1	1	1	1	1	1
Assistant Surveyor	2	T	-	1	1	2	2	2	2	2
Storemen	6	T	2	4	6	6	6	6	6	6
Mechanics, Fitters & Electricians	10	T	5	5	10	10	10	10	10	10
Workshop Assistants	20	L	5	10	15	20	20	20	20	20
Secretary/Typist	6	PA	1	2	4	6	6	6	6	6
Accounts Clerks	6	C	1	2	4	6	6	6	6	6
General Clerks	6	C	1	2	4	6	6	6	6	6
Building & Service Operation and Maintenance	20	SL	-	4	8	16	20	20	20	20
Building & Services Maintenance Labour	20	L	-	4	8	16	20	20	20	20
Irrigation & Drainage Operators	112	SL	-	14	28	56	84	112	112	112
Irrigation Maintenance Foremen	5	SL	-	1	2	3	5	5	5	5
Maintenance Plant Operators	17	SL	-	3	6	9	17	17	17	17
Irrigation System Maintenance Labour	30	L	-	6	12	15	30	30	30	30
Drivers	25	SL	10	20	25	25	25	25	25	25
Cleaners/Messengers	6	L	-	2	4	6	6	6	6	6
Watchman	4	L	-	2	4	4	4	4	4	4

			Year							
Designation	No.	Grade	1	2	3	4	5	6	7	8
Agriculturalist	1	EXP	-	1	1	1	1	1	-	-
Accountant	1	EXP	-	1	1	1	1	1	-	-
Mechanisation Supervisor	1	EXP	1	1	1	1	1	1	-	-
Block Manager	10	SE	1	3	5	7	9	10	10	10
Accountants	10	SE	1	3	5	7	9	10	10	10
Mechanisation Supervisor	10	SE	1	3	5	7	9	10	10	10
Irrigation Supervisors	11	SE	1	3	5	7	10	11	11	11
Field Officers (Agriculture)	30	T	2	7	14	21	28	30	30	30
Field Assistants (Agriculture)	90	JT	6	21	42	63	84	90	90	90
Irrigation Foremen	176	JT	12	41	82	123	164	176	176	176
Tractor Drivers	164	SL	12	40	77	113	151	164	164	164
Vehicle Drivers	25	SL	1	8	14	21	25	25	25	25
Secretary/Typist	20	C	-	2	6	14	18	20	20	20
Clerks/Storemen	80	C	-	8	24	56	72	80	80	80
Cleaner/Watchmen	30	L	-	3	9	21	27	30	30	30

continuously during periods of heavy rain. Drainage water is discharged into the Jubba at periods of low flow, via a flap gate to prevent back flow.

The operation of the flood protection works is summarised below:

(a) The Eastern Reservoir should be maintained at a maximum level of 17.5 m to facilitate emptying of the Northern Reservoir. If the water level in the Northern Reservoir exceeds 22.5 m, water must be released to the Eastern Reservoir until its maximum level of 18.5 m is reached. The maximum design water level in the Northern Reservoir is 22.5 m, although this may rise to 22.8 m under the 1 in 1000 year storm conditions. The maximum design capacity of the Northern Reservoir Outlet Structure is 330 cumecs.

(b) The Eastern Reservoir Outlet Structure is to be open whenever discharge into the Jubba River is possible. Historical simulation has shown that the outlet capacity of this structure need only be 10 cumecs.

Three operators (three shifts) will be provided for each structure and to ensure their presence at all times, a small operator's quarters will be constructed near each structure. Both structures should have a radio link to the project headquarters.

Total staff requirements for the operation of the Irrigation and Drainage System is presented in Table 7.3.

