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MINISTRY OF AGRICULTURE
NATIONAL IRRIGATION BOARD

BURA IRRIGATION
SETTLEMENT PROJECT

PROJECT PLANNING REPORT

VOLUME 6 ANNEXES

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Sir M. MacDonald & Partners
Hunting Technical Services Ltd.
East African Engineering Consultants

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The Bura Irrigation Settlement Project, Project Planning Report,
comprises the following volumes:-

- 1 Main Report

 Annexes
- 2 Soils
 Hydrology
 Agricultural Planning
- 3 Livestock
 Fisheries
 Wildlife and Ecology
 Forestry
- 4 Sociology and Settlement
 Public Health
 Institutions and Services
- 5 Village Planning and Design
 Housing and Buildings
 Utility Services
 Processing
- 6 Principles and Criteria for Development
 Organisation, Management and Training
 Project Costs
 Economic and Financial Analyses
 Implementation

BURA IRRIGATION SETTLEMENT PROJECT
PROJECT PLANNING REPORT
PRINCIPLES AND CRITERIA FOR DEVELOPMENT ANNEXE

BURA IRRIGATION SETTLEMENT PROJECT

PROJECT PLANNING REPORT

PRINCIPLES AND CRITERIA FOR DEVELOPMENT ANNEXE

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(vii) Housing and Settlement: principles for the selection of tenants, their migration and induction at site, and the development of village communities.

(viii) Institutions and Services: the development of local institutions and services and the local community.

(ix) Village Planning, Buildings and Utilities: criteria for the construction of structurally adequate and economic homes and buildings for an integrated community development with due consideration to health, comfort, power and water requirements and general amenities.

(x) Management: principles and criteria for the management of the project, of implementation and agricultural production.

(xi) Economics and Costs: criteria for accurate cost estimates, the proper calculation of returns, and the cash flow for the project.

Detailed discussion of the principles and criteria is included in the project appraisal, only the main considerations being summarised here.

SUMMARY

This annexe describes the principles and criteria adopted in the review of the ILACO feasibility study and the World Bank appraisal reports, and the additional studies carried out for the Project Planning Report.

The topics covered include the following:

- (i) Soils: criteria for the identification of soil types with reference to the requirements for irrigated cotton, and the prediction of crop yields.
- (ii) Agricultural planning: criteria for the prediction of crop yields, requirements for fertilisers, chemicals and farm machinery and implements.
- (iii) Hydrology: the prediction of water availability, water demand, drainage design and sediment load.
- (iv) Livestock, Fisheries and Wildlife: criteria for the development of the project in a manner which will mitigate its effect on the existing ecosystems in the area.
- (v) Forestry: principles and criteria for the development of fuelwood supplies for the project, conservation of the existing natural forest, and provision of amenity trees.
- (vi) Public Health Services: criteria for the development of disease surveillance and monitoring programmes and preventative and curative local medical services.
- (vii) Sociology and Settlement: principles for the selection of tenants, their migration and induction at site, and the development of village communities.
- (viii) Institutions and Services: the development of local institutions and services and the local community.
- (ix) Village Planning, Buildings and Utilities: criteria for the construction of climatically adequate and economic homes and buildings in an integrated community development with due consideration to health, comfort, power and water requirements and general amenity.
- (x) Management: principles and criteria for the management of the project, of implementation and agricultural production.
- (xi) Economics and Costs: criteria for accurate cost estimates, the proper calculations of returns, and the cash flow for the project.

Detailed discussion of the principles and criteria is included in the specialist annexes, only the main considerations being summarised here.

CHAPTER 1 INTRODUCTION

The development of a complex project such as the Bura Irrigation Settlement Project involves the participation of many disciplines and organisations. Because of the complexity of the project and the interaction of so many organisations it is impossible to provide within the project solutions which satisfy the ideals of each discipline or organisation, and some of the criteria adopted are compromises, between conflicting requirements.

The amount of information to be presented to cover all the components of the project is so extensive as to make it difficult to understand all the principles and criteria adopted in the development of the project without a study of all the annexes. To mitigate these problems, the principles and criteria are all summarised in this annex, and reference can be made to the individual annexes for the more detailed information.

The suitability of existing soils, water availability and agricultural development including livestock, fisheries and forestry is discussed first, then the principles forming the basis of selection of tenants, public health services and administrative services. The criteria for the provision of the physical infrastructure of housing, water supply, sanitation, power supply and industry are then considered and a final section is devoted to the principles and criteria used in management costs estimates, economic analysis and financial control.

PART I

AGRICULTURAL DEVELOPMENT

CHAPTER 2 - SOILS

2.1 Soil Assessment

The Study Project is sited on a variety of mapped soil units, the areas of the types being given in Table 2.1. The system of assessing suitability used is primarily for irrigated action.

Table 2.1 - Soil Classes in the Project Area

Class	ILACO Classification			USSR Classification		
	Soil Type	Area(ha)	%	Soil Type	Area(ha)	%
1	C	2 601	41	C	2 691	41
	S1	1 755	26	S1	1 755	26
2	GU1, N41	541	13	GU1, N41	1 454	22
	N2, S2	1 352	20	N42, GU2		
3	N42, S2			N2, S2	729	11
	US2	3	0.05	US2	3	0.05

The criteria used for the mapping are given in Table 2.2. The area identified as good because the intensity of sampling has been too low to identify all the major variations from the representative region, which are considerable within each area reflected on the map.

PART 1

For example, the typical favorable US1 type is a heavy clay with a non-saline non-alkali layer less than 20 cm and others with a saline layer less than 20 cm. A soil survey has been made at a top soil depth of 20 cm, but substantially different results may occur within the two resulting categories. In addition, the limit of alkali has been taken throughout at US1 15, but the actual ESP found in the immediate layer may range in salinity from 4 to 30 mehos/cm. It is therefore apparent that US1 soil may include very different soils in respect of depth of top soil and salinity and alkali status of the lower soil. Added to this is the fact that the texture of both the top soil and the subsoil may vary widely. Specifically the texture diagrams of the Ag-ent-ILACO report show that the top soil of the S unit may vary from sand to clay texture, and similar textural ranges are indicated for other soils.

The problems which arise from soil variability may well require variations of agronomic techniques between farms, or financial adjustments of various water charges.

CHAPTER 2 SOILS

2.1 Soil Assessment

The Bura Project is sited on a variety of mapped soil units, the areas of the types being given in Table 2.1. The system of assessing suitability used is primarily for irrigated cotton.

Table 2.1 - Soil Classes in the Project Area

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	Soil Types	Area(ha)	%	Soil Types	Area(ha)	%
1	C	2 691	41	C	2 691	41
2	S1	1 755	26	-	-	-
3	GU1, N41	841	13	S1	1 755	26
4	N2, GU2	1 352	20	GU1, N41	1 464	22
5	N42, S2	-	-	N42, GU2	-	-
6	US2	3	neg.	N2, S2	729	11
	-	-	-	US2	3	neg.

The criteria used for the mapping are given in Table 2.2. This is an idealised legend because the intensity of sampling has been too low to identify on the map variations from the representative horizon, which are considerable within each area defined on the map.

For example, the typical Halorthid (S) type includes soils with the non-saline non-alkali layer less than 10 cm and others with a depth exceeding 60 cm. A division has been made at a top soil depth of 20 cm, but substantially different depths may occur within the two resulting categories. In addition, the limit of alkali has been taken throughout at ESP 15, but the actual ESP found in the saline-alkali layer may range in salinity from 4 to 30 mmhos/cm. It is therefore apparent that an S1 soil may include very different soils in respect of depth of top soil and salinity and alkali status of the lower soil. Added to this is the fact that the texture of both the top soil and the subsoil may vary widely. Specifically the texture diagrams of the Acres/ILACO report show that the top soil of the S unit may vary from sand to clay texture, and similar textural ranges are illustrated for other soils.

The problems which arise from soil variability may well require variations of agronomic techniques between farms, or financial adjustments of tenants' water charges.

Table 2.2 - Mapping Legend of the Detailed Soil Surveys

Mapping Unit		Mapping Symbol
Typic Psammustent:		PR
Typic Natrargid:	> 50 cm over capped natric horizon	N1
Typic Natrargid:	20-50 cm over capped natric horizon	N21
Typic Natrargid:	< 20 cm over capped natric horizon	N22
Typic Natrargid:	as N22 but above horizon only poorly developed	N23
Mazic Natrargid:	with surface crust	N31
	subsoil exposed	N32
Vertic Natrargid:	> 20 cm over natric horizon	N41
	< 20 cm over natric horizon	N42
Typic Camborthid:		C
Typic Halorthid:	> 20 cm over saline/alkaline subsoil	S1
	< 20 cm over saline/alkaline subsoil	S2
Natric Grumustert:	> 20 cm over saline/alkaline subsoil	GU1
	< 20 cm over saline/alkaline subsoil	GU2
Natric Grumaquert:	> 20 cm over saline/alkaline subsoil	GA1
	< 20 cm over saline/alkaline subsoil	GA2
Vertic Hapludent:		U

2.2 Crop Yields

The assessment for Bura is based on results at Hola, and the project average yield has been equated to the yield on Class 2 land, and the yields on other classes of land varied as shown in Table 2.3.

Table 2.3 - Ratio of Yields by Land Classes

Crop	Class 1	Class 2	Class 3	Class 4
Cotton	1.15	1.00	0.85	0.75
Groundnuts	1.19	1.00	0.68	0.61
Maize	1.12	1.00	0.85	0.75
Cowpeas	1.18	1.00	0.85	0.63

2.3 Monitoring of Soils

It is proposed that two per cent of holdings should have a pre-irrigation sampling, which would then be repeated at two yearly intervals to measure soil changes due to irrigation. The holdings would be selected by a stratified random selection modified so that sufficient holdings on marginal land were included to provide for valid statistical analysis. A provisional sampling intensity would be three per holding and the sampling depths and laboratory measurements would be discussed with the Soil Survey of Kenya before land preparation starts.

These holdings would also be subject to more detailed routine recording of farming practices and insect inspections. Details of the monitoring procedure are described in the Soils Annexe.

CHAPTER 3 HYDROLOGY

3.1 Water Availability

The Tana River is Kenya's largest and most important river, with an average annual flow, measured at Garissa, of 5 000 million cubic metres. Investment in a river regulating reservoir in the upper catchment - the 'Upper Reservoir Scheme' - is proceeding with a live storage of 1 560 million cubic metres. River regulation at the moment is achieved using the reservoir at Kamburu which has a storage of 123 million cubic metres, less than 3 per cent of the total average annual flow.

Discharges, measured at Garissa since 1934, fluctuate throughout the year with two low flow seasons, February to March, and September to October. The higher flood flows occur from April to June and November to December. The minimum river flows to be maintained downstream of the project offtake are not clearly defined. Government policy is to guarantee "natural" flows in the river. This has been interpreted by the Tana River Development Authority (TRDA) to be a monthly flow of 80 million cubic metres, except for March which is 68 million cubic metres, and these values have been used in this study.

3.2 Water Demand

The average open water evaporation for the Bura area has been calculated using climatic data and the Penman method, to yield an average value of 6.4 mm a day. Crop water requirements were calculated using crop factors very similar to those estimated by ILACO. These are shown in Table 3.1. A first irrigation application of 150 mm has been allowed for in the irrigation demand calculations, and an end of season soil moisture depletion of 50 mm has been assumed.

Table 3.1 - Crop Factors by Months of Growth

Growth Month	Crop			
	Cotton	Groundnuts	Maize	Cowpeas
1st	0.40	0.40	0.40	0.50
2nd	0.70	0.70	0.80	0.95
3rd	0.90	0.95	1.00	0.90
4th	1.00	0.90	0.80	-
5th	0.90	-	-	-
6th	0.70	1.00	-	-

For calculating available supply from the Tana River and the monthly critical design flows for the irrigation system, an effective rainfall of zero was assumed, and for calculating the irrigation demands using a 1 in 5 dry year design, an effective rainfall of 336 mm was assumed.

The field application efficiency of 87.5 per cent assumed in previous reports was considered to be high and a figure of 70 per cent was adopted. When combined with a conveyance efficiency of 70 per cent this gave an overall efficiency of 50 per cent, which was used in calculating the net irrigation demand.

The estimated intake requirements for Phase I, Stage I, of the Bura Project were calculated for the 1 in 5 dry design year. Allowances were added to the crop irrigation requirements to allow for the irrigation supply to tenants' gardens, domestic and industrial water supply, the wildlife drinking pools and all losses. The calculated intake requirements are shown in Table 3.2.

Table 3.2 - Estimated Intake Requirement - Phase I, Stage I, Bura Project (cumecs, 24 hours per day)

Month	JAN	FEB	MAR	APR	MAY	JUN
Flow	0.8	4.7	6.9	4.2	7.1	7.8
Month	JUL	AUG	SEP	OCT	NOV	DEC
Flow	5.7	2.4	3.4	4.0	3.1	2.1

The peak intake requirement is estimated to occur in a 10 day period in May and amount to 9.1 cubic metres per second for 24 hours per day.

3.3 Drain Design

The drain design was based upon a five year return period storm. It was assumed that it would take 24 hours to drain such a flood from the irrigated land. The calculations indicate that in such a case the run-off rate will be 1.2 litres per second per hectare for 30 hectares. This run-off rate will reduce for the larger drained areas and areal reduction factors were obtained, using relationship derived for East Africa by TRRL, whereby:

$$\text{ARF} = 1 - 0.044 A^{0.275}$$

where

ARF = areal reduction factor

A = area in km²

3.4 Flood Flows

The annual maximum daily flows recorded at Garissa were reviewed, fitted to a Gumbel distribution and used to estimate the flood flows expected to occur at certain return periods. The results obtained were very close to the ILACO estimates.

The laga flows for various return periods were estimated by employing the US Soil Conservation Service method to calculate run-off from estimated catchment rainfall.

3.5 Sediment Transport

A review of the sediment transport data available for the rivers of Kenya was made by Dunne in 1974. His results indicate that the rate of sediment transport in the Tana River has been seriously over-estimated, because data collected after 1961 have been ignored. For the range of flow most likely to be considered, Dunne's relationship between discharge and sediment transport yields about one half the sediment flow rate previously assumed, and has been used in our review.

CHAPTER 4 AGRICULTURAL PLANNING

4.1 Basic Crops

The cropping pattern proposed for Stage 1 (West Bank) of the Bura Project is based upon investigations and experience gained at Hola. The main components of the cropping pattern are as follows:-

- (i) Cotton is the main cash crop because it is well adapted to the soils and environment generally in the Lower Tana River Basin, as indicated by the good results achieved at Hola. It is proposed that the whole cropped area would be planted to cotton during the main season.
- (ii) The 'off-season' crops included are maize, cowpeas and groundnuts, and a fallow break of 52 per cent has also been included in the off-season period, to give an overall cropping intensity of 148 per cent.

4.2 Mechanisation

Estimates of mechanisation requirements were detailed in the Bura Feasibility Study (ILACO 1975). These basic figures have been used to estimate the mechanisation needs of the smaller area of Phase I of the Bura Project, with the following modifications.

- (a) Experience at Hola and elsewhere indicates the need to employ larger machines to achieve the most effective land preparation in the available time. Tractors used will thus include machines in the 70 to 80 horsepower range, with tools to match their capability.
- (b) Machine working rates have been modified to allow for the tractor type envisaged. Times required for operations, based on experience at Hola, and under similar conditions in other countries are set out in Table 4.1 below.

Table 4.1 - Basic Times for Various Tractor Operations

Operation	Hours per hectare	
	Cotton	Off-season Crops
Ploughing	2.5	2.5
Harrowing	1.3	-
Levelling*	0.5	-
Ridging	1.5	1.5
Lifting groundnuts	-	1.5

*1.0 hour per ha required every two years.

In addition to the above time spent directly on the operation indicated, about 15 per cent of a tractor's time would be spent on 'unproductive' work, i.e. travelling between plots, to servicing and parking. Thus a tractor working on 'double shifts' with a potential 12 working hours available would in practice achieve 10.2 working hours.

The number of implements required has been determined by allowing a reserve of stand-by units and the total requirements are shown in Table 4.2.

Table 4.2 - Estimated Implement Requirements

Implement	Basic No.	Reserve	Total
Plough	27	5	32
Harrow	14	3	17
Leveller	5	1	6
Ridger	16	3	19
Groundnut lifter	6	1	7

4.3 Cotton Transport Requirements

Cotton being a bulky crop requires vehicles capable of dealing with the volume involved. The tractor-trailer combination appears suitable for Bura due to the short distances involved from villages to the ginnery (average 7 km). The transport requirements have been estimated on the following criteria:

- (a) Average distance village to ginnery = 7 km
- (b) Average inwards time 0.75 hour per load
- (c) Average outward time 0.3 hour per load
- (d) Average loading/unloading/weighing time 1.0 hour per load
- (e) Average time per load 2.0 hours for 2.1 tons/load*
- (f) Thus each unit of tractor and trailer would complete 5 trips per day and would haul 10.5 tons
- (g) Total crop (19 400 tons) requires 2 351 trips in 70 days
- (h) Number of units required would be 26.

*based on 5 ton trailer unit

4.4 Seed and Fertiliser

All crops will be hand planted at Bura because holdings are small and it is necessary to maintain the height of ridges. Seeding rates required to achieve the required plant population for each crop are shown in Table 4.3.

The main nutrient applied will be nitrogen probably in sulphate of ammonia form. Rates of application projected by the World Bank increase as shown in Table 4.3, keeping pace with the rise in management standards which will occur over the first ten years of project operation.

Table 4.3 - Seed and Fertiliser Rates

Crop	Seed (kg per ha)	Sulphate of Ammonia (kg per ha)
Cotton	20	285 increasing to 380 over 10 years
Maize	15	240 increasing to 475 over 10 years
Cowpeas	30	-
Groundnuts (shelled)	90	50

4.5 Crop Protection

Effective pest control will be essential if the projected seed cotton yields are to be attained. A variety of pests occur at Hola and these are bound to be encountered at Bura and it is probable that the challenge will be greater here due to the larger area of crop planted.

A variety of insecticides are applied by aerial spraying, the current NIB programme for Hola provides 10 sprays with the materials given in Table 4.4. It has been assumed that similar procedures will be followed at Bura.

Weed control measures will be largely by hand hoeing and will require continuous attention to timing and frequency. The programme will be based on current practice at Hola, and allowance made on the research programme for trials, including the use of herbicides.

Table 4.4 - Plant Protection Requirements

Insecticide	No. Sprays	Cotton Spraying	
		Qty. per ha	Qty. per ha
Endosulfan 35%	6	20.0 litres	Diuron 1.5 kg.
DDT 75% W.P.	3	3.9 kg	
Carbaryl 85% W.P.	5	7.7 kg	
Dimetheote	2	1.0 litre	

4.6 Potential Yields

Basic yield potential is determined primarily by the environmental factors of climate and soils, and the extent to which it is realised in practice depends on management factors. For Bura the experience at Hola provides reliable evidence of yield potential as determined by environmental factors and under the management obtaining there. There is no evidence to suggest that conditions at Bura will differ markedly from Hola, in fact the majority of soils, based on the ILACO assessment will be somewhat better.

The average yields which farmers at Bura are likely to achieve have been projected by the World Bank on the basis of experience at Hola. In making their projections allowance has been made for yields to increase over five to six years as experience and farming expertise of tenants improve. The expected crop yields are given in Table 4.5.

Table 4.5 - Potential and Expected Crop Yields (Tonnes/ha)

Crop	Potential Yield	Expected Yield in Year of Production					
		1	2	3	4	5	6
Seed Cotton	5.5	2.5	2.6	2.7	2.8	2.9	3.0
Maize Grain	5.0	2.0	2.5	2.8	3.1	3.4	3.7
Cowpeas	1.5	0.5	0.6	0.7	0.8	0.9	1.0
Groundnuts (unshelled)	4.5	1.4	1.6	1.8	1.9	2.0	2.0
Home garden crops	-	7.0	7.0	7.0	7.0	7.0	7.0

CHAPTER 5 LIVESTOCK AND FISHERIES

5.1 The Existing Situation

The project area at Bura is traditionally used by Orma pastoralists to herd their cattle. More recently the area has also been used by Somalis to herd their camels.

It is to be expected that tenants will wish to own livestock after they have built up some income, although it is unlikely that they will bring any livestock with them when they migrate to the project, except for local Orma and Pokomo tenants.

5.2 Control and Compensation

Livestock cannot be permitted within the area of the irrigation scheme except in pens or controlled feedlots, and it is unlikely that tenants' animals will be herded with the Orma cattle outside the project.

The Orma will lose an important drought grazing area to the project and will have less access to the riverine forest areas. Compensation should be provided for the Orma identified as being so affected, but no compensation should be provided for the Somalis who have only recently started to use the area, and have no tradition of use. Compensation should be in kind and the Sociologist Specialist and the District Officer will decide the nature and extent of this compensation.

Waterholes are to be provided alongside the supply and main canals. These should only be used by livestock during the day and left for wildlife at night. There is a tendency for permanent settlements to be established near waterholes but no permanent settlement should be allowed within two kilometres of the waterholes to avoid disturbance of the wildlife by humans and livestock and over grazing. The use of waterholes should be strictly controlled by the extension service of the Ministry of Agriculture and by the Wildlife Service.

5.3 Feedstuffs

It is anticipated that the bulk of the protein and vitamins for the tenant's diet will be initially provided by the maize and the legumes (such as cowpeas) grown on his farm holding, and the vegetables cultivated in his garden. The initial demand for milk and meat is not expected to be large and can be met from the sales of meat by the Orma and dried milk from the project traders. As tenants acquire cash they will probably raise a few livestock or small stock for meat and milk. These will have to be stall fed on crop residues, which are better suited to small stock. The tenants will require advice on the management of stall fed stock and a livestock extension service is proposed under the Ministry of Agriculture. The extension service input will carry out initial trials to establish suitable management techniques for stall fed stock.

A low key development programme of Orma livestock is proposed as a source of milk and meat for the tenants and the population of the rural centre. The rate of development of this programme will depend upon the interest of the Orma. If this proves successful it would be a valuable form of compensation to the Orma for their loss of grazing.

CHAPTER 6 WILDLIFE AND FISHERIES

6.1 Existing Wildlife Situation

Although animal densities tend to be low, the Tana River District is an important area for wildlife in Kenya. The Bura Irrigation Settlement Project can be expected to affect some 1 500 square kilometres of wildlife habitat. The loss of the actual area to be irrigated will not have such serious consequences for wildlife as the restriction of access to the riverine forest, the good grazing of the floodplain and the river itself. The proposed Supply Canal which will bring water from the headworks near Nanigi to the project area is of particular importance in this respect, and provision will have to be made to enable animals to cross the canal.

The other problems which will arise are the poaching of wildlife by the project population, crop damage caused by wildlife, and game animals becoming trapped in the canal.

6.2 Canal Crossings and Water Holes

Eleven drinking pools will be provided along the west side of the canal, which will help reduce the number of animals wishing to cross the canal. The construction of extensive fences to reduce wildlife damage to the Supply Canal can be justified neither on the grounds of effectiveness nor expense. Experience at Hola has shown that after a time game animals become accustomed to the canal and cause little damage.

Inverted siphons will be provided to carry the Supply Canal across the natural drainage lines, which will thus provide wildlife crossings, and several fords or drifts will be provided for the same purposes. Additional ford crossings have been allowed for in the estimates, should sites of high challenge be identified after the canal has been constructed.

6.3 Crop Raiding and Poaching

The most effective deterrent to wildlife activity is intense human activity, and for a variety of planning reasons the settlement villages have been sited at the perimeter of the project.

This is well suited to reducing the challenge of wildlife to the irrigated area. The main canal to the west and the drainage channels to the north and south of the irrigated area will also do much to reduce damage by wildlife. Fencing to the irrigated area is considered to be of questionable value and trenching too expensive. Vegetative barriers are a possible alternative and it is proposed that trials should be started in 1978, at Hola, in conjunction with the tree species trials, using vegetative barriers of *Opuntia Ficus-indica* and *Euphorbia breviarticulata*. These may well prove a cheap method of excluding wildlife from the irrigated area.

The control of game in the project area and poaching problems will be met by the provision of a force of 12 game scouts and a Junior Warden equipped with vehicles and radio. They will also deal with any animals mired in the canal.

6.4 Fish Farming

Although there is little commercial fishing in the vicinity of Bura, it is an important activity and most of the riverine people fish to supplement their diet. Commercial fishing is undertaken downstream of Bura, but recorded landed catches have been reduced since a ban on the use of nets was introduced in 1975.

There may be a considerable potential for fish farming for the Bura Project and the development of this activity would provide a valuable supplement to the project tenants' diet. Fish farming

trials are proposed to the north of the project, near the headworks, to avoid contamination from aerially sprayed pesticides. It is proposed that trials be established to investigate the potential production from fish tanks and from fish cages suspended in the Supply Canal and the local market demands.

6.5 Pesticide Monitoring

The levels of pesticide residues in the environment from aerial spraying of crops, particularly cotton, must be monitored to determine their effect on both aquatic and terrestrial ecological systems. Programmes for all the proposed fisheries activities, together with details of capital and recurrent costs, are given in the Fisheries Annex.

CHAPTER 7 FORESTRY

7.1 Introduction

The Bura Irrigation Settlement Project is essentially an agricultural scheme. However, the need for fuelwood and timber supplies has been recognised, and other project requirements have been considered for study.

The following major topics have been identified:-

- (a) Conservation of the natural vegetation, particularly the riverine forests.
- (b) The demand for and supply of timber and fuelwood, mentioned above.
- (c) Forest extension and amenity requirements in the proposed settlement villages.
- (d) Research.

7.2 Conservation of Natural Vegetation

The first item, the conservation of the natural vegetation, is generally dealt with by gazettelement, including the removal of inhabitants from the gazetted areas. There is little point in gazetting areas which have been already heavily exploited or populated. The principle has been adopted that specific blocks of natural vegetation should be selected for protection and that these should be gazetted as soon as possible, and three areas that appear to be critical in relation to the proposed irrigation project have been so selected.

For each of these blocks, management proposals and cost estimates have been prepared. Maps of these have been prepared at a scale of 1:50 000 from 1975/76 aerial photography with the aid of the Forest Department, and are given in the Forestry Annexe.

7.3 Fuelwood

The second topic deals with the demand and the supply of timber and fuelwood. Demand has been projected over a 20 year period on the basis of population estimates, per caput consumption and an assumed rate of substitution of alternative fuels for wood. The projected demand has been compared with estimated supplies from the natural vegetation. It appears that unless the riverine forests are clear-felled, a policy which is not recommended, there will be a serious shortage of fuelwood. By the 1990's it is estimated that the annual deficit will be in the region of 45 000 cubic metres (solid volume).

Alternative sources of supply have been examined. These include:

- (a) Dry land plantations in the neighbourhood of Garissa.
- (b) Irrigated plantations adjacent to the Bura Project.
- (c) Natural forests such as Witu and Boni to the south-east of the project.
- (d) Alternative fuels such as paraffin (kerosene).

Accepting that the riverine forests should be protected, the least cost method of meeting the project's demand appears to be from gravity-fed supplementarily irrigated plantations adjacent to the project. To meet projected demand to the year 2000, a plantation programme has been prepared. This is based on the following critical assumptions:

- (a) Demand projections developed as above.
- (b) A rotation length of seven years.
- (c) A mean annual increment of 15 cubic metres per hectare.

Of the three assumptions, that concerning yield may be the most controversial in view of the ILACO estimate of 35 cubic metres per hectare per annum, and that of 100 quoted in the NIB draft paper on forestry. Research records, however, indicate that yields of this magnitude are unlikely to be achieved in Bura. According to the proposed planting programme, a net area of 3 900 hectares will be required for afforestation. Allowing for roads and irrigation works, a total area of 4 500 hectares is considered necessary.

Adjacent to, and immediately to the east of, the proposed irrigated project area, there are approximately 6 000 hectares above the Tana River floodplain. Assuming that 25 per cent of this were to be rejected, on the grounds of topography and soil characteristics, sufficient land would still remain to implement the proposed afforestation programme.

7.4 Amenity Planting

The amenity aspects of forestry, which involve tree planting in the 23 village centres, are considered in Part 3 of the Forestry Annexe. Experience in other settlements indicates that while part of the tree planting could be undertaken by the tenants themselves, an initial organised programme of tree planting in public places would be desirable. The Forest Department, which has its own extension service, could undertake part of this programme and it is recommended that the schools in each village are involved in the remainder.

7.5 Research

Finally, there is the question of research. In 1965 a series of species trials were initiated at the Hola scheme. Unfortunately, these were abandoned in 1974/75 and only one series of measurements, for four species, were obtained in 1972. These are quite inadequate to form the basis of a relatively large afforestation programme. New trials of twenty-four species are recommended and it is proposed that these trials should be statistically replicated. Preliminary discussion with the research team (funded by the Government of the Netherlands) located at Bura, indicates that in principle the forestry trials could be supervised, provided the necessary funds were made available. Details of the species proposed, irrigation requirements, and costs of the trials are given in the Forestry Annexe.

CHAPTER 3 SOCIOLOGY AND SETTLEMENT

3.1 Tenant Selection Criteria

ICAC (1975), NFD (1976) and ISPD (1977) have each proposed somewhat different criteria for the selection of tenant settlers, which are reviewed in the Sociology and Settlement Annex. The currently proposed criteria are as follows:

(i) *Tenants shall be males aged 25-45 years*

There are numerous female heads of rural households in Kenya, and women often supply up to 75 per cent of the labour for agriculture, but there is an initial responsibility for tenants to build their own houses, which can only be considered as a man's job, especially on account of the construction methods involved.

This project management might nevertheless wish to experiment with a few female tenants, say one group of six initially, to see if masculine prejudice against female heads of households who could fulfil the other selection criteria, can be justified or not.

The age criterion is based on the following considerations. Men of this age are still close to their physical peak and may be expected to have several older children who would be a great asset in working the holdings - unless they were to spend most of their time away at secondary school off the project scheme. Mature men are also necessary for the development of social and cultural life in the project villages. Younger men lack the experience of carrying public responsibility, and depend on their wives to provide the institutional stability which is vitally necessary for an evolving community.

PART 2

(ii) *Tenants shall be medically fit* **SOCIAL DEVELOPMENT**

This criteria is to exclude the chronically ill and incurably feeble, but not those who are temporarily indisposed or suffering from readily curable afflictions. Since medical fitness is intended as a test of labour effectiveness, it would be logical to have all the working members of the household examined.

In practice this is not feasible before selection because of the great numbers of people involved, and the shortage of staff to conduct examinations. The most appropriate procedure would be a simple screening process conducted by the District Selection Committee to sort the basically fit from the chronically ailing. It is suggested that the entire process for a full medical examination of each candidate be dropped.

Those who are suffering from readily curable ill should be treated before their departure and if the cure is not complete, they should carry a note to the Bura health officer who would be separately informed of the arrival of the patient on the scheme by the District medical officer.

(iii) *Tenants shall be unemployed or under-employed and landless*

The main social and economic objectives of the Bura Project are to provide a livelihood for as many poor and landless people as possible, by producing cotton on a profitable basis.

This aspect should be stressed to District Selection Committees. The project is not intended for people who have adequate alternative livelihoods, nor for those who are incapable of successful farming.

(iv) *Tenants shall be married and able to provide two adult equivalents of labour besides himself and his wife*

The requirement that the tenants be married is reasonable in view of the finding that on Mwea

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(iv) *Tenants shall be married and able to provide two adult equivalents of labour besides himself and his wife*

The requirement that the tenant be married is reasonable in view of the finding that on Mwea

unmarried tenants are likely to have low crop yields. It is also unlikely that unmarried people could muster the necessary work force.

There are important consequences following on the selection of larger families. Many otherwise eligible families will be excluded. Older families will more easily meet the requirement for four adult equivalents. Each holding will therefore have to support more people than if three adults were required.

The arguments supporting three and four labour unit families respectively are inconclusive. The consultants suggest that the NIB/IBRD proposal for a four labour unit family be retained, but that especially promising or deserving applicants with three labour units should also be considered for selection.

It is necessary to define what kind of people, besides a man and his wife, constitute an adult equivalent of labour. It is assumed that the man and wife will cope with the labour demands of their holding and garden throughout the year, except for about 20 to 30 days during the peak harvesting season. At this time they will need the help of their children whose school holidays are assumed to cover this period, and it is suggested that anyone over 14 years of age be regarded as an adult for cotton picking purposes, and that each child between 7 and 14 years be considered as half an adult equivalent.

(v) *Tenants shall have a rural background*

The evidence from a study at the Mwea project does not support the conclusion that previous agricultural experience is a prerequisite for successful tenancy on an irrigation scheme. In fact ex-traders were among the most successful groups in terms of agricultural performance at Mwea. Ex-white collar workers and students were, however, somewhat less successful as a group.

ILACO stressed that "the Bura Project is more in need of plot-holders with a rural, if not an agricultural background, than any other NIB scheme undertaken so far (except for the Tana Pilot Scheme), notably in the first years of project implementation, as the project is located far away from any urban centre and will continue to consist of mainly rural settlements" (ILACO 1975, Annexe G).

The consultants agree with ILACO that a rural background is the most important requirement and this would conform to the Mwea experience.

8.2 Tenant Population Criteria

Extensive details of the criteria adopted in determining the project population for planning social services, public health, education and other requirements are given in Part 2 of the Sociology and Settlement Annexe, and only the major criteria are listed here.

An average tenant household size of seven on entry has been assumed for planning purposes. The natural increase assumed for tenant family population is 3.5 per cent in the first year of settlement, rising by 0.1 per cent per annum to a figure of 4.2 per cent, which rate will be maintained until at least the tenth year of development of the project. The tenant family population projection is shown in Table 8.1.

Table 8.1 - Tenant Family Population Projection¹

Year	Incoming ² tenants	Total incoming tenant population (AX7)	Cumulative total of tenant population (static)	Annual tenant population increase	Estimated total tenant population
1979-80	640	4 480	4 480	157 (3.5%)	4 637
1980-81	1 200	8 400	3 037	469 (3.6%)	13 506
1981-82	2 200	15 400	28 906	1 070 (3.7%)	29 976
1982-83	1 110	7 770	37 746	1 434 (3.8%)	39 180
1983-84	(5 150)	—	39 180	1 528 (3.9%)	40 708
1984-85	—	—	40 708	1 628 (4.0%)	42 336
1985-86	—	—	42 336	1 736 (4.1%)	44 072
1986-87	—	—	45 923	1 929 (4.2%)	47 852
1987-88	—	—	47 852	2 010 (4.2%)	49 862

Notes: ¹ This table includes only the authorised tenants who will have been allocated plots and residential sites on the project.

² Numbers of tenants on the project at the mid-point of fiscal years, i.e. the end of each calendar year.

The projected age distribution is shown in Table 8.2 and compared with the local and national averages.

Table 8.2 - Projected Age Distribution of the Tenant Family Population

Age group (years)	Kenya %	Tana River District %	Bura Irrigation Project %
0 - 4	19.4	18.8	23.6
5 - 9	16.6	17.6	17.6
10 - 14	12.6	12.6	11.1
15 - 19	10.1	8.6	7.2
20 - 24	8.0	7.3	6.9
25 - 29	6.9	7.2	10.6
30 - 34	5.2	10.9	8.6
35 - 39	4.7	—	6.7
40 - 44	6.6	6.7	6.0
50 - 59	4.6	4.9	0.5
60	5.4	5.5	0.9

The bias towards a young population on the project has several practical implications, briefly these are the following:

- (a) A high rate of natural population increase.
- (b) A high proportion of children too young to work, and therefore a relatively wide ratio of dependants to providers.
- (c) An especially heavy demand on public health facilities and staff by the large child population.
- (d) An unusually large proportion of the population at school age.
- (e) A low death rate, both because of the small number of old people and the provisions for child health care.

- (f) A shortage of mature men experienced in the duties of 'elders' in the village community, and a resulting need for special attention to developing suitable forms of internal village administration and a sense of public responsibility among family heads.

8.3 Non-Agricultural Settlement Population

Commercial Population

The population of the project will need a range of commercial services similar to those found on the Hola Scheme at present. These services are offered from a variety of shops, many of which may initially occupy a portion of a tenant's house. Recently, as more money has become available for investment at Hola, more purpose-built trading premises are being erected. Most are operated as a side-line to agriculture by the tenants themselves, sometimes with the help of relatives assimilated into the household to run the business.

The criterion adopted at Bura is based on the ward of 72 tenant households proposed. The premises provided would be one shop (duka), one cafe (hoteli) and one butchery, each operated by a full-time tradesman which should suffice for such a neighbourhood.

Some tenants could be expected to carry on small part-time businesses from their houses, in addition to these licensed and relatively large scale operations, but it is expected that these side-line businesses will only develop slowly as money becomes available from cotton sales, and it will be necessary to ensure that the community is adequately provided with the basic commercial services from the outset.

For every hundred agricultural tenant households provision should be made for four suitably experienced and financed tradesmen to be granted residential - cum - business holdings in the villages, and if possible 500 square metres of gardens as well. They should be regarded as a part of the official settlement programme, and brought in on a pro rata basis to the agricultural tenants. The average household size of this group is assumed to be six, and their rate of growth would remain stable at 3.5 per cent per annum. Total numbers and the natural increase of these non-agricultural families is given in Table 8.3.

Table 8.3 - Non-Agricultural Population Projection

Year	Incoming settlers	Incoming families	Cumulative total (static)	Natural increase	Total
1	27	162	162	6	168
2	48	288	456	16	572
3	88	528	1 100	39	1 139
4	44	264	1 403	49	1 452
5	—	—	1 452	51	1 503
6	—	—	1 503	53	1 556
7	—	—	1 556	54	1 610
8	—	—	1 610	56	1 666
9	—	—	1 666	58	1 724
10	—	—	1 724	60	1 784

Informal Settlement

There are examples of large scale informal settlement and squatting around various urban centres in Kenya, including Isiolo where arid environment, and seemingly limited economic opportunities, have nevertheless attracted a sizeable population. This and other situations are described in the Sociology and Settlement Annexe.

On the Mwea Scheme the proportion of labourers and 'others' living on the scheme to tenants is about 28 per cent. Because tenants at Bura will be more or less self-sufficient in labour, while Mwea tenants are not, it seems likely that Bura would attract fewer informal settlers.

The Bura Project will certainly attract a fringe of semi-sedentary ex-nomads, mainly Orma, and some people from further afield, but by their nature such settlements cannot be planned for or against. Unless they expand to the size anticipated by IBRD they are unlikely to exert any adverse influences on the project which are beyond the powers of the management and the divisional administration to handle. It is expected that most informal settlement on the project will occur near the rural centre, and space has been allocated for this purpose in the town plan.

The overall population of the project used in planning is shown in Table 8.4.

Table 8.4 - Overall Project Population Projections¹

Year	Tenants ²	Traders ³	Staff ⁴	Total Project ⁵	Itinerant workers & servants	Overall total
1979-80	44 637	168	1 080	5 000	2 100	7 100
1980-81	13 506 (settle-	572	2 052	16 100	4 800	20 900
1981-82	29 976 ment	1 139	3 762	34 900	4 400	39 300
1982-83	39 180 period)	1 452	4 452	45 100	3 300	48 400
1983-84	40 708	1 503	4 607	46 800	3 300	50 100
1984-85	42 336	1 556	4 768	48 700	3 200	51 900
1985-86	44 072	1 610	4 935	50 600	3 100	53 700
1986-87	45 923	1 666	5 108	52 700	3 000	55 700
1987-88	47 852	1 724	5 287	54 900	2 800	57 700
1988-89	49 862	1 784	5 472	57 100	2 700	59 800

- Notes:
- ¹ Population at mid-point of each fiscal year, i.e. end of calendar year.
 - ² Annual tenant population increase starting at 3.5% p.a. and rising by 0.1% p.a. to a maximum of 4.2%.
 - ³ Traders at 1:25 tenant families, family of six assumed, growing at 3.5% p.a.
 - ⁴ Project staff increasing according to staff schedules; family of six assumed, growing at 3.5% p.a.
 - ⁵ Figures rounded to nearest hundred.

8.4 Tenant Migration

The basic programme for tenant migration is as follows:

Fiscal Year	1979-80	1980-81	1981-82	1982-83
Number of new tenants	1 125	1 800	1 800	425

The tenants will construct their own houses and other village buildings, as described in the Housing and Buildings Annex, in groups of six, and will arrive at the project site at the rate of one group of thirty-six tenants every week, their families following some eight weeks later, after their houses have been constructed. A transit camp will be provided near Nairobi to accommodate those who are more than one day's journey from the site. The basic programme is shown in Table 8.5.

Table 8.5 - Migration and Transportation Programme
(Fiscal years)

Detail	1979-80	1980-81	1981-82	1982-83
Number of tenants	1 125	1 800	1 800	425
Number of family members	6 750	10 800	10 800	2 550

Province	Number of bus loads transported*							
	Tenants	Families	Tenants	Families	Tenants	Families	Tenants	Families
Central	5	20	7	32	7	32	2	8
Coast	8	35	13	56	13	56	3	13
Eastern	8	35	13	57	13	56	3	14
Nyanza	5	20	7	32	7	32	2	8
Western	5	20	7	32	7	32	2	8
North East	1	5	2	7	2	7	—	—
Rift Valley	2	7	3	11	3	11	1	4
TOTAL	34	132	52	226	52	226	13	55

Note: * Tenants transported in loads of 36 per bus. Families transported in loads of 48 persons per bus with one 7 ton lorry per bus for belongings.

8.5 Village Communities

The earliest development of community activities is recognised as of paramount importance in welding the diverse elements of a village population into a community with a sense of purpose and an evolving role in the project itself. The cellular layout of a village will greatly foster both community spirit and involvement in local village administration. These aspects have been considered in detail, and proposals are described in the Sociology and Settlement and Institutions and Services Annexes.

CHAPTER 9 PUBLIC HEALTH

9.1 Introduction

The substantial developments taking place in the Tana River catchment area will have a complex and profound impact on the health of populations in the area. The Bura Irrigation Settlement Project, in particular, will be associated with substantial changes in ecology leading to alterations in the epidemiology of important communicable and vector-borne diseases. In addition, the assimilation of large immigrant populations with variable immunity to locally endemic diseases will further affect the epidemiological situation leading to alterations in disease endemicity and possible introduction of exotic disease.

The introduction of immigrant populations into an area, previously sparsely populated and with little existing infrastructure, requires an integrated programme to provide expanding facilities which are both adequate and appropriate to the needs of the community. The development of health care programmes and public health facilities should be based on the existing health status of the people and existing disease epidemiology, as well as a consideration of the probable impact of the development of irrigated agriculture.

Consideration is also required of the populations of the area not directly related to the development programme. The Bura Project and Upper Reservoir developments are likely to have an increasing effect on existing rural populations remote from the development projects. Health care programmes are required for these populations both to avert a deterioration in community health and to permit the growth of an integrated community health programme throughout the area.

Responsibility for the administration of health care in large scale developments such as the Bura Project requires careful definition, if long-term promotive, preventative and curative services are to be effectively implemented, within the existing financial and logistic constraints. In addition to providing a satisfactory community care programme, the system should be capable of monitoring and evaluating the epidemiological consequences of the project and the impact of health care and control measures introduced.

9.2 Background Studies

Extensive studies in the area were undertaken between 1974 and 1976 by the Medical Research Council Team, and the results of earlier surveys were also available. These studies have provided comprehensive information on the existing disease status and disease epidemiology in the area, the effect of irrigation development on disease-vector populations and the existing health care facilities. In addition, statistical analyses of population census figures provided valuable information on likely tenant family composition and age groupings.

9.3 Criteria for Development

From this considerable volume of information, various criteria have been derived, as follows:-

- (i) Two-fifths of the project population are expected to be children under ten years of age, and the health care facilities must provide adequate maternity, child health and nutritional services.
- (ii) The development programme shall take account of the health care facilities for people outside the project area, including informal sector settlement and the remaining groups of the riverine Pokomo and nomadic Orma.
- (iii) Full account should be taken of the health implication of the development. The

villages should be as far as possible from irrigation facilities, untreated irrigation water should not enter the village and snail-free bathing areas should be available for children. Treated water supplies should be provided as close to the individual homesteads as possible.

The development of Public Health Service facilities should be based on the following principles:

- (a) Health care facilities should be integrated into a Health Unit, comprising a Health Centre at the town or rural centre, and three Health Sub-Centres located at market centres. The unit would provide curative and preventative facilities, maternity and acute admission beds, and serve as a base for surveillance and control services, and training facilities.
- (b) The Health Unit would be strengthened at village level by the health workers, providing initially limited curative and preventative services. The innovative nature of such workers stipulates careful training and supervision.
- (c) Specific disease control programmes should be an integral part of the health service rather than an isolated service operating independently. Disease control programmes should aim at reducing the morbidity from disease and increasing case detection and treatment, rather than attempting eradication.
- (d) Surveillance and control programmes should be introduced on the existing Holt Irrigation Scheme and neighbouring communities, in advance of the development of the Bura Project. In addition to reducing disease prevalence in the area, this would permit the development of appropriate techniques and provide training for future staff of the Bura Project, to where the programmes can be extended at the appropriate time.
- (e) Health screening of tenants and their families should be carried out on arrival rather than in their place of origin. This will not only prevent the tenants considering health screening as an obstacle to their selection, which might result in evasion and corruption, but would demonstrate to them that health care on the project is a major consideration and, at the same time, provide the necessary basic information upon which to establish the health care service.
- (f) Health care services to the staff and labour force of the construction works should, where possible, be provided by the developing project facilities. Mobile services will be required for the diversion structure labour force, but other labour should use the Health Centre which should be constructed by late 1978.

CHAPTER 10 INSTITUTIONS AND SERVICES

10.1 Introduction

The project area is at present devoid of the services which would make it productive and habitable. Its future productivity will depend upon the introduction of irrigation and mechanical facilities, along with the agricultural skills to use them. The successful settlement and development of the area will depend upon the introduction of the institutional framework within which the social, technical and administrative services can operate. It will be necessary to ensure that the Bura Irrigation Project does not become an 'island of development'. Agricultural extension to the surrounding areas, particularly the riverine Pokomo settlements, should be intensified to encourage increased production of crops and livestock which the settlement population will need. Each part of the institutional framework is considered individually in the following sections, and the basic principles for its establishment discussed.

10.2 The Administrative Services

These are concerned with regulating the relationship between communities and institutions, guiding development, and maintaining the integrity of the legal and political fabric of the State in accordance with the policy of Government.

The Sub-District Administration will co-ordinate and advise the government agencies which provide service in the project area. It will be responsible for maintaining a reasonable balance between the interests of the project tenants, the Pokomo and Orma, government staff, NIB staff and the informal sector. As such it will be necessary to establish a Bura Development Council, supported by five Standing Committees, as a co-ordinating agency under the chairmanship of the District Commissioner. The Council will in turn co-ordinate with the Tana River District Development Committee.

To allow for the initial lack of social cohesion in the project villages, an above average number of chiefs should be provided in the local administration structure. This is partly for administrative purposes, and partly as an additional means of stimulating an early sense of community responsibility. Each chief would be responsible for two villages, each of which would elect a committee under a headman, usually in the person of an elected and approved Head Cultivator.

Special problems in policing may be anticipated because of the diverse origin and social status of the tenants. These will be exacerbated by the presence of contractors and squatters and the temptations for poaching game. It is intended that a full police station be established at the rural centre, independent of Hola, fully staffed and equipped.

Provision is made in the 1974/78 Kenya Development Plan for a modern prison to be built at Bura. If this is given a priority rating by Government, it could perform a useful supporting role to the project. 150 hectares of irrigated land could be made available for a prison farm, which could provide seed production and forestry nursery services. The prison proposed by the Government would accommodate 600 - 1 000 prisoners.

Government policy favours the development of effective local authorities with a positive role in development. Constraints arise from lack of revenue, leadership and staff. Self-financing services which should devolve onto local councils include markets, licensing, nursery schools; supported services include refuse collection, property rating and the like. As an interim measure, it is proposed that these services be run by an Executive Officer under the administrative and financial authority of the Bura District Officer, pending the development of an elected local authority, responsible to the local population.

10.3 Education Services

The present selection criteria will lead to a number of social education problems at Bura, arising from the unusually high proportion of school age children mainly in the younger groups. These considered in the light of Government policy objectives, lead to the conclusion that one double stream primary school will be needed for each of the 23 project villages, with a further two at the rural centre. The education requirements will be reviewed after tenants have been selected where details of their family composition are known, but for the present it has been assumed that one double stream primary school will be provided in each village. The primary school building programme will proceed in phase with the arrival of tenants, whose first assignment will be to build their own houses. School buildings (excluding teachers' houses) and the community centre would then be erected under a harambee construction programme.

One secondary boarding school would be built in 1981, ready to accept pupils in 1982. It would have triple stream Forms I to III, and double stream Forms IV to VI, and these would have provision for teaching applied subjects.

10.4 Social Services

The active involvement from a very early stage of the Department of Social Services will be essential to the development of cohesive village communities. An experienced and dedicated Senior Community Development Officer will be required to take charge.

Social services would be village based, and will include the provision of day-care centres, creches, adult literacy courses, village polytechnics, women's clubs and youth clubs.

10.5 Co-operative Services

Economic self-help activities based on co-operative principles will be promoted by the encouragement of co-operative societies in all villages. These would provide a suitable channel for organising marketing, including seed cotton storing and delivery services. A programme of member education, book-keeping, management and cotton-handling training will be required with the collaboration and support of the NIB project management.

Co-operative activities will expand as the capability of the societies develops, and could include such items as:-

- Primary collecting and marketing of all crops
- Accountancy and member records
- Savings and credit
- Fuelwood supply

10.6 Technical and Specialist Staff

(a) *Agricultural Extension*

The promotion of agricultural activities, particularly among the riverine Pokomo, will require additional staff from the Ministry of Agriculture. The development of minor irrigation schemes, improved crop production, soil conservation and livestock improvement would be encouraged and home economics advice provided.

(b) *Posts and Telecommunications*

These services will be provided by the Post and Telecommunications Agency in accordance with its standard development programme. A 'minimum development unit' post office and telephone exchange would be provided at the rural centre, with a local post office at each market centre.

and a sub-post office at each local centre. The latter would be on an agency basis.

(c) Ministry of Labour

At a very early stage the services of a Labour Office will be required to deal with possible labour disputes during the construction phases. They will also be needed throughout the project operations to advise on NGSF problems, factory regulations and industrial relations.

A fully staffed Labour Office is proposed for Garissa, and the Bura project area would be handled from there. Although it will be outside the project area, it is essential that this development be given a top priority rating.

PART 3

PHYSICAL DEVELOPMENT

Introduction

The purpose of this manual is to provide a guide for the selection and design of the physical development program for the child and the young adult and to provide a basis for the selection of the physical development program for the child and the young adult.

Physical Development Program

The physical development program is a program of physical education for the child and the young adult. The program is designed to provide a basis for the selection of the physical development program for the child and the young adult. The program is designed to provide a basis for the selection of the physical development program for the child and the young adult.

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PHYSICAL DEVELOPMENT

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11.1 Introduction

The determination of a series of planning parameters for site selection and village design was based upon previously established planning criteria, site visits, a review of relevant documents and meetings with the authorities concerned.

11.2 Village Structure and Locations

A maximum population of 2 500 persons is recommended for villages, for health, sociological and administrative reasons. This parameter, coupled with a maximum walking distance by tenants to their holdings of two kilometres, led to the conclusion that at least 23 villages will be required in Phase I of the project, to accommodate the expected population. These villages form a hierarchy of centres of three economic orders, namely: 4 market centres, 8 local centres and 11 sub-local centres, which complies with the Department of Physical Planning standards. Their respective functions vary in terms of educational, health, commercial and administrative resources, yet their population sizes would be approximately equal.

The sites for the 23 villages should be identified within the context of the following parameters: soils suitability, walking distances to holdings, relationship to the proposed transportation infrastructure, relationship to each other, and cost of servicing runs. Wherever possible and feasible, villages will be grouped together, so that services and roads can cater for one or more sites.

In general, the villages shall be located near branch or block canals, at the perimeter of irrigation fields, but buffered from the canals for health reasons.

11.3 Rural Centre Location and Structure Plan

To meet the specialised economic and administrative requirements of the project, and to accommodate associated industrial, educational and residential uses, an administrative or rural centre is required. This should be centrally located, accessible, near the scheme, and include sufficient space to allow for all anticipated uses and for expansion. A suitable location for this urban area has been identified north of the Pumwani branch canal, east of the Main Canal. It is accessible from the relocated Garsen - Garissa trunk road and from all villages, and commands sufficient space to contain all anticipated uses.

Conceptual structure plans, reflecting the spatial dimensions and location of various land uses within the administrative centre, have been prepared. The land-use components include a ginnery, a National Irrigation Board (NIB) workshop, a National Youth Service (NYS) yard, infrastructural servicing plants, and schools. In addition, an administrative zone, a commercial district, a health centre and residential areas are included, and industrial traffic is routed outside the main commercial and residential areas.

The rural centre would contain between 8 000 and 10 000 inhabitants at the mature state of Phase I of Stage I of the project. Expansion space is allocated for informal sector population growth, natural increases and for the eventuality that Phase II of Stage I of the project is initiated.

Two alternative conceptual plans for the rural centre are discussed in the Village Planning and Design Annexe.

11.4 Village Design

To avoid the monotony and dilution of spaces experienced in the grid-iron patterned villages of the Hala Irrigation Scheme, a new concept, based on the proposed procedure of settling smallholders, is envisaged. This concept is grounded on a hierarchical system of units, cells, modules and wards, assembled in increments of six houses. Thus, two units of six houses would compose a cell, arranged around a central courtyard. Two cells of twelve houses would, in turn, make up one module. Three modules would form one ward of 72 houses and a complete village would be composed of four residential wards.

The residential wards would be symmetrically aligned along a central village axis. Basic commercial, administrative, social and educational amenities would be located at the centre of the village, on either side of the central axis. These non-residential uses and the central axis would thus separate the settlement into residential quadrants.

This conceptual layout has certain advantages as follows:

- (a) Each village is introspectively orientated, and walking distances to the central area can be equalised due to the concentric pattern.
- (b) A compact village structure, in harmony with climatic design criteria for hot arid regions, results.
- (c) The modular arrangement fosters the creation of a hierarchy of spaces for play, meetings, aesthetic enhancement and orientation. The monotony of grid-layouts is avoided.
- (d) Water supply to standpipes in the courtyards of the cells is relatively economical.
- (e) The proposed plot size of 392 square metres per house permits easy extension of structures within the plot.
- (f) The layout concept could be generally applied to all villages required for the project, with modifications in response to preferred village orientation, desired population capacity, given site configuration, require non-residential land-use components and prevailing physical characteristics.

CHAPTER 12 HOUSING AND BUILDINGS

12.1 Climatic Criteria

One of the most important factors dictating design in Bura is its climate. The site lies in a semi-desert zone with the following climatic characteristics:-

- High temperatures in day and night, with
mean max: 33.5 - 35°C
mean min: 22.0 - 24°C
- Rainfall: annual mean 150 - 500 mm
- Winds: generally light but persistent. At times strong dust laden winds are experienced.
- Humidity: annual mean relative humidity at 1500 hours is between 35 and 45 per cent.
- Vegetation: desert type scrub to dry bushed grasslands and leafless woodland.

Against this background of climatic factors, the designs of houses and other buildings are reviewed to determine their efficient functioning for maximum body comfort and weathering qualities of the materials specified.

The ideal house plan for Bura is one that allows maximum air movement through the rooms for cross ventilation. The positioning of windows, and p.v.s. and their sizes will determine effectiveness of air movement within the house. The 'Design for Climate' guidelines recommend provision of outdoor living areas for both day and night uses, and allowance for big roof overhangs for both shading of walls and minimisation of solar heat gains. Such outdoor living areas can be achieved by an inward facing plan to form a courtyard which will create a micro-climate within the house plot.

The most suitable materials for the climate of Bura are those that will minimise heat gains in the day and maximise heat losses at night.

The ideal orientation of buildings is the one with the openings facing north and south to avoid direct solar insolation from the east and west sun. The early morning sun is tolerable as it is high enough by the time it gets hot. This permits south-east orientation. The west afternoon sun must be avoided wherever possible. Minor rooms such as toilets and stores may face west without undue indoor discomfort as they are seldom used.

The climatic characteristics outlined above will to some fair extent dictate the preferred design approach. There is need to examine the designs further to ascertain other functions complementary to climatic requirements in the fulfilment of good design.

12.2 Functional Criteria

Any good design should successfully isolate differing functions and at the same time facilitate their successful integration and interaction. Unless this is achieved, good circulation, privacy and economies are sacrificed.

Day and night rooms should be separated by grouping bedrooms together, and living room, kitchen and dining room together. These two areas share common facilities such as toilets which become the areas of interaction. Proper isolation of functions with well thought out circulation

or 'traffic lines', ensures privacy to occupants walking from bedrooms to the bathroom. It further maximises utilisation of space by avoiding traffic across the living room.

It is also desirable to create separate external spaces. The front verandah is used for entertainment of guests and the rear as a backyard for kitchen and related activities.

Minimum bedroom sizes should be determined by the expected room occupancy, and the air changes per hour required. Minimum area of living rooms is a function of the economic level of the family and its social characteristics and cultural habits.

There is need to have a greater minimum room size for this climate than would be acceptable in other cooler climates. However, in the absence of more research, it is recommended that a minimum bedroom size should accommodate two single beds. An allowance should be made for circulation and for the hot climate. One hundred per cent more area for these two aspects has been assumed. The minimum bedroom area therefore used in the review is theoretically to hold four beds.

12.3 Services

Services to a house or building constitute a great proportion of the costs. Inadequacy would lower the comfort of the occupants of the house. Over-provision would result in under-utilisation and undue expense.

The designs with 'in-house' sanitary facilities will be reviewed to establish their achievement in economic grouping of facilities to minimise costs and the adequacy or otherwise of the amenities.

12.4 Materials and Construction

Bura, being very far from the main urban areas and not having much to offer in the way of building materials, the materials proposed for use in the NIB specifications will be reviewed to take account of easy availability, durability in the climatic conditions at site, costs of materials, including transportation costs, and structural soundness.

Reference is made to the recommendations of the Housing Research and Development Unit of the University of Nairobi, 'Design for Climate' and to the NIB 'Technical Field Survey on HOLA' by Otto Kaszner.

To ensure conformity of the review material with the official standards, the Republic of Kenya 'Building Code' will be used to determine such aspects as minimum plot size, minimum room size, building lines and setbacks; Grade II by-laws and 'Scheduled Special Areas and Special Buildings', sections of the code will be used in particular.

12.5 Tenant Housing

The core house will act as a nucleus around which extensions will form the completed house thus the design should be conceived as a complete unit with the possibility of building it up in phases. It should, after extensions, retain p.vs., windows and entrance points at convenient locations for each habitable room.

The Technical Field Survey indicates a great desire by tenants to extend their houses to cater for the large number of occupants in their extended families, particularly in cases where there are more than one wife and grown-up daughters nursing their own children. A tenant house should have ample possibility for extension without blocking existing windows and p.vs. The design of the core house should dictate the size, nature and direction of extensions. This can be achieved by ensuring that the end of the building to be added onto has enough plot space and that the extensions would not block windows or other openings.

CHAPTER 13 UTILITY SERVICES

13.1 Domestic Water Supply

Two different types of domestic water supply and treatment systems are considered, individual village treatment and central treatment.

The detailed criteria for the two outline designs are as follows:

Design criteria for individual village and separate rural centre treatment

- (a) All water supply to be fully treated.
- (b) Alum dosing of raw water at about 50 milligrammes per litre (mg/litre) to accelerate deposit of sediment.
- (c) Upward flow sedimentation units with a flow rate of between 1.0 and 1.5 metres per hour (m/hr).
- (d) Downward flow rapid gravity filters with a rate of filtration of about 4 cubic metres per square metre per hour ($\text{m}^3/\text{m}^2/\text{hr}$). Filters to be backwashed from pressure mains provided from the water tower.
- (e) Chlorination of treated water before entry into clear water storage reservoir at the rate of 2 to 4 mg/litre to give a residual chlorine of at least 0.4 mg/litre at furthest point of each system. Calcium chloride or calcium hypochlorite to be used as chlorinating agent.
- (f) The chlorination of treated water will prevent bilharzia, but as an additional precaution treated water will be stored for at least 48 hours. This storage will also ensure continuity of supply when raw water channels are closed for cleaning (a re-assessment to be made of size of storage at final design) and will be designed to minimise short-circuiting.
- (g) Where necessary, alum dosing of treated water with soda ash to correct pH value.
- (h) All distributive piping would be uPVC.
- (i) Each village precinct of 12 household plots will be provided with one communal water point with 2 No.12 mm deadman bibcocks and 2 showers, 1 for women and 1 for men.
- (j) Distribution piping will be sized to enable each village household plot to take a future individual connection.
- (k) Water-borne sewage will not be provided for villagers.
- (l) Consumption of water in the villages based upon 100 litres per head per day (l/h/d) and 2 500 persons per village.
- (m) Each village will require a screened intake from a tertiary channel, a low life diesel pump to provide raw water to a small treatment works, a high lift diesel pump to carry clean water from a treated water reservoir, containing at least 48 hours storage, to a water tower holding 4 hours storage and servicing the village by gravity.
- (n) Screens would be stationary, in duplicate, and will be cleaned by hand daily or more frequently as required. Hose connections to village water supply tower for cleaning screens.

- (o) No duplicate pumps and engines will be sited at villages, all stand-by equipment will be retained at the rural centre. Similarly, stand-by chemical equipment and emergency stores of chemicals would be retained centrally.
- (p) Water-borne sewage at the rural centre, together with individual household clean water connections; consumption based upon 150 l/h/d at a rural centre population of 8 000.
- (q) An additional amount of 20 per cent has been allowed for wastage, leakage and operation of treatment works for the individual villages, and 25 per cent has been provided for the separate rural centre works to cover these items.
- (r) The separate treatment works at the rural centre would be served by electric power and operated on a 24 hour basis, utilising raw water from the main canal.

Design Criteria for Central Treatment Works

The design criteria (a) to (m) and (p) to (r) of the previous section also apply to the central system. In addition the following criteria will be applicable:-

- (s) The central treatment system will be located near the main canal and the rural centre utilising the natural slope of the ground to minimise pumping costs.
- (t) A central water tower approximately 10 metres to the base of the tank will contain four hours supply to balance supply and demand at peak period.
- (u) The central system will serve by gravity a number of lower level balancing water towers each serving a group of villages.

The central treatment system is preferable because it can be more easily maintained and operated: it is also slightly cheaper in capital and operational costs.

13.2 Sanitation

Sanitation for the villages will be provided by augered pit latrines about 7 metres deep and 30 centimetres in diameter. A pit latrine will be provided for each household located on the individual house plot as far as possible from the house itself.

In the denser populated rural centre a water-borne sewage system will be required and will comprise three simple oxidation ponds in series. Wherever possible the topography of the area will be utilised to permit gravity flow but pumping from a collection point or points will be necessary. This system has been well proven in Kenya.

