



SOMALI DEMOCRATIC REPUBLIC
STATE PLANNING COMMISSION

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MOGAMBO IRRIGATION PROJECT

Supplementary Feasibility Study

ANNEX 6 Infrastructure and Institutions ANNEX 7 Economics

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MOGAMBO IRRIGATION PROJECT
SUPPLEMENTARY FEASIBILITY STUDY

This report comprises the following volumes:-

Main Report

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ANNEX 7

ECONOMICS

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CHAPTER 1

SUMMARY

This annex examines the economic and agricultural background in Somalia, and discusses the marketing mechanisms and financial and economic crop prices. Economic models for the project are constructed and analysed, and the recommended model is discussed in detail.

Somalia is one of the world's lesser developed countries, and has a population of nearly 4 million. The majority of the country's economic activity is concerned with agriculture and stock-raising, but prospects for increasing either are limited, particularly for dryland farming and traditional stock-raising. Irrigated agriculture along the Shabelle and Juba rivers can be developed, and increased production would reduce or eliminate food imports.

The national balance of payments situation is serious, with exports being valued at just over 30% of imports, although considerable amounts of aid have been received.

The purchasing, distribution and marketing of foodstuffs is controlled by various Government agencies, particularly the Agricultural Development Corporation, and prices are fixed by Government decree.

The urgency to produce more food efficiently in Somalia is great, in terms of self-sufficiency, foreign exchange loss, and a low per capita GNP. It was decided to propose an irrigated agricultural development scheme for Mogambo using a state farm approach for reasons detailed in other Annexes, not the least of which were the potential speed of development of a state farm, and the lack of experience in Somalia with large scale settlement and cooperative schemes.

Two major factors affecting the design of the project were the two basic soil types and the prospect of perennial water availability from the proposed Bardheere dam. The project irrigable area comprises approximately 50% basin clays which can be surface irrigated, and 50% levee and other soils for which overhead irrigation is proposed. Proposals have been submitted for construction of a dam at Bardheere, which would guarantee perennial regulated water supplies, but the dam is unlikely to be finished before year 7 of the Mogambo project implementation.

The initial design of the project considered these factors in conjunction with the crop budgets derived for the suitable crops identified in Annex 3. The first plan comprised some 3 300 ha of surface irrigated paddy rice on the basin soils in the gu season, followed by 2 300 ha of maize in the der. On the levee soils, 1 100 ha of cotton, 1 000 ha of upland rice followed by maize, and 1 000 ha of der season maize were proposed. This cropping pattern would be virtually unaffected by the implementation of Bardheere dam, except that there would be more flexibility in planting dates and longer maturing varieties could be introduced.

Both the economic and financial rates of return were found to be very low, at just over 3%, and sensitivity tests showed that the internal rate of return (IRR) was little affected even by 20% changes in costs or revenues. The returns were too low for the project to be recommended, so five alternative cases were

examined. These variously included developing the basin soils only, delaying the project until Bardheere dam is operational, and substituting the higher valued crop of bananas after Barddheere dam is constructed.

Restricting the project to the basin soils caused little improvement since higher per hectare returns were offset by the loss of economies of scale. The most profitable case involved delaying the whole project until Bardheere dam is operational, then including 1 200 ha of bananas on the levee soils instead of single-cropped maize. However, this case was not favoured because it would have meant waiting an estimated eight years before the project would start, whereas there is an urgent need in the national context to implement as fast as possible.

Of the six options examined, the one which is recommended involves developing the project as in the original model over the whole area from the start but introducing 1 200 ha of bananas on the levee soils when Bardheere water becomes available. The economic rate of return of this option is just under 6%, and the financial rate of return is just over 4%. An assumed two year delay in the construction of Bardheere dam only causes a reduction of 0.5% in the rate of return.

An important feature of the proposed project is that foreign exchange earnings considerably exceed foreign exchange costs, even when discounted to the present day. Since the Somali shilling is regarded by most funding agencies, including the IBRD, as being overvalued by some 50%, shadow pricing foreign exchange at the true open market exchange rate gives an internal rate of return for the recommended option of just over 9%.

The original proposals for the project, put forward in the TAMS/FINTECS study, showed much higher rates of return. The reasons for this are discussed in detail in Chapter 9 of this annex, but the main reason is that the capital costs of the engineering works es estimated by TAMS/FINTECS are approximately 55% of the estimates given in this report. It is considered that the TAMS/FINTECS study did not consider the engineering works in sufficient detail to enable an accurate cost estimate to be developed.

CHAPTER 2

ECONOMIC AND AGRICULTURAL BACKGROUND

2.1 Economic Background

2.1.1 General

Somalia is one of the world's lesser developed countries. The IBRD estimated the per capita gross domestic production at \$ 110 in 1977. The United Nations Economic Commission for Africa have estimated the annual growth of per capita GDP at 1.5% during the period 1970 to 1976. This rate implies an actual annual growth of 4.1%, given a population growth rate during that period of 2.6% per year. The country was severely affected by drought in 1974/75; recent demographic studies suggest the annual growth rate may have risen to 2.9% since the drought.

A national population and livestock census was undertaken in 1975. Because of administrative difficulties, the results had not been completed for all districts at the time of writing (May 1979). Table 2.1 shows provisional summary figures supplied by the State Planning Commission (SPC) as background data for the draft Revised Three Year Development Plan. It should be remembered that these data were collected under very difficult conditions at the height of the drought and, in addition, subsequent mortality and associated compensatory regrowth may have altered the situation.

Of the human population estimated at 3.5 million, some 60% are nomadic and the remainder are nearly equally divided between settled agriculture and non-agricultural occupations. The total area of Somalia is approximately 637 000 km² giving an overall population density of less than 6 persons/km². Only in the extreme north-west, in Mogadishu, and along the developed Shabelle valley does the population density exceed 10 persons/km². However, the concentration of development effort along the Juba river should increase the density in this region significantly.

The poor resource base away from the river valleys, difficulties in communications and the nomadic habits of the majority of the population have all hampered national efforts to improve rural infrastructures and social services. The life expectancy of 41 years is one of the lowest in the world. Between 15 and 20% of all children born in Somalia die before the age of one, and another 15% before the age of five. A recent pilot household survey indicated that 70% of urban families had a food intake below the level required to establish a minimum diet of 2 200 calories per adult person.

2.1.2 Central Government Finance

Table 2.2 shows details of the financial activities of the Central Government from 1947 to 1977 and the budget for 1978.

From 1974 to 1976 a small surplus had been achieved on the ordinary budget, that is the difference between tax and other internal revenue, and general domestic Government expenditure. However, expenditures classified as 'Development' and 'Extra-budgetary' have exceeded 'Ordinary' expenditures in all years. Funding for these categories has been provided mainly by external grants and loans and, to a lesser extent, by domestic finance. External assistance was particularly heavy during the drought period in 1975.

TABLE 2.1
Provisional Results of 1975 Census (see Figure 2.1)
Human Population Levels and Densities by Region

Region	Population (000)				Land area (000 km ²)	Density (persons/ km ²)
	Nomadic	Settled farming	Non- agri- cultural	Total		
1. West Galbeed	271	118	51	440	45	10
2. Togdheer	198	42	18	258	41	6
3. Sanaag	113	22	10	145	54	3
4. Bari	116	27	11	154	70	2
5. Nugal	66	15	6	87	50	2
6. Mudug	170	32	13	215	70	3
7. Galgadud	119	44	19	182	43	4
8. Hiran	116	22	9	147	34	4
9. Middle Shabelle	166	68	29	263	22	12
10. Lower Shabelle	193	143	62	398	25	16
11. Benadir ⁽¹⁾	-	-	380	380	1	380
12. Gedo	181	22	9	212	32	7
13. Middle Juba	141	52	23	216	23	9
14. Lower Juba	155	48	20	223	61	4
15. Bakool	79	15	6	100	27	4
16. Bay	100	141	61	302	39	8
TOTAL	2 184	811	727	3 722	637	6
Groups of Regions⁽²⁾						
1-2 North-west	469	160	69	698	86	8
3-5 North-east	295	64	27	386	174	2
6-7 Central	289	76	32	397	113	4
8-11 Shebelle river	475	233	480	1 188	82	14
12-14 Juba river	477	122	52	651	116	6
15-16 Inter-riverine	179	156	67	402	66	6

Notes: (1) Comprises Mogadishu and district

(2) Groups used here have no administrative significance.

Source: State Planning Commission

Somalia: regions and districts

2.1

- Region Boundary
- District Boundary
- Mogambo Project

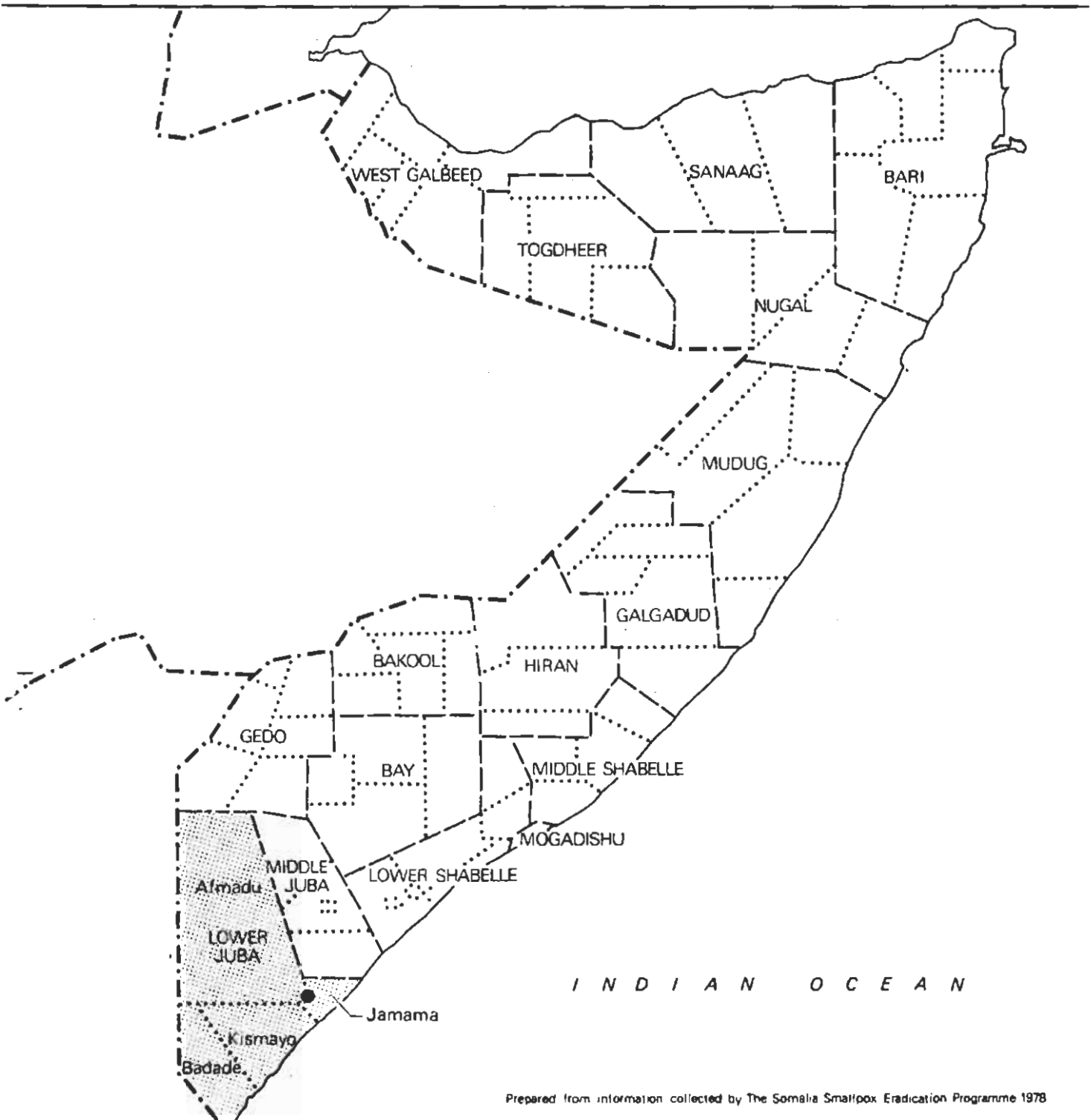


TABLE 2.2
Central Government Finance (million SoSh)

Classification	1974	1975	1976	1977	1978
	actual	actual	actual	preliminary actual	budget
Tax Revenue					
On net income & profits	38	45	54	62	55
On goods & services	121	148	165	164	375
On international trade, etc.	261	246	254	289	630
Others	42	52	56	63	105
Total Tax Revenue	462	491	529	578	1 165
Non-Tax Revenue					
Property Income	67	106	102	138	256
Other	27	27	36	47	34
Total Non-Tax Revenue	94	133	138	185	290
Total ordinary revenue	556	624	667	763	1 455
Expenditure					
General public services	190	193	206	244	497
Defence	135	145	165	200	500
Social services	93	127	160	197	235
Economic services & others	90	102	117	124	130
Total ordinary expenditure	508	567	649	765	1 363
Ordinary surplus	47	57	18	(2)	92
Development expenditure	351	355	624	945	1 163
Extra-budgetary expenditure	310	578	307	95	-
Overall Deficit	614	876	913	1 042	1 071
Financed by					
External grants	304	631	250	657	400
External loans, net	255	269	424	205	400
Domestic finance, net	55	(25)	239	181	271

Sources: Ministry of Finance and IBRD

Import duties have been increased during recent years but physical levels of imports are expected to stabilise after a period of rapid growth. The full effectiveness of import taxation is restricted because exemptions are usually granted on development goods at the request of external financing agencies. In addition, goods entering under the Franco Valuta system (see Section 2.1.3) are frequently undervalued when declared for customs purposes.

The autonomous agencies (public enterprises) contribute approximately 17% of all Government revenues. Currently 80% of the agencies' profits net of depreciation allowances are taken by the turnover tax (50%) and profit share (30%). In addition, the Government receives 50% of depreciation provisions. The profitability of state enterprises has not kept pace with the increase in Government levies, with the result that some agencies have been forced to borrow to pay their taxes.

Expenditure is divided between wages and salaries (45%) goods and services (41%) and transfer payments (14%). Continuous inflation pressures exist in all these areas.