TABLE 7.3 STAFF REQUIREMENTS FOR THE OPERATION OF THE IRRIGATION AND DRAINAGE SYSTEM

Name	Number shifts	Total	Location
Irrigation and drainage engineer	1 x 1	1	Project headquarters
Assistant irrigation engineer	1 x 1	1	Project headquarters
Irrigation supervisor	11 x 1	11	Block villages
PHQ base			
Operator	4 x 2	8	Drainage pump stations
Operator	8 x 3	24	Regulator groups
Operator	1 x 3	3	Supply Canal head regulator
Operator	1 x 3	3	Northern reservoir
Operator	1 x 3	3	Eastern reservoir
Operator	1 x 3	3	Lower Outfall drain
Canal operator	34 x 2	68	Distributary canals
Irrigation foreman	88 x 2	176	Watercourse units

7.6 MAINTENANCE OF THE IRRIGATION AND DRAINAGE SYSTEM

In Section 3 of Annex II (Volume 3) full details of maintenance requirements are discussed. The main features may be summarised as follows:

(a) Weeds

Weed growth in canals and watercourses can be controlled in many ways but a combination of underwater cutters, flail mowers and hand weeding is recommended at Homboy.

(b) Silt

Silt build-up over a period is inevitable, and recommendations for its removal are given.

(c) Structure

Regular inspection and repairs as necessary to all structures are recommended. Particular care must be taken to ensure that all movable gates and weirs are free to operate properly and to check for piping downstream of structures having high head differential.

(d) Roads

Access is important not only to the irrigation system but also to allow the agricultural production process to work efficiently. Timely maintenance will prevent serious damage, and heavy vehicles, particularly tractors should not be allowed on the earth roads immediately after rain.

Maintenance staff requirements for the maintenance of the irrigation and drainage system are shown in Table 7.4.

TABLE 7.4 STAFF REQUIREMENTS FOR THE MAINTENANCE OF THE IRRIGATION AND DRAINAGE SYSTEM

Name	Number	Vehicle Type
Assistant irrigation and drainage engineer	1	Motor cycle
Surveyor	1	Pick-up
Assistant surveyors	2	
Pump and engine mechanic	1	Motor cycle
Maintenance foremen	5	Pick-ups
Labourers	30	
Stone mason	1	
Plant operators - Hydraulic excavator	6	
Plant operators - Dragline	4	
Plant operators - Grader	3	
Plant operators - Bulldozer	2	
Plant operators - Flail mowers	2	
Drivers - FWD pick-up	6	
Drivers - Trucks	4	
Drivers - Tractors	10	
Drivers - Low loaders	1	
Drivers - Mobile workshop	1	

8

Economic and Financial Studies

8.1 INTRODUCTION

A detailed financial and economic analysis of the Homboy Scheme has been conducted. Attention has been focussed on determining the financial viability of the scheme, its impact on settlers and the costs and benefits of the scheme to the nation as a whole.

8.2 ECONOMIC AND AGRICULTURAL BACKGOUND

Somalia is primarily a rural nation with the agricultural and livestock sectors providing the majority of the nations 4 million people with their livelihood. Somalia is also poor country with per capita GDP in 1977 estimated at $110. Nevertheless during the period 1970-1976, per capita GDP grew an average of 1.5 per cent per year.

The livestock sector is the nation's major export earner, accounting for 87 per cent of all exports in 1978. Despite a 63 per cent increase in exports between 1977 and 1978, Somalia's balance of trade continued to worsen. However, thanks to a steady increase in capital inflow, the balance of payments remained in surplus in 1978.

The recent Three Year Development Plan (1979-1981) places great emphasis on the development of the agricultural sector. In 1977, the value of food imports was equivalent to 38 per cent of the estimated value of domestic food production. Given climatic constraints, one option generally favoured for increasing food production is the development of irrigated agriculture. Somalia has an estimated 250,000 ha of land considered suitable for developing for controlled irrigated farming. The Homboy Scheme is one of several projects intented to exploit some of this land. Unlike many of the others, it also has an important social aim; the resettlement of 8,850 nomad families currently living at the unsuccessful Dujuuma Settlement.