13.3 Electricity Supply

Phase I of Stage I of the Bura Project could be supplied with electrical power either by a transmission line from the national grid or by diesel powered generation. The cost of a transmission line would have to be paid for by the project and Phase I of Stage I of the project is too small to justify the capital costs involved. It is therefore intended that electric power will be initially diesel-generated at the rural centre to serve the ginnery, local industry and the residential area of the rural centre. No provision has been made for supplying the villages in the project area. The generation of power on site would be reviewed when further development of the Lower Tan River Basin is undertaken.

The generation and distribution systems have been based upon studies made for electricity generation in a number of rural townships in Kenya, and on discussions with the East African Power and Light Company (EAPLC).

The estimated power requirement is about 1 500 kVA and is based upon 700 kVA for the ginnery, 150 kVA for local industry workshops, etc., and about 650 kVA for the residential area of the rural centre (1.5 kW has been allowed for each senior grade house and 0.5 kW for each other type of house). The generating sets will be two 500 kVA and two 250 kVA to give maximum flexibility and will be installed in a main generating hall (close to the ginnery) with space for a further 500 kVA set which may be installed by EAPLC to provide additional power to Hola. The generating hall will have adjacent workshops, switchroom and transform compound with ancillary offices and staff housing. The power station will be operated by EAPLC.

Power generation will be at 415 volts but because transmission distances exceed two kilometres the voltage will be increased to 11 kV at the generating station using step-up transformers. Pole-mounted sub-stations at local centres in the residential areas will reduce the voltage to 415/240 V for local distribution. The distribution system will be combined HV/MV overhead lines sharing common poles on major routes with a four-wire 415 voltage system on minor roads. A fifth wire for street lighting control will be provided for pole-mounted street/security lighting in strategic areas. Where possible in the residential areas house services will be via underground cable from the nearest available pole.

The requirements of spinners likely to use cotton produced at Hola covering such aspects as:

- (a) lint quality requirements
- (b) variety
- (c) future demand patterns

The evaluation of the relative merits of 'raw' versus 'ginned' ginning systems which might be employed for the project, including capital and operating costs and economic assessments.

The system of ginning to be adopted and the scale of operations, whether there should be one large ginnery or a number of smaller ginneries, either located in the same building or distributed in the project area.

The staffing and manpower requirements of the processing programme, including estimated period required and salary scales of expatriate staff grades and the experience required of local staff involved in technical or skilled jobs.

The total covered storage required for cotton seed and to evaluate the relative merits of total storage requirement at the ginnery or partial storage at ginnery and villages.

The present capacity of cotton seed oil extracting industry in relation to anticipated Bura surplus seed.

Little was done in past years to encourage cotton production in Kenya because supplies were inadequate and other crops rightly required development priority, but Kenya can no longer depend on its neighbouring States for supplies of cotton, and now the policy of Government is to encourage and promote cotton production with the target of being completely self-sufficient in cotton at the earliest possible date.

Production of cotton may be increased to about 70 000 bales per annum to obtain numerical self-sufficiency in bales from now to 1978. From 1980 textile mill requirements are expected to increase and may reach 120 000 bales by 1984.

Production of cotton in Kenya, numerically by bales, could meet the requirements of the local textile industry by 1978 and the production planned for Phase I, Stage 1 of the Bura Project will not necessarily be required for local consumption, and could be profitably exported if of a higher standard than that required by the local mills.

The 70 000 bales requirement is made up from:

CHAPTER 14 PROCESSING

14.1 Introduction

The production and processing of cotton seed is a complex operation involving many inter-related factors. The variety of cotton to be grown on Stage I Phase I of the Bura Project and its method of processing may depend not only upon the future requirements of the textile industry, but also upon the financial return to the individual project tenant. An objective and comprehensive study has been carried out into the subject, and this has been described in the Processing Annex.

14.2 Cotton Production Criteria

The criteria considered for the study of cotton production and processing included the following:

- (i) The requirements of spinners likely to use cotton produced at Bura covering such aspects as:
 - (a) lint quality requirements
 - (b) variety
 - (c) future demand patterns
- (ii) The evaluation of the relative merits of 'saw' versus 'roller' ginning systems which might be employed for the project, including capital and operating costs and economic assessments.
- (iii) The system of ginning to be adopted and the scale of operations, whether there should be one large ginnery or a number of smaller ginneries, either located in the same building or distributed in the project area.
- (iv) The staffing and manpower requirements of the processing programme, including estimated period required and salary scales of expatriate staff grades and the experience required of local staff involved in technical or skilled jobs.
- (v) The total covered storage required for cotton seed and to evaluate the relative merits of total storage requirement at the ginnery or partial storage at ginnery and villages.
- (vi) The present capacity of cotton seed oil extracting industry in relation to anticipated Bura surplus seed.

Little was done in past years to encourage cotton production in Kenya because supplies were adequate and other crops rightly required development priority, but Kenya can no longer depend on its neighbouring states for supplies of cotton, and now the policy of Government is to encourage and promote cotton production with the target of being completely self-sufficient in cotton at the earliest possible date.

Production of cotton must be increased to about 70 000 bales per annum to obtain numerical self-sufficiency in bales from now to 1979. From 1980 textile mill requirements are expected to increase and may reach 130 000 bales by 1984.

Production of cotton in Kenya, numerically by bales, could meet the requirements of the local textile industry by 1979 and the production planned for Phase I, Stage I of the Bura Project will not necessarily be required for local consumption, and could be profitably exported if of a higher standard than that required by the local mills.

The 70 000 bale requirement is made up from:

54 000 bales:	31/32 inches - 33/32 inches staple
10 000 bales:	34/32 inches - 35/32 inches staple
6 000 bales:	36/32 inches and over staple

The textile mill industry is not over-concerned about the varieties used, and the main criteria for variety is the return to

- and
- (a) the tenant farmers,
 - (b) the project as a whole,
 - (c) the country as a whole,

which leads to a compromise requirement for a medium staple variety, high yield and of high out-turn, which will provide a satisfactory return for the tenants, and a middle range cotton which local industry could use as a substantial preparation of its cotton mixes, and if overseas supplies were difficult to obtain or expensive then more of the variety could be used. It would be a cotton that would be used more and more locally as the demand for better quality cloth increased.

The alternative varieties and the relative economics of saw or roller ginning, which could affect the decision on cotton variety, are discussed in the Processing Annex.

CHAPTER 15 ENGINEERING DESIGN REVIEW

As part of the terms of reference of this report, separate reviews have been undertaken of the river headworks, and the irrigation and drainage networks. These are described in the original reviews, but one major principle affecting the design should be noted here.

The original headworks design was primarily concerned with serving the west bank of the Tana River, and only at a much later date was provision made to serve the east bank. The area of soils to be developed on the west bank has been reduced, while the indications are that there is a much larger and contiguous area of better soils to be developed on the east bank. There has thus been a marked shift of emphasis and the need to serve the east bank adequately is now a matter of major importance.

The diversion of part of the flood flow of the river over an uncontrolled spillway and its discharge across the line of the east bank canal, as previously proposed, is very questionable. Apart from the effects on the east bank canal, the downstream approaches of the spillway will gully back by erosion because of the imbalance between the flood flow over the weir of the main structure and that of the spillway and would require constant and expensive maintenance. Also the location of a weir at one side of the floodplain does not permit proper use of the full width of the floodplain, and the high weir of the main structure will cause considerable initial downstream retrogression.

A run-of-the-river structure taking the full flood discharge would be greatly preferable, permitting direct offtaking irrigation canals to serve both banks without interference and reducing downstream retrogression. Such a structure would be centrally located in the floodplain at a site about seven kilometres downstream of that originally proposed, protected by armoured horns upstream and downstream to prevent outflanking, and be served by direct upstream and downstream river approaches.

15.4 Training Criteria

A major consideration in planning the Burs' organisation is the need to devolve responsibility for implementation activities to the appropriate levels in the overall NIB structure and to define accountability at each level of responsibility. This latter would be essential to ensure that delegation of authority does not lead to inefficiency.

The overall structure recommended for the development of Burs' is based on the following training criteria:

- (a) The Burs' Project management would be set up and operated under a line of authority derived directly from the NIB general manager.
- (b) Responsibility and execution of the basic functions during the construction and operation phases of implementation will be devolved to the particular organisation and the staff undertaking the work.
- (c) Essential technical and administrative support to the project through its different phases will be provided from headquarters divisions through the Project Manager.
- (d) Provision for effective liaison between the NIB headquarters and the various Ministries and statutory authorities involved through the Steering Committee and the Burs' Project Co-ordinator.

PART 4

ORGANISATION AND ECONOMICS

16.2 NIB Headquarters Organisation

Three distinct functions must be fulfilled by the headquarters organisation:

- (i) Final planning and supervision of the project development during the construction and initial operation;
- (ii) Technical backup, particularly in engineering, mechanisation and agricultural fields;
- (iii) Administration support for both construction and operating phases.

Distinct divisions or departments under the NIB general manager, incorporating various specialised sections, are required for these functions.

The manning required to implement this cannot be justified at present, but it will become necessary as the size and complexity of the NIB operations grow with the implementation of the Burs' Project.

The immediate need will be to appoint the development director, in its initial form as the Burs' Project Co-ordinator's Office (BPCO).

The General Manager, whose chief responsibility is policy formulation and overall control of all operations, should have senior officers under him in charge of each of the three divisions to deal with technical and day-to-day administration matters. The Deputy General Manager would co-ordinate these functions and ensure that the various sections carry out their part for the smooth implementation of the NIB programme.

CHAPTER 16 ORGANISATION, MANAGEMENT AND TRAINING

16.1 Planning Criteria

A prime consideration in planning the Bura organisation is the need to devolve responsibility for implementation activities to the appropriate levels in the overall NIB structure and to define accountability at each level of responsibility. This latter would be essential to ensure that devolution of authority does not lead to inefficiency.

The overall structure recommended for the development of Bura is based on the following planning criteria:

- (a) The Bura Project management would be set up and operated under a line of authority derived directly from the NIB general manager.
- (b) Responsibility and execution of the basic functions during the construction and operation phases of implementation will be devolved to the particular organisation and the staff undertaking the work.
- (c) Essential technical and administrative support to the project through its different phases will be provided from headquarters divisions through the Project Manager.
- (d) Provision for effective liaison between the NIB headquarters and the various Ministries and statutory authorities involved through the Steering Committee and the Bura Project Co-ordinator.

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- (ii) technical backup, particularly in engineering, mechanisation and agricultural fields;
- (iii) administration support for both construction and operating phases.

Distinct divisions or departments under the NIB general manager, incorporating various specialised sections, are required for these functions.

The restructuring required to implement this cannot be justified at present, but it will become necessary as the size and complexity of the NIB operations grow with the implementation of the Bura Project.

The immediate need will be to establish the development division, in its initial form as the Bura Project Co-ordinator's Office (BPCO).

The General Manager, whose chief responsibility is policy formulation and overall control of all operations, should have senior officers under him in charge of each of the three divisions to deal with technical and day-to-day administration matters. The Deputy General Manager would co-ordinate these functions and ensure that the various sections carry out their roles for the smooth implementation of the NIB programme.

16.3 Project Management

At the project level the initial development period will require staff under the BPCO to be stationed on site to supervise the work being carried out by contractors. Once the construction phase is over, the project level organisation should take over full control of all operations.

The project management organisation will perform the essential supply, servicing, production and marketing functions necessary to get water to the area, prepare and plant crops and organise the disposal and processing of output. The organisation required at Bura will need to take account of the remoteness of the area and the complexity of problems that the creation of a new community will involve. The need for collaboration and liaison with other government organisations, and the establishment of links with the surrounding area and its inhabitants to develop an integrated community, requires careful consideration and provision of appropriate institutions.

16.4 Training Requirements

The range of training required to cater for the needs of the project can be categorised as follows:

- (a) Pre-service training prior to undertaking a formal training course or appointment to a post following a qualification obtained at an institution.
- (b) In-service training for otherwise unqualified personnel leading to appointment to a post.
- (c) In-service training for qualified staff for the purposes of upgrading or general improvement of capability or of a refresher nature.
- (d) Formal institutional training for otherwise unqualified or under-qualified staff, leading to a basic qualification.
- (e) Tenant training in basic farming or other skills relevant to them.

In Kenya all methods of training are undertaken and all staff employed on the Bura Project will require to have some qualification whether obtained by formal or informal training systems.

The full gamut of training procedures will need to be considered and the establishment of a training section in the NIB headquarters organisation as early as possible in the development programme is necessary.

Consideration will also need to be given to the training requirements of other agencies, for example, health and education.

16.5 Pre-Service Training

Pre-service training will be most relevant to the more senior staff grades such as Field Officer (Irrigation Officer) which require a graduate level qualification. Specialised courses are required to cover aspects such as irrigation techniques, practical applications of theoretical principles and management techniques.

Up to a full year's service on an operational project would be desirable either before formal training commenced or during the training period.

NIB sponsored students should be employed on irrigation projects during vacations. This would enable the NIB to gauge the capability and interest of the prospective employees with a view to making a decision on their assignment in the organisation.

16.6 In-Service Training

In-service training will be required for otherwise unqualified individuals leading to their appointment to a post and is intended to replace formal institutional training. Staff trained in this way should, however, have the same employment and promotion prospects as the individual with a qualification obtained at an institution. This is appropriate at Field Assistant or Water Guard level. Because these grades account for a large proportion of the staff required, the training facilities will need to be geared to this requirement particularly.

In-service training would be given to serving staff to achieve two purposes:

- (a) To maintain or improve their capability in carrying out their present duties.
- (b) To upgrade their capability to qualify them for promotion or to enable them to carry out a wider range of jobs.

This is appropriate in cases where it is necessary to recruit staff with basic qualifications but lacking irrigation or management experience.

Training for this category may be both on-the-job or at institutions providing specialised courses such as the Mananga Training Centre in Swaziland.

16.7 Institutionalised Training

Institutionalised training will be largely for new recruits who will require a basic qualification before their appointment to a post in the NIB organisation.

To secure the numbers of staff required in the junior and senior grades, for which this type of training is appropriate, the NIB will have to 'sponsor' students at various institutions, including the following:

- (a) University of Nairobi where degree courses in agriculture and engineering, and a post-graduate diploma in irrigation is offered. Both these qualifications would be required for Field Officers, Research Officers, Plant Protection Officers and Engineers.
- (b) Egerton College which offers a diploma in agriculture which is regarded as equivalent to a graduate qualification.
- (c) Embu and Bukura Colleges which offer certificate level training which is appropriate for Field Assistant level staff.

16.8 Tenant Training

Tenant training is essentially part of the extension programme, and will aim at giving farmers with little or no knowledge or experience of farming the practical skills needed successfully to operate their 1.3 hectare holdings as tenants on the project.

16.9 Monitoring and Evaluation

In broad terms the objectives of the monitoring and evaluation programme would be as follows:-

- (a) To assess the technical and physical achievements of the development programme and thereafter the progress of activities involved in its continued operation and maintenance.

- (b) To carry out regular evaluations of financial and economic performance during the life of the project.
- (c) To assess the extent to which an integrated community is created at Bui and to evaluate the sociological aspects of the programme as well as its impact on the rural economy of the surrounding area.

To achieve effectively the above objectives, the monitoring and evaluation programme should include not only base line studies to establish the present situation in the area, but also an interpretation of actual development problems and patterns in the terms of future action and adjustments required to the development programme.

(a) *Soils*

Physical and chemical changes as well as productivity of all the main soil types, particularly the S₂ and G₂ classes; the requirements would be covered by a sampling procedure involving two per cent of all tenant holdings.

(b) *Forestry*

Changes in the riverine ecosystems and the extent of the riverine forests; the afforestation programme requires recording and assessment of growth and survival rates, water use data, soil analyses and felling data.

(c) *Wildlife and Ecology*

Both terrestrial and aquatic ecological systems must be considered and will require pre-development base line studies; game numbers, concentration and migration patterns, ecto-parasite and other invertebrate populations as well as the occurrence of rodent pests; fish populations including their ecology and migration in the Tana River before and after the diversion structure is built; vegetation composition and regeneration and associated fauna in the riverine and other areas, and the occurrence of pesticide and chemical residues in drainage water, vegetation and fauna of the project area.

(d) *Tenants*

The process of settlement, sociology of tenant life and the communities the project will create will require studies over a period of at least 5 years. Allied to these aspects are the questions of population growth and the impact of the project on the surrounding rural economy and its associated communities.

(e) *Irrigation and Drainage System*

Water quantity, quality and silt loads should be recorded for the main supply system and branch canals; similarly quantitative records of the drainage system, including regular measurements of groundwater levels throughout the project area, are required. Continuous evaluation of irrigation practices in conjunction with agricultural production at the field level will be required.

(f) *Agricultural Production*

In conjunction with the soils monitoring work assessment of crop production, objective studies and records covering crop husbandry practices, mechanisation and pest control services, the use of inputs and output from the scheme as a whole are required.

(g) *Training*

All aspects of the numbers of people and types of training given under the project training programmes should be considered in the relation to their performance in the development of the project.

Data on disease endemicity in the project communities would be collected by village health staff supplemented by specific epidemiological surveys of important diseases and other aspects such as nutrition, births and deaths. Similarly surveillance of disease vectors and animal reservoirs will be required in the project area.

(i) Economic and Financial Aspects

At the farm level incomes and resource use will be assessed and linked to broader studies of the overall economic performance of the project and returns to the resources employed. The financial aspects studies will cover both the utilisation and flow of funds on the project and the impact of its development on the NIB's financial situation and status.

16.10 Data Collection, Documentation and Reporting Systems

The assembly of the required data and statistics will require specific action by the organisations involved in the project, including the following:

- (a) Reporting on a regular basis, daily, weekly, monthly and annually, according to the nature of the activity. As far as possible, these reports would follow a standard presentation of information to facilitate assessment of progress, summarisation and further evaluation.
- (b) The development of an integrated management information system covering all activities involved in the project implementation and operation. The aim would be to cover all aspects of project formulation, planning, budgeting, current management information and information storage. It would incorporate a standardised framework for all project formulation and documentation following on from the PPR.
- (c) Preparation of regular financial statements and analyses for each fiscal year and at intervals within the year by the NIB, NYS, Forest Department, Wildlife Department, Ministry of Health, Ministry of Works and any other organisations or Ministries responsible for expenditure of funds in the project area.

Effective monitoring and evaluation of the project will require careful formulation of procedures for reporting and documentation and responsibility for interpretation of assembled information. Responsibility for this should lie with the NIB with the BPCO being given the job of setting up the necessary framework and co-ordinating its operation.

17.5 Building Estimates

Estimated costs of each building under review are broken down into the following building elements:

- Foundation (structure) work
- External walling
- Internal walling
- Roof construction
- Floor covering
- Windows
- Doors
- Finishing
- Electrical installations

CHAPTER 17 COST ESTIMATES AND ECONOMIC ANALYSIS

17.1 Introduction

The base costs used for all estimates are January 1977 prices. They are given in terms of prices FOB Bura, except where items are specified for use in the National Irrigation Board offices at Nairobi, when prices are given FOB Nairobi.

The cost estimates include the operating costs of the project from the present up to and including the financial year 1982-83, and are thus greater than those included in the World Bank financing plan, which covered costs up to and including 1981-82.

17.2 Construction Costs

Construction costs at Bura for civil engineering works have been estimated by applying unit rates to calculated quantities. The unit rates have been calculated by three different methods, as follows:-

- (i) from rates for other construction contracts in Kenya, extended to the situation at Bura,
- (ii) developing rates from the basic costs of units of materials, plant and labour,
- (iii) comparison of current contract rates for similar work in other countries, extended for different circumstances at Bura.

For the National Youth Services (NYS) work, estimates have been based on the published unit rate charges for NYS plant, with the costs of fuel, operation and supervisory staff and other charges included.

17.3 Vehicle and Plant Costs

These costs have been based on delivered prices quoted by local dealers including all taxes and other charges, or manufacturers' list prices and delivery charges, all less cash discounts where appropriate.

17.4 Salaries

Salary costs have been based on published Government salary scales with additional allowances for accommodation, hardship, travel, pensions and other charges, where appropriate.

17.5 Building Estimates

Estimates costs of each building under review are broken down into the following building elements:

- Foundation (substructure) work
- External walling
- Internal walling
- Roof construction
- Roof covering
- Windows
- Doors
- Plumbing
- Electrical installations

Ceiling finishes
Wall finishes
Floor finishes
Fittings
Labour

Allowance is made for external works within plot boundary and drainage up to sewer line septic tank. Works beyond plot boundaries have been taken care of in infrastructure sections the costs estimates.

Foreign exchange components are identified for typical buildings of each class, and the same foreign exchange proportion is assumed to apply to other buildings of the same class.

17.6 Economic Appraisal

The economic analyses have been carried out as required under the terms of reference for the project planning report.

The appraisal is carried out at three levels, namely the national economy, individual farm and NIB project organisation. The basic assumptions and methodology employed include the following:

- (a) Shadow pricing of foreign exchange, tenant family labour and capital.
- (b) Input prices are assessed at January-March 1977 levels by direct contact with suppliers in Nairobi. Staff costs are based on current salaries and wages paid by the NIB and Kenya Government.
- (c) Output prices are based on IBRD projections at constant 1977 values for the economic analysis and local market values for financial analyses.

The price paid to farmers for seed cotton was assumed to be K Sh 3.50 per kg, taking account of improved varieties and lower ginning costs compared to the present.

For the economic analysis, two basic situations were distinguished, firstly with foreign exchange shadow pricing and secondly without shadow pricing of this item. For the analysis a proportion of various project costs (major irrigation works) and costs of government social services provided were costed against the project. Sensitivity tests were carried out to assess the effect of changes in costs and benefits and the cropping pattern.

17.7 Farm Budgets

Farm budgets are prepared for three situations. The first relates to tenant net cash income, after meeting subsistence. This was calculated to be between K Sh 5 000 and K Sh 7 000 per annum.

The second was a check that:

- (a) The tenant would be capable of meeting all charges made for the repayment of advances for house construction, village (harambee) buildings and initial subsistence, and that
- (b) under average conditions, the tenant can pay the land and water charges proposed by the IBRD.

The position of tenants whose farms are mainly on marginal soils was assessed, with the result that if lower yields are obtained the payment capacity in respect of the land and water charges would be halved.

17.8 NIB Cash Flow

The financial outcome of the NIB project operation was examined by a cash flow analysis. All the costs and revenues of items which the NIB would directly control were analysed over a twenty year period. During the development period all funds required to establish the project were assumed to be provided by the Government on a grant basis. Thereafter the project would operate under its own budget with funds derived from the payments of land and water charges by tenants and the repayment of house, harambee buildings and subsistence advances.

17.9 Financing Plan

The financing plan is the subject of detailed negotiation with the various financing agencies, and has been dealt with outside the scope of this report.

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PART 2 TRAINING

The training requirements of the project were identified to include the following categories:

- (a) Pre-employment training for staff prior to undertaking formal training or appointment to a post.
- (b) In-service training either to provide untrained staff with the skills needed for appointment to a job or to upgrade already qualified staff.
- (c) Formal institutional training leading to a qualification.
- (d) Tenant training.

SUMMARY

PART I ORGANISATION AND MANAGEMENT

The background, criteria and principles relevant to the formulation of the organisation and management proposals are presented in some detail. The major considerations were the remoteness of the area; the need for a multi-agency approach to provide a comprehensive range of services to the project and the dearth of trained and experienced staff for its operation.

The management proposals envisage the strengthening and restructuring of the NIB headquarters to cope with the large increase in staff which the project involves. The existing Bura office would be expanded and strengthened to become the Bura Project Co-ordinators Office (BPCO) and would be responsible for the construction phase of the implementation programme. It would deal with all aspects of final planning, design of works and building, technical supervision, tenant selection, financial control and co-ordination with all Government Ministries involved in the project. The staff required for the BPCO will include a number of specialised technicians most of whom will initially be expatriates. An important consideration in setting up the BPCO will therefore be to ensure that all its staff work as a team under the Co-ordinator and the Kenyan counterpart staff are trained to form a nucleus of an NIB Development Division which in the longer term will be responsible for all new projects. The transfer of skills and technology which this involves will be the particular concern of the Training Specialist who should be assigned to the NIB headquarters staff.

Co-ordination with other Ministries will be achieved through the Bura Steering Committee and by direct contacts between BPCO and Ministry staff.

The BPCO will have an important function on site to supervise and control all contractor operations, directly control construction work undertaken by NIB and co-ordinate with district agencies responsible for providing services to the project and who will occupy the buildings or works constructed. A group of staff under the Chief Resident Engineer and working with the Deputy Project Manager, who would act as site co-ordinator, would be required.

The project level management organisation proposals involve four divisions under a Project Manager dealing with settlement, engineering, crop production and administration. This organisation would take over all works and facilities procured by the BPCO and would operate under a direct line of authority from the NIB General Manager.

Due to the vital importance of achieving success from the outset and the need for skilled and experienced staff to achieve the levels of output necessary for ensuring a viable operation, it is proposed that the services of a specialised management organisation should be contracted. This organisation would be given full responsibility for the operation of the project and NIB would second its staff to it, while it was in control at Bura.

PART 2 TRAINING

The training requirements of the project were identified to include the following categories:

- (a) Pre-service training for staff prior to undertaking formal training or appointment to a post.
- (b) In-service training either to provide untrained staff with the skills needed for appointment to a job or to upgrade already qualified staff.
- (c) Formal institutional training leading to a qualification.
- (d) Tenant training.

All forms of training would be essential for the development of the manpower resources necessary for carrying out the project programme. It is recommended that a training section should be established in the NIB headquarters to co-ordinate this sphere of operations.

Details of training requirements of various categories have been worked out and costed. The total numbers of staff trained would be as follows:

Graduates	10
Post Graduates	6
Diplomates	14
Specialised in-service training courses	22

Proposals are made for training Field Assistant grade staff using the Hola Training Centre for at least the first two years of the programme. A new centre would be established at Bura once water was available. This centre would provide facilities for conducting specialised courses for all types of staff personnel working on the project, and would be the centre of project training activities. The Project Training Officer would run the centre in addition to carrying out his general training duties.

PART 3 MANAGEMENT INFORMATION AND FINANCIAL CONTROL SYSTEMS

Details are given of the Management Information System based on proposals prepared by NIB staff. The system provides a basic framework for project formulation and planning, documentation, budgeting and accounting, and the preparation of information for decision making and management purposes. The various sub-systems it comprises and the component and configuration systems are described.

An outline is given of the accounting procedures and requirements of the project during the construction and operation phases of implementation. These proposals are formulated on the assumption that the project will be operated as an independent financial entity within the overall NIB structure. The detailed requirements for accounting systems and the related physical control of stores and equipment will be worked out in due course by the senior staff assigned to the project.

An important requirement of the accounting system is that it should provide the information required by the project management, the NIB and the financing agencies.

Finally, details are given of the monitoring and evaluation requirements of the project. These would aim to assess physical, technical and economic performance as well as sociological development. Details are given of specific studies required to establish base line data for the project.

CHAPTER 1. BACKGROUND AND FORMULATION OF A BASIC APPROACH

1.1 Introduction

While the Longleighton Irrigation Project will be one of the most expensive and sophisticated agricultural developments undertaken in Kenya it should be recognised that it is in effect only the first step of the much larger development on the west bank of the Tana River. As such it is of major national significance.

1.2 Key Problems faced at Bura

Small scale settlement projects are notoriously difficult to manage and although Kenya has demonstrated capability in this field the Bura project has several features which make it unique, these include the following:

- (a) It is a "national" project which will involve people from all districts in the country and inevitably therefore from different population groups and with varied cultural backgrounds.
- (b) The remoteness of the site - 425 km from Nairobi and 350 km from Mombasa - coupled with the lack of infrastructure and the inhospitable environment, pose problems which have not been tackled in the past.
- (c) The need to develop the whole range of services and infrastructure to make the location of a large settlement viable requires a multi-agency approach. Virtually all the Ministries of government will thus be involved in the project. This is a major task and presents a real challenge.
- (d) Funding for the construction programme will be from several international donor agencies mainly the World Bank, European Development Fund, Dutch Government and the British Government. A common basis of lending and conditions attached to the use of funds, has to be considered as well as the co-ordination of applications between the various project components and monitoring and reporting procedures.
- (e) The large commitment which the project represents in terms of Government resources, both financial and human, and the overriding need to ensure success which this necessitates.

PART 1 ORGANISATION AND MANAGEMENT

As with all projects involving settlement of people, who will depend for their whole livelihood on the output under the project, failure cannot be contemplated. Moreover in the case of Bura high levels of production, commensurate with the financial commitments and the economic objectives of the Government, will be necessary to secure viability and to ensure farmer satisfaction. To achieve these the standard of management will have to be of the highest order.

The relative isolation of the project, at the end of long and difficult lines of communication, indicates the need for self-reliance in aspects of its immediate operations involved and their control. These will be of particular importance in the supply of water, the mechanisation and input supply systems and the maintenance of all works and infrastructure serving the project settlements. These, and a host of minor aspects, will require careful planning and supervision during construction and operation. Failure to do so could result in substantial delays, unproductive levels of crop production and an unmet social objective.

CHAPTER 1 BACKGROUND AND FORMULATION OF A BASIC APPROACH

1.1 Introduction

While the Bura Irrigation Settlement Project will be one of the most expensive and sophisticated agricultural developments undertaken in Kenya it should be recognised that it is in effect only the first stages of the much larger development on the east bank of the Tana River. As such it is of major national significance.

1.2 Basic Problems Faced at Bura

Small holder settlement projects are notoriously difficult to manage and although Kenya has demonstrated capability in this field the Bura project has several features which make it unique, these include the following:

- (a) It is a 'national' project which will involve people from all districts in the country and inevitably therefore from different population groups and with varied cultural backgrounds.
- (b) The remoteness of the area - 425 km from Nairobi and 380 km from Mombassa - coupled with the lack of infrastructure and the inhospitable environment, pose problems which have not been tackled in the past.
- (c) The need to develop the whole range of services and infrastructure to make the creation of a large new population centre viable requires a multi-agency approach. Virtually all the Ministries of government will thus be involved in the programme and the co-ordination of their various functions and inputs poses a real challenge.
- (d) Funding for the construction programming will be from several international donor agencies mainly the World Bank, European Development Fund, Dutch Government and the British Government. A common basis of lending, and conditions attached to the use of funds, has to be considered as well as the co-ordination of applications between the various project components, and monitoring and reporting procedures.
- (e) The large commitment which the project represents in terms of Government resources, both financial and human, and the overriding need to achieve success which this necessitates.

As with all projects involving settlement of people, who will depend for their whole livelihood on the output under the project, failure cannot be countenanced. Moreover in the case of Bura high levels of production, commensurate with the financial commitments and the economic objectives of the Government, will be necessary to achieve viability and to secure tenant satisfaction. To achieve these the standard of management will have to be of the highest order.

The relative isolation of the project, at the end of long and difficult lines of communication, indicates the need for self-reliance in respect of the immediate operations involved and their control. Those which will be of particular importance are the supply of water, the mechanisation and input supply systems and the maintenance of all works and infrastructure serving the project settlements. These, and a host of minor aspects, will require careful planning and supervision during construction and operation. Failure to do so could result in disastrous delays, uneconomic levels of crop production and an unsettled tenant community.

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SUMMARY

PART 1 ORGANISATION AND MANAGEMENT

The background, criteria and principles relevant to the formulation of the organisation and management proposals are presented in some detail. The major considerations were the remoteness of the area; the need for a multi-agency approach to provide a comprehensive range of services to the project and the dearth of trained and experienced staff for its operation.

The management proposals envisage the strengthening and restructuring of the NIB headquarters to cope with the large increase in staff which the project involves. The existing Bura office would be expanded and strengthened to become the Bura Project Co-ordinators Office (BPCO) and would be responsible for the construction phase of the implementation programme. It would deal with all aspects of final planning, design of works and building, technical supervision, tenant selection, financial control and co-ordination with all Government Ministries involved in the project. The staff required for the BPCO will include a number of specialised technicians most of whom will initially be expatriates. An important consideration in setting up the BPCO will therefore be to ensure that all its staff work as a team under the Co-ordinator and the Kenyan counterpart staff are trained to form a nucleus of an NIB Development Division which in the longer term will be responsible for all new projects. The transfer of skills and technology which this involves will be the particular concern of the Training Specialist who should be assigned to the NIB headquarters staff.

Co-ordination with other Ministries will be achieved through the Bura Steering Committee and by direct contacts between BPCO and Ministry staff.

The BPCO will have an important function on site to supervise and control all contractor operations, directly control construction work undertaken by NIB and co-ordinate with district agencies responsible for providing services to the project and who will occupy the buildings or works constructed. A group of staff under the Chief Resident Engineer and working with the Deputy Project Manager, who would act as site co-ordinator, would be required.

The project level management organisation proposals involve four divisions under a Project Manager dealing with settlement, engineering, crop production and administration. This organisation would take over all works and facilities procured by the BPCO and would operate under a direct line of authority from the NIB General Manager.

Due to the vital importance of achieving success from the outset and the need for skilled and experienced staff to achieve the levels of output necessary for ensuring a viable operation, it is proposed that the services of a specialised management organisation should be contracted. This organisation would be given full responsibility for the operation of the project and NIB would second its staff to it, while it was in control at Bura.

PART 2 TRAINING

The training requirements of the project were identified to include the following categories:

- (a) Pre-service training for staff prior to undertaking formal training or appointment to a post.
- (b) In-service training either to provide untrained staff with the skills needed for appointment to a job or to upgrade already qualified staff.
- (c) Formal institutional training leading to a qualification.
- (d) Tenant training.

All forms of training would be essential for the development of the manpower resources necessary for carrying out the project programme. It is recommended that a training section should be established in the NIB headquarters to co-ordinate this sphere of operations.

Details of training requirements of various categories have been worked out and costed. The total numbers of staff trained would be as follows:

Graduates	10
Post Graduates	6
Diplomates	14
Specialised in-service training courses	22

Proposals are made for training Field Assistant grade staff using the Hola Training Centre for at least the first two years of the programme. A new centre would be established at Bura once water was available. This centre would provide facilities for conducting specialised courses for all types of staff personnel working on the project, and would be the centre of project training activities. The Project Training Officer would run the centre in addition to carrying out his general training duties.

PART 3 MANAGEMENT INFORMATION AND FINANCIAL CONTROL SYSTEMS

Details are given of the Management Information System based on proposals prepared by NIB staff. The system provides a basic framework for project formulation and planning, documentation, budgeting and accounting, and the preparation of information for decision making and management purposes. The various sub-systems it comprises and the component and configuration systems are described.

An outline is given of the accounting procedures and requirements of the project during the construction and operation phases of implementation. These proposals are formulated on the assumption that the project will be operated as an independent financial entity within the overall NIB structure. The detailed requirements for accounting systems and the related physical control of stores and equipment will be worked out in due course by the senior staff assigned to the project.

An important requirement of the accounting system is that it should provide the information required by the project management, the NIB and the financing agencies.

Finally, details are given of the monitoring and evaluation requirements of the project. These would aim to assess physical, technical and economic performance as well as sociological development. Details are given of specific studies required to establish base line data for the project.

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PART 1
ORGANISATION AND MANAGEMENT

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CHAPTER 1 BACKGROUND AND FORMULATION OF A BASIC APPROACH

1.1 Introduction

While the Bura Irrigation Settlement Project will be one of the most expensive and sophisticated agricultural developments undertaken in Kenya it should be recognised that it is in effect only the first stage of the much larger development on the east bank of the Tana River. As such it is of major national significance.

1.2 Basic Problems Faced at Bura

Small holder settlement projects are notoriously difficult to manage and although Kenya has demonstrated capability in this field the Bura project has several features which make it unique, these include the following:

- (a) It is a 'national' project which will involve people from all districts in the country and inevitably therefore from different population groups and with varied cultural backgrounds.
- (b) The remoteness of the area - 425 km from Nairobi and 380 km from Mombassa - coupled with the lack of infrastructure and the inhospitable environment, pose problems which have not been tackled in the past.
- (c) The need to develop the whole range of services and infrastructure to make the creation of a large new population centre viable requires a multi-agency approach. Virtually all the Ministries of government will thus be involved in the programme and the co-ordination of their various functions and inputs poses a real challenge.
- (d) Funding for the construction programming will be from several international donor agencies mainly the World Bank, European Development Fund, Dutch Government and the British Government. A common basis of lending, and conditions attached to the use of funds, has to be considered as well as the co-ordination of applications between the various project components, and monitoring and reporting procedures.
- (e) The large commitment which the project represents in terms of Government resources, both financial and human, and the overriding need to achieve success which this necessitates.

As with all projects involving settlement of people, who will depend for their whole livelihood on the output under the project, failure cannot be countenanced. Moreover in the case of Bura high levels of production, commensurate with the financial commitments and the economic objectives of the Government, will be necessary to achieve viability and to secure tenant satisfaction. To achieve these the standard of management will have to be of the highest order.

The relative isolation of the project, at the end of long and difficult lines of communication, indicates the need for self-reliance in respect of the immediate operations involved and their control. Those which will be of particular importance are the supply of water, the mechanisation and input supply systems and the maintenance of all works and infrastructure serving the project settlements. These, and a host of minor aspects, will require careful planning and supervision during construction and operation. Failure to do so could result in disastrous delays, uneconomic levels of crop production and an unsettled tenant community.

1.3 The Integrated Management and Training Approach

One of the main problems facing the NIB in establishing the organisation necessary for the operation of the project will be the shortage of personnel with experience of irrigation development under Kenyan conditions. Existing schemes have a total area of some 8 500 hectares and accommodate some 5 000 tenants in all. The NIB establishment to deal with those schemes comprises some 650 staff, mainly in the junior and subordinate grades. Phase I of Stage I of the Bura project will thus effectively nearly double the area, the number of tenants and the overall NIB establishment in the short space of five years. In formulating the staff recruitment and training programme, it is evident that while formal training is relatively easy to dispense, developing the practical experience and new skills required will be a major task. It is apparent therefore that training and transfer of technology will have to be regarded as a prime responsibility of management at all levels. As such it must be incorporated as an integral part of the overall management concept for the project. Similar considerations apply to the training of newly arrived tenants, their induction and orientation to the project.

1.4 Aspects Covered by the Management and Training Proposals

The main aspects which the present proposals aim to cover are as follows:

- (a) The relationship between the NIB and other organisations involved in the implementation of the Bura project.
- (b) The NIB headquarters organisation required to ensure that responsibility for guidance, detailed planning and control of operations and formulation of policy are clearly established.
- (c) The provision of adequate support to the project level operation from NIB headquarters.
- (d) The project level management organisation requirements including staffing and training aspects.
- (e) All aspects of the control and supervision of the technical and financial aspects of the development programme insofar as these can be foreseen. These would include monitoring and evaluation requirements.
- (f) The need to develop a management organisation which will ensure that all its members work as a team and contribute fully to the development of Kenyan manpower resources.

CHAPTER 2 THE PRESENT NIB ORGANISATION

2.1 The Overall Organisation Pattern

The National Irrigation Board (NIB) was established under the Irrigation Act of 1966 for the development, control and improvement of irrigation schemes. At that stage several schemes such as Mwea and Hola were already in existence and covered some 3 300 ha. Since then Mwea has been considerably extended, and new schemes established at Ahero, West Kano, and Bunyala. No significant new developments have taken place for some years.

The main component of the NIB organisation is the Board, comprising fourteen members, eight of whom are officials from various Ministries and five are provincial representatives. The board meets infrequently and most business is in fact dealt with by three standing committees. The executive committee is of prime importance dealing with most policy matters, while the tender and staff committees handle matters which are basically administrative in character.

For the execution of its policy, and the day-to-day administration of irrigation schemes gazetted under the Act, the Board has established an organisation headed by a general manager, with an assistant general manager below him. This organisation can broadly be divided into headquarters and scheme, or project level components.

2.2 Headquarters Organisation

The present NIB headquarters organisation structure is shown in Figure 2.1 and demonstrates the wide spread of horizontal divisions which exists at present. However, the organisation has been discussed in some detail in previous reports and there would be little purpose in further elaboration of its strengths and weaknesses at this stage. The main function of the headquarters organisation is to advise the Board on the formulation of policy and to supervise its implementation. It has technical and administrative sections to carry out these duties, and scheme managers are responsible for carrying out day-to-day operations, and are directly responsible to the general manager. In practice there is some variation in the extent to which scheme managers are delegated authority and therefore the extent to which they are able to take administrative and technical decisions on their own. Technical advice and supervision is provided as far as possible by the headquarters staff, who are organised in a number of specialised sections. The Assistant General Manager deals with most day-to-day administrative matters.

2.3 Scheme Level Organisation

The pattern of scheme level organisation varies according to the size and nature of the project involved. The Mwea project, being the largest and most successful offers the most useful basis for formulating the Bura project organisation. However, allowance would need to be made for the differing technical components involved, in particular the multiple cropping and the system of irrigation to be employed at Bura which will be significantly different from Mwea. Insofar as the procurement and distribution of inputs, mechanical maintenance facilities, and crop marketing aspects are concerned, there should be sufficient similarity to provide a basis for planning.

It is apparent that what determines whether a large project such as Bura will be a success or failure depends in the final analysis on the effectiveness of the project level management organisation. In this regard there is a clear indication from the Mwea experience that a degree of independence from the headquarters organisation is desirable for smooth and efficient execution of essential production functions. While the minimum of bureaucracy and control from above is vital for success, competence and efficiency on the part of staff are equally essential.

2.4 Evaluation of the Present Organisation

The main reasons for the present National Irrigation Board Organisation and its administration are as follows:

(a) The proliferation of line functions in the Headquarters organisation does not permit an effective chain of command or line of responsibility to develop. It is also wasteful of man's management time.

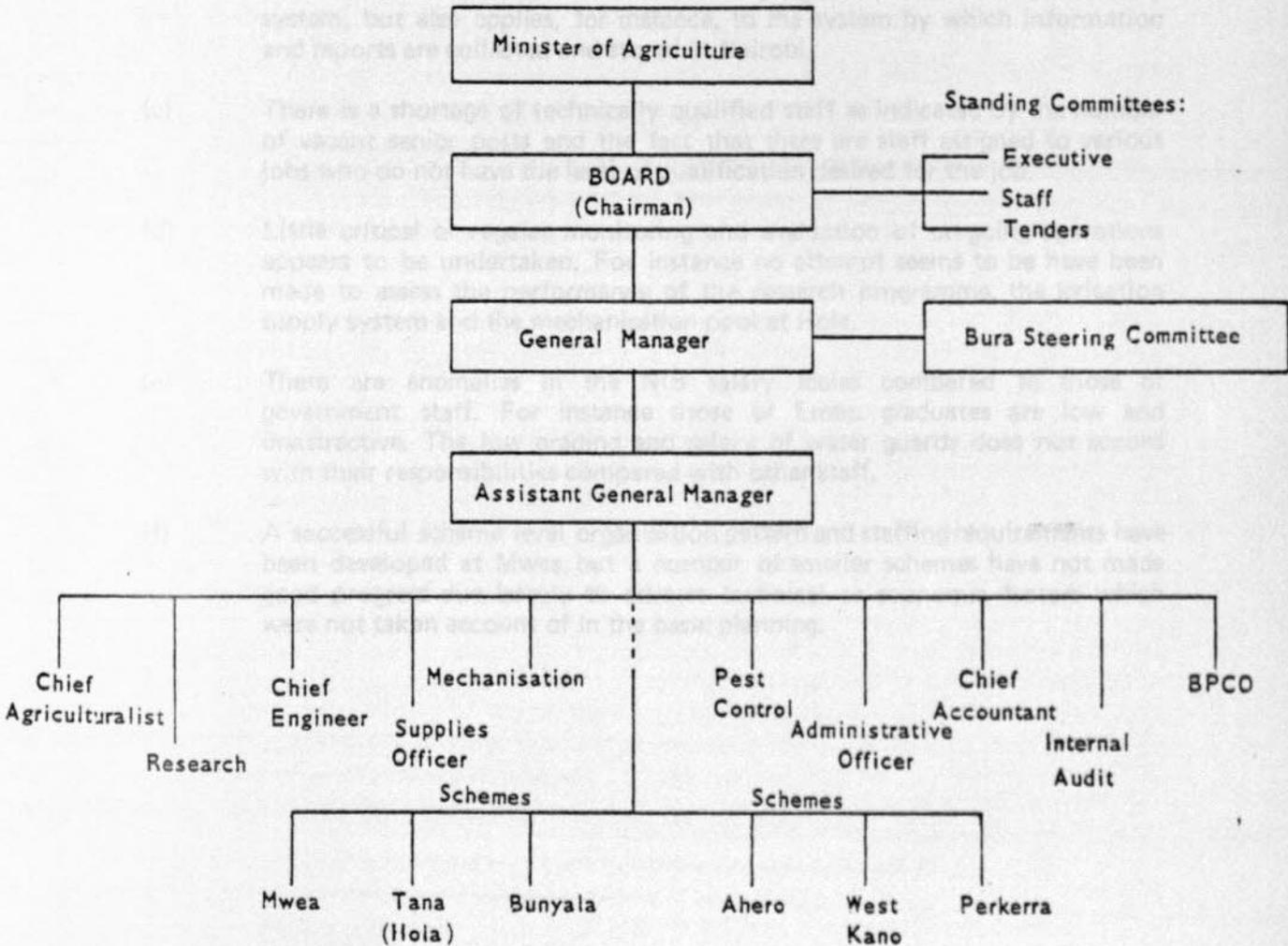
(b) A purposeful and clearly defined policy in relation to specific ongoing operation and future developments appears to be lacking. This is particularly clear at Iloilo in respect of the research programme and the water supply system, but also in the manner in which information and reports are handled.

(c) There is a shortage of technically qualified staff as well as a shortage of jobs who do not require such qualifications.

(d) Little critical appraisal of the present organisation appears to be undertaken. For instance, no attempt seems to have been made to assess the present supply system.

(e) There are anomalies in the present organisation in so far as government staff. For instance, a large number of graduates are low and unproductive. The present organisation does not accord with their respective qualifications.

(f) A successful system of recruitment and staffing procedures have been developed at Iloilo but similar schemes have not made



2.4 Evaluation of the Present Organisation

The main comments, which appear to be relevant to the present organisation and its administration, are as follows:

- (a) The proliferation of line functions in the headquarters organisation does not permit an effective chain of command or line of responsibility to develop. It is also wasteful of scarce management time.
- (b) A purposeful and clearly defined policy in relation to specific on-going operation and future developments appears to be lacking. This is particularly clear at Hola in respect of the research programme and the water supply system, but also applies, for instance, to the system by which information and reports are collected and stored in Nairobi.
- (c) There is a shortage of technically qualified staff as indicated by the number of vacant senior posts and the fact that there are staff assigned to various jobs who do not have the level of qualification desired for the job.
- (d) Little critical or regular monitoring and evaluation of on-going operations appears to be undertaken. For instance no attempt seems to have been made to assess the performance of the research programme, the irrigation supply system and the mechanisation pool at Hola.
- (e) There are anomalies in the NIB salary scales compared to those of government staff. For instance those of Embu graduates are low and unattractive. The low grading and salary of water guards does not accord with their responsibilities compared with other staff.
- (f) A successful scheme level organisation pattern and staffing requirements have been developed at Mwea, but a number of smaller schemes have not made good progress due largely to adverse technical or economic factors which were not taken account of in the basic planning.

CHAPTER 3 THE ORGANISATION STRUCTURE PROPOSED FOR PROJECT IMPLEMENTATION

3.1 Principles and Planning Criteria Applicable

A prime consideration in planning the Bura organisation is the need to devolve responsibility for implementation activities to the appropriate levels in the overall NIB structure and to define accountability at each level of responsibility. This latter would be essential to ensure that devolution of authority does not lead to inefficiency.

The overall structure recommended for the development of Bura is shown in Figure 3.1 and is based on the following planning criteria:

- (a) The Bura project management would be set up and operated under a line of authority derived directly from the NIB general manager.
- (b) Provision should be made for responsibility and execution of the basic functions during the construction and operation phases of implementation to be devolved to the particular organisation and the staff undertaking the work.
- (c) Provision of the essential technical and administrative support to the project through its different phases from headquarters divisions through the Project Manager.
- (d) Provision for effective liaison between the NIB headquarters and the various Ministries and statutory authorities involved through the Steering Committee and the Bura Project Co-ordinator.

3.2 NIB Headquarters Organisation Requirements

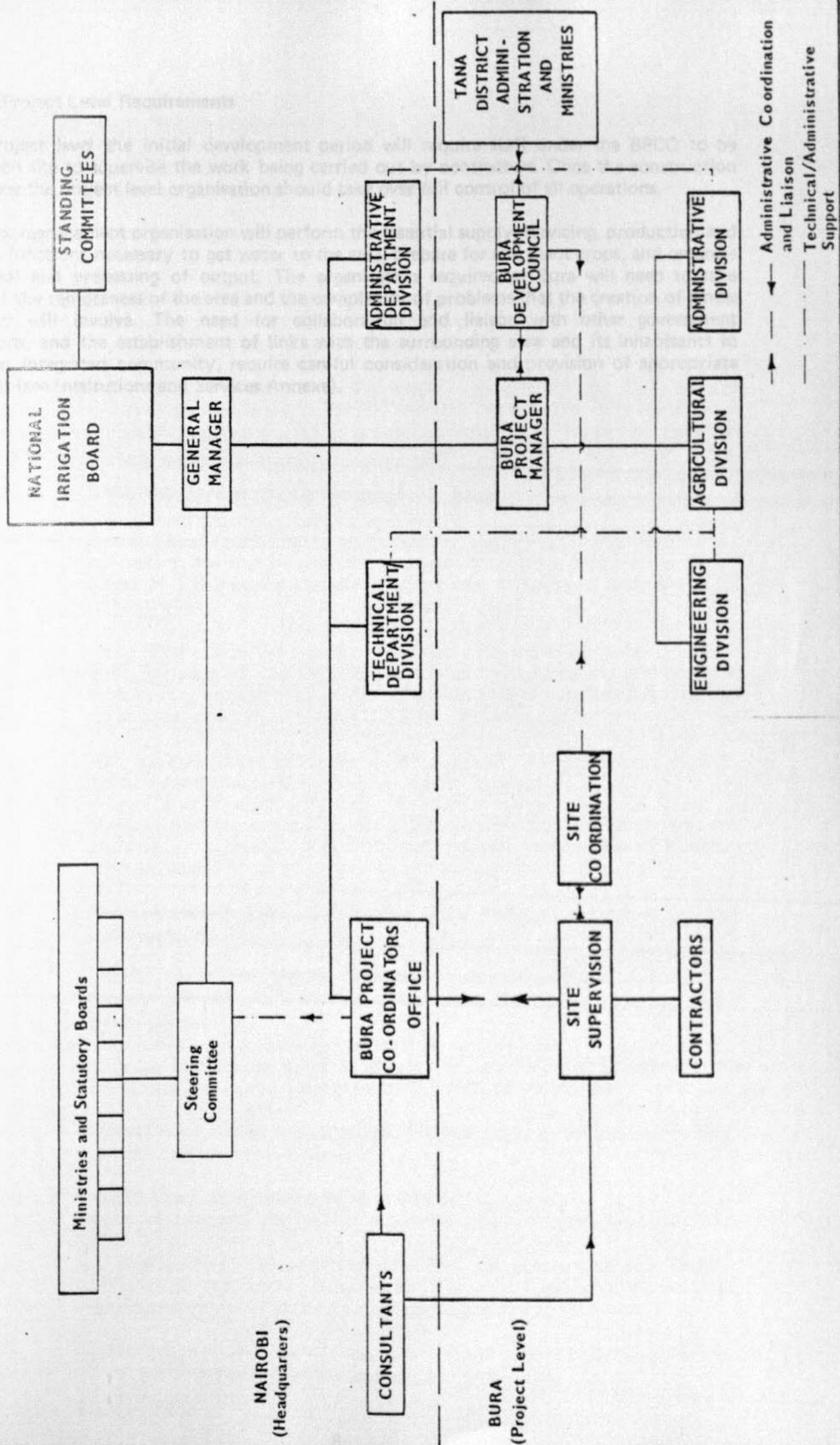
There are three distinct functions which the headquarters organisation must provide for: final planning and supervision of the project development during the construction and initial operation period; technical back-up particularly in engineering, mechanisation and agricultural fields; and administration support for both construction and operating phases. To develop these functions fully will in the long term require establishment of three distinct divisions or departments under the NIB general manager. Each division would in turn incorporate various specialised sections.

The restructuring required to implement the above cannot be justified and is probably not necessary at present. But it will become necessary as the size and complexity of the NIB operations grow with the implementation of the Bura project. A progressive approach will be required aiming at careful expansion and changes being made as experience and need justify them. The long term aim would be to establish the three divisions indicated with appropriate authority and responsibilities devolved to them.

The immediate need will be to establish the development division in its initial form as the Bura Project Co-ordinator's Office (BPCO). This office already exists but will require considerable expansion both in size and function. Further details are given in Chapter 4.

The General Manager, whose chief responsibility is policy formulation and overall control of all operations, should have senior officers under him in charge of each of the three divisions to deal with technical and day-to-day administration matters. The Deputy General Manager would co-ordinate these functions and ensure that the various sections carry out their roles for the smooth implementation of the NIB programme.

OVERALL ORGANISATION STRUCTURE



3.3 Project Level Requirements

At the project level the initial development period will require staff under the BPCO to be stationed on site to supervise the work being carried out by contractors. Once the construction phase is over the project level organisation should take over full control of all operations.

The project management organisation will perform the essential supply, servicing, production and marketing functions necessary to get water to the area, prepare for and plant crops, and organise the disposal and processing of output. The organisation required at Bura will need to take account of the remoteness of the area and the complexity of problems that the creation of a new community will involve. The need for collaboration and liaison with other government organisations, and the establishment of links with the surrounding area and its inhabitants to develop an integrated community, require careful consideration and provision of appropriate institutions (see Institutions and Services Annexe).

The Stage I programme for the Bura Project Co-ordinator's Office would be established in the NIB Nairobi Headquarters to undertake the final planning, design, technical supervision, tenant selection, financial control and administrative co-ordination of all works and activities which the project involves during the construction phase.

The duties involved in carrying out these activities would be as follows:

- (a) Planning and co-ordinating of the inputs required for engineering works, agriculture, housing and settlement, education, welfare, security, health and nutrition, and ensuring that they are provided promptly to meet the needs of the project.
- (b) Procurement of all the facilities required such as engineering works, on-farm works, housing and buildings for NIB and other Ministries and organisations, vehicles and equipment, whether by international competitive bidding (ICB), local competitive bidding (LCB) or force account.
- (c) Planning and co-ordinating the total supply of farm inputs such as seeds, fertilizer and chemicals under donor agency funding.
- (d) Making adjustments to the planned programme to accommodate changes due to delays or completion ahead of schedule of various operations or technical considerations.
- (e) Planning, arranging and co-ordinating initial training programmes for staff and tenants.
- (f) Planning and arranging for selection, transportation and induction of tenants, and co-ordinating settlement with the construction of village infrastructure.
- (g) Planning and taking steps to ensure the harmonious integration of the individual population living in peripheral areas to the project.
- (h) Co-ordination of the various research projects and base line surveys necessary for monitoring and evaluation.
- (i) Monitoring and evaluation of farm economics, advising on farmers' charges, repayment capacity and method of levying water and land charges.
- (j) Arranging for studies and reports as may be necessary on such items as agricultural machinery requirements, crop processing and marketing developments, soil changes, groundwater movement and the like.
- (k) Procurement of services required to undertake studies not detailed elsewhere or on abnormal aspects of the development programme.

CHAPTER 4 THE ORGANISATION PROPOSED FOR THE CONSTRUCTION PHASE OF IMPLEMENTATION

4.1 The Bura Project Co-ordinator's Office (BPCO)

Phase I of Stage I of the Bura project does not on its own entirely justify setting up a fully fledged development division, this would however be necessary if Stage II on the east bank proceeds. If it follows closely on Stage I then a progressive build-up would be feasible, from the organisation proposed here. In any event every effort should be made to ensure continuity of staffing so that full advantage can be obtained from the opportunity to build up a core of qualified and experienced development staff and the transfer of experience and knowledge.

For the immediate problem of implementing the Stage I programme the Bura Project Co-ordinator's Office would be established in the NIB Nairobi headquarters to undertake the final planning, design, technical supervision, tenant selection, financial control and administrative co-ordination of all works and activities which the project involves during the construction phase.

The duties involved in carrying out these activities would be as follows:

- (a) Planning and co-ordination of the inputs required for engineering works, agriculture, housing and settlement, education, welfare, security, health and nutrition, and ensuring that they are provided timeously to meet the needs of the project.
- (b) Procurement of all the facilities required such as engineering works, on-farm works, housing and buildings for NIB and other Ministries and organisations, vehicles and equipment, whether by international competitive bidding, (ICB), local competitive bidding (LCB) or force account.
- (c) Planning and co-ordinating the initial supply of farm inputs such as seeds, fertilizers and chemicals under donor agency funding.
- (d) Making adjustments to the planned programme to accommodate changes due to delays or completion ahead of schedule of various operations or technical considerations.
- (e) Planning, arranging and co-ordinating initial training programmes for staff and tenants.
- (f) Planning and arranging for selection, transportation and induction of tenants, and co-ordinating settlement with the construction of village infrastructure.
- (g) Planning and taking steps to ensure the harmonious integration of the indigenous population living in peripheral areas to the project.
- (h) Co-ordination of the various research projects and base line surveys necessary for monitoring and evaluation.
- (i) Monitoring and evaluation of farm economics, advising on farmers' charges repayment capacity and method of levying water and land charges.
- (j) Arranging for studies and reports as may be necessary on such items as agricultural machinery requirements, crop processing and marketing developments, soil changes, groundwater movement and the like.
- (k) Procurement of services required to undertake duties not detailed elsewhere or on abnormal aspects of the development programme.

- (l) Planning and control of the funds required for the project, including detailed estimates, budgets, cash flow statements and disbursement procedures under the various loan and credit agreements made for funding.
- (m) Liaison and co-ordination with all the government Ministries and statutory authorities providing services in or to the project area and its inhabitants.
- (n) Monitoring progress of development and preparation of reports according to the reporting procedures of Government, and the agencies financing the project.
- (o) Supervising the preparation of the feasibility study for the development of the area on the east bank as Stage II of the Lower Tana river development programme.

The above activities are both diverse and complex. It is apparent that the BPCO must be geared from the outset to not only handle the logistics of all operations under the direct control of the NIB, but also be responsible for the correct phasing and co-ordination of those components which are the concern of other government or statutory agencies.

The proposed organisation and its relationship to the NIB and other Ministries is shown in Figure 4.1. The Steering Committee, site supervision, procurement and financial control and implementation of the BPCO are discussed below.

A Project Co-ordinator would be appointed at Assistant General Manager level, to take charge of the BPCO. He would have a deputy who will be experienced in the integrated development of irrigation agriculture, and administration of multi-discipline teams. The supporting staff required on a full time basis to carry out the duties of the BPCO will include the following:

- Engineers specialised in planning, construction and procurement
- Agricultural economist (planning)
- Sociologist
- Training specialist
- Settlement officer
- Information officer
- Financial controller and administrator

These staff would be responsible under the Deputy Co-ordinator's direction, for identifying the various agricultural, engineering, infrastructural, human, technical and financial elements of the development programme components. During the construction phase they would be involved in the detailed planning, preparation of designs, execution of various operations, adjustment of the programme and the assembly of all data and reports required for effective control, monitoring and evaluation. In the post-construction phase various members of the team, particularly the planning engineer, the economist and the sociologist would have a continuing role in evaluating progress over the longer term.

An overall consideration in setting up the BPCO will be the need to ensure that the staff comprising it works as a team under the Co-ordinator's direction, and as an integral unit of the NIB organisation. Thus while it may be necessary initially, due to the shortage of qualified and suitably experienced staff, to employ expatriates from various sources, a basic pre-qualification of their employment would be their willingness to participate as a member of a development team. To this would be added the requirement to train Kenyan counterparts and junior staff with the ultimate objective that they would form the nucleus of the future development division. To achieve these objectives it will be essential to have clearly defined responsibilities and authority at all levels and that counterpart staff are given on-the-job training in the course of their duties.

4.2 The Bura Steering Committee

A Steering Committee was established by the NIB in connection with the feasibility study of Stage I of the project. However, the functions and operation of this committee will require up-dating for its future role and should be clearly specified and understood by the Ministries involved. In the past it was mainly concerned with policy issues and the control of contract operations. In future its role will be to ensure that there is co-ordination and satisfactory performance of the NIB controlled activities and those carried out by the various Government agencies required to provide services necessary for the implementation of the project.

The Committee would be formed from senior officers of the participating agencies (see Figure 4.1) under the chairmanship of the NIB General Manager. In general each of these officers would be the actual individual in the Ministry directly concerned with, or responsible for the project activities. The Project Co-ordinator would be secretary to the committee and this would reinforce the direct links between the BPCO and the Ministries and enhance the committee's role as a forum for discussion.

The Steering Committee will have a relatively large membership and thus will not be able to meet very frequently if it is not to cause interference with the normal duties of the staff sitting on it. To fulfill the need for action on day-to-day matters it is recommended that an Executive Committee consisting of not more than six members be appointed. The membership of this committee would include the representatives of the following agencies:

Office of the President (Department of District Administration)
Ministry of Finance and Planning
Ministry of Works

4.3 Award of Procurement Contracts

Procurement contracts will be required for the construction of the works and the provision of vehicles, plant and equipment for the operation of the project. The preparation and issue of tender documents and analysis of tenders would be undertaken by the project consultants. Their recommendations would be forwarded to the Project Co-ordinator's office for review and submission to the NIB General Manager for approval.

4.4 Site Supervision and Co-ordination

During construction, when the main project works are being undertaken by contractors, it will be essential for the BPCO to perform three basic functions at Bura:

- (a) Supervision and control of contractor operations to ensure that specifications are adhered to, to monitor progress of work and to measure completed works for certification and payment purposes (and re-imburement from funding agencies).
- (b) Direction of work being undertaken by the NIB direct, such as 'harambee' construction of community halls and schools, and the tenant house building programme.
- (c) Co-ordination with the agencies who will occupy or use the buildings or works on completion, for instance, health, education and local administration.

The main staff involved in this aspect of the BCPO's work will be the Procurement Engineers, the Chief Resident Engineer and the Site Co-ordinator. The latter task would be assigned to the Deputy Project Manager who would be required to establish the vital liaison link between construction and operational teams and phases of the development programme.

The Chief Resident Engineer (CRE) will be responsible to the Deputy Project Co-ordinator for ensuring that the works are constructed in accordance with the contract documents. Each month he will certify the work done in accordance with the contract documents and certify payment due. On approval of the payments due NIB will make the necessary local and foreign currency disbursements and advise the Ministry of Finance and Planning to apply for any reimbursement from the cofinancers according to the terms of the loan and credit agreements.