Both revenue and expenditure were budgeted to increase sharply in 1978. In view of the limited opportunities for increasing revenue, no significant ordinary revenue surplus should be expected. Thus, reliance will continue to be placed on external sources for grants and loans to finance development expenditure.

2.1.3 Balance of Payments

Table 2.3 shows the balance of payments situation from 1973 to 1977. The overall total is positive in four out of the five years, but several important factors lie behind these results.

Merchandise exports fell to 35% of imports in 1977⁽¹⁾. The most important export commodities, accounting for 91% of the total in 1977, are livestock, livestock products and bananas (see Table 2.4). Live animal exports have been restricted both by the after effects of the drought and by depression in the world beef markets. The Sopral meat factory closed completely and the Kismayo plant was severely affected by the withdrawal of Soviet assistance.

Exports of hides and skins were thus reduced. Banana exports dropped considerably over the period both in quantity as well as financial terms due to increasingly poor productivity and the temporary loss of 2 500 ha in the 1974/75 drought and 1977 flood. A dispute with the main purchaser of bananas in Saudi Arabia also reduced exports in 1977.

Future prospects for exports should be brighter. The live beef market in Saudi Arabia is buoyant and expanding, and herds have now been reconstituted. A new contract for bananas is under negotiation with Kuwait, and the Banana Board has improved its programme of technical assistance to farmers.

Import levels have been kept reasonably stable in real terms in line with the slow growth in the economy (see Table 2.5). Sugar imports rose to nearly 50 000 tons in 1977 after consumption rose from 50 000 tons per year in 1970 to 78 000 tons in 1977, but this drain on foreign exchange should be relieved when the Juba Sugar project begins to produce sugar. Food imports constitute only 16% of the total; manufactured goods and machinery make up the highest proportion of imports, reflecting the slow development of the industrial sector in Somalia. Of food imports, cereals and cereal products account for three-quarters of the total. Substantial grants of food aid have been made in the past.

TABLE 2.3

Somalia - Balance of Payments, 1973-1977 (million SoSh)

	1973	1974	1975	1976	1977
Exports (FOB)	358	403	558	510	449
Imports (CIF)	(704)	(967)	(1 021)	(1 108)	(1 296)
Trade balance	(346)	(564)	(463)	(598)	(847)
Transport and insurance	(7)	(12)	(18)	(20)	(7)
Travel	(9)	(14)	(32)	(40)	(15)
Investment income	9	12	2	8	13
Government (not included elsewhere)	(50)	(54)	(11)	(52)	3
Other services	(20)	(18)	(121)	(95)	(32)
Services balance	(77)	(86)	(180)	(95)	(38)
Net unrequited transfers					
Private	18	23	12	7	14
Official	163	303	631	250	666
Transfers balance	181	326	643	257	680
Net capital account					
Private	28	39	59	22	97
Central Bank	170	225	269	424	355
Commercial banks	50	(61)	(134)	93	(110)
Capital balance	248	203	194	539	342
Errors and omissions	-	(5)	(6)	-	41
TOTAL	6	(127)	188	103	178

Source: Central Bank of Somalia

TABLE 2.4

Exports from Somalia, 1970 and 1974 to 1977

Item	1970	1974	1975	1976	1977
Livestock	119.3	222.4	382.0	301.9	299.5
Bananas	62.9	79.8	64.3	88.2	53.0
Meat and meat products	6.4	35.7	44.1	37.1	32.1
Fish and fish products	1.4	15.2	11.6	23.3	21.2
Hides and skins	15.0	14.1	26.2	44.4	23.6
Myrrh	7.2	10.8	8.0	11.3	11.9
Others	12.1	12.6	21.4	4.1	7.7
TOTAL	224.3	390.6	557.6	510.3	449.0

Source: State Planning Commission - Foreign Trade Returns
Central Bank of Somalia

TABLE 2.5

Imports to Somalia, 1970 and 1974-1977 (million SoSh)

Item	1970	1974	1975	1976	1977(1)
Cereals and cereal products	55.0	71.5	161.0	134.1	191.4
Coffee, tea, cocoa, spices, etc.	8.2	13.9	12.2	22.4	20.7
Dairy products, eggs	1.7	1.5	7.4	12.5	12.9
Fruit and vegetables	15.5	13.2	18.8	5.0	6.3
Sugar and sugar preparations	0.9	61.5	4.4	1.4	1.6
Other food	2.0	1.3	1.6	2.9	5.1
Beverages and tobacco	8.8	7.3	18.4	22.9	19.9
Inedible crude materials	19.0	44.0	38.7	54.4	64.1
Mineral fuels	20.3	60.3	60.0	67.0	62.5
Animal and vegetable oils and fats	16.3	12.8	29.6	51.4	51.4
Chemicals and rubber products	21.7	67.5	66.2	80.0	95.4
Manufactured goods	76.1	303.4	204.8	200.9	306.1
Agricultural machinery	2.2	25.3	10.3	22.9	52.0
Other machinery	51.0	168.5	298.4	253.1	458.2
Other	23.5	46.4	41.9	59.2	74.2
TOTAL	322.2	898.4	973.7	979.9	1 432.8

Notes: (1) Provisional figures. Central Bank estimates place the total expenditure in 1977 at SoSh 1 296 million.

Source: State Planning Commission - Foreign Trade Returns

The net inflow of official transfers totalled SoSh 2 087 million in the period 1973 to 1977 of which some 65% came from the Arab countries. Part of the transfers represented concessionary assistance, but a large proportion were in the form of emergency assistance particularly for the 1975 drought. Such high levels may not be available in the future. The country requires to build up its absorptive capacity for project assistance to capture funds while they are available - only SoSh 1 341 million out of the SoSh 2 087 million available were disbursed.

Finally, the official balance of payments statistics do not include imports contracted under 'franco valuta'. This is a system used frequently by the large number of Somali people working abroad. Estimates of the number of Somalis working in the Gulf States range from 50 000 to 120 000 and a figure of 100 000 is usually taken for planning purposes. The official value placed on private unrequited transfers of SoSh 14 million in 1977, suggests that, on average, each worker remits US \$ 220 per year. Net earnings in the Gulf should be considerably higher than this, and the IBRD estimates that some SoSh 315 million worth of goods are imported each year under the franco valuta system by expatriate Somalia workers.

A franco valuta transaction works as follows. A group of Somalis purchase, say, a cargo of sugar in Jeddah, paid for in Saudi Riyals. An entrepreneur then arranges shipment into Somalia and pays nominated Somali agents or the expatriates' families with Somali shillings. Goods are frequently undervalued when declared for customs' purposes. This practice has contributed to the establishment of an unofficial value for the Somali shilling, which is presently quoted at 9.5 per US dollar on the black market in the Gulf.

The Government is now attempting to control these imports by issuing licences to traders wishing to make purchases abroad with foreign exchange.

2.1.4 Government Planning Strategy

The Government has prepared and implemented a series of National Development Plans. The most recent of these, the Five Year Development Plan (FYDP) ran from 1974 to 1978. SoSh 3 750 million were originally allocated for expenditure under this plan. SoSh 3 438 million were actually spent, but the budgeted cost, in current terms, had risen to SoSh 7 162 million by the completion date. This rise was due to the worldwide increase in prices and the inclusion of extra projects subsequently found to be necessary. Thus, approximately half of the plan was implemented.

However, it must be remembered that Somalia was beset by forces outside its control during this period. First, the international monetary crisis and subsequent world-wide inflation caused considerable price increases. The percentage change in the Mogadishu consumer price index ran at 7% during the period 1966 to 1972 but increased by 113% from 1972 to November 1978, as shown in Table 2.6. The effect was especially felt as the value of Somali imports is more than double that of exports.

TABLE 2.6

Percentage Changes in Consumer Price Index - Mogadishu, 1966 to 1978

Period	Food	Clothes	House rent	Fuel and lighting	Miscellaneous	Total
1966 - 1972	8	37	-18	-1	21	7
1972 - 1978	114	93	18	9	85	113

Source: State Planning Commission

Secondly, the increased wealth of the Arab nations led to a drain of skilled personnel from Somalia, although the financial effect was mitigated by increased remittances from these workers. Thirdly, from 1973 to 1975 the country experienced a very severe drought, which particularly affected the nomads and their livestock. Fourthly, resources were diverted to deal with border conflicts during this period. In the context of these difficulties, the achievements under the FYDP must be seen as creditable.

At the time of writing, a new Three Year Development Plan (TYDP) was being finalised, with the objective of completing the most important elements of the FYDP and adding new projects considered important. Preliminary estimates of expenditure under the TYDP are given in Table 2.7.

TABLE 2.7

Preliminary Estimates of Expenditure in the Three Year Development Plan

Sector	million SoSh	Percentage of total
Agriculture, livestock & fisheries	2 516	36
Minerals and manufacturing	1 279	18
Economic infrastructure (transport, communications, power and water)	2 041	29
Education	523	7
Others	745	10
TOTAL	7 104	100

Source: State Planning Commission

2.2 Agricultural Background

2.2.1 Agricultural Production

Out of a total land area of 64 million ha, only 8.2 million is regarded as cultivable. Of this, the latest Ministry of Agriculture estimates suggest that only about 500 000 ha are under cultivation. Part of the land is cropped twice a year in the higher rainfall areas of the dryland farming belt and where irrigation is possible. The overall cropping intensity is assessed at 135%.

The estimated and potential areas of irrigated and rainfed farming are shown in Table 2.8.

TABLE 2.8

Present and Potential Cultivated Areas ('000 ha)

	Present	Potential
Under controlled irrigation		
North-west region	1	4
Shabelle river	35	86
Juba river	14	160
Sub-total	50	250
Under uncontrolled flood irrigation	100	-
Rainfed farming	350	7 950
TOTAL	500	8 200

Source: State Planning Commission

TABLE 2.9

Agricultural Production of Annual Crops in Somalia - 1978 Estimates (1)

Area (000 ha)	Maize	Sesame	Rice	Groundnuts	Vegetable	Cotton	Sorghum	Beans	Total
West Galbeed	-	-	-	-	1.7	-	52.5	-	54.2
Togdheer	-	-	-	-	0.1	-	22.7	-	22.9
Sanaag	-	-	-	-	0.4	-	3.0	0.9	4.3
Bari	-	-	-	-	0.1	-	0.3	1.7	2.1
Nugal	-	-	-	-	0	-	1.7	2.2	3.9
Mudug	-	-	-	-	-	-	0.7	12.9	13.6
Galgaduud	-	-	-	-	-	-	0.7	13.2	13.9
Hiran	6.1	5.3	-	0.8	0.1	0.5	22.7	2.6	38.1
Middle Shabelle	17.2	12.7	1.1	0.2	0.1	1.5	15.0	-	48.0
Lower Shabelle	71.8	76.0	3.9	2.0	1.8	0.9	49.8	-	206.3
Benadir	-	-	-	-	-	-	-	-	-
Gedo	6.6	1.6	-	-	0.1	-	12.0	-	20.4
Middle Juba	18.3	18.1	1.7	0.3	0.6	0.3	16.1	-	55.4
Lower Juba	14.7	19.6	0.5	0.3	0.1	1.4	16.7	-	53.3
Bakool	-	-	-	-	-	-	18.1	-	18.1
Bay	-	-	-	0.4	0.1	-	102.4	-	102.8
Total	134.6	133.3	7.3	4.0	5.3	4.6	334.5	33.5	657.2
Production (000 tonnes)									
West Galbeed	-	-	-	-	8.4	-	22.1	-	-
Togdheer	-	-	-	-	0.7	-	9.6	-	-
Sanaag	-	-	-	-	2.3	-	1.3	0.3	-
Bari	-	-	-	-	0.4	-	0.1	0.5	-
Nugal	-	-	-	-	-	-	0.7	0.7	-
Mudug	-	-	-	-	0.1	-	0.3	3.9	-
Galgaduud	-	-	-	-	-	-	0.3	4.0	-
Hiran	4.8	1.6	-	0.6	0.7	0.3	9.6	0.8	-
Middle Shabelle	13.8	3.8	1.8	0.1	0.7	1.1	6.4	-	-
Lower Shabelle	57.4	22.8	6.5	1.4	8.9	0.6	21.0	-	-
Benadir	-	-	-	-	-	-	-	-	-
Gedo	5.3	0.5	-	-	0.8	-	5.1	-	-
Middle Juba	14.6	5.4	2.9	0.2	2.9	0.2	6.8	-	-
Lower Juba	11.7	5.9	0.8	0.2	0.3	1.0	7.1	-	-
Bakool	-	-	-	-	-	-	7.1	-	-
Bay	-	-	-	0.3	0.4	-	43.2	-	-
Total	107.7	40.0	12.1	2.8	26.5	3.2	141.1	10.1	-

Note: (2) Estimates refer to total of su and der production. Intensity of cropping estimated at 135%.

Source: Ministry of Agriculture

TABLE 2.10

Estimated Value of Present Agricultural Production in Somalia

Crop	Output (000 tonnes)	Farmgate price (SoSh/tonne)	(million SoSh)
Maize	107.7	750	80.8
Sesame	40.0	2 400	96.0
Rice	12.1	3 200 ⁽¹⁾	38.7
Groundnuts	2.8	1 350	3.8
Vegetables	26.5	4 000 ⁽²⁾	106.0
Cotton	3.2	2 500 ⁽³⁾	8.0
Sorghum	141.1	750	105.8
Beans	10.1	1 000	10.1
Bananas- export	57.1	560	32.0
- local	30.7	200	6.1
Sugar cane	320.0	160 ⁽²⁾	51.2
TOTAL			538.5

- Notes: (1) Assuming a mixture of upland rice at SoSh 3 500 and paddy rice at at SoSh 2 850.
 (2) Estimate
 (3) 50% Grade I; 50% Grade II.

TABLE 2.11

ADC Purchases and National Production (1978)

Crop	Production ⁽¹⁾ (tonnes)	ADC purchases (tonnes)	Purchases by ADC (%)
Maize	107 740	10 760	10.0
Sorghum	141 090	43 867	38.2
Sesame	40 000	8 065	20.2
Rice	12 060	847	7.0
Groundnuts	2 790	20	0.7
Cotton	3 240	1 294	39.9

Note: (1) From Ministry of Agriculture estimates

Source: ADC

Dryland and flood irrigated farming is still the predominant pattern from which some 170 000 families obtain their subsistence and a marketable surplus. These families operate smallholdings averaging 3 to 4 ha each and rear some livestock. They account for almost the whole domestic production of food grains and oilseeds.