8.3 BASES FOR THE FINANCIAL AND ECONOMIC ANALYSIS

Several assumptions have been made for the financial and economic anlaysis. Project life has been taken as thirty years since the costs and benefits occurring after this period would have minimal impact on the overall results. Salvage value at the end of this period has only been calculated for agricultural machinery. Heavy construction equipment would probably be kept and used as a source of spares. In both the financial and economic analysis, skilled and semi-skilled labour has been valued at full cost since demand for this type of labour is high both at home and abroad. In the economic analysis however, unskilled

labour has been valued at zero cost. Without the scheme, the settlers would probably remain at Dujuuma and represent a real cost to the nation.

The cost of all inputs are based on December 1979 constant prices. Machinery costs have been worked out on an hourly basis and are standardised according to operation. All operations requiring a heavy tractor cost 103 SoSh/hour (financial prices) while those requiring a light tractor cost 89 SoSh/hour. Such standardisation of machinery rates will simplify administration of the project.

In the economic analysis, product prices are based on projected 1985 world prices (in 1978 constant values). These are taken from IBRD forecasts and worked back to the farmgate. In the financial analysis, product prices are based on current ADC and Somalatex prices which have been adjusted for projected movements in world prices. The exception is groundnuts, where it has been assumed that given the desire to increase production, domestic prices will not follow the downward trend projected in world prices.

No attempt has been made to shadow price foreign exchange for the economic analysis though there is evidence that the official rate of exchange may undervalue the cost of foreign exchange. However there is no consensus as to what the shadow rate should be. In the economic analysis, all costs are net of taxes and duties. Only half the cost of the Dhey-Tubaako to Homboy road, flood protection and technical assistance have been included in the economic cost stream since the benefits resulting from these will reach beyond just the project. In calculating project benefits, allowance has been made for the value of food currently produced in the project area. Benefits resulting from settlers involvement in rainfed agriculture and livestock have not been included in the benefit stream since the analysis is primarily concerned with evaluating the impact of the irrigation scheme.

8.4 MARKETING AND MARKET PROSPECTS

An examination of the market prospects for the crops to be grown at Homboy reveals that all, with the exception of vegetables, are currently imported in substantial quantities. Projections show that demand for both food crops and cash crops will rise considerably during the next twenty years. Consequently crop output from Homboy will limit growth in the nation's import bill.

All produce, with the exception of cotton, will be marketed through the Agricultural Development Corporation which is the state marketing agency. However settlers will retain some of the rice and maize production as well as all vegetable production for home consumption. Cotton will be marketed through Somalatex and taken to their ginning facilities at Jamaame.

8.5 RESULTS OF THE FINANCIAL ANALYSIS

Crop bugets for the crops to be grown at Homboy have been calculated. Upland and paddy rice and cotton provide the highest returns to land while paddy rice provides the highest returns to labour. Despite the low profitability of certain traditional agricultural crops such as sesame and maize, these have also been included in the proposed cropping pattern (Table 8.1). The overall objective is to provide settlers with both food and a source of cash income. Overall cropping intensity has been fixed at 160 per cent. Just one vegetable

crop, tomatoes has been included, though in reality, settlers are expected to grow a variety of vegetables.

During the first three seasons of settlement, the cropping pattern will be simplified, comprising maize and rice only. During the first five seasons, the scheme will be run largely along State Farm lines. The simplification of the cropping pattern and centralisation of management will allow settlers to spend the early years concentrating on acquiring basic agricultural skills. As they progress, the more complicated full cropping pattern will be introduced and responsibilities for managing the project will be devolved. Yields are expected to start at a modest level, building-up over a ten year period.