On satisfactory completion of the works, certified by a Certificate of Completion issued by the CRE subject to the approval of the General Manager of NIB through the Project Co-ordinator, they will be formally handed over by the contractor or construction organisation to NIB, under the direction of the CRE. A 'Maintenance Period' normally follows the issue of the Completion Certificate during which the contractor or construction organisation is liable for defects resulting only from bad workmanship or materials. It would not be responsible for maintenance due to normal fair wear and tear which would be an NIB responsibility.

The CRE would prepare a monthly progress report on each contract setting out the general progress of the works, contractors, plant and personnel on site, any delays or anticipated bottlenecks, and the financial state of the contract. These reports will be reviewed by the Project Co-ordinator's staff to assess the general progress of the works and to ensure proper liaison with other participating government organisations.

The responsibilities of the CRE will be fully described in the contract documents and in the Agreement for Consulting Services between NIB and the project consultants. The CRE will be assisted by a Resident Engineer responsible for each contract supported by Assistant Engineers and Clerks of Works who will be mainly experienced employees of the project consultants. However these staff will include a number of local graduate engineer trainees who will, when trained, be able to undertake responsible posts in the supervision of subsequent construction contracts.

On completion of a contract the CRE will prepare sets of 'as constructed' drawings and a Completion Report, and assemble manufacturers' maintenance and operational manuals. These will be formally submitted to NIB. If required and instructed by NIB the project consultants would prepare an 'Operations and Maintenance Manual' as an additional duty. The Final Measurement of the contract would be prepared and any monies due to the contractor would be certified by the CRE, and on approval by the General Manager of NIB through the Project Co-ordinator, payment would be made by NIB and the Ministry of Finance and Planning advised accordingly.

4.5 Other Aspects of the BPCO Operation

Various other aspects of the BPCO organisation and its duties need to be mentioned here:

The Role of Consultants

The need for consultants will arise during the initial construction phase to provide the required specialised staff with experience of implementation and control of large scale irrigation programmes. This strengthening of the BPCO should be geared not only to the successful development of the project but also to the establishment of a core of competent local staff as a nucleus for the NIB Development Division. The need to achieve transfer of 'know-how' and technical skills must be given due attention in the formulation of agreements covering the services provided.

Supervision of Tenants Housing and Harambee Building Construction

The construction of tenants houses and various harambee buildings by the tenants shortly after their arrival on the project will require direct supervision and should be a function of the BPCO site operations. The staff required to carry out the works would in fact be the future building section of the project management organisation.

Although the BPCO will operate as an independent division there will need to be close links with the other NIB headquarters divisions. Those which will be most significant are the following:

- (a) Technical design work which will be necessary for irrigation works and houses should be discussed with the relevant specialist section. For instance a case in point is in housing where the outline conceptual designs for houses should be prepared by the Architectural Section.
- (b) Staff appointments which will have to be made through the Administrative Division.
- (c) Financial matters and procedures will similarly need to be incorporated into the NIB system.
- (d) Procurement of major items will need to be dealt with by the Tender Committee of the Board.

5.2 The Sura Project Management Organization

The project management organization would be responsible for carrying out the following functions:

Agricultural Production

Supervision of all cropping and irrigation activities, tenant husbandry practices, mechanization, soil management, pest and disease control, research and soil monitoring.

Engineering

Operation and maintenance of the irrigation and drainage system, building maintenance, repair and maintenance of the agricultural machinery and heavy irrigation system (pump plant).

Accounting and Administration

Procurement of supplies and stores control, credit and project accounting, personnel administration, statistics and office administration, training of staff and tenants, tenant relations (post settlement).

Caravan

Tenant reception, feeding and induction, orientation, initial organization and initial development of village communities.

Co-ordination and Liaison

Liaison and co-ordination with local authorities and government ministries providing services to the settlement communities (staff and tenants).

The organizational structure recommended to perform these functions is shown in Figure 5.1. It would consist of the Project Manager and his deputy under whom four divisions would be set up to deal with settlement, engineering, agricultural production and administration, respectively. The settlement division would only continue during the period of tenant arrival and relocation on the project, once all the villages were fully established this division would be dismantled. The staff assigned to it from the Ministry of Land and Settlement would then either return to their

CHAPTER 5 THE ORGANISATION PROPOSED FOR PROJECT OPERATION

5.1 General

Formulation of the overall management requirements for operation of the project poses no special technical problems because the NIB has gained useful experience at Mwea and other on-going schemes. Perhaps the most significant principle relevant to the Bura situation is the need for full managerial, financial and administrative control to be vested in the Project Manager at Bura under the direct authority of the Board and the General Manager in Nairobi.

The recommendation of the World Bank which is fully supported by the Consultants, is that the operation of the project be undertaken by a firm or organisation specialising in the management of agricultural projects. The organisation should be given full responsibility for this aspect of the implementation programme under a contractual arrangement covering a minimum period of six years, commencing in the fiscal year 1977/78. This will ensure that their staff are involved in the final detailed planning of the project by the BPCO. The contracted organisation would provide a Project Manager and the supporting staff who are not available or cannot be recruited in Kenya. The NIB would second all other supporting senior staff and junior staff to the organisation during the period of its control.

5.2 The Bura Project Management Organisation

The project management organisation would be responsible for carrying out the following functions:

Agricultural Production

Supervision of all cropping and irrigation activities, tenants husbandry practices, mechanisation services management, pest and disease control, research and soil monitoring.

Engineering

Operation and maintenance of the irrigation and drainage system, building maintenance, repairs and maintenance of the agricultural machinery and heavy irrigation system upkeep plant.

Accounting and Administration

Procurement of supplies and stores control, tenant and project accounting; personnel, staff administration, statistics and office administration, training of staff and tenants, tenant relations (post settlement).

Settlement

Tenant reception, feeding and induction, orientation, initial organisation and initial development of village communities.

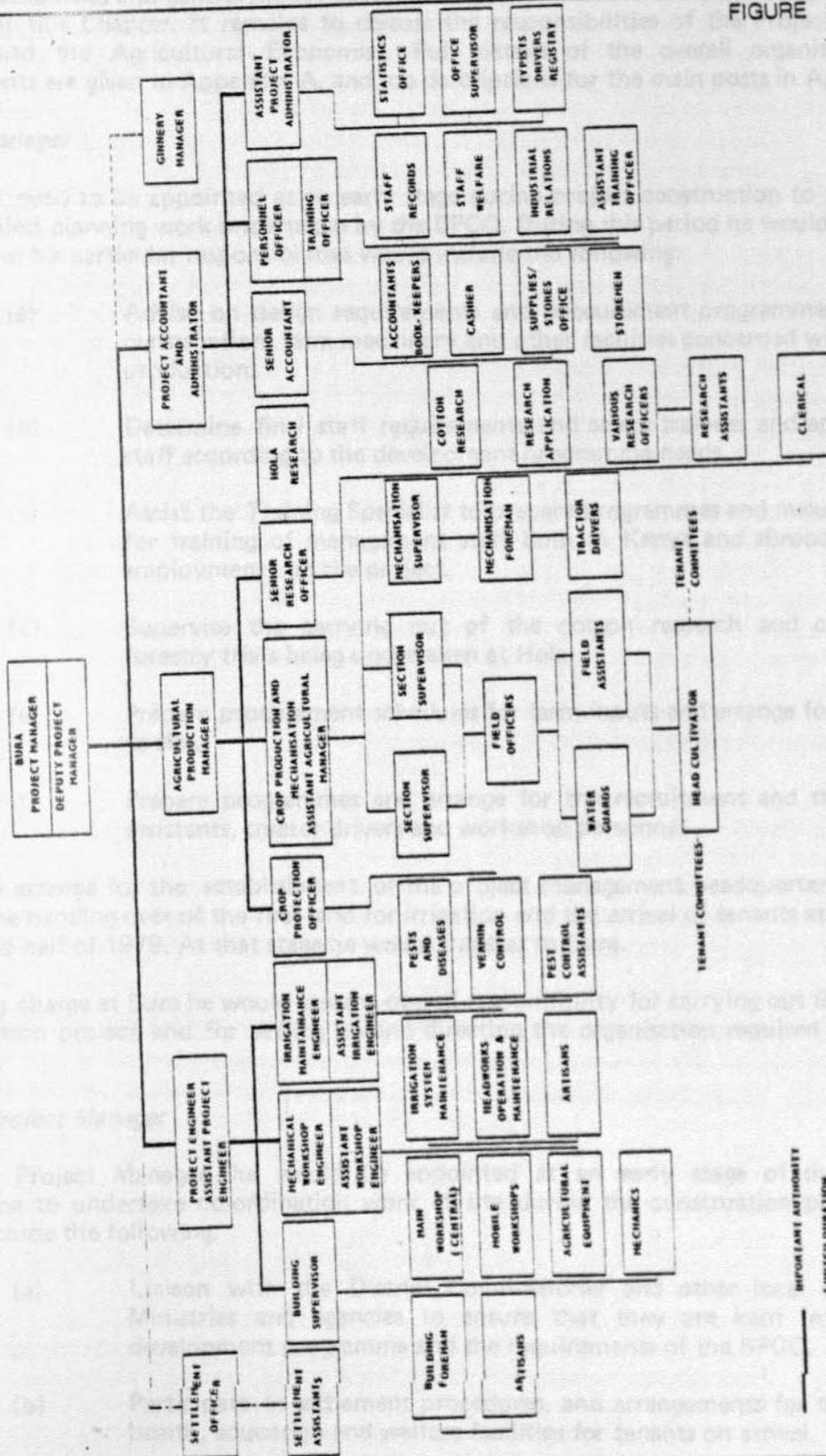
Co-ordination and Liaison

Liaison and co-ordination with local administration and government Ministries providing services to the settlement communities (staff and tenants).

The organisation structure recommended to perform these functions is shown in Figure 5.1. It would consist of the Project Manager and his deputy under whom four divisions would be set up to deal with settlement, engineering, agricultural production and administration, respectively. The settlement division would only continue during the period of tenant arrival and induction on the project, once all the villages were fully established this division would be dismantled. The staff seconded to it from the Ministry of Lands and Settlement would then either return to their

PROJECT MANAGEMENT ORGANISATION (FOR OPERATION)

FIGURE 5.1



——— REPORTING AUTHORITY
 - - - - - LIMITED DURATION
 - - - - - NON-ADMINISTRATIVE
 RESPONSIBILITY

own department or transfer to the next phase of the development project which might be on the east bank of the Tana River.

The responsibilities and general *modus operandi* of the four divisions is described in the following sections of this Chapter. It remains to discuss the responsibilities of the Project Manager, his Deputy and the Agricultural Economist. Full details of the overall organisation staffing requirements are given in Appendix A, and job descriptions for the main posts in Appendix B.

Project Manager

He would need to be appointed at an early stage during project construction to assist with the final detailed planning work undertaken by the BPCO. During this period he would be resident in Nairobi and his particular responsibilities would include the following:

- (a) Advise on design requirements and procurement programmes for buildings construction, farm machinery and other facilities concerned with agricultural production.
- (b) Determine final staff requirements and select trainees and appoint suitable staff according to the development programme needs.
- (c) Assist the Training Specialist to prepare programmes and make arrangements for training of management staff both in Kenya and abroad prior to their employment on the project.
- (d) Supervise the carrying out of the cotton research and co-ordinate the forestry trials being undertaken at Hola.
- (e) Prepare procurement schedules for farm inputs and arrange for their delivery to site.
- (f) Prepare programmes and arrange for the recruitment and training of field assistants, tractor drivers and workshop personnel.

He would arrange for the establishment of the project management headquarters at Bura to fit in with the handing over of the first land for irrigation and the arrival of tenants at the site during the second half of 1979. At that stage he would transfer to Bura.

On taking charge at Bura he would assume overall responsibility for carrying out the operation of the irrigation project and for setting up and directing the organisation required to achieve this objective.

Deputy Project Manager

Like the Project Manager, he would be appointed at an early stage of the development programme to undertake co-ordination work at site during the construction phase. His duties would include the following:

- (a) Liaison with the District Commissioner and other local officials of the Ministries and agencies to ensure that they are kept informed of the development programme and the requirements of the BPCO.
- (b) Participate in settlement procedures, and arrangements for the provision of health, education and welfare facilities for tenants on arrival.
- (c) Liaise with the Chief Resident Engineer in charge of construction and form the bridge between construction and local administration and services.

- (d) Until the arrival of the Project Manager on site, to receive from the contractors, on the recommendations of the Chief Resident Engineer, those portions of the works completed and commissioned.
- (e) Arrange for the handing over of buildings and facilities to local officials appointed to deal with local administration, health, education, welfare and security.
- (f) Assist the Training Officer to organise training programmes for tenants covering community development and agricultural aspects.

Following the completion of the construction programme and settlement of tenants he will have particular responsibility for the welfare of tenants and will deal with all matters connected with tenants' leases, discipline, services, co-operative development and the co-ordination of the agricultural and livestock extension carried out by the Ministry of Agriculture. In due course depending on the performance and capability demonstrated and with the agreement of the co-financiers and the management specialist contractor, he may be promoted to be in overall charge of the project.

Agricultural Economist (Management)

The Agricultural Economist (Management) who would be a local officer would play an important role in carrying out detailed management and production economic studies of the major enterprises and activities necessary to assess their efficiency in physical and financial terms. He would also monitor and evaluate the detailed economic situation of the tenant farms in terms of the resources, cropping patterns and production, and income achievements. He would also assist in the interpretation of research results in terms of their economic implications.

His work would cover all the activities undertaken on the project and he would be under the direct control of the Project Manager.

5.3 The Settlement Division

The staff in this division would be seconded from the Ministry of Lands and Settlement to deal with the settlement of tenants on the project. During their secondment they would be responsible to the project management, being under the direct control of the Deputy Project Manager.

The responsibilities of the division would be the reception, placement, induction and orientation of tenants arriving on the project. In carrying out these responsibilities a close working relationship would be necessary with the Community Development staff of the Department of Social Services.

5.4 The Engineering Division

This division would be responsible for the performance of the engineering functions on the project which are as follows:

- (a) The supply and regulation of water to the cultivated area, to the afforestation area and for the drinking pools.
- (b) The maintenance and upkeep of all project works including the supply and main canals, the irrigation layout and on-farm works, the distribution works in the afforestation area and the project road network.
- (c) The maintenance of all buildings including those of the NIB and other agencies.

- (d) The maintenance and repair of all NIB vehicles, heavy plant and agricultural machinery including the operation of the necessary workshops and supplies of stores and spares required.
- (e) The design and construction of new works and repair or remedial works delegated by NIB headquarters.
- (f) Collaboration with the Ministry of Water Development and the Ministry of Works in matters concerning water supplies and buildings.
- (g) Provision of service to the cotton ginnery and any other organisation on a repayment basis.

The Project Engineer would have overall charge of the division but would have under him an Assistant Project Engineer and senior staff in charge of three sections dealing with specialised operations. The three sections and their organisation as shown in Figure 5.1 would be as follows:

Building Maintenance

Controlled by an experienced Building Supervisor the section would maintain all NIB housing, offices, workshops, stores and community centres and any other buildings whose maintenance was delegated to the NIB. The staff of the section would comprise 20 artisans and an equal number of labourers under the 'direct' control of a Building Foreman. The section would have its own section in the project stores and equipment.

During the construction phase of the programme the staff of this section would direct and supervise the construction of tenant houses and buildings constructed under the harambee system.

Mechanical Workshops

The central project workshops would be located in the Rural Centre and would be under the control of an experienced qualified Mechanical Engineer. All project vehicles, plant and equipment would be repaired and maintained by these workshops. Similar services would be provided to other organisations and the cotton ginnery on a commercial charge basis. The workshops would have their own comprehensive spares and stores. Mobile workshop units would deal with routine servicing and minor repairs in the field.

The staffing of the workshops would be as follows:

- 1 Assistant Mechanical Engineer/Supervisor
- 2 Workshop Foremen, one of whom would be in charge of mobile units and the other for one main workshop.
- 16 Mechanics
- 16 Labourers
- 2 Storemen/Clerks

Irrigation Operation and Maintenance

This key section would deal with all irrigation supply and distribution works under the Irrigation Maintenance Engineer and Assistant Irrigation Engineer. The canal headworks and initially the temporary pumping station, would be controlled by the Headworks Operator. The operation and maintenance of the supply canal, main canal, night-storage reservoirs and all gates and structures would be the responsibility of the Irrigation Foreman and the Senior Water Guard with assistance from the mechanics and labour assigned to the section.

A full complement of heavy plant and equipment required for keeping the headworks and canal system free of silt and weeds is necessary. The operation and use of this machinery would be the Irrigation Section's responsibility.

5.5 The Agricultural Production Division

This division will be responsible for the performance of all agricultural production operations which the project undertakes directly or which are carried out by tenants. The functions carried out will be as follows:

- (a) the carrying out of all basic land preparation operations for crop production;
- (b) assisting and advising tenants on all aspects of crop husbandry and the use of inputs supplied by the NIB;
- (c) the application and control of irrigation water application to crops;
- (d) the harvesting, grading and preparation of crops for disposal or storage for the tenants' own use;
- (e) provision of pest and weed control services;
- (f) research into all aspects of crop production involved in the project programme;
- (g) monitoring the performance and quality of all crop production operations and output and soil changes.

The division would be controlled by the Agricultural Production Manager and would be operated in three sections (see Figure 5.1) as follows:

Crop Protection

The Crop Protection Officer would be assisted by two Assistant Crop Protection Officers, one dealing with pests and diseases, and the other with vermin control. Other staff would be 12 Pest Control Assistants and 6 Pest Control Guards. The latter staff would be resident in the villages.

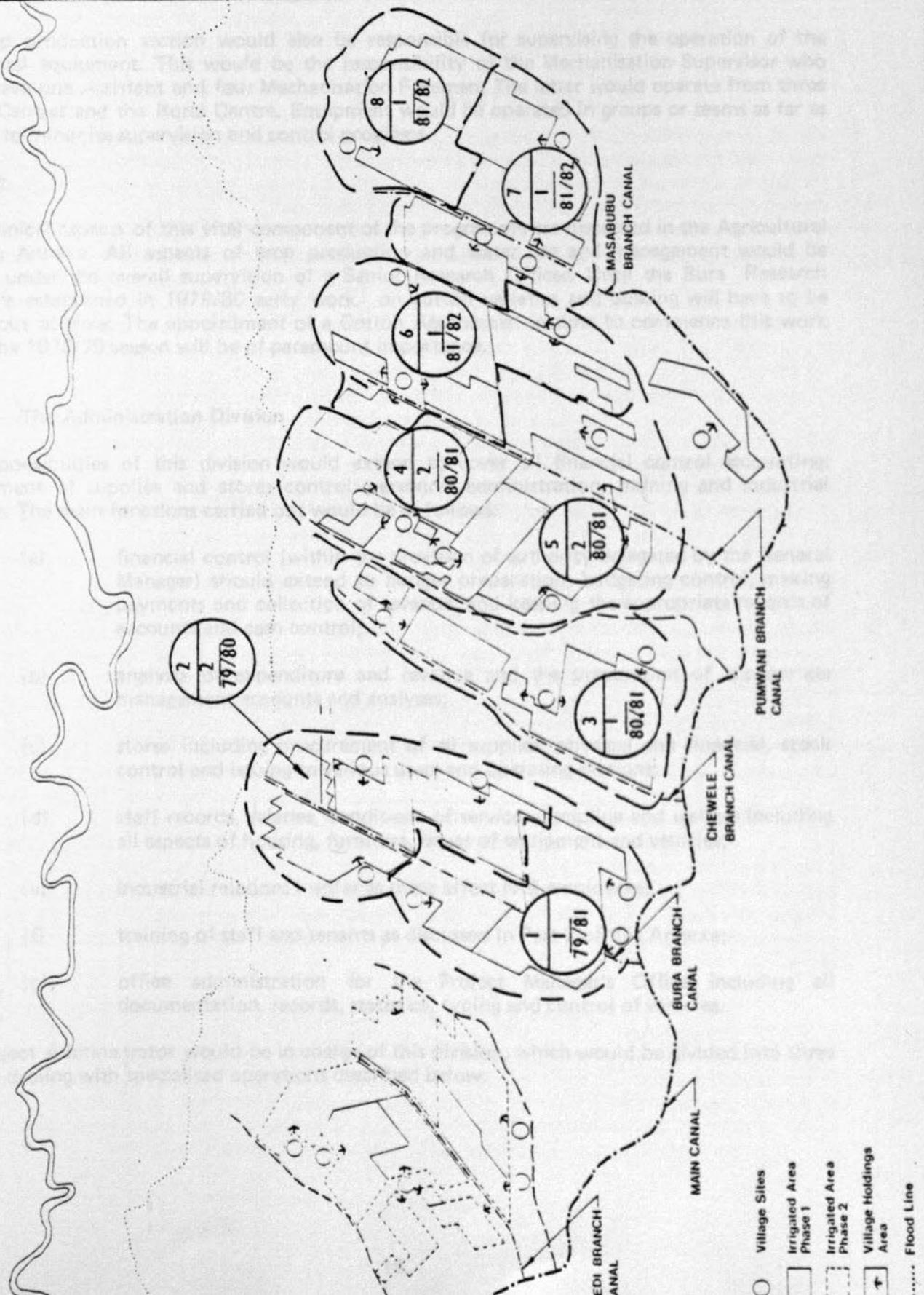
These staff would generally work as a team carrying out surveys and counts to monitor levels of infestation of pests and prepare control programmes based on their findings. They would also supervise the application of all insecticides and rodenticides to ensure their proper use and to avoid any hazards to human and animal population.

Crop Production and Mechanisation

This section would be under the Assistant Agricultural Manager and would provide the main technical extension and mechanisation requirements of the project. Appropriately it would have a relatively large specialised staff who would be organised to ensure that their areas of responsibility coincide as far as possible with irrigation blocks and units.

Initially the project would be divided into two sections each under the direction of a Section Supervisor. In due course the need for this category of staff is expected to disappear and the main division of the project would be into Field Blocks of about 500 hectares, each under a Field Officer (equivalent to the present Irrigation Officer which is considered to be an inappropriate term considering the nature of their duties). There would be eight Field Officers (see Figure 5.2 for location of the areas) who would direct all crop production activities carried out in their blocks. The Field Assistants will be the staff dealing directly with tenants and supervising their farming operations while Water Guards will handle the distribution of water to tenants. Both these categories of staff will be resident in villages and it would be particularly desirable that the area each man covers coincides with identifiable units in the irrigation system. The overall requirements and rates of staffing used for planning are as follows:

DIVISION AND PHASING OF FIELD OFFICE BLOCKS



	Number per Village	Total Number
Field Assistants	3 reducing to 2 after 4 years	68 reducing to 48
Water Guards	2	46

Senior Field Assistants and Senior Water Guards would be stationed in Market Centres and Local Centres and would number 12 and 4 respectively.

The crop production section would also be responsible for supervising the operation of the agricultural equipment. This would be the responsibility of the Mechanisation Supervisor who would have one Assistant and four Mechanisation Foremen. The latter would operate from three Market Centres and the Rural Centre. Equipment would be operated in groups or teams as far as possible to minimise supervision and control problems.

Research

The technical aspects of this vital component of the programme are discussed in the Agricultural Planning Annex. All aspects of crop production and water use and management would be covered under the overall supervision of a Senior Research Officer. Until the Bura Research Station is established in 1979/80 early work on cotton varieties and bulking will have to be carried out at Hola. The appointment of a Cotton Agronomist in time to commence this work during the 1978/79 season will be of paramount importance.

5.6 The Administration Division

The responsibilities of this division would extend to cover all financial control accounting; procurement of supplies and stores control; personnel administration, training and industrial relations. The main functions carried out would be as follows:

- (a) financial control (within the provision of authority delegated by the General Manager) should extend to budget preparation, budgeting control, making payments and collection of revenue, and keeping the appropriate records of accounts and cash control;
- (b) analysis of expenditure and revenue and the preparation of appropriate management accounts and analyses;
- (c) stores including procurement of all supplies, physical and financial, stock control and issuing to various users and operating sections;
- (d) staff records, salaries, conditions of service, discipline and welfare including all aspects of housing, furniture, issues of equipment and vehicles;
- (e) industrial relations insofar as these affect NIB employees;
- (f) training of staff and tenants as discussed in Part 2 of this Annex;
- (g) office administration for the Project Manager's Office including all documentation, records, statistics, typing and control of vehicles.

The Project Administrator would be in charge of this division, which would be divided into three sections dealing with specialised operations described below.

Accounting and Stores

The Senior Project Accountant will be in charge of these operations, which will be carried out by the following staff:

2	Accountants
1	Head Cashier
2	Cashiers
2	Bookkeepers
1	Stores/Supply Officer
1	Stores Superintendent
10	Storemen
	Various Stores Labourers

The section will handle the ordering and physical control of all inputs and supplies required by the project. A large central store will deal with all general items such as agricultural seeds, fertilisers, fuel, building materials and the like. Stock control and verification checks would be carried out on specialised stores operated by other divisions.

This section would also deal with all accounting matters and for this purpose will develop and operate a comprehensive management accounting system. This system would aim to provide financial control, accounts analyses and management information. The preparation of the system will be undertaken by the Project Administrator in collaboration with the BPCO Financial Controller.

In view of the large number of tenant accounts, the need for full analysis of costs and revenues and full stock control, it is assumed that the system will be mechanised. This would facilitate the production of costings for services and project accounts at regular intervals during the year as required by management.

The section would have a section dealing with cash payments, which would include salary payments to staff and cash payments to tenants when these were required.

Personnel and Training

The administration of all the employees on the project will require a strong personnel section headed by the Senior Staff Officer and comprising an Assistant Staff Officer, a Welfare Officer and clerical staff. They would keep all staff records and deal with industrial relations matters which are bound to arise. There would be close collaboration with the NIB headquarters administration division on these matters.

The training section is discussed in detail later in this Annexe.

Office Administration

This is in effect the servicing section for the project management headquarters and will provide all the facilities required such as office services, statistics, documentation and registry, project library, vehicles and the like. The Assistant Project Administrator would be in charge of this section and would have under his control all staff not directly employed in other sections such as:

- Secretaries and Typists
- Draughtsmen
- Drivers
- Watchmen
- Cleaners

CHAPTER 6 IMPLEMENTATION PROGRAMME FOR THE ORGANISATION

6.1 Introduction

The timing of various elements of the management organisation will be critical to the success of the overall project programme. There is considerable interlocking between the management components and the other major components of the project. The aim of this section of the report is to elaborate what these linkages are.

6.2 The Bura Project Co-ordinator's Office

The Project Co-ordinator, the Deputy Co-ordinator and the Engineering Planning staff of the BPCO will be required as soon as possible after July 1977 to put in hand the preparation of final design work, bills of quantities and contracts, which should be completed in time for the construction of the canal supply system and irrigation distribution system of the first branch canal command before the 1980 cotton season. Similar remarks apply to the building programme; the need to prepare basic designs to be followed by detailed designs, and bills of quantities must be given high priority.

Similarly the selection of tenants and the setting up of district organisations and any publicity campaign required should be commenced at the earliest possible date in 1977. The secondment of staff from the Ministry of Lands and Settlement and the appointment of the Sociologist should be put in hand as soon as possible.

The agricultural planning aspects of the programme will require the presence of the Bura Project Manager and he should be involved in final decisions on the irrigation system and 'on-farm' developments. His appointment should therefore be made early in 1978, together with the Agricultural Economist (Planning).

While the above activities are going on the procurement, recording, documentation and accounting systems required to take care of the availability of funds and their control according to the requirements of the government and funding agencies, must be dealt with prior to any expenditure actually being made on the project. This will require the early presence of the Financial Controller.

The effective setting up of the BPCO and organisation of its operation and delegation of responsibilities to its staff will be undertaken by the Co-ordinator and his Deputy and should ideally precede the other activities. Their appointment should therefore receive the highest priority in the immediate future.

Site co-ordination staff will be required to coincide with the arrival of contractors and the need for co-ordination with the Ministries or organisations taking over completed buildings.

Figure 6.1 shows the timing of various activities required for implementation of the BPCO aiming to initiate construction to ensure delivery of irrigation water on site in January 1980 and the arrival of the first tenants in July 1979.

6.3 Project Management

The Project Manager and his Deputy would both be involved at an early stage in the construction programme to assist with final planning and to ensure that there is a smooth commissioning of the works and buildings. The Project Manager would transfer to site during the second quarter of 1979 to prepare for the arrival of tenants in July; the Deputy Manager would continue to act as site co-ordinator for construction, but would also undertake duties connected with the operational programme.

The build-up of all other staff and the procurement of equipment and the commissioning of major and minor works would follow the general pattern of the development programme commencing with the supply of water as follows:

- (a) training of field assistants would be undertaken at Hola commencing in late 1977 to ensure that full advantage is taken of the 1978 cotton season;
- (b) cotton research programme to be put in hand before the 1978 cotton season, requires the appointment of a Cotton Research Officer before the end of 1977;
- (c) tenants' arrival and their induction and orientation requires secondment of site settlement staff from the Ministry of Lands and Settlement at the end of the first half of 1979: appointment of first agricultural staff also at that stage;
- (d) tenant houses and harambee buildings construction commencing in July 1979 requires appointment of Building Section staff not later than the beginning of April 1979;
- (e) commissioning of the temporary pump station and canal works to supply water to the project by January 1980 requires appointment of Irrigation Section staff during the second half of 1979;
- (f) preparation of the first land for planting in February 1980 requires arrival of agricultural machinery during the second half of 1979 together with setting up of agricultural section of the project workshop and appointment of machinery supervisors;
- (g) vehicles and plant required for the earlier staff and direct construction work involved in tenant houses and the like will require workshops and engineering facilities at the appropriate time: the engineering division section to provide these will have to be established by April 1979;
- (h) the supply of materials and inputs, as well as the administration of staff matters, will require the Administration Division to be set up during the second quarter of 1979.

Details of the timing and phasing of the above activities are shown in Figure 6.2.

BPCO IMPLEMENTATION PROGRAMME

CALENDAR YEAR	1977	1978	1979	1980
STAFF APPOINTMENT/ARRIVAL				
BPCO Nairobi :				
Co - ordinator	—			
Deputy Co - ordinator				
Engineering Planners				
Financial Controller				
Settlement				
Information				
Bura Project Manager				
Agricultural Economist				
Training Specialist		—		
Bura Site:				
Resident Engineer		—		
Site Co - Ordinator				
Project Manager to Site				
ACTIVITIES AND OPERATIONS				
Set Up Working Procedures	—			
Final Designs & Planning	—			
Contracts Preparation & Tendering	—			
Contractors on Site	—			
Training Staff		—		
Tenant Selection & Migration		—	—	—
Tenants to Site			—	—
Procurement Equipment for Agricultural Operations			—	—
Procurement Equipment for Temporary Pump Station			—	—
Procurement Equipment for Irrigation System			—	—

CHAPTER 7 BASIC PRINCIPLES AND CRITERIA FOR THE TRAINING PROPOSALS

7.1 Introduction

The wide variety of training needs shown by the Bura project coupled with the present shortage of qualified staff underlines the significance and importance of this aspect of the development programme. The range in requirements is from tenants through to the level management, while the numbers involved in all NIB staff grades (excluding labourers) total some 485, tenants add a further 5 000 to this. However the problem must be seen in perspective. Greater numbers of both staff and tenants have been trained for some developments by Kenya in the past, and the later stages of development in the Lower Tang Basin will involve up to five times the present project numbers.

The overall staffing required for the NIB operation is summarised in Appendix A and will be built up over a three to four year period. Added to this there are two years during which construction only will be in progress. Thus the time available for training is relatively limited particularly for the large institutional type.

7.2 Types of Training Required

The range of training required to cater for the needs of the project can be categorised as follows:

- (a) Pre-service training prior to undertaking a formal training course or appointment to a post following a qualification obtained at an institution.
- (b) In-service training for otherwise unqualified personnel leading to appointment to **PART 2**
TRAINING
- (c) In-service training for qualified staff for purposes of upgrading or general improvement of capability or of a refresher nature.
- (d) Formal institution training for otherwise unqualified or underqualified staff, leading to a basic qualification.
- (e) Tenant training in basic farming or other skills relevant to them.

In Kenya all methods of training are undertaken and it is noted that all staff employed on the Bura project will require to have some qualification whether obtained by formal or informal training means. Because there is strong competition for graduates from institutions in the country it is very likely that a large proportion, of at least the more junior grades of staff, will have to be trained by the less formal method. Recruits for more senior posts will preferably have had experience on other projects following a formal qualification. The needs for this category will fall into the in-service type of training to improve their capability. It may for instance be possible to recruit agricultural graduates without experience of irrigation and provide specialised short programmes at institutions and on operational aspects to cover this aspect.

The full ambit of training procedures will need to be considered and it is recommended that this will require the establishment of a training section in the NIB headquarters organisation as early as possible in the development programme.

Consideration will also need to be given to the training requirements of other agencies. For instance the needs and education programmes involve the recruitment of relatively large numbers of staff. Their needs are discussed in the appropriate reports of the Agencies dealing with them.

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7.1 Introduction

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The overall staffing required for the NIB operation is summarised in Appendix A and will be built up over a three to four year period. Added to this there are two years during which construction only will be in progress. Thus the time available for training is relatively limited particularly for the formal institutional type.

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The range of training required to cater for the needs of the project can be categorised as follows:

- (a) Pre-service training prior to undertaking a formal training course or appointment to a post following a qualification obtained at an institution.
- (b) In-service training for otherwise unqualified personnel leading to appointment to a post.
- (c) In-service training for qualified staff for purposes of upgrading or general improvement of capability or of a refresher nature.
- (d) Formal institution training for otherwise unqualified or underqualified staff, leading to a basic qualification.
- (e) Tenant training in basic farming or other skills relevant to them.

In Kenya all methods of training are undertaken and it is noted that all staff employed on the Bura project will require to have some qualification whether obtained by formal or informal training systems. Because there is strong competition for 'graduates' from institutions in the country it is very likely that a large proportion, of at least the more junior grades of staff, will have to be trained by the less formal methods. Recruits for more senior posts will preferably have had experience on other projects following a formal qualification. The needs for this category will fall into the in-service type of training to improve their capability. It may for instance be possible to recruit agricultural graduates without experience of irrigation and provide specialised short programmes at institutions and on operational projects to cover this aspect.

The full gambit of training procedures will need to be considered and it is recommended that this will require the establishment of a training section in the NIB headquarters organisation as early as possible in the development programme.

Consideration will also need to be given to the training requirements of other agencies. For instance the health and education programmes involve the recruitment of relatively large numbers of staff. Their needs are discussed in the appropriate sections of the Annexes dealing with them.

7.3 Pre-service Training

This type of training will be most relevant to the more senior staff grades such as Field Officer (Irrigation Officer) which require a graduate level qualification. Specialised courses, on either an informal or formal basis would cover aspects such as irrigation techniques, practical applications of theoretical principles and management techniques.

Up to a full year's service on an operational project would be desirable either before formal training commenced or during the training period.

In the case of NIB sponsored students they should be employed on irrigation projects during vacations. This would enable the NIB to gauge the capability and interest of the prospective employees with a view to making a decision on his assignment in the organisation.

7.4 In-service Training

Two categories of training needs are distinguished here. The first is for otherwise unqualified individuals leading to their appointment to a post and in essence is intended to replace formal institutional training. Staff trained in this way should, however, have the same employment and promotion prospects as the individual with a qualification obtained at an institution.

The great advantage of in-service training, or on-the-job training, as it might be more accurately described, is that the services of the trainees are available to the development programme during their training. The main problem is that staff trained in this way do not have a recognised 'paper' qualification which is recognised by all potential employees. They may therefore suffer from being unable to move freely from one job to another if they so desire.

Taking account of the above problems it is apparent that for staff being trained for a post the system would be most appropriate at Field Assistant and Water Guard level. Because these grades account for a large proportion of the staff required, the training facilities will need to be geared to these requirements particularly.

The second category of in-service training would be given to serving staff to achieve two purposes:

- (a) To maintain or improve their capability in carrying out their present duties.
- (b) To upgrade their capability to qualify them for promotion or to enable them to carry out a wider range of jobs.

Both aspects would be important in the context of the Bura project and would apply to all grades of staff. It will be particularly appropriate however in cases where it is necessary to recruit staff with basic qualifications but lacking irrigation or management experience.

Training for this category may be both on-the-job or at institutions providing specialised courses such as the Mananga Training Centre in Swaziland.

7.5 Institutionalised Training

The requirement here will be largely for new recruits who will require a basic qualification before their appointment to a post in the NIB organisation.

To secure the numbers of staff required in the Junior and Senior grades, for which this type of training is appropriate, the NIB will have to 'sponsor' students at various institutions. The main institutions involved will be the following:

CHAPTER 5
5.1
5.1.1
(a) University of Nairobi where degree courses in Agriculture and Engineering, and a post-graduate diploma in irrigation is offered. Both these qualifications would be required for Field Officers, Research Officers, Crop Protection Officers and Engineers.

(b) Egerton College which offers a diploma in agriculture which is regarded as equivalent to a graduate qualification.

(c) Embu and Bukura colleges which offer certificate level training which is appropriate for Field Assistant level staff.

7.6 Tenant Training

At this level the training involved would essentially be part of the extension programme. It will aim at giving farmers with little or no knowledge or experience of farming the practical skills needed to successfully operate their 1.3 hectare holdings as tenants on the project. The training will therefore be very simple, conducted mainly in the field either with individuals or in groups.

A variety of specialised in-service type training courses should be arranged for graduate staff in all fields from engineering to administration. Since most staff would already be technically qualified a large portion of this training would be directed to the development of management skills as shown in Table 5.1. This training would be given either immediately prior to staff taking up their appointment on the project or after twelve to eighteen months of their appointment.

The latter approach would be preferred since it would allow more assessment of their capability to be made by project management. It would also allow the individual to relate his training to the work he would be doing. For this to be practical would require relatively short term programmes since long term absence of any number of project staff would lead to some dislocation of the operational programme. The type of training offered at the Masanga Training Centre in Switzerland would therefore appear to be very suitable for this purpose.

The other disciplines for which specialised in-service training will be required are engineering, crop protection, project administration and accounting and training. In these fields courses are available of various durations offered or would be arranged for by arrangement with operational projects or by various agencies or organisations.

6.2 Certificate Level Training or Equivalent

The staff trained at this level fall mainly into the Field Assistant category. It will be desirable to recruit as many as possible with formal certificate qualification. However, because it is unlikely that more than half the numbers required will be forthcoming from the Embu and Bukura Colleges, due to staff competition for their graduates, on-the-job training will be necessary.

The main body of these staff will need to be recruited over a three year period from 1979/80 through to 1981/82 with numbers required increasing from 27 in the first year to 26 in the second and third years. It is assumed for planning purposes that 50 graduates would be obtained from the colleges in each year and these would be sponsored during their training period; the balance of 27 in 1979/80 and 18 in 1980/81 and 19/82 will need to be trained at the Holt Training Centre and receive on-the-job instruction as outlined in a later section of this report.

The overall requirements are summarised in Table 6.2.

It is perhaps pertinent to note here that in the past all this grade of staff employed by NIB have been trained at local training centres, such as at Holt, followed by on-the-job in-service instruction or purely through on-the-job instruction.

CHAPTER 8 PROPOSALS FOR THE TRAINING PROGRAMME

8.1 Graduate Training for Senior Staff

Graduates with university degrees or diplomas would only be available by 1981 if they commenced their training in 1977 under the Bura programme. But it is assumed that some students currently being sponsored by the NIB will be available for Bura when they graduate in due course. Thus it is possible that a few posts will be filled directly by new graduates even in the early years. Students sponsored under the Bura programme would not necessarily be appointed to Bura, but might replace staff transferred or posted to Bura from other projects; this would allow the greatest flexibility in staffing the programme.

The posts and numbers budgeted for are given in Table 8.1. The figures should of course be treated as preliminary estimates which will be reviewed in due course by the BPCO Training Specialist. Provision is made for post-graduate training which would mainly be in irrigation techniques but would also cover disciplines such as accounting, engineering and specialised agricultural fields.

A variety of specialised in-service type training courses should be arranged for graduate staff in all fields from engineering to administration. Since most staff would already be technically qualified a large proportion of this training would be directed to the development of management skills as shown in Table 8.1. This training would be given either immediately prior to staff taking up their appointment on the project or after twelve to eighteen months of their appointment.

The latter situation would be preferred since it would allow some assessment of their capability to be made by project management. It would also allow the individual to relate his training to the work he would be doing. For this to be practical would require relatively short term programmes since long term absence of any number of project staff would lead to some dislocation of the operational programme. The type of training offered at the Mananga Training Centre in Swaziland would therefore appear to be very suitable for this purpose.

The other disciplines for which specialised in-service training will be required are engineering, crop protection, project administration and accounting and training. In these fields courses are available at various institutions abroad or would be catered for by arrangement with operational projects or by various agencies or organisations.

8.2 Certificate Level Training or Equivalent

The staff trained at this level fall mainly into the Field Assistant category. It will be desirable to recruit as many as possible with formal certificate qualification. However because it is unlikely that more than half the numbers required will be forthcoming from the Embu and Bukura Colleges, due to stiff competition for their graduates, on-the-job training will be necessary.

The main body of these staff will need to be recruited over a three year period from 1979/80 through to 1981/82 with numbers required increasing from 21 in the first year to 28 in the second and third years. It is assumed for planning purposes that 10 graduates would be obtained from the colleges in each year and these would be sponsored during their training period, the balance of 11 in 1979/80 and 18 in 1980/81 and 81/82 will need to be trained at the Hola Training Centre and receive on-the-job instruction as outlined in a later section of this report.

The overall requirements are summarised in Table 8.2.

It is perhaps pertinent to note here that in the past all this grade of staff employed by NIB have been trained at local training centres, such as at Hola, followed by on-the-job in-service instruction, or purely through on-the-job instruction.

Table 8.1 - Training Requirements for Graduate Level Staff

Course / Staff Category	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	Total number staff trained
<i>University Graduates</i>								
Administrator / Accountant		1	1	1				1
Agricultural Management and Research Officers	4	5	7	7	4	2	1	7
Engineers	2	2	2	2	1			2
Post-graduate Diploma or equivalent					4	1	1	6
<i>Diplomates</i>								
Basic Diploma	5	8	8	5				8
Post-diploma in-service training or specialised courses				3	3			6
Total Diploma and Graduate (basic qualification)	14	16	18	13	5	2	1	18
Post-graduate / Diploma courses			3	3	4	1		12
<i>Specialised In-Service Training</i>								
Management orientated	1	4	6	4	1			16
Other specialised courses	1	2	1	1	1			6

Table 8.2 - Training Requirements for Staff at Certificate Level

Course/Category	Numbers to be trained				
	1977/78	1978/79	1979/80	1980/81	1981/82
College Certificate Courses (2 years)	10	20	20	10	1
Hola/Bura Training Centre (12 months)	11	18	18		
In-Service Training for Hola Trainees (12 months)		11	18	18	

8.3 In-service Training for Technical Staff

All staff employed on the project should receive regular training and instruction as part of their normal service. The type of instruction involved would include both refresher programmes covering basic techniques and principles already in use and any new developments which are being introduced to their work programmes.

In this type of training senior staff will be directly involved in training their more junior colleagues. Details of the content and method of instruction would be worked out with the training officer who would monitor progress and evaluate results in collaboration with the senior management staff of each division.

Up-grading training would be required for the promotion of more junior grades of staff. Individuals would be selected on the basis of proven capability and performance and would receive a combination of on-the-job instruction and training at selected institutions or on other projects. The project training officer would be responsible for organising this aspect of training with assistance from the NIB headquarters training section.

In-service training for more senior staff would generally involve specialised courses at institutions or on other projects. Details and arrangements would be worked out by the project manager and the NIB headquarters training section.

8.4 Other Staff Training Requirements

The training requirements of a number of staff, who will play a vital role in the project operation, but for whom no specific qualifications or institutional training is available are dealt with here. The categories of employees in the group account for over 50 per cent of the project staff and are made up as follows:

Job	Number employed under the programme
Water guards (incl. senior)	50
Clerical and stores	47
Draughtsmen	4
Book-keeper & cashiers	9
Mechanics and Foremen	26
Artisans and Foremen	26
Mechanisation Foremen,	
Drivers and Plant Operators	137
Pest control guards	6
TOTAL	305

The level and type of training necessary for the diverse range of jobs which are performed will have to be determined by the management organisation as the project implementation programme proceeds. A high degree of on-the-job instruction will be involved and to this end all senior staff will be required to participate in the programme, which will be prepared by the training specialist assigned to the BPCO and the project training officer.

Training at this level will be a continuous operation catering on the one hand for the need to ensure that new recruits entering the organisation acquire competence in the basic operations they will perform. On the other hand there will also be the need to provide up-grading and basic instruction in new skills for all employees.

8.5 Tenant Training

Tenant training will be the responsibility of field officers and field assistants under their normal extension programme. The overall approach adopted would be determined by the project training officer and the senior management staff. Assistance with visual aids and materials would be provided by the training officer who would work out the overall programme for the project as a whole.

The methods employed in this type of training will be largely determined by the literacy and previous experience of the tenants. Assuming that they will mostly be illiterate and lacking in irrigation farming experience very simple demonstrations and visual aids will be required. The need for this training soon after their arrival on the project and continuing throughout the first cropping season will be a very important component of the project implementation programme.

The numbers and timing of tenants' arrivals would be as follows:

1979/80	1980/81	1981/82	1982/83
1125	1800	1800	425

In any year tenants would arrive at the rate of about 200 per month and their training would need to be geared to the season and the crops they would grow first.

CHAPTER 9 TRAINING FACILITIES AND ORGANISATION

9.1 Project Level Facilities

The existing training centre at Hola can provide teaching and boarding accommodation for 10 to 15 students. It is apparent that to obtain the numbers of Field Assistants required for the Bura programme the Hola Centre will need to be used for training this category of staff for at least two years prior to the establishment of the project. Because of the distance from Bura to Hola and the time that would be taken up travelling between the two centres, it would not be practical to use Hola in conjunction with Bura.

A training centre will be required at Bura for residential courses and specialised training programmes. It is proposed that it should provide accommodation for up to 30 persons and should be built at the start of the project. This will cater for courses given to trainee junior grade staff and upgrading courses for existing employees already in the establishment during their orientation and pre-service period.

Although the main work of the centre will be concerned with agricultural training it will also be used for project staff in all disciplines and by other Ministries. Thus it is expected to cater for engineers, water guards, clerks and storemen, mechanics, plant operators, tractor operators and the like.

In addition to providing a facility for conducting training courses the centre will serve two other purposes. Firstly, it will be the headquarters of the Bura Project Training Officer from which he will plan, organise and execute his duties. Secondly, the staff at the centre will compile and produce audio-visual aids, training manuals and other material to be used on the project. These would be stored at the centre and made available for use when they were required by any section.

9.2 The Bura Training Centre

The centre should be sited on land adjacent to the rural centre and should have about 5 hectares of land available for teaching and demonstration purposes. The main buildings required would be the following:

- (a) Lecture rooms to seat a total of 45 persons (floor space of about 180 square metres).
- (b) Dormitory accommodation and ablutions for 20 to 25 persons (about 180 square metres).
- (c) Dining room and kitchen to seat up to 45 persons (about 140 square metres).
- (d) Office and storage space for the training staff, equipment and materials (about 70 square metres).

Housing for staff would be available in the rural centre with other NIB employees.

9.3 Organisation, Staff Requirements and Costs

The training programme for the project would be established finally by the Training Specialist in the NIB headquarters organisation. At the project level the training would be the responsibility of a Training Officer who would be in the Administration Division with the Personnel Officer, under the Project Administrator's control.

The other staff in the section would be as follows:

- 1 Assistant Training Officer mainly occupied in conducting training courses for Field Assistants
- 2 Technical Assistants (Instructors) to assist with courses and demonstrations particularly for tenants and their wives (one would be senior in Home Economics and the other in Crop Production)
- 1 Technical Assistant (audio-visual aids) to be responsible for the material and equipment available at the centre
- 1 Driver
- 2 Cooks
- 1 Labourer
- 1 Watchman

The centre would require the use of a personnel carrier or bus when staff or tenants were being brought to it for courses, this would be drawn from the NIB vehicle pool.

A full range of equipment as used by tenants should be available at the centre or available on loan from the other sections. The same would apply to agricultural machines or plant. The audio-visual aids would include mobile projectors for both cine and still pictures, posters and the like and a full range of text books and literature suitable for the level of instruction to be given.

The costs of implementing the above proposals are included in the general NIB budget and are summarised in Tables 9.1 and 9.2.

Table 9.1 - Estimated Capital Costs of Training Facilities

Item	Amount (1 000 K Sh)	Year Expended (Fiscal)
Capital		
Buildings 600 m ²	756	1979/80
Furniture	144	1979/80
Equipment	120	1979/80
Contingencies 10%	102	
Total Capital	1 122	

Table 9.2 - Estimated Recurrent Costs of the Training Programme (K Sh 1 000)

Item	Unit cost	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86
1. Scholarships and Sponsorships										
Graduate and Diploma	No.	19	15	15	9	3	2			
Student sponsorship	17.0	323	255	255	153	51	34			
Post-graduate Diploma or similar courses	No.	1	1	3	3	4	1	1	1	1
Certificate level students	17.0	17	17	51	51	68	17	17	17	17
Sponsorship	No.	10	20	20	10					
Specialist training courses	14.0	140	280	280	140					
	No.	1	5	7	5	2				
	-	77	98	112	98	77				
Sub Total		557	650	698	442	196	51	17	17	17
2. Training Centre Operating										
Boarding and upkeep - Hola Centre		90	120	120						
Boarding and upkeep - Bura Centre				32	65	65	65	65	65	65
Materials and miscellaneous		12	12	12	12	12	12	12	12	12
Equipment maintenance		6	6	6	13	13	13	13	13	13
Sub Total		108	138	170	90	90	90	90	90	90
Total Base Cost		665	788	868	532	286	141	107	107	107
Physical Contingency	10%	67	79	87	53	29	14	11	11	11
TOTAL COST		732	867	955	585	315	155	118	118	118

CHAPTER 10 MANAGEMENT INFORMATION SYSTEM

10.1 Introduction

The Gore office produced a draft proposal for the management information system (MIS) in April, 1977, and this chapter is based on these proposals. The objective of the system is to deal in an integrated manner with the requirements of project formulation, evaluation and implementation activities.

The various reports generated by the MIS are the following:

- (a) Project formulation
- (b) Documentation (storage of data and information)
- (c) Planning
- (d) Budgeting and accounting
- (e) Preparation of information for decision making
- (f) Supply of information for managing purposes

Some aspects of the MIS are already in use by the Gore office but it is desirable that the Co-ordinator and the Deputy Co-ordinator should direct the introduction of the final system employed by the SPO. The use of a standard system throughout the project would have great advantages. It would simplify planning and reporting procedures, increase efficiency in data collection, storage and interpretation. There would probably be decreased risk of failure and increased efficiency of operation.

PART 3

MANAGEMENT INFORMATION AND FINANCIAL CONTROL SYSTEMS

The sub-systems envisaged for the MIS and their interrelationships are shown in Figure 10.1. This shows how data and information generated in connection with the project would be systematically received and broken down according to its particular objectives which would be defined in detail as necessary.

The advantage of the proposed system is that it provides a systematic approach to documentation, relating data to the component activities making up the project. At the same time it provides a systematic method of formulating activities which enables overall appraisal to be gained of the total input and organisation requirements of the programme.

A preliminary breakdown of the project into components and sub-components prepared by the Gore Office staff is given in Appendix C. This has been adapted for the project implementation programme presented in the Implementation Annex.

The procedure for formulating the activities or elements involved in each component is similarly developed by a systematic method based on a standard set of formulation or configuration categories which are as follows:

- major and minor works
- buildings
- major works
- infrastructure
- vehicles, plant and machinery
- tools and equipment
- materials and consumables input
- manpower/staff/people
- procedures and legal matters
- consultancy and studies

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10.2 Sub-systems

The sub-systems envisaged for the MIS and their interrelationships is shown in Figure 10.1. This shows how data and information generated in connection with the project, would be systematically classified and broken down according to its particular content leading to action being taken as necessary.

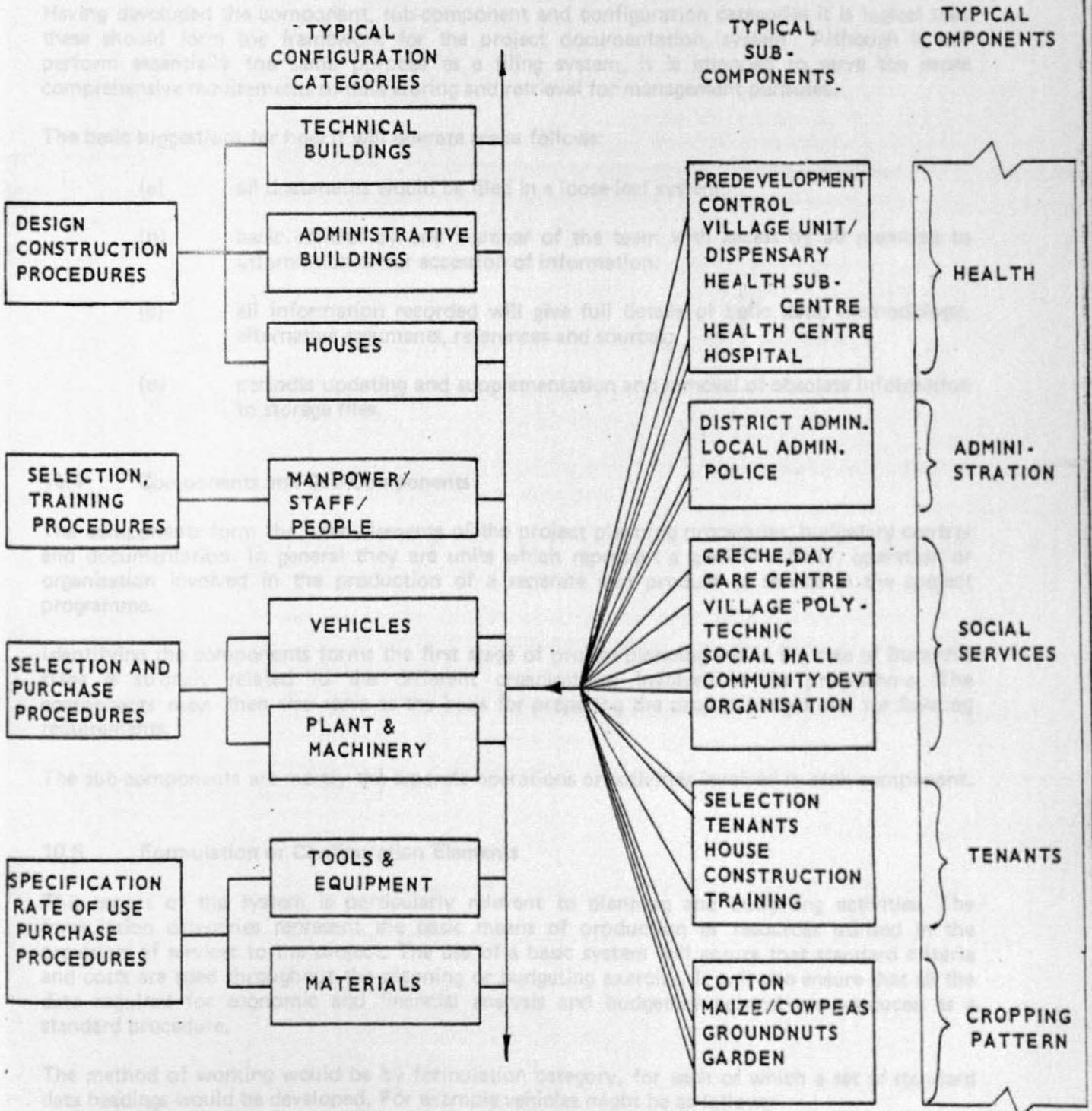
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- tools and equipment
- materials and consumable inputs
- manpower/staff/people
- procedures and legal matters
- consultancy and studies

OUTLINE MANAGEMENT INFORMATION SYSTEM



It will be noted that these categories provide a useful basis for presenting costs in the budgeting and accounting system.

The breakdown of the project into components and sub-components and their formulation using the configuration categories also provides a useful basis for cross checking completeness of coverage in planning. The system will also provide a basis on which progress can be checked and reported on.

10.3 Documentation System

Having developed the component, sub-component and configuration categories it is logical that these should form the framework for the project documentation 'system'. Although it will perform essentially the same purpose as a filing system, it is intended to serve the more comprehensive requirements of data storing and retrieval for management purposes.

The basic suggestions for how it will operate are as follows:

- (a) all documents would be filed in a loose-leaf system;
- (b) basic control by one member of the team with access by all members to information or for accession of information;
- (c) all information recorded will give full details of basic data, methodology, alternative arguments, references and sources;
- (d) periodic updating and supplementation and removal of obsolete information to storage files.

10.4 Components and Sub-Components

The components form the basic elements of the project planning procedures, budgetary control and documentation. In general they are units which represent a specific activity, operation or organisation involved in the production of a separate end product or service in the project programme.

Identifying the components forms the first stage of project planning and in the case of Bura this stage is strongly related to the different organisations involved in the programme. The components may then also serve as the basis for preparing the project budget and for funding requirements.

The sub-components are merely the separate operations or activities involved in each component.

10.5 Formulation or Configuration Elements

This aspect of the system is particularly relevant to planning and budgeting activities. The formulation categories represent the basic means of production or resources utilised in the provision of services to the project. The use of a basic system will ensure that standard criteria and costs are used throughout the planning or budgeting exercise. It will also ensure that all the data required for economic and financial analysis and budgetary control are produced as a standard procedure.

The method of working would be by formulation category, for each of which a set of standard data headings would be developed. For example vehicles might be as follows:

- Dealer price
- Delivery costs
- Discount
- Duty and Taxes
- Useful life
- Residual value
- Annual depreciation
- Registration cost
- Annual road tax
- Annual insurance
- Tyres cost (set)
- Tyre life
- Fuel consumption
- Oil consumption
- Spare parts
- Stock required for spares
- Garaging requirements
- Operator requirements

These details would be tabulated for all vehicle types required for the project development programme. Standard operating costs and replacement scheduling details would also be worked out and applied across the board, or to specific components as required. On this basis an overall plan of physical requirements or budget of costs can be prepared as necessary.

CHAPTER 11 ACCOUNTING AND FINANCIAL CONTROL

11.1 Introduction

The accounting procedures for the project are a vital component of the overall management system. This is particularly true since the project, during its construction phase, involves the expenditure and control of the funds provided by international financing agencies, while in the operational phase the project management will control its own budget under the NIB.

Details are given in Chapter 4 of the organisation required for the accounting sections and in the chapter dealing with the management information system the need for integration of documentation systems has been emphasised. It will be particularly important for a common breakdown of components and sub-components to be employed throughout implementation for all management and accounting purposes.

The proposals made here are not intended to be comprehensive but to give an outline of basic requirements which can be used for policy decisions in the initial planning stages. Details will need to be worked out by the senior staff assigned to undertake the financial control and accounting functions.

11.2 Construction Phase Requirements

The BPCO will be primarily involved in this phase during which the basic needs will be as follows:

- (a) Control of all funds received by the NIB for project implementation, mainly in the form of a grant from the government.
- (b) Control of payments to contractors, NYS and other organisations involved in construction of works or providing services.
- (c) Preparation of the required documentation for reimbursement of expenditure being funded by financing agencies.

During the first years of implementation, while construction and basic development is proceeding, the NIB will receive annual grants from the Government under the development budget. The system of accounts used by the BPCO during this period will therefore need to meet the basic requirements of the Treasury and the financing agencies. Since these are not known in any detail at this stage it would be inappropriate to make detailed proposals.

Nevertheless, it is possible to give a preliminary outline of the form of accounts required, which are expected to be along the following lines:

- (a) Statement of income and expenditure.
- (b) Balance sheet in respect of the assets, and liabilities under the NIB's control.
- (c) Analysis of transactions for specific works or operations, for example:
 - (b) Main supply canal
 - (c) On-farm developments
 - (b) Wild life conservation works
 - (b) Village infrastructure
 - (b) Tenant housing

During construction the main payments will be made to contractors undertaking construction works or other procurement contracts, such as, supplying vehicles, plant and equipment.

Procedures for the acceptance and certification of payments have already been described in Section 4.3. However an appropriate system of accounting control will be required by the Project Co-ordinator's office to ensure that necessary payments are made and necessary reimbursement procedures are carried out and progressed.

Particular attention must be paid to the progress and the analysis of costs of the NYS constructed works to ensure that adequate progress is being made at acceptable construction costs. Proper and up-to-date records will have to be kept on site for this purpose and made available in good time to the Project Co-ordinator's Office each month.

Other payments, which would be made during this phase, will include salaries and allowances of staff, costs of specialised studies or surveys, and the costs of direct purchases of materials or services for the project.

In setting up the system the BPCO would be treated as an independent unit within the NIB with control over its own finances. However there would be close collaboration with the NIB headquarters division to ensure that a unified overall system is used. The headquarters division would also be responsible for carrying out stores and internal auditing checks. External auditing would similarly be arranged through them.

11.3 Operational Phase Requirements

Once the project becomes operational a prime concern will be to ensure that the Bura Project Management Organisation has control of its own budget. Thus a full accounting system would be required with the following basic objectives:

- (a) The system should satisfy all basic financial and stores control functions at the project level.
- (b) Financial analyses and information should be produced as required by the management.
- (c) Accounting information should be produced as required by the NIB headquarters to fit in with the national system of accounting for NIB operations.
- (d) Information to be produced for monitoring and evaluation purposes by the NIB and financing agencies.

Primarily however, the preparation and analysis of accounts will be of vital importance for effective management control of the on-going operations.

The final form of accounting employed will need to be decided by the Project Administrator and the Senior Accountant in conjunction with the Ministry of Finance and Planning, the Project Co-ordinator's Office, and the Project Manager. The following is an outline of the basic aspects to be covered by the system:

- (a) Statement of income and expenditure.
- (b) Balance sheet in respect of the assets and liabilities of the project.
- (c) Tenant accounts and transactions.
- (d) Analyses of operations carried out and services provided, such as:

Farm input supplies
Mechanisation services
Irrigation water supplies

- (e) Advances and credit made available and repayments of outstanding balances.
- (f) Transactions to outside agencies, for example, the cotton ginnery and co-operative societies.
- (g) Salaries and wages control for staff employed on the project.
- (h) Budgeting for future operations and budgetary control as required by management.

The project will involve the handling of considerable quantities of items such as farm inputs, building materials, spares and fuel. A comprehensive system of receipts, issues and stock control will be required for this purpose. This will ensure that not only is financial and physical control maintained but also that ordering and replenishment of stocks is adequate.

The project will require a comprehensive budgeting system. This should incorporate not only the needs for forecasting annual requirements but also those of budgetary control to ensure that continuous updating of initial estimates is carried out.