Table 2.9 shows the estimates of the production of annual crops in Somalia presented by region. Sorghum is grown throughout the country and covers about 50% of the total cropped area, almost entirely under rainfed conditions. Maize and sesame are confined to the southern regions but cover 20% each of the cropped area. Production of cotton, rice, fruit and vegetables is relatively low and of minor importance so far.

Amongst the perennial crops, the most important are bananas and sugar cane. Bananas were grown on 4 600 ha in 1978, 60% in the Shabelle valley and 40% in the Juba valley. Net exportable production amounted to 57 000 tonnes, although half as much again was disposed of on the local market. Sugar cane is grown on nearly 7 000 ha at Jowhar in the Middle Shabelle region, yielding some 320 000 tonnes of cane. Refined sugar production came to 30 000 tonnes - none were exported. A new sugar estate is under construction in the Lower Juba at Marere for which development will be in two stages of 8 000 and 5 000 ha, respectively. At full development, over 100 000 tonnes of sugar should be produced annually, generating a small surplus for export. Grapefruit production is not significant at present, but a plantation extending up to 1 500 ha is being established at Goleweyn in the Lower Shabelle area. Target yields are 30 tonnes/ha, 50% of which may be exported.

Table 2.10 shows an estimate of the value of present production at actual or estimated farmgate prices. Apart from the export (banana) or industrial (sugar cane) crops, the Agricultural Development Corporation (ADC) is charged with the purchase and distribution of food within Somalia. Table 2.11 compares the estimates of total production in 1978 with the amount purchased by ADC. It is fairly clear that ADC handles the minority of the crop. The rest is consumed by the producer or traded privately; ADC claim to handle 60% of the volumes traded.

Referring to Table 2.5, the estimated value of imports of cereals, fruit and vegetables, sugar and other foods totalled SoSh 204.4 million in 1977. Although this represents only 14% of the value of all imports, it is equivalent to 38% of the estimated value of domestic production.

2.2.2 Livestock Production

Livestock production is Somalia's chief industry. Livestock and animal products provide nearly 80% of total exports (Table 2.4). Some 80% of the population is engaged in livestock raising of one sort or another and the 60% of the population who are nomadic depend on a stable diet of milk and meat from their herds.

Table 2.12 shows the provisional results of the 1975 livestock census, and Table 2.13 the density of livestock populations per head of population and per km². Sheep, goat and camel populations are highest in the north and cattle in the south; the arid north-east carries the least stock. Cattle are more associated with the developed areas, especially the Shabelle and Juba river valleys, but because of higher population levels, densities of sheep, goats and camels per head of population are low in these regions.

TABLE 2.12

Estimate of Livestock Populations in Somalia by Region ('000 head)

Region	Camels	Cattle	Sheep	Goats	Total
West Galbeed	606	145	2 242	3 076	6 609
Togdheer	320	44	917	902	2 183
Sanaag	205	74	1 521	664	2 464
Bari	240	15	1 388	2 095	3 738
Nugal	155	12	223	611	1 001
Mudug	751	340	1 136	2 744	4 971
Galgadud	395	218	588	1 734	2 935
Hiran	461	170	287	1 159	2 077
Middle Shabelle	236	366	325	720	1 647
Banadir	1	22	6	19	48
Lower Shabelle	293	419	90	200	1 002
Juba	297	1 036	81	177	1 591
Gado	784	528	500	725	2 537
Bay	362	255	55	192	864
Bakool	192	100	79	274	645
TOTAL	5 298	3 744	9 438	15 292	33 772

Source: State Planning Commission, 1975 Census Provisional Results

The offtake from nomadic herds and flocks is usually sent for live export, particularly through the port of Berbera, whereas the domestic market for slaughter animals is supplied from nearby areas. Approximately one-third of Somalia's livestock offtake is for export.

2.3 Implications for the Project

It is clearly very much in the national interest to increase agricultural and livestock production in Somalia, not only to raise living standards but also to improve the current serious balance of payments situation. All of the crops identified for inclusion at Mogambo are either import-substitutes or can be sold directly for export.

The Juba valley is one of the few areas where significant increases in production are technically feasible, and the Mogambo site is one of the most favoured in the valley.

The state farm organisation proposed by the Government of Somalia has the attraction that full development should be attainable reasonably quickly, as opposed to the slower build up of a settlement or smallholder scheme, the experience of which is limited in Somalia and negligible to date in the Juba valley. Seen from the national viewpoint, there is great urgency for increased food production.

TABLE 2.13

Density of Small Livestock Population - by Regional Grouping

	North-west(1)	North-east(2)	Central(3)	Shabelle(4)	Juba(5)	Inter-riverine(6)
Livestock Population ('000 head)						
Camels	926	600	1 146	991	1 081	554
Cattle	189	101	558	977	1 564	355
Sheep and Goats	7 137	6 502	6 202	2 806	1 483	600
Area ('000 km ²)	86	174	113	82	116	66
Livestock Densities (head/km ²)						
Camels	10.8	3.5	10.1	12.1	9.3	8.4
Cattle	2.2	0.6	4.9	11.9	13.5	5.4
Sheep and Goats	83.0	37.4	54.9	34.2	12.8	9.1
Human Population ('000 head)	698	386	397	1 188	651	402
Livestock per Head of Population						
Camels	1.3	1.6	2.9	0.8	1.7	1.4
Cattle	0.3	0.3	1.4	0.8	2.4	0.9
Sheep and Goats	10.2	16.8	15.6	2.4	2.3	1.5

- Notes: (1) West Galbeed and Togdheer
 (2) Sanaag, Bari and Nugal
 (3) Mudug and Galgaduud
 (4) Hiran, Middle Shabelle, Lower Shabelle and Benadir
 (5) Gedo, Middle Juba and Lower Juba
 (6) Bakool and Bay

Source: Table 2.12

CHAPTER 3

MARKET PROSPECTS AND PRICES

3.1 Background

3.1.1 Introduction

The agricultural and livestock elements of the project are discussed in Annexes 3 and 4. The following chapters are concerned with the crop and stock types selected rice, maize, sesame, cotton, bananas and beef cattle. Aspects covered include production, consumption, the balance of supply and demand, market prices and the derivation of economic prices where appropriate.

The project site lies about 70 km from Kismayo, along a good quality metalled road. Kismayo would logically be used as the port for the importation of machinery and materials for the project, and the export of bananas and livestock. Mogadishu lies some 480 km distant. The road is tarred from Mogambo to Gelib, and from Golweyn to Mogadishu. The intervening section is being improved, and the whole road should be metalled by 1981, well in advance of the completion of the Mogambo project.

Transport rates quoted by ADC were :

Rough roads	30 cents/quintal/km
Good roads	25 cents/quintal/km

These rates are not known to be subsidised and can therefore be used in economic calculations.

There are some discrepancies and anomalies in source marketing data available in Somalia, although the Government is in the process of instituting a more rigorous statistical reporting system. The data are, however, sufficiently representative to fulfill the chief objective of this section, which is to establish whether a reasonable market can be expected for the crops proposed at Mogambo, in the quantities envisaged.

3.1.2 Official Bodies involved in Marketing

Four Government bodies are particularly involved in the marketing of the project products. They are commonly referred to by the initials of their English or Italian titles - ADC, ENC, ENB and LDA.

(a) Agricultural Development Corporation (ADC)

ADC is now a part of the Ministry of Agriculture. Its mandate is to purchase and distribute food crops from farmers. Recent ADC purchases are shown in Table 2.11. Operations are organised from 16 regional offices and during the purchasing season temporary collection centres are established.

Where necessary, ADC will store the crop and organise transport. Nationally, storage is available for 162 000 tonnes. On-selling destinations vary between crops. Food grains typically go to municipalities or wholesalers, but may be redistributed nationally in co-operation with ENC. Oilseeds may be consumed locally or transported to the oil mill in Mogadishu. Cotton is sold to Somaltex.

ADC performs other functions. Seed is supplied to farmers and may be graded and treated by the Ministry of Agriculture. ADC owns and operates rice mills in Jowhar and Shalambod, and a total of seven maize driers will shortly be operational. ADC also imports crops not dealt with by ENC, such as maize, sorghum and wheat. Details are shown in Chapter 3.3.

Producer prices for commodities traded by ADC are set by the Council of Ministers. Recommendations on price levels are made jointly by ADC and the Ministry of Agriculture, considering various factors including world price levels and financial returns to farmers.

A farmgate (collection centre) purchase price is established and the resale price is based on this. The mark up, except for cotton, is SoSh 41 per quintal. Technically, a producer must market his produce via ADC, with the exception that each family member can retain 2 quintals of each crop produced. If the producer wishes to keep amounts in excess of this level, he is required to purchase from ADC at the selling price, but this does not always happen. Table 3.1 shows ADC purchase and sales prices current in May 1979.

TABLE 3.1
ADC Purchase and Sales Prices, May 1979
(at collection centre)

Crop	Purchase (SoSh/quintal)	Sale (SoSh/quintal)	Note
Maize	75	116	(1)
Sorghum	75	116	(1)
Upland rice	350	391	(2), (4)
Paddy rice	285	326	(3), (4)
Sesame	240	281	
Cotton - Grade A	260	700	(5)
- Grade B	240	700	
- Grade C	220	700	

- Notes: (1) for 102 kg to allow for moisture loss
 (2) *Oryza Indica*
 (3) *Oryza japonica*
 (4) Hulled rice
 (5) At ginnery gate

Source: Agricultural Development Corporation

TABLE 3.2

Purchase of ENC, 1972 to 1979

Quantity (tonnes)	1972	1973	1974	1975	1976	1977	1978	1979 (estimated)
Pasta	10 485	6 054	48	349	3 807	3 302	2 775	7 000
Wheat flour	29 898	14 350	9 979	36 510	42 752	23 923	34 075	84 079
Rice	38 522	25 432	16 875	21 963	18 500	29 321	33 155	110 316
Tea	2 992	1 605	1 324	2 361	2 707	1 828	4 624	1 174
Sugar-SNAI (1)	15 000	33 855	30 897	30 136	32 798	32 250) 119 074) 127 621
-other	-	23 195	11 940	12 646	24 479	23 203) 14 534) 15 758
Edible oil	3 735	2 587	3 006	8 451	9 521	11 974	4 270	8 346
Dates	-	-	-	12 151	3 000	7 073	51	n.a.
Coffee (2)	1 258	2 250	8 000	275	3 612	616		
Value CIF (1000 SoSh)								
Pasta	9 478	6 011	227	1 807	19 037	16 509	13 876	35 000
Wheat flour	19 357	9 433	15 430	49 451	58 218	32 446	43 181	120 109
Rice	29 438	40 183	53 531	37 731	31 374	58 364	81 116	248 422
Tea	16 743	9 542	8 959	15 406	15 122	17 037	72 278	18 901
Sugar-SNAI (1)	20 391	34 024	32 902	39 499	55 757	54 024) 302 216) 291 148
-other	-	42 872	60 583	43 059	57 854	42 867) 82 458) 114 567
Edible oil	10 114	11 169	20 304	37 098	37 536	58 362	8 469	13 828
Dates	-	-	-	14 011	2 266	8 023	206	n.a.
Coffee	56	111	361	29	267	124	1 732	52 503
Other	24 184	37 047	79 514	28 198	27 366	30 200		
TOTAL	129 761	190 392	271 811	266 239	304 797	317 956	606 532	894 478

Notes: (1) SNAI sugar factory, Jowhar
(2) Cartons

Source: National Trading Agency

TABLE 3.3
Details of 1978 ENC Purchases

Value ('000 SoSh)	ENC Letter of Credit	Donations	Local Production	Franco Valuta	Total
Pasta	-	-	13 876	-	13 876
Wheat flour	2 466	31 464	-	9 250	43 181
Rice	23 296	36 837	-	20 982	81 116
Tea	21 431	154	-	51 693	73 278
Sugar	-	11 605	40 860	249 751	302 216
Edible oil	48 532	33 926	-	-	82 458
Dates	-	-	-	8 469	8 469
Coffee	206	-	-	-	206
TOTAL	97 665	113 986	54 736	340 146	606 532

Percentage of Total, by Value

Pasta	-	-	100	-	100
Wheat flour	6	73	-	21	100
Rice	29	45	-	26	100
Tea	29	-	-	71	100
Sugar	-	4	14	82	100
Edible oil	59	41	-	-	100
Dates	-	-	-	100	100
Coffee	100	-	-	-	100
TOTAL	16	19	9	56	100

Source: National Trading Agency

(b) National Trading Agency (ENC)

ENC was set up in 1964 as the agency for receiving aid, and became a commercial agency in 1970. It is now part of the Ministry of Commerce and operates from headquarters in Mogadishu with branches in 16 regional capitals. Its mandate requires it to import and distribute foodstuffs to the regional level, and to co-operate in the nationwide controlling of food prices.

The major commodities imported include pasta, wheat flour, rice, tea, sugar, coffee, edible oil and dates, but various other items are also handled.

Table 3.2 shows the imports by ENC from 1972 to 1978 in volume and value terms, plus forecasts for 1979. General increases can be noted between 1972 and 1977, with a dramatic increase particularly for tea and sugar in 1978. The estimated data for 1979 are included on the table. Some of the entries may be exaggerated, particularly in the case of rice where it is implied that consumption will triple between 1978 and 1979.

The situation is a little more complicated than it first appears, since goods are handled under a variety of different arrangements. Table 3.3 shows the breakdown of 1978 purchases. Sugar, tea and dates mainly come in under the system of Franco Valuta. ENC is mostly involved in rice, tea, oil and coffee purchases, and donations are most frequent for cereals and oil. 1978 was a reasonably good year for harvests, but nearly 20% of foods handled by ENC was donated. Finally, produce from the local pasta and sugar factories is distributed by ENC.

For its own purchases, ENC uses normal commercial practice, buying by letter of credit on world markets.

(c) National Banana Board (ENB)

The National Banana Board is administratively part of the Ministry of Agriculture. It is now responsible for all aspects of banana production and marketing. ENB conducts its own research, and operates demonstration farms for growers. It has recently taken over the supply of inputs to banana growers from ONAT, and also provides technical advice on production.