TABLE 8.1 PROPOSED CROPPING PATTERN FOR HOMBOY

Crop	Season 'Gu' Intensity %	'Der' Intensity %
Rice	20	20
Maize	20	20
Sesame	-	15
Groundnuts	15	-
Cotton	-	40
Tomatoes	5	5
Total	**60**	**100**

The financial analysis has been conducted at three levels. The first is at the fifty family 50 ha unit level. Social and productive functions will be organised around these units. Each unit will be advanced inputs and machinery by its respective block to crop its fifty hectare plot of land. Results worked up from crop budgets show that the net value of crop production will be sufficient to allow settlers to achieve a reasonable target income. Two target incomes have been selected, the lower being 3,000 SoSh/family/year, the higher 4,000 SoSh. If the value of food produced on the scheme which is retained for home consumption is included, these incomes rise to 4,000 SoSh and 5,000 SoSh respectively. The higher option is based on ILO recommendations which are discussed in the Inter Riverine Study, (HTS, 1978) the lower on the supposition that settlers will augment their income with rainfed crop production. In early years when yields are relatively low, units will have to be subsidised by their repective blocks, though in later years, these subsidies can be repaid. With the lower income option, subsidy payment will be required over the first eight years, and repaid over the following five years whereas with the higher option, payments will be required over ten years to be repaid over the following eleven.

The financial analysis at the block level establishes a financial projection for the blocks over the project's entire life. Cash receipts consist of revenues from the sale of crops produced by the 50 ha units. This includes the value of all crop production less that retained by the units for home consumption. Each block is endowed with an initial capital working fund to finance the purchase of necessary inputs, pay for use of machinery and cover crop processing costs. These funds are replenished at the end of each cropping season

with revenues from the sale of crops. Cash outflow consists of payments for items noted above as well as transfer payment made to project headquarters and to the units. Transfers to headquarters comprise payments for repair and replacement of agricultural machinery since both these are dealt with at the project level. Transfer to the units consist of wages paid during the cropping season and bonuses paid at harvest time. Wages are set at a level sufficient to cover settlers daily needs. With the lower income option they are fixed at 8 SoSh/day while with the higher income option they are 10 SoSh/day. Bonuses are introduced in Year 4 and are directly linked to the level of crop production. In the case of the lower income option, they start at 5 per cent of gross crop revenue rising to 15 per cent over a ten year period while with the higher income option they start at 10 per cent and rise to 20 per cent. The intention of the bonuses is to encourage settlers to increase output. By the end of the tenth year, bonus payments will at a level which, when added to wages paid during the cropping season will ensure that target incomes are met.

The financial projection at block level shows that in the long run, they will be financially viable. If settlers receive the lower income, the block net cash flow becomes negative in Year 2 and continues this way until Year 6. However the cumulative deficit can be more than covered by the surplus accumulated from Year 7 to Year 11. If settlers receive the higher income, subsidy repayments will be required for five years from Project Headquarters, though these can later be repaid out of operating surpluses. In both cases, blocks will be able to eventually make a substantial contribution towards covering project management costs.

At the project level, another financial projection shows that project cash receipts from payments by the blocks for machinery repair and replacement together with any operating surpluses are insufficient to cover the cost of project management and replacement of vehicles, machinery and equipment. Consequently, the project will require continued external support, though this will be fairly modest given the total project outlay. If settlers receive the lower income, an average of 9.125 million SoSh would be required annually during the first 18 years. After this the project is expected to be in a position where it can cover all its operating costs including replacement of vehicles, machinery and equipment. Economy measures could probably be made which would reduce the amount of external support and the length of time over which such support will be required. One such measure would be to gradually reduce the size of the management team once settlers have acquired the necessary skills and the units take on some certain organisational functions. Under no circumstances should the income of settlers be cut to below the 3,000 SoSh level. Such action would merely remove incentives necessary to encourage settlers to increase production and consequently would be self defeating.

8.6 RESULTS OF THE ECONOMIC ANALYSIS

The project shows an internal rate of return of 2.5 per cent dropping to 2.3 per cent when the full cost of flood protection is included. While not overly encouraging, these results are similar to those obtained for Mogambo (MMP/HTS 1979). The costs of developing and running such irrigation schemes are high, while the value of crops produced is relatively modest. This is particularly true when food crops make up a significant portion of the cropping pattern.