11.4 Books of Account and Forms

It is assumed that some form of mechanised accounting will be adopted for at least the operational phase. The books of account and forms used will need to be designed to fit the system selected. A comprehensive study will need to be carried out by the senior staff in collaboration with the NIB headquarters administrative division for this purpose.

It is nevertheless in order to mention at this stage a few basic principles that should be observed:

- (a) All payment and receipt documents should be designed to include account analysis and component coding.
- (b) Duplicate copies should be made of all transactions conducted on a sub-accountancy basis.
- (c) The system should incorporate provision for effective checks to be carried out at the lowest level of operation.
- (d) The coding of all transactions should ensure that the analyses and consolidation processes can be effectively mechanised.

CHAPTER 12 MONITORING AND EVALUATION

12.1 Introduction

The various agencies providing funds for the development programme will all require detailed monitoring of the use of their funds and the progress achieved by the components which their funds have been expended upon. The problems of monitoring and evaluation are therefore increased in quantity and complexity by the wide range of activities and the number of organisations involved in the project.

To carry out the monitoring function effectively will require the collaboration of all staff and agencies engaged in the project implementation starting with the construction and progressing through to the operational phase.

12.2 Monitoring Programme Objectives

In broad terms the objectives of the monitoring and evaluation exercise would be as follows:

- (a) To assess the technical and physical achievements of the initial development programme and thereafter the progress of activities involved in its continued operation and maintenance.
- (b) To carry out regular evaluations of financial and economic performance during the life of the Project.
- (c) To assess the extent to which an integrated community is created at Bura and to evaluate the sociological aspects of the programme as well as its impact on the rural economy of the surrounding area.

To achieve effectively the above objectives the programme required should include not only base line studies, to establish the present situation in the area, but also an interpretation of actual development problems and patterns in terms of future action and adjustments required to the development programme.

12.3 Area to be Covered by the Monitoring Programme

Details of the areas to be covered and actual requirements are given in the various Annexes dealing with the various activities. The following is a brief summary of the main areas involved and their requirements.

(a) Soils

Physical and chemical changes as well as the productivity of all the main soil types particularly the S₂ and GU₂ classes; the requirements would be covered by a sampling procedure involving two per cent of all tenant holdings.

(b) Forestry

Changes in the riverine ecosystems and the extent of the riverine forests; the afforestation programme requires recording and assessment of growth and survival rates, water use data, cost analyses and felling data.

(c) *Wildlife and Ecology*

Both terrestrial and aquatic ecology systems must be considered and will require pre-development base-line studies; game numbers, concentration and migration patterns; ecto-parasite and other invertebrate populations as well as the occurrence of rodent pests; fish populations including their ecology and migration in the Tana River before and after the offtake structure is built; vegetation composition and regeneration and associated fauna in the riverine and other areas and the occurrence of pesticide and chemical residues in drainage waters, vegetation and fauna of the project area.

(d) *Tenants*

The process of settlement, sociology of tenant life and the communities the project will create, will require studies over a period of at least five years. Allied to these aspects are the questions of population growth and the impact of the project on the surrounding rural economy and its associated communities.

(e) *Irrigation and Drainage System*

Water quantity, quality and silt loads should be recorded for the main supply system and branch canals; similarly quantitative records of the drainage system including regular measurements of groundwater levels throughout the project area are required. Continuous evaluation of irrigation practices in conjunction with agricultural production at the field level.

(f) *Agricultural Production*

In conjunction with the soils monitoring work assessment of crop production, objective studies and records covering crop husbandry practices, mechanisation and pest control services and the use of inputs and output from the scheme as a whole are essential.

(g) *Training*

All aspects of the numbers of people and types of training given under the project training programmes should be considered in the relation to their performance in the development of the project.

(h) *Health*

Data on disease endemicity in the project communities would be collected by village health staff supplemented by specific epidemiological surveys of important diseases and other aspects such as nutrition, births and deaths. Similarly surveillance of disease vectors and animal reservoirs will be required in the project area.

(i) *Economic and Financial Aspects*

At the farm level incomes and resource use will be assessed and linked to broader studies of the overall economic performance of the project and returns to the resources employed. The financial aspects studied will cover both the utilisation and flow of funds on the project and the impact of its development on the NIB's financial situation and status.

12.4 Data Collection, Documentation and Reporting Systems

The assembly of the required data and statistics will require specific action by the organisations involved in the project including the following:

- (a) Reporting on a regular basis, daily, weekly, monthly and annually, according to the nature of the activity. As far as possible these reports would follow a standard presentation of information to facilitate assessment of progress summarisation and further evaluation.
- (b) The development of an integrated management information system covering all activities involved in the project implementation and operation. The aim would be to cover all aspects of project formulation, planning budgeting, current management information and information storage. It would incorporate a standardised framework for all project formulation and documentation following on from the Project Planning Report (PPR).
- (c) Preparation of regular financial statements and analyses for each fiscal year and at intervals within the year by the NIB, NYS, Forestry Department, Wildlife Department, Ministry of Health, Ministry of Works and any other organisations or Ministries responsible for expenditure of funds in the Project Area. The format and detail of the statements and the analyses required will be determined by the Project Co-ordinator and his staff in consultation with the organisation involved.

12.5 Organisation Requirement

Effective carrying out of monitoring and evaluation activities will require careful formulation of procedures for reporting and documentation, and designation of responsibility for interpretation of information assembled. Responsibility for this should lie with the NIB with the BPCO being given the job of setting up the necessary framework and co-ordinating its operation.

The staff involved in monitoring will include engineers, agriculturalists and sociologists, with one individual, the Agricultural Economist, being assigned overall responsibility for the programme under the Bura Project Co-ordinator.

Considerable liaison and co-ordination with the Ministries and organisations involved would be necessary and close working arrangements would be established with the Project Management at Bura. It is also envisaged that organisations such as Nairobi University should be associated with the programme, particularly with regard to the interpretation of data collected.

12.6 Specific Studies Required

A number of specific studies are needed to establish base line data against which later measurements can be compared, or in continuing studies of various aspects of the project. The more important are as follows:

- (a) Kenya Soil Survey: Soils analysis and monitoring of changes.
- (b) Research Division of the Wildlife Service and the Kenya Rangeland Ecological Monitoring Unit: Wildlife and livestock counts and monitoring of vegetation changes.
- (c) University of Nairobi: Sociological studies and surveys of the rural economy of Tana River District.

- (d) **British Government (Ministry of Overseas Development):** Health surveys and evaluation of data collected via health centres as well as surveillance of the village health programme generally and conditions in the surrounding area.
- (e) **National Agricultural Laboratories:** Pesticide residue monitoring.
- (f) **National Environment Secretariat:** Biology and ecology of the section of the Tana River affected by the project.

APPENDIX A

TABLE A.1 NIB HEADQUARTERS BURA CO-ORDINATOR'S OFFICE STAFFING

Post	Grade	Salary (thousand Ksh/annum)	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	Vehicle (2) requirements No	Type
Co-ordinator	G	91.7	1	1	1	1	1	1	1	1	1	Saloon
Assistant Engineer	C	41.4	.5	1	1	1	1	1	1	1	1	PU
Supply Officer	C	41.4	.5	1	1	1	1	1	1	1	1	
Draughtsman	A	26.6	.5 x 2	2	2	2	2	2	2	2	2	
GOK Grade												
Senior Settlement Officer Gd I ¹			.5	1	1	1	1	1	1	1	1	LR/SW
Settlement Officer Gd III ¹			.5 x 2	2	2	2	2	2	2	2	2	LR/SW
Information Officer ¹			.5	1	1	1	1	1	1	1	1	PU
Information Assistants			.5 x 2	2	2	2	2	2	2	2	2	
Personal Secretary	II	17.7	0.5 x 1	3	3	3	3	3	3	3	3	
Clerical and others (including assistant for Sociologist)	III	13.6	0.5 x 3	4	5	5	5	4	3	2	2	
Drivers	IV/III	11.5	0.5 x 5	5	5	5	4	4	1	1	1	
Deputy Co-ordinator	Expat.		0.5	1	1	1	1	1	1	1	1	CR/SW
Engineer: Construction	Expat.		0.5	1	1	1	1	1	1	1	1	
Engineer: Supplies	Expat.		0.5	1	1	1	1	1	1	1	2	LR/PU
Engineer: Planning	Expat.		0.5	1	1	1	1	1	1	1	1	LR/PU
Sociologist	Expat.		0.5	1	1	1	1	1	1	1	1	LR/PU
Training Specialist	Expat.		-	1	6.5	-	-	-	-	-	1	LR/PU
Financial Controller/ Administrator	Expat.		0.5	1	1	1	1	1	1	1	1	Saloon
Economist (Planning)	Expat.		0.5	1	1	1	1	1	0.3	0.3	1	LR/SWB
Total			14	31	31.5	29	29	20	12.3	8.3		

Notes (1) Seconded from Ministry of Land and Settlements/ Ministry of Information

(2) Vehicle type abbreviations used: Saloon: Saloon car; LR/SW: Land rover station wagon, long wheel base;

LR/SWB: Land rover station wagon, short wheel base; LR/PU: Land rover long wheel base pick-up; P/PU: Pick-up utility;

M/C: Motor cycle;

TABLE A.2 PROJECT MANAGEMENT ORGANISATION STAFFING

Post	Grade	Salary (1000 KSh/Annium)	Number												House Grade	Vehicle No.	Type	
			1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	following					
Project Manager	F	76.9	.5*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1	1	1	1	1	L/R SW
Deputy Project Manager	E	58.0	.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	L/R SW
Agricultural Economist (Management)	D	49.3	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	L/R SW
Sub Total			1.0	2.5	3	3	3	3	3	3	3	3	3	3	3	3		
Administration Division																		
Project Administrator/																		
Accountant	E	58.0	0.5*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1	1	1	1	1	L/R SW**
Senior Accountant	D	49.3	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	PU
Accountant	C	41.4	0.5	1	2	2	2	2	2	2	2	2	2	2	2	2	2	C
Head Cashier	B	34.2		1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Cashier	I	21.2		1	2	2	2	2	2	2	2	2	2	2	2	2	2	E
Bookkeepers/Ast. Accountant	I	21.2	0.5x3	3	4	6	6	6	6	6	6	6	6	6	6	6	6	E
Senior Staff Officer	D	49.3	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Ast. Staff Officer	I	21.2		1	1	1	1	1	1	1	1	1	1	1	1	1	1	E
Welfare Officer	C	41.4	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Training Officer	C	41.4	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Technical Ast. (Training)	III	13.6	0.5x3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	F
Ast. Training Officer	I	21.2		1	1	1	1	1	1	1	1	1	1	1	1	1	1	E
Assistant Administrator	D	49.3	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Stores/Supply Officer	C	41.4	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Stores Superintendent	B	34.2	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Storemen/Clerks	III	13.6	0.5x10	15	23	30	30	30	30	30	30	30	30	30	30	30	30	D
Draughtsmen	A	26.6	0.5	1	2	2	2	2	2	2	2	2	2	2	2	2	2	F
Drivers	III/IV	11.5	0.5x2	7	12	13	14	14	14	14	14	14	14	14	14	14	14	D
Watchmen, Cleaners & Others	V	6.0	0.5x20	30	46	46	46	46	46	46	46	46	46	46	46	46	46	F
Sub Total			30	77	106	116	116	116	116	116	116	116	116	116	116	116	116	
Settlement Division	GOK Grade																	
Senior Settlement Officer	H	30	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	C
Settlement Officer Gd. III	G	23	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	D
Settlement Assistants	F	17	1.0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	F
Sub Total			33.5	86	125	125	125	125	125	125	122	116	116	116	116	116	116	
TOTAL																		

* Denotes Expatriate Post
 ** Denotes driver equipped with Vehicle

TABLE A. 2 PROJECT MANAGEMENT ORGANISATION STAFFING

Post	Grade	Salary (1000 KSh/ Annum)	78	79	1978/	1979/	1980/	1981/	1982/	1983/	1984/	1985/	1986/87 & House	Vehicle			
															78	79	1979/
Engineering Section																	
Project Engineer	F	58.0	1	.05*	1*	1*	1*	1*	1*	1*	1	1	1	1	B	1	L/R SW**
Assistant Project Engineer	D	49.3			1	1	1	1	1	1	1	1	1	1	C	1	L/R PU
Irrigation Maintenance Engineer	D	49.3			1	1*	1*	1*	1*	1*	1	1	1	1	C	1	L/R PU **
Ast. Irrigation Engineer	C	41.4			1	1	1	1	1	-	-	-	-	-	C	1	L/R PU
Head Water Operator	III	13.6			1	1	1	1	1	1	1	1	1	1	F	1	PU
Senior Water Guard	IV	9.3			1	3	4	4	4	4	4	4	4	4	F	4	M/C
Building Supervisor	C	41.4			1	1	1	1	1	1	1	1	1	1	C	1	L/R PU
Building/Irrigation Foremen	I	21.2			2	2	2	2	2	2	2	2	2	2	E	2	L/R PU
Workshop Engineer/Supervisor	D	49.3			1*	1*	1*	1*	1*	1*	1	1	1	1	C	1	L/R PU**
Ast. Workshop Engineer	C	41.4			1	1	1	1	-	-	-	-	-	-	C	1	PU
Workshop Foremen	B	34.2			1	1	2	2	2	2	2	2	2	2	D	2	M/C
Storemen/Clerical	III	13.6			1	2	2	2	2	2	2	2	2	2	F	2	
Mechanics	II/III	15.7			5	10	20	20	20	20	20	20	20	20	E	20	
Artisans	III/IV	11.5			5	12	24	24	24	24	24	24	24	24	F	24	
Labourers & Watchmen	VB	6.0			24	36	42	42	42	42	42	42	42	42	G/H	42	
Drivers (Vehicles & Plant)	III/IV	11.5			3	27	27	27	27	27	27	27	27	27	F	27	
TOTAL			5	58	100	130	130	131	130	129	129	129	129	129			

Denotes Expatriate Post
* Denotes Vehicle Provided with Driver

TABLE A.2 PROJECT MANAGEMENT ORGANISATION STAFFING

(Sheet 1)

Post	Grade	Salary (1000 KSh/ Annum)	Number										House Grade	Vehicle No.	Type		
			1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87					
Agricultural Production Section																	
Production Manager	E	58.0	1	0.5*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1	B	1	L/R SW***
Assistant Agricultural Production Manager	D	49.3		0.5	1	1	1	1	1	1	1	1	1	1	C	1	L/R PU
Section Supervisor	D	49.3		0.5	1	2	2	2	2	2	2	2	2	2	C	2	L/R PU
Field Officer																	
(Irrigation Officer)	A/B/C	24.2		0.5x2	2	5	8	8	8	8	8	8	8	8	D	8	L/R PU
Head Field Assistant	I	21.2			3	7	11	12	12	12	12	12	12	12	E	12	MC
Field Assistant	III	13.6		0.25x18	18	42	68	49	48	48	48	48	48	48	F	68	cycles
Water Guard	VB	6.0			12	28	44	46	46	46	46	46	46	46	G	46	cycles
Head cultivator	ungraded	7.5			6	14	22	23	23	23	23	23	23	23			
Crop Protection Officer	D	49.3			1*	1*	1*	1*	1*	1*	1*	1*	1*	1	C	1	L/R PU***
Assist.Crop Protection Officer (pest and diseases)	B	34.2			1	1	1	1	1	1	1	1	1	1	D	1	PU
Assist.Crop Protection Officer (vermin located)	B	34.2			1	1	1	1	1	1	1	1	1	1	D	1	PU
Pest Control Assistants	III	13.6			3	3	6	6	6	6	6	6	6	6	G	6	cycles
Pest Control Guards	VB	6.0			2	3	6	6	6	6	6	6	6	6	G	6	cycles
Senior Research Officer	E	58.0			1*	1*	1*	1*	1*	1*	1*	1*	1*	1	B	1	L/R S ***
Research Officer (cotton)	D	49.3			1*	1*	1*	1*	1*	1*	1*	1*	1*	1	C	1	L/R PU***
Research Officer (Irrigation and Drainage)	D	49.3		2**	2**	2**	2**	2**	2**	2**	2**	2**	2**	2	C	1	L/R PU
Research Officer (Agronomy)	D	49.3		1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1	C	1	L/R PU
Research Officer (Entomology)	D	49.3		1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1	C	1	L/R PU***
Research Officers	C	41.4		NA	4	4	4	4	4	4	4	4	4	4	C	2	P/U
Research Assistants	III	13.6		NA	10	10	10	10	10	10	10	10	10	10	F	10	M/C
Research Assistants	III	13.6		NA	5	5	5	5	5	5	5	5	5	5	F	5	M/C

TABLE A.2 PROJECT MANAGEMENT ORGANISATION STAFFING

(Sheet 2)

Post	Grade	Salary (1000 KSh / Annuum)	1977/ 78	1978/ 79	1979/ 80	1980/ 81	1981/ 82	1982/ 83	1983/ 84	1984/ 85	1985/ 86	1986/87 & following	House Grade	Vehicle No.	Type
Permanent Labour	VB	6.0	NA	NA	30	30	30	30	30	30	30	30	F		
Mechanisation															
Supervisor	D	49.3		1*	1*	1*	1*	1*	1*	1*	1	1	C	1	L/R PU***
Assist. Mech.															
Supervisor	I	21.2	1	1	1	1	1	1	1	1	1	1	D	1	L/R PU
Mechanisation Foremen	II	17.7	1	2	3	4	4	4	4	4	4	4	E	4	M/C
Watchmen	VB	6.0	5	9	13	13	13	13	13	13	13	13	G		
Drivers: Vehicles	II/III	11.5	0.5x2	6	7	11	11	11	11	11	11	11	F		
Drivers: Tractors	IV	9.3	10	33	63	63	76	76	76	76	76	76	F		
Total			5	19	104	225	324	339	329	320	319	319			

* Denotes expatriate post budgeted for Management organisation

** Denotes expatriate research staff provided under Dutch Technical Assistance Programme

*** Denotes vehicle provided with driver

APPENDIX B

STAFF JOB DESCRIPTIONS

The descriptions which follow cover the most important posts required for the NIB organisation. Some of the minor posts are not covered because the role of these staff, and their responsibilities, are considered to be reasonably clear from the description given in the body of the report.

B.1 Post: Project Coordinator

Qualifications:

Graduate with wide experience of agricultural development and administration. Working knowledge of settlement schemes and appropriate organisations for their operation would be desirable.

Job description:

He would be responsible for directing the Bura Project Coordination office under the NIB General Manager. His duties would deal with all aspects concerning the construction phase of the project and the development of a viable multi-discipline approach. To achieve this the following aspects will be his particular concern:

- (a) The establishment of a clear policy framework for the project covering both NIB and other agencies.
- (b) Organisation of the BPCO to ensure that the functions, responsibilities and working procedures of the multi-discipline team are fully understood so that an integrated team will be established.
- (c) Establish working contacts with all the ministries involved in the project and help establish the operation of the Steering Committee on the basis which will best serve the needs of the development programme.
- (d) Oversee the tenant selection process including all publicity, the setting up of district committees and the organisation required to carry out final vetting by the NIB.
- (e) Reporting on the progress of the project and the preparation of appropriate publicity.
- (f) Overall monitoring and evaluation of achievements and completed work.

B.2 Post: Deputy Project Coordinator

Qualifications:

Graduate in civil engineering or equivalent with wide experience in the integrated development of irrigated agricultural projects, including planning, construction and operation aspects.

Job description

He would be the Consultant's Resident Representative in Kenya and would be responsible to the Project Coordinator for the planning, co-ordination and implementation of the project. His duties would include:

- (a) Planning and co-ordination of the inputs required for engineering works,

agriculture, housing and settlement, education, welfare, security, health and nutrition and ensuring that they are provided timeously to meet the needs of the Project.

- (b) Procurement of all the facilities required such as engineering works, on-farm works, housing and buildings for NIB and other Ministries and organisations, vehicles and equipment, whether by ICB, LCB or NYS.
- (c) Planning and co-ordinating the supply of farm inputs such as seeds, fertilizers and chemicals.
- (d) Planning, arranging and co-ordinating training programmes.
- (e) Planning and arranging for settlement of tenants and co-ordinating settlement with construction.
- (f) Planning and taking steps to ensure harmonious integration of the indigenous population with the Project.
- (g) Co-ordination of the various research projects and base line surveys necessary for monitoring and evaluation.
- (h) Monitoring and evaluation of farm economics, advising on farmer's repayment capacity and method of levying water and land charges.
- (i) Arranging for studies and reports as may be necessary on such items as agricultural machinery requirements, crop processing and marketing development, soil changes and groundwater movement, etc.
- (j) Procurement of services required to undertake duties not detailed elsewhere or on abnormal aspects of the development programme.
- (k) Planning and financial control of the funds required for the Project, including detailed estimates, annual budgets and cash flow statements, disbursement procedures under Bank and other credit agreements.
- (l) Monitoring progress of development and preparation of reports according to the reporting procedures of Government, Bank and other co-financers.
- (m) Supervising the preparation of the feasibility study for the development of the land on the east bank of the Lower Tana River.

B.3 Post: Engineer – Planning

Qualification:

Graduate in civil engineering or equivalent with wide experience of general co-ordination, planning, progress and control of projects.

Job description:

He would be responsible to the Deputy Project Coordinator for all planning and co-ordination of the inputs required for the completion of the project, His particular duties would include:

- (a) Ensuring the timely provision of engineering works, housing and buildings, infrastructural works, utility services and the cotton ginnery.

- (b) Monitoring progress of development and preparation of reports according to the reporting procedures of Government and the co-financers.
- (c) Liaison with Financial Controller and the Chief Resident Engineer to ensure that monthly payments for contractors are promptly and properly processed, paid and reimbursement procedures followed.
- (d) Co-ordination of various research projects and base line surveys necessary for monitoring and evaluation.

B.4 Post: Engineer – Procurement

Qualifications:

Graduate in civil engineering or equivalent, with experience and knowledge of procurement procedures.

Job description:

He would assist with contractual arrangements for the procurement of works and goods, liaise with site and administrative aspects, and advise and assist in the withdrawal procedures under the various credit and loan agreements. His duties would include:

- (a) Liaison with the project consultants on tendering, analysis of tenders, and the award of contracts for construction of the works and the procurement of goods, such as vehicles, plant, machinery and equipment.
- (b) Arranging for the inspection and delivery of goods to NIB for the operation of the project.
- (c) Dealing with any matters arising from defects damage or loss of goods.
- (d) The processing of procurement payment certificates, and other contractual matters and inspection.
- (e) Liaising with the Financial Controller to ensure that payments and reimbursements are made in accordance with government and co-financers' requirements.

B.5 Post: Agricultural Economist – Planning

Qualifications:

Graduate in agricultural economics or equivalent, with experience and knowledge of the economics relevant to agricultural projects.

Job description:

He would assist with all aspects of the final detailed planning of the project and the relevant economic considerations. His duties would cover the following aspects:

- (a) Updating or revision of the final development plans for the project, particularly the cropping programme and farm budgets to take account of improved or changed technology.
- (b) The co-ordination of requirements and organisation for monitoring and related base line studies. He would be specifically responsible for setting up the monitoring programme for the assessment of tenant farming performance.

- (c) Evaluation of the Hola Pilot Scheme and other projects in Kenya with regard to aspects relevant to the Lower Tana development and irrigation generally.

B.6 Post: Sociologist Specialist

Qualifications:

Graduate sociologist with broad experience in all aspects of settlement projects.

Job description:

He would be responsible for finalising the detailed planning of settlement proposals and liaise with the government organisations involved. His duties would include:

- (a) The sociological factors of tenant selection and the process of settlement. He would assist in determining the allocation of tenant quotas to districts and would investigate the possibility of applying aptitude tests in the selection process. He would collaborate closely with the Settlement Staff in the organisation of the settlement process aiming to minimise the disorientation of tenants' lives and easing the problems encountered on arrival on the project.
- (b) The rural economy of the surrounding area and its communities. This aspect would cover not only base line studies of the communities but also how the project is likely to affect them and how compensation would best be organised for any losses suffered as a result of the project construction.
- (c) The sociology of tenant life on the project would be studied particularly with a view to establishing working arrangements between scheme management and tenants. He would also collaborate in ensuring that social services on the project are related to tenants' needs.
- (d) He would work closely with the Institute of Development Studies.

B.7 Post: Training Specialist

Qualifications:

Graduate agriculturalist with wide experience of the organisation and operation of all types of agricultural training and extension programmes.

Job description:

He would be required to establish the training requirements of the NIB organisations generally and the specific needs of the Bura project in particular. His duties would cover the following aspects:

- (a) The formulation of an overall training policy for the NIB and priorities for action on Bura requirements.
- (b) Planning and organisation of the programme for training the junior and senior staff required for the project. For this purpose the capacity of various institutions in Kenya would need to be assessed and suitable curricula discussed with them.
- (c) Suitable candidates will be selected for sponsorship at training institutions or training at Hola/Bura for the Bura project programme.

- (d) Setting up the organisation required and supervision of the training courses for Junior staff at the Hola/Bura training centre.
- (e) The preparation of training manuals for all grades of staff in the Bura management organisation.

B.8 Post: Financial Controller/Administrator

Qualifications:

Degree in commercial administration or equivalent, with wide experience of the financial and procurement aspects of project administration.

Job description:

He would be responsible, under the Co-ordinator, for the control of all funds allocated to the NIB for the Bura project and the administration of the BPCO. His duties would include:

- (a) Setting up an appropriate accounting and financial control system to fit in with the requirements of the organisations providing funds for the project and the government system.
- (b) Assisting with the procurement of various items, particularly those which are dealt with under local procedures.
- (c) Organisation of the BPCO office administration procedures and dealing with its day-to-day operation and management requirements.

B.9 Post: Bura Project Manager

Qualifications:

Degree in Agriculture or equivalent, with wide experience and proven capability for management of projects involving irrigation and settlement. A working knowledge of all aspects of planning, training and financial control would be essential.

Job description:

He would be in overall control of the project under the NIB General Manager.

Initially he would assist the BPCO with final detailed planning and would organise in the selection of staff for training or orientation.

Once the construction phase was completed he would have overall responsibility for the operation of the project and for setting up and directing the management organisation required to run it. He would be concerned with all technical, administrative and financial aspects and would direct the work of specialist staff engaged to undertake the work, including the following:

- (a) Planning and budgetting.
- (b) Procurement of inputs, supplies and services.
- (c) Staff appointments, discipline and training.
- (d) Liaison and co-ordination with all other agencies providing supporting services to the project.
- (e) Tenants' settlement, community development and performance of farming operators.

- (f) Reporting, monitoring and evaluation systems required to assess the performance of the project.
- (g) Project security.
- (h) Liaison with agencies involved carrying out operations which are directly involved in the project operation, for instance in connection with wildlife and forestry activities.

He would be directly assisted by the heads of divisions in carrying out these duties.

B.10 Post: Deputy Project Manager

Qualification:

Degree in Agriculture or equivalent, with appropriate experience of project development and administration.

Job description:

He would assist the Project Manager with the overall direction of the project operation. Initially during the construction phase he would act as site co-ordinator to ensure that close liaison is maintained with supporting agencies. Once the project became operational he would have special responsibility for all matters concerning the tenants including the following:

- (a) Reception and orientation to the project.
- (b) Training in farming practices.
- (c) Development of tenant community organisations such as village committees, and co-operatives.
- (d) Tenancy arrangements and discipline.

During the period when tenants and their families are arriving on the project he would be assisted by the settlement officer seconded to the NIB from the Ministry of Lands and Settlement.

B.11 Post: Agricultural Economist – Management

Qualifications:

Graduate agricultural economist or agriculturalist with post graduate training. Experience of farm management and production economics essential.

Job description:

He would be responsible, under the Bura Project Manager, for carrying out detailed studies of the main production activities of the project. These would include:

- (a) Assessment of efficiency of enterprises and services undertaken or provided by the project.
- (b) Evaluation of the tenants economic performance.
- (c) Interpretation of research results and findings.

B.12 Post: Agricultural Production Manager

Qualifications:

Degree in Agriculture or equivalent with wide experience of managing field operations of irrigation projects.

Job description:

He would be responsible under the Project Manager, for all aspects of agricultural production on the project and would direct the work of the agricultural staff concerned. His duties would include:

- (a) Planning and direction of crop production operations such as land preparation, distribution and use of farm inputs and land levelling.
- (b) Planning and direction of crop production operations particularly cotton spraying and disease control measures, but also insect and disease control on other crops.
- (c) Planning and direction of research activities particularly with regard to the content of the programme, monitoring of progress and application of findings and results.
- (d) Checking on performance of the crop production operations including surveys and measurements for monitoring and evaluation purposes and reporting on these.

He would be assisted by an Assistant Production Manager who would be particularly concerned with tenant crop production and husbandry.

B.13 Post: Crop Protection Officer

Qualifications:

Degree in Agriculture with specialisation in Entomology. Experience of cotton pests and control systems for large scale operations would be necessary as would a knowledge of pests and diseases of other crops grown. A working knowledge of weeds and their control measures would be desirable.

Job description:

He would be responsible for all aspects of the crop protection programme which would deal with pests, diseases and weed control on the project. This will involve assessing the incidence and control measures required.

He would direct the work undertaken by the staff of the Crop Protection Section and organise training programmes for staff and tenants.

He would assist with the work of the pesticide monitoring programme to be undertaken by the National Agricultural Laboratories.

He would have a staff consisting of two Assistant Crop Protection Officers and Pest Control Assistants and guards.

B.14 Post: Field Officer

Qualifications:

Agricultural graduate with appropriate experience of operational projects including irrigation.

Job description:

He would be responsible for all agricultural operations carried out in an area or block of about 500 hectares including:

- (a) Land preparation by the project mechanisation pool.
- (b) Irrigation practices and performance.
- (c) Crop husbandry by tenants.
- (d) Collection and preparation of crops for market and storage by tenants.

He would prepare overall plans of operation and work programmes required. Progress would be reported on and basic records kept covering all aspects of operations performed and production levels achieved in the block.

The work of all junior crop production staff in the area would be directed and supervised and training programmes carried out as necessary. The staff involved would be as follows:

- 1 or 2 Head Field Assistants
- 6 to 8 Field Assistants
- 6 Water guards

B.15 Post: Head Field Assistant

Qualifications:

F.A. basic qualification with demonstrated capability of performance of duties and handling of staff and tenants.

Job description:

Head Field Assistants would be responsible for supervising the work of 4 to 6 Field Assistants. They would provide a link between Field Officers and Field Assistants particularly in respect of the following:

- (a) Co-ordinating land preparation operations.
- (b) Checking on specific problems such as inadequate irrigation, pest outbreaks etc.
- (c) Reporting on shortfalls or delays in the programme.

They would supervise and directly assist in the in-service training programme of Trainee Field Assistants.

B.16 Post: Field Assistant

Qualifications:

Agricultural certificate or equivalent with pre-service training in irrigation.

Job description:

Field Assistants would be responsible for supervising and guiding the day-to-day farming operations carried out by about 110 tenants, including:

- (a) Land preparation (manual).
- (b) Planting and subsequent crop husbandry.
- (c) Irrigation practices.
- (d) Harvesting and preparation of crops for market or storage.
- (e) Crop storage for subsistence.

Tenant training and demonstration covering simple basic farming techniques would be carried out.

Basic records would be kept of agricultural operations carried out and measurements made to assess crop yields and other performance parameters required for monitoring.

B.17 Post: Mechanisation Supervisor

Qualifications:

Appropriate trade qualification with wide experience of agricultural machinery operation.

Job description:

He would be responsible for organising the agricultural machinery pool and supervising the actual carrying out of all mechanised operations on the project.

He would direct the work of the mechanisation foremen and driver and would ensure that they are trained to carry out their respective jobs. Specific aspects which his duties would cover are:

- (a) Land preparation operations, land levelling and transport of inputs and produce.
- (b) All records and documentation relating to the operation of the agricultural equipment, checks on efficiency and specifications of work carried out.

He would be assisted by an Assistant Mechanisation Supervisor and four Mechanisation Foremen.

B.18 Post: Project Engineer

Qualifications:

Engineering degree with wide experience of operating irrigation systems and the maintenance of plant and equipment.

Job description:

He would be in charge of the engineering division at project level and would be responsible to the Project Manager for its performance.

The activities which he would cover include the following:

- (a) The regulation and supply of water for crop production, domestic and drinking pools requirements.
- (b) Maintenance of all the project works and roads, including canals, distribution systems and on-farm works.
- (c) Maintenance of all NIB buildings and facilities together with any which other organisations delegate to the NIB.
- (d) Operation of the project workshops for the maintenance of vehicles, farm machinery, plant and equipment.
- (e) Reporting on performance and operation of all project engineering works.

In connection with the above the engineer will be required to plan and organise the overall requirements of the work programme and staff involved; prepare designs for new and remedial works required; co-ordinate joint working programmes with other organisations; and carry out training programmes required for staff.

The Assistant Project Engineer would assist him in carrying out the above duties.

B.19 Post: Irrigation Maintenance Engineer

Qualifications:

Engineering degree and appropriate experience of irrigation system operation and maintenance.

Job description:

He would be responsible under the Project Engineer, for all aspects of project works operation and maintenance and road maintenance. His duties would involve the following:

- (a) Operation of the temporary pumping plant.
- (b) Operation and maintenance of the irrigation and drainage system from the river off-take structure to irrigation unit distribution.
- (c) Control of the operation of all NIB heavy maintenance plant.
- (d) Control of all staff employed in the section.

All records of water use, plant use and operation and reporting on performance would be his responsibility. He would also train junior staff in the performance of their duties.

B.20 Post: Irrigation Foreman

Qualifications:

Appropriate trade qualification or agricultural certificate with proven capability for operation of irrigation system.

Job description:

He would be responsible, under the Irrigation Maintenance Engineer, for supervision of the control of staff and plant engaged in the maintenance of the irrigation supply system.

B.21 Post: Senior Water Guard

Qualifications:

Promotion on the basis of proven capability at water guard level.

Job description:

Responsible for supervising the work of 10 to 12 water guards in an irrigation block, including the following:

- (a) Operation of canal and unit gates and nightstorage reservoirs.
- (b) Reporting on operational problems and checking the condition of the supply system and secondary distribution network.
- (c) Training water guards in the performance of their duties.
- (d) Keeping records of the irrigation operations for the block.

B.22 Post: Water Guard

Qualifications:

Primary school leaving (grade six) plus appropriate in-service training.

Job description:

Responsible for the control of water at the irrigation unit level including:

- (a) Supplying water to tenants.
- (b) Operation of the drainage system.
- (c) Assisting Field Assistants to supervise tenant irrigation operations.
- (d) Checking the condition of the minor works and distribution system.
- (e) Checking on field levelling.

B.23 Post: Workshop Engineer/Supervisor

Qualifications:

Mechanical engineering degree or higher trade qualification with wide experience of operating large workshops for the maintenance of vehicles, agricultural machinery and heavy plant.

Job description:

He would be responsible under the Project Engineer for the control and supervision of the project workshops (main and mobile units). His duties would include the following:

- (a) Planning the overall programme required to cater for the maintenance and repair of all NIB vehicles, agricultural machinery and heavy plant.

B.26 Post: Building Foreman

Qualifications:

Building trade qualification and proven capability for carrying out building works of all kinds.

Job description:

He would be responsible, under the Building Supervisor, for the direct supervision of artisans employed on maintenance work.

During the initial construction phase he would be responsible for supervising the tenant house and building construction programme.

B.27 Post: Project Administrator/Accountant

Qualifications:

Appropriate qualification in business administration and/or accounting with wide experience of project administration and financial control.

Job description:

He would be responsible under the Project Manager for all aspects of the day-to-day administration of the project including the following:

- (a) Financial control and accounting requirements of the project.
- (b) Stores and supplies procurement and distribution.
- (c) Staff records, discipline and welfare.
- (d) Staff training programmes.
- (e) Office administration, documentation systems and control of staff vehicles.
- (f) Industrial relations affecting NIB employees.

He would have a comprehensive staff under him comprising Accountants, Storemen, Personnel Officer, Training Officer and an Assistant Administrator.

B.28 Post: Training Officer

Qualifications:

Agricultural graduate with post-graduate training in extension and teaching. Experience of agricultural training.

Job description:

He would be responsible for organising training programmes for all project staff and tenants, preparation of audio-visual materials for use in extension programmes.

He would be responsible for running the training centre at Bura which would provide facilities to all organisations operating in the area.

He would organise the training programme for all staff of Assistant grade being conducted on the project.

- (b) Control of the workshop operation and all staff involved.
- (c) Specialised stores control.
- (d) Keeping appropriate records of all vehicles, machines and plant for costing and performance assessment purposes.
- (e) Training workshop staff.

The Assistant Workshop Engineer would assist him in carrying out his duties.

B.24 Post: Workshop Foreman

Qualifications:

Trade qualification with proven capability for mechanical workshop supervision and knowledge of repair and maintenance work.

Job description:

There would be two jobs involved:

Foreman 1: Supervision of the main central workshops operation, and staff employed in them.

Foreman 2: Supervision of the mobile workshops and all staff employed on them.

The men would be required to maintain strict control and ensure that all work was carried out to the required standard.

B.25 Post: Building Supervisor

Qualifications:

Trade qualification and wide experience of building construction and maintenance.

Job description:

He would be responsible, under the Project Engineer, for all aspects of building maintenance, and construction after the main contracts have been completed in the project area. His duties would involve:

- (a) Control and supervision of all building maintenance staff.
- (b) Inspection and checking on all buildings for assessment of maintenance and repair work requirements.
- (c) Design of new buildings and extensions and supervision of construction.
- (d) Control of all plant and equipment required for maintenance work.

He would liaise with the central project stores on ordering of materials and supplies required for the building section.

ENDIX C

DOCUMENTATION SYSTEM COMPONENT
AND SUB-COMPONENTS

Number	Components Detail	Number	Sub-Components Detail
1	Agricultural Operation	1	Management
		2	Agricultural Section
		3	Accounting Section
		4	Irrigation Supply Section
		5	Maintenance Irrigation System
		6	Maintenance Roads
		7	Maintenance Buildings
		8	Pest Control Section
		9	Vermin Control Section
		10	Agricultural Mechanisation
		11	Workshops
		12	Research Station
		13	Pool: drivers, clerks, labour
2	Education	1	Primary School
		2	Secondary School
3	Health	1	Predevelopment Control
		2	Village Unit/Dispensary
		3	Health Sub-centre
		4	Health Centre
		5	Hospital
4	Administration	1	District Administration
		2	Local Administration
		3	Police
		4	Local Council
5	Social Services	1	Village Creches/day-care centres
		2	Village Polytechnic
		3	Community Centres
		4	Community Development Organisation
6	Tenants	1	Selection Programme
		2	Transport, Reception and Induction
		3	Training
7	Cropping Pattern	1	Cotton
		2	Maize/Cowpeas
		3	Groundnuts
		4	Garden
8	Livestock	1	Meat Production
		2	Milk Production
		3	Research
30	Forestry	1	Firewood supply
		2	Charcoal
		3	Kerosene supply
		4	Research

		5	Recreational forest
		6	Gazetting and protection of riverine forest
		7	Pole supply
10	NIB Headquarters	1	NIB Board
		2	Technical Division
		3	Administrative Division
		4	BPCO
13	Training	1	Training
14	Implementation	1	Implementation Programme
60	Road Works	1	Roads to Villages
		2	Nanigi Road
		3	Garsen - Garissa road
50	Riverworks	1	Weir
		2	Offtake
		3	Bridge
		4	Embankments
		5	Overflow/spillway flood plain
51	Supply Canal	}	Structures, Earthworks (with further breakdown into elements)
52	Primary Irrigation system (Main canal)		
53	Secondary irrigation and drainage system		
54	Tertiary irrigation and drainage system		

NOTE: The above breakdown differs in a few instances from that produced by the Bura Office of the NIB. Further revision will be required before it can effectively be used for documentation purposes.

BURA IRRIGATION SETTLEMENT PROJECT

PROJECT PLANNING REPORT

PROJECT COSTS ANNEXE

BURA IRRIGATION SETTLEMENT PROJECT

PROJECT PLANNING REPORT

PROJECT COSTS ANNEXE

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SUMMARY

The annexe details the estimated costs of the components of the project, and describes the basis for their calculation. Major factors influencing the estimates are discussed, and examples of typical unit costs are given.

Appendices are included in the annexe with tables setting out details of the capital and recurrent costs of the components of the project. Budgets are included detailing the year-by-year expenditure on capital and recurrent cost items during the implementation period, which ends with the financial year 1982-83.

The total estimated project cost is K Sh 936 million (US\$112.1 million), comprising a base cost of K Sh 660 million (US\$ 78.9 million), physical contingencies of K Sh 86.4 million (US\$ 10.3 million), and price contingencies of K Sh 189.7 million (US\$ 22.9 million).

The costs are generally similar to those included in the IBRD/IDA financing plan, except that an additional year's cost of operating the project has been included to provide in the budget for completion of settlement during the second half instead of the first half of 1982, and provision has been made for some items previously not included. All the additional costs involved are a charge on the Government of Kenya and do not affect the financing plan.

1.3 Presentation of Estimates

The estimates are presented in a form similar to that used in the International Bank for Reconstruction and Development (IBRD) appraisal reports, for ease of reference and comparison. The components have been grouped together with inclusion in construction or procurement contracts in the annexed tables.

This has required some change from the layout adopted in the appraisal reports. For example, public health buildings and housing have been included in the capital cost summary tables under the earlier building works, and not under public health, although they are included in the public health budget. Major construction works comprise all the major construction works, details, irrigation network, and on-farm development works; and minor construction works comprise the wildlife conservation works and roads and airfields.

The bills for the staffing, provision of buildings and vehicles and other requirements are described in considerable detail in the various specialist reports. Budgets are included in each of the annexes but for completeness all budgets are included in Appendix 5 of this annexe. These budgets give the programme of capital expenditure year-by-year during the implementation period, and the recurrent costs including salaries, vehicle running, expendable materials and other maintenance costs.

1.4 Implementation Period and Contingencies

The implementation period is assumed to run from October 1977 to the end of the financial year 1982-83, and all costs are shown at January 1977 prices.

Physical contingencies have been allowed at different rates for different classes of work according

CHAPTER 1 INTRODUCTION

1.1 Introduction and Terms of Reference

The terms of reference for the Project Planning Report require a financial and an economic analysis to be made and updated cost estimates to be prepared for all project components, based upon previous designs.

The requirements include the preparation of cost estimates for the following items:-

- (a) Project irrigation works;
- (b) housing and buildings for all components of the project, and infrastructure works, including treated domestic water supplies, electricity and drainage;
- (c) local administration costs, post and telegraph services, police, health and social services;
- (d) agricultural inputs, wildlife and forestry costs, and project management.

These cost estimates are described in this annexe, which effectively brings together costs of each discipline discussed in detail in the various specialist annexes.

The method of presentation and the general assumptions made are explained, together with the methods of determining the construction costs of work carried out by contractors and by the National Youth Service (NYS). The basis of estimates for buildings, infrastructure works and other components is detailed, and information is given on salaries and other recurrent cost items.

The total project capital and recurrent costs and the programme of expenditure are discussed and summary tables are included showing all project costs.

1.2 Presentation of Estimates

The estimates are presented in a form similar to that used in the International Bank for Reconstruction and Development (IBRD) appraisal reports, for ease of reference and comparison. The components have been grouped together with inclusion in construction or procurement contracts in the simplest manner.

This has required some change from the layout adopted in the appraisal reports. For example, public health buildings and housing have been included in the capital cost summary tables under the section entitled buildings, and not under public health, although they are included in the public health budget. Major construction works comprise all the river diversion works, canals, irrigation network and on-farm development works, and minor construction works comprise the wildlife conservation works and roads and airfields.

The basis for the staffing, provision of buildings and vehicles and other requirements, are described in considerable detail in the various specialist annexes. Budgets are included in each of the annexes but for completeness all budgets are included in Appendix B of this annexe. These budgets give the programme of capital expenditure year-by-year during the implementation period, and the recurrent costs, including salaries, vehicle running, expendable materials, and other maintenance costs.

1.3 Implementation Period and Contingencies

The implementation period is assumed to run from October 1977 to the end of the financial year 1982-83, and all costs are shown at January 1977 prices.

Physical contingencies have been allowed at different rates for different classes of work according

to an assessment of the comprehensiveness of the estimating material. Thus contingencies on such items as plant and equipment are less than for village housing. The different rates are as follows:-

- (a) 15 per cent on major and minor project works, infrastructure works and the cotton ginnery;
- (b) 20 per cent on tenant housing and other village construction, such as schools and multi-purpose halls, and forestry;
- (c) 10 per cent on items of plant, equipment and vehicles and salaries.

The price contingencies have been calculated on the following rates of inflation, the base costs items being distributed in accordance with the project programme in the Implementation Annexe:

	Construction and Building (%)	Salaries, Equipment and Operating Costs(%)
1977-1979	9	7.5
1980 onwards	8	7.0

These rates are those used by the IBRD in their appraisal reports.

All calculations have been based on a rate of exchange of 8.35 Kenya Shillings equivalent to US \$1.00, the exchange rate used in the IBRD appraisal report of May 1977.

The cost estimates include all local taxes and import duties.

1.4 Budgetted Expenditure Tables

The project base capital costs are at January 1977 prices. Budgets have been prepared showing the project base cost expenditure year-by-year through the implementation period for each government agency, based on the implementation programme. The tables are given in the specialist annexes and are included together in Appendix B of this annexe for completeness.

These tables have also been used to determine price contingencies by using the inflation factors described in Section 1.3 to calculate multiplying factors for inflation each year. The factors have been applied to the programmed base cost expenditure in each year to determine the inflated base cost. The price contingency has been calculated by subtracting the base cost expenditure for the year from the inflated base cost.

1.5 Financial and Economic Analysis

Financial and economic analyses have been carried out based on the total capital and recurrent project costs included in this annexe and are fully detailed in the Economic and Financial Analyses Annexe.

CHAPTER 2 BASIS OF COSTS ESTIMATES

CAPITAL COSTS

2.1 Engineering Works Quantities

In accordance with the terms of reference, the quantities on which the engineering costs estimates have been based have been calculated from the drawings accompanying the ILACO feasibility study report and from the more detailed draft irrigation layouts received during the course of preparing this report.

With the exception given below, no account has been taken of any modifications of these drawings which may be required as a result of the Design Review Report.

Because the information available from the drawings is in some cases limited, the calculated quantities have been compared with those used in the ILACO feasibility study report and the IBRD appraisal reports. The following practices have been adopted as a result of these comparisons:-

- (a) The quantities in the previous reports have been adopted where calculated quantities have been in close agreement with the quantities given in the previous reports.
- (b) The previous quantities have also been adopted where in one or two cases quantities have been currently calculated which are very much less than those given in previous reports and there has been no obvious explanation of the discrepancy.
- (c) The currently calculated quantities have been adopted where they are greater than those given in previous reports and are clearly correct.

It should be noted that in accordance with the terms of reference for the Project Planning Report, the estimates in this report should be based upon the original ILACO design for the river works. The design has been discussed in the Design Review Report, which recommends that to serve more effectively both the proposed west bank and east bank development, a new design be considered.

This new design is estimated to cost no more, perhaps less, than the proposed original, but because the ILACO Feasibility Report costs did not include all headworks costs, notably those for works to deliver irrigation water to the east bank, there is an additional amount of about K Sh 25 million (US\$3.0 million) over and above the ILACO costs, which has been allowed for in this annexe. This represents just under three per cent of the total project costs including physical and price contingencies, and may be absorbed by the contingency items.

2.2 Rates for Contractors' Work

It has been assumed that the construction of the headworks, the main canal, irrigation network and on-farm development works together with the structures on the supply canal, will be carried out by experienced contractors following international competitive bidding.

Estimates for these components of the project works have been obtained by applying unit rates to the calculated quantities. Lump sum items have been included where appropriate, for example, for gates and for camp facilities.

The unit rates used in the estimate were determined after calculation of unit rates by three different methods, described below.

The first method used was to build up rates by costing the basic elements of labour, plant and materials for the different operations required to construct the works, using local rates of pay, plant operation, materials costs, and rates of construction. Additional elements for contractors' head office overheads and profit, together with any other on-costs, were added to arrive at an overall composite rate for the work item.

The second method established rates based on current contract rates in various parts of Kenya. These rates were then extended to allow for the conditions for construction at Bura relative to the original contract location. The current contract rates used were obtained from the Ministry of Works, contractors and consultants operating in Kenya.

The third method of calculation used was to extend recent international tender rates obtained for similar work with similar terrain and infrastructure in other countries to the situation at Bura. This method was used only as a check on the first two methods, because it is difficult to relate risks and taxation elements of cost between countries.

The unit rates calculated by the three methods were compared and an appropriate unit rate selected for use in the estimates. The rates include for overseas head office costs and profits, insurances, transport and other preliminary items where no specific provision has been made elsewhere in the estimates. Typical unit rates for contractors' work are given in Table 2.1.

Table 2.1 - Typical Rates for Contractors' Work
used in Cost Estimates (K Sh)

Item	Unit	Unit Rate
Clearing forest at headworks site	hectare	12 500
Excavation for foundations	cubic metre	25
Concrete for structures	cubic metre	2 100
Riverbank protection	square metre	160
Grass cover of embankments	hectare	59 500
Excavation and compacted fill (for embankments)	cubic metre	30
Clearing bush for canal construction	hectare	2 450
Excavation and compacted fill (for canals)	cubic metre	22
General excavation	cubic metre	21
Stone pitching, dry and in concrete	square metre	480
Excavation and compacted fill (minor canals)	cubic metre	17
Excavation for minor structures	cubic metre	15
Stone pitching for minor structures	square metre	400

Note: Rates based on January 1977 prices and include for contractors' overheads and profit.

2.3 Rates for National Youth Service Work

The National Youth Service (NYS) has been assumed to be responsible for the supply canal earthworks, the Garsen-Garissa road upgrading and the Nanigi access road, together with the airstrips and assistance in village development.

Unit rates for NYS work have been calculated for the earthworks based on the NYS hire charge rates schedule effective from 1st July 1976, with the additional of fuel costs and supervisory and operating staff salaries and allowances. Fuel has been allowed for at a price per litre of K Sh 1.95 for diesel and K Sh 2.72 for super petrol, FOB Hola. Rates of construction for the calculation of unit rates have been estimated from NYS records and observation of NYS in the field.

The cost estimates for NYS work on the roads and airfields components have been presented as lump sums for each component. These lump sums have been calculated from the total number of machine hours required to complete the works, with the addition of materials, transport and NYS supervisory costs. This is a more reliable method than applying unit rates to calculated quantities, because the rate of completion of a length of road by a plant spread has been determined by observation in the field on the Garsen-Garissa road. The costs of NYS work in stockpiling supplies of building materials at the villages are included in the estimates for village housing, discussed in the Housing and Building Annexe.

NYS procedures for the procurement of some spare parts are at present slow and inflexible. It is essential to ensure an adequate supply of spare parts if proper progress is to be maintained on the works. It is recommended that a supply of spares be obtained before the work starts, adequate for the full working life of all NYS plant allocated to the Bura project, and that the current procurement procedure for spare parts be simplified to ensure there are no delays to plant operation.

2.4 Building Construction

Existing Ministry of Works housing designs require extensive modification or redesign to be acceptable climatically and in cost terms at Bura. New and revised designs may be required for housing to be occupied by the staff of the National Irrigation Board and Government agencies at the project. The Housing and Building Annexe describes seven house types which were assumed for the purpose of estimating the housing costs for the project. The allocation of houses by grade assumed in the estimates is shown in Table C.1 at the end of this annexe.

Costs estimates have been based on existing building construction costs in Kenya, taken from typical building contracts and extended to allow for the additional transport and other costs necessary at Bura.

Tenant housing costs have been calculated on the basis of tenants constructing their own houses under supervision from NIB personnel. Labour costs for supervision have been included together with the costs of a subsistence labour allowance for tenants. The construction of village schools and multi-purpose halls has also been assumed to be done by tenant labour.

All other buildings have been costed on the basis of construction under contract by contractors with supervision by either NIB personnel or the project consultants as appropriate. Procurement of these contracts generally will be by standard IBRD procedures incorporating a preference margin for local contractors. Procurement is described in the Implementation Annexe.

The estimated costs of standard types of buildings are summarised on Table 2.2 below.

Table 2.2 - Unit Cost Rates for Typical Building Types

	Unit Cost (K Sh)
Staff house type A	310 000
Staff house type B	200 000
Staff house type C	165 000
Staff house type D	110 000
Staff house type E	58 000
Staff house type F	14 000
Tenant house (figure used in IBRD appraisal report, actual cost will vary with type selected)	4 000
Health Centre	1 350 000
Health Sub-centre	160 000
Post Office	600 000
Office building (typical cost/m ² depending on fittings, etc.)	1 200 - 1 500
Special workshops (steel framed, typical cost/m ²)	950
Storage buildings and workshops (typical cost/m ²)	750

Details of the building requirements for each component of the works, NIB, Administration, Public Health, etc., are given in the specialist annexes, and the overall housing requirements for the project are summarised in Table C.1.

The estimates for public health buildings are based on current Ministry of Health construction cost records and the costs of offices, workshops and other buildings are either taken from current costs records of similar construction in Kenya, or else developed using basic cost data for materials, labour and plant components.

2.5 Vehicle Procurement

Details of the vehicle requirements for each component of the project are given in each specialist annexe and are summarised in Table C.2 of Appendix C.

Estimated vehicle costs are based on list prices current in Kenya in January 1977 obtained from a range of vehicle suppliers. All prices are quoted CIF Nairobi or Bura as appropriate. Prices include all taxes and duties appropriate to the vehicle under current legislation, with a deduction for suppliers' discounts. All prices have been rounded to the nearest 1 000 K Sh. Typical details of vehicles costs are shown in Table 2.3.

Procurement will be generally by competitive bidding and it is possible that some reduction in cost may result from this procedure.

Allowance for the capital costs of building up a spares supply has been made by allocating an additional item amounting to 20 per cent of costs of the vehicles for this purpose.

Table 2.3 - Typical Vehicle Costs used in Estimates (1 000 K Sh)

Item	Local Unit Price exclusive of Taxes	Taxes and Duties	Dealers Discount	Net Total Cost
Saloon cars	40	19	2	57
Four wheel drive:				
SWB hard top	58	14	4	68
SWB pick up	54	13	4	63
LWB hard top	68	17	5	80
LWB pick up	67	14	4	77
LWB station wagon	78	17	4	91
Pick up	35	10	2	43
3 ton lorry	94	31	9	116
7 ton lorry	134	44	14	164
Motor cycles	5	1	1	5
Bicycles	1	-	-	1

2.6 Plant and Machinery Procurement

The plant and machinery component includes all plant necessary for the maintenance of the engineering works and all the agricultural machinery. Some changes have been made to the previous proposals for heavy maintenance equipment and road maintenance equipment. For example, only one cutter suction dredger is now proposed in place of two different capacity machines, while three dragline machines are proposed for canal maintenance. Some reductions in overall costs have also been achieved by integrating the plant requirements for irrigation maintenance and road maintenance.

The costs of individual items have been obtained from Kenyan suppliers on the same basis as

described above for vehicles. All prices are CIF Bura, and the allowance for special tools and spares has been costed at 20 per cent of the cost of the plant items.

2.7 Equipment and Tools Procurement

The specific requirements for equipment and tools have been dealt with in appropriate annexes. The estimated costs have been based on CIF prices at Bura, as described in Section 2.5.

Telecommunications equipment costs have been based on contract prices for similar equipment supplied recently to irrigation contracts in other African countries, with adjustments for different transport costs and taxes relating to the situation at Bura. Hydrological and meteorological equipment costs have been estimated on a similar basis.

2.8 Treated Water Supply, Roads and Other Infrastructure Costs

The capital cost estimates for the treated water supply system have been based on current contract rates for water supply systems in rural Kenya, adjusted for the Bura location. The estimate is based on a central water treatment plant located at the rural centre and obtaining raw water from the main canal. The water is treated as described in the Utility Services Annexe and distributed to the villages by a gravity uPVC mains system.

The estimate includes for the water treatment works, the distribution system to the villages, and the local distribution system within the villages and the rural centre.

An estimate is included for the project roads linking the sub-local, local and market centres and the rural centre. The roads are assumed to be all-weather roads built on the embankments of the branch canals and block feeders. It has been assumed that the work will consist of trimming the formation and providing a 150 mm thick murrum or similar surfacing, graded to falls and compacted, and that the grading and surfacing work will be carried out by the National Youth Service using its own plant.

An estimate has also been included for a piped waterborne sewage supply for the rural centre only. This is required because the density of settlement will be too great for pit latrines or septic tank drainage to be practical. The estimate includes for main sewers, pumps and oxidation ponds. The costs of individual connections have been included in the estimates for individual buildings.

An electricity generating compound has been provided at the rural centre to supply the cotton ginnery, the houses and other buildings within the rural centre, street lighting, and the water and sewerage pumps. An estimate is included for the generating equipment and the distribution system. No allowance has been made for an electricity supply to the village settlements. The costs estimates are based on East African Power and Light Company contract prices and operating cost records: they make no allowance for any additional supply to the Hola Irrigation Scheme because this would not be a charge on the Bura Project.

RECURRENT COSTS

2.9 Personnel Costs

The detailed requirements for personnel for the different components of the project are described in the specialist annexes.

The personnel costs are calculated generally on the basis of the published salary scales of the National Irrigation Board and the Government of Kenya, or on a normal consultancy basis for expatriate staff.

The mid-point of the appropriate scale has been assumed for calculation of the estimates, except in the case of some National Irrigation Board staff. A number of these staff will be newly trained and recruited for the Bura Project and will start at the bottom of the appropriate salary scale. This has been allowed for in the estimates for NIB salaries during the implementation period.

In certain cases personnel will be entitled to allowances for hardship, furnishings and other items, and in the case of certain expatriate staff air fares on leave, and education allowances. These costs have been included in the estimates, where appropriate under salary costs.

The costs of hard furnishings for some grades of staff are met by the government agency in addition to providing a house. The estimated costs of housing indicated in Table C.1 include an allowance of about 10 per cent for hard furnishings for staff house types A to D inclusive.

2.10 Operation and Maintenance of Works, Buildings and Utilities

The costs for personnel involved in maintenance work have been included as described in Section 2.9.

A figure of two per cent of the estimated costs of buildings has been allowed for the annual cost of materials for the maintenance of buildings and workshops, the costs of labour and plant being included in the salaries and plant operating costs heads of budget.

The operating costs of utilities has been calculated on the basis of an annual cost for spares of about 15 per cent of the costs of all pumps, generators and other mechanical equipment plus estimated actual costs of fuel and lubricants. Staff salaries and allowances have also been included in the operating costs, together with an allowance for replacement of the civil and building works equal to 0.25 per cent of the estimated capital costs of the works.

2.11 Operation and Maintenance of Vehicles, Plant and Machinery

The recurrent costs of operation of vehicles, plant and machinery include: fuel costs and lubricants, licences, taxes and insurances; and a supply of spares amounting to approximately 11 per cent per annum of the capital costs of the vehicles, plant and machinery (the actual allowance varying between 7 and 12 per cent depending on type). Typical operating and maintenance costs are detailed on Tables 2.4 and 2.5 for different types of vehicles and farm machinery.

Salary costs for maintenance have been included in the personnel costs described in Section 2.9.

2.12 Administrative Running Costs

No separate allowance generally has been made for administrative running costs, because these have been assumed to be covered in the maintenance costs of buildings, furnishings and fittings and the additional allowances included in personnel costs.

In certain cases where direct expenditure on stationery, office stores and consumables can be to some extent quantified, a specific item for administrative running costs has been included.

2.13 Farming Inputs and Materials

The recurrent costs of farm inputs and materials have been based on January 1977 costs of seed, chemicals, fertilisers, crop spraying and other items. They have been described in the Agricultural Planning Annex and details of farm inputs are tabulated in the Economic and Financial Analysis Annex.

Funding for the incremental farm inputs has been shown separately from the National Irrigation Board operating costs in the IBRD appraisal report of May 1977, but in this report the farm inputs have been incorporated in the NIB operating costs directly.

Item	Unit	Quantity	Unit Cost (K\$)	Total Cost (K\$)	Remarks
1. Diesel engine	hp	50	1.75	87.50	50 hp diesel engine
2. Fuel oil	litres	1000	0.15	150.00	1000 litres of fuel oil
3. Spare parts	per engine	1	1.00	1.00	Spare parts for engine
4. Lubrication	per engine	1	0.50	0.50	Lubrication for engine
5. Transport	per engine	1	0.50	0.50	Transport cost for engine
6. Total				144.50	
7. Tractor	hp	50	1.75	87.50	50 hp tractor
8. Fuel oil	litres	1000	0.15	150.00	1000 litres of fuel oil
9. Spare parts	per tractor	1	1.00	1.00	Spare parts for tractor
10. Lubrication	per tractor	1	0.50	0.50	Lubrication for tractor
11. Transport	per tractor	1	0.50	0.50	Transport cost for tractor
12. Total				140.50	
13. Station wagon	unit	1	10.00	10.00	Station wagon
14. Fuel oil	litres	1000	0.15	150.00	1000 litres of fuel oil
15. Spare parts	per wagon	1	1.00	1.00	Spare parts for wagon
16. Lubrication	per wagon	1	0.50	0.50	Lubrication for wagon
17. Transport	per wagon	1	0.50	0.50	Transport cost for wagon
18. Total				152.50	
19. Motor cycle	unit	1	5.00	5.00	Motor cycle
20. Fuel oil	litres	1000	0.15	150.00	1000 litres of fuel oil
21. Spare parts	per cycle	1	1.00	1.00	Spare parts for cycle
22. Lubrication	per cycle	1	0.50	0.50	Lubrication for cycle
23. Transport	per cycle	1	0.50	0.50	Transport cost for cycle
24. Total				157.50	
25. Miscellaneous	unit	1	1.00	1.00	Miscellaneous
26. Fuel oil	litres	1000	0.15	150.00	1000 litres of fuel oil
27. Spare parts	per misc.	1	1.00	1.00	Spare parts for misc.
28. Lubrication	per misc.	1	0.50	0.50	Lubrication for misc.
29. Transport	per misc.	1	0.50	0.50	Transport cost for misc.
30. Total				153.50	
31. Grand Total				1440.00	

Table 2.4 - Vehicle Operating and Maintenance Costs

Type	Motor Cycle	Land Rover LWB Pickup	Land Rover Station Wagon	Pickup	Saloon Car	Lorry 3 ton	Lorry 7 ton
<i>Planning Criteria</i>							
Average annual km	5 000	20 000	20 000	20 000	20 000	15 000	25 000
Tyre life km	5 000	20 000	20 000	15 000	15 000	15 000	15 000
Fuel(km/litre)	30	5	4.5	6	8	4	
Life (years)	3	6	6	5	5	6	
<i>Operating Costs (annual/K Sh)</i>							
Fuel (1)	450	10 880	12 090	9 070	6 400	10 000	19 000
Lubrication (2)	90	1 360	1 510	1 130	800	2 000	2 400
Tyres	150	3 280	3 280	2 100	2 100	4 000	8 000
Spares (3)	610	7 000	8 000	3 000	5 000	11 000	18 000
Insurance and taxes	230	4 400	4 400	4 250	6 250	6 000	8 000
TOTAL	1 530	26 920	29 280	19 550	20 450	33 400	56 000
Average cost (sh/km) for budgetting	0.30	1.35	1.45	1.00	1.00	1.60	
Annual	1 500	27 000	29 000	20 000	20 000	24 000	50 000
Initial cost (K Sh)	6 200	77 300	90 600	42 600	57 000	115 000	164 000
Depreciation (K Sh) (4)	2 370	16 850	19 760	10 680	14 280	25 200	36 000

- Notes:**
- (1) Fuel costs (K Sh per litre):
- | | | | |
|--|---------|-------------|---------------------|
| | Bura | Diesel 1.95 | Premium petrol 2.72 |
| | Nairobi | 1.77 | 2.57 |
- (2) Lubrication estimated at 12½ per cent of fuel cost for vehicles and 20 per cent for motor cycles.
- (3) Spares costs based on estimated rates:
- | | | |
|---------------|--------------------|---------------|
| Land Rovers — | LWB and SWB Pickup | 35 cts per km |
| | Station wagon | 40 cts per km |
| Pickup | | 15 cts per km |
| Saloon car | | 20 cts per km |
| Lorry — | 3 ton | 40 cts per km |
| | 7 ton | 60 cts per km |
- Motor cycle based on 10 per cent of purchase price
- (4) Depreciation calculated as the annual equivalent of the initial cost, including interest at 10 per cent and residual value of 5 per cent of initial cost.