The board operates packhouses for growers who do not have their own facilities, and takes responsibility for the transport, storage, handling and export of the fruit. It is also involved in joint ventures in Italy (with SMO) and Kuwait (with AFPC) for importing and marketing bananas under the 'Somalita' trade name.

Further details of banana marketing will be found in Section 3.8.

(d) Livestock Development Agency (LDA)

Details of the activities of LDA are given in Annex 4.

3.2 Rice

3.2.1 Production

There is some disagreement as to the present volume of rice production in Somaliland. Table 3.4 Summarises the opinions of various authorities.

TABLE 3.4

Estimates of 1978 Rice Production in Somalia

Source	Area (ha)	Production (tonnes)
Ministry of Agriculture estimates	7 280	12 060
Saakow report (Il Nuovo Castorc)	n.a.	4 200
Afgoi-Mordile (MMP/HTS)	n.a.	3 240
Genale-Bulo Mareerta (MMP/HTS)	2 000	3 500

In line with other consultancy estimates, in this report, it will be assumed that 4 000 tonnes will be produced in 1979 from 2 000 ha.

3.2.2 Imports

According to ENC the following quantities of rice were imported between 1974 and 1978 :

Year	tonnes
1974	16 875
1975	21 963
1976	18 500
1977	29 321
1978	33 155

3.2.3 Prospects for Supply and Demand

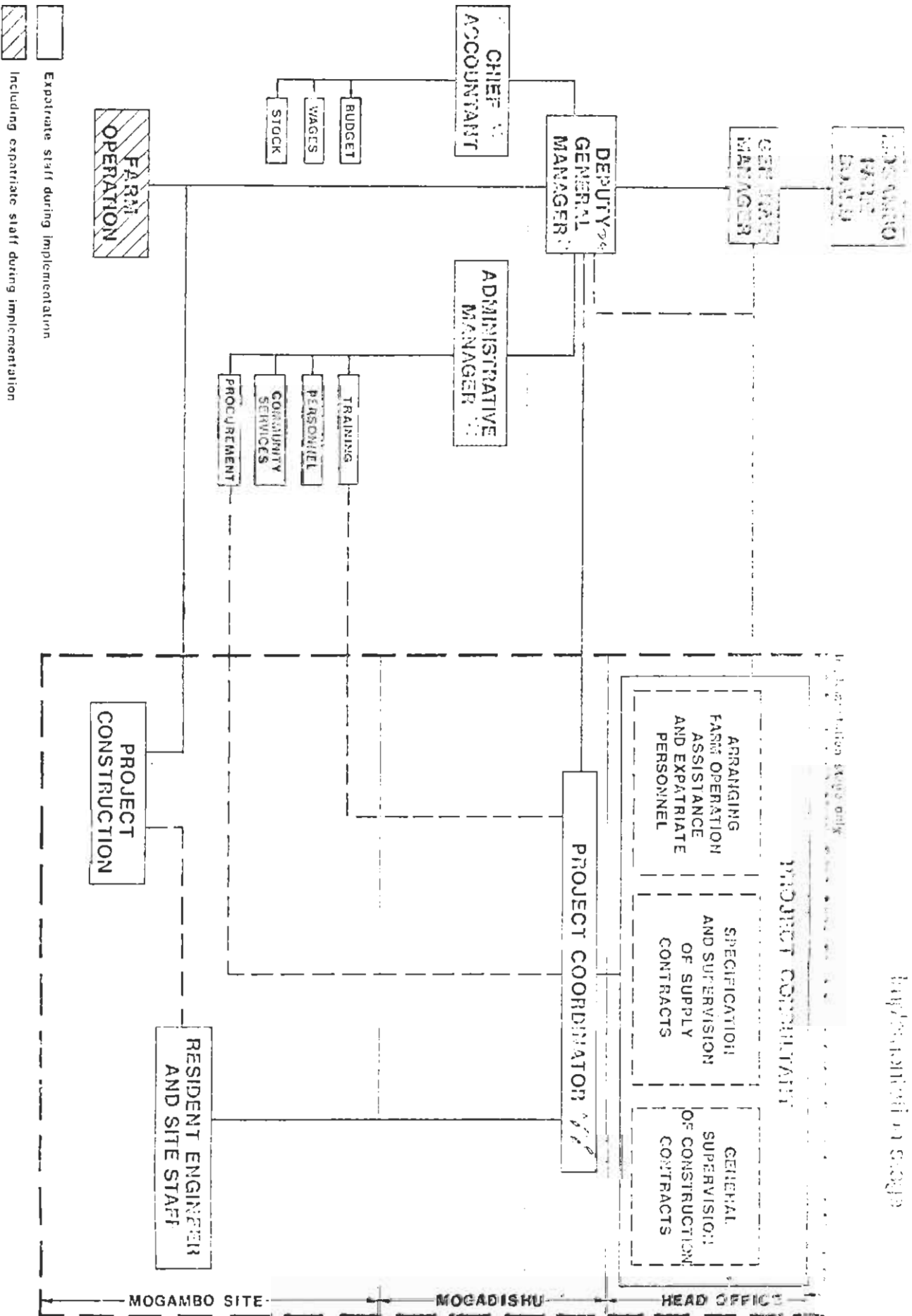
The demand for rice in Somalia can be expected to increase substantially. Table 3.5 gives recent information on cereal and rice consumption.

TABLE 3.5

Cereal Consumption

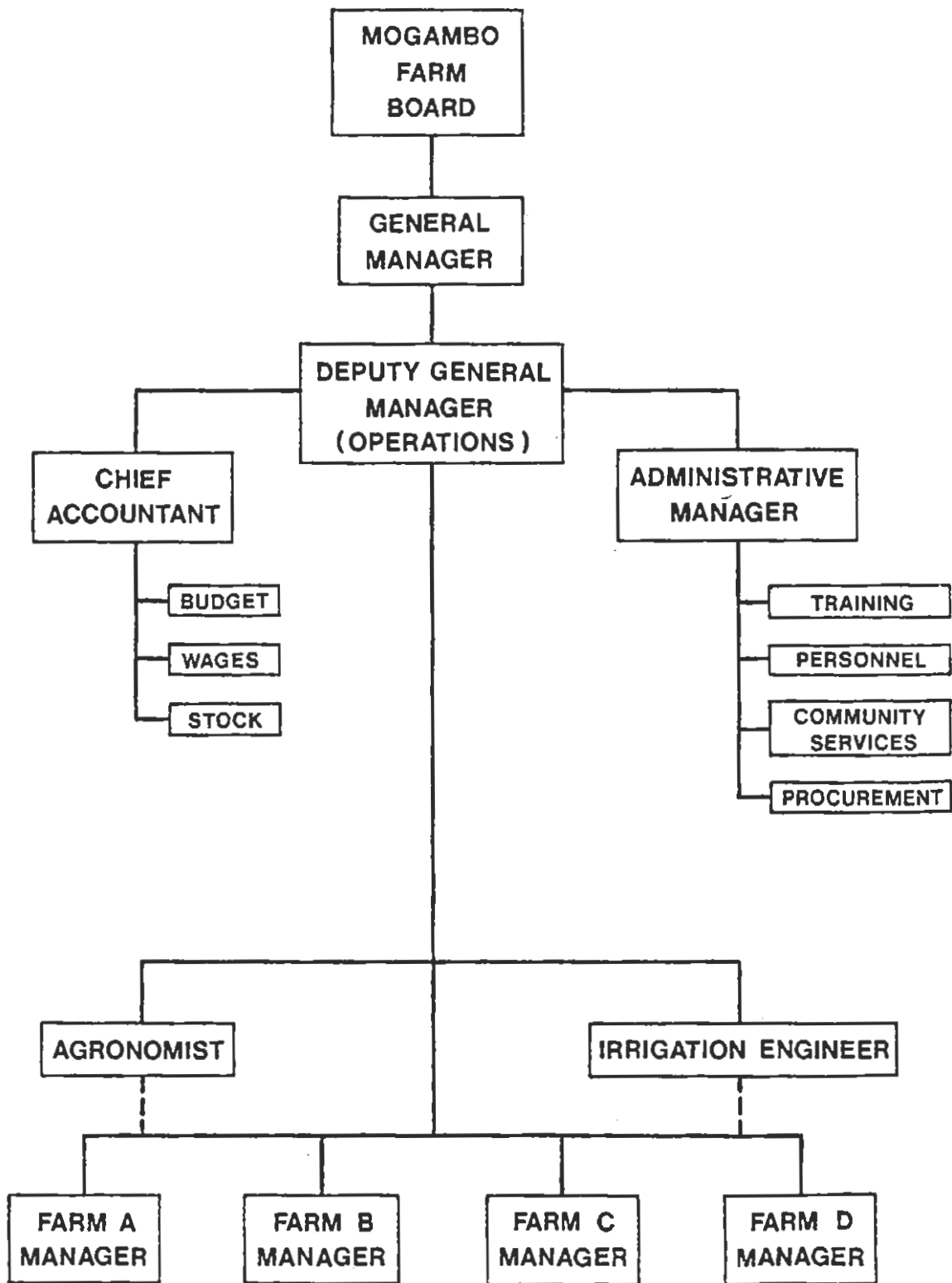
Year	Per capita cereal consumption (kg)	Rice consumption (' 000 tonnes)
1975	97	27
1980	105	35
1990	120	67

Source: FAO Commodity Projections 1970 to 1980
Technital for 1990



Organisation of
Mogambo Farm:
Operational stage

3.2



The increase in demand is partly due to increasing population levels, but also to the fact that rice is considered a luxury grain in comparison with maize and sorghum, and consumption should increase with rising affluence. IBRD estimate the income elasticity of demand for rice at 0.20.

A marked consumer preference does exist for the long grained indica variety. However, a large proportion of rice imported has been in the form of food aid, where no choice is available, and ENC report no difficulty in disposing of stocks of short grained japonica rice.

Estimates of future production vary. Significant schemes have been proposed at Jowhar, Balad, Afgoi-Mordile, Genale and Saakow, and Chinese experts reportedly wish to grow rice on the majority of the state farm at Fanoole. Production from these schemes will depend on the availability of funding, the speed of implementation, and the availability of river water. It is estimated that without Mogambo, not more than 20 000 tonnes will be produced by 1985, and 35 000 tonnes by 1990. This would leave some 20 000 tonnes to be imported each year.

3.2.4 Prices

(a) Financial

Recent prices paid by ADC for hulled rice presented at a collection centre are given in Table 3.6.

TABLE 3.6
Prices for Rice Paid by ADC
(SoSh/quintal)

Year	Paddy (Japonica)	Upland (Indica)
1975	-	250
1976	-	250
1977	285	350
1978	285	350
1979	285	350

Source: Agricultural Development Corporation

The IBRD forecast a rise from US \$ 308 to US \$ 410 per tonne of rice, in constant 1978 dollars, between 1978 and 1985.

Since ADC prices have been unchanged for 2 years, a similar price rise of 33% to SoSh 465 per tonne has been projected for 1985 financial values.

(b) Economic

The world market for rice is inherently unstable since 90% of production originates in Asia, and is subject to variations in the monsoon. World wide, 96%^c is consumed domestically, leaving a small residual market vulnerable to price

swings. The major exporters are the USA, Thailand, Burma and Pakistan, and these countries are instituting buffer stocks to avoid fluctuations. However, price changes lose some significance since 65% of the traded rice is sold on concessionary terms or on government to government contracts.

After a period of low prices, population increases are expected to force the world price up from \$ 308 per tonne in 1978 to \$ 410 in 1985 (1978 constant dollars) for Thai 5% broken, FOB Bangkok.

The economic price assumed is calculated as :

	SoSh/quintal
FOB Bangkok	258
CIF Kismayo	296
+ ENC storage & handling	70
Total	366
less local transport 80 km @ 25 cents	20
Total	346

(c) By-products

Rice straw has a low nutritive value, and is not valued as a stock feed. Rice grain is traded in Somalia in the hulled form and output from the project would be sold to ADC after having the husks removed. These relatively inedible husks have no market value at present.

3.2.5 Conclusions

A continuous and increasing demand can be expected for rice in Somalia. Present plans for production are unlikely to satisfy this demand, even when an additional 11 750 tonnes becomes available from Mogambo. The high price of imported rice represents a significant drain of foreign exchange from Somalia.

3.3 Coarse Grains

3.3.1 Production

The Ministry of Agriculture estimates the 1978 production of maize and sorghum to have been :

Maize	134 680 hectares -	107 740 tonnes
Sorghum	334 510 hectares -	141 090 tonnes

Purchases by ADC of the two major coarse grains over the last seven years are shown in Table 3.7.

There appears to be a recent trend for sorghum sales by farmers to exceed maize sales. The reason for this is unknown since the profitability of maize should be higher than for sorghum and maize is known to be the preferred grain, although substitutability between maize and sorghum does exist.

TABLE 3.7

ADC Purchases of Sorghum and Maize 1972 to 1978

Year	Sorghum (' 000 tonnes)	Maize (' 000 tonnes)
1972 (Very good season)	19.3	54.6
1973) (Drought)	21.4	15.3
1974)	9.6	18.4
1975) (Mixed seasons)	19.5	31.7
1976)	10.0	30.0 (estimated)
1977 (Good sorghum, poor maize)	43.5	24.4
1978 (Good in south, poor in north)	53.8	11.7

Source: World Food Program, Mogadishu

3.3.2 Imports

Coarse grain imports for 1975 to 1978 are given in Table 3.8

TABLE 3.8

Coarse Grain Imports (tonnes)

	1975	1976	1977	1978
Maize	35 316	15 509	30 000	20 687(1)
Sorghum	11 006	-	-	-
Wheat	21 340(1)	-	-	-

Note: (1) Food and gifts

Source: Agricultural Development Corporation

In normal years, imports of coarse grains run at some 20 000 tonnes/year, depending on domestic production and stocks, the availability of rice, and grants under food aid programmes.

3.3.3 Prospects for Supply and Demand

The projections for demand are shown in Table 3.9.

TABLE 3.9
Projection of Demand for Cereals

Year	Per capita cereal consumption (kg)	Maize and sorghum consumption ('000 tonnes)
1975	97	295
1980	105	353
1990	120	494

Source: FAO Commodity Projections 1970 to 1980
Technital for 1990

Referring to Section 3.2, the total demand for rice is expected to rise by 250% between 1975 and 1990. Maize and sorghum consumption is only expected to rise some 170% during this period (the population increase of 2.9% per year = 158% during the same period), reflecting the lower inherent preference for these grains compared with rice.