Sensitivity analyses (Table 8.2) indicate that a twenty per cent increase in the value of agricultural production or a three year delay in agricultural benefits can be expected to alter the project's economic performance considerably. Exclusion of costs of building the social infrastructure from the economic cost stream improves overall performance.

Shadow pricing of foreign exchange would improve the picture since all crop production, with the exception perhaps of tomatoes can be considered as import substitution. Consequently, the project's impact on the nation's balance of payments is likely to be favourable despite the high foreign exchange content of construction costs. Of importance too, are the non-quantifiable benefits arising from the project. These include the creation of employment opportunities for 8,850 families as well as improvement in health, nutrition and educational opportunities which will result from the provision of social services. In many respects, the social considerations of the Homboy Scheme, which include the resettlement of these 8,850 families must take precedence over the economic ones.

TABLE 8.2 RATES OF RETURN UNDER VARIOUS ASSUMPTIONS

Assumption	Rate of Return (%)
Normal	2.5
Cost of flood protection included	2.3
Twenty per cent over-run in costs	0.3
Twenty per cent increase in the value of agricultural output	5.2
Three year delay in benefits	0.2
Exclusion of cost of social infrastructure	3.3

Appendices

APPENDIX A

TERMS OF REFERENCE FOR THE FANOOLE SETTLEMENT PROJECT

Since the completion of the Inter-Riverine Agricultural Study, Phase 1, it has been proposed by the Settlement Development Agency that the settlement at Dujuuma should be translocated to an alternative area east of the Fanoole-Gelib-Kamsuma road. Prior to relocation it is necessary that thorough investigations should be carried out to prove that the new area has a potential for the development of irrigated agriculture.

The following specific tasks will be undertaken:

1. Reconnaissance Survey of some 60,000 hectares, to include soils, hydrological, engineering and agricultural investigations, to identify 24,000 hectares of irrigable land.

2. Study of 24,000 hectares involving soils investigations and topographic survey. Priority will be given to the survey of the Phase 1 - 9,000 ha development area. Preliminary engineering investigations will be made within the Phase 1 area to collect sufficient data for the final engineering design. Villagisation studies and relocation planning to facilitate the early transfer of settlers from Dujuuma to the new site will be carried out concurrently.

3. Final Engineering Design of the 9,000 hectares priority Phase 1 development area.

Specific terms of reference for the above items are given below.

1. RECONNAISSANCE SURVEY

(i) A reconnaissance survey will be made on an area of 60,000 hectares of land lying to the east of the Fanoole-Gelib-Kamsuma road to locate and identify a project of 24,000 hectares of land for the development of irrigated agriculture.

(ii) Investigate the soils of approximately 60,000 hectares at reconnaissance level, with sufficient field and laboratory tests to classify the land for irrigation suitability.

(iii) Update the hydrological findings of the Inter-Riverine Phase 1 report in view of the recent investigations at Saakow Barrage and the proposed Bardheere Dam. Prepare a monthly river operational study to show the estimated availability in the unregulated and regulated river.

(iv) Inspect all possible offtake sites. Review and evaluate different methods of water abstraction. Evaluate the problems of providing water distribution networks on a single large scheme and a series of small schemes.

(v) Using the cropping patterns discussed in the Inter-Riverine Phase 1 report, together with the findings of the soils and engineering studies, evaluate the various sites and make recommendations for an irrigation project.

(vi) Prepare a report and maps giving the results of the findings of the above study.

2. STUDY OF 24,000 HECTARE AREA

The studies required for the 24,000 hectare irrigation area shall comprise the following:

(i) Soil Survey and Land Classification

A semi-detailed soil survey will be carried out at an overall examination density of one site per 25 hectares. The studies shall examine the chemical and physical properties of the soils and determine their suitability for the development of irrigated agriculture.

(ii) Topographic Survey

The whole of the 24,000 hectares will be surveyed at a scale of 1:10,000 with a contour interval of 0.25 metre.