Table 2.5 - Farm Machinery Operating Costs

Item	Initial Cost (KSh 1000)	Hours/km per annum	Useful Life (years)	Depreciation per annum ² (K Sh)	Operating Costs				Miscel- laneous	Total
					Fuel	Oil & Lubrication	Repairs & Maintenance ³ (K Sh)			
Tractor 60-70 hp	85.4	900	8	14 400	8 775	1 755	6 410	300	17 240	
Tractor 70-80 hp	92.6	900	8	15 600	10 530	2 100	6 900	300	19 830	
Plough - 3 furrow	9.7	750	8	1 820	-	-	485	-	485	
Plough - 4 furrow	13.2	750	8	2 470	-	-	660	-	660	
Ridger	6.0	750	8	1 120	-	-	300	-	300	
Harrow	13.1	650	8	2 450	-	50	650	-	700	
Trailer - 5 ton	19.7	-	12	2 890	-	100	590	-	690	
Trailer - 3 ton	13.1	-	12	1 920	-	100	390	-	490	
Land leveller	42.6	400	12	6 250	-	100	430	-	530	
Digger shaker	17.3	220	12	2 540	-	250	860	-	1 115	
Mobile lubrication & fuel unit (3 ton truck)	153.0	10 000	8	25 800	6 600	1 300	7 300	9 000 ⁴	24 200	
Mobile workshop (7 ton truck)	179.0	20 000	8	30 200	12 900	1 600	11 900	14 100 ⁴	40 500	

Notes: ¹ Average hours worked per unit calculated as: $\frac{\text{Estimated Total Hours}}{\text{No. of units}}$

² Depreciation calculated as the annual equivalent of the initial cost, including interest at 10 per cent, residual values allowed for tractors and vehicles at 10 per cent of initial cost.

³ Repairs and maintenance estimated as percentage of initial cost on following basis:

Tractors	7½ per cent
Plough, ridger, harrow, groundnut lifter	5 per cent
Trailer	3 per cent
Leveller	1 per cent

⁴ Includes tyres, insurance and taxes

CHAPTER 3 CONCLUSIONS

3.1 Total Project Cost

The total estimated project cost is K Sh 936 million (US\$ 112.1 million) including physical and price contingencies. This estimate includes all capital and recurrent costs of the project, and its associated institutions up to the end of the financial year 1982/83, settlement being programmed for completion at the end of 1982. The total base cost of the project, excluding physical and price contingencies, is K Sh 660 million (US\$ 78.9 million). Details of the composition of these costs are given in Table 3.1.

These project costs are somewhat greater than those given in the IBRD appraisal report of May 1977. For example, an additional year's operational costs of K Sh 60.53 million (US\$ 7.24 million) has been included because the final migration and settlement of the last of the tenant families will take place in the first quarter of the fiscal year 1982/83. These operational costs are the responsibility of the Kenya Government and do not affect the financing plan for the project.

A comparison of the IBRD project costs and those estimated for this report are given in Table 3.2 together with explanatory notes.

Table 3.2 - Comparison of Project Costs Estimates by World Bank and Project Consultants(1) (US\$million)

Item	World Bank Estimate (IBRD/IDA)	Project Planning Report Estimate (PPR)
Major construction works (2)	19.8	22.8
Minor construction works	2.0	2.0
Buildings (10)	10.0	10.0
Plant and Machinery	2.6	2.6
Vehicles (3)	0.7	1.3
Operation - NIB and Farm Inputs (4)	7.3	9.9
Operation - Institutions (5)	0.9	2.5
Utilities/infrastructure	5.7	5.8
Equipment	0.3	0.3
Consultancy Services (6)	4.2	9.4
Training	0.5	0.4
Agricultural Management (7)	1.8	2.7
Forestry (8)	3.2	4.4
Livestock, Fisheries and Wildlife (9)	—	0.6
Public Health	0.7	0.8
Ginnery (10)	4.9	3.4
Total Base Cost	64.6	78.9
Physical Contingencies	8.8	10.3
Price Contingencies	18.3	22.9
Total Project Cost	91.7	112.1

Notes:

- (1) The World Bank estimates are based on a five year implementation period and do not include expenditures beyond fiscal year 1981/1982. The Project Planning Report estimates are based on settlement being completed during the fiscal year 1982/1983 and include expenditures during that year.

TABLE 3.1

Summary of Project Implementation Costs

Item	Unit	Quantity	Unit cost	Kenya Shillings '000 000			US \$ '000 000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
Major Construction Works				86.0	104.5	190.5	10.3	12.5	22.8	55
Minor Construction Works				8.3	8.4	16.7	1.0	1.0	2.0	50
Buildings				62.9	20.5	83.4	7.5	2.5	10.0	25
Plant and Machinery				5.8	15.8	21.6	0.7	1.9	2.6	73
Vehicles				5.2	6.1	11.3	0.6	0.7	1.3	54
Operation - NIB and Farm Inputs				50.6	32.4	83.0	6.0	3.9	9.9	39
Operation - Institutions				19.5	1.5	21.0	2.3	0.2	2.5	7
Utilities/Infrastructure				22.2	26.1	48.3	2.7	3.1	5.8	54
Equipment				1.0	1.5	2.5	0.1	0.2	0.3	61
Consultancy Services				15.0	63.8	78.8	1.8	7.6	9.4	81
Training				2.3	1.0	3.3	0.3	0.1	0.4	30
Agricultural Management				8.9	13.3	22.2	1.1	1.6	2.7	60
Forestry				29.7	7.4	37.1	3.5	0.9	4.4	20
Livestock, Fisheries and Wildlife				3.8	1.3	5.1	0.4	0.2	0.6	26
Public Health				5.8	1.0	6.8	0.7	0.1	0.8	15
Ginnyery				11.8	16.5	28.3	1.4	2.0	3.4	60
Base Cost				338.8	321.1	659.9	40.4	38.5	78.9	48
Physical Contingencies				44.8	41.6	86.4	5.4	4.9	10.3	
Expected Price Increases				98.1	91.6	189.7	12.0	10.9	22.9	
TOTAL PROJECT COST				481.7	454.3	936.0	57.8	54.3	112.1	

Note: Major construction works comprise the river diversion works, canals, irrigation network and on-farm development works. Minor construction works comprise the wildlife conservation works, roads and airfields.

- (2) PPR figure includes US \$ 3.0 million for additional cost of river diversion structure to supply irrigation water to both east and west banks and not included in the IBRD estimate.
- (3) PPR figure includes vehicles for institutions, services and other developments not the responsibility of NIB, which were not previously included in the project costs.
- (4) PPR figure includes the operating costs for 1982/83.
- (5) PPR figure includes the operating costs for 1982/83 and also assumes higher staffing levels for some services.
- (6) PPR figure includes the following costs not previously included in the estimates:
 - (i) BPCO staff assumed previously to be free under various aid programmes — US \$ 1.8 million
 - (ii) Topographical and soils survey work previously assumed under Dutch aid — US \$ 0.9 million
 - (iii) Additional site supervision previously assumed undertaken by NIB as in (i) — US \$ 1.3 million
 - (iv) Design services in connection with new headworks design, and modifications to existing documents — US \$ 1.2 million
- (7) PPR figure includes the costs for 1982/83, and allows for earlier mobilisation of some staff.
- (8) PPR figure includes the costs for 1982/83.
- (9) PPR figure includes the costs of livestock, fisheries and wildlife trials and extension work which were not finalised and thus not included before.
- (10) PPR estimates for ginnery exclude costs of cotton storage buildings provided for at ginnery in IBRD/IDA estimates. The bulk of the storage is now proposed at the villages and the costs of this storage are included under Buildings, which would otherwise show a reduction on the IBRD/IDA estimate.

3.2 Cost Tables

The project implementation costs are summarised in Appendix A and the budgetted expenditure for each component is presented in Appendix B. Appendix C contains summary tables of types of buildings and vehicles allocated to each component, and details of the salary scales and allowances and vehicle and plant operating costs, assumed in calculating recurrent costs of component expenditure.

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PROJECT COSTS SUMMARY TABLES

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TABLE A.1

Summary of Project Implementation Costs

Item	Unit	Quantity	Unit cost	Kenya Shillings '000 000		US \$ '000 000		% Foreign Exchange		
				Local	Foreign	Local	Foreign		Total	Total
Major construction works				86.0	104.5	190.5	10.3	12.5	22.8	55
Minor construction works				8.3	8.4	16.7	1.0	1.0	2.0	50
Buildings				62.9	20.5	83.4	7.5	2.5	10.0	25
Plant and Machinery				5.8	15.8	21.6	0.7	1.9	2.6	73
Vehicles				5.2	6.1	11.3	0.6	0.7	1.3	54
Operation - NIB and Farm Inputs				50.6	32.4	83.0	6.0	3.9	9.9	39
Operation - Institutions				19.5	1.5	21.0	2.3	0.2	2.5	7
Utilities/infrastructure				22.2	26.1	48.3	2.7	3.1	5.8	54
Equipment				1.0	1.5	2.5	0.1	0.2	0.3	61
Ginnery				11.8	16.5	28.3	1.4	2.0	3.4	60
Consultancy Services				15.0	63.8	78.8	1.8	7.6	9.4	81
Training				2.3	1.0	3.3	0.3	0.1	0.4	30
Agricultural management				8.9	13.3	22.2	1.1	1.6	2.7	60
Forestry				29.7	7.4	37.1	3.5	0.9	4.4	20
Livestock, Fisheries and Wildlife				3.8	1.3	5.1	0.4	0.2	0.6	26
Public Health				5.8	1.0	6.8	0.7	0.1	0.8	15
Base Cost				338.8	321.1	659.9	40.4	38.5	78.9	48
Physical Contingencies				44.8	41.6	86.4	5.4	4.9	10.3	
Price contingencies				98.1	91.6	189.7	12.0	10.9	22.9	
Total Project Cost				481.7	454.3	936.0	57.8	54.3	112.1	

NOTE: Major construction works comprise the river diversion works, canals, irrigation network and on-farm development works
 Minor construction works comprise the wildlife conservation works, roads and airfields.

TABLE A.2

Capital Cost Summary of Major Construction Works

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange		
				Local	Foreign	Local	Foreign		Total	
a	River diversion structure			26,872	32,838	59,710	3,216	3,934	7,150	55
b	Supply canal earthworks			11,791	11,792	23,583	1,412	1,413	2,825	50
c	Other irrigation works									
	Temporary pumpstation			1,174	3,506	4,680	140	420	560	
	Supply canal structures			2,912	3,563	6,475	348	427	775	
	Main canal			5,223	6,386	11,609	626	764	1,390	
	Irrigation network			16,363	19,999	36,362	1,960	2,394	4,354	
	On-farm development			10,406	12,720	23,126	1,246	1,524	2,770	
	Sub-total c			36,078	46,174	82,252	4,320	5,529	9,849	
	Total Base cost			74,741	90,804	165,545	8,948	10,876	19,824	55
	Physical contingencies			11,211	13,621	24,832	1,342	1,631	2,973	
	Price contingencies			21,324	26,062	47,386	2,554	3,121	5,675	
	Total cost			107,276	130,487	237,763	12,844	15,628	28,472	

TABLE A.3

Itemised Cost Summary of Major Construction Works

Sheet 1 of 3

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange
				Local	Foreign	Local	Foreign	
(a) River Works (contractor)	m ³	417,000	25.00	4,691	5,734	562	686	1,248
Excavation	(lump sum)			1,534	1,876	184	224	408
Weir foundations	m ³	3,900	350.00	614	751	73	90	163
Sheet piling	m ³	9,353	1,670.00	7,029	8,591	842	1,029	1,871
Concrete (spillway)	m ³	2,833	2,100.00	2,677	3,273	320	392	712
Concrete structures	m ³			337	413	40	50	90
Gates and stoplogs	(lump sum)	42,800	160.00	3,082	3,766	369	451	820
Riverbank protection	m			630	770	75	93	168
Temporary bridge etc. (lump sum)	(lump sum)			225	275	27	33	60
Clearing jungle	ha	40	12,500.00	285	348	34	42	76
Excavation	m ³	25,300	25.00	2,677	3,272	321	391	712
Excavation and fill	m ³	198,300	30.00	2,040	2,494	244	299	543
Overflow protection	m ²	20,150	225.00	214	262	25	32	57
Grass cover to dykes	ha	8	59,500.00					
Flood protection at Garissa	(lump sum)			247	303	29	37	66
Camps and offices	(lump sum)			590	710	71	85	156
Sub-total (a)				26,872	32,838	3,216	3,934	7,150
(b) Temporary pumping station (Contractor)	(lump sum)							
Civil works	(lump sum)			504	546	60	66	126
Supply and delivery of plant	(lump sum)			-	1,982	-	237	237
Transport and erection of plant	(lump sum)			670	978	80	117	197
Sub-total (b)				1,174	3,506	140	420	560
Sheet total carried forward				28,046	36,344	3,356	4,354	7,710

TABLE A.3

Itemised Cost Summary of Major Construction Works

Sheet 3 of 3

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
				brought forward from sheet 2						
(f) Irrigation Network (Contractor)	3									
Excavation and fill	m ³	1,270,000	22	47,972	58,058	106,057	5,742	6,958	12,700	
Excavation	m ³	19,000	21	12,573	15,367	27,940	1,506	1,840	3,346	
Concrete	m ³	1,620	2,100	180	219	399	22	26	48	
Stone pitching	m ³	3,750	400	1,531	1,871	3,402	183	224	407	
Gates and Stop logs	m	82	4,500	675	825	1,500	81	99	180	
Miscellaneous (lump sum)	No			166	203	369	20	24	44	
Farm Ditches and drains, access	Km	280	9,500	41	51	92	5	6	11	
Sub-total (f)				1,197	1,463	2,660	143	175	318	55
(g) On-farm Development (Contractor)				16,363	19,999	36,362	1,960	2,394	4,354	
Land clearing	ha	7,300	1,068	3,508	4,288	7,796	420	514	934	
Land levelling	ha	7,300	2,100	6,898	8,432	15,330	826	1,010	1,836	
Sub-total (g)				10,406	12,720	23,126	1,246	1,524	2,770	55
Total base costs				74,741	90,804	165,545	8,948	10,876	19,824	
Physical contingencies				11,211	13,621	24,832	1,343	1,631	2,974	
Price contingencies				21,324	26,062	47,386	2,554	3,121	5,675	
Total Cost				107,276	130,487	237,763	12,844	15,628	28,472	

TABLE A.4
Capital Cost Summary of Minor Project Works

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange	
				Local	Foreign	Local	Foreign		Total
(a) Wildlife Conservation									
Drinking Pools	No.	11	19,700	98	119	217	12	14	26
Canal Crossings	No.	3	160,000	216	264	480	26	31	57
Other Works (lump sum)				367	448	815	43	54	97
Sub-total (a)				681	831	1,512	81	99	180
(b) Roads and Airfields									
Garissa - Garsen road				4,578	4,578	9,156	549	549	1,098
Nanigi access Road				420	420	840	50	50	100
Maintenance				1,134	1,134	2,268	136	136	272
Project roads				1,050	1,050	2,100	125	125	250
Airfields				420	420	840	50	50	100
Sub-total (b)				7,602	7,602	15,204	910	910	1,820
Total base costs				8,283	8,433	16,716	991	1,009	2,000
Physical contingencies				1,242	1,265	2,507	149	151	300
Price contingencies				1,908	1,942	3,850	229	232	461
Total costs				11,433	11,640	23,073	1,369	1,392	2,761

TABLE A.5

Capital Cost Summary of Buildings

Sheet 1 of 2

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
(a) Tenants Dwellings	No.	5,150	4,000	16,480	4,120	20,600	1,972	493	2,465	20
(b) Village Schools	No.	23	144,000	2,650	662	3,312	318	79	397	20
(c) Village multi-purpose halls	No.	23	42,000	773	193	966	93	23	116	20
(d) Housing - N.I.B.										
House Type A		1	310,000	200	110	310	24	13	37	35
B		9	200,000	1,260	540	1,800	151	64	215	30
C		27	165,000	3,120	1,335	4,455	374	160	534	30
D		18	110,000	1,485	495	1,980	178	59	237	25
E		28	58,000	1,218	406	1,624	146	48	194	25
F		298	14,000	3,338	834	4,172	400	100	500	20
G		109	10,000	872	218	1,090	104	26	130	20
Other		(lump sum)	385,000	308	77	385	37	9	46	20
Sub-total (d)				11,801	4,015	15,816	1,414	479	1,893	25
(e) Housing - Other agencies										
House Type A		1	310,000	200	110	310	24	13	37	35
B		5	200,000	700	300	1,000	84	36	120	30
C		16	165,000	1,848	792	2,640	221	95	316	30
D		25	110,000	2,062	688	2,750	247	82	329	25
E		192	58,000	8,352	2,784	11,136	1,000	333	1,333	25
F		472	14,000	5,286	1,322	6,608	633	158	791	20
G		85	10,000	680	170	850	82	20	102	20
Other		(lump sum)	275,000	220	55	275	26	7	33	20
Sub-total (e)				19,348	6,221	25,569	2,317	744	3,061	24
Sheet total carried forward				51,052	15,211	66,263	6,114	1,818	7,932	

TABLE A.5

Capital Cost Summary of Buildings

Sheet 2 of 2

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
				brought forward						
(f) Offices and workshops (NIB)				51,052	15,211	66,263	6,114	1,818	7,932	30
(g) Offices and workshops - (administration)				7,220	3,094	10,314	865	370	1,235	30
(h) Police Station				691	296	987	83	35	118	30
(j) Post offices				350	150	500	42	18	60	30
(k) Rural centre primary schools				504	336	840	60	40	100	40
(l) Secondary school	No.	2	675	1,012	338	1,350	122	40	162	25
(m) Public health buildings				741	494	1,235	89	59	148	40
Total base cost				1,355	580	1,935	162	70	232	30
Physical contingencies (10% except village buildings)				62,925	20,499	83,424	7,537	2,450	9,987	25
Price contingencies				8,283	2,547	10,830	992	305	1,297	25
Total Cost				17,702	5,901	23,603	2,120	707	2,827	
				88,910	28,947	117,057	10,649	3,462	14,111	

TABLE A.6

Capital Cost Summary of Ginnery

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
Site preparation, roads				150	150	300	18	18	36	50
Machinery				403	7,000	7,403	49	838	887	95
Buildings				10,000	7,808	17,808	1,198	935	2,133	44
Staff housing				800	220	1,020	96	26	122	22
Ancillary equipment				425	1,300	1,725	50	156	206	75
Total base cost				11,778	16,478	28,256	1,411	1,973	3,384	60
Physical contingencies				1,767	2,471	4,238	212	296	508	
Price contingencies				2,594	3,629	6,223	311	434	745	
Total cost				16,139	22,578	38,717	1,934	2,703	4,637	

TABLE A.7

Capital Cost Summary of Utilities and Infrastructure

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
(a) Sewerage System										
Mains and Pumping Stations				4,550	4,550	9,100	545	545	1,090	50
Sewage Treatment Plant				1,400	600	2,000	168	72	240	30
Sub-total (a)				5,950	5,150	11,100	713	617	1,330	
(b) Electricity Supply				1,776	5,224	7,000	213	626	839	75
(c) Water Supply				12,287	14,783	27,070	1,472	1,770	3,242	55
(d) Village roads and sanitation				2,220	950	3,170	266	114	380	30
Total base cost				22,233	26,107	48,340	2,664	3,127	5,791	54
Physical contingencies				3,335	3,916	7,251	400	469	869	
Price contingencies				5,785	6,791	12,576	693	813	1,506	
Total cost				31,353	36,814	68,167	3,757	4,409	8,166	

TABLE A.8

Capital Cost Summary of Vehicles

Sheet 1 of 3

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
				(a) N.I.B. Vehicles NAIROBI OFFICE:						
Saloon Cars		2	57	66	48	114	8	6	14	
4 wheel drive SWB		1	68	35	33	68	4	4	8	
4 wheel drive LWB station wagon		3	91	138	135	273	17	16	33	
4 wheel drive LWB pick-up		3	77	114	117	231	14	14	28	
Pick up/utility		3	43	45	84	129	5	10	15	
BURA OFFICE:										
4 wheel drive SWB		1	68	35	33	68	4	4	8	
4 wheel drive LWB station wagon		8	91	368	360	728	44	43	87	
4 wheel drive LWB pick-up		27	77	1,024	1,053	2,079	123	126	249	
Pick-up/utility		11	43	165	308	473	20	37	57	
Lorry		8	116	464	464	928	55	56	111	
Tipper truck		4	180	340	380	720	40	46	86	
Motor cycle		52	5	52	208	260	6	25	31	
Bicycle		132	1	570	132	132	68	16	16	
Spares		(lump sum)			671	1,241		81	149	54
Sub-total (a)				3,416	4,028	7,444	408	484	892	
Sheet total carried forward				3,416	4,028	7,444	408	484	892	

TABLE A.8

Capital Cost Summary of Vehicles

Sheet 3 of 3

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
brought forward				4,423	5,214	9,637	527	627	1,154	
(c) Institutions and Services										
4 wheel drive - SWB		4	68	140	132	272	17	16	33	
Pick-up/utility		1	43	15	28	43	2	3	5	
Lorry - 5 ton		1	135	67	68	135	8	8	16	
4 wheel drive - LWB hard top		4	80	164	156	320	19	19	38	
Lorry - 7 ton		2	164	162	166	328	19	19	39	
Motor cycles		21	5	21	84	105	3	10	13	
School vehicles				80	80	160	9	10	19	
Bicycles		56	1		56	56		7	7	
Spares	(lump sum)			130	154	284	16	18	34	
Sub-total (c)				779	924	1,703	93	111	204	
Total base cost				5,202	6,138	11,340	620	738	1,358	54
Physical contingencies				520	614	1,134	62	74	136	
Price contingencies				1,150	1,351	2,501	138	162	300	
Total cost				6,872	7,103	14,975	820	974	1,794	

TABLE A.9
Capital Cost Summary of Plant and Machinery

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000			% Foreign Exchange	
				Local	Foreign	Total	Local	Foreign		Total
				(a) Heavy Maintenance Equipment						
Dragline		3	640,000	620	1,300	1,920	74	56	230	
Cutter-dredger		1	1,050,000	450	600	1,050	54	72	126	
Bulldozer - 320 h.p.		1	1,540,000	231	1,309	1,540	27	157	184	
Compactor/Vibrator		1	228,000	90	138	228	10	17	27	
Loader-excavator		1	306,000	121	185	306	15	22	37	
Front-end Loader		1	532,000	210	322	532	25	39	64	
Grader		2	640,000	500	780	1,280	60	93	153	
Tractor		1	100,000	15	85	100	2	10	12	
Mobile Crane		1	789,000	339	450	789	40	54	94	
Low Loader		1	584,000	223	361	584	27	43	70	
Tanker - 1,200 gallons		1	206,000	90	116	206	11	14	25	
Tanker - trailers - 500 gallons		2	35,000	10	60	70	1	7	8	
Water Pumps		2	5,000	1	9	10	0	1	1	
Mobile Workshop		1	179,000	96	83	179	11	10	21	
Mobile Lubrication Unit		1	153,000	77	76	153	9	9	18	
Miscellaneous equipment		(lump sum)	230,000	45	255	300	5	31	36	
Ditcher		1	230,000	85	145	230	11	17	28	
Parts and Tools		(lump sum)		640	1,255	1,895	77	150	227	
Sub-total (a)				3,843	7,529	11,372	460	901	1,361	
Sheet total carried forward				3,843	7,529	11,372	460	901	1,361	

TABLE A-9

Capital Cost Summary of Plant and Machinery

Sheet 2 of 2

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange
				Local	Foreign	Local	Foreign	
				Total	Total	Total	Total	
brought forward								
(b) Farm Machinery								
Tractor 70 h.p.		36	85,000	540	2,520	65	302	367
Tractor 80 h.p.		36	93,000	504	2,844	60	341	401
Plough 3 Furrow		16	10,000	16	144	2	17	19
4 Furrow		16	13,000	16	192	2	23	25
Harrow		17	13,000	34	187	4	22	26
Land planes		6	43,000	78	180	9	22	31
Ridger		19	6,000	38	76	5	9	14
Digger-shaker		7	17,000	42	77	5	9	14
Trailer		26	20,000	104	416	12	50	62
Mobile Workshop		1	179,000	96	83	11	10	21
Mobile Lubrication Units		2	153,000	154	152	19	18	37
Spare parts and Special tools		(lump sum)		325	1,374	39	165	204
Sub-total (b)				1,947	8,245	233	988	1,221
Total base cost				5,790	15,774	693	1,889	2,582
Physical contingencies				579	1,577	69	189	258
Price contingencies				1,653	4,502	198	539	737
Total cost				8,022	21,853	960	2,617	3,577

TABLE A.10

Capital Cost Summary of Equipment

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		Total	% Foreign Exchange
				Local	Foreign	Local	Foreign		
Telecommunications (NIB)			194	450	644	23	54	77	70
Hydrological/Meteorological network			90	210	300	11	25	36	70
Miscellaneous instruments			30	70	100	4	8	12	70
Workshop machinery			444	444	888	53	53	106	50
Post Office equipment			90	210	300	11	25	36	70
Creche and day-care equipment			138	138	276	17	16	33	50
Total base cost			986	1,522	2,508	119	181	300	61
Physical contingencies			99	152	251	12	18	30	
Price contingencies			281	439	720	33	53	86	
Total cost			1,366	2,113	3,479	164	252	416	

TABLE A.11

Capital Cost Summary of Agricultural Management.

Sheet 1 of 2

Item	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
<u>A. Details of Agricultural Management Staff</u>						
(Man-Months)						
Project General Manager	6	12	12	12	12	12
Irrigation Engineer	-	6	12	12	12	12
Agricultural Manager	-	6	12	12	12	12
Civil Engineer, Maintenance	-	6	6	12	12	12
Workshop Engineer	-	6	12	12	12	12
Mechanical Supervisor	-	-	12	12	12	12
Project Accountant	-	6	12	12	12	-
Senior Research Officer	-	12	12	12	12	12
Cotton Research Officer	12	12	12	12	12	12
Pest and Disease Control Officer	-	-	12	12	12	12
Head Office Support	-	2	3	6	6	6
Total	18	68	117	126	126	114
Total base cost (1,000 Kenya Shillings)	700	2,650	4,560	4,915	4,915	4,450
(Total base cost = 22,190,000 Kenya Shillings)						

TABLE A.11
Capital Cost Summary of Agricultural Management

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
				B. Agricultural Management base costs			8,876	13,314	22,190	
Physical contingencies			888	1,331	2,219	106	159	265		
Price contingencies			3,012	4,518	7,530	361	541	902		
Total cost			12,776	19,163	31,939	1,530	2,294	3,824		

TABLE A.12 a
 Capital Cost Summary of Consultancy Services - Current
 (1,000 Kenya Shillings)

Item	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	Total	% Foreign Exchange
A. <u>Preliminary Planning and Design Services</u>								
Project Planning Report	2,400	-	-	-	-	-	2,400	80
Review of Designs and Documents	310	-	-	-	-	-	310	100
B. <u>Design Services</u>								
Preparation of Designs and Tender Documents	8,000	2,190	-	-	-	-	10,190	90
C. <u>Project Coordination, Procurement, Supervision of Construction</u>								
Project Coordination and Management Services	3,600	5,000	5,000	2,000	2,000	600	18,200	80
Supervision and Construction	5,400	8,500	8,500	8,000	6,000	1,000	37,400	80
D. <u>Stage II Feasibility Study</u>								
Preliminary report	1,350	1,350	-	-	-	-	2,700	80
Soils and topographical surveys	6,000	1,600	-	-	-	-	7,600	80
Total	27,060	18,640	13,500	10,000	8,000	1,600	78,800	81

TABLE A.12 a

Capital Cost Summary of Consultancy Services - Current

Sheet 2 of 2

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange	
				Local	Foreign	Local	Foreign		
				Total		Total			
Consultancy Services base cost				63,800	78,800	1,796	7,641	9,437	
Physical contingencies				6,380	7,880	180	764	944	
Price contingencies				12,730	15,720	358	1,525	1,883	
Total Cost				82,910	102,400	2,334	9,930	12,264	

TABLE A.12 b

Capital Cost Summary of Consultancy Services - IBRD/IDA Appraisal

Sheet 1 of 2

(1,000 Kenya Shillings)

Item	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	Total	% Foreign Exchange
A. <u>Preliminary Planning and Design Services 1/</u>								
Project Planning Report	2,400	-	-	-	-	-	2,400	80
Review of Designs and Documents	310	-	-	-	-	-	310	100
B. <u>Project Coordination, Procurement, Supervision of Construction</u>								
Project Coordinator's Office Procurement and Supervision of Construction 2/	600	600	600	600	600	-	3,000	80
C. <u>Stage II Feasibility Study 3/</u>								
Total	11,310	7,700	5,700	5,690	4,600	-	35,000	82

1/ Costs derived from Agreement for Consulting Services, November 1976.

2/ Costs derived from Consultants' Proposal dated July 1976, comprising:

Procurement and engineering services for Irrigation Works excluding design

Construction supervision (general)

Supervision fee

Site supervision @ K Sh 18,000 per man-month

Architectural and engineers' services for buildings and houses

Additional work on infrastructure, etc.

Total

3/ Costs derived from Consultants' Proposal dated July 1976, less topographical and soil surveys expected to be undertaken by Government with Netherlands technical assistance.

K Sh '000

2,400

4,200

2,000

11,000

2,200

3,490

25,290

TABLE A.12 b

Capital Cost Summary of Consultancy Services - IBRD/IDA Appraisal

Sheet 2 of 2

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange	
				Local	Foreign	Local	Foreign		Total
				Total	Total	Total	Total		Total
Consultancy Services base cost				28,700	6,300	755	3,437	4,192	
Physical contingencies				2,870	630	76	343	419	
Price contingencies				5,938	1,304	156	711	867	
Total Cost				37,508	8,234	987	4,491	5,478	

TABLE A.13
Implementation Cost Summary of Training

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange	
				Local	Foreign	Local	Foreign		Total
				Total	Total	Total	Total		Total
Training courses			1,816	778	2,594	217	93	310	30
Training centre operating costs			480	206	686	57	25	82	30
Total base cost			2,296	984	3,280	274	118	392	
Physical contingencies			230	98	328	27	12	39	
Price contingencies			522	223	745	62	27	89	
Total cost			3,048	1,305	4,353	363	157	520	30

TABLE A.14
Implementation Cost Summary of Public Health Services

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
				Public Health Equipment				270	300	
Public Health Running Costs				781	6,509	686	94	780	12	
Total base costs 1/				1,051	6,809	690	126	816	15	
Physical contingencies				105	681	69	13	82		
Price contingencies				333	2,160	219	40	259		
Total cost				1,489	9,650	978	179	1,157		

Note: 1. Buildings for public health are included in Table A.5

TABLE A.15
Implementation Cost Summary of Forestry

Item	Unit	Quantity	Unit cost	Kenya Shillings '000		US \$ '000		% Foreign Exchange	
				Local	Foreign	Local	Foreign		Total
				Total	Total	Total	Total		Total
Capital Costs				3,002	15,010	1,438	360	1,798	20
Running Costs				4,410	22,050	2,113	528	2,641	20
Total base costs				7,412	37,060	3,551	888	4,439	
Physical contingencies				1,482	7,412	710	178	888	
Price contingencies				1,538	7,690	737	184	921	
Total Cost				10,432	52,162	4,998	1,250	6,248	20

TABLE A.16

Implementation Cost Summary of Livestock, Fisheries and Wildlife

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
LIVESTOCK										
Extension services										
capital costs				169	42	211	20	5	25	20
running costs				144	36	180	18	4	22	20
Trials										
capital costs				382	96	478	46	11	57	20
running costs				566	142	708	68	17	85	20
Sub-Total				1,261	316	1,577	152	37	189	20
FISHERIES										
Ecological study										
capital costs				167	166	333	20	20	40	50
running costs				712	475	1,187	85	57	142	40
Fish farming trials										
capital costs				177	118	295	21	14	35	40
running costs				355	150	505	42	18	60	30
Sub-Total				1,411	909	2,320	168	109	277	40
WILDLIFE										
capital costs				70	69	139	8	8	16	50
running costs				1,030	54	1,084	123	7	130	5
Sub-Total				1,100	123	1,223	131	15	146	10
Total base cost				3,772	1,348	5,120	451	161	612	26
Physical contingencies				377	135	512	45	16	61	
Price contingencies				1,085	381	1,466	130	46	176	
				5,234	1,864	7,098	626	223	849	

TABLE A.17
Implementation Cost Summary of National Irrigation Board
Operating Costs

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
Salaries				24,696	-	24,696	2,958	-	2,958	0
Works maintenance				640	160	800	77	19	96	20
Buildings maintenance				998	250	1,248	119	30	149	20
Vehicle operating costs				5,003	3,336	8,339	599	400	999	40
Farm Machinery operating costs				1,474	2,212	3,686	176	265	441	60
Heavy maintenance equipment operating costs				2,934	2,935	5,869	351	352	703	50
Administrative running costs				192	48	240	23	6	29	20
Farm Inputs				9,101	21,235	30,336	1,090	2,543	3,633	70
Settlement Programme				4,937	1,826	6,763	591	219	810	27
Pump Station Operating cost				630	420	1,050	76	50	126	40
Total base cost				50,605	32,422	83,027	6,060	3,884	9,944	39
Physical contingencies				5,061	3,242	8,303	606	388	994	
Price contingencies				20,410	13,049	33,459	2,444	1,563	4,007	
Total cost				76,076	48,713	124,789	9,110	5,835	14,945	

TABLE A.18
Implementation Cost Summary of Institutions - Operating Costs

Item	Unit	Quantity	Unit cost	Kenya Shillings '000			US \$ '000			% Foreign Exchange
				Local	Foreign	Total	Local	Foreign	Total	
District and Local Administration				2,203	300	2,503	264	36	300	12
Local Authority				918	230	1,148	109	28	137	20
Police				1,090	149	1,239	130	18	148	12
Ministry of Co-operative Development				794	88	882	95	11	106	10
Posts and Telecommunications Agency				964	-	964	115	-	115	0
Ministry of Social Services				2,272	171	2,443	273	20	293	7
Ministry of Information				254	-	254	30	-	30	0
Ministry of Lands and Settlement				1,102	-	1,102	132	-	132	0
Ministry of Education				9,926	522	10,448	1,188	63	1,251	5
Total base cost				19,523	1,460	20,983	2,336	176	2,512	7
Physical contingencies				1,952	146	2,098	234	17	251	
Price contingencies				8,505	640	9,145	1,018	77	1,095	
Total cost				29,980	2,246	32,226	3,588	270	3,858	

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TABLE B.1

Budgetted Expenditure - Major and minor works - capital costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
I Headworks		-	-	24,710	35,000	-	-
II Other Irrigation Works		-	1,030	3,650	-	-	-
(a) Temporary pumps		-	22,000	10,660	-	-	-
(b) Supply canal	4,000						
(c) Main Canal	1,609		5,000	5,000	-	-	-
(d) Irrigation network	2,000		10,000	10,000	7,898	-	-
(e) On-farm development works	-		8,000	10,000	5,126	-	-
Sub-total II	7,609		46,030	39,310	13,024	-	-
III Wildlife Conservation Works		-	-	1,512	-	-	-
IV Roads and Airfields							
(a) Garsen - Garissa and Nanigi access	8,100		1,896	-	-	-	-
(b) Maintenance of above roads	365		1,048	855	-	-	-
(c) Surfacing of scheme roads	-		-	900	900	300	-
(d) Landing strips	400		440	-	-	-	-
Sub-total IV	8,865		3,384	1,755	900	300	-
Total Base Cost	16,474		49,414	67,287	48,924	300	-
Physical contingencies	2,471		7,412	10,093	7,339	45	-
Total Cost	18,945		56,826	77,380	56,263	345	-

TABLE B.2

Budgetted Expenditure - National Irrigation Board - capital cost summary (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Guided Harambee Construction		-	-	5,616	8,688	8,688	1,886
Training		-	-	755	910	2,600	-
Settlement Programme		-	-	1,653	2,289	2,259	562
Offices, workshops etc.		300	1,775	4,819	1,520	1,520	380
Housing and Schools		385	5,227	7,046	6,138	5,040	1,080
Farm Machinery		-	-	1,603	3,247	4,140	1,201
Heavy Maintenance Equipment		1,121	5,749	3,346	1,536	-	-
Miscellaneous Equipment		44	50	850	500	450	38
Vehicles		2,249	2,208	1,675	576	622	120
Total Base Cost		4,099	15,009	27,343	25,404	25,319	5,267
Physical Contingencies		410	1,501	3,300	3,409	3,401	715
Total Cost		4,509	16,510	30,643	28,813	28,720	5,982

TABLE B.3

Budgetted Expenditure - National Irrigation Board - capital costs of buildings
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
National Irrigation Board							
Main Offices		-	800	-	-	-	-
Workshops and stores (Rural Centre)		300	400	1,500	-	-	-
Training Centre		-	-	756	-	-	-
Research Centre		-	-	335	-	-	-
Community Centres and Staff Clubs		-	575	1,278	-	-	-
Workshop and store units (Villages)	No. Cost			5	8	8	2
Rural Centre Primary Schools 1/	190	-	-	950	1,520	1,520	380
Primary School Housing 1/	-	-	-	675	-	675	-
Housing Type A	-	-	-	1,860	2,790	2,170	930
B	310	-	1	-	-	-	-
C	200	-	5	3	1	-	-
D	165	-	1,000	600	200	-	-
E	110	-	13	11	2	-	-
F	58	-	2,145	1,815	330	165	-
G	14	-	6	3	5	4	-
Guest House	10	-	660	330	550	440	-
Physical contingencies		-	4	8	7	7	2
Total base cost		385	7,002	11,865	7,658	6,560	1,460
Total cost		685	7,702	13,050	8,424	7,216	1,606
Physical contingencies		69	700	1,185	766	656	146
Total cost		754	8,402	14,235	9,190	7,872	1,752

1/ See Ministry of Education capital costs Table B.30 for details.

TABLE B.4

Budgetted Expenditure - National Irrigation Board - capital cost of vehicles
(1,000 Kenya Shillings)

Item		Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
NIB	Nairobi							
	Saloon Cars	No. Cost	$\frac{2}{114}$	-	-	-	-	-
	4 wheel drive SWB	No. Cost	$\frac{1}{68}$	-	-	-	-	-
	4 wheel drive station wagons	No. Cost	$\frac{3}{273}$	-	-	-	-	-
	4 wheel drive LWB pick-ups	No. Cost	$\frac{3}{231}$	-	-	-	-	-
	Pick-ups/utilities	No. Cost	$\frac{3}{129}$	-	-	-	-	-
NIB	Bura							
	4 wheel drive SWB	No. Cost	$\frac{1}{68}$	-	-	-	-	-
	4 wheel drive station wagons	No. Cost	$\frac{1}{91}$	$\frac{7}{637}$	-	-	-	-
	4 wheel drive LWB pick-ups	No. Cost	$\frac{4}{308}$	$\frac{9}{693}$	$\frac{6}{462}$	$\frac{3}{231}$	$\frac{4}{308}$	$\frac{1}{77}$
	Pick-ups/utilities	No. Cost	-	$\frac{5}{215}$	$\frac{5}{215}$	$\frac{1}{43}$	-	-
	Lorries	No. Cost	$\frac{2}{232}$	$\frac{2}{232}$	$\frac{2}{232}$	$\frac{1}{116}$	$\frac{1}{116}$	-
	Tipper Trucks	No. Cost	$\frac{2}{360}$	-	$\frac{2}{360}$	-	-	-
	Motor Cycles	No. Cost	-	$\frac{9}{45}$	$\frac{22}{110}$	$\frac{9}{45}$	$\frac{9}{45}$	$\frac{3}{15}$
	Bicycles	No. Cost	-	$\frac{18}{18}$	$\frac{17}{17}$	$\frac{45}{45}$	$\frac{49}{49}$	$\frac{3}{3}$
	Spares	No. Cost	-	$\frac{368}{368}$	$\frac{279}{279}$	$\frac{96}{96}$	$\frac{104}{104}$	$\frac{19}{19}$
	Total Base Cost		2,249	2,208	1,675	576	622	120
	Physical contingencies		225	221	168	58	62	12
	Total Cost		2,474	2,429	1,843	634	684	132

TABLE B.5

Budgetted Expenditure - National Irrigation Board - capital, costs of farm machinery
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Tractors (70 hp)	No. Cost	-	-	5 425	12 1,020	15 1,275	4 340
Tractors (80 hp)	No. Cost	-	-	5 465	11 1,023	15 1,395	5 465
Ploughs (3 furrow)	No. Cost	-	-	3 30	4 40	7 70	2 20
Ploughs (4 furrow)	No. Cost	-	-	2 26	5 65	6 78	3 39
Harrows	No. Cost	-	-	3 39	4 52	7 91	3 39
Ridgers	No. Cost	-	-	3 18	5 30	8 48	3 18
Trailers	No. Cost	-	-	3 60	8 160	11 220	4 80
Land Levellers	No. Cost	-	-	2 86	2 86	2 86	-
Groundnut Lifter/shakers	No. Cost	-	-	2 34	3 51	2 34	-
Mobile Lubrication Units	No. Cost	-	-	1 153	-	1 153	-
Mobile Workshops	No. Cost	-	-	-	1 179	-	-
Spares and Tools	-	-	-	267	541	690	200
Total base cost	-	-	1,603	3,247	4,140	4,140	1,201
Physical contingencies	-	-	160	325	414	414	120
Total Costs	-	-	1,763	3,572	4,554	4,554	1,321

TABLE B.6

Budgetted Expenditure - National Irrigation Board - capital costs of heavy maintenance equipment (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Dragline	No. Cost	-	-	2 1,280	1 640	-	-
Cutter-Dredger	No. Cost	-	-	1 1,050	-	-	-
Bulldozer - 320 hp	No. Cost	-	1 1,540	-	-	-	-
Loader - Excavator	No. Cost	-	1 306	-	-	-	-
Compactor-Vibrator (self powered)	No. Cost	-	-	1 228	-	-	-
Front-end Loader	No. Cost	-	1 532	-	-	-	-
Ditcher	No. Cost	-	-	1 230	-	-	-
Grader	No. Cost	-	1 640	-	1 640	-	-
Tractor	No. Cost	1 100	1 100	-	-	-	-
Mobile Crane	No. Cost	-	1 789	-	-	-	-
Low Loader	No. Cost	-	1 584	-	-	-	-
Tanker - 1200 gallons	No. Cost	2 412	-	-	-	-	-
Tanker-trailer - 500 gallons	No. Cost	2 70	-	-	-	-	-
Water Pump	No. Cost	4 20	-	-	-	-	-
Mobile Workshop	No. Cost	1 179	-	-	-	-	-
Mobile Lubrication Unit	No. Cost	1 153	-	-	-	-	-
Miscellaneous Equipment	(lump sum)	-	300	-	-	-	-
Spares and tools		187	958	558	256	-	-
Total base cost		1,121	5,749	3,346	1,536	-	-

TABLE B.7

Budgetted Expenditure - National Irrigation Board - capital costs of miscellaneous equipment
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Telecommunications (NIB)		44	-	250	200	150	-
Hydrological/Meteorological Network		-	-	300	-	-	-
Miscellaneous instruments		-	-	100	-	-	-
Workshop machinery		-	50	200	300	300	38
Total base cost		44	50	850	500	450	38
Physical contingencies		4	5	85	50	45	4
Total Cost		48	55	935	550	495	42

TABLE B.8

Budgetted Expenditure - National Irrigation Board - miscellaneous capital costs
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Guided Harambee Construction							
Tenant housing	4	-	-	1,125 4,500	1,800 7,200	1,800 7,200	425 1,700
Multi-purpose halls	42	-	-	6 252	8 336	8 336	1 42
Village Primary Schools	144	-	-	6 864	8 1,152	8 1,152	1 144
Sub-total		-	-	5,616	8,688	8,688	1,886
Training		-	-	755	910	2,600	-
Settlement Programme		-	-	1,653	2,289	2,259	562
Total base cost		-	-	8,024	11,887	13,547	2,448
Physical contingencies		-	-	1,364	2,058	2,224	433
Total Cost		-	-	9,388	13,945	15,771	2,881

TABLE B.9

Budgetted Expenditure - National Irrigation Board - Recurrent Costs Summary
(L,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries		260	1,183	3,387	5,465	7,102	7,299
Works maintenance					100	200	500
Buildings maintenance				81	242	403	522
Vehicle operating costs		324	930	1,464	1,762	1,886	1,973
Farm Machinery operating costs				110	705	1,310	1,561
Heavy Maintenance equipment operating costs		101	209	636	1,203	1,550	1,716
Administrative running costs				20	50	70	100
Farm inputs				1,028	4,969	10,421	13,918
Pump Station operating costs				175	525	350	
Training operating costs		665	788	868	532	286	141
Total base cost		1,350	3,110	7,769	15,553	23,578	27,730
Physical contingencies		135	311	777	1,555	2,358	2,773
Total cost		1,485	3,421	8,546	17,108	25,936	30,503

TABLE B.10

Budgetted Expenditure - National Irrigation Board - vehicle operating costs
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Nairobi Office:							
Saloon Car	No. Cost	$\frac{2}{20}$	$\frac{2}{40}$	$\frac{2}{40}$	$\frac{2}{40}$	$\frac{2}{40}$	$\frac{2}{40}$
4 wheel drive SWB	No. Cost	$\frac{1}{15}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$
4 wheel drive station wagon	No. Cost	$\frac{3}{50}$	$\frac{3}{87}$	$\frac{3}{87}$	$\frac{3}{87}$	$\frac{3}{87}$	$\frac{3}{87}$
4 wheel drive LWB pick-up	No. Cost	$\frac{3}{40}$	$\frac{3}{81}$	$\frac{3}{81}$	$\frac{3}{81}$	$\frac{3}{81}$	$\frac{3}{81}$
Pick-up/utility	No. Cost	$\frac{3}{30}$	$\frac{3}{60}$	$\frac{3}{60}$	$\frac{3}{60}$	$\frac{3}{60}$	$\frac{3}{60}$
Bura Office:							
4 wheel drive SWB	No. Cost	$\frac{1}{15}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$
4 wheel drive station wagon	No. Cost	$\frac{1}{15}$	$\frac{8}{150}$	$\frac{8}{232}$	$\frac{8}{232}$	$\frac{8}{232}$	$\frac{8}{232}$
4 wheel drive LWB pick-up	No. Cost	$\frac{4}{60}$	$\frac{13}{220}$	$\frac{19}{430}$	$\frac{22}{560}$	$\frac{26}{650}$	$\frac{27}{729}$
Pick-up/utility	No. Cost		$\frac{5}{50}$	$\frac{10}{160}$	$\frac{11}{220}$	$\frac{11}{220}$	$\frac{11}{220}$
Lorry - 3 ton	No. Cost	$\frac{2}{24}$	$\frac{4}{72}$	$\frac{6}{120}$	$\frac{7}{168}$	$\frac{8}{192}$	$\frac{8}{192}$
Tipper truck	No. Cost	$\frac{2}{55}$	$\frac{2}{110}$	$\frac{4}{170}$	$\frac{4}{220}$	$\frac{4}{220}$	$\frac{4}{220}$
Motor Cycle	No. Cost		$\frac{7}{6}$	$\frac{23}{30}$	$\frac{30}{40}$	$\frac{37}{50}$	$\frac{39}{58}$
Total base cost		324	930	1,464	1,762	1,886	1,973
Physical contingencies		32	93	146	176	189	197
Total Cost		356	1,023	1,610	1,938	2,075	2,170

TABLE B.11 National Irrigation Board - Salary Costs (1,000 Kenya Shillings#)
PROJECT MANAGEMENT - AGRICULTURAL MANAGEMENT

Post	Grade	Salary	Number and Cost									
			1977/78	1978/79	1979/80	1980/81	1981/82	1982/83				
Project Manager 1/ Deputy Project Manager Agricultural Economist	F E D	76.9 58.0 49.3	.5* .5 0.5	58 25	58 49	58 49	58 49	1* 1 1	1* 1 1	1 58 49	1* 1 1	58 49
Administration Section												
Project Administrator/Accountant 1/ Senior Accountant	E D	58.0 49.3	0.5* 0.5	25	49	49	49	1* 1	1* 1	49 83	1* 1	58 49
Accountant	C	41.4	0.5	21	34	34	34	1	1	34	1	34
Head Cashier	B	34.2			21	21	21	1	1	21	1	21
Cashier	I	21.2			32	64	64	3	4	85	6	127
Bookkeeper/Assistant Accountant	I	21.2	0.5x3	25	25	49	49	1	1	49	1	49
Senior Staff Officer	D	49.3	0.5	21	21	21	21	1	1	21	1	21
Assistant Staff Officer	I	21.2			21	41	41	1	1	41	1	41
Welfare Officer	C	41.4	0.5	21	21	41	41	1	1	41	1	41
Training Officer	C	41.4	0.5	21	20	41	41	1	3	41	3	41
Tech. Assist. (Training)	III	13.6	0.5x3	20	20	21	21	3	1	21	1	21
Assist. Training Officer	I	21.2			25	49	49	1	1	49	1	49
Assistant Administrator	D	49.3	0.5	21	21	41	41	1	1	41	1	41
Stores/Supply Officer	C	41.4	0.5	21	17	34	34	1	1	34	1	34
Stores Superintendent	B	34.2	0.5	17				1	1		1	
Storemen}	III	13.6	0.5x10	68	204	204	313	23	30	408	30	408
Clerks }	A	26.6	0.5	13	27	27	53	2	2	53	2	53
Draughtsmen	III/IV	11.5	0.5x2	12	138	138	150	13	14	161	14	161
Drivers	VB	6.0	0.5x20	60	180	180	276	46	46	276	46	276
Watchmen, cleaners and others	GOK Grade											
Senior Settlement Officer 2/ Settlement Officer Gd. III 2/ Settlement Assistants 2/	H G F	30 23 17	0.5 0.5					1 1 4	1 1 4		1 1 4	1 1 4

NOTES:
 1/ Costs included in Table A.11
 2/ Costs included in Table B.29
 * denotes expatriate post

TABLE B.11
AGRICULTURAL PRODUCTION SECTION

National Irrigation Board - Salary Costs (1,000 Kenya Shillings)
Sheet 2 of 4

Post	Grade	Salary	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
<u>Agricultural Production Section</u>								
Agricultural Production Manager 1/	E	58.0						
Assistant Agricultural Prod. Manager	D	49.3		.5*	49	49	49	1*
Section Supervisors	D	49.3		.5	49	99	99	1
Field Officer (Irrigation Officer)	A/B/C	34.2		0.5x2 34	68	171	274	8
Head Field Assistant	I	21.2			64	148	233	12
Field Assistant	III	13.6		0.25x18 61	245	571	925	65
Water Guard	VB	6.0			72	168	264	46
Head Cultivator	Ungraded	7.5			9	21	33	23
Plant Protection Officer 1/	D	49.3		1*				1*
Assist. Plant Protection Officer (Pest and Disease)	B	34.2			34	34	34	1
Assist. Plant Protection Officer (vermin Control)	B	34.2						
Pest Control Assistants	III	13.6			41	95	150	12
Pest Control Guards	VB	6.0			12	18	36	6
Senior Research Officer 1/	E	58.0		1*				1*
Research Officer (Cotton) 1/	D	49.3		1*				1*
Research Officer (Irrig. & Drainage) 2/	D	49.3		2*				2*
Research Officer. (Agronomy) 2/	D	49.3		1*				1*
Research Officer (Entomology) 2/	D	49.3		1*				1*
Research Officer	C	41.4			166	166	166	2
Research Assistants	III	13.6		10	136	136	136	10
Clerical	III	13.6		5	68	68	68	5
Permanent Labour	VB	6.0			30	180	180	30
Mechanisation Supervisor 1/	D	49.3		1*				1*
Assistant Mech. Supervisor	I	21.2			21	21	21	1
Mechanisation Foremen	II	17.7			17	35	35	3
Watchmen	VB	6.0		5	54	78	78	13
Drivers: Vehicles	IV/III	11.5		0.5x2 12	69	81	127	11
Drivers: Tractors	IV	9.3		10	93	207	586	76

TABLE B.11 National Irrigation Board - Salary Costs (1,000 Kenya Shillings)
NIB HEADQUARTERS - BURA CO-ORDINATORS OFFICE

Sheet 3 of 4

Post	Grade	Salary	Number and Cost								
			1977/78	1978/79	1979/80	1980/81	1981/82	1982/83			
Co-ordinator	G	91.7	1	1	1	1	1	1	92	1	92
Assistant Engineer	C	41.4	0.5	1	1	1	1	1	41	1	41
Supply Officer	C	41.4	0.5	1	1	1	1	1	41	1	41
Draughtsmen	A	26.6	0.5x2	2	2	2	2	2	53	2	53
Senior Settlement Officer GdI 1/ Settlement Officer Gd III 1/ Information Officer 2/ Information Assistants 2/ Personal Secretary	GOK GOK GOK GOK II		0.5 0.5x2 0.5 0.5x2 0.5x1	1 2 1 2 3	1 2 1 2 3	1 2 1 2 3	1 2 1 2 3	1 2 1 2 3	53	1 2 1 2 3	53
Clerical and other (incl. Assist & pers. Secretary)	III IV/III	17.7	0.5x3 0.5x5	4 5	4 5	5 5	5 5	5 5	68 58	5 5	68 58
Drivers	Expatriate	13.6	0.5	1	1	1	1	1	58	1	58
Deputy Co-ordinator 3/ Engineer:Construction 3/ Engineer:Supplies 3/ Engineer:Planning 3/ Sociologist 3/ Training Specialist 3/ Financial Controller 3/ Economist 3/	" " " " " " "	11.5	0.5 0.5 0.5 0.5 0.5 - 0.5 0.5	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1	68 58	5 5 5 5 5 5 5 5	68 58

NOTES:

1/ Costs included in Table B. 29

2/ Costs included in Table B. 28

3/ Costs included in Table A. 12

TABLE B.11

National Irrigation Board - Salary Costs (1,000 Kenya Shillings)

ENGINEERING SECTION

Number and Cost Sheet 4 of 4

Post	Grade	Salary	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
<u>Engineering Section:</u>								
Project Engineer 1/	E	58.0		0.5	1*	1*	1*	1*
Assistant Project Engineer	D	49.3					49	49
Irrigation Maintenance Engineer 1/	D	49.3		0.5*	1*	1*	1*	1*
Assistant Irrigation Engineer	C	41.4						
Headworks Operator	III	13.6			1	1	1	1
Senior Water Guard	IV	9.3			1	1	1	1
Building Supervisor	C	41.4		0.5	1	1	1	1
Building/Irrigation Foremen	I	21.2		0.5	2	2	2	2
Workshop Engineer/Supervisor	D	49.3		0.5*	1*	1*	1*	1*
Assistant Workshop Engineer	C	41.4			1	1	1	1
Workshop Foremen	B	34.2		0.5	1	1	1	1
Storemen/Clerical	III	13.6			1	1	1	1
Mechanics	II & III	15.7		0.5x2	5	10	20	20
Artisans	III & IV	11.5			5	12	24	24
Labourers and Watchmen	VB	6.0			24	36	42	42
Drivers (vehicles and plant)	III & IV	11.5		0.5x3	3	27	27	27
			41	533	1,203	1,530	1,678	1,736
			-	187	1,267	2,480	3,546	3,756
			219	392	406	406	406	286
				71	511	1,049	1,472	1,521
Total from Sheet 1			260	1,183	3,387	5,465	7,102	7,299
Total base cost			26	118	339	546	710	730
Physical contingencies			286	1,301	3,726	6,011	7,812	8,029
Total Cost								

NOTE:

1/ Costs included in Table A 11

TABLE B.12

Budgetted Expenditure - National Irrigation Board - farm machinery
(1,000 Kenya Shillings)

operating costs

1982-83

1981-82

1980-81

1979-80

1978-79

1977-78

Unit
Cost

Item

Tractors (70 hp)	No. Cost	17.2	-	-	5 43.0	17 292.4	32 550.4	38 653.6
Tractors (80 hp)	No. Cost	19.8	-	-	5 49.5	16 316.8	31 613.8	38 752.4
Ploughs (3 furrow)	No. Cost	0.5	-	-	3 0.7	7 3.5	14 7.0	16 8.0
Ploughs (4 furrow)	No. Cost	0.7	-	-	2 0.7	7 4.9	13 9.1	16 11.2
Harrow	No. Cost	0.7	-	-	3 1.6	7 4.9	14 9.8	17 11.9
Ridgers	No. Cost	0.3	-	-	3 0.4	8 2.4	16 4.8	19 5.7
Trailers	No. Cost	0.7	-	-	3 1.1	11 7.7	22 15.4	26 18.2
Land planes	No. Cost	0.5	-	-	2 0.5	4 2.0	6 3.0	6 3.0
Groundnut Harvesters	No. Cost	1.1	-	-	2 1.1	5 5.5	7 7.7	7 7.7
Mobile Lubrication Units	No. Cost	24.2	-	-	1 12.1	1 24.2	2 48.4	2 48.4
Mobile Workshops	No. Cost	40.5	-	-	-	1 40.5	1 40.5	1 40.5
Total base cost			-	-	110	705	1,310	1,561
Physical contingencies			-	-	11	71	131	156
Total Costs			-	-	121	776	1,441	1,717

TABLE B.13

Budgetted Expenditure - National Irrigation Board - Heavy Maintenance Equipment
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
		No. Cost	No. Cost	No. Cost	No. Cost	No. Cost	No. Cost
Dragline	84				$\frac{3}{100}$	$\frac{3}{180}$	$\frac{3}{252}$
Cutter-dredger	149				70	149	149
Bulldozer-D8	210			100	210	210	210
Loader-excavator	87			50	87	87	87
Compactor	50				30	50	50
Front end loader	91				50	91	91
Ditcher	77				50	77	77
Grader				$\frac{1}{50}$	$\frac{1}{100}$	$\frac{2}{200}$	$\frac{2}{294}$
Tractor	147			$\frac{2}{40}$	$\frac{2}{40}$	$\frac{2}{40}$	$\frac{2}{40}$
Mobile Crane	20		$\frac{2}{30}$	106	106	106	106
Low loader	81			81	81	81	81
Tanker-1200 galls				$\frac{2}{112}$	$\frac{2}{112}$	$\frac{2}{112}$	$\frac{2}{112}$
Tanker trailer 500 galls.	56	$\frac{2}{56}$	$\frac{2}{112}$	$\frac{2}{112}$	$\frac{2}{112}$	$\frac{2}{112}$	$\frac{2}{112}$
		$\frac{2}{2}$	$\frac{2}{2}$	$\frac{2}{2}$	$\frac{2}{2}$	$\frac{2}{2}$	$\frac{2}{2}$
	0.7	1	1	1	1	1	1
Water pumps							
Mobile workshop	40.5	20	40	40	40	40	40
Mobile lubrication unit	24.2	12	24	24	24	24	24
Miscellaneous equipment and tools				30	100	100	100
Total base cost		101	209	636	1,203	1,550	1,716
Physical contingencies		10	21	64	120	155	172
Total cost		111	230	700	1,323	1,705	1,888

TABLE B.14

Budgetted Expenditure - District and Local Administration - Capital Costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Offices		-	-	420	-	-	-
Main Office		-	-	80	-	-	-
Stores and miscellaneous Buildings		-	-	500	-	-	-
Sub-total		-	-	1 310	-	-	-
Housing Type A	No. Cost	-	1 110	1 110	1 58	1 58	1 58
D	No. Cost	-	4 232	58	8	14	6 84
E	No. Cost	-	1 14	28	112	196	84
F	No. Cost	-	1 10	392	-	-	-
G	No. Cost	-	366	10	170	254	142
Sub-total		-	366	880	170	254	142
Vehicles		-	-	80	-	-	-
4-wheel drive - L.W.B.	No. Cost	-	-	80	-	-	-
- S.W.B.	No. Cost	-	-	68	-	-	-
Motor Cycle	No. Cost	-	-	1 5	1 5	2 10	1 5
Bicycles	No. Cost	-	-	7 7	4 4	7 7	4 4
Spares	No. Cost	-	-	32	2	3	2
Sub-total		-	-	192	11	20	11
Total base cost		-	366	1,572	181	274	153
Physical contingencies		-	37	157	18	27	15
Total cost		-	403	1,729	199	301	168

TABLE B.15

Budgetted Expenditure - District and Local Administration - Recurrent Costs - Salaries
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries							
DISTRICT ADMINISTRATION							
District Officer	37			28	37	37	37
Administrative Assistant	19	5		19	19	19	19
Clerk	No. Cost			1 5	2 9	2 14	2 14
Driver	No. Cost		1 2	2 12	2 14	2 14	2 14
Messenger	No. Cost		1 1	2 9	2 10	2 10	2 10
Sergeant Adm. Police	5			4.5	9	9	9
Constable Adm. Police	9			9	9	9	9
	5			22.5	45	45	45
LOCAL ADMINISTRATION							
Chief	No. Cost			1 10.5	2 21	3 35	4 56
Sub-Chief	No. Cost			1 4.5	3 16.5	7 40.5	8 48
Clerk	No. Cost			1 5.0	2 10.5	3 17.5	4 28
Corporal Adm. Police	No. Cost			1 5.0	2 10.5	3 17.5	4 28
Constable Adm. Police	No. Cost			5 20	10 37.5	15 62.5	20 100
Sub-total	No. Cost		8	145	239	321	408
Allowances etc.	No. Cost		2	29	48	64	82
Total cost	No. Cost		10	174	287	385	490