Under present price-cost relationships, rice will probably be preferred to coarse grains on new or improved irrigation schemes in Somalia. Some of these schemes will include a coarse grain component, and plans exist for the expansion and improvement of dryland farming, but it seems reasonable to assume that there will be some shortfall between supply and demand in the medium-term future.

3.3.4 Prices

(a) Financial

ADC farmgate prices for maize and sorghum grain have been identical since 1975. As in the case of rice there has been no price rise between 1977 and May 1979. Prices are shown in Table 3.10.

A financial price of SoSh 97 per quintal has been projected for 1985, based on the IBRD forecasts of a rise in the world price from US \$ 115 to US \$ 149 per tonne.

3.3.5 Conclusions.

Somalia is not quite self-sufficient in coarse grains at present, and this deficit is likely to increase. Maize is more suited to conditions in the south at Mogambo. The estimated production of 17 200 tonnes off 4 300 ha annually can be considered as an import substitute and additionally, the maize stover could be utilised as an animal feed.

3.4 Sesame

3.4.1 Production

Recent Ministry of Agriculture estimates place the production of sesame at far higher levels than has previously been the case. MMP/HTS (1978) quoted an estimated hectareage of 70 500; Ministry of Agriculture estimates for 1978 put the level at 133 300 ha, yielding 40 000 tonnes. Statistics for sunflower are not available, but groundnut production was given as 2 790 tonnes from 4 000 ha.

Recent purchases by ADC are shown in Table 3.11.

TABLE 3.11
ADC Purchases of Oilseeds (tonnes)

Year	Sesame ⁽¹⁾	Groundnut ⁽²⁾	Sunflower ⁽²⁾	Cotton seed ⁽³⁾
1973	18 747	700	-	-
1974	9 621	1 000	800	450(2)
1975	11 197	1 000	800	483
1976	6 638	800	700	514
1977	9 782	600	n.a.	477
1978	8 065	20(1)	n.a.	518

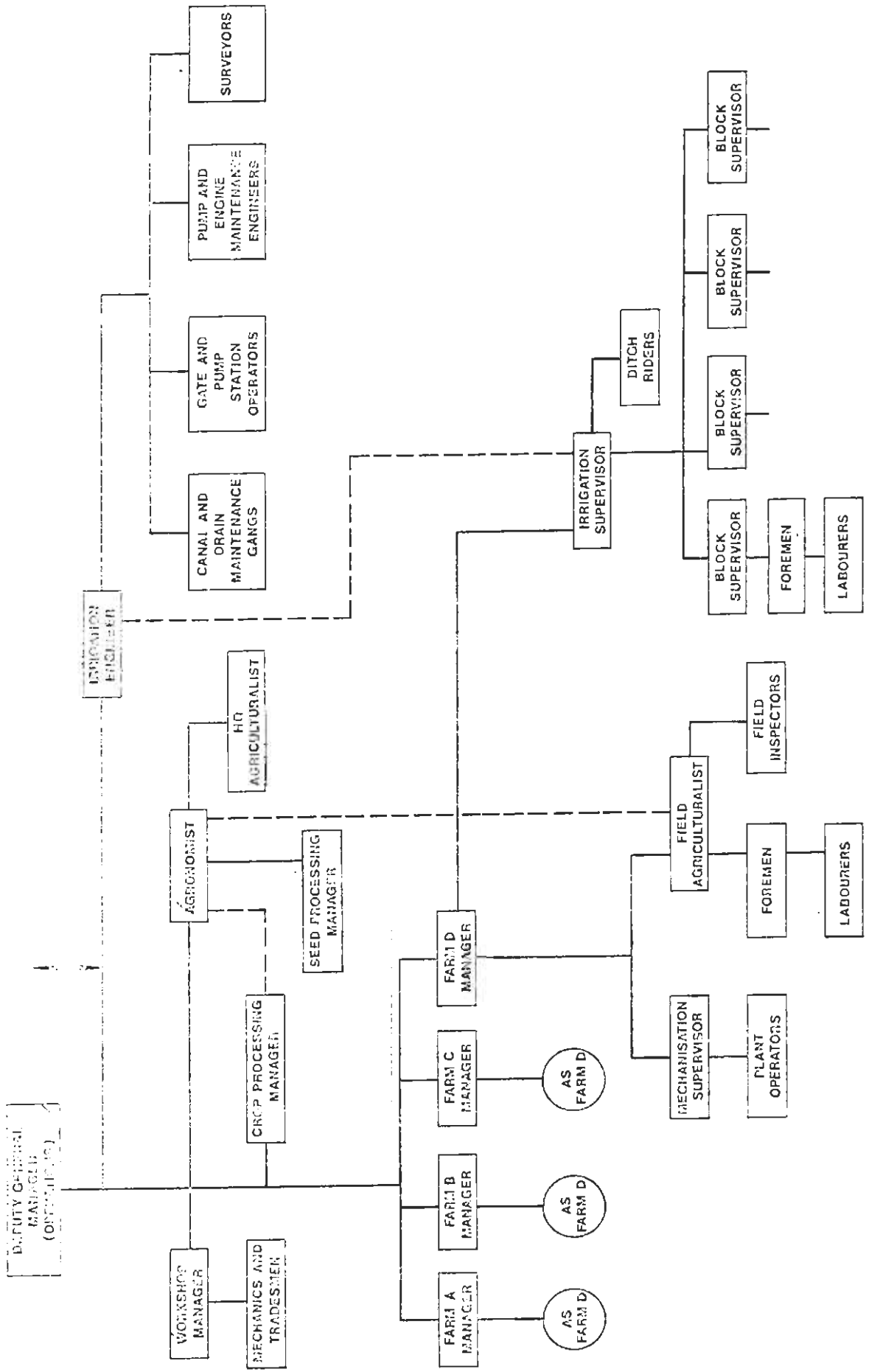
Notes: (1) Source - ADC

(2) Source - MMP/HTS (1978)

(3) Source - Somaltex

If the Ministry of Agriculture figures are correct then only 20 % of sesame production is sold via ADC. This might be true - sesame is the preferred oilseed for local consumption and considerable amounts are known to be retained or traded privately, as oil or grain. However, in this section it will be assumed that 33% of oilseed crops are marketed via ADC.

Farm organisational structure 3.4



3.4.2 Imports

Table 3.12 shows imports of oil and oil seeds according to ENC and the Foreign Trade Statistics (FTS).

TABLE 3.12
Imports of Oil and Oilseeds, Somalia, 1970 & 1973-78

Year	Edible oils				Oilseeds, oilnuts, etc.	
	FTS		ENC		FTS	
	tonnes	SoSh '000	tonnes	SoSh '000	tonnes	SoSh '000
1970	6 350	16 307	n.a.	n.a.	64	59
1973	2 801	7 911	2 587	11 169	111	131
1974	2 674	12 782	3 006	20 304	1	10
1975	4 993	29 565	8 451	37 098	60	46
1976	9 920	41 441	9 521	37 536	1 263	1 470
1977	12 240	51 448	11 974	58 362	1 124	5 174
1978	n.a.	n.a.	14 534	82 458	n.a.	n.a.

Allowing for discrepancies in the data, it would appear that total imports of edible oils are running at some 14 000 tonnes/year.

3.4.3 Balance of Supply and Demand

Supply consists of local production plus imports. An estimate has been made in Table 3.13 of the total volumes involved.

TABLE 3.13
Estimated Supply of Edible Oils

	1978	Extraction rate ⁽¹⁾ (%)	Edible oils
Local Production (tonnes)			
Sesame	24 000	35	8 400
Groundnuts	1 000	33	330
Sunflower	1 000	33	330
Cotton seed	500	13	65
Imports (tonnes)			
Seeds, nuts, kernels, etc	1 200	45 ⁽²⁾	540
Edible oils	13 500	-	13 500
			23 165

Notes: (1) IBRD data x 75 % to allow for crude rural mills.
(2) Processed at National Oil Mill, Mogadishu.

The demand level of 25 000 tonnes per year implies a per capita consumption of 6.22 kg/year. This is higher than the 4.1 kg previously assumed, but IBRD accept an average consumption of some 5 kg/head in developing countries, rising to 25 to 30 kg in developed nations. In previous reports, per capita consumption figures were taken as 1.9 kg in 1975, 2.2 kg in 1980 and 3.5 kg in 1990, but these estimated 1990 levels were already exceeded by imports alone in 1978.

At present, some 60% of domestic demand is supplied by imports. Production of oilseed crops is not particularly emphasised in the various production schemes now being implemented, so the situation is not likely to improve overmuch as population levels and income standards rise.

3.4.4 Prices

(a) Financial

Recent ADC farmgate purchase prices for sesame seed have been :

	SoSh/quintal
1974	180 to 200
1975	200
1976	200
1977	240
1978	240
1979	240

A financial price of SoSh 267 per quintal has been projected for 1985, based on the IBRD forecasts of an increase in the world price from \$ 450 to \$ 500 per tonne. Sesame oil is now retailed by the Mogadishu oil mill at SoSh 13 per kg.

(b) Economic

Apart from direct consumption of edible oils, world demand for oilseeds is also a function of expressed cake supplies, with the complication that as more cake is fed to livestock, there is an increase in the subsequent availability of animal fats. The direct demand for oils increases less fast than incomes, but indirect demand for oilcake strengthens as meat consumption rises.

Overall, fats and oils prices are expected to drop slightly in the short term, with better prospects for high meal content seeds such as soya in comparison with high oil crops such as copra. In the long term, prices are expected to strengthen slightly. In addition, soft oils (soya, cotton and maize) are expected to become more attractive for human consumption.

Neither sesame seed nor sesame oil are imported into Somalia in significant quantities; coconut oil expressed from copra is the usual substitute, although sesame is preferred by consumers. The ratio of coconut oil to sesame oil prices charged by the Mogadishu oil mill is 11 : 13.

However, since only a small proportion of Somalia sesame seed is milled in Mogadishu, the CIF Yemen price for sesame seed will be used. The economic price for sesame is derived from the 1985 forecast of \$ 500/tonne in 1978 constant dollars :

	SoSh
Sesame seed CIF Yemen	315
Transport to Kismayo	20
Port and handling charges	20
 Total CIF Kismayo	 355
Less local transport	20
 Farmgate price	 335

(c) By-products

The present price for expressed sesame cake is SoSh 1.20 per kg in Mogadishu, at the mill gate.

3.4.5 Conclusions

Oilseed crops are likely to be increasingly in demand in Somalia and 60% edible oils are presently imported. Sesame is clearly the most preferred of the oilseed crops. Any production by the project could be sold directly to ADC. However, if a simple screw expression oil mill were located nearby, the expressed cake could be used for cattle feed, and the crude oil sent to Mogadishu for further refinement.

3.5 Cotton

3.5.1 Production

The great majority of seed cotton produced in Somalia is bought by the State agency, Somaltex, for use in the textile factory at Balad. Somaltex own one gin at Balad, and have recently taken control of the other national gin at Jamama. Table 3.14 shows recent production data.

TABLE 3.14

Somaltex Ginnery Purchases of Seed Cotton 1975 to 1978 (tonnes)

	1975	1976	1977	1978
Balad		(27.5	105.8	273.6
Jamama	402.8	(400.8	219.7	157.8
Total lint cotton	402.8	428.3	397.5	431.4
Seed cotton equivalent ⁽¹⁾	1 208.4	1 284.9	1 192.5	1 294.2
Cotton seed production ⁽¹⁾	483.4	514.0	477.0	517.7

Note: (1) Assuming 100 kg of seed cotton yield 33 kg of lint, 40 kg of seed and 27 kg of waste.

Source: Somaltex and ADC

In contrast to the above figures, the Ministry of Agriculture estimates that 3 240 tonnes of seed cotton were produced from 4 620 ha. Of the two estimates, that from Somaltex/ADC will be used since it is based on factory gate data rather than field estimates.

3.5.2 Imports

Table 3.15 shows details of recent purchases of cotton lint.

TABLE 3.15

Somaltex Purchases of Cotton Lint 1975 to 1978

	1975	1976	1977	1978
Domestic - tonnes	402.8	428.3	397.5	431.4
Value (SoSh '000)	2 819.7	2 997.9	2 782.5	3 119.6
SoSh/kg	7.0	7.0	7.0	7.2
Imported - tonnes	399.8	551.1	397.8	1 694.5
Value (SoSh '000)	3 217.2	4 703.4	5 329.8	20 586.9
SoSh/kg	8.0	8.5	13.4	12.1
Total purchases - (tonnes)	802.6	979.4	795.3	2 125.8
Percentage volume imported	50	56	50	80

Source: Somaltex

Tables 3.14 and 3.15 clearly show the effects of the modernisation of the Balad ginnery and textile factory completed in 1977. The increasing importance of Balad over Jamama as a ginnery was emphasised, production in the Jamama area was running down whereas new schemes were started near Balad. The availability of factory capacity allowed total purchases to more than double in 1978. The sharp increase in import prices was partly due to world price increases, and partly due to the imposition of taxes. The majority of imports come from Turkey and Tanzania.

3.5.3 Balance of Supply and Demand

The future supply from domestic sources is difficult to estimate. In the Juba valley, Somaltex propose developing 2 000 ha under irrigation, which with another 600 ha from Fanoole state farm (assuming that rice monoculture is not adopted) and 1 100 ha from Mogambo would total 3 700 ha. Less water is available in the Shabelle river, but a large area under irrigation is being developed at Balad, of which maybe 3 000 ha would be under cotton. Assuming that present schemes are developed over 7 000 ha, this would yield some 2 400 tonnes of lint taking conservative yields of 1 000 kg of seed cotton per hectare.

The theoretical capacity of the Somaltex factory is 20 000 yards of fabric, equivalent to 2 250 tonnes of fibre. Thus, if all schemes were implemented, the factory could be fully supplied from domestic production. However, total national demand for fibre is estimated at 4 500 tonnes, rising to 6 000 tonnes by 1990. At present there is a preference for imported fabric over that produced by Somaltex, but this is partly due to the rather coarse nature of domestic fabric caused by low quality input. With better seed cotton, improved quality control and expanded capacity, Somaltex should be able to substitute for imports and expand production. There are tentative plans for the establishment of a second textile factory at Jamama.