(iii) Preliminary Engineering Investigations

Engineering investigations will be carried out on the 9,000 hectare Phase 1 priority development area, in sufficient detail to allow the Final Engineering design to be prepared.

(iv) Agricultural Studies

A study will be made to determine the type of agricultural development most suited to the 9,000 ha area. Investigations will include crop selection, cropping patterns and crop water requirements.

(v) Villagisation Studies

In conjunction with the agricultural and engineering investigations, a villagisation study will be made of the new settlement area, including location of village sites, the requirement of social and other services, the design of houses, village layout and the phasing of development.

(vi) Relocation Planning

In conjunction with the above plans will be prepared for most of the settlers currently at Dujuuma to the new area east of Gelib.

3. FINAL ENGINEERING DESIGN

Following instructions to proceed from the Settlement Development Agency, the consultants would carry out detailed engineering design for the irrigation and surface drainage systems for the selected priority 9,000 ha Phase 1 area, including the preparation of tender documents to enable the Agency to obtain contracts for the construction of the works.

The terms of reference above were subsequently amended with the approval of the SDA to confine the topographic and semi-detailed soil surveys to an area large enough to produce a net irrigable area of 9,000 hectares for Phase 1 development.

APPENDIX B

HOMBOY IRRIGATED SETTLEMENT SCHEME:

TERMS OF REFERENCE FOR ADDITIONAL STUDY

1. ADDITIONAL ENGINEERING STUDIES

1.1 Cost of Engineering Works

Cost estimates will be prepared for the engineering works component of the project.

The engineering works comprise the irrigation supply system, and the irrigation and drainage systems including flood protection, in-field works and access roads.

The cost estimate will be sub-divided into plant, labour and materials components.

1.2 Operation and Maintenance

A note outlining operation and maintenance procedures will be provided which will include provisional lists of plant, equipment and labour required.

1.3 Infrastructure

Using the villagisation and relocation reports as a basis the infrastructure requirements for the project will be assessed. Outline details of the infrastructure components will be provided, which will include:

- housing for management;
- workshops, stores, hardstanding and covered areas;
- buildings for administration and training;
- community buildings;
- electric power supply;
- potable water supply;
- sewerage;
- telephone/radio communications.

Cost estimates will be prepared based on the outline details and/or similar work elsewhere.

1.4 Organisation and Management

A note will be prepared to outline the requirements for the organisation and management of the project.

1.5 Implementation

A note on the methods of implementation for the project will be prepared which will include a programme and details of staff requirements. This will take into account the special requirements of the SDA regarding construction. Recommendations for training staff will also be given.

2. ADDITIONAL AGRICULTURAL STUDIES

2.1 Development of Cropping Pattern

The cropping pattern will be reviewed and the phasing of introduction considered. Because of significant differences in soil types, adjustments will be made to the cropping pattern, and proposed cropping for each block will be shown.

2.2 Labour and Machinery Requirements

A study will be made of labour and machinery requirements for each block.

2.3 Livestock

The availability of crop residues produced on the scheme, and livestock will be studied. Alternative methods of integrating livestock into the scheme will be evaluated and the problem of stock displaced by project development discussed.

2.4 Management

Various options for the management of the scheme will be examined and recommendations made as to the system considered most appropriate.

2.5 Development Programme

An agricultural development programme, compatible with the engineering construction programme and other project components will be determined. Phased requirements for implementation including labour, machinery, storage and processing, buildings, seeds, fertilisers, agrochemicals, management staff and training will be shown, and the role of specialist advisors will also be considered.

3. ECONOMIC AND FINANCIAL ANALYSIS

Markets, cropping patterns, and farm requisites will be studied and a financial and economic analysis undertaken of the development programme as a whole. Economic benefits would be shown and an internal rate of return established. Cash flow statements will be prepared.

4. REPORTING

The results of the study will be reported in an expanded Agriculture volume, which would include implementation, and separate volumes on Engineering and Infrastructure, Economics, and a Main Report which would summarise all the separate volumes.