TABLE B.16

Budgetted Expenditure - District and Local Administration - Recurrent Costs Summary
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (From Table B15)		-	10	174	287	385	490
Building Maintenance		-	-	-	10	10	10
Offices		-	-	41	171	292	392
Housing (all but N.I.B.)		-	-	41	181	302	402
Sub-total							
Vehicle Operation	No.			2	2	2	2
4 Wheel Drive	Cost 27			54	54	54	54
Motor Cycle	No.			1	2	3	4
	Cost 1.5			1.5	3	4.5	6
Sub-total				55.5	57	58.5	60
Total base cost			10	270.5	525	745.5	952
Physical contingencies			1	27.5	53	74.5	95
Total cost			11	298	578	820	1,047

Note: Administrative running costs are included in the allowances in Table B15

TABLE B.17

Budgetted Expenditure - Local Authority - capital costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Abattoir		-	-	60	-	-	-
Town Hall		-	-	-	427	-	-
Housing Type D	No. Cost 110	-	-	-	$\frac{1}{110}$	-	-
E	No. Cost 58	-	-	$\frac{3}{174}$	-	-	-
F	No. Cost 14	-	-	$\frac{2}{28}$	$\frac{3}{42}$	$\frac{3}{42}$	-
G	No. Cost 10	-	-	$\frac{3}{30}$	$\frac{7}{70}$	$\frac{4}{40}$	$\frac{4}{40}$
Sub-total		-	-	292	649	82	40
VEHICLES:							
Lorry - 7 ton	No. Cost 164	-	-	$\frac{1}{164}$	-	-	-
Pick-up	No. Cost 43	-	-	$\frac{1}{43}$	-	-	-
4 wheel drive S.W.B.	No. Cost 68	-	-	-	$\frac{1}{68}$	-	-
Bicycle	No. Cost 1	-	-	$\frac{2}{2}$	-	$\frac{2}{2}$	-
Spares etc.		-	-	49	14	-	-
Sub-total		-	-	292	82	2	-
Total base cost		-	-	584	731	84	40
Physical Contingencies		-	-	58	73	8	4
Total Cost		-	-	642	804	92	44

TABLE B.18

Budgetted Expenditure - Local Authority - Recurrent Costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries							
Executive Officer	19	-	-	-	19	19	19
Licencing Officer	14	-	-	7	14	14	14
Meat Inspector	9	-	-	4.5	9	9	9
Abattoir Supervisor	14	-	-	7	14	14	14
Clerical	No. Cost	-	-	1 3.5	3 21	5 35	5 35
Driver	No. Cost	-	-	1 3.5	2 14	3 21	3 21
Subordinate	No. Cost	-	-	3 7.5	10 50	14 70	18 90
Allowances etc.	5	-	-	7	28	36	40
Sub-total		-	-	40	169	218	242
Building maintenance		-	-	-	14	18	20
Administrative Running Costs		-	-	4	4	5	5
Vehicle Operation	No. Cost	-	-	1 55	1 55	1 55	1 55
Lorry-7 ton.	No. Cost	-	-	1 27	2 54	2 54	2 54
4 wheel drive		-	-				
Sub-total		-	-	82	109	109	109
Total base cost		-	-	126	296	350	376
Physical contingencies		-	-	13	30	35	38
Total cost		-	-	139	326	385	414

TABLE B.19

Budgetted Expenditure - Police - Capital Costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Police Station				500			
Housing Type C	No. Cost			$\frac{1}{165}$		$\frac{1}{58}$	
E	No. Cost			$\frac{1}{58}$		$\frac{2}{28}$	$\frac{6}{84}$
F	No. Cost			$\frac{16}{224}$	$\frac{12}{168}$		
G	No. Cost			$\frac{1}{10}$			
Sub-total				957	168	86	84
Vehicles:							
4 wheel drive L.W.B.	No. Cost			$\frac{2}{160}$			
Lorry - 5 ton	No. Cost						$\frac{1}{135}$
Bicycle	No. Cost			$\frac{3}{3}$	$\frac{1}{1}$	$\frac{2}{2}$	
Spares	No. Cost			33	-	-	27
Sub-total				196	-	2	162
Total base cost				1,153	169	88	246
Physical contingencies				115	17	9	25
Total Cost				1,268	186	97	271

TABLE B.20

Budgetted Expenditure - Police - Recurrent Costs (1,000 Kenya Shillings)

Item	House Type	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries			-	-	12.5	25	25	25
Inspector	C	25	-	-	-	-	-	-
Sergeant	E	No. Cost	-	-	$\frac{1}{4.5}$	$\frac{2}{9}$	$\frac{2}{13.5}$	$\frac{2}{18}$
Corporal	F	No. Cost	-	-	$\frac{1}{3.5}$	$\frac{2}{10.5}$	$\frac{2}{14}$	$\frac{3}{21}$
Constable	F	No. Cost	-	-	$\frac{10}{30}$	$\frac{20}{90}$	$\frac{20}{120}$	$\frac{25}{150}$
Clerical	F	No. Cost	-	-	$\frac{1}{3.5}$	$\frac{2}{10.5}$	$\frac{3}{17.5}$	$\frac{3}{21}$
Signals	F	No. Cost	-	-	$\frac{2}{7}$	$\frac{2}{14}$	$\frac{2}{14}$	$\frac{2}{14}$
Driver	F	No. Cost	-	-	$\frac{2}{7}$	$\frac{2}{14}$	$\frac{2}{14}$	$\frac{3}{21}$
Messenger	G	No. Cost	-	-	$\frac{1}{2.5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
Allowances, etc.			-	-	14	34	45	55
Sub-total			-	-	85	212	268	330
Vehicle: Operation 4-wheel Drive		No. Cost	-	-	$\frac{2}{54}$	$\frac{2}{54}$	$\frac{2}{54}$	$\frac{2}{54}$
Lorry - 5 ton		No. Cost	-	-	-	-	-	$\frac{1}{45}$
Sub-total			-	-	54	54	54	99
Building Maintenance			-	-	-	25	28	30
Total base cost			-	-	139	291	350	459
Physical contingencies			-	-	14	29	35	46
Total cost			-	-	153	320	385	505

TABLE B.21

Budgetted Expenditure - Ministry of Co-operative Development - Capital Costs
(L,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Offices	(see District Administration budget)						
Housing Type D	No. Cost			$\frac{2}{220}$		$\frac{1}{110}$	
E	No. Cost			$\frac{2}{116}$	$\frac{2}{116}$	$\frac{2}{116}$	$\frac{1}{58}$
F	No. Cost			$\frac{1}{14}$			
G	No. Cost			$\frac{1}{10}$			
Sub-total				360	116	226	58
Vehicles							
4 wheel drive - SWB	No. Cost			$\frac{1}{68}$		$\frac{1}{68}$	
Motor Cycle	No. Cost			$\frac{3}{15}$	$\frac{2}{10}$	$\frac{2}{10}$	
Bicycle	No. Cost			$\frac{1}{1}$			
Spares				17	2	16	
Sub-total				101	12	94	
Total Base Cost				461	128	320	58
Physical Contingencies				46	13	32	6
Total Cost				507	141	352	64

TABLE B.23

Budgetted Expenditure - Posts and Telecommunications Agency - Capital Costs
(1000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Post Offices							
Rural Centre	600			600			
Market Centre	No. Cost			$\frac{1}{60}$	$\frac{1}{60}$	$\frac{1}{60}$	$\frac{1}{60}$
Sub-total				660	60	60	60
Housing Type	No. Cost			$\frac{1}{110}$			
D							
E	No. Cost			$\frac{1}{58}$	$\frac{1}{58}$	$\frac{1}{58}$	$\frac{1}{58}$
F	No. Cost			$\frac{10}{140}$	$\frac{4}{56}$	$\frac{4}{56}$	$\frac{4}{56}$
G	No. Cost			$\frac{5}{50}$	$\frac{2}{20}$	$\frac{2}{20}$	$\frac{2}{20}$
Sub-total				358	134	134	134
Equipment				300	-	-	-
Total Base Cost				1,318	194	194	194
Physical Contingencies				132	19	19	19
Total Costs				1,450	213	213	213

TABLE B.24

Budgetted Expenditure - Posts and Telecommunications Agency - Recurrent costs
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Housing Type							
Salaries (including allowances)							
Post Superintendent	D	23		23	23	23	23
Post Officer	F	No. Cost		$\frac{6}{40}$	$\frac{6}{48}$	$\frac{8}{64}$	$\frac{12}{88}$
Telephone Assistant	F	No. Cost		$\frac{4}{24}$	$\frac{4}{32}$	$\frac{6}{48}$	$\frac{10}{72}$
Messenger	G	No. Cost		$\frac{3}{15}$	$\frac{3}{18}$	$\frac{4}{24}$	$\frac{6}{33}$
Watchman	G	No. Cost		$\frac{2}{9}$	$\frac{2}{12}$	$\frac{3}{18}$	$\frac{5}{27}$
Senior Post Officer	E	No. Cost		$\frac{1}{9}$	$\frac{1}{17}$	$\frac{2}{34}$	$\frac{4}{60}$
Sub-total			120	150	211	303	70
Building maintenance				50	60		
Equipment maintenance - financed out of revenue							
Total base cost			120	200	271	373	
Physical contingencies			12	20	27	37	
Total cost			132	220	298	410	

TABLE B.25

Budgetted Expenditure - Ministry of Social Services - Capital Costs
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Offices			(see District Administration, N.I.B. budgets)				
Housing Type							
B	No. Cost	200	$\frac{1}{200}$				
D	No. Cost	110	$\frac{5}{550}$				
F (villages)	No. Cost	14	$\frac{12}{168}$		$\frac{8}{112}$	$\frac{3}{42}$	
F	No. Cost	14	$\frac{2}{28}$		$\frac{2}{28}$		
G	No. Cost	10	$\frac{1}{10}$		$\frac{1}{10}$		
Sub-total			956		150	42	
Vehicles							
4-wheel drive - LWB	No. Cost	80	$\frac{1}{80}$				
Passenger Carrier - 7 ton	No. Cost	164			$\frac{1}{164}$		
Motor Cycle	No. Cost	5	$\frac{7}{35}$				
Bicycle	No. Cost	1	$\frac{12}{12}$		$\frac{8}{8}$	$\frac{3}{3}$	
Spares			25		34	1	
Sub-total			152		206	4	
Equipment							
Creches			18		36	60	24
Day-Care Centres			18		36	60	24
Sub-total			36		72	120	48
			1,144		434	134	53

TABLE B.26

Budgetted Expenditure - Ministry of Social Services - Salary Costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (including allowances, etc.) House Type							
Senior Community Development Officer (CDO) B	44	44		44	44	44	44
Assistant CDO (youth) D	23	23		23	23	23	23
Assistant CDO (adult ed.) D	23	23		23	23	23	23
Assistant CDO (social welfare) D	23	23		23	23	23	23
Assistant CDO (day care) D	23	23		23	23	23	23
Assistant CDO (self help) D	23	23		23	23	23	23
Clerk F	No. Cost	$\frac{1}{8}$		$\frac{1}{8}$	$\frac{2}{16}$	$\frac{2}{16}$	$\frac{2}{16}$
Driver F	No. Cost	$\frac{1}{8}$		$\frac{1}{8}$	$\frac{2}{16}$	$\frac{2}{16}$	$\frac{2}{16}$
Messenger G	No. Cost	$\frac{1}{6}$		$\frac{1}{6}$	$\frac{2}{12}$	$\frac{2}{12}$	$\frac{2}{12}$
Community Development Assistant F	No. Cost	$\frac{12}{204}$		$\frac{20}{340}$	$\frac{23}{391}$	$\frac{23}{391}$	$\frac{23}{391}$
Assistant - Creche -	No. Cost	$\frac{3}{0.6}$		$\frac{9}{1.8}$	$\frac{19}{3.8}$	$\frac{23}{4.6}$	$\frac{23}{4.6}$
Assistant - Day Centre -	No. Cost	$\frac{3}{0.6}$		$\frac{9}{1.8}$	$\frac{19}{3.8}$	$\frac{23}{4.6}$	$\frac{23}{4.6}$
Total		386		547	602	603	603

TABLE B.27

Budgetted Expenditure - Ministry of Social Services - Recurrent Costs Summary
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (from Table B26)		-	-	386	547	602	603
Building Maintenance (see District Administration budget)		-	-				
Vehicle Operation							
4 wheel drive - LWB	No. Cost	-	-	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$	$\frac{1}{27}$
Passenger Carrier - 7 ton	No. Cost	-	-	-	$\frac{1}{55}$	$\frac{1}{55}$	$\frac{1}{55}$
Motor Cycle	No. Cost	-	-	$\frac{5}{7.5}$	$\frac{5}{7.5}$	$\frac{5}{7.5}$	$\frac{5}{7.5}$
Sub-total		-	-	35	90	90	90
Total base cost		-	-	421	637	692	693
Physical Contingencies				42	63	69	69
Total Costs				463	700	761	762

TABLE B.28

Budgetted Expenditure - Ministry of Information - recurrent costs. (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (including allowances)							
Information Officer	35	18	35	35			
Information Assistant	No. Cost	2 14	2 28	2 28	1 14	1 14	
Secretary	9	5	9	9	7	7	
Driver	7	4	7	7			
Messenger	5	3	5	5			
Total base cost		44	84	84	21	21	
Physical contingencies		4	8	8	2	2	
Total cost		48	92	92	23	23	

Note:

1. Salaries to be re-imbursed from Project Funds under Co-ordinator's office costs.

TABLE B.29

Budgetted Expenditure - Ministry of Lands & Settlement - recurrent costs
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (including allowances, etc.)							
House Type							
Settlement Officer I	No. Cost	$\frac{1}{20}$	$\frac{2}{60}$	$\frac{2}{80}$	$\frac{2}{80}$	$\frac{2}{80}$	$\frac{2}{80}$
		40					
Settlement Officer III	No. Cost	$\frac{2}{23}$	$\frac{3}{58}$	$\frac{3}{69}$	$\frac{3}{69}$	$\frac{3}{69}$	$\frac{2}{46}$
		23					
Settlement Assistant	No. Cost			$\frac{4}{68}$	$\frac{4}{68}$	$\frac{4}{68}$	$\frac{4}{68}$
				17			
Driver	No. Cost	$\frac{1}{4}$	$\frac{2}{12}$	$\frac{2}{16}$	$\frac{2}{16}$	$\frac{3}{24}$	$\frac{3}{24}$
		4					
Total base cost		47	130	233	233	241	218
Physical contingencies		5	13	23	23	24	22
Total cost		52	143	256	256	265	240

Note 1: Salaries re-imbursed from Project funds.

2: Vehicles and administrative running costs are included in NIB budget under the Project Co-ordinator's office.

TABLE B.30

Budgetted Expenditure - Ministry of Education - capital costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
School Vehicles (miscellaneous) Buildings at rural centre						160	
Primary schools 1/	No. Cost	-	-	$\frac{1}{675}$		$\frac{1}{675}$ 1,235	-
Secondary School Sub-total	1,235	-	-	675	-	1,910	-
Housing for primary schools 1/							
Type E	No. Cost	-	-	$\frac{18}{1,044}$	$\frac{27}{1,566}$	$\frac{21}{1,218}$	$\frac{9}{522}$
F	No. Cost	-	-	$\frac{54}{756}$	$\frac{81}{1,134}$	$\frac{63}{882}$	$\frac{27}{378}$
G	No. Cost	-	-	$\frac{6}{60}$	$\frac{9}{90}$	$\frac{7}{70}$	$\frac{3}{30}$
Sub-total	10	-	-	1,860	2,790	2,170	930
Housing for secondary schools							
Type C	No. Cost	-	-	-	-	$\frac{1}{165}$	-
D	No. Cost	-	-	-	-	$\frac{8}{880}$	-
E	No. Cost	-	-	-	-	$\frac{8}{464}$	-
F	No. Cost	-	-	-	-	$\frac{14}{196}$	-
Sub-total	14	-	-	-	-	1,705	-
Total base cost						3,100	-
Physical contingencies						310	
Total cost						3,410	

NOTE 1/ Included in National Irrigation Board Budget

TABLE B.31

Budgetted Expenditure - Ministry of Education - salary costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries							
Primary School							
Headmaster	No. 21 Cost	6 59.5			15 206.5	22 393.8	25 572.7
Deputy Head	No. 14.5 Cost	6 41.1			15 142.6	22 271.9	25 354.0
Teacher (PI)	No. 14 Cost	6 39.7			15 137.7	22 262.5	25 341.8
Teacher (P2)	No. 9.6 Cost	36 163.2			90 566.4	132 1,080.0	150 1,406.4
Teacher (P3)	No. 8.4 Cost	36 142.8			90 495.6	132 945.6	150 1,230.6
Clerk	No. 6 Cost	6 17.0			15 59.0	22 112.5	25 146.5
Secondary School							
Headmaster							
Deputy Head							
Teacher (Graduate)	No. 25 Cost						
Teacher SI	No. 19 Cost						
Bursar							
Accounts Clerk							
Typist							
Lab Assistant							
Driver							
Matron/housekeeper							
Cateress							
Subordinates	No. 3 Cost						
Total salaries cost		463.3			1,607.8	3,110.8	4,555

TABLE B.32

Budgetted Expenditure - Ministry of Education - recurrent costs (1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries (from table B31) 3/		-	-	463.3	1,607.8	3,110.8	4,555
Building Maintenance		-	-	-	-	-	60
Secondary school		-	-	-	-	-	-
Administration and running costs		-	-	28	96	184	243
Primary schools 1/		-	-	-	-	-	-
Secondary schools 2/		-	-	-	-	-	-
Vehicle Operation		-	-	-	-	50	50
School vehicles		-	-	-	-	-	-
Total Base Cost		-	-	491	1,704	3,345	4,908
Physical Contingencies		-	-	49	170	335	491
Total Cost		-	-	540	1,874	3,680	5,399

Notes: 1/ Calculated at 6% of salary bill

2/ To be met from fees, etc.

3/ Part of bill to be offset against fees.

TABLE B.33

Budgetted Expenditure - Ministry of Agriculture - Agricultural extension - capital cost.
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Offices: (included in District Administration Budget).							
Housing: Type C	No. Cost			$\frac{2}{330}$		$\frac{1}{165}$	
F	No. Cost			$\frac{3}{42}$	$\frac{3}{42}$		
G	Cost			10			
Sub-total				382	42	165	
Vehicles:							
4-wheel drive LWB	No. Cost	77					
Pick-up	No. Cost	43				43	
Bicycle	No. Cost	$\frac{1}{1}$		$\frac{1}{1}$	$\frac{3}{3}$		
Spares				24	-	9	
Sub-total		145		145	3	52	
Total base cost		527		527	45	217	
Physical contingencies				53	5	22	
Total cost		580		580	50	239	

TABLE B.34

Budgetted Expenditure - Ministry of Agriculture - Agricultural extension - recurrent cost
(1,000 Kenya Shillings)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Salaries:							
House Type							
Agricultural Officer	40			40	40	40	40
Assistant Agricultural Officer	No. Cost			1 $\frac{1}{30}$	1 $\frac{1}{30}$	2 $\frac{2}{60}$	2 $\frac{2}{60}$
Agricultural Assistants	No. Cost			1 $\frac{1}{12}$	4 $\frac{4}{48}$	4 $\frac{4}{48}$	48
Clerical				8	8	8	8
Driver				8	8	8	8
Messenger				6	6	6	6
Sub-total				104	140	170	170
Building maintenance (houses only)	2%				8	8	12
Vehicle Operation:							
4-wheel drive	27			27	27	27	27
Pick-up	20			20	20	40	40
Sub-total				47	47	67	67
Demonstrations and miscellaneous costs (lump sum)				10	15	20	20
Total base cost				161	210	265	269
Physical contingencies				16	21	27	27
Total cost				177	231	292	296

TABLE B.35

Budgetted Expenditure - Overall Summary - Bura Irrigation Settlement Project (1,000,000 K Sh)

Item	Unit Cost	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
Major Construction Works		7.6	46.0	69.0	68.0		
Minor Construction Works		8.9	3.4	3.3	0.9		
Buildings		-	18.4	25.1	19.0	19.0	1.9
Plant and Machinery		1.1	5.7	4.9	4.8	4.1	1.2
Vehicles		2.2	2.2	3.2	1.6	1.5	0.6
Operation - NIB		0.7	2.5	8.8	17.4	25.7	28.3
Operation - Institutions		0.1	0.2	2.0	4.1	6.3	8.3
Utilities / Infrastructure		1.1	13.8	29.7	3.0	0.8	-
Equipment		-	0.1	1.2	0.6	0.6	0.1
Consultancy Services		27.1	18.6	13.5	10.0	8.0	1.6
Training		0.7	0.8	0.9	0.5	0.3	0.1
Agricultural Management		0.7	2.7	4.6	4.9	4.9	4.5
Forestry		1.4	2.2	4.8	12.2	12.5	4.0
Livestock, Fisheries & Wildlife		-	0.4	0.7	1.0	1.8	1.2
Public Health		0.5	1.0	1.1	1.3	1.5	1.5
Ginnery		-	13.1	15.1			
Total Base Cost		52.1	131.1	187.9	149.3	87.0	53.3
Physical Contingencies		6.6	18.0	25.8	20.2	10.3	5.5
Total Cost		58.7	149.1	213.7	169.5	97.3	58.8

TABLE B.36

Estimated Ginnery Operating Cost at Full Capacity (KSh 1,000)

Item	Cost
Depreciation (Annual Depreciation + 10% per annum interest)	
Buildings (40 year life)	1 793. 1
Machines (20 year life)	819. 9
Furniture and equipment (10 year life)	138. 3
Vehicles (6 year life)	100. 0
Repairs and Maintenance.	
Machinery	529. 2
Buildings	470. 7
Workshops and Equipment	41. 5
Salaries	
Permanent staff	409. 0
Casual Labour wage costs	139. 5
Baling Materials	1 029. 7
Seed Bags, etc.	780. 8
Power Costs	765. 0
Vehicle Operating Costs	85. 0
Office Running and Accounting Costs	76. 0
Interest on Operating Expenditure	144. 0
Miscellaneous	231. 0
SUB-TOTAL	7 552. 7
Contingencies and Operating Margin	1 132. 7
TOTAL GINNING COST	8 685. 4
Average Cost per Bale	213
Average Cost per Kg. Limit	1. 16

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Table C. 4 Government of Kenya Institutions and Services - Staff Grades, Salaries and Allowances

		C	D	E	F	G
Management		3			6	1
Finance		1	1	7	6	
Legal				1	12	
Factory		2		6	37	
Procurement	7	2		16	11	
Marketing			2	7	3	1
Transport		1				
Development		1	5	83	238	28
Health			4	13	42	20
Social Services	1		5		25	
Communications			1	4	22	11
Infrastructure		3		9	57	
Security and Local Administration	21	3	3	23	104	22
Total Housing at Site (Total Staff)	2	14	42	45	187	184
	(15)	(24)	(56)	(240)	(650)	(123)

1. House type 4 allowed for Senior District Officer
 2. House type II allowed for Police Inspector and Agricultural Officer
 3. Educational housing allows for some teachers as married couples, see Institutions and Services Annex
 4. Figures in brackets are total staffing at site and Nairobi - housing allowances for Nairobi Level staff provided in operational costs

TABLE C.1 Total Housing Requirements at Site - Summary

Housing at Site							
House Type	A	B	C	D	E	F	G
Area (m ²)	160	118	105	80	56	40	40
Cost (K Sh 1 000)	310	200	165	110	58	14	10
NIB Scale							
Staff Scales	H	E to G	C & D	A & B	I & II	III & IV	V
Grade/Median Scale (K Sh 1 000)							
Agency	Principal 70	Senior 1 55	Senior 2 40	Senior 3 27	Junior 1 15	Junior 2 8	Subordinate 6
NIB operational staff	1	9	27	18	28	298	109
Livestock	—	—	3	—	—	6	1
Fisheries	—	—	1	1	7	6	—
Wildlife	—	—	—	—	1	12	—
Forestry	—	—	2	—	6	37	—
Processing	—	2	2	—	16	11	—
Marketing	—	—	—	3	7	3	1
Research	—	—	1	—	—	—	—
Education ³	—	—	1	8	83	239	25
Health	—	—	—	4	13	18	25
Social Services	—	1	—	5	—	25	—
Communications	—	—	—	1	4	22	11
Infrastructure	—	—	3	—	9	12	—
District and Local Administration	1 ¹	2 ²	3	3	23	104	22
Total Housing at Site	2	14	43	43	197	793	194
(Total Staff)⁴	(2)	(15)	(53)	(55)	(248)	(850)	(251)

- Notes:
- ¹ House type A allowed for Senior District Officer
 - ² House type B allowed for Police Inspector and Agricultural Officer
 - ³ Educational housing allows for some teachers as married couples, see Institutions and Services Annexe
 - ⁴ Figures in brackets are total staffing at Site and Nairobi: housing allowances for Nairobi based staff provided in operational costs

TABLE C.2 Vehicle Summary

Vehicle Type	Agency										TOTAL
	N I B	Forestry	Public Health	District & Local Admin.	Fisheries & Wildlife	Co-operative Development	Social Services	Education	Infrastructure	Police	
Saloon Car	2										2
4 wheel drive:											
- SWB hard top	2			2							6
- Pickup		2									2
- LWB station wagon	11		6								11
Special				1							6
Hard top											2
Pickup	30				3						11
Pickup / Utility	14			1	2			3		2	36
Lorry: 3 ton	8										17
5 ton									1		9
7 ton		2								1	1
Tipper	4			1							4
Misc. school vehicles											1
Tractor		1									1
Trailer		1									1
Tanker: 1200 gall.		1									1
Motor-cycles	52	4									79
Bicycles	132			5	2						188
				26						6	

TABLE C.3 NIB Staff Grades, Salaries and Allowances (1 000 K Sh per annum)

Post	Grade	Basic Salary	Estimated allowances	On-cost	Total annual salary	House grade
Bura Project Co-ordinator	G	73.3	11.1	7.3	91.7	B
Bura Project Manager	F	60.7	10.1	6.1	76.9	B
Deputy Project Manager	E					
Project Administrator/Accountant	E					
Agricultural Production Manager	E	44.9	8.6	4.5	58.0	B
Project Engineer	E					
Senior Research Officer	E					
Agricultural Economist	D					
Senior Accountant	D					
Senior Staff Officer	D					
Assistant Administrator	D					
Assistant Agricultural Manager	D					
Section Supervisor	D	37.7	7.8	3.8	49.3	C
Plant Protection Officer	D					
Research Officer (Specialist)	D					
Mechanisation Supervisor	D					
Assistant Project Engineer	D					
Workshop Engineer	D					
Assistant Engineer	C					
Accountant	C					
Welfare Officer	C					
Supply Officer	C					
Research Officer	C	31.1	7.2	3.1	41.4	C
Building Supervisor	C					
Assistant Workshop Engineer	C					
Assistant Irrigation Engineer	C					
Training Officer	C					
Stores Superintendent	B					
Head Cashier	B					
Field Officer	B	25.1	6.6	2.5	34.2	D
Assistant Plant Protection Officer	B					
Workshop Foreman	B					
Draughtsman	A	18.7	6.0	1.9	26.6	D
Cashier	Group I					
Bookkeeper						
Assistant Staff Officer		14.3	5.5	1.4	21.2	E
Assistant Training Officer						
Head Field Assistant						
Assistant Mechanical Supervisor						
Building/Irrigation Foreman						
Personal Secretary	Group II	11.9	4.6	1.2	17.7	E
Mechanisation Foreman						
Mechanic						
Clerical Assistant	Group III					
Storeman						
Research/Technical Assistant		9.1	3.6	0.9	13.6	F
Field Assistant						
Pest Control Assistant						
Plant Operator's Driver						
Headworks Operator						
Artisan						
Driver	Group IV	6.2	2.5	0.6	9.3	F
Senior Water Guard						
Artisan						
Head Cultivator	Group VA	4.9	1.7	0.5	7.1	G
Head Water Guard						
Watchmen, Cleaner	Group VB					
Water Guard		4.0	1.6	0.4	6.0	G
Pest Control Guard						
General Labourer						

TABLE C.4 GOK Institutions and Services - Staff Grades, Salaries and Allowances (1 000 K Sh)

No.	Bura Establishment	GOK Job Group	Salary Range	Median Point	Estimated Cost of Allowances, etc.	Total Cost per individual
1	Senior District Officer	K				
1	Senior CD Officer	K	32-42	37	7	44
1	Agricultural Officer	K				
1	Agricultural Officer (Livestock)	J				
2	Assistant AO	J	27-36	31	6	37
1	Senior Information Officer	J				
1	Inspector of Police	H				
2	Settlement Officer I	H	22-29	25	5	30
1	Co-operative Officer	H				
1	Administration Assistant	G				
1	Executive Officer (Local Gvt.)	G				
4	Settlement Officer III	G	16-22	19	4	23
2	Assistant Co-operative Officers	G				
5	Assistant Community Development Officers	G				
4	Chiefs	F				
1	Licensing Officer	F				
16	Agricultural Assistant	F				
4	Settlement Assistant	F	12-17	14	3	17
2	Information Assistant	F				
6	Co-operative Assistant	F				
23	Community Development Assistant	F				
2	Sergeants (Police)	D				
1	Sergeant (Admin. Police)	D	7-11	9	2	11
1	Secretary	D				
1	Meat Inspector	D				
20	Clerical	C				
3	Corporal (Police)	C	5-8	7	1	8
4	Corporal (Admin. Police)	C				
16	Driver	C				
8	Sub-Chief	B				
25	Police Constable	B	4-7	6	1	7
29	Admin. Police Constable	B				
28	Messengers	A	3-5	5	1	6
	Permanent Labour	A				

Note: Allowances, etc. - a figure of 20% of salary has been taken to cover travelling, transport, leave, special allowances, housing, etc. This estimate is based upon an examination of GOK Recurrent Expenditure Estimates 1976-77.

Teaching Services - Grades, Salaries, Allowances (1 000 K Sh)

No.	Bura Establishment	Qualification	Salary	Allowances (hardship & responsibility)	Total Cost per individual
1	Secondary Headmaster	B.Ed.	23	15	38
1	Secondary Deputy Head	B.Ed.	21	7	28
7	Secondary Teachers	BA or B.Sc.	21	4	25
25	Primary Headmasters	S1	16	5	21
8	Secondary Teachers	S1	16	3	19
25	Primary Deputy Heads	P1	12	2.5	14.5
25	Primary Teachers	P1	12	2.0	14
150	Primary Teachers	P2	8	1.6	9.6
150	Primary Teachers	P3	7	1.4	8.4
1	Secondary Bursar	-	16	3	19
39	Other Staff	-	7	1	8

BUHA IRRIGATION SETTLEMENT PROJECT
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(d) Under average conditions the tenant can pay the land and water charges provided by the ISRD.

(e) On marginal soils, if lower yields are obtained the payment capacity in respect of the land and water charges would be halved.

In the economic study, two basic situations were distinguished: firstly, with foreign exchange market prices; and, secondly, without shadow pricing of the item. For the analysis a proportion of various project costs (mainly irrigation works) and cost of government social services provided were charged against the project. Sensitivity tests were carried out to assess the effect of changes in costs and benefits and the cropping pattern. The results of these analyses summarise as follows:

SUMMARY

The economic analyses have been carried out as required under the terms of reference for the Project Planning Report (PPR). However, because the PPR virtually only updates costs and does not examine basic assumptions and criteria for the major items affecting costs and benefits, the results of the analyses are to be regarded as confirmatory of previous analysis carried out at the feasibility study stage. There would appear to be scope for studying the basic cropping regimes, mechanisation system and carrying out a thorough evaluation of the Hola Pilot Scheme.

The appraisal was carried out at three levels, namely the national economy, individual farm, and the National Irrigation Board (NIB) project organisation. The basic assumptions and methodology employed included the following:

- (a) Shadow pricing of foreign exchange, tenant family labour and capital.
- (b) Input prices were assessed at January - March, 1977 levels by direct contact with suppliers in Nairobi. Staff costs were based on current salaries and wages paid by the NIB and Kenya Government.
- (c) Output prices were based on the International Bank for Reconstruction and Development (IBRD) projections at constant 1977 values for the economic analysis and local market value for financial analyses.

The price paid to farmers for seed cotton was assessed to be K Sh 3.50 per kilogramme (kg) taking account of improved varieties and lower ginning costs compared to the present.

Farm budgets were prepared for three situations, the first two being basic tenant situations arising due to tenants arrival throughout the year. The third was aimed at assessing the position of tenants whose farms were mainly on marginal soils. The results of the analyses showed that:

- (a) The tenant would have a net cash income, after meeting subsistence, of between K Sh 5 000 and K Sh 7 000 per annum.
- (b) The tenant would be capable of meeting all charges made for the repayment of advances for house construction village (harambee) buildings and initial subsistence.
- (c) Under average conditions the tenant can pay the land and water charges proposed by the IBRD.
- (d) On marginal soils, if lower yields are obtained the payment capacity in respect of the land and water charges would be halved.

For the economic analysis two basic situations were distinguished; firstly, with foreign exchange shadow priced; and, secondly, without shadow pricing of this item. For the analysis a proportion of various project costs (major irrigation works) and costs of government social services provided were costed against the project. Sensitivity tests were carried out to assess the effect of changes in costs and benefits and the cropping pattern. The results of these analyses summarise as follows:

Situation	IERR* (%)	NPV** (at 10%) (K Sh million)
Basic project with foreign exchange shadow priced	13	126
Basic project without shadow pricing of foreign exchange	11¼	46
Capital costs rise by 20 per cent	11¼	
Gross benefits fall by 20 per cent	9½	
Cropping pattern changed to 80% cotton	12	

* Internal economic rate of return

** Net present value

It appears that the project economics are not particularly sensitive to changes in basic costs or returns.

The financial outcome of the NIB project operation were examined by a cash flow analysis. All the costs and revenues of items which the NIB would directly control were analysed over a twenty year period. During the development period all funds required to establish the project were assumed to be provided by the Government on a grant basis. Thereafter the project would operate under its own budget with funds derived from the payments of land and water charges by tenants and the repayment of house, harambee buildings and subsistence advances.

The cash flow of the project showed slight deficit or surplus balances during the first twelve years but thereafter showed a surplus of about 13 per cent over costs. The surplus would not represent a significant contribution to capital costs.

CHAPTER 1 INTRODUCTION AND ASSUMPTIONS

The terms of reference for the Project Planning Report (PPR) includes provision for economic and financial analyses (project costs and return, internal rates of return, farm budgets, repayment capacity and water charges) to be carried out for Phase I, Stage I, of the project. Most of the decisions on matters such as cropping patterns, methods of production, the future irrigated area, holding sizes and other factors which affect economic and financial viability had already been taken before the PPR. Thus from the viewpoint of economic analysis, the main contribution of the PPR is to produce updated and more detailed cost estimates and then to reanalyse the economics of the project on the basis of these revised costs. Because the main parameters affecting benefits (e.g. cropping patterns) had already been defined and the engineering works proposed are not greatly changed, all that this analysis achieved is a refinement of those undertaken previously. Thus the evaluations carried out here should essentially be regarded as confirmatory of those done by ILACO, IBRD and the TRDA during 1975 and 1976.

The effects of possible basic changes in the project have, however, been examined by sensitivity analyses (analyses of the effects of changes in extraneous factors such as crop prices have also been made). Crop yields and cropping intensities are the main factors within the project which may be found in practice to differ from the original plans. Crop yields are likely to vary due to the soils of the area and the level of farming skills of the tenants. The high cropping intensity envisaged might not be achieved because of the lack of flexibility within the cropping pattern, the shortage of time for completion of farming operations within the 'season' and the possible long-term effect, in terms of disease and pest regimes, of cropping the whole project with cotton each year.

It would appear that at the detailed planning stage it would be useful to examine more closely the following aspects:

- (a) Mechanisation systems, particularly with regard to their effectiveness in land preparation during peak periods.
- (b) Alternative crops and crop varieties, to increase the flexibility of the cropping regime.
- (c) Evaluation of the Hola Pilot Scheme results and experience, with regard to technical and human factors.

CHAPTER 2 METHODOLOGY AND ASSUMPTIONS

2.1 The Appraisal Criteria Adopted

The project appraisal has been carried out at three levels, namely:

(a) *The National Economy*

To assess the contribution to the national economy, the internal economic rate of return has been calculated from the discounted cost and benefit flows generated by the project (this is the economic analysis).

(b) *Farm Level*

The net income achieved by the farmers and their capacity to pay for various services provided by the project has been assessed by means of detailed budgets showing costs and returns on an annual basis.

(c) *NIB Level*

A detailed cash flow statement demonstrates the projected financial viability of the NIB project organisation, the agency responsible for implementation.

2.2 Shadow Pricing for the Economic Analysis

For three main elements, foreign exchange, labour and capital, shadow prices have been used to adjust market prices to reflect more closely the real value of these resources to the Kenyan economy. Secondly, in the economic analysis import duties and other taxes on cost items have been omitted, because these are transfer payments rather than real economic costs.

Foreign Exchange

The official exchange rates for the Kenya Shilling in terms of the major foreign currencies likely to be involved are as follows (January 1977):

US \$ 1 = K Sh 8.35

Sterling £1 = K Sh 14.30

For the economic analysis the US Dollar shadow foreign exchange rate applied by IBRD has been adopted, namely:

US \$ 1 = K Sh 11.0

Labour

No shadow price has been assigned to staff costs, on the assumption that overall salary levels (including allowances) represent the opportunity cost to the economy of the different types of manpower employed. At present wage levels of management staff may be undervalued and unskilled labour overvalued, but there are no reliable estimates available on which to quantify this. It is assumed that overall these two factors balance one another out.

As regards tenants and their families, it is envisaged that most would be landless, underemployed people. For analysis purposes the value of their labour can be taken as their present average earnings in cash and kind in their area of origin.

Various attempts to put a value on this category of labour have been made in the past. The International Labour Organisation (ILO) in 1972 estimated the average agricultural earnings of unemployed and landless people to be K Sh 400 or less per annum. If this figure is inflated by the estimated average growth rate for the Agriculture and Forestry section of 7.1 per cent for the six years from 1971 to 1977 the current value would be K Sh 650 per annum.

Most landless families also derive earnings from casual employment during peak work seasons. It is estimated that a family of seven might be expected to obtain 75 days (2½ months) of work per year for two man-equivalents. The value of this would be K Sh 900.

On the basis of these figures an average of K Sh 750 per family (at 1977 prices) has been taken as the opportunity cost of tenant labour.

Capital

Recent appraisals of projects in Kenya have used interest rates of 8 to 10 per cent as the opportunity cost of capital. A rate of 10 per cent is used here.

2.3 Input Prices

Following the requirement of the terms of reference, 1977 (January - March) prices have been used throughout the study. Market (financial) prices have been assessed by direct contact with traders, suppliers and statutory authorities dealing in the inputs or produce concerned. Basic prices ex-supplier's warehouse have been adjusted for transport costs to Bura and the handling involved.

For the economic analysis, adjustments have been made to account for shadow pricing those elements of cost or output whose economic value differs from their market value. Details are given below of these costs.

Agricultural inputs

Tender prices or large scale suppliers' prices have been employed. No allowance for project handling or on-cost is made, because these are covered elsewhere in the project costs. Rates of use are those proposed by the IBRD Appraisal Mission (1976), which are outlined in the Agricultural Planning Annex, and shown in Appendix A.

Engineering inputs

All items concerned with the irrigation system, buildings, village infrastructure and utilities are included. Capital costs were built up from basic quantities and unit rates assessed for the operations and the conditions at Bura.

Maintenance of buildings were estimated as a percentage of initial outlay, to cover the cost of materials and outside services employed.

Vehicles, agricultural machinery and plant

Costs were assessed using suppliers' prices less normal trade discounts.

- (i) Recurrent costs covering fuel, lubricants, tyres, spare parts, road tax and insurance were computed from detailed estimates for each element. Operator salaries were not included, being dealt with separately (see below).
- (ii) Replacement costs were estimated as an annual equivalent on the basis of sinking fund payments with interest at 10 per cent.

Staff and labour

Detailed staffing schedules were prepared for all agencies involved in the project.

The establishment thus obtained was costed at the appropriate Government of Kenya (GOK) or NIB salary determined in the following manner:

- (i) Basic salary, established as the mid point of the grade applicable to the post.
- (ii) The following on-cost allowances to cover gratuities, pension, holiday travelling and hardship allowances:

GOK	—	20 per cent
NIB	—	hardship allowances, plus a further 10 per cent of basic salary

2.4 Output Prices

The main crops produced on the project will be cotton, maize, cowpeas and groundnuts. For the economic analysis, border parity prices were used in the case of cowpeas. For the financial analysis market prices were applied, because these are the values which would be received by the farmers. Expected long-term prices were used, based on recent IBRD commodity forecasts.

The economic prices of cotton, maize and groundnuts, all of which have large world markets, have been derived from world market values. Because there is no major international trade in cowpeas this has been valued purely on the basis of local prices. For cotton the IBRD projected price for 1980-85 (US \$ 0.70 per lb of lint at 1977 prices) has been taken as the long-term price. In the case of groundnuts and maize IBRD forecasts indicate that long-term prices will be similar to those of 1976-77, current prices have therefore been used. Cotton seed price trends can be expected to be broadly similar to those of other oilseeds such as groundnuts, and future cotton seed prices have therefore been assumed to be the same as those of 1976-77.

Cotton

The economic value of seed cotton has been based on the export value of lint and seed (Table 2.2) produced from ginning the raw seed cotton and the estimated cost of ginning at Bura. The estimated ginning cost based on a saw ginnery at Bura handling 20 000 tons of seed cotton per annum is given in Table 2.1. Table 2.3 shows the market price assumed.

Table 2.1 - Estimated Ginning Cost at Bura (K Sh)

Item	Average Cost per bale of lint (182 kg)	
	Market Prices	Economic Prices
Capital depreciation	70	
Repairs and maintenance and operating costs	115	
Contingencies and operating margin	28	
Total Cost per bale (40 700 per annum)	213	244
Average cost per kg lint	1.16	1.34
Average cost per kg seed cotton	0.43	0.50

For analysis purposes a figure of K Sh 0.50 per kg of seed cotton has been used.

Table 2.2 - Estimated Economic Value of Cotton

Detail	Amount	
	US \$ per ton	
1. Lint: Mexican SM - 1 ^{1/16} inch CIF N. Europe	1 543	
Less: insurance and freight from Mombassa	163	
FOB Mombassa price	1 380	
	K Sh per ton	
K Sh value at foreign exchange shadow price	15 180	
Less: Transport from Bura	475	
Ex-ginnery price	14 705	
2. Seed: local market price ex-ginnery	900	
3. Seed cotton value: (K Sh/ton raw cotton)	Foreign Exchange shadow priced	Foreign Exchange not shadow priced
Lint 37% (90% AR and 10% BR grades)	5 170	3 885
Seed 61%	550	550
Gross value	5 720	4 435
Ginning cost	500	425
Net value	5 220	4 010

Table 2.3 - Estimated Market Price of Seed Cotton

Detail	K Sh per ton
Lint value (37% GOT, 90% AR and 10% BR)	3 885
Seed value	550
Gross value	4 435
Less:	
Ginning cost	500
Seed cotton buying commission @ 0.20 per kg	250
CLSMB overheads levy @ K Sh 0.18 per kg	180
Net value at farmgate	3 505
Average price per kg (K Sh)	3.50

The price paid to the farmer of K Sh 3.50 per kg compares with the current price paid by the CLSMB of K Sh 3.20.

Maize

Maize will be grown primarily for domestic consumption by tenants and their families. If it were not produced on the project grain would have to be imported from the highland regions of the country.

Producer prices for maize are fixed country-wide by the Maize and Produce Board (MPB), the current price being K Sh 80 per 90 kg bag (K Sh 889 per ton) delivered to MPB depots. The nearest depot at present is at Mombassa, although it will probably be necessary to establish one in the Lower Tana area in due course. In this case the depot price would apply to sales by Bura farmers.

The price of maize imported from the Mount Kenya region is estimated to be as follows:

	K Sh per ton
Price at MPB depot	889
Transport	400
Trading margins and handling	65
Total	1 354
Price per bag (90 kg)	122

For the economic analysis, the border parity price must be based on export values, since Kenya usually exports surpluses. The basic value on this basis is estimated to be as follows:

	K Sh per ton
Export price FOB Mombassa	1 000
MPB handling	250
Border parity price at MPB Depot	750
Transport from Bura, handling etc.	475
Value at Bura	1 225

This is the value with foreign exchange at the official rate. With foreign exchange shadow pricing the value would be K Sh 1 465 per ton; this price has been used for the economic analysis.

Cowpeas

Cowpeas will be grown, like maize, for subsistence purposes. If the crop were not produced legumes would be imported from other parts of the country.

Small quantities of cowpeas are bought by the MPB, mainly from Coast Province, and the official prices paid are K Sh 150 per bag (90 kg) for large and K Sh 113 for small cowpeas. The latter type is grown on the project and the price calculated for the economic analyses is related to this as follows:

	K Sh per ton
Price ex MPB depot Mombassa	1 255
Transport to Bura, trading margins etc.	475
Value at Bura	1 730

For the economic analysis a value of K Sh 1 700 per ton has been used, while a price to the farmer of K Sh 1 250 has been applied, on the assumption that MPB will establish a depot in the area.

Groundnuts

Production of groundnuts in Kenya is low at present and the main value of the marketed crop from Bura would be as an import-substitute, rather than as an export crop. On the basis of recent world market prices a CIF Mombassa price of K Sh 2 170 per ton has been assumed. Thus prices for the economic analysis would be as follows:

	K Sh per ton	
	Foreign Exchange shadow priced	Foreign Exchange not shadow priced
CIF Mombassa	2 860	2 170
Transport and handling from Bura	475	475
Value at Bura	2 385	1 695

For farm budgeting purposes a market price based on the current MPB price for shelled nuts of K Sh 178 per bag (80 kg), equivalent to K Sh 2 220 per ton at Bura, has been used.

Garden Crops

The whole of the garden plot output would be consumed and would consist of a variety of vegetables and fruits. For the farm budgeting and economic analysis a value of K Sh 1.0 per kg has been adopted.

Timber and Fuel Wood

Details are given in the Forestry Annex of the background to the valuation of forestry products. The current market price of fuelwood at Hola of about K Sh 280 per cubic metre solid volume has been applied to timber produced at Bura.

CHAPTER 3 FARM BUDGETS

3.1 Introduction

The purpose of presenting detailed farm budgets here is to demonstrate the income-generating capacity of the 1.30 hectare (ha) holding which is proposed, given the cropping patterns outlined in the Agricultural Planning Annexe. The capacity of the holding to pay project charges relating to the supply of irrigation water and the provision of other services and provide a basic cash income of K Sh 4 000 to K Sh 5 000 is then examined.

3.2 Development Assumptions

It is assumed that tenants would commence farming operations as soon as possible after their arrival and construction of their house. Because settlement would continue throughout the year, two basic cases, as detailed in the Agricultural Planning Annexe, arise, with slightly differing cropping patterns in the first year. Thereafter changes occur with the introduction and gradual increase of groundnuts instead of maize from the fourth year, and yield changes as a result of increased skill and improving husbandry standards achieved by the tenants.

Tenants are assumed to manage their own holdings and provide all labour required to carry out farming operations with the exception of:

- (a) Land preparation, which would be mechanised.
- (b) A small proportion of cotton harvesting, for which some families may use hired assistance.

All inputs, mechanisation and spraying services would be paid for directly out of the proceeds of crop sales. Seasonal credit is assumed to be provided, with an interest rate of 11 per cent. The average prices used in the farm budgets are given in Table 3.1.

Mechanisation services would be paid for on the basis of a direct charge, which for budgeting purposes, has been calculated to cover operating costs (fuel, lubricants, spares, taxes), maintenance, depreciation and operator salaries. Summaries of these costs and charges are given in Table 3.2 and 3.3.

Details of the input costs by crops are given in the gross margins calculations shown in Appendix A.

Table 3.1 - Farm Input Prices (K Sh)

Item		Unit	Price
Seed:	Cotton	kg	1.00
	Maize	kg	3.00
	Cowpeas	kg	1.25
	Groundnuts	kg	2.20
Fertiliser:	Ammonium Sulphate	ton	1 640
Crop protection:			
Cotton:	DDT 75% W'P'	kg	12.45
	Carbaryl 85% W'P'	kg	35.00
	Endosulphan 35%	litre	22.15
	Dimethoate (Rogor)	litre	24.45
Other:	DDT 5%	kg	2.25
	Diuron (Karmex)	kg	47.20
Aerial spraying of cotton:			
	High volume application using fixed-wing aircraft	ha	29.65

Table 3.2 - Operating Costs of Agricultural Machinery

Machine	Hours operated per annum	Depreciation (K Sh/annum)	Operating cost (K Sh/annum)	Driver etc. (K Sh/annum)	Total	Average cost per hr (K Sh)
Tractor 60-70 hp	900	14 400	17 240	12 100	43 740	50.71
70-80 hp	900	15 600	19 830	12 100	47 530	
Plough 3 furrow	750	2 145	575	—	2 720	3.63
Plough 4 furrow						
Harrow	650	2 450	700	—	3 150	4.85
Ridger	750	1 120	300	—	1 420	1.89
Land leveller	400	6 250	530	—	6 780	16.95
Groundnut lifter/shaker	220	2 540	1 115	—	3 655	16.61
Trailer (5 ton)	220	2 890	690	—	3 580	16.27

Table 3.3 - Mechanisation Charges

Crop	Operation	Unit	Tractor hours per unit	Charge* per unit (K Sh)
Cotton	Land preparation	ha	5.8	370
	Transport	ton	0.5	30
Maize/Cowpeas	Land preparation	ha	4.0	250
Groundnuts	Lifting/shaking	ha	1.5	120

* Allowing 15 per cent margin and contingency allowance.

Subsistence Consumption

A basic objective of farming is to produce the subsistence requirements of the tenant family. These are estimated on the basis of data obtained from the NIB and the ILACO Feasibility Study Report (1975). The quantities of various crops consumed and used for seed are given in Table 3.5. A nominal allowance has been included for storage losses. The value of produce so consumed is estimated to be K Sh 1 910 during the first three years of settlement and K Sh 2 260 thereafter.

Table 3.5 - Estimated Subsistence Consumption by Tenant Families

Crop	Maximum amount consumed (kg)	Seed used (kg)	Storage loss (kg/%)	Total (kg)
Maize	1 200	—	60 (5%)	1 260
Cowpeas	300	18	32 (10%)	350
Groundnuts (shelled)	200	28	22 (10%)	250
Garden Crops	350	—	—	350

Capital Items

The tenant will construct his own house on arrival for which the NIB will provide materials and pay him for his labour (see Housing and Building Annex). The estimated cost of the house is K Sh 4 800 and this amount is assumed to be repaid over 15 years, without interest, at a rate of K Sh 320 per annum.

During the first nine months on the project the tenant would receive a subsistence advance of K Sh 6 per day from the NIB to provide cash for his day-to-day requirements. Some six weeks of this time would be spent on building work; these costs are covered elsewhere. Therefore 7½ months or a total of K Sh 1 350 is paid to him as an advance. For budgeting purposes it is assumed that this amount is repaid over 15 years at the rate of K Sh 90 per annum (i.e. without interest).

TABLE 3.4 Crop Gross Margins (K Sh per hectare)

	Unit	1	2	3	4	5	6	8	10							
Cotton:																
Gross output: Seed cotton	tons	3,500	2.5	8,750	2.6	9,100	2.7	9,450	2.8	9,800	2.9	10,150	3.0	10,500	3.0	10,500
Variable Costs		2,327		2,347		2,386		2,407		2,426		2,465		2,465		2,505
Gross Margin		6,423		6,753		7,083		7,414		7,974		8,035		8,035		7,995
Maize/Cowpeas:																
Gross output: Maize	tons	890	2.0	1,780	2.5	2,225	2.8	2,490	3.1	2,760	3.4	3,025	3.7	3,295	3.7	3,295
Cowpeas	tons	1,250	0.5	625	0.6	750	0.7	875	0.8	1,000	0.9	1,125	1.0	1,250	1.0	1,250
Total		2,405		2,975		3,365		3,760		4,150		4,545		4,545		4,545
Variable Costs		757		796		836		875		913		952		1,031		1,147
Gross Margin		1,648		2,179		2,529		2,885		3,237		3,593		3,514		3,398
Groundnuts:																
Gross output: Shelled Nuts	tons	2,220														
Variable Costs																
Gross Margin																
Home Garden:																
Gross output/Gross Margin	kg	1.0	250	350	350	350	350	350	350	350	350	350	350	350	350	350

Water and Land Charges

To cover the NIB costs of operating the project a series of charges have been proposed by the IBRD. These charges would be subject to review to take account of changes in the economy or the tenants' position. The rates agreed with the Bank are as follows:

- (a) K Sh 1 600 per hectare per annum starting at the end of the first year of a tenant's cotton production.
- (b) K Sh 2 000 per hectare per annum starting at the end of the third year of cotton production.
- (c) K Sh 2 800 per hectare per annum starting at the end of the eighth year of cotton production.

3.3 Basic Farm Budgets

The budgets given in Table 3.6 and 3.7 show the basic income flows generated by the average tenant holding and its capacity to meet subsistence needs and pay various charges the tenant will have to meet, while also providing a net cash income of about K Sh 5 000 per annum.

Comments and conclusions drawn from these budgets are as follows:

- (a) The income target of K Sh 5 000 can be met from the 1.3 ha holding, given the yield and cost assumptions made.
- (b) The tenant is able to meet all necessary charges for house repayment, harambee buildings and subsistence advance repayments over a fifteen year period and without interest. If interest were included in these repayments at, say 8 per cent, they would amount to K Sh 825 per annum. On the basis of the present budget calculations tenants would have the capacity to pay such an interest charge.
- (c) The water and land charges calculated for the project by the IBRD can be met. In fact there appears to be scope for increasing the charge to K Sh 2 800 per ha from the fifth or sixth years instead of the ninth as proposed at present.
- (d) If the value of subsistence is included the tenants' net income would be about K Sh 8 000 per annum.

3.4 Possible Farm Budget Variations

The effect of possible variations in crop yields and farm income which might result from differences in soil production potential (see Soils Annexe) for holdings located on marginal soil types have been investigated. The farm budget, prepared on the basis of crop gross margins given in Appendix B, is given in Table 3.8 and the conclusions are as follows:

- (a) Net cash income (after private consumption) would be below the target level of K Sh 5 000 per annum in all years.
- (b) The income deficiency could be remedied by either an increase in the holding size or a decrease in water and land charges. The water and land charge would need to be reduced by up to 45 per cent to make good the deficit.

TABLE 3.6 Farm Budget for Case 1 Holdings (1.3 ha, fiscal year basis)
(K Sh)

Detail	Unit	Years of Settlement											
		1	2	3	4	5	6	8	10-16	17 and following			
Cropped Area:													
Cotton	ha	0.65	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Maize/Cowpeas	ha	1.2	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Groundnuts	ha				0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Home garden	ha	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Crop Gross Margins:													
Cotton	K Sh	4,175	8,440	8,855	9,265	9,680	10,090	10,045	9,995	9,995	9,995	9,995	9,995
Maize/Cowpeas	K Sh	1,975	1,305	1,515	1,440	1,620	1,615	1,405	1,360	1,360	1,360	1,360	1,360
Groundnuts	K Sh				135	160	305	450	450	450	450	450	450
Garden crops	K Sh	250	350	350	350	350	350	350	350	350	350	350	350
Total Farm Gross Margin	K Sh	6,400	10,095	10,720	11,190	11,810	12,360	12,250	12,115	12,115	12,115	12,115	12,155
Production Consumed or Used for Seed	K Sh	1,810	1,910	1,910	2,260	2,260	2,260	2,260	2,260	2,260	2,260	2,260	2,260
Balance available as cash	K Sh	4,590	8,185	8,810	8,930	9,550	10,100	9,990	9,895	9,895	9,895	9,895	9,895
Fixed Farm Expenses:													
House repairs (SX)	K Sh	-	240	240	240	240	240	240	240	240	240	240	240
Tools and equipment	K Sh	100	100	100	100	100	100	100	100	100	100	100	100
Interest on seasonal credit	K Sh	185	190	190	190	190	190	190	190	190	190	190	200
Operating Cash Income	K Sh	4,305	7,655	8,280	8,400	9,020	9,570	9,460	9,355	9,355	9,355	9,355	9,355
Other Charges:													
Water and land charges	K Sh	2,080	2,080	2,080	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600	3,640
House repayments	K Sh	-	320	320	320	320	320	320	320	320	320	320	-
Matambe village buildings	K Sh	-	60	60	60	60	60	60	60	60	60	60	-
Subsistence advance repayment	K Sh	-	90	90	90	90	90	90	90	90	90	90	-
Net Income (after private consumption)	K Sh	2,225	5,105	5,850	5,330	5,950	6,500	6,390	6,395	6,395	6,395	6,395	5,715

TABLE 3.7 Farm Budgets for Group 2 Holdings (1.3 ha, Fiscal year ending 1977)

Detail	Unit	1	2	3	4	5	6	8	10-16	17 and following
Cropped Area:										
Cotton	ha	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Maize/Cowpeas	ha	1.2	0.6	0.6	0.5	0.5	0.45	0.4	0.4	0.4
Groundnuts	ha	-	-	-	0.1	0.1	0.15	0.2	0.2	0.2
Home garden	ha	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Crop Gross Margins:										
Cotton	K Sh	8,030	8,440	8,855	9,265	9,680	10,090	10,045	9,995	9,995
Maize/Cowpeas	K Sh	1,975	1,305	1,515	1,440	1,620	1,615	1,405	1,360	1,360
Groundnuts	K Sh	-	-	-	135	160	305	450	450	450
Garden crops	K Sh	250	350	350	350	350	350	350	350	350
Total farm Gross margin	K Sh	10,255	10,095	10,720	11,190	11,810	12,360	12,250	12,115	12,155
Produce Consumed or Used for Seed	K Sh	1,810	1,910	1,910	2,260	2,260	2,260	2,260	2,260	2,260
Balance available as cash	K Sh	8,445	8,185	8,810	8,930	9,550	10,100	9,990	9,895	9,895
Fixed Farm Expenses:										
House repairs (5%)	K Sh	-	240	240	240	240	240	240	240	240
Tools and equipment	K Sh	100	100	100	100	100	100	100	100	100
Interest on seasonal credit	K Sh	285	190	190	190	190	190	190	200	200
Operating Cash Income	K Sh	8,160	7,655	8,280	8,400	9,020	9,570	9,460	9,355	9,355
Other Charges:										
Water and land charges	K Sh	2,080	2,080	2,080	2,600	2,600	2,600	2,600	3,640	3,640
House repayments	K Sh	320	320	320	320	320	320	320	320	-
Harambee village buildings	K Sh	60	60	60	60	60	60	60	60	-
Subsistence advance repayment	K Sh	90	90	90	90	90	90	90	90	-
Net Income (after private consumption)	K Sh	5,610	5,105	5,850	5,330	5,950	6,500	6,390	5,395	5,715

The overall comment which should be made here is that it will be necessary to maintain a careful check of farm incomes and regularly to review policy relating to various charges made to cover project overheads and tenant capital works. The situation of tenants whose holdings fall on marginal land should be reviewed by the Bura Co-ordinator's Office and Project Management together.

TABLE 3.8 Budget for Holders on Class 3 Holes (1.3 ha. Each Year Basis)
(K Sh)

Detail	Unit	Years of Settlement					10-16	17 and following
		1	2	3	4	5		
Crop Area:								
Cotton	ha	0.65	1.25	1.25	1.25	1.25	1.25	1.25
Maize/Cowpeas		1.2	0.6	0.6	0.5	0.5	0.4	0.4
Groundnuts					0.1	0.1	0.2	0.2
Home garden		0.05	0.05	0.05	0.05	0.05	0.05	0.05
Crop Gross Margins:								
Cotton		3,500	7,145	7,120	7,535	7,945	8,310	8,260
Maize/Cowpeas		1,550	1,040	1,215	1,160	1,310	1,135	1,090
Groundnuts					110	125	180	180
Home garden		250	350	350	350	350	350	350
Total Farm Gross Margin		5,300	8,535	8,685	9,155	9,730	9,975	9,880
Production Consumed or Used for Seed								
		1,810	1,910	1,910	2,260	2,260	2,260	2,260
Balance available as Cash								
		3,490	6,625	6,775	6,895	7,470	7,715	7,620
Fixed expenses								
		285	530	530	530	530	530	540
Operating Cash Income								
		3,205	6,095	6,245	6,365	6,940	7,185	7,080
Other charges								
		2,080	2,550	2,550	3,070	3,070	3,070	3,640
Net income (after private consumption)								
		1,125	3,545	2,695	3,295	3,870	4,115	2,970

CHAPTER 4 ECONOMIC ANALYSIS

4.1 Basic Assumptions and Methodology

The internal economic rate of return calculation has been confined to those elements which involve direct costs or benefits attributable to the irrigation development programme. The detailed physical assumptions underlying the analysis which follows are given in the various annexes dealing with the components of the programme. These are brought together in the overall implementation programme.

The basic assumptions applied in the calculations of costs and benefits were as follows:

- (a) The analysis period used was 50 years, because this is the expected life of the main capital investment items, such as the irrigation works.
- (b) The analysis takes account only of those components which are directly involved in the irrigation development or which contribute vital services necessary for the survival of the communities associated with the programme and its implementation.
- (c) The costs used in the analysis were extracted from the relevant budgets prepared for the agencies or activities required to implement the programme. They are in constant 1977 terms and do not therefore include allowances for inflation. Taxes and duties have been excluded throughout while physical contingencies have been included at the appropriate rates. Replacement costs of capital items have been estimated on the basis of the initial cost depreciated over the useful life of the items, which are taken to be as follows:

	Years
Vehicles, motorcycles and bicycles	5
Heavy maintenance equipment	7½
Tractors	6
Other equipment	10

- (d) As described in Section 2.2 shadow prices have been applied to foreign exchange elements of benefits and costs and to tenant labour.
- (e) The cost of various components involved in the projects have been included, prorated or excluded on the following basis:
 - 100 per cent of the costs of the irrigation distribution works, wildlife conservation, roads and airfields, NIB buildings, vehicles and equipment, settlement costs of tenants, the NIB operating costs, farm inputs, and consultancy services (excluding the Stage II Feasibility Study).
 - 50 per cent of the capital costs of village infrastructure, public health, administrative services, social services and education.
 - 25 per cent of the operating and maintenance costs of the various village and public services.
 - The major works involved in the river off-takes structure, supply canal and main canal may be treated as either wholly costed against the 6 700 ha developed in Phase I or prorated according to the areas they are designed to command. Thus the river works have a possible net area of 37 000 ha on both banks and 18 per cent of the cost is attributable to Phase I, Stage I.