3.5.4 Prices

(a) Financial

The pricing structure for cotton is rather complex. ADC pays the following prices to the producer, at the ginnery gate (SoSh/kg):

Grade A	- 2.60	- Sold to Somaltex
Grade B	- 2.40	- Sold to Somaltex
Grade C	- 2.20	- Sold to Somaltex
Grade D.1	- 2.00	- Poor quality, sold locally
Grade D.2	- 1.80	- Poor quality, sold locally
Grade D.3	- 1.50	- Poor quality, sold locally

Ginning at Balad is performed by Somaltex. The cost per kg is SoSh 1.06, but this is excessive since the gin is running at only 20% of capacity. A true cost at full capacity would be SoSh 0.45 per kg of lint (Somaltex estimate).

The lint is then bought by Somaltex from ADC at SoSh 7.0 per kg.

Seed cotton at Jamama is now purchased by ADC, ginned by Somaltex, who have recently taken over the running of the gin, transported by ADC to Balad, at a cost of SoSh 1.58 per kg and sold to Somaltex for SoSh 7.00 per kg. Ginning costs at Jamama are unknown, but could be expected to be high in view of the age of the machinery, and under-utilisation. Even assuming 45 cents per kg lint for ginning costs, this pricing structure implies a subsidy by ADC as follows:

Assume cotton is grade B		Cost per kg (SoSh)
Purchase cost	=	2.40 seed cotton
	=	7.20 lint
+ Ginning cost	=	0.45
+ Transport	=	1.58
Total		9.23

Thus, the ADC subsidy on lint from Jamama is some SoSh 2.23 per kg. At present low levels of production in the Juba valley, this sum is not substantial, but the price may be renegotiated if output increases.

Recent price levels for seed cotton are given in Table 3.16.

TABLE 3.16
Cotton Prices (SoSh/quintal)

Year	Grade A	Grade B	Grade C
1972	130	120	100
1973	130	120	100
1974	130	120	100
1975	200	160	120
1976	200	160	120
1977	260	240	220
1978	260	240	220
1979	260	240	220

Source: ADC

As with most other agricultural commodities in Somalia, the producer price is established on the basis of advice from ADC and the Ministry of Agriculture. Somaltex is arguing strongly that the present price is too low to encourage production. This claim appears reasonable since even the Balad state farm, which is supposed to supply cotton to Somaltex, but is not under the direct control of the factory, has been planting sesame rather than cotton, because of better returns. This is also partly due to the low productivity of Balad cotton. A financial price of SoSh 286 per quintal of grade A seed cotton as been projected for 1985, based on the IBRD forecast of a rise in the world price from US \$ 0.71 to US \$ 0.78 per kg, in constant 1978 dollars.

(b) Economic

Worldwide, both the consumption and production of cotton are expected to rise at some 2% per year in the near future. The highest increase in demand is expected in the developing countries, since there is greater competition from man-made fibres in developed nations. For example, the income elasticity of demand is estimated at 0.5 in developing countries, but at 0.07 in developed. Supply responses to increased demand are easier with an annual crop such as cotton than with perennial or tree crops.

Prices fell from the record levels of 1973 owing to exceptional harvests, and excess production capacity for man-made fibres. A temporary fall from 1978 levels is expected, but the price for Mexican S.M., 1¹/₁₆ Inch CIF North Europe is expected to reach 172.2 cents per kg by 1985 (in 1978 constant US Dollars), or SoSh 10.84 per kg.

Imported cotton in 1978 was bought at an average price of SoSh 11.6 per kg plus SoSh 0.78 for handling and transport to Balad (Somaltex data).

The ginnery gate price at Jamama is calculated as:

Imports CIF Mogadishu	172.2 US cents per kg - = SoSh 10.84 per kg -
plus handling and transport	0.78
Lint price at Balad	11.62
less transport from Jamama	1.58
Lint in Jamama	10.04
less ginning cost	0.45
Price of lint	9.59
Therefore seed cotton price (grade A)	SoSh 3.16 per kg

(c) By-products

Some 40% of the volume of seed cotton consists of cotton seed. This has a high edible oil content, although the taste is not preferred, and the expressed cake can be used as cattle feed. The buying and selling prices of seed, at SoSh 20 and SoSh 40 per quintal, respectively, have been unchanged since 1971. The value of cotton seed has been omitted from the calculation of the economic price for seed cotton, since the oil price is very low, reflecting low consumer demand, and the cake can only really be disposed of economically if a substantial livestock outlet is available locally. The Mogadishu oil mill exported some cake to Denmark, at a loss, for SoSh 60 per quintal, because the local demand was low. However, at times of low stock feed levels, even the cotton seed husks have been sold at SoSh 30 per quintal.

3.5.5 Conclusion

Even at the present time, Somalia would definitely benefit from the production of cotton at Mogambo. Up to 80% of domestic requirements have to be imported, and, although other projects may produce cotton later, rising consumer demand suggests that Somaltex will require maximum local production for the foreseeable future. Additionally, Mogambo is already in a cotton growing area, with ginning facilities at Jamama, and either a project feedlot or the Trans-Juba livestock project should provide a market for cotton seed cake.

3.6 Bananas

3.6.1 Production

Approximately 65% of Somali bananas produced are sent for export. Recent exports are shown in Table 3.17.

TABLE 3.17
Exported Banana Production (tonnes)

Year	Net tonnes	Percentage to Italy	Middle East & West Germany
1950	17 496	-	-
1955	45 605	-	-
1960	76 854	-	-
1965	98 828	-	-
1970	102 844	-	-
1971	103 148	74.8	25.2
1972	133 935	58.5	41.5
1973	111 931	58.9	41.1
1974	107 299	37.6	62.4
1975	81 841	44.8	55.2
1976	72 531	62.5	37.5
1977	53 812	73.3	24.7
1978	57 079	59.9	40.1

Source: National Banana Board

Production levels peaked between 1964 and 1973, after which they have suffered a continuous decline to the present volume of less than 60 000 tonnes. The reasons for this decline are explained in Annex 3, but basically it results from agronomic problems, lack of skilled management, flood and drought damage and marketing difficulties.

Somali banana production is concentrated in the Shabelle and Juba valleys. Table 3.18 details the number of producing farms, available area and cropped area from 1972 to 1978. Prior to 1976, slightly more than half the national production came from the Juba valley. The effects of the 1977 Juba river floods are clearly seen; production from the Juba valley area dropped to about 40% of the total.

The average yield of exportable bananas per hectare dropped from nearly 19 tonnes in 1972 to 12 tonnes in 1978.

TABLE 3.18

Banana Production - Farm Characteristics 1972 to 1978

	1972	1973	1974	1975	1976	1977	1978
Number of farms							
Shabelle	81	67	66	57	48	49	53
Juba	64	72	74	72	68	73	64
Total	145	139	140	129	116	122	117
% in Juba	44	52	53	56	59	60	55
Cultivated area (ha)							
Shabelle	4 700	4 694	3 964	4 209	3 987	3 895	4 011
Juba	4 428	5 075	5 075	4 133	3 434	2 488	2 820
Total	9 128	9 770	9 039	8 342	7 422	6 383	6 831
% in Juba	49	52	56	50	46	39	41
Productive area (ha)							
Shabelle	3 236	3 097	2 726	2 813	2 625	2 658	2 785
Juba	3 901	3 956	3 995	3 335	2 693	1 889	1 820
Total	7 137	7 054	6 721	6 148	5 318	4 547	4 605
% in Juba	55	56	59	54	51	42	40
Percentage of cultivated area in production							
Shabelle	69	66	69	67	66	68	69
Juba	88	78	79	81	78	76	65
Total	78	72	74	74	72	71	67

Source: National Banana Board

3.6.2 Exports

Somalia has met with two particular difficulties recently in export markets for bananas. Firstly, the traditional market in Italy has been eroded, as is shown in Table 3.19.

Although the size of the market has doubled in the last fifteen years, Somalia's share has dropped from over 50% to 10 to 15%. In addition to production difficulties in Somalia, strong competition has been encountered from the well-organised Central American producers, and recently the French have succeeded in increasing imports to Italy from their Caribbean territories.

TABLE 3.19
Italian Imports of Bananas 1963 to 1978

Year	Total (' 000 tonnes)	Percentage from		
		Somalia	EEC affiliates	Others
1963	157	54	28	18
1964	168	56	33	11
1965	268	34	43	23
1966	313	26	23	51
1967	306	23	17	60
1968	322	24	21	55
1969	324	24	13	63
1970	312	26	3	71
1971	323	20	0	80
1972	351	20	6	74
1973	353	17	1	82
1974	318	12	3	85
1975	304	11	2	87
1976	268	13	9	78
1977	305	14	7	79
1978	336	10	16	74

Source: SMO

Secondly, the Middle East market expanded rapidly, and Somalia exported over 65 000 tonnes in 1974. However, arguments arose between the ENB and the main Saudi Arabian importer, with the result that the contract was repudiated. A new agreement is now being negotiated with the Agricultural Food Products Company (AFPC) in Kuwait. It is proposed that AFPC will not only market Somali bananas in Kuwait and elsewhere in the Middle East, but also provide technical assistance in Somalia.

3.6.3 World Market Prospects

Table 3.20 shows recent and projected world banana imports and exports. Overall, little change, apart from increases due to population growth, is expected. Consumption in developed countries is fairly close to saturation point - the income elasticity of demand for bananas in the USA is 0.08. The only expanding markets will be those in the Middle East and the centrally planned economies.

Prices are expected to drop slightly as Central American producers recover from the hurricane of 1975, but are only expected to rise again slightly. The long term price forecast has been set at the marginal cost of production since no significant increases in production efficiency are expected.

TABLE 3.20

World Banana Imports and Exports ('000 tonnes)

	1965	1970	1974	1975	1976	1977 esti- mate	1985 proj- ected
Exports							
Central America	2 730	4 008	4 186	4 122	4 260	4 400	5 340
Philippines	-	107	663	823	796	800	940
EEC associate members ⁽¹⁾	1 038	811	879	776	786	800	850
Others	926	878	866	710	736	720	770
Total	4 694	5 804	6 594	6 421	6 578	6 720	7 900
Imports							
Developed Countries							
- EEC	1 888	1 789	1 965	1 915	1 847	1 940	2 180
- N America	1 732	2 045	2 268	2 187	2 411	2 320	2 590
- Japan	358	844	857	894	832	870	974
- Other	271	368	506	456	444	480	576
Total	4 249	5 046	5 596	5 452	5 534	5 610	6 320
Developing countries							
Centrally planned economies	378	458	508	509	548	580	700
Total	4 683	5 603	6 257	6 170	6 317	6 450	7 580

Note: (1) Caribbean countries, Ivory Coast, Cameroon and Somalia.

Sources: FAO Commodity Projections
IBRD Forecasting Division

3.6.4 Prices

(a) Financial

The present FOB Somali port price for bananas is SoSh 1 240 per tonne or SoSh 124 per quintal. Of this the producer receives SoSh 56.50, the deductions being calculated as follows:

	SoSh/quintal.
FOB price	124
less carton price	49
	75
less ENB deductions for transport, port charges and packing centres	19.50
Total	56.50

One locally made carton, containing 16.5 kg (or 6.06 cartons per quintal) costs SoSh 6.60 plus 0.50 for the plastic plus 1.00 transport, totalling SoSh 8.10. Imported cartons are available at SoSh 5.50 each, or SoSh 33 per quintal.

The ENB operates a number of packing centres. If the producer uses his own facilities, ENB deductions are reduced to SoSh 13.50, allowing a net producer price of SoSh 61.50 per quintal.

The world price is only expected to rise some 9% from 1979 to 1985, from 20.7 to 22.5 US cents per kg CIF Hamburg in constant 1978 dollars. Since Somali bananas are already competing on the open market, the FOB Somalia price should be raised by the same percentage, allowing SoSh 1 350 per tonne in 1985. This would allow a 1985 financial producer price of SoSh 67.50 per tonne.

(b) Economic

In deriving the economic producer price, the same FOB price of SoSh 1 350 is used, but the cost of imported cartons can be substituted, since using over-priced local cartons implies a subsidy.

The final producer price, (assuming packing facilities provided by ENB) is then:

	SoSh/quintal
FOB Kismayo	135.0
less carton charge	33.3
less ENB deductions	18.5
Total	83.2

(c) By-products

Non-exportable bananas fetch on average 20 cents/kg. Of 100 kg produced, some 65% go for export, 20% are sold on the local market and 15% have no market value.

3.6.5 Conclusions

Bananas from Somalia should be competitive in the world markets. The appearance of the best fruit is good, and the flavour is excellent. The Italian and Middle East markets should be able to absorb at least a 50% increase in production from Somalia - the fruit is already established in Italy, and the Middle East markets are very close by. The major question is whether production can be increased, and at a competitive cost.

CHAPTER 4

BASES FOR ECONOMIC AND FINANCIAL ANALYSES

4.1 Introduction

The Mogambo irrigation project as proposed in this report takes the form of a discrete entity, a state farm. This state farm will be developed on an area of land where the present population levels and value of agricultural production are relatively low. In concept, the project differs from other possible developments or settlement schemes wherein the basic units are smallholder farms. The chief differences are that production can be regarded as coming from one large farm rather than a group of smaller ones, and the workforce will be hired labour rather than family labour.

As is usual for any development scheme, the report will consider the effects of the introduction of the state farm in both financial and economic terms. The financial analysis is concerned with the viability of the project itself, being basically a comparison of cash expenditure and receipts over the life of the project. The economic analysis considers the operation of the project in the larger context of the costs and benefits to the country itself.

4.2 Project Life

The effective life of the project has been taken at 30 years which is the probable life of the most durable component, the civil engineering works. Salvage values have not been assumed for plant and machinery, since there is a shortage of potential buyers in Somalia, so the machines are unlikely to be taken in part exchange as a trade-in, and they will probably be retained on the project as an occasional source of spare parts.

4.3 Labour Values and Shadow Pricing

The financial labour wage rates used in this report have been based on a combination of official Government wage scales, Juba Sugar project rates, and prices paid by other local organisations or farmers. In the economic analysis, labour's value to the country is not taken as the cash wage paid but rather the opportunity cost; that is what the labourer would be earning if not working on the project. In the case of skilled and semi-skilled personnel, demand is very high in Somalia and there should be little unemployment, so the economic rate has been taken at the full financial rate.

For unskilled labour, the situation is more complex. In purely traditional agricultural and pastoral activities in the Juba valley there is certainly seasonal unemployment. If Mogambo were the only other employment available, then the economic rate ('shadow price') should be set at the opportunity cost, assessed at 50% of the market rate reflecting six months' probable unemployment. However, employment opportunities are increasing in the Lower Juba valley at Kismayo, the Juba Sugar project (JSP) and Gelib, and can be expected to increase further when the Bardheere dam is constructed. Additionally, all employers are currently reporting labour shortages, although this is probably due to the low wages offered. The Fanoole state farm initially paid SoSh 10 per day, but reduced this to SoSh 8 per day in line with the rate offered by JSP. At that

rate, JSP were having to send transport some distance to pick up labour and were still reporting shortages. It would appear that some potential workers regard SoSh 8 per day as not being worth working for. This independence of attitude may be supported by non-recorded family earnings, particularly remittances from relatives working in Arabia. Local banana growers reported having to pay up to SoSh 20 per day for seasonal pickers, and the Balad cotton farm, although in a different part of Somalia, has paid SoSh 25 per day for pickers.

For the purpose of this report, a wage and benefits package well above the minimum now paid has been assumed for the financial analysis, in order to attract and keep workers. The unemployment which does exist in Somalia, although probably to a greater extent in other regions than the Lower Juba valley, has been reflected in a shadow value for unskilled labour in the economic analysis.

The financial labour rate has been assumed at SoSh 12 per day, plus the provision of housing, health and education benefits, and access to an irrigated plot of land for family food production. A shadow price of SoSh 8 per day (67%) will be used for the economic analysis.

4.4 Valuation of Foreign Exchange

The importance of this type of project to Somalia's foreign exchange position is high. Considerable foreign exchange costs will be incurred, particularly for construction and for agricultural machinery, but all the proposed products are either import substitutes or can be exported directly. In assessing the economic viability of the project, it is therefore important to establish the true relationship between the local and foreign currencies.

The Somali shilling has been linked to the US dollar since 1972 at an exchange rate of SoSh 6.295 = 1 US dollar. However, in the only other areas where the Somali shilling is traded (Jeddah, Djibouti and the Gulf), the rate of exchange may be as low as SoSh 15 per dollar. This trade is concerned with the wish of Somalis working overseas to repatriate their earnings, either in cash or by means of franco valuta shipments. The IBRD use a rate of SoSh 9.5 = US \$ 1 in shadow pricing foreign exchange, and this rate will be adopted in a sensitivity analysis of the economic rate of return.

4.5 Taxes and Duties

Internal taxes and duties applied within a country to purchased inputs must be regarded as a financial cost (a cost to the project) but, since the monies levied revert to the national treasury, should be ignored when calculating the economic cost of inputs (cost to the country).

Normally in Somalia, a semi-public development project would be exempt from these taxes and duties. Libsoma and JSP have this exemption. However, the exemption is not granted as a right, but must be claimed and negotiated for. At the request of the State Planning Commission, these taxes and duties will be included in the financial prices, but excluded from economic prices.

Details of the effects of these changes on the prices of inputs are given in Appendix I.

4.6 The Feedlot Project

The original TAMS/FINTECS report included a substantial feedlot component. During the reappraisal of the first study, the civil engineering works and cropping proposals have been changed significantly. These alterations affect the form and viability of the feedlot unit, as discussed in Annex 4. The feedlot is not now considered to be a financial or economic proposition, and has been omitted from the overall analysis of the project. The specification, costing and analysis of this component is shown separately, in Annex 4.

4.7 The Effects of Bardheere Dam

The basic project model proposes a project which will be relatively little affected by the availability of year-round irrigation water after Bardheere dam is completed. However some alternative models have been prepared, in which an area of 1 200 ha of bananas is introduced when Bardheere dam is fully implemented, replacing 1 000 ha of maize and 200 ha of upland rice/maize. These models are described and presented in Chapter 7.

4.8 Sensitivity Analyses

The terms of reference call for a range of sensitivity analyses to be performed. This has been carried out on both the with and without Bardheere dam models, and the results are presented in Chapter 7.

Specifically, the sensitivity tests are :-

- | | | |
|---|-----|---|
| A | (1) | Foreign exchange upvalued by 50% |
| B | (1) | 20% Increase in capital costs |
| | (2) | 20% increase in operating costs |
| | (3) | 20% decrease in value of output |
| | (4) | 2 year delay in achieving agricultural production |
| C | (1) | 20% decrease in capital costs |
| | (2) | 20% decrease in operating costs |
| | (3) | 20% increase in value of output |
| | (4) | Agricultural production advanced by one year |

4.9 Cost and Price Assumptions

For ease of reference, Appendix I presents the costs of inputs and prices of outputs, listing their financial and economic values and the foreign exchange components.

4.10 Flood Protection and Water Costs

If the project is implemented before Bardheere dam is in operation, it will be necessary to provide flood protection works. These would, however, provide a considerable benefit to downstream farmers by diverting flood water away from the cultivated lands. For this reason it has been decided only to charge 40% of flood protection costs as a direct cost to Mogambo. At present there is no Development Authority may be instituted in the future, and Bardheere dam will probably be constructed, no charge for water has been made in the analysis of the Mogambo project. This is because the civil costs involved and eventual numbers of downstream users are unknown at present, and any estimate would be so ill-founded as to be misleading.

CHAPTER 5

CROP BUDGETS

5.1 Introduction

Tables 5.1 to 5.9 present, in financial and economic terms, budgets for the crops identified in Annex 3 as potentially suitable for Mogambo.

The budgets have been prepared in order to compare the returns to each crop on an equivalent basis, rather than to include every possible attributable cost. Unskilled labour used for each crop is included, but multiplying the labour requirements by the hectareage of each crop does not exactly give the labour cost shown in the economic analysis because of the policy of employing a 'core' labour force year-round, and because of the requirements for management, supervisory and administrative staff. Materials costs reflect the physical recommendations made in Annex 3. Prices are summarised in Appendix I (Costs and Prices of Input and Outputs).

Machinery cost data are detailed in Appendix II.

Processing costs charged to rice and maize are detailed in Appendix III.

5.2 Summary of Crop Budgets

The net margin derived from the crop budgets are:

TABLE 5.1

Net Margins

Crop	Net margin (SoSh/ha)	
	Financial	Economic
Paddy rice	9 482	6 409
Upland rice	7 917	5 257
Maize - surface	1 238	2 368
Maize - sprinkler	1 330	2 435
Sesame	47	811
Cotton - hand harvested	3 245	4 550
Cotton - machine harvested	1 880	2 753
Bananas (average over 6 years)	4 464	9 631

Paddy rice is the most profitable annual crop in economic terms, followed in descending order by upland rice, cotton and maize. Sesame shows low returns, due to the poor incremental yield available to irrigation water.

Under conditions at Mogambo, cotton becomes less attractive since only one crop can be grown in a year - rice, maize and even sesame can be grown in either or both seasons.

In economic terms the perennial crop of bananas shows similar returns to the paddy rice - maize combination.

In financial terms, the ranking of the annual crops stays the same, although rice becomes more profitable whereas the other crops become less so. Bananas are less attractive, although more profitable than cotton on the levee soils.

Table 5.2 shows the economic and financial net margins per 1 000 m³ of irrigation water supplied per hectare of each crop. The rankings are approximately in the same order in the case of economic prices, i.e. rice - cotton - bananas - maize - sesame. However, the range of the net margins is reduced since the poorer valued crops require less irrigation water to be supplied.

In financial terms the order is still the same, but the range increases owing to the wider divergence of the financial net margins over the economic.

For the purpose of selecting the most profitable crops the results shown in Table 5.1 rather than Table 5.2 have been used.

TABLE 5.2

Returns to Irrigation Water (SoSh per ha)

Crop	Net margin		Water use ⁽¹⁾ m ³ per ha per year	Net margin per 1 000 m ³	
	Fin.	Econ.		Fin.	Econ.
Paddy rice	9 482	6 409	13 690	693	468
Upland rice	7 917	5 257	6 630	11 294	793
Maize - surface	1 238	2 368	9 940	125	238
Maize - sprinkler	1 330	2 435	7 440	179	327
Sesame	47	811	5 890	8	138
Sesame - surface	47	811	7 350	6	110
Cotton - hand harvested	3 245	4 550	10 090	322	451
Cotton - machine harvested	1 880	2 753	10 090	186	273
Bananas (average over 6 years)	4 464	9 631	24 490	182	393

Note: (1) Requirements for irrigation water would be different if crops were grown in a different season (e.g. gu season maize (sprinkler) = 5 380 m³/year). Also, requirements would increase if longer maturing varieties were introduced for the rice crops. For example, in the above Table upland rice (sprinkler) requires less than maize (sprinkler) since the rice is a 105 day variety and the maize a 120 day variety.

TABLE 5.3

Paddy Rice (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 120 kg	558	558	-
Fertiliser	- 150 kg of N	429	429	386
	30 kg of P ₂ O ₅	94	94	85
Herbicide	- 9 l of Preforan 30 EC	314	283	255
	2 l of Propanil 36 EC	86	78	70
Pesticide	- 5 l of Dimecron 250 ULV (in two applications)	168	151	136
Aerial spraying	- 4 applications	140	140	140
TOTAL		1 789	1 733	1 072
(2) Machinery operations (excluding operators)				
150 hp tractor	- 1.89 h	239	213	
110 hp tractor	- 2.97 h	191	168	
75 hp tractor	- 0.75 h	29	26	
Rice combine	- 0.91 h	164	157	
Equipment costs		67	67	
TOTAL		690	631	
(3) Machinery operators		39	39	
(4) Machinery depreciation		429	429	
(5) Unskilled labour (22 man days)		264	176	
(6) Processing costs				
Drying, storing and milling		327	271	
TOTAL costs		3 538	3 279	
(7) Returns				
28 quintals milled rice		13 020	9 688	
(8) Net margin		9 482	6 409	

TABLE 5.4
Upland Rice (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 120 kg	558	558	-
Fertiliser	- 150 kg of N	429	429	386
	30 kg of P ₂ O ₅	94	94	85
Herbicide	- 9 l of Preforan 30 EC	314	283	255
	3 l of Propanil 36 EC	129	117	105
Pesticide	- 5 l of Dimecron 250 ULV (in two applications)	168	151	136
Aerial spraying	- 5 applications	175	175	175
TOTAL		1 867	1 807	1 142
(2) Machinery operations (excluding operators)				
150 hp tractor	- 1.89 h	239	213	
110 hp tractor	- 2.41 h	155	136	
75 hp tractor	- 0.50 h	20	17	
Rice combine	- 0.91 h	164	157	
Equipment costs		49	49	
TOTAL		627	572	
(3) Machinery operators		34	34	
(4) Machinery depreciation		386	386	
(5) Unskilled labour (23 man days)		276	184	
(6) Processing costs				
Drying, storing and milling		286	237	
TOTAL costs		3 476	3 220	
(7) Returns				
24.5 quintals milled rice		11 393	8 477	
(8) Net margin		7 917	5 257	

TABLE 5.5
Surface Irrigated Maize (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 20 kg	19	19	-
Fertiliser	- 110 kg of N	315	315	284
	25 kg of P ₂ O ₅	79	79	71
Herbicide	- 5 l of Primagram 500 FW	307	277	249
Pesticide	- 5 l of Nuvacron Combi (in two applications)	184	165	149
Aerial spraying	- 3 applications	105	105	105
TOTAL		1 009	960	858
(2) Machinery operations (excluding operators)				
150 hp tractor	- 2.23 h	282	251	
110 hp tractor	- 2.41 h	155	136	
75 hp tractor	- 1.56 h	61	53	
Maize combine	- 1.25 h	241	232	
Equipment costs		59	59	
TOTAL		798	731	
(3) Machinery operators		45	45	
(4) Machinery depreciation		491	491	
(5) Unskilled labour (22 man days)		264	176	
(6) Other costs				
Drying and storage		35	29	
TOTAL costs		2 642	2 432	
(7) Returns 40 quintals		3 880	4 800	
(8) Net margin		1 238	2 368	

TABLE 5.6
Sprinkler-Irrigated Maize (SoSh/ha)

	Financial	Economic	Foreign exchange
(1) Material costs			
As for total of surface-irrigated maize	1 009	960	868
(2) Machinery operations (excluding operators)			
150 hp tractor - 2.23 h	282	251	
110 hp tractor - 2.41 h	155	136	
75 hp tractor - 1.33 h	52	45	
Maize combine - 1.25 h	241	232	
Equipment costs	57	57	
TOTAL	787	721	
(3) Machinery operators	43	43	
(4) Machinery depreciation	484	484	
(5) Unskilled labour (16 man days)	192	128	
(6) Other costs			
Drying and storage	35	29	
TOTAL costs	2 550	2 365	
(7) Returns 40 quintals	3 880	4 800	
(8) Net margin	1 330	2 435	

TABLE 5.7
Sesame (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 10 kg	27		27
Fertiliser	- 50 kg of N	143		143
	25 kg of P ₂ O ₅	79		79
Herbicide	- 1.8 l of Tréflan 30 EC	154		139
Pesticide	- 2 l of Basodin 60 EC	134		121
	1.0 l of Nogos 60 EC	49		44
Desiccant	- 3.5 l of Reglone	211		193
Aerial spraying	- 3 applications	105		105
TOTAL		902		851
(2) Machinery operations (excluding operators)				
150 hp tractor	- 2.23 h	282		251
110 hp tractor	- 2.47 h	159		140
75 hp tractor	- 0.50 h	20		17
Equipment costs		65		65
TOTAL		526		473
(3) Machinery operators		31		31
(4) Machinery depreciation		282		282
(5) Unskilled labour (29 man days)		348		232
TOTAL costs		2 089		1 869
(6) Returns	8 quintals	2 136		2 680
(7) Net margin		47		811

TABLE 5.8
Cotton - Hand Harvested (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 30 kg (undelinted)	17	17	-
Fertiliser	- 80 kg of N	229	229	206
	25 kg of P ₂ O ₅	79	79	71
Herbicide	- 2.8 l of Treflan	154	139	125
Pesticide	- 2.5 l of Nuvacron Combi C500 (in 8 applications)	734	660	594
Aerial spraying	- 10 applications	350	350	350
TOTAL		1 563	1 474	1 346
(2) Machinery operations (excluding operators)				
150 hp tractor	- 1.89 h	239	213	
110 hp tractor	- 2.41 h	155	136	
75 hp tractor	- 1.83 h	71	62	
Equipment costs		67	57	
Transportation of cotton to Jamama ⁽¹⁾		275	275	
TOTAL		797	743	
(3) Machinery operators		37	37	
(4) Machinery depreciation		272	272	
(5) Unskilled labour (103 man days)		1 236	824	
TOTAL costs		3 905	3 350	
(6) Returns	25 quintals	7 150	7 900	
(7) Net margin		3 254	4 550	

Note: (1) Calculated as: ADC price of SoSh 5.0 per tonne per ha for 22' km.
This is twice normal rate due to the low bulk density of cotton.