Table 4.1 - Economic Benefits and Costs of Phase I Stage I of the Bura Project
(K Sh million)

Analysis Year*	With foreign exchange shadow pricing				Without foreign exchange shadow pricing				Net cash flow
	Benefits	Capital and replacement costs	Recurrent costs	Settlers labour opportunity cost	Benefits	Capital and replacement costs	Recurrent costs	Settlers labour opportunity cost	
1	-	35.4	1.8	-	-	30.1	1.7	-	(31.8)
2	-	88.1	4.6	-	-	77.3	4.2	-	(81.5)
3	1.3	126.4	11.3	0.5	1.1	112.4	10.4	0.5	(122.2)
4	10.9	72.7	21.9	1.5	8.9	64.9	19.9	1.5	(77.4)
5	40.7	46.3	32.3	3.0	32.3	44.1	28.7	3.0	(43.5)
6	80.1	15.0	38.4	3.9	63.3	12.8	33.7	3.9	12.9
7	106.5	9.0	38.7	3.9	83.7	7.7	34.0	3.9	38.1
8	110.9	6.4	39.0	3.9	87.2	5.6	34.4	3.9	43.3
9	115.2	6.4	39.4	3.9	90.5	5.5	34.7	3.9	46.4
10	128.2	6.2	39.7	3.9	102.7	5.4	35.0	3.9	58.4
11	130.9	6.8	40.1	3.9	104.9	5.8	35.3	3.9	59.9
12	132.2	6.2	40.5	3.9	106.1	5.2	35.7	3.9	61.3
13	131.3	6.2	40.9	3.9	105.1	5.3	36.0	3.9	59.9
14	131.9	5.1	41.2	3.9	105.7	4.2	36.2	3.9	61.4
15	132.7	5.3	41.3	3.9	106.5	4.3	36.3	3.9	62.0
16	133.4	5.4	41.3	3.9	107.2	4.4	36.3	3.9	62.6
17	134.2	5.4	41.3	3.9	108.0	4.4	36.3	3.9	63.4
18 to 50	134.2	5.4	41.3	3.9	108.0	4.4	36.3	3.9	63.4

Notes: * Year 1 is 1977-78

† (-) signifies negative value

Similarly, because the main and supply canals would command 12 000 ha on the west bank only 56 per cent of their cost is attributable to the Phase I of 6 700 ha.

The subsidiary enterprises, which are allied with the main irrigated cropping development, are forestry, livestock and fisheries. Since no definite proposals are made at this stage for the livestock and fishery activities their costs are not included. The irrigated forestry activity which is proposed for some 4 500 ha is regarded as essential to the success of the project and is included in the analysis.

- (f) Benefits have been assessed on the basis of the projected market prices for the major commodities at constant 1977 terms, as described previously. Adjustments have been made for the value of foreign exchange content of earnings as shown in Section 2.4, these are summarised below:

	Economic (K Sh per ton)	Financial
Seed cotton	5 220	3 500
Maize	1 465	890
Cowpeas	1 700	1 250
Groundnuts (shelled)	2 385	2 220
Garden crops	1 000	1 000

4.2 The Internal Economic Rate of Return Analysis

Table 4.1 shows the estimated costs and benefits over the project's 50 year life with and without foreign exchange shadow pricing. Appendix C gives further details.

With foreign exchange shadow pricing the internal rate of return would be 13 per cent, as compared to 11¼ per cent in the other case (see Table 4.2).

Table 4.2 - Internal Economic Rates of Return

	With foreign exchange shadow priced	Without foreign exchange shadow priced
Net present value at 10% interest (K Sh million)	126	46
Internal rate of return	13%	11¼%

The project should give adequate returns to the Kenyan economy, with an internal rate of return of 13 per cent. Even if foreign exchange were not shadow priced, it would still be attractive, the rate of return being 11¼ per cent exceeds the opportunity cost of capital.

4.3 Sensitivity Analyses

Three sensitivity analyses have been undertaken, as follows:

- (a) Capital costs are 20 per cent higher than predicted.
- (b) Gross benefits are 20 per cent below the projected level, due to lower yields and/or lower crop prices.
- (c) It proves impossible to maintain a 100 per cent cotton intensity, so the cotton area is reduced to 80 per cent and other crop areas are increased by 40 per cent.

The results of these sensitivity tests are shown in Table 4.3. In all cases foreign exchange has been shadow priced.

Table 4.3 - Sensitivity Tests Results

Sensitivity Test	Internal economic rate of return (%)
Capital costs rise by 20%	11%
Gross benefits fall by 20%	9%
Cropping pattern changes, with 80% instead of 100% cotton	12

It appears that the rate of return is not particularly sensitive to changes in capital costs or in benefits, and that the change in cropping pattern similarly would have little effect.

CHAPTER 5 NIB FINANCIAL ANALYSIS

5.1 Introduction

The purpose of this chapter is to review the financial position of the NIB as the agency responsible for implementing the project. In particular the analysis aims to show to what extent the NIB will be able to meet its outgoings on the project from income derived from the various charges collected from tenants or other sources during the operational phase.

The analysis does not aim to assess the repayment capacity of the project in the conventional sense, although there are some indications from the analysis about its performance in this regard.

The analysis is carried out at constant 1977 prices and includes all physical contingency allowances but not inflation.

5.2 Assumptions for the Analysis

One of the main assumptions on which the analysis is based is derived from the funding agreement with the IBRD and is that all development funds required will be made available to the NIB by the government on a grant basis. These grants are assumed to continue to 1985-86 to cover the provision of agricultural management and BPCO administrative running costs.

Other assumptions made and the basis for calculating costs and revenue projections were as follows:

Costs

All capital and recurrent costs of operations carried out directly by the NIB are included. Village halls and school buildings are also included, because tenants will repay the cost of their construction.

Tenant settlement costs and subsistence advances are included in the capital costs.

Replacement of vehicles, agricultural machinery, plant and miscellaneous equipment have been included in recurrent costs. The amounts provided were estimated on a sinking fund basis with interest at 10 per cent.

Revenue

The principal revenue of the project will be derived from the payments of water and land charges, farm inputs costs, and charges for cultivation and transport services. These items are included at the rates set out in Chapter 3.

The other items, for which provision is made at the rates previously described, cover the following:

- (a) Tenant house repayments, without interest, over 15 years, discounted at 10 per cent to present value terms.
- (b) Tenant payments for other buildings, schools, classrooms and multipurpose halls, over 15 years, discounted at 10 per cent to present value terms.
- (c) Interest at 11 per cent on seasonal credit for inputs supplied to tenants.
- (d) Tenants repayments of subsistence advances over 15 years, without interest.
- (e) Tenant commitment fees at K Sh 20 per head.

TABLE 5.1 NIB Cash Flow Projection (K Sh million)

Item	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91 to 1995/96	1996/97 and following
Expenditure:															
Capital	23.4	72.4	108.2	86.1	28.3	7.3									
Recurrent	2.7	7.6	15.6	25.2	34.7	42.2	38.1	35.8	35.0	34.7	34.8	34.9	35.1	35.3	35.6
Total outgoings	26.2	80.1	123.8	111.2	63.0	46.5	38.1	35.1	35.0	34.7	34.8	34.9	35.1	35.3	35.6
Revenue:															
Government grant for development	25.7	78.8	120.5	101.9	45.9	25.1	3.9	1.1	0.5						
NIB Revenue	-	-	1.4	8.2	19.2	28.4	31.5	32.5	33.6	35.0	35.0	35.7	37.8	40.0	40.5
Total income	25.7	78.8	121.9	110.4	65.8	54.4	36.3	34.4	35.0	35.0	35.0	35.7	37.8	40.0	40.5
Operating Balance (deficit)	(0.4)	(1.2)	(2.0)	0.9	2.8	7.9	(1.9)	(1.4)	-	0.4	0.2	0.6	2.7	4.5	4.9

5.3 Cash Flow Projection

The cash flow for the project is summarised in Table 5.1 (details in Appendix D) and shows the annual balance after all sources of income and expenditure have been taken into account. The main comments on these projections are as follows:

- (a) The annual deficits and surpluses over the first eight years are not seriously out of balance, with a total deficit of K Sh 7.7 million and surpluses of K Sh 10.8 million over the period.
- (b) From the eighth year onwards the project operation would show an annual surplus of revenue over expenditure. This surplus would average about K Sh 4.5 million from 1990-91 onwards, representing 13 per cent margin over outgoings.
- (c) The actual amount of the government grant to the NIB should be assessed annually during the first four to five years of development. This will be necessary to take account of deficit or surplus situations arising in any year.
- (d) Once the position is reached when the project become self-financing no further government grants should be necessary.
- (e) The cash flow would be improved, and a balance between expenditure and revenue achieved earlier, if land and water charges were increased in the middle years. Whether this will in fact be feasible can be assessed only after the project is operational.
- (f) The possible applications of surpluses will be a matter to be determined between the NIB and government.

Consideration should be given to setting aside the payments made by tenants, in respect of the village buildings and schools and subsistence advances, in a development fund for use in future schemes.

In overall terms the cash flow presented here demonstrates the financial viability of the project on a recurrent operational basis. On the present basis the annual cash flow surpluses would not fund the capital investments involved during the projects' construction. These costs are, however, being treated as a national budget commitment.

APPENDIX A
CROP GROSS MARGINS

Year	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024																																							
Wheat	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0				
Barley	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0			
Oats	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0		
Maize	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	
Other Cereals	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0
Total	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0	30.5	31.0	31.5	32.0	32.5	33.0	33.5	34.0	34.5	35.0	35.5	36.0	36.5	37.0	37.5	38.0	38.5	39.0	39.5	40.0	40.5	41.0	41.5	42.0	42.5	43.0	43.5	44.0	44.5	45.0	45.5	46.0	46.5	47.0	47.5	48.0	48.5	49.0	49.5	50.0		

TABLE A.2 Maize/Cowpeas

Item	Unit	Unit Cost	Years of Settlement																	
			1	2	3	4	5	6	7	8	9	10								
Gross Output:																				
Maize	tons	890	2.0	1,780	2.5	2,225	2.8	2,490	3.1	2,760	3.4	3,025	3.7	3,295	3.7	3,295	3.7	3,295	3.7	3,295
Cowpeas	tons	1,250	0.5	625	0.6	750	0.7	875	0.8	1,000	0.9	1,125	1.0	1,250	1.0	1,250	1.0	1,250	1.0	1,250
Total Value			2,405	2,957	3,365	3,760	4,150	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545	4,545
Inputs:																				
Seed: maize	kg	3	15	45	15	45	15	45	15	45	15	45	15	45	15	45	15	45	15	45
cowpeas	kg	1.25	30	38	30	38	30	38	30	38	30	38	30	38	30	38	30	38	30	38
Amn. sulphate	kg	1.64	238	390	262	429	286	469	310	508	333	546	357	585	381	625	405	664	429	703
Insecticides	kg	2.25	15	34	15	34	15	34	15	34	15	34	15	34	15	34	15	34	15	34
Cultivation charges	ha	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Total Costs			757	796	836	875	913	952	992	1,031	1,070	1,117	1,167	1,217	1,267	1,317	1,367	1,417	1,467	1,517
Gross Margin			1,648	2,179	2,529	2,885	3,237	3,593	3,553	3,514	3,475	3,436	3,397	3,358	3,319	3,280	3,241	3,202	3,163	3,124

TABLE A.3 Groundnuts

Item	Unit	Unit Cost	Years of Settlement																	
			1	2	3	4	5	6	7	8	9	10								
Gross Output:																				
Unshelled nuts	tons			1.4	1.6	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Shelled nuts	tons	2,220		0.9	2,000	1.0	2,220	1.2	2,440	1.4	2,660	1.6	2,880	1.8	3,100	2.0	3,320	2.2	3,540	2.4
Inputs:																				
Seed	kg	2.20	90	200	90	200	90	200	90	200	90	200	90	200	90	200	90	200	90	200
Fertiliser	kg	1.64	48	79	48	79	48	79	48	79	48	79	48	79	48	79	48	79	48	79
Cultivation charges		250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Harvesting (Lifting and shelling)		100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Total Costs			629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629
Gross Margin			1,371	1,591	1,811	2,031	2,251	2,471	2,691	2,911	3,131	3,351	3,571	3,791	4,011	4,231	4,451	4,671	4,891	5,111

TABLE 8.1 Crop Gross Margins on Class 3 Soils (K \$/ha per holding)

	Years of Settlement						
	1	2	3	4	5	8	10
<u>Control</u>							
Gross Output	8 700	8 050	8 050	8 400	8 750	8 100	9 100
Cost	2 515	2 385	2 355	2 370	2 395	2 450	2 480
Gross Margin	6 185	5 665	5 695	6 030	6 355	5 650	6 620
<u>Water Contours</u>							
Gross Output	2 745	2 830	2 880	3 195	3 530	3 885	3 385
Cost	950	795	875	875	910	1 030	1 145
Gross Margin	1 795	2 035	2 005	2 320	2 620	2 855	2 240

APPENDIX B

CROP GROSS MARGINS ON CLASS 3 SOILS

Gross Output	1 700	1 820	2 450	2 450
Cost	625	625	825	625
Gross Margin	1 075	1 195	1 625	1 825

TABLE B.1 Crop Gross Margins on Class 3 Soils (K Sh per holding)

	Years of Settlement						
	1	2	3	4	5	8	10
<u>Cotton:</u>							
Gross Output	7 700	8 050	8 050	8 400	8 750	9 100	9 100
Costs	2 315	2 335	2 355	2 370	2 395	2 450	2 490
Gross Margin	5 385	5 715	5 695	6 030	6 355	6 650	6 610
<u>Maize/Cowpeas:</u>							
Gross Output	2 045	2 530	2 860	3 195	3 530	3 865	3 865
Costs	755	795	835	875	910	1 030	1 145
Gross Margin	1 290	1 735	2 025	2 320	2 620	2 835	2 720
<u>Groundnuts:</u>							
Gross Output				1 700	1 890	2 450	2 450
Costs				625	625	625	625
Gross Margin				1 075	1 265	1 825	1 825

ECONOMIC ANALYSIS DATA

TABLE C.1 Project Costs with Shadow Pricing Foreign Exchange (K Sh million)

	Proportion of total cost (%)	1977/	1978/	1979/	1980/	1981/	1982/	1983/	1984/	1985/	1986/	1987/	1988/	1989/	1990/	1991/	1992/93 and following
		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	
1. Capital Costs and Replacements (Including physical contingencies)																	
River headworks	18			5.5	7.8												
Main and supply canals	56	3.8	18.5	10.7													
Other irrigation works and on-farm development	100	2.5	23.5	29.2	16.1	0.6											
Roads and airfields	100	10.8	3.6	2.1	1.4												
Harabee construction and settlement of tenants	100																
Agricultural Management	100	0.9	3.3	6.8	10.5	10.5	2.5										
NIB buildings	100	0.7	7.6	5.7	6.2	6.2	5.6										
NIB agricultural machinery	100			10.1	5.2	4.0	0.6										
NIB heavy maintenance plant	100	1.0	5.0	1.8	3.7	4.7	2.0	0.4	0.6	0.8	1.0	1.2	1.4	1.5	1.6	1.7	1.8
NIB miscellaneous equipment	100	0.1	0.1	3.1	1.4	0.6	0.4	0.7	1.1	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
NIB vehicles	100	1.9	1.9	1.4	0.5	1.2	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Wildlife Conservation works	100			0.9													
District and local administration	50		0.2	0.8	0.1	0.1	0.1										
Local authority	50			0.5	0.2												
Police	50			0.6	0.1												
Ministry of Community Development (MCD)	50			0.2	0.1	0.2											
East African Post and Telecomm. (EAPT)	50			0.7	0.1	0.1	0.1										
Ministry of Social Services (MOSS)	50			0.9	0.4	0.2											
Ministry of Education (MOED)	50			1.8	2.5	3.5	0.6										
Ministry of Health (MOH)	50	0.3	1.4	0.3	0.1	0.2											
Ministry of Agriculture-Livestock Extension	100						0.1	0.2									
Ministry of Agriculture-Agricultural Extension	100			0.5		0.2											
Domestic water supplies	100		10.6	21.3					0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rural Centre sewerage	100		4.1	8.9													
Rural Centre electricity	34	0.5	0.2	1.4	0.9												0.1
Forestry and afforestation	100	0.6	0.6	2.4	7.3	7.7	1.5	1.5	1.5	1.6	1.7	2.1	1.3	1.2			
Planning, design and supervision of construction	100	12.3	7.5	7.5	7.5	6.1											
Sub total		35.4	88.1	126.4	72.7	46.3	15.0	9.0	6.4	6.4	6.2	6.8	6.2	6.2	5.1	5.3	5.4

TABLE C.1 Continued

	1977/ 78	1978/ 79	1979/ 80	1980/ 81	1981/ 82	1982/ 83	1983/ 84	1984/ 85	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91	1991/ 92	1992/93 and following
Proportion of total cost (%)																
2. Recurrent Costs (including physical contingencies)																
NIB costs including farm inputs and training	100			17.7	27.5	32.8	33.1	33.2	33.4	33.6	33.8	34.0	34.3	34.6	34.7	34.7
Wildlife conservation	100	3.4	8.6	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
FAPD	25		0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
District and local administration	25		0.1		0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Local authority	25			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Police	25			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MCD	25			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MoSS	25			0.5	0.9	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
MoEA	25			0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
MoH	25			0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Rural Centre electricity	34	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Rural Centre sewerage	100		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Domestic water supplies	100		0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Ministry of Lands and Settlement	100		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Forestry and afforestation	100		0.9	1.3	1.1	1.2	1.2	1.3	1.5	1.6	1.8	2.0	2.1	2.1	2.1	2.1
MoA - livestock extension	100				0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MoA - agricultural extension	100		0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sub total		1.8	4.6	11.3	21.9	32.3	38.4	38.7	39.0	39.4	39.7	40.1	40.5	40.9	41.2	41.3
Total Costs		37.2	92.7	137.7	94.6	78.6	53.4	47.7	45.4	45.8	45.9	46.7	47.1	46.3	46.6	46.7

TABLE C.2 Project Costs Without Shadow Pricing Foreign Exchange (K Sh million)

	Proportion of total cost (Z)	1977/	1978/	1979/	1980/	1981/	1982/	1983/	1984/	1985/	1986/	1987/	1988/	1989/	1990/	1991/	1992/93
		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	and following
1. Capital Costs and Replacements																	
(Including physical contingencies)																	
River headworks	18	-	-	4.9	7.0	-	-	-	-	-	-	-	-	-	-	-	-
Main and supply canals	56	3.5	16.6	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Other irrigation works and on-farm development	100	2.1	21.2	26.3	13.5	-	-	-	-	-	-	-	-	-	-	-	-
Roads and airfields	100	9.7	3.2	1.9	1.2	0.6	-	-	-	-	-	-	-	-	-	-	-
Barabee construction and settlement of tenants	100	-	-	7.9	11.8	13.4	2.5	-	-	-	-	-	-	-	-	-	-
Agricultural management	100	0.7	2.8	4.8	5.1	5.1	4.7	3.7	-	-	-	-	-	-	-	-	-
NIB buildings	100	0.7	6.9	9.2	4.8	3.7	0.5	-	-	-	-	-	-	-	-	-	-
NIB agricultural machinery	100	-	-	1.4	2.9	3.6	1.4	0.3	0.5	0.6	0.8	0.9	1.1	1.1	1.2	1.2	1.3
NIB heavy maintenance plant	100	0.8	4.0	2.4	1.1	-	-	0.5	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
NIB miscellaneous equipment	100	0.1	0.1	1.1	0.5	0.4	-	-	-	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NIB vehicles	100	1.5	1.5	1.1	0.4	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Wildlife conservation works	100	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-
District and local administration	50	-	0.2	0.7	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-
Local authority	50	-	-	0.5	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Police	50	-	-	0.5	0.1	-	0.1	-	-	-	-	-	-	-	-	-	-
MCD	50	-	-	0.2	0.1	0.2	-	-	-	-	-	-	-	-	-	-	-
EAPF	50	-	-	0.8	0.4	0.2	-	-	-	-	-	-	-	-	-	-	-
MoEd	50	-	-	1.7	2.3	3.2	0.5	-	-	-	-	-	-	-	-	-	-
MoH	50	0.3	1.2	0.3	0.1	0.2	0.1	0.2	-	-	-	-	-	-	-	-	-
MoA - Livestock Extension	100	-	-	0.5	-	0.2	-	-	-	-	-	-	-	-	-	-	-
MoA - Agricultural Extension	100	-	-	0.5	-	0.2	-	-	-	-	-	-	-	-	-	-	-
Domestic Water supplies	100	-	9.3	17.8	-	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rural Centre Sewerage	100	-	3.6	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-
Rural Centre electricity	34	0.4	0.2	1.1	0.7	-	-	-	-	-	-	-	-	-	-	-	-
Forestry and afforestation	100	0.6	0.5	2.2	6.6	7.0	1.4	1.4	1.4	1.5	1.6	1.9	1.1	1.1	-	-	-
Planning, design and supervision of construction	100	9.7	6.0	6.0	6.0	4.8	-	-	-	-	-	-	-	-	-	-	-
Sub total		30.1	77.3	112.4	64.9	44.1	12.8	7.7	5.6	5.5	5.4	5.8	5.2	5.3	4.2	4.3	4.4

Replacement of vehicles and equipment
0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5

TABLE C.2 Continued

	1977/ 78	1978/ 79	1979/ 80	1980/ 81	1981/ 82	1982/ 83	1983/ 84	1984/ 85	1985/ 86	1986/ 87	1987/ 88	1988/ 89	1989/ 90	1990/ 91	1991/ 92	1992/93 and following
Proportion of total cost (%)																
2. Recurrent Costs																
(Including physical contingencies)																
NIB costs including farm inputs and training	100	3.1	7.8	15.7	24.0	28.3	28.6	28.7	28.9	29.0	29.2	29.4	29.6	29.8	29.9	29.9
Wildlife conservation	100	-	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
District and local administration	25	-	0.3	0.7	0.9	1.0	1.0	1.0	1.0	1.0	0.1	0.1	0.1	0.1	0.1	0.1
Local Authority	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Police	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCD	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EAPT	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MoSS	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ministry of Lands and Settlements	100	-	0.1	0.5	0.9	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
MoEd	25	0.1	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Moh	25	-	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Rural Centre electricity	34	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Rural Centre sewerage	100	-	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Domestic Water supplies	100	-	-	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Forestry and afforestation	100	0.3	0.8	1.3	1.0	1.1	1.1	1.3	1.4	1.6	1.7	1.9	2.0	2.0	2.0	2.0
MoA - livestock extension	100	-	-	-	-	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MoA - agricultural extension	100	-	-	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sub total		1.7	4.2	10.4	19.9	28.7	33.7	34.0	34.4	34.7	35.0	35.3	35.7	36.0	36.2	36.3
Total Costs		31.8	81.5	122.8	84.8	72.8	46.5	41.7	40.0	40.2	40.4	41.1	40.9	41.3	40.4	40.6

Table C.3 Project Benefits with Shadow Pricing Foreign Exchange (K Sh million)

(Note: Due to rounding of figures in compilation columns may not add exactly)

Crop/Product	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94 and following
Cotton		5.7	29.8	64.3	88.7	92.1	95.4	98.4	100.3	100.9	100.9	100.9	100.9	100.9	100.9
Maize	1.2	4.2	8.6	11.4	12.2	12.3	12.5	12.4	11.9	11.4	11.2	11.2	11.2	11.2	11.2
Cowpeas	Neg	0.3	1.2	2.5	3.3	3.6	3.7	3.9	3.9	3.7	3.6	3.6	3.6	3.6	3.6
Groundnuts				0.1	0.5	1.1	1.6	2.2	2.7	3.0	3.2	3.2	3.2	3.2	3.2
Garden Crops	0.1	0.6	1.1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Afforestation Timber								9.6	10.3	11.4	10.7	11.3	12.1	13.6	
Total	1.3	10.9	40.7	80.1	106.5	110.9	115.2	128.2	130.9	132.2	131.3	131.9	132.7	133.4	134.2

Table C.4 Project Benefits without Shadow Pricing Foreign Exchange (K Sh million)

(Note: Due to rounding of figures in compilation, columns may not add exactly)

Crop/Product	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94 and following
Cotton		4.4	22.9	49.4	68.2	70.7	73.3	75.6	77.0	77.4	77.4	77.4	77.4	77.4	77.4
Maize	1.0	3.5	7.2	9.5	10.1	10.3	10.4	10.3	9.9	9.5	9.3	9.3	9.3	9.3	9.3
Cowpeas	Neg	0.3	1.2	2.5	3.3	3.6	3.7	3.9	3.9	3.7	3.6	3.6	3.6	3.6	3.6
Groundnuts				0.1	0.4	0.8	1.2	1.5	1.9	2.2	2.3	2.3	2.3	2.3	2.3
Garden crops	0.1	0.6	1.1	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Afforestation Timber								9.6	10.3	11.4	10.7	11.3	12.1	12.8	13.6
Total	1.1	8.9	32.3	63.3	83.7	87.2	90.5	102.7	104.9	106.1	105.1	105.7	106.5	107.2	108.0

APPENDIX D

NIB CASH FLOW PROJECTIONS

BURA IRRIGATION SETTLEMENT PROJECT
PROJECT PLANNING REPORT
IMPLEMENTATION ANNEXE

BURA IRRIGATION SETTLEMENT PROJECT

PROJECT PLANNING REPORT

IMPLEMENTATION ANNEXE

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SUMMARY

Programmes of activities are presented for implementing the Bura Irrigation Settlement Project. These have been based upon the cardinal criterion that early implementation of the project is vital, and all activities have been related to the schedule of construction of the works. The programmes cover all components of the project and indicate for project management the time scales for various activities. Important factors which could affect the rate of progress are discussed and the method of developing the programmes from the inter-relation of the activities is explained.

The second part of the annexe explains the organisation proposed at NIB headquarters and in other agencies' offices, and identifies the items of work required to be carried out in design, specification and procurement, and mobilising staff. The responsibility for the execution of these items of work is defined, and the requirements of the financing agencies with regard to the approval of documents and prequalification procedures are briefly discussed, the full details being given in the published guideline documents.

Recommendations are made for the allocation of construction works, goods and materials into contracts for procurement purposes, after consideration of possible alternatives. Changes are proposed from the allocation of works to NYS suggested by ILACO in the feasibility study report, which should provide more efficient use of the NYS plant, while enabling the other construction contractors better control of their operations.

The responsibilities of government agencies for the mobilisation of project tenants and staff are identified and the organisational structure of the National Irrigation Board presented in the Organisation, Management and Training Annexe is summarised and related to the activities of the agencies.

Proposals are presented for specialist assistance to the National Irrigation Board by project consultants and agricultural management consultants, and the overall responsibility of the Bura Co-ordinator for the implementation of the project and the control of funds allocated to the project is identified.

INTRODUCTION

This annexe describes the overall method of implementing the project. The detailed descriptions of organisations and methods of operation contained in the previous specialist annexes are summarised. The interdependence of these activities is analysed and programmes formulated for the work in Part 1.

The procedures to be followed for the procurement of contracts for works construction, and the supply of goods and services are described in Part 2. Components for financing by the donor agencies are identified. Where possible, these have been arranged to provide flexibility of funding.

The management and organisation of the project during implementation is summarised in Part 3, and certain details not covered in depth in the management annexe are amplified. Part 4 summarises procedural and organisational recommendations for implementing the project.

CHAPTER I - FORMATION OF OVERALL PROGRAMME

1.1 - Introduction

Part I of this report describes the formation of programmes for the implementation of the main project. The various items have been classified in the various sections for administrative, financial and technical reasons. Further programmes are included for environmental protection, which will be dealt with in detail.

Behind the scenes of the project, various other activities and programmes are being carried out. A list of these activities, which will be dealt with in detail in the next chapter.

1.2 - Project Team Organisation

The structure of the programme is described in the Section on the Organisation of the Project. It is assumed that the project will be carried out in a number of phases. The first phase will be the formation of the project team and the second phase will be the formation of the project team. The third phase will be the formation of the project team. The fourth phase will be the formation of the project team.

The project will be carried out in a number of phases. The first phase will be the formation of the project team and the second phase will be the formation of the project team. The third phase will be the formation of the project team. The fourth phase will be the formation of the project team.

PART 1

FORMATION OF PROGRAMMES

The main programme is the formation of the project team. The first phase will be the formation of the project team and the second phase will be the formation of the project team. The third phase will be the formation of the project team. The fourth phase will be the formation of the project team.

1.3 - Land Clearance and Levelling

Programme for land clearance and levelling will cover the cost of clearing the land and levelling it. It is assumed that the land will be cleared and levelled in a number of phases. The first phase will be the formation of the project team and the second phase will be the formation of the project team. The third phase will be the formation of the project team. The fourth phase will be the formation of the project team.

1.4 - Supply of Domestic Water

The project will be carried out in a number of phases. The first phase will be the formation of the project team and the second phase will be the formation of the project team. The third phase will be the formation of the project team. The fourth phase will be the formation of the project team.

The temporary water supply to the rural centre will be the responsibility of the contractor.

CHAPTER 1 FACTORS AFFECTING OVERALL PROGRAMME

1.1 Introduction

Part 1 of this annexe describes the formation of programmes for the implementation of the overall project. Programmes have been presented in the various annexes for some individual components, and these are repeated here for convenience. Further programmes are included for components not previously dealt with in detail.

Before considering the methodology adopted overall and discussing the component programmes in detail, some of the activities critical to the development of the project will be discussed in this first chapter.

1.2 Project Tenant Mobilisation

The operation of the settlement programme is described in the Sociology and Settlement Annexe. Although a number of settlement schemes of different types have been operated in Kenya in the past, this is the first irrigation settlement project of any size to be developed, and the integration of settlement of tenants from all parts of the country into other components of the project is consequently more complex than usual.

To ensure that agricultural development can start in early 1980, the first tenants should arrive at the project in mid 1979. A long publicity period is required to ensure that the population of Kenya is adequately informed about the project and that people are given an opportunity to apply for holdings on the project. This will be followed by a selection procedure which will be time-consuming.

The earliest possible start on the settlement procedures is necessary to satisfy the Government's desire for early implementation of the project. Once the tenants have been selected, the rate of settlement at the project will be governed by the availability of land for settlement, the provision of infrastructure works and the recruitment and training of agricultural extension, social services and health staff.

1.3 Land Clearance and Levelling

Progress in land clearance and levelling will govern the rate at which land becomes available for settlement and for cultivation. It is considered that NYS does not have the experience to execute the land levelling work. This is not a bulk earthmoving operation but requires movement and accurate levelling of small quantities of earthworks, particular care being required in the case of shallow soils. Because of this situation, the land clearance and levelling work has been included in the irrigation works international tender, described later.

1.4 Supply of Domestic Water

The project area has no treated water supply at present and it will be necessary to provide a temporary supply for all tenants, construction workers and technical and administrative staff who arrive before the proposed permanent water treatment works at the rural centre becomes operational. This event is dependent upon the completion of construction of both the waterworks and the supply and main canals as far as the rural centre. The arrangements for temporary water supplies and the phasing of the construction of the water distribution mains with the progress of the irrigation works require careful consideration in programming and are discussed in detail below.

The temporary water supply to the rural centre will be made the responsibility of the contractor

for the advanced building, who will also construct the basic sewerage system. This contractor will be appointed by international competitive bidding by July, 1978.

If the operating performance of the treatment works at Hola becomes adequate to meet the temporary requirements of the Bura Project, then treated water could be brought from Hola in road tankers. For present purposes, however, it has been assumed that water will be pumped from the river at a suitable location close to the new rural centre, and transported there by road tanker. It is estimated that up to five 1 500 gallon capacity vehicles will be required. It will then be treated and stored in tanks to provide at least a seven-day supply reservoir. Treated water will also be supplied to the villages developed before installation of permanent water supplies. The storage tanks at the rural centre will be subsequently dismantled under the second buildings contract and re-erected near groups of villages to provide balancing reserves.

The water treatment works and the distribution mains for the permanent village supplies will be included in the second buildings contract, starting in mid 1979. These items will have priority of construction, so that the treatment works and rural centre connections can be completed coincident with the supply of water via the supply and main irrigation canals, to minimise the period of reliance on the temporary supply.

The distribution mains for village supplies are located in the verges of the village roads, and the installation of mains is consequently dependent upon the rate of completion of the irrigation network. Except for the first few villages which are to be developed before water supplies are available from the canals, all village sites will have a treated piped water supply from the central works before project tenants arrive to build their houses.

1.5 Communications

The National Youth Service (NYS) have started work on the upgrading of the Garsen-Garissa road to provide an all-weather road link to Nairobi and Mombassa. This should ensure access to the project area during most of the rainy season. Completion of this work will be followed by the construction of the Nanigi access road to provide access to the river diversion structure site.

The Ministry of Works is studying the permanent improvement of the Garsen-Garissa road to full all-weather standard, assisted by Dutch consulting engineers, DHV. This work is unlikely to be started before the early 1980's. Thus the National Youth Service work has been designed as a temporary solution to the problem, suitable for construction by NYS plant. The road has an unsealed surface and a non-standard cross-section, comprising a 4.5 metre nominal width raised central section of roadway, with a section about 5.0 metres wide on either side for dry weather use.

Negotiations with the Posts and Telecommunications Agency for the provision of telephone links to the project should take place as soon as possible so that equipment is available for installation as soon as there is a National Irrigation Board presence on site; until the equipment is installed communications will have to be sent through the National Irrigation Board's office at Hola.

1.6 Health Facilities

The health care service requires development at an early stage to ensure that it is in operation before staff and tenants arrive at the project. Initial service will be provided from Hola hospital as described in the Public Health Annexe, using mobile clinics.

Considerable importance is attached to the medical examination of project tenants and their families immediately on arrival at site. These initial medical examinations will not only provide vital base line data but also establish the particular aspects of public health which must be emphasized in the early years of the project health care programmes: indications of likely aspects have been given in the Public Health Annexe. These initial examinations will provide the opportunity for the issue of preventative medicine and instructions on health care, hygiene and nutrition.

1.7 Design and Procurement Procedures

It is necessary to have extensive consultations with various government agencies during the design stages of the project, and there is a requirement to consult with the financing agencies before inviting tenders or appointing contractors. These factors limit the time available for design work and the preparation of tender documents, and the formulation of the project programmes has taken account of this.

Recommendations are made in the second part of this report for the procedures which are intended to limit possible delays in obtaining approvals at various stages in the project.

The programmes developed for this project planning report have been developed separately and presented in simple tabular form, and have been interrelated using simple cross-cut relationships. Programmes have been developed for different parts of the project, referred to as components, with specific other components being defined in general terms only. Detailed sub-programmes can be developed during the implementation phase of the project, once the general principles of implementation have been agreed.

Decision times for activities have been determined either from experience or from the development activities of other programmes.

1.1 Components

Components have been defined as units which have a separable identity within the overall project. Components may consist of a unit to be basically executed by the agency, such as an occasionally tendered construction contract, or a unit involving a single stage of periods of time with inputs and outputs, such as project launch mobilisation or the procurement of all activities for use in the projects.

Programmes are developed in this report for the following components:-

- (a) agricultural operations;
- (b) education development;
- (c) public health services;
- (d) administrative services;
- (e) other government services, such as social services and co-operative development;
- (f) settlement;
- (g) livestock;
- (h) forestry;
- (i) wildlife;
- (j) N/A administration;
- (k) training;
- (l) major and minor project works;
- (m) buildings and infrastructure;
- (n) vehicles, plant and machinery;
- (o) stores.

1.3 Activities

The activities shown in these programmes are generally capable of being broken down into sub-programmes, and this may be necessary for project coordination and control purposes during implementation. However, for the forming of programmes for project planning purposes, any

CHAPTER 2 METHODOLOGY OF PROGRAMME DEVELOPMENT

2.1 Principal Criterion for Development

The prime purpose of the Bura Project is to provide as soon as possible an initial basic livelihood for as many unemployed or under-employed families as possible: the objectives being to reduce the drift of the rural population to urban areas, to increase employment and agricultural production, and to achieve greater self-sufficiency and a reduction of foreign expenditure.

Given these objectives, the earliest implementation of Phase I Stage I of the project must be the principal criterion for development. The governing factor for early implementation is the construction of the engineering works to which all programmes have been related.

The programmes established for this project planning report have been developed manually and presented in simple bar chart form, and have been interrelated using simple critical path techniques. Programmes have been developed for different parts of the project, referred to as components, with activities within components being defined in general terms only. Detailed sub-programmes can be developed during the implementation phase of the project once the general principles of implementation have been agreed.

Duration times for activities have been determined either from experience or from the development analyses of sub-programmes.

2.2 Components

Components have been defined as units which have a separable identity within the overall project. Components consist either of a unit to be basically executed by one agency, such as an internationally tendered construction contract, or a unit involving a single class of persons or items with inputs by many agencies, such as project tenant mobilisation or the procurement of all the vehicles for use at the project site.

Programmes are included in this report for the following components:-

- (a) agricultural operations;
- (b) education development;
- (c) public health services;
- (d) administrative services;
- (e) other government services, such as social services and co-operative development;
- (f) settlement;
- (g) livestock;
- (h) forestry;
- (i) wildlife;
- (j) NIB administration;
- (k) training;
- (l) major and minor project works;
- (m) buildings and infrastructure;
- (n) vehicles, plant and machinery;
- (o) processing.

2.3 Activities

The activities shown in these programmes are generally capable of being broken down into sub-programmes, and this may be necessary for project co-ordination and control purposes during implementation. However, for the forming of programmes for project planning purposes, any

CHAPTER 3 DESCRIPTION OF PROGRAMMES

GENERAL

3.1 Introduction

A general description is given of each of the programmes presented in bar chart form at the end of this chapter, and activities of importance are discussed. A more detailed explanation of the procurement procedures and the co-ordination and management of the project is given in later sections of this annexe.

3.2 Overall Implementation

This programme is a summary of the component programmes described below, and is shown in Figure 3.1. It demonstrates how the various activities are interrelated both to one another and to the time scale of the construction programme.

SETTLEMENT

3.3 Settlement

Three programmes are included covering settlement, and a detailed discussion of the settlement procedure is included in the Sociology and Settlement Annexe. The three programmes comprise; the tenant selection and mobilisation programme; a development programme for the construction of a typical village; and the settlement and agricultural development programme.

The tenant selection programme is shown in Figure 3.2 and demonstrates that tenant selection and mobilisation activities are critical to the progress and success of the project once the engineering works have been constructed. The earliest possible start should be made to agree the criteria and procedures for tenant selection, and before this can be done, the co-ordinator and the consulting sociologist must be appointed and staff must be seconded from the Ministry of Lands and Settlement and the Ministry of Information. These seconded staff will form a unit in the co-ordinator's office dealing solely with settlement problems.

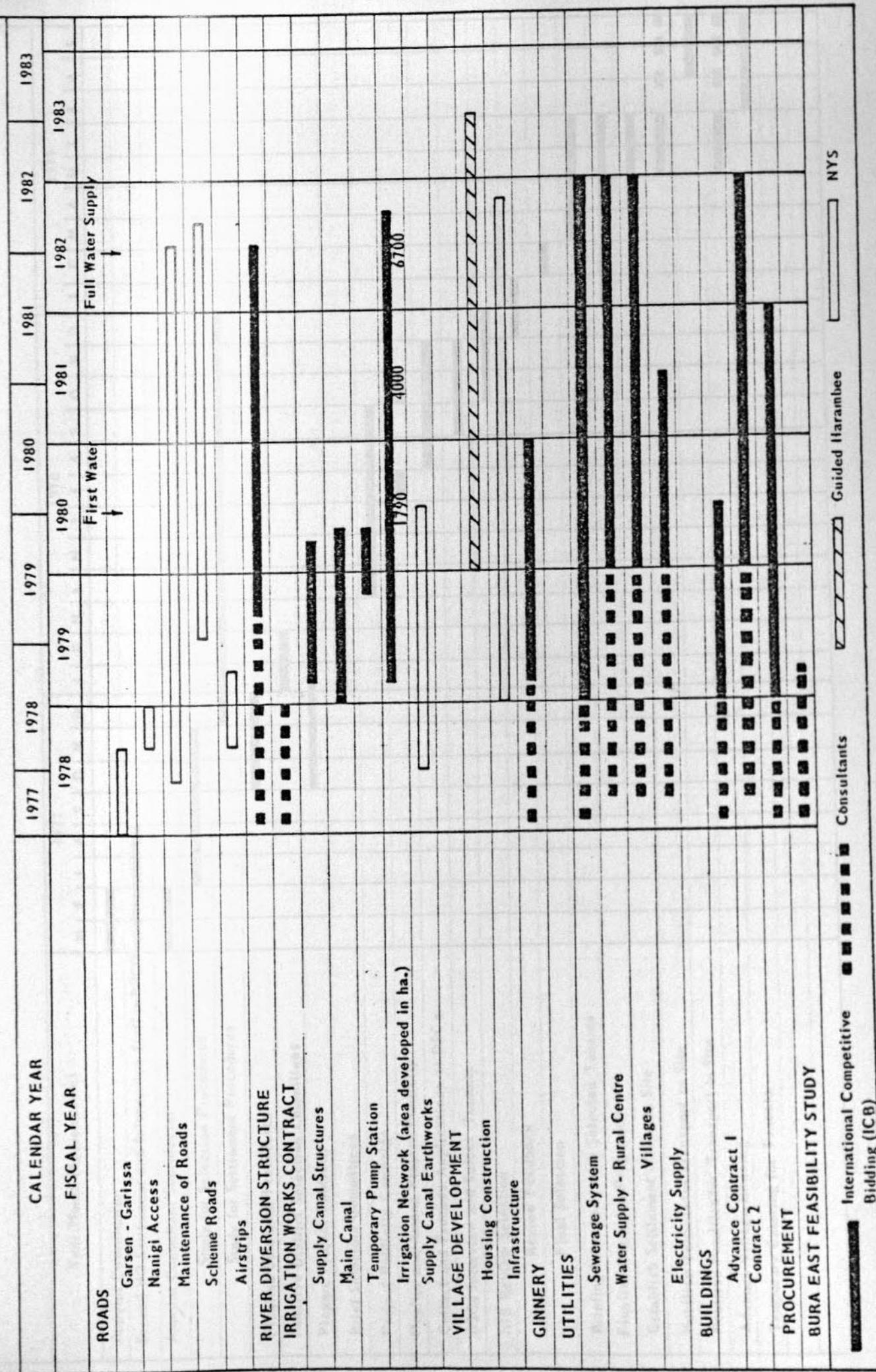
The settlement staff will be involved in establishing tenant selection criteria, setting up District Selection Committees and preparing papers for any publicity and the processing of applications. The finalising of the settlement programme is dependent upon the selection of all tenants. The programme can then be formed to give maximum economy in the use of transport, temporary housing and other facilities.

3.4 Settlement and Agricultural Development

Figure 3.3 shows the development of a typical village and Figure 3.4 summarises the rate of settlement of villages and the preparation of land for cultivation.

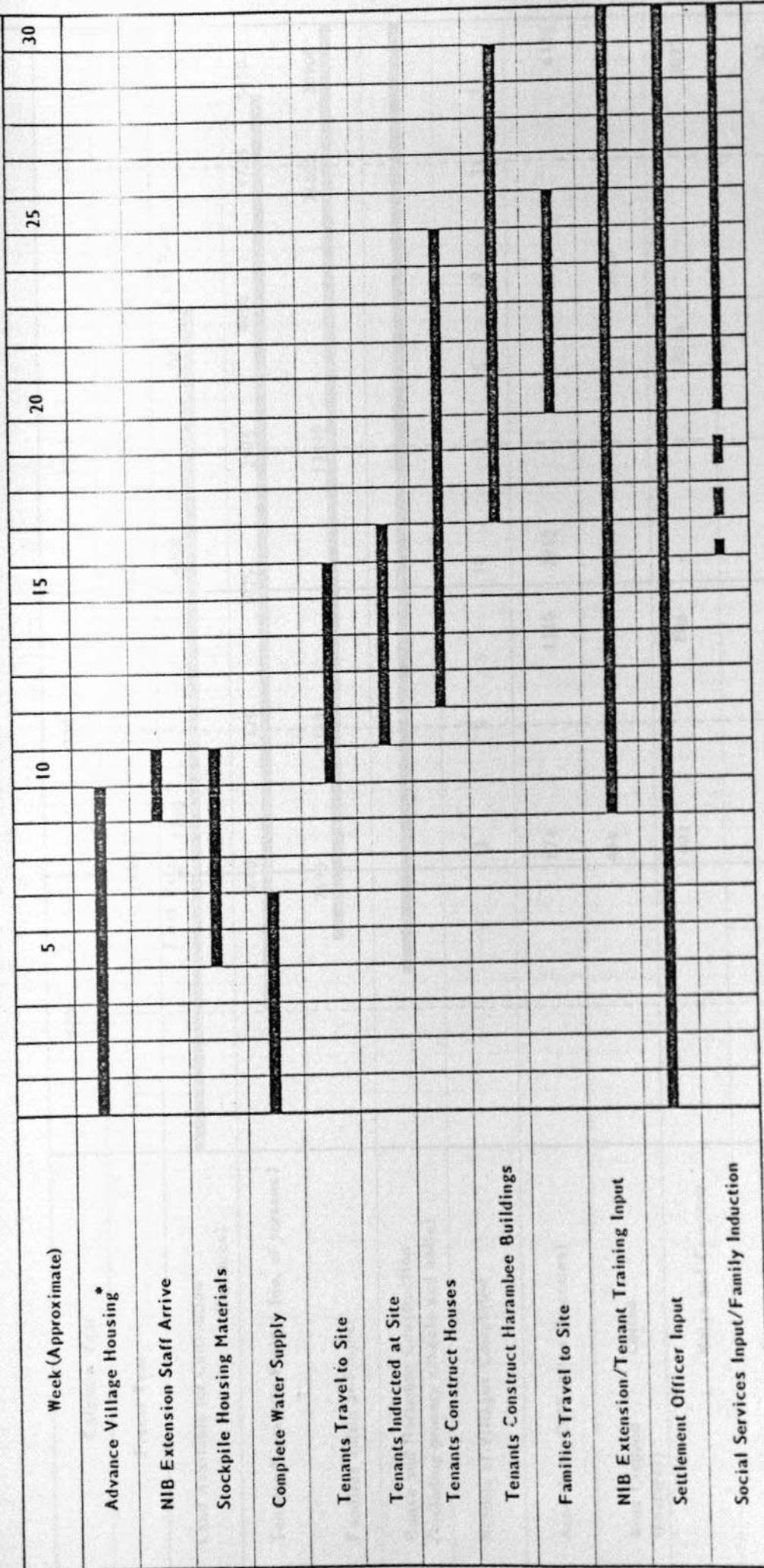
It is intended that National Irrigation Board and government staff houses in the villages will be constructed and occupied in advance of the tenants' arrival so that the staff become integrated in the community at the earliest possible stage. Normally the village water supply will be operational before tenant arrival, but for the first three villages to be developed a temporary water supply will be required. This will be provided as an extension to the temporary supply at the rural centre.

BURA IRRIGATION SETTLEMENT PROJECT
IMPLEMENTATION SCHEDULE



International Competitive Bidding (ICB)
 Consultants
 Guided Harambee
 NYS

TYPICAL OUTLINE DEVELOPMENT OF A VILLAGE



* Comprises NIB staff housing, compound and stores, and 12 - 18 tenant houses for temporary accommodation

RATE OF SETTLEMENT AND CULTIVATION

Calendar Year	1979		1980		1981		1982	
	1979	1980	1980	1981	1981	1982	1982	1983
Fiscal Year		1790		4000		6700		Full Water
Land Available for Cultivation (hectares)		640	1125	2025	2925	4050	4725	5150
Tenants Migrate to Project (no. of persons)		2690	5380		13440		26880	30900
Families Settle at Project								
House and Harambee Construction (including primary schools and halls)								
Number of Villages Completed		3	5	6	10	15	19	23
Area Under Cultivation (hectares)		874	1310	2912	3640	5533	6115	
Area Cropped - Cotton (hectares)		434	-	2800	-	5320		
- Maize and Cowpeas		403	806	-	2016		3023	
- Groundnuts			-	-	-	-	67	
- Vegetables		34	67	112	168	213	258	

It is proposed that a stockpile of building materials be built up at each village either by the NYS or a contractual organisation. This will ensure an even flow of materials for the tenant housing, village primary schools and multi-purpose community halls construction, and mitigate the problems of inflationary supply in the mangrove pole industry.

The total time to develop a village is indicated as 30 weeks on Figure 3.3. In practice this period will vary with the capabilities and adaptabilities of each group of tenants and no detailed programme for successive village development has been shown, but the sequence of village development is indicated on Figure 3.5.

However, the period of 30 weeks is considered to be a realistic average period of construction, and includes time for the induction and instruction of the tenants, and for the rebuilding of any substandard house construction. As the supervising and organisational staffs become more experienced the rate of construction should improve.

CONSTRUCTION

3.5 Advance Buildings

To supervise construction work, and prepare for settlement and agricultural operations staff from the project consultants, the National Irrigation Board and other government agencies will be required to work in the project area from early 1978; some staff houses will be needed in the rural centre and some in the first three villages. A number of tenant houses will also be required initially to house the first tenants whilst they are building their own houses in these villages.

Various possible arrangements have been considered including the following:-

- (a) using NIB facilities to extend the housing at Hola;
- (b) providing housing in the major civil engineering works contract;
- (c) an early start on the rural centre and staff housing contract;
- (d) a separate advance contract for part of the rural centre and the housing for the first three villages.

The last alternative was adopted, because it provided the best use of available sources, giving two buildings contracts of reasonable magnitude and duration, suitable for parallel financing. Housing will be standard types, and the contract would include office and recreational accommodation. The permanent sewerage work, temporary water supplies and power generation will form part of the contract, equipment for the latter two may be provided by a nominated supplier, under Dutch aid.

The programme is shown in Figure 3.6.

3.6 Buildings and Infrastructure

The majority of the houses and buildings, the construction of the permanent water supply and its treatment works, and the distribution water mains to the villages, are included in a separate second contract for international competitive bidding.

The houses and buildings will comprise seven basic types of staff housing, and offices, workshops and other buildings, to complete the rural centre development, except for industrial development. Advanced staff and tenant housing in some twenty villages will also be included in this second contract.

The construction of the permanent water supply treatment works will be the first work to be completed under this contract, to coincide with the completion of the canal works. The

construction of the water distribution mains to the villages will be phased with the operations of the National Youth Service, who are responsible for the grading and surfacing of the village roads. This will require detailed programming at the construction stage, based on certain key dates to be included in the ICB contract.

The overall programme for this building and infrastructure contract is shown in Figure 3.7 and details of the infrastructure in Figure 3.8. The contractor will be required to make his own arrangements for accommodation, water supplies and other services because the advanced building contract will only provide for such facilities for project staff of NIB, other government agencies, and their consultants.

3.7 Major and Minor Works

Programmes for the construction of major and minor works by contractors appointed after international competitive bidding are given in Figure 3.9, while Figure 3.10 shows the programme for work to be undertaken by the National Youth Service (NYS).

The allocation of work proposed differs from the original ILACO proposals, and the reasoning for the new allocation is considered in Chapter 6.

The requirement for first water by early 1980 (decided at the co-financiers meeting in March, 1977) is a controlling factor deciding the arrangement of construction contracts, together with the need to make the works attractive to international competitive bidders, and to utilise the NYS capabilities and plant to best effect. To meet these requirements it is proposed to include in one contract the supply canal structures, the main canal earthworks and structures, and the irrigation works and land levelling for the 6 700 hectares of Stage I, Phase I, together with a temporary pump station of 4 cumecs capacity at the headworks site. This will give a contract worth about 11.3 million Kenyan shillings extending over about three and a half years.

The river diversion structure and ancillary works will form a second contract at a later date, also for international competitive bidding.

The NYS will be responsible for construction of the supply canal earthworks, the Nanigi access road, the airfields, upgrading of the Garsen-Garissa road, land clearance and materials stockpiling for village construction, and the construction of pit latrines, showers, water points, ponds and distribution water mains within the villages.

The start of the river diversion structure works is dependent on the completion of studies and surveys forming part of the Stage II Feasibility Study which is detailed in Figure 3.23. Because the construction of the river diversion structure is later than previous programmes the period of NYS maintenance of the Garsen-Garissa road has been extended from 24 months to 27 months to cover the duration of the ICB contract.

PROCUREMENT OF EQUIPMENT

3.8 NIB Vehicles

The vehicle procurement programme which is shown in Figure 3.11 is based upon the staffing programme, which in turn, is related to the programme for implementation and agricultural development. Vehicles are provided for staff at Bura and at the Bura Co-ordinator's office in Nairobi. Procurement would be by tender, subject to the funding requirements of the particular co-financer.

3.9 Other Government Agency Vehicles

The programme for the provision of other government agency vehicles is shown in Figure 3.12. It is proposed that NIB and government agency procurement be combined to achieve maximum economy, subject to internal agreements on procedure between the agencies and the requirements of the particular co-financer.

3.10 Farm Machinery and Implements

The farm machinery and implements procurement programme follows the rate of agricultural development and the needs for staff training in advance of development. To simplify documentation procedures it is proposed that vehicles of each type be procured by annual contracts as indicated in the programme shown in Figure 3.13.

3.11 Engineering Plant, Machinery and Equipment

The delivery of these items is phased to suit staff training requirements and the expiry of contractors' responsibility for works maintenance, so that staff are fully trained in operating techniques before they are required to assume responsibility for operation and maintenance of the works' vehicles and machinery. Figure 3.14 shows the programme, which indicates how the procurement procedures vary to accord with the requirements of co-financers for some procurement in the country of origin of finance. The exact plant to be nominated for such supply is subject to confirmation by the co-financers and some subsequent modification of the programme may be necessary.

3.12 Ginnery

The ginnery will be provided under a turnkey contract awarded after international competitive bidding. It will include the provision of all machinery, buildings, vehicles and equipment necessary for the operation of the ginnery, and these separate items are indicated in the programme for ginnery development shown in Figure 3.15.

SERVICING

3.13 Staff Recruitment and Training

The timely recruitment of staff and their adequate training are two essentials for the successful operation of the project. In addition to the extensive NIB staff requirement, many staff are required at the project by other government agencies.

Their training and backgrounds should be such that they are suitable for working in the particular conditions of Bura, and their arrival at the project area must be phased with the completion for occupation of houses and offices.

Details of the staff requirements are given in the Institutions and Services, and the Agricultural Planning Annexes, and are summarised in the following figures:-

- Figure 3.16 Education
- Figure 3.17 Administration
- Figure 3.18 Police
- Figure 3.19 Social Services
- Figure 3.20 Co-operative Development
- Figure 3.21 East Africa Posts and Telecommunications

3.14 Consultancy Services

Figures 3.22 and 3.23 show the programme for design work for the project. Certain design and approval activities are critical to the implementation programme, where they relate to advance housing, and the state of construction works.

It is intended that the tender packages for the housing and infrastructure works should be prepared in Kenya, and this will require a mobilisation period which is not shown in the programme, although the start date shown for design work, does allow for prior mobilisation.

Figure 3.24 shows the durations for inputs to supervise the construction of works. The total numbers of staff required have not been indicated on the programme, because they will depend upon the final form of the contracts.

3.15 Financial Procedures

An outline of the various procedures necessary to obtain approval of tender documents, prequalified contractors, and to award contracts is shown in Figure 3.25. Detailed programmes have not been developed for these procedures for all work, but the time durations allowed for approval in the component programmes are based on following the outline procedure given in the Figure.

3.16 Trials and Development

The staffing requirements and the programmes for forestry, livestock, wildlife and fisheries are described in detail in the appropriate annexes, and summary programmes are presented here for completeness in the following figures:-

Implementation Schedule:

- Figure 3.26 Forestry
- Figure 3.27 Wildlife and Ecology
- Figure 3.28 Livestock
- Figure 3.29 Fisheries

The Forestry and Wildlife schedules contain activities which are critical to the project development, but the Livestock and Fisheries activities are not directly connected with any critical development component.

3.17 Co-ordination

The responsibility for co-ordination of all work programmes will lie with the Bura Co-ordinator's Office of the National Irrigation Board. The Engineer (Planning) will be directly responsible for this work, monitoring progress with all agencies, providing updated programmes for all components, and maintaining a master programme.

Regular reporting procedures will be established for all design and procurement operations, all contracts and managerial functions, so that progress can be properly monitored. Effective co-ordination will of course be an essential prerequisite for the timely completion of the project and its implementation.

BUILDINGS (CONTRACT No. 2)

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1981	1982	1983	1983
Tender Period and Award Contract							
Mobilise							
Construction of Housing Type							
B			1	4	5		
C			5	10	11	13	14
				4	9	14	17
D			10	25	34	43	51
E (rural centre)			2	15	30	47	62
(villages)			48	111	151	191	211
F (rural centre)			42	127	197	263	308
(villages)				26		30	33
G (rural centre)			7	24	29	51	70
(villages)							80
N.I.B. - Training Centre							
- Community Centre							
- Staff Clubs							
- Village Workshops & Store							
- Research Centre							
Police Station							
Secondary School							
Primary School (Rural Centre)							
Post Office (Market Centres)							
Health Sub - Centres (Market Centres)							
District Administration Offices							
Town Hall							
Abattoir							
Infrastructure (see Figure no. 3.8)							

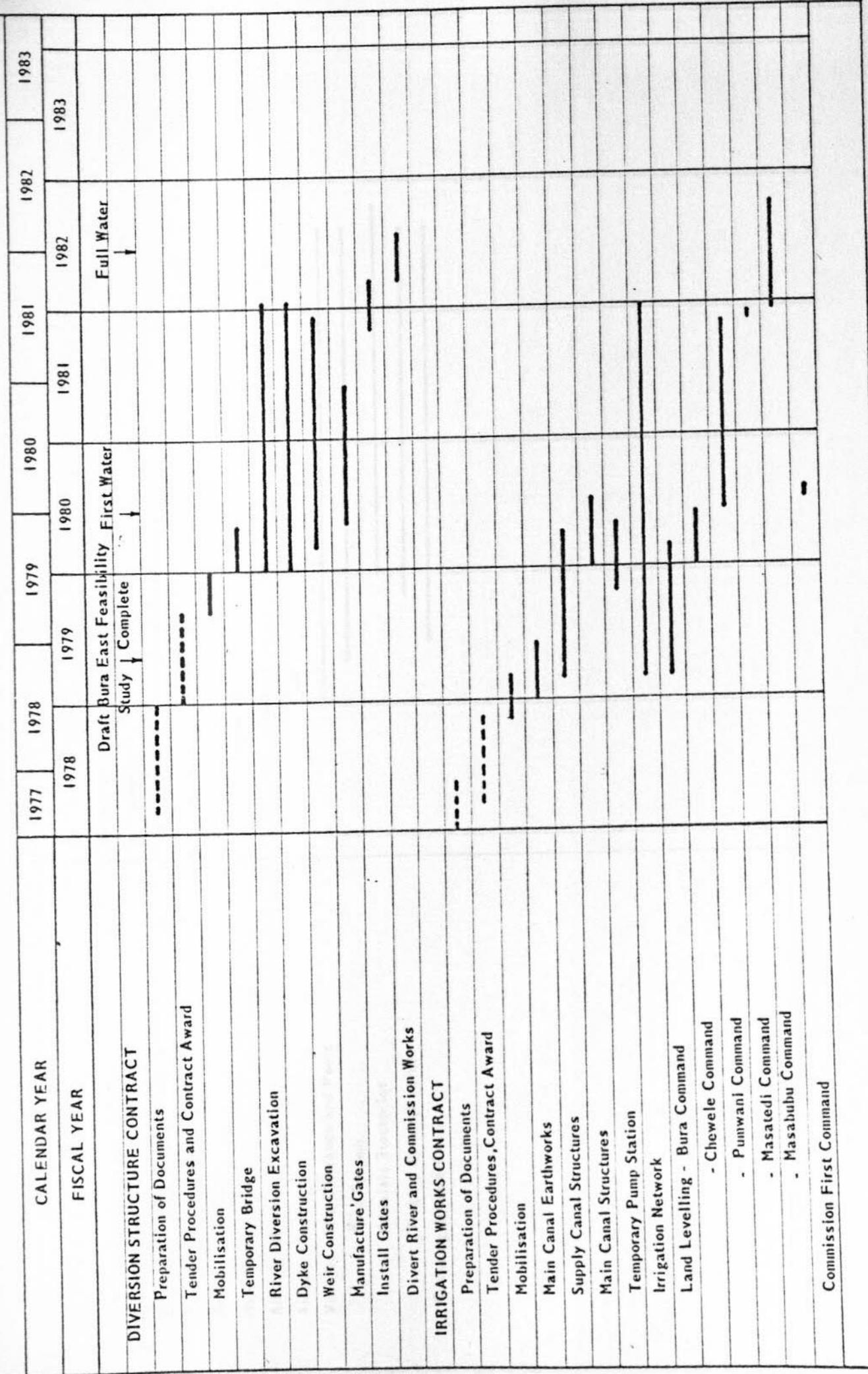
Figure 3.7: Expenditure within Building Contract No. 2

INFRASTRUCTURE

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1981	1982	1983	1983
ELECTRICITY SUPPLY							
Housing			█				
Generator Compound			█				
Transmission System			█				
Installation of Plant			█				
SEWAGE TREATMENT							
Extension of Sewer System			█				
House Connections			█				
WATER SUPPLY							
Housing			█				
Treatment Works			█				
Urban Distribution System			█				
Village Distribution System			█				

NOTE : █ Incorporated within building contract no. 2

IRRIGATION WORKS - ICB CONTRACTS



IRRIGATION WORKS - NATIONAL YOUTH SERVICE

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1981	1982	1983	1983
Complete Documents and Drawings							
Mobilise Plant etc,	-----						
Earthworks - Supply Canal	-----						
Garsen - Garissa Road	-----	Maintenance					
Nanligi Access Road	-----						
Main Airstrip Bura	-----						
Airstrip - North	-----						
Airstrip - South	-----						
Villages - Site Clearance and Pools							
Road System							
Materials Stockpiles							
Washing Points, Latrines							
Surfacing Scheme Roads							

Note: 1. Values for this category are not available for 1977 and 1978. 2. Values for 1983 are preliminary and subject to audit.

PROCUREMENT OF VEHICLES - NIB

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1980	1981	1982	1983
Preparation of Documents	---						
Review of Documents by NIB/IBRD	---						
Prequalification /Advertisement for Bids	Contract 1	Contract 2					
Tender Period	---	---					
Tender Review	---	---					
Negotiation and Award of Contracts	---	---					
Delivery of Vehicles 1/							
CONTRACTS 1 AND 2 - Motor Vehicles							
SWB Hard Top (4 Wheel Drive)		2					
LWB Pick - Up (4 Wheel Drive)		11	16				
LWB Station Wagon (4 Wheel Drive)		8					
Pick - Up/Utility		5	6				
3 - Ton Lorry		4	4				
Tipper Truck		2	2				
Mobile Lubrication Unit		1	1				
Mobile Workshop		1	1				
CONTRACT 3 - bicycles (local purchase)		18	17	45	52		
CONTRACT 4 - motor cycles (local purchase)		10	20	10	12		

Note : 1 Vehicles for Bura Co-ordinators Office purchased locally in 1977 as required.
 (2 no. saloon cars, 3 no. 4 wheel drive station wagons, 3 no. 4 wheel drive LWB pick-ups, 3 no. pick-up /utilities)

PROCUREMENT OF VEHICLES - GOVERNMENT AGENCIES

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1978	1979	1980	1981	1982	1983
Preparation of Documents	---						
Review of Documents by NIB/IBRD	---						
Prequalification / Advertisement for Bids	---						
Tender Period	Contract 1		Contract 2				
Tender Review	---						
Negotiation and Award of Contract	---						
Delivery of Vehicles	---						
CONTRACTS 1 & 2 - MOTOR VEHICLES							
SWB Hard - Top (4 Wheel Drive)				4			
LWB Pick - Up (4 Wheel Drive)				6			
SWB Pick - Up (4 Wheel Drive)			2				
LWB Station Wagon (4 Wheel Drive)			6				
LWB Hard Top (4 Wheel Drive)				4			
Tractor and Trailer			1				
Pick - Up/Utility				3			
Tanker - 1200 gallon			1				
7 Ton Lorry			2				
5 Ton Lorry				1			
3 Ton Lorry				1			
Miscellaneous School Vehicles				1			
CONTRACT 3 - BICYCLES (local purchase)				56			
CONTRACT 4 - MOTOR CYCLES (local purchase)			4	23			

PROCUREMENT OF AGRICULTURAL MACHINERY

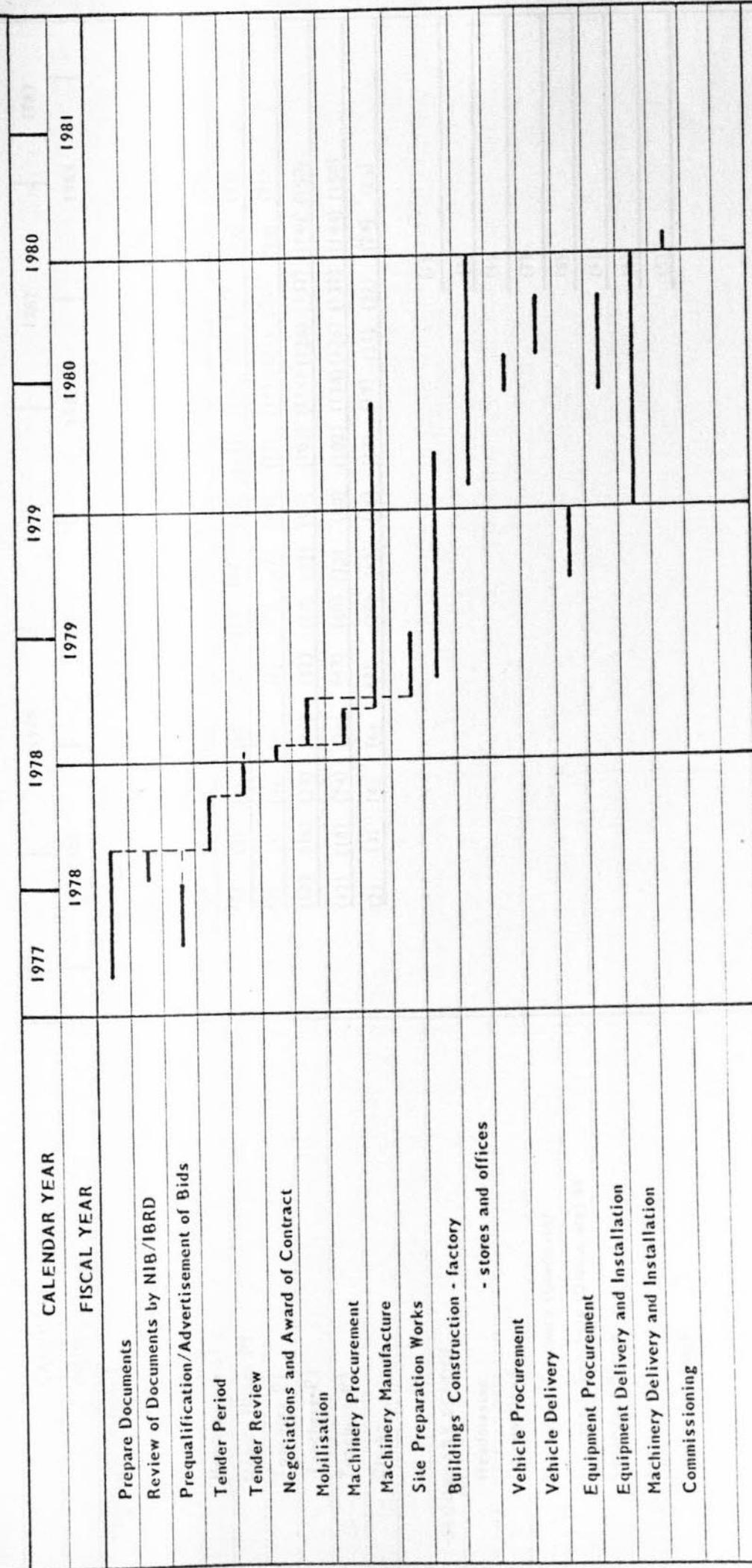
CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1981	1982	1983	1983
PREPARATION OF DOCUMENTS							
Review of Documents by NIB	—	—	—	—			
Prequalification/Advertisement for Bids	—	—	—	—			
Tender Period	—	—	—	—			
Tender Review	—	—	—	—			
Negotiation and Award of Contracts	—	—	—	—			
DELIVERY OF MACHINERY							
Tractor (70 hp)			10	10	16		
Tractor (80 hp)			10	10	16		
Plough (3 furrows)			5	5	6		
Plough (4 furrows)			5	5	6		
Harrow			5	5	7		
Ridger			5	5	9		
Trailer			5	10	11		
Land Leveller			2	2	2		
Groundnut Lifter / Shaker			2	3	2		

NOTE: Procurement in three separate contracts for numbers as shown.

PROCUREMENT OF HEAVY MAINTENANCE EQUIPMENT

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1979	1980	1981	1982	1983	1983
Preparation of Documents	—	—	—	—	—	—	—
Review of Documents by NIB/IBRD	—	—	—	—	—	—	—
Prequalification/Advertisement for Bids	—	—	—	—	—	—	—
Tender Period	—	—	—	—	—	—	—
Tender Review	—	—	—	—	—	—	—
Negotiation and Award of Contract	—	—	—	—	—	—	—
DELIVERY OF PLANT							
Bulldozer 320 h.p.		—	—	—	—	—	—
Compactor/Vibrator		—	—	—	—	—	—
Loader Excavator		—	—	—	—	—	—
Front End Loader		—	—	—	—	—	—
Grader		—	—	—	—	—	—
Mobile Crane		—	—	—	—	—	—
Low Loader		—	—	—	—	—	—
Tractor		2	—	—	—	—	—
Ditcher		—	—	—	—	—	—
DRAGLINE PROCUREMENT							
Prepare Documents		—	—	—	—	—	—
Review of Documents by NIB/IBRD		—	—	—	—	—	—
Tender Period		—	—	—	—	—	—
Tender Review and Award Contract		—	—	—	—	—	—
Delivery (No.)		—	—	2	—	—	—
NOMINATED HOLLAND PROCUREMENT							
Negotiate Pumps and Equipment Purchase		—	—	—	—	—	—
Delivery		—	—	—	—	—	—
Negotiate Dredger Purchase		—	—	—	—	—	—
Delivery		—	—	—	—	—	—

GINNERY TURKEY CONTRACT



STAFFING - ADMINISTRATION

CALENDAR, YEAR	1979		1980		1981		1982		1983	
	FISCAL YEAR		FISCAL YEAR		FISCAL YEAR		FISCAL YEAR		FISCAL YEAR	
DISTRICT ADMINISTRATION										
District Officer	(1)									
Administrative Assistant				(2)						
Clerical Staff	(1)	(2)								
Drivers	(1)	(2)								
Subordinate Staff			(10)							
Administrative Police Unit (D.H.Q.)					(2)	(3)	(4)			
Chiefs	(1)	(1)	(2)	(2)	(3)	(4)				
Clerical Staff (Chiefs Offices)	(5)		(10)	(15)	(20)					
Administrative Police (Market Centres)			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sub - Chiefs										
LOCAL ADMINISTRATION										
Executive Officer				(1)						
Licensing Officer										
Meat Inspector										
Clerical Staff				(1)	(3)	(5)				
Drivers				(1)	(2)	(3)				
Alattoir Officer				(1)						

STAFFING - POST AND TELECOMMUNICATIONS AGENCY

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
	FISCAL YEAR						
RURAL CENTRE							
Post Office			(1)				
Post Superintendent			(1)				
Post Officer			(4)				
Telephone Assistant			(2)				
Messenger			(2)				
Watchman			(1)				
MARKET CENTRES							
Post Office				(1)	(2)	(3)	(4)
Senior Post Officer				(1)	(2)	(3)	(4)
Post Officer				(2)	(4)	(6)	(8)
Telephone Assistant				(2)	(4)	(6)	(8)
Messenger				(1)	(2)	(3)	(4)
Watchman				(1)	(2)	(3)	(4)

CALENDAR YEAR	1977	1978	1979	1980
FISCAL YEAR	1978	1978	1979	1980
PRELIMINARIES				
Submit PPR	—			
Agreement Negotiated	—			
IRRIGATION WORKS CONTRACT:				
Submit Design Review Report	—			
Review of Report by NIB / Financers	—			
Preparation of Documents	—			
Prequalification of Contractors	—			
Tender Period	—			
Review Tenders and Award Contract	—			
NYS CONTRACT				
Preparation of Documents	—			
PLANNING AND BUILDINGS				
Detailed Structure Planning - Rural Centre	—			
Discussions with Government Ministries	—			
Preparation of Infrastructure Design	—			
Preparation and Adaptation of Building Designs	—			
ADVANCE CONTRACT (No. 1)				
Preparation of Documents	—			
Prequalification of Contractors	—			
Tender Period	—			
Review Tenders and Award Contract	—			
BUILDING CONTRACT(No. 2)				
Preparation of Documents			—	
Prequalification of Contractors			—	
Tender Period			—	
Review Tenders and Award Contract			—	

CONTRACT 1 | CONTRACT 2

CONSULTING SERVICES - DESIGN OF DIVERSION STRUCTURE

	1977		1978		1979		1980	
	CALENDAR YEAR	FISCAL YEAR						
BURA EAST FEASIBILITY STUDY								
DIVERSION STRUCTURE :								
FIELD INVESTIGATION								
GEOTECHNICAL SURVEY								
PRELIMINARY DESIGN								
HYDRAULIC MODEL								
DETAILED DESIGN								
TENDER DOCUMENTS								
TENDER PROCEDURES								
CONSTRUCTION PERIOD								

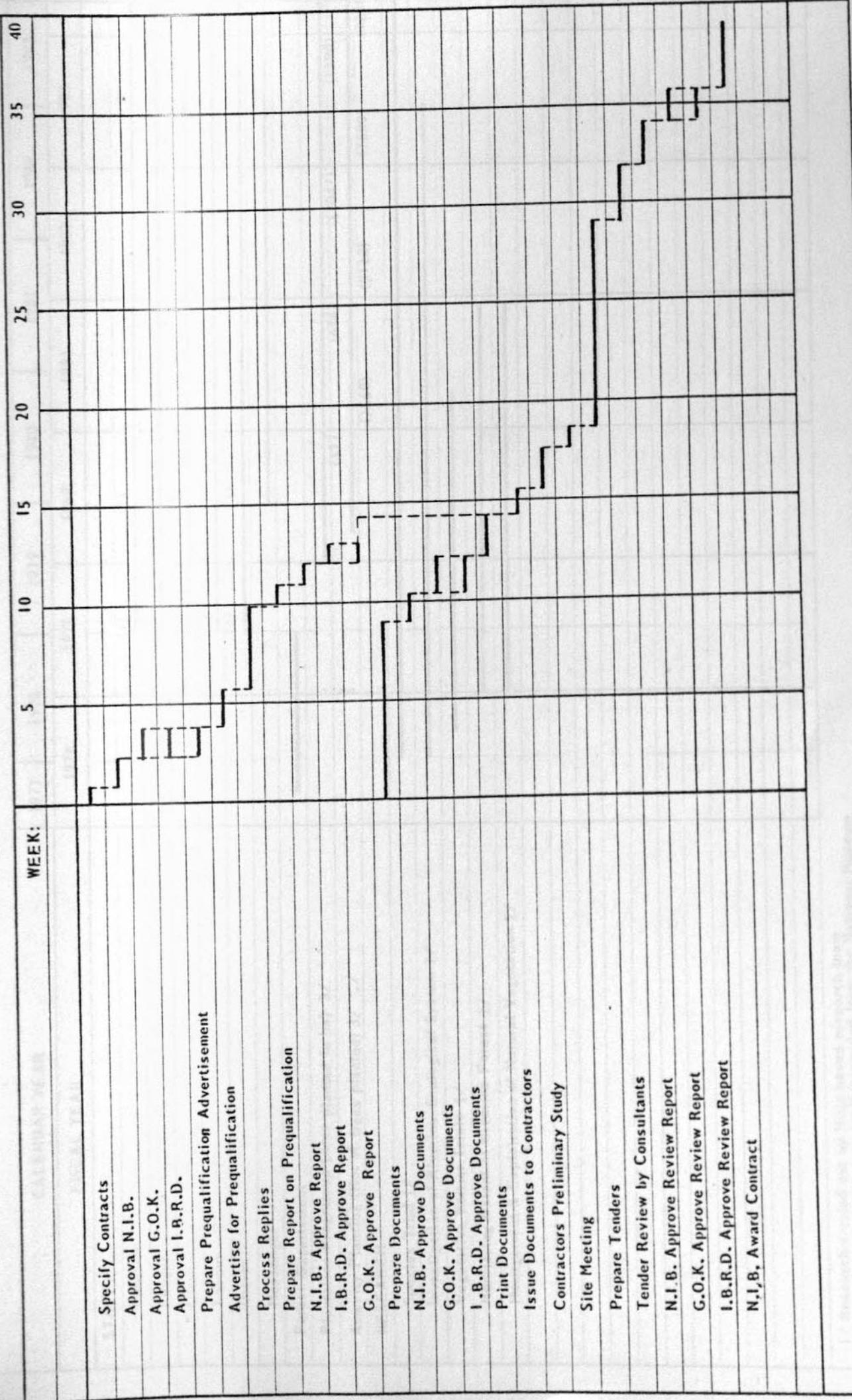
TO AUG. 1981



CONSULTING SERVICES - OTHER

CALENDAR YEAR	1977	1978	1979	1980	1981
SUPERVISION OF CONSTRUCTION AND SUPPLIES					
NYS Contract					MARCH 1982
ICB Contracts - Diversion Structure					
- Irrigation Works					
- Advance Buildings					
- Buildings and Infrastructure					
- Ginney					JULY 1982
- Supply Contracts					
PROJECT COORDINATION AND MANAGEMENT					
Surveys and Data Collection					
Specialist Studies					
Engineering					
Supplies					
Implementation and Operation					
BURA EAST FEASIBILITY STUDY					
Soils and Topographic Surveys					
Study and Report Preparation					

TYPICAL SIMPLIFIED APPROVAL PROCEDURES



LIVESTOCK

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1978	1979	1980	1981	1982	1983
LIVESTOCK TRIALS:							
Smallstock Trials							
Cattle Trials							
Forage Crop Trials							
Orma Study							
LIVESTOCK EXTENSION:							
Agricultural Officer			(1)				
Livestock Officer			(1)		(1)		
Assistant Agricultural Officer					(2)		
Agricultural Assistant			(1)	(4)	(8)	(10)	
Driver			(1)			(2)	
Clerk			(1)				
Messenger			(1)				

FISHERIES

CALENDAR YEAR	1977	1978	1979	1980	1981	1982	1983
FISCAL YEAR	1978	1978	1979	1980	1981	1982	1983
Ecology Study							
Collection of Pesticide Residue Data							
Fish Farming Trials							
STAFFING:							
Senior Research Officer		(1)					
Graduate Student :		(2)					
Research Assistant :		(1)					
Boatman		(1)					
Fisherman		(2)					
General Labour		(2)					
Manager (Trials)					(1)		
Headman,					(2)		
Technician					(1)		
Clerk					(1)		
Driver					(1)		
Labour					(10)		

CHAPTER 4 ORGANISATION

4.1 Introduction

The day-to-day running of the development of the project will be carried out by the Dues Project Co-ordinator, who is in the National Irrigation Board (NIB), under the overall control of its General Manager. A Dues Steering Committee comprising representatives of all government agencies involved in the project, and chaired by the Chairman of the National Irrigation Board (NIB), will act as a major liaison between the agencies. It will set up an executive committee to provide a co-ordinating linkage. Full details are given in the Organisation, Management and Training Annex.

4.2 Co-ordinator's Office

The Co-ordinator will be responsible for the direction of all project work carried out by NIB, and the co-ordination of all work which is the responsibility of other government agencies. He will have NIB and Consultants staff individually responsible for overall planning, construction contracts and supplies (vehicles, plant and equipment) as described in the Organisation, Management and Training Annex.

These staff will ensure that contract documents are prepared, approved and issued for signature at the appropriate time and in accordance with the procedures described below and in the Organisation Annex.

PART 2

4.3 Consultants Staff

PROCUREMENT

The project Consultants will provide staff for the Co-ordinator's Office and give training to counterparts and other staff. Site supervision will be carried out by the project consultants. Some local or temporary staff will also be employed on site as described later.

4.4 Supplies

Pre-delivery inspection of vehicles, plant and equipment will be carried out by qualified inspectors where appropriate.

4.5 Design and Contract Documents

Design and contract documents will be carried out by the project consultants or their UK offices. The design and preparation of contract documents will be carried out in the UK for irrigation works, vehicles, ginnyery, plant and equipment. The design and preparation of tender documents for buildings and infrastructure works may be carried out in Nairobi in accordance with the many government agencies involved in these aspects of the project.

4.6 Grazing

The provision of manure for the gazetting of land will be the responsibility of the FAO, and all field work in connection with natural forest gazetting will be carried out by the Forest Department of the Ministry of Natural Resources. The Co-ordinator's office will be responsible for ensuring the timely completion of gazetting. Detailed proposals are given in the Grazing Annex.

CHAPTER 4 ORGANISATION

4.1 Introduction

The day-to-day running of the development of the project will be carried out by the Bura Project Co-ordinator's office in the National Irrigation Board (NIB), under the overall control of its General Manager. A Bura Steering Committee comprising representatives of all government agencies involved in the project, and chaired by the Chairman of the National Irrigation Board (NIB), will ensure proper liaison between the agencies. It will set up an executive committee to provide a continuous linkage. Full details are given in the Organisation, Management and Training Annexe.

4.2 Co-ordinator's Office

The Co-ordinator will be responsible for the direction of all project work carried out by NIB, and the co-ordination of all work which is the responsibility of other government agencies. He will have NIB and consultants' staff individually responsible for overall planning, construction contracts, and supplies (vehicles, plant and equipment) as described in the Organisation, Management and Training Annexe.

These staff will ensure that contract documents are prepared, approved and issued for tenders at the appropriate times and in accordance with the procedures described below and in the programme tables.

4.3 Consultants' Staff

The project consultants will provide staff for the Co-ordinator's Office and give training to counterpart Kenyan staff. Site supervision will be carried out by the project consultants: some local or other expatriate staff will also be employed on site as described later.

4.4 Inspection

Pre-delivery inspection of vehicles, plant and equipment will be carried out by qualified inspectors where appropriate.

4.5 Design and Contract Documents

Designs and tender documents will be carried out by the project consultants mainly in their UK offices. The design and preparation of contract documents will be carried out in the UK for irrigation works, vehicles, ginnery, plant and equipment. The design and preparation of tender documents for buildings and infrastructure works may be carried out in Nairobi to simplify liaison with the many government agencies involved in these aspects of the project.

4.6 Gazettement

The preparation of plans for the gazettement of land will be the responsibility of the NIB, and all field work in connection with natural forest gazettement will be carried out by the Forest Department of the Ministry of Natural Resources. The Co-ordinator's office will be responsible for ensuring the timely completion of gazettement. Detailed proposals are given in the Forestry Annexe.

4.7 Settlement

The settlement programme will be executed through the Ministry of Land and Settlement who will second the necessary staff to NIB to work in the Project Co-ordinator's office and at the project site. Staff will also be seconded from the Ministry of Information to assist in this work. The Co-ordinator's office will ensure that settlement is carried out in accordance with the established programme, under the direction of a rural sociologist. The Sociology and Settlement Annexe describes all these activities in detail.

4.8 Other Government Agencies

The functions of other Ministries and the co-ordination of all activities at the project site are also described in detail in the appropriate annexes. Again the Co-ordinator's office will be responsible for the liaison of these government organisations and ensuring that their tasks are completed in time and in accordance with the established programme.

4.9 Financial Control and Disbursements

The withdrawal of proceeds of the International Bank for Reconstruction and Development (IBRD) loan and International Development Agency (IDA) credit will be in accordance with their Guidelines published in October 1974 and referred to in the loan and credit agreements. The proceeds of the loans of other financiers will be handled in accordance with similar guidelines to be incorporated in their agreements with the Government of Kenya.

These withdrawals will be executed by the Ministry of Finance and Planning on behalf of the Government, and given to NIB as a grant for the execution of the parts of the project for which NIB has responsibility. Existing procedures will be followed by the Ministry for the funding of other government agencies, except that it is proposed that the Bura Co-ordinator should be required to approve all disbursements made from funds allocated to the project. Thus the Co-ordinator's office will effectively have both executive and financial control over all matters affecting the project.

Financial control and accounting procedures are described in the Organisation, Management and Training Annexe.

CHAPTER 5 SPECIFICATION, DESIGNS AND STUDIES

5.1 Background

The specification and design work to be carried out by the project consultants will be based as far as possible on the work previously done by ILACO. A design review report has been submitted under separate cover, reviewing the drawings and draft contract documents produced by ILACO for the headworks, supply and main canals, irrigation network, and on-farm works. The ILACO documents are based on the National Youth Service carrying out all the work in the irrigated area, except for the main canal structures, together with the roadworks described elsewhere, and a contractor appointed after international competitive bidding constructing the headworks, the supply canal and the main canal structures.

5.2 Proposed Revisions

Early implementation of Phase I Stage I of the Bura Project is a principal recommendation of this report. The construction programmes have been modified to ensure the provision of irrigation water to the first part of Phase I by early 1980, and all other programmes have been related to the construction of the works. This will involve a different allocation of construction, described below, and some modification of the contract documents.

It is also proposed that the design of the river headworks be modified to provide a more suitable structure to serve the apparently larger area of better soils on the eastern bank of the river. More detailed soil surveys will be required together with a topographical survey before the headworks designs can be finalised. These matters are discussed in detail in the design review reports.

5.3 Extent of Work to be Done

Detailed design of infrastructural works and buildings has not been carried out to date, although alternative designs have been reviewed and costed. The overall designs and study work to be carried out by the project consultants thus include the following items:-

- (a) East bank feasibility study
- (b) Revised design of headworks and any associated modification of the upper section of the supply canal
- (c) Revision of contract documents for major and minor project works
- (d) Detailed structural planning of rural centre and villages
- (e) Detailed working drawings for houses and other buildings, following conceptual designs by NIB
- (f) Detailed design of water supply, sewerage, and electricity supply and distribution systems
- (g) Contract documents for the above items for international competitive bidding, including a separate contract for advance works by local procurement
- (h) Contract documents for the procurement of vehicles and equipment
- (i) Advice and assistance on staffing, training and other project matters.

5.4 Consultants' Organisation

The work for the east bank feasibility study will be carried out in the field and in the consultants office in Nairobi and UK. The preparation of designs and contract documents for the major and minor project works and vehicles and equipment procurement will be carried out in the UK, while structural planning, buildings and infrastructure work may be handled in Nairobi. A small design staff will be provided at the project site as described later.

All this work will be carried out under the direction of the consultants' representative in Nairobi who will also be the Deputy Co-ordinator, but the leaders of each design team will be responsible for direct liaison with the appropriate government agencies involved as discussed below.

5.5 Department of Physical Planning

The Department of Physical Planning has agreed with the general principles of structural planning described in the Village Planning and Design Annexe, and will be closely involved in the next stage of developing the structural plans, and co-ordinating the work with the other government agencies involved.

5.6 Ministry of Works

The Ministry of Works (MOW) is generally responsible for the design and construction of all roads, government housing and other buildings. In some special cases, notably parastatal organisations, this responsibility is delegated, as in the case of hospitals and clinics which are designed by the Ministry of Health. Various MOW designs for housing are available as reviewed in Section 5.8 below, but in the case of the Bura situation these are not generally considered suitable.

The delegation of responsibility for design and construction of buildings to NIB and its consultants is permitted by agreement between the Treasury and the Ministry of Works and it is proposed that such delegation be allowed for the Bura Project, because of the particular circumstances.

It is proposed that initial designs be developed by the National Irrigation Board architect in association with the consultants' design team, for approval, if necessary by the Ministry of Works. The consultants' team would then produce working drawings and contract documents for construction.

5.7 Garsen-Garissa Road

The Garsen-Garissa road, under construction by the NYS, is being constructed to a non-standard cross-section with an unsealed surface. This cross-section has been designed to suit the locality, the available materials and the NYS method of working, and has been agreed with the Ministry of Works.

The general location of the new section of road bypassing the project area has been agreed with the Ministry of Works on the basis of it being a temporary road and the Ministry has assumed responsibility for fixing the bypass line on the ground for NYS to proceed with the construction of the road.

5.8 Housing and Buildings

The MOW and other government agency house and building designs are reviewed in the Housing and Building Annexe. The review has shown that no entirely suitable house design exists for the climatic conditions at Bura, and that for most houses a total redesign would be greatly preferable. Proposals for carrying out this work have been mentioned in Section 5.6 above.

Where necessary designs for ancillary buildings will be prepared. Specifications and contract documents will be prepared in accordance with the normal Kenya practice, modified so as to be suitable for international competitive bidding.

5.9 Water Supply and Sewerage

The general principles of central water treatment works, the distribution system and the sewerage proposals described in the Utility Services Annexe have been discussed with the Ministry of Water Development. Detailed designs and tender documents will be prepared in accordance with the Ministry's standard practice except that certain items will be specified to International Organisation Standards (ISO). This is acceptable to the Ministry.

The work will be incorporated in the main buildings contract, subject to agreement between the financing agencies involved, and special tendering requirements may be required for the supply of some items of plant and the uPVC pipe for the water distribution mains. This results from the requirements of the Government of the Netherlands regarding the expenditure of a proportion of their funding of the infrastructure works in the Netherlands.

5.10 Electricity Supply

The electricity supply will be operated by the East Africa Power and Light Company (EAPLC) who have assisted us in the formulation of our proposals. At this stage, allowance has been made only for a supply to industrial and domestic consumers at the project rural centre, but it is the intention of EAPLC ultimately to operate sufficient generating equipment there to supply Hola also, installing a transmission line to Hola for that purpose.

Designs and contract documents for this part of the project will be based on equipment procurement from Dutch sources.

5.11 Vehicles and Equipment

The final requirements for the project will be developed in Nairobi in discussion with NIB and in particular the Project Manager, who will work initially in the Project Co-ordinator's office. Final specifications will then be prepared in Kenya and UK in accordance with World Bank procurement guidelines, the division of contracts being as set out in the programme section of this annexe.

Vehicles and equipment for government agencies not directly involved in the project will be procured under local procedures where appropriate.

5.12 Approval Procedures

All designs, contract documents and list of proposed tenders will be reviewed by the staff of the Bura Co-ordinator's office and submitted to the General Manager of the National Irrigation Board for approval, and onward transmission to the financing agencies for their comment and approval. Prequalification procedures will be followed where required by the co-financers. On submission of the tenders the project consultants will prepare a report on tenders with recommendations for the award of a contract where appropriate, for approval by the General Manager, the Ministry of Finance and Planning, and the co-financers. An outline of these procedures is shown in Figure 3.25.

The breakdown of the project into contracts and the procedures for progressing these contracts is described in the following chapters.

CHAPTER 6 MAJOR AND MINOR WORKS

6.1 Introduction

The original proposals made by ILACO for the division of construction work into contracts suitable for execution by the National Youth Service and by contractors appointed after international competitive bidding has been reviewed. The roads and airfields work now in hand remain with NYS, but a different arrangement is proposed for the irrigation works.

6.2 Criteria for Contracts

The following criteria have been used in assessing alternative arrangements for the irrigation works contracts:-

- (a) Contracts should be clearly defined one from another;
- (b) work suitable for NYS has been identified as bulk earthmoving of a repetitive nature suitable for construction by plant already in use or on order, and not requiring completion on a tight time schedule;
- (c) structural concrete and steelwork has been included in the works for international competitive bidding, together with other work requiring special skills;
- (d) first irrigation water should be supplied to the project in early 1980.

The bulk earthmoving in the project comprises the river diversion channel, the supply canal, the main canal, and the irrigation and drainage networks. These last works are not suitable for excavation by NYS plant because quite complicated movement of small earthworks is involved and also a considerable number of small but important structures. The river diversion works require co-ordination with the headworks structure, and the co-ordination of work in the main canal area between the NYS and contractors would present difficulties.

6.3 Proposed Contract Arrangements

A three contract arrangement for the irrigation works is proposed to satisfy these considerations, two contracts to be awarded after international competitive bidding (ICB), and the third to be executed by the National Youth Service under force account.

6.4 International Competitive Bidding (ICB) Contracts

One contract for ICB would comprise the headworks, the river diversion channel and associated works. The second contract would comprise the temporary pump station, the supply canal structures, the main canal and its structures, and the irrigation and drainage network, including land levelling.

6.5 National Youth Service (NYS) Contracts

The NYS work would comprise the supply canal earthworks, the Garsen-Garissa road improvement and diversion, the Nanigi access road, airstrips, scheme roads surfacing, and village site clearance, roadworks and minor construction works, such as showers, washing points and latrines. NYS would also be responsible for transporting to site and stockpiling materials for tenant housing. The NYS earthworks would terminate at a cut line adjacent to each of the structures of the supply canal, and a short section of earthworks would be included with the structures in the second ICB contract. The earthworks of the main canal have not been included in the NYS contract because their inclusion may well make the earthworks a critical factor in

meeting the fairly tight construction programme. The proposed arrangement will ensure that the main construction contracts will be executed in separate, well defined areas.

6.6 Management and Progress of NYS Works

The second ICB contract would provide for a construction management input into NYS to strengthen the site organisation. This would include managers, foremen, engineers, mechanics and a stores controller, all to be paid for on a man-month basis.

A programme would be written into the NYS contract limiting its operations to the complete construction of a short section of the supply canal earthworks at a time, starting from the north end. Should there be any shortfall in progress by NYS, this would enable negotiations to be carried out with the second ICB contractor to assume responsibility for the northern section of the supply canal earthworks to avoid delay to the overall project programme.

6.7 Prequalification

In accordance with World Bank procedures, prequalification is proposed for tenderers for the ICB contracts. The invitation to prequalify will be advertised in the general circulation newspapers in Kenya, and selected international newspapers and technical magazines.

The invitation will give a brief specification of the works, and the requirements for prequalification, calling for details of the prospective tenderers' experience and performance on previous similar contracts, capabilities with respect to personnel, plant and equipment, and financial history. It will be issued at least sixty days before the intended date of issue of documents to tenderers to allow for a proper response and an assessment of the applicants for prequalification.

A report will be prepared by the project consultants on the response, and a selected list of tenderers recommended. This report will be passed through NIB to the co-financers for comment and approval.

Following the approval of this report and the tender documents, tenders will be called for.

6.8 Site Visit

The tender period for all major construction works contracts will include a site visit for all tenderers at an early stage. The arrangements for this visit will be made by the project consultants, and there will be an opportunity for discussion and clarification of the requirements of the contract documents. Should any amendment or other actions be required as a result of the site visit they can be taken in good time before the end of the tender period, which will be not less than 90 days.

6.9 Tender Reviews

The tender reviews will be made by the project consultants in accordance with the World Bank guidelines and submitted to the General Manager of the NIB for approval and forwarding to co-financers. The reviews will include a recommendation for a contract award, unless circumstances arise which render no recommendation possible.

The recommendation will require approval by the co-financers and the Ministry of Finance and Planning before the NIB can proceed to negotiate the contracts. It is advisable to allow a period for negotiations for the contract because it is likely that tenderers will raise qualifications and add riders to their tenders which will have to be resolved in negotiation.

The conditions of contract will be the Conditions of Contract (International) for Works of Civil Engineering Construction (Second Edition July 1969, reprinted 1972) published by FIDIC, with modifications to suit the particular requirements of each contract. For those contracts where the European Development Fund (EDF) is financing parts of the works, additional contract clauses will be required to clarify the position of the EDF delegate, because the conditions of contract used by EDF do not allow the Engineer the same independence as obtained under the FIDIC conditions.

6.10 Contract Supervision

Each construction contract will be supervised by Resident Engineers appointed by the project consultants, responsible to a Chief Resident Engineer who will have overall responsibility for all construction work at the site. The Chief Resident Engineer would be responsible to the Engineer's Representative in Nairobi. Each resident engineer will have a staff of assistant engineers and inspectors appropriate to the size and complexity of the contract works, to assist him in carrying out the responsibilities delegated to him by the Engineer. Provision has been made for training in site supervision local staff seconded by NIB.

The resident engineering staff will be responsible for supervising all aspects of the construction works to ensure that it is carried out in accordance with the drawings and specifications. Progress on the work will be monitored and delays and other problems identified in a monthly report prepared by the Chief Resident Engineer so that appropriate measures can be taken to complete the works correctly and on time.

6.11 Payment

The initial and final measurements of the works and approval of interim and final payment certificates will be undertaken by the Chief Resident Engineer and his staff. The certificates will then be passed by the Chief Resident Engineer through the Project Co-ordinator to the General Manager of the National Irrigation Board for approval and payment. The NIB will charge payment against funds granted by the Ministry of Finance and Planning, who will then withdraw the appropriate sums from the co-financers loans on presentation of the Engineer's certificate under the standard procedure laid down in the loan/grant agreements.

In the case of the work carried out by the National Youth Service on force account, it is recommended that payment be made on the basis of certificates issued by the resident engineer responsible for supervising the NYS work. At present the documentation being submitted by the NYS in justification is not considered adequate for proper control to be exercised. This is in part the result of a lack of field supervision but until such time as an adequate independent supervisory staff is established in the field no improved system can be adopted.

CHAPTER 7 BUILDINGS AND INFRASTRUCTURE

7.1 Extent of Work

This work includes the construction of all the buildings in the 23 villages and the rural centre to be provided under the project. Thus, offices and workshops for agricultural and government operations, housing for tenants, NIB and government agency staff, the treated domestic water supply and the rural centre sewerage and electricity generation are all included.

7.2 Village Construction

Materials for tenant housing will be delivered to the project by NYS or some contracted organisation, and stored at the village sites before the tenants arrive. NYS will also form the village roads, construct the augered pit latrines and their slabs, ponds, water points and village water distribution mains, and set out the house plots.

NIB staff, other government staff and primary school teacher housing will all be constructed by a building contractor before the arrival of tenants. A number of tenant houses will also be constructed by this contractor as temporary tenant accommodation, between 12 and 18 houses for each village, depending on the detailed settlement programme.

The tenants will construct their own houses as soon as possible after their arrival, the arrangements for this being described in the Housing and Building Annexe. They will then proceed to construct the primary school buildings and the village multi-purpose halls with materials provided by NIB, the cost of which will be refunded by the tenants from their cash crop payments. The tenant building work will be managed by the NIB project building supervisor and his staff (see the Organisation, Management and Training Annexe) and overall supervision will be by a clerk of works of the project consultant's staff. The NIB will pay the tenants for their labour during the construction work period (repayable from the first cash crop payments) and provide temporary catering arrangements (also repayable) until the arrival of the tenant families, see the Sociology and Settlement Annexe.

7.3 Rural Centre Construction

The rural centre will contain all the main offices for the agricultural operations, including administrative offices, workshops for the maintenance of NIB vehicles, machinery and plant, together with offices for all government services to the project area. Housing will be provided for all government and NIB staff servicing the project within the rural centre, except for field assistants' and water guards' houses at the villages. Staff manning the utility services, that is the treated water supply, sewerage and electricity supply, will also be provided with housing.

All this building work will be included in two contracts for international competitive bidding. The contracts will be for the development of the complete rural centre and project infrastructure, plus all public health buildings, the water supply distribution system to the villages together with the road system within the rural centre.

The division into two contracts has been described in the programmes description section of this annexe. Each of these contracts will be carried out after selection of a contractor by international competitive bidding and the work will include some items for which suppliers will be nominate;-n accordance with the requirements of the financing agencies.

On completion of the works the various buildings will be handed over to the government agencies responsible for their operation, and on expiry of the contractual maintenance period, it is proposed that the responsibility for maintenance will be assumed by NIB under an agency agreement with the Ministry of Works and other agencies concerned.

The construction of shops, factories and commercial buildings (other than the cotton ginnery), places of worship and the like, will be left to private enterprise. However, as it will be difficult to adopt the normal self-help (harambee) method of primary school construction in the rural centre, it is proposed that the two primary schools should be constructed by NIB under the ICB contract. Staff clubs will also be constructed in this way. A complete list of the buildings to be constructed under this contract is given in Table A.5 of the Project Costs Annexe.

7.4 Contract Procedure

The procedure for procurement and implementation of the ICB contracts for these building and infrastructure works will be identical to the ICB contracts for major works described previously, including prequalification. Supervision will be carried out by the project consultants.

CHAPTER 8 VEHICLES, PLANT, MACHINERY AND EQUIPMENT

8.1 Introduction

The procurement of the vehicles, plant, machinery and equipment generally will be by international competitive bidding, although there will be some limitations on this imposed by the financing agencies. The extent of these limitations has been defined earlier in the text.

The procedures for preparing tender documents and obtaining approval before issue for tendering will be similar to those described for the construction of works.

8.2 Tender Documents

Tender documents for items requiring installation at site will be based on the Model Form of General Conditions (B2) recommended by the Institution of Mechanical Engineers, the Institution of Electrical Engineers, and the Association of Consulting Engineers, for use in connection with Export Contracts, Delivery FOB, CIF, or FOR, with supervision of erection, 1960 Edition. Tender documents for supply and delivery only will be based on suppliers' conditions of sale, and contracts with successful tenderers will be negotiated on the basis of such conditions.

8.3 Vehicles

One set of tender documents will be issued for all wheeled vehicles to be used on roads, excluding construction plant such as loaders, for supply in any one year. Similar documents will be used in successive years for the different numbers of vehicles then required. The tender document will be drawn up in such a manner that tenderers will be able to submit bids only for a single type of vehicle, for example, four-wheel drive vehicles, if they do not have the capacity to tender for all types.

It is proposed that the contracts will include vehicles required by government agencies as well as the National Irrigation Board to simplify purchasing procedures, and to conform with the loan and credit conditions. The internal government machinery to achieve this will have to be developed in discussion between departments.

Bicycles and motorcycles will be purchased under local tender as required during the development of the project.

Table A.8 of the Project Costs Annexe lists the vehicles specified for the project.

8.4 Plant

A similar procedure to that proposed above for vehicles will be adopted for plant, with the exceptions noted below:

Dredgers and dredging equipment will be provided under Dutch aid, and the manufacturer and type of equipment will be nominated by the project consultants. Prices of different types of dredging equipment will be obtained from the suppliers and the most suitable and economic type of equipment will be selected for nomination.

Other plant will be obtained from the Netherlands in a similar manner, and negotiations are in hand with the Dutch government to identify what available plant is suitable for nomination. This plant will probably comprise trailer equipment, loaders, pumps, compressors and minor tools. Thus, most of the major items of plant will be included in the list for international competitive bidding.

Table A.9 of the Project Costs Annexe lists the plant specified for the project.

8.5 Farm Machinery and Implements

Farm machinery and implements are listed in Table A.9 of the Project Costs Annexe and will be procured in a similar manner to plant, above, in one tender document. Trailers will be provided directly under Dutch aid.

Workshop machinery has not yet been identified in detail. Special tools for use with particular vehicles or items of plant will be purchased under the appropriate major contract, and the other machinery will be identified at detailed design stage and a tender document prepared on the basis noted in Section 8.2.

8.6 Equipment

Telecommunications equipment for NIB and for the EAPT will be provided under Dutch aid. All other equipment will be tendered for under international competitive bidding. Separate documents will be provided for specialist equipment such as the hydrological / meteorological measurement equipment, but all general agricultural equipment will be included in one document to be bid for as separate units in a similar manner to the vehicles referred to in Section 8.3.

8.7 Inspection

In certain cases, it will be necessary to appoint inspecting engineers to examine items either at works or at dockside before despatch. Such cases will be advised by the project consultants in sufficient time for the appointments to be approved by the National Irrigation Board and any other agencies involved.

8.8 Progress and Payment

The progress of these items from initial specification through contract negotiations to final delivery, will be monitored and controlled by the Engineer (Procurement) in the Bura Co-ordinator's office. The administrative staff of this office will deal with records, inspections, shipping documents and other such matters.

Payment certificates will be issued by the Co-ordinator's office for approval and payment by NIB and reimbursement as specified in the loan and credit agreements.

8.9 Ginnery

The ginnery will be procured by a turnkey contract to include all the buildings, equipment and machinery necessary for its operation, except for electricity supply which will be procured as described in the infrastructure section and operated by the East African Power and Light Company.

Contract conditions will be the FIDIC International Conditions referred to elsewhere and normal international competitive bidding procedures will be adopted, including the prequalification of tenderers.

8.10 Agricultural Inputs

Agricultural inputs such as seed and chemicals, will be procured through the normal National Irrigation Board procedures for such items, and will be controlled by the project agricultural management directly as part of its normal function.

CHAPTER 9 AGRICULTURAL STAFFING AND TRAINING

9.1 Introduction

Details of agricultural staffing and training have been described in the Organisation, Management and Training Annexe and this section is limited to identifying the organisational elements which will ensure proper development of the project. The Project Manager will be responsible for the appointment and training of his staff, and he will be assisted in the implementation period by staff in the Project Co-ordinator's office as well as by his own project training and welfare staff.

9.2 Agricultural Management

The agricultural management of the project will be undertaken initially by an experienced expatriate core staff provided by a management organisation together with counterpart senior and other Kenyan staff. The Kenyan staff will assume full management control as soon as they have been trained and acquired experience. It is anticipated that the management organisation core staff will be entirely replaced within six years. The duties and responsibilities of the the management team are fully described in the Organisation, Management and Training Annexe.

9.3 Staff Recruitment and Training

The Project Manager for the management organisation will spend at least the first six months of his assignment in the Bura Co-ordinator's office. He will finalise staffing, training and machinery requirements with the Co-ordinator's staff, in particular the training specialist. The training specialist will be responsible for liaison with the educational establishments providing training and new staff for the project and the initial recruitment and training of staff. On the early appointment of training and staffing personnel at the project, they will assume responsibility for these functions. Full details are given in the Organisation, Management and Training Annexe.

9.4 Staff Settlement

Staff settlement will be arranged by the Staff and Welfare Officers at the site. The building contractor will complete housing in accordance with a schedule issued in the contract documents, and related to the staffing programme. The Welfare Officer will be informed regularly of building progress by the Resident Engineer responsible for the building and infrastructure contract, so that hand over to the appropriate government organisation and staff migration can be arranged accordingly.

Any modifications to staffing requirements and consequently housing demand, or any delays in completion of housing construction will be dealt with by reference through the Co-ordinator's office.

CHAPTER 10 MOBILISATION OF GOVERNMENT SERVICES

10.1 Introduction

The role of the government agencies in the project is described in the Institutions and Services Annexe and the other specialist annexes. Full details of staffing and other requirements are given in these annexes, but for convenience staffing levels are also shown in this annexe in Figures 3.15 to 3.20 inclusive.

10.2 Buildings and Equipment

The majority of government agency staff will be housed at the rural centre. All housing and office accommodation for staff in the rural centre and villages will be constructed by NIB under the ICB building and infrastructure contracts described in Chapter 7.

This is a departure from normal practice in Kenya where all government building is generally carried out by the Ministry of Works, under a Treasury circular directive. The remoteness of the site and the difficulty of different contractors working in the same small area would mean uneconomic and delayed construction in this case if separate contracts for NIB and other government agency work was involved.

10.3 Staff Recruitment and Mobilisation

Staff recruitment and mobilisation will be the responsibility of each individual agency in accordance with the staffing numbers and budgets set out in the specialist annexes. However, liaison with the Project Co-ordinator's office through the Bura Steering Committee will be essential.

10.4 Staff Migration

Housing and social facilities are provided under the building contracts at the rural centre and villages for all the staff of government agencies. Completion is programmed in accordance with the planned appointment of staff to the project area.

The Senior Settlement Officer seconded to NIB at the project site will be responsible for co-ordinating migration with the various agencies under the overall direction of the Co-ordinator. He will be advised of construction progress monthly by the Chief Resident Engineer's report and will then inform the various agencies when the appropriate grades of housing are available for their staff, and make arrangements for transportation and reception.

10.5 District Administration and Local Administration

The administrative services will be the co-ordinating unit between all government agencies at the project site and Nairobi. The District Officer based at the rural centre will be acting chairman of the Bura Development Committee, whose function is described in the Institutions and Services Annexe. He will be appointed at the earliest possible time and operate from the Hola office until accommodation is available at the project area. All administrative staff should be appointed at the earliest possible time indicated in the programme, Figure 3.16. The development of a project in such a remote area with a new population gathered from all over Kenya will present many problems which will only be capable of resolution if a full administration service is available from the start.

10.6 Police and Prisons

A police station and barracks will be constructed as part of the rural centre development. There will be no other police posts in the project area, which will be covered by mobile patrols. An early build-up of the force is necessary because of the need to control problems arising out of the diverse backgrounds and customs of the tenants, and the influx of labour for the construction work. The build-up of police staffing is shown in Figure 3.17.

There is a proposal for a state prison to be developed within the project area. This has been incorporated in the structural planning work and the staffing problems examined, but the proposal has not been developed to the stage where it can be treated as part of the project implementation.

10.7 Ministry of Education

The Ministry of Education is faced with a considerable problem in staffing the schools in the project area. The programme for the schools is shown in Figure 3.15. It can be seen that 96 staff are required by mid 1980 and 160 by 1981.

Normally primary school buildings and the associated teacher housing are provided on a self-help (harambee) basis, the Education Ministry providing the staff. In the case of this project the normal practice cannot be followed because new communities of mixed backgrounds are being formed. Thus while the village schools will be built by tenants using materials provided by NIB, but subject to repayment, the teachers' houses at both the rural centre and the villages, and the two primary schools at the rural centre will be built under contract.

Housing for education has been provided on the basis that some married couples will both be teachers, and accordingly only 12 houses per double stream school have been provided for 15 teaching staff. These numbers will require adjustment to suit the mix of staff actually recruited for the project.

10.8 Public Health Development

The Public Health Annexe gives a detailed programme for development. Public health buildings and housing are included in the ICB building contracts because their provision under a separate contract would be uneconomic and difficult to integrate with the other work at site. The NIB and the Ministry of health will have to agree procedures for the work to be done as proposed because the Ministry of Health is currently responsible for all public health building construction.

Predevelopment work and some staff training would be carried on from Hola Hospital. The health centre construction and associated housing are included in the advance building contract.

CHAPTER 12. RESPONSIBILITIES FOR PROJECT IMPLEMENTATION

12.1. Introduction

The general supervision of the National Irrigation Board for the Bura Project has been fully described in the Commission, Management and Training Annex. However, to ensure that all aspects of the project contained in this Implementation Annex, a summary of the organization of it is given for the implementation of the project and discusses the role of other government agencies, as well as the private sector.

12.2. The Bura Steering Committee

The Bura Steering Committee will meet under the chairmanship of the Chairman of NIB to discuss matters of general policy, and to advise the Minister of Agriculture accordingly. It will have representatives of all government agencies involved in the project and will have a general policy co-ordinating role resolving any inter-departmental problems of priorities or other difficulties which cannot be resolved through the day-to-day contact at the Bura Co-ordinator's Office level.

An executive sub-committee, under the leadership of the chairman of the National Irrigation Board, will act as the Steering Committee between its regular meetings to avoid delays. This committee will effectively be the body responsible to the Government of Kenya for the implementation of the project.

PART 3

12.3. The Bura Project Co-ordinator's Office

ORGANISATION AND MANAGEMENT DEVELOPMENT

The Bura Project Co-ordinator's Office will be staffed by permanent NIB staff and advisers, seconded staff from government ministries, and other agencies, and project consultants staff.

All these staff will operate as one team under the Project Co-ordinator and not as separate units applying for funds. The role of the office must be active, initiating action in the other agencies concerned in the various components of the project, rather than a purely passive co-ordinating role, and it must be made clear to all participating agency staff so that the need to refer matters to the Executive Committee for decision is minimized.

12.4. Bura Development Committee

Matters relating to the administration of construction contracts which arise at the project site will be dealt with by the Chief Resident Engineer's staff in co-ordination with the P.M.O. Other matters at the project site will be initially the responsibility of the Deputy Project Manager who will liaise with local representatives of the various government organizations. Apart from matters arising during construction there will be a continuing need during the operation of the project for close liaison between the project management and local district administration. A Bura Development Committee is proposed for this purpose, to be set up during the implementation period. Its functions and membership are fully described in the Institutions and Services Annex, but its main purpose will be to resolve problems in the fields of housing, welfare and local organization at site level, and to act as a channel of communication between the project management and the local administration.

CHAPTER 11 RESPONSIBILITIES FOR PROJECT IMPLEMENTATION

11.1 Introduction

The proposed organisation of the National Irrigation Board for the Bura Project has been fully described in the Organisation, Management and Training Annexe. However, to ensure that all project aspects are contained in this Implementation Annexe, a summary of the organisation as it affects the implementation of the project and discusses the role of other government agencies, is set out below.

11.2 The Bura Steering Committee

The Bura Steering Committee will meet under the chairmanship of the Chairman of NIB to discuss matters of general policy, and to advise the Minister of Agriculture accordingly. It will have representatives of all government agencies involved in the project and will have a general policy co-ordinating role resolving any inter-departmental problems of priorities or other difficulties which cannot be resolved through the day-to-day contact at the Bura Co-ordinator's Office level.

An executive sub-committee, under the leadership of the chairman of the National Irrigation Board, will act for the Steering Committee between its regular meetings to avoid delays. This committee will effectively be the body responsible to the Government of Kenya for the execution of the project.

11.3 Bura Project Co-ordinator's Office

The Bura Project Co-ordinator's Office (BPCO) will effectively run the implementation phase of the project, and will be staffed by permanent NIB staff and advisers, seconded staff from government ministries, and other agencies, and project consultants' staff.

All these staff will operate as one team under the Project Co-ordinator and not as separate units within the office. The role of the office must be active, initiating action in the other agencies responsible for various components of the project, rather than a purely passive co-ordinating role, and this must be made clear to all participating agency staffs so that the need to refer matters to the Executive Committee for decision is minimised.

11.4 Bura Development Committee

Matters affecting the administration of construction contracts which arise at the project site will be dealt with by the Chief Resident Engineer's staff in co-ordination with the BPCO. Other matters at the project site will be initially the responsibility of the Deputy Project Manager who will liaise with local representatives of the various government organisations. Apart from matters arising during construction there will be a continuing need during the operation of the project for close liaison between the project management and local district administration. A Bura Development Committee is proposed for this purpose, to be set up during the implementation period. Its functions and membership are fully described in the Institutions and Services Annexe, but its prime purpose will be to resolve problems in the fields of housing, welfare and local organisation at site level, and to act as a channel of communication between the project population and the local administration.

11.5 Seconded Government Staff

Seconded government staff will operate as members of the Bura Co-ordinator's office based in Nairobi, or as members of the Project Manager's office based at the project site. Salaries and allowances will be paid to the staff by their parent Ministry in the usual way, and the Ministry will be reimbursed for such expenditure from project funds by the Treasury under a certificate from NIB authorising the reimbursement. Housing will be provided by NIB at site when required. Staff will be allocated on a full time basis by the Ministries of Information and Lands and Settlement as indicated earlier.

Other government staff appointed to Ministry duties at the project site will be funded on a similar basis during the implementation period. At the end of this period, staff will become a direct charge on each Ministry's budget in the normal way. Budgets for the implementation period terminating at the end of June 1983, are shown in the specialist annexes.

Housing will be constructed under the NIB building contracts, and allocated by the Senior Settlement Officer. It is proposed that an agency agreement be made between the Ministry of Works and NIB for the NIB to maintain the government housing and office buildings in the project area. This will avoid the need to duplicate the NIB maintenance staff in this remote area. Should the Ministry of Works wish to establish a maintenance team at the project, however, provision has been made in the structural plan for a Ministry of Works component at the rural centre.

11.6 The Bura Project Manager

The Project Manager will initially be provided by a specialist management organisation together with other key members of the project management team. His function will be to manage agricultural operations. He will work with the Project Co-ordinator in Nairobi until the end of 1978, when he will take charge of the project site to manage the developing project. He will have no responsibility for construction, which will rest with the Chief Resident Engineer, or for the establishment of government administration, which is the responsibility of the District Officer, but he will be an executive member of the Bura Development Committee.

11.7 Consultants' Staff

The consultants' staff at the project site will be responsible for the administration and supervision of contract works under the direction of the Chief Resident Engineer, who will report directly to the Deputy Project Co-ordinator (the consultants' Resident Representative) thus placing all matters relating to contracts directly under the Co-ordinator's office. The Chief Resident Engineer will be the third executive member of the Bura Development Committee, and responsible for liaison with the NIB Welfare Officer and the Senior Settlement Officer on all settlement matters.

The job descriptions of the consultants's staff to be employed in the Bura Co-ordinator's office are given in the Organisation, Management and Training Annexe (OMT). Each member of the staff will have a particular responsibility for planning, procurement or construction, and the training of counterpart staff.

11.8 Control and Co-ordination

These aspects are described in detail in OMT Annexe, and the management organisation diagrams from that annexe are reproduced for completeness in Figures 11.1 and 11.2.

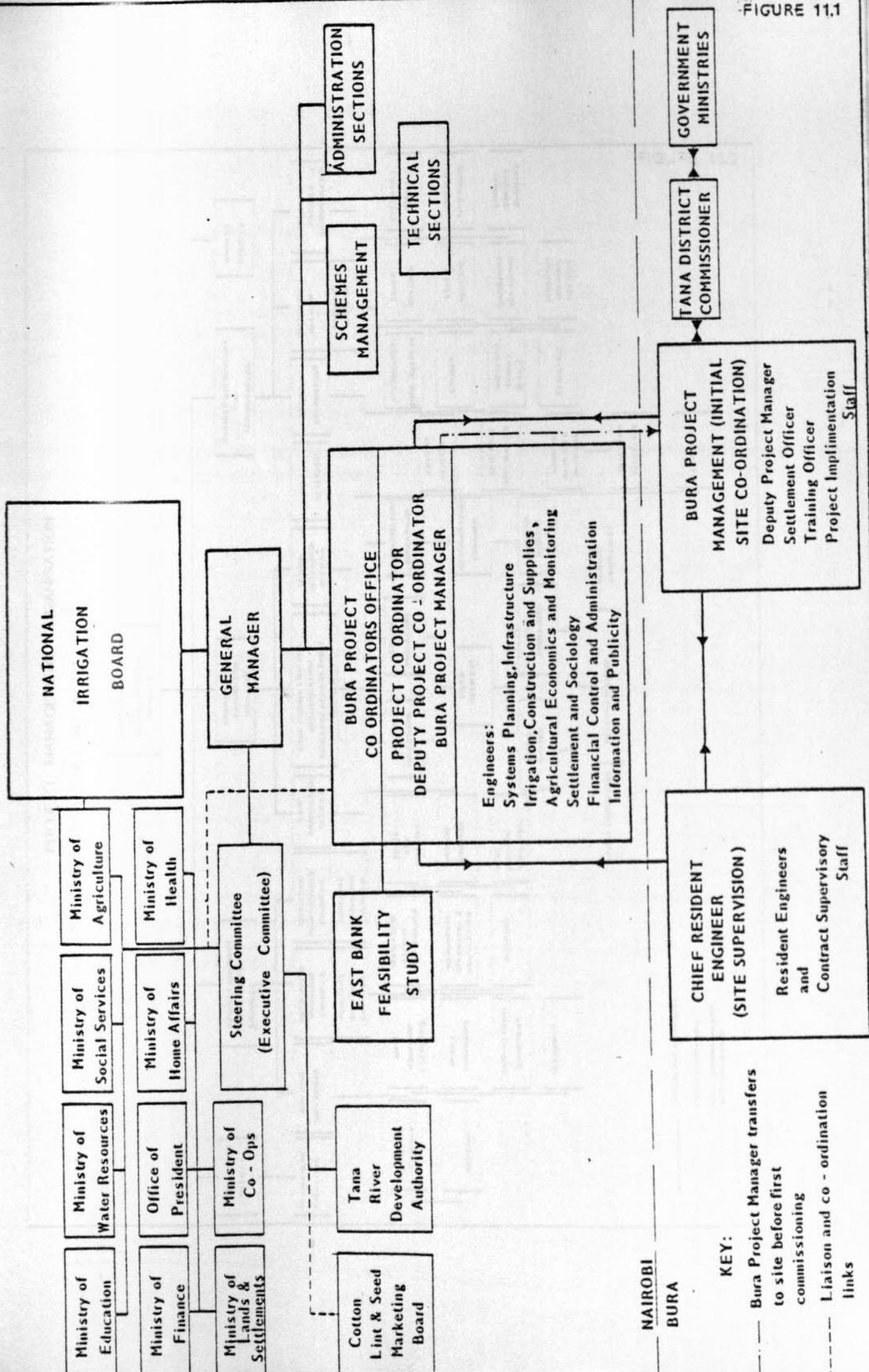


FIGURE 11.1

KEY:

- Bura Project Manager transfers to site before first commissioning
- - - Liaison and co-ordination links



TRAINING DIVISION

DEPUTY DIRECTOR

ASSISTANT DIRECTOR

SPECIAL AGENT IN CHARGE

GENERAL INVESTIGATIVE DIVISION

TO ALLIANCE WITH
 DOMESTIC SECURITY
 AND ABROAD - SECTION 1
 SECURITY INVESTIGATION

LABORATORY

TRAINING DIVISION

RECORDS DIVISION

GENERAL INVESTIGATIVE DIVISION

TRAINING DIVISION

RECORDS DIVISION

TRAINING DIVISION
 RECORDS DIVISION

11.9 Transition to Agricultural Management

The initial development of the project, procuring contracts, organising tenants to migrate to the project, and mobilising government staffing for the area, will be the responsibility of the Bura Project Co-ordinator's office.

As construction proceeds on site, and the first staff and tenants arrive, the emphasis will change and the project will come increasingly under the control of the Bura Development Committee although within NIB the Co-ordinator's office will still fulfil a major function.

On completion of the development phase of the project, the office staffing levels will be modified, so that it may utilise the experience gained in the Bura Project in any new National Irrigation Board developments, including the development of Stage II of the Bura Project.

11.10 Agricultural Management Organisation

The agricultural management input from an outside management organisation is planned to be of six year duration. Each member of the expatriate core management team will have a Kenyan counterpart, who will be trained to assume project management responsibilities as soon as possible, in less than the six year period if appropriate.

The project management will communicate directly with the NIB management at Headquarters on all matters once development has taken place. Full details are given in the Organisation, Management and Training Annexe.

11.11 Local Administration

The local administration will be housed in accommodation provided by the NIB initially, and as the community develops and becomes established it will take over from the NIB the administration of the abattoir, sewage disposal, refuse collection, the development of amenities and local planning.

Treated water supply will not become the responsibility of the local administration, but will be taken over by the Ministry of Water Development.

CHAPTER 12 SUMMARY OF RECOMMENDATIONS

12.1 Organisation

- (a) The National Irrigation Board under its Chairman shall be responsible for the development of the project.
- (b) The Bura Steering Committee shall co-ordinate activities by all government agencies in developing the project.
- (c) The Bura Project Co-ordinator's office shall be established in the NIB, incorporating NIB staff, seconded government staff and consultants' staff to implement the project.
- (d) The Project Co-ordinator will be responsible to the Chairman of the NIB, and act as secretary of the Bura Steering Committee.
- (e) Finance shall be made available to NIB by the Ministry of Finance and Planning in the form of a grant, for the work on the project for which NIB is responsible.
- (f) Finance for other components of the project will be disbursed by the Ministry of Finance and Planning, after certification by NIB, who will co-ordinate all project expenditure.
- (g) The Ministry of Finance and Planning will be responsible for the withdrawals of the proceeds of all loans, grants and other financial aid allocated to the project.

12.2 Procurement

ICB Contracts

Construction work shall be allocated to contracts for international competitive bidding as follows:-

- (a) River diversion structure and associated earthworks.
- (b) Temporary pump station, supply canal structures, main canal, irrigation network, on-farm development works and project roads.
- (c) Advance buildings, sewerage works and temporary domestic water supply to the rural centre and first three villages.
- (d) Buildings, domestic water treatment works and distribution system to villages, advance tenant housing.
- (e) Ginnery, turnkey contract including all machinery and operating equipment.

The National Youth Service

The National Youth Services shall construct the following works under force account:-

- (a) Supply canal earthworks including wildlife crossings and pools.
- (b) Garsen-Garissa road.
- (c) Main airstrip at new rural centre and two crop-spraying airstrips.

- (d) Nanigi access road.
- (e) Delivery and stockpiling of tenant house construction materials.
- (f) Pit latrines, showers, water points and washing areas in villages.

Vehicles, Plant and Equipment

Vehicles, farm machinery, equipment and plant shall be provided by international competitive bidding in annual contracts with bidding permitted for individual items, except for nominated supply items.

12.3 Specialist Assistance

- (a) NYS construction operations shall be managed by experienced contracting personnel appointed through the successful contractor for ICB contract (b) described above.
- (b) Bura Co-ordinator's office shall be strengthened by the appointment of project consultants' staff to that office to assist in project management, planning and co-ordination.
- (c) Staff experienced in settlement and information operations should be seconded to the Co-ordinator's office and to the project site to assist in the settlement operation.
- (d) An agriculture management organisation shall be appointed to operate the project and train local staff for an initial period.
- (e) All design and site supervision shall be carried out by the project consultants except where otherwise indicated in this annex.