TABLE 5.9

Cotton - Machine Harvested (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Seed	- 50 kg (delinted)	28	28	-
Fertiliser	- 20 kg of N	57	57	51
	50 kg of P ₂ O ₅	157	157	141
Herbicide	- 2.8 l of Treflan	154	139	125
	0.11 kg of Diuron	6	5	5
Pesticide	- 2.5 l of Nuvacron Combi C500 (in 8 applications)	734	660	594
Desiccant	- 3.5 l of Regalone	211	193	174
Aerial spraying	- 11 applications	385	385	385
TOTAL		1 732	1 624	1 475
(2) Machinery operations (excluding operators)				
150 hp tractor	- 1.89 h	239	213	
110 hp tractor	- 2.41 h	155	136	
75 hp tractor	- 1.83 h	71	62	
Equipment costs		54	54	
Stripper harvester	- 2.5 h	415	400	
Transportation of cotton to Jamama ⁽¹⁾		220	220	
TOTAL		1 154	1 085	
(3) Machinery operators		52	52	
(4) Machinery depreciation		614	614	
(5) Unskilled labour (24 man days)		228	192	
TOTAL cost		3 840	3 567	
(6) Returns	20 quintals	5 720	6 320	
(7) Net margin		1 880	2 753	

Note: (1) As for hand harvested cotton but 20 quintals/ha.

TABLE 5.10

Plant Crop Bananas (SoSh/ha)

		Financial	Economic	Foreign exchange
(1) Material costs				
Suckers	- 2 000/ha	3 000	3 000	
Fertiliser	- 296 kg of N	845	847	762
	- 50 kg of P ₂ O ₅	157	157	141
	- 100 kg of K ₂ O	287	287	258
Herbicide	- 4 l of Gesapax	171	154	139
	12 l of Gesapax/Gepiron	547	492	443
Insecticide	- 120 kg of Furadan 10 G	2 346	2 124	1 912
TOTAL		7 373	7 061	3 655
(2) Machinery operations				
150 hp tractor	- 9 h	1 137	1 013	
110 hp tractor	- 3 h	193	170	
75 hp tractor	- 6.5 h	254	222	
Implements costs		112	112	
TOTAL		1 696	1 517	
(3) Unskilled labour (205 man days)				
		2 460	1 640	
TOTAL costs		11 529	10 218	

TABLE 5.11

5 Year Ratoon Bananas (SoSh/ha)

	Financial	Economic	Foreign exchange
(1) Material costs			
Fertiliser - 296 kg of N	847	847	762
50 kg of P ₂ O ₅	157	157	141
100 kg of K ₂ O	287	287	258
Insecticide - 120 kg of Furadan 10 G	2 364	2 124	1 912
TOTAL	3 655	3 415	3 073
(2) Machinery costs			
110 hp tractor - 1 h	64	57	
75 hp tractor - 16 h	624	546	
Implement	109	109	
TOTAL	797	712	
(3) Unskilled labour (422 man days)	5 064	3 376	
TOTAL costs	9 516	7 503	
(4) Returns			
Exportable - 250 quintals	16 875	20 800	
Local - 50 quintals	1 000	1 000	
TOTAL returns	17 875	21 800	
(5) Net margin over 6 years			
TOTAL costs	59 109	47 733	
TOTAL returns	89 375	109 000	
Average net return per year	5 044	10 211	
Less: Machinery operators	100	100	
Machinery depreciation	480	480	
Net annual return	4 464	9 631	

CHAPTER 6

ANALYSIS OF BASE CASE

6.1 Introduction

The cropping pattern in the base case has been developed by maximising the averages of the crops with the highest net margins, having regard to the agronomic constraints identified in Annex 3.

On the surface irrigated basin soils, the whole 3 321 ha are cropped with paddy rice in the gu season. Although double cropping paddy rice would generate high revenues, it is felt that growing two 120-day crops requiring high quality soil and water management would be over-optimistic, particularly since early or delayed rains in either of the two rainy seasons would seriously affect operations. Instead, a more conservative approach has been taken wherein only 70% of the area is cropped, with 90-day maize.

On the levee soils, bananas cannot be grown until the Bardheere Dam is implemented. Upland rice will be susceptible to graminaceous weed infestation and bird damage, so upland rice has been restricted to one-third of the area (998 ha) during the gu season. Another 1 100 ha are planted with cotton, the next most profitable crop. The area of cotton is limited by the availability of casual labour. In view of the present labour shortage in the area, only 1 000 ha of handpicked cotton will be grown. Another 100 ha will be mechanically harvested on a trial basis. The remaining 1 000 ha of levee soils will be planted to maize in the der season. The agricultural implementation schedule is detailed in Appendix V.

6.2 Results of Analysis

The supporting data for the analyses are presented in Appendix IV. Table 6.1 shows the 30 year cash flow at economic prices, Table 6.2 at financial prices, and Table 6.3 the foreign currency flows.

A series of sensitivity tests has been run to calculate the Internal rate of return under various assumptions. The results are presented in Table 6.4.

The IRR of the base case at economic prices is very low, at 3.05%. This is mainly due to the high initial costs of the project. Table 6.1 shows that at full development the value of incremental output runs at 140% of total average costs, exceeding them by some SoSh 20 million per year. However, the accumulated net costs have reached SoSh 330 million by the end of year 5, when the benefits are nearly at maximum levels and the subsequent revenues from the project take until year 21 to repay the accumulated costs, assuming no interest charges on repayment of loans.

The IRR at financial prices is only slightly higher than the economic IRR being 3.27%. This balance is a result of higher forecast financial prices being offset by greater costs when taxes and duties are included. Shadow pricing unskilled labour makes little difference since these costs are very low in relation to the overall project.

TABLE 6.1 BASE CASE - CASH FLOW AT ECONOMIC PRICES

ITEMS	So. Sil. x 1000																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
RETURNS																																	
Value of Proposed Agricultural Production	-	3416	13949	34310	52372	61067	67309	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035	68035		
Value of Present Production Foregone	364	719	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103		
Value of Incremental Production	(364)	2677	12846	33207	51269	59964	66286	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732	68732		
OPERATING COSTS																																	
Agriculture - Inputs	-	1043	4135	9704	11327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327	13327		
- Labour	-	1634	3527	5625	7082	6485	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127		
- Machinery	73	844	2506	5067	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934	6934		
Engineering (1)																																	
- Labour	1399	2112	2822	2771	1771	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456		
- Fuel & Oil	213	633	1952	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176		
- Spare Parts and Materials	-	559	1329	2637	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924		
Overheads/Admin.																																	
- Labour	492	2445	2817	3176	3321	2252	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643		
Total Operating Costs	2177	9250	19088	34235	40535	38554	37567	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587	37587		
CAPITAL AND REPLACEMENT COSTS																																	
Agricultural Machinery																																	
- First Purchase	549	5124	7883	10766	7134	0	1257	3604	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
- Replacement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Engineering - Major construction works	40270	77735	77268	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
- Buildings	14558	29489	9134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
- Services and others	8027	19835	11901	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
- Replacements	0	0	0	4237	551	1296	4057	5118	995	2155	4028	16602	16539	2936	776	1296	10539	4502	3083	2028	2508	15345	10513	4936	800	2669	6723	6376	6376	6376			
Total Capital Costs	6113	13182	106208	14937	7685	1296	6154	8722	8738	11977	9495	20230	13379	8466	6220	5686	16391	12967	9466	6817	4803	10987	16201	9638	7818	6943	10441	12037	6478	5267	5267		
Total Annual Costs	65701	41432	325296	48172	48220	39850	41741	45309	46325	49564	47082	57817	50986	46503	43807	43273	54081	305549	67053	44606	62300	57540	57068	57225	53640	44530	64929	49642	45365	67555	67555		
Net Annual Value of Production	(65701)	13182	138758	112450	(15865)	3049	20114	22545	22407	19168	21650	10915	17766	22679	24925	23495	14651	10183	17679	24328	26332	11261	14053	21507	23127	24202	27345	19106	23477	23477	23477		

(1) Includes Civil works, Irrigation, Marketing, Power, Building Maintenance, Processing Plant
 (2) Includes Design and Supervision.

TABLE 6.2
BASE CASE - CASH FLOW AT FINANCIAL PRICES

ITEM	So.Sh. x 1000																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
RETURNS																															
Value of Proposed Agricultural Production	3549	15188	39112	59257	69080	76354	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	79040	
Value of Present Production Foregone	292	593	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	886	
Value of Incremental Production	(292)	2956	14302	38226	58371	68194	75468	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154	78154		
OPERATING COSTS																															
Agriculture - Inputs	1089	4317	10193	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885	13885		
- Labour	1724	3985	6589	8425	7888	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530	7530		
- Machinery	88	948	2766	5555	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593	7593		
Engineering (1)	1399	2112	2822	2771	1771	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456		
- Fuel and Oil	302	899	2772	7349	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350	7350		
- Spare Parts and Materials	615	1462	2901	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216	3216		
Overheads/Admin	497	2466	2855	3214	3359	2290	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681	1681		
Total Operating Costs	2286	9853	20979	38572	45599	43678	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711	42711		
CAPITAL AND REPLACEMENT COSTS																															
Agriculture Machinery	58	5123	7883	10700	7134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
- First purchase	0	0	0	0	0	0	1257	3604	7743	9822	5467	3628	2840	5530	5444	4390	5955	6460	6383	4789	2235	4537	5748	6702	6929	4263	3058	5662	5770		
- Replacements	47100	87682	88516	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Engineering - Major construction works	17038	35239	10928	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
- Buildings	9519	23603	12766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
- Services and other	0	0	0	4872	923	1490	5631	5886	1144	2478	4632	19092	12119	3377	893	1490	12120	7477	3546	2333	2953	17646	12090	3377	1022	3082	7340	7311	1045		
- Replacements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Capital Costs	74206	151647	120093	15572	8057	1490	6888	9490	8887	12300	10099	22720	14959	8907	6337	5880	18075	19373	9929	7122	5188	22183	17838	10079	7951	7345	11298	12993	6815		
Total Annual Costs	76482	161500	141072	54144	53656	45168	49599	52201	51598	55011	52810	65431	57670	51618	49048	48591	60786	56648	52640	49833	47899	64894	60549	52790	50662	50056	54009	55704	48526		

(1) Includes Civil Works, Irrigation, Workshops, Power, Building Maintenance, Processing Plant.
(2) Includes Design and Supervision.

TABLE 6.3 BASE CASE NITROGEN ESTIMABLE PLANT

ITEM	50, Sh. x 1000																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
RETURN																																
Value of Proposed Agricultural Production	306	14014	11350		42012	5919	11711	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977	61977		
Value of Present Production Forgone	152	716	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048	1048		
Value of Incremental Production	154	1384	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082		
OPERATING COSTS																																
Agriculture	816	3181	7220	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000	9000		
Labor	512	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790	790		
- Machinery	0	760	2455	4960	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241	6241		
Engineering (1)	916	1232	1490	1140	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
- Fuel and Oil	192	570	1757	4050	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650	4650		
- Spares and Materials	0	503	1196	2173	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642	2642		
Overhead/Admin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
- Labor	200	1239	1239	1239	1239	512	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total Operating Costs	1490	5652	11924	21996	25722	24217	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416	23416		
CAPITAL AND DEPRECIATION COSTS																																
Agricultural Machinery	474	4611	7095	9630	6421	0	1140	3240	6969	8046	4926	3245	2536	4977	4967	3921	5306	5813	5745	4310	2612	3003	3003	3003	3003	3003	3003	3003	3003	3003		
Engineering (1) (2)	8022	84635	84603	3813	496	1166	4366	4668	696	1940	3625	14942	9465	2442	696	1166	9402	3652	2775	1845	2111	13011	9162	4432	160	2112	5745	5745	5745	5745		
Total Capital Costs	8496	89246	71696	13443	6917	1166	5506	7908	7865	10786	8545	18207	12041	7619	5206	5117	13092	11666	8520	6125	4323	17094	14615	1671	1616	6213	9367	3644	3644	3644		
Total Annual Costs	9986	94898	85620	85419	32619	25383	28952	31260	31280	34199	31969	31626	35466	31668	29647	28636	30263	35005	31933	29554	27342	31113	30604	30455	29608	27226	27226	27226	27226	27226		

(1) Includes Civil Works, Irrigation, Workshops, Power, Building Maintenance, Processing Plant
 (2) Includes Design and Supervision.

Model 3 shows an IRR of 10.4% when only items generating, or paid for in, foreign exchange are included. Although the capital intensive nature of the project generates a high foreign exchange requirement, the revenues, being all export crops or import substitutes, more than offset the costs.

This condition is reflected in Model 4, where the Somali Shilling is shadow priced at the unofficial rate available in the Gulf States, i.e. SoSh 9.5 per dollar. The increased surplus of foreign exchange revenues over costs lifts the base case economic IRR from 3.1 to 5.2%.

TABLE 6.4

Internal Rate of Return of Base Case under Various Assumptions

Model Nr	Assumptions	IRR
1	Economic values - Table 6.1	3.05
2	Financial values - Table 6.2	3.27
3	Relationship of Foreign Exchange flows - Table 6.3	10.39
4	As 1 but Foreign Exchange devalued by 50% ⁽¹⁾	5.16
5	As 1 but Capital Costs increased by 20%	1.30
6	As 1 but Operating Costs increased by 20%	0
7	As 1 but Output decreased by 20%	negative
8	As 1 but Output delayed by 2 years	0.88
9	As 1 but Capital Costs decreased by 20%	5.80
10	As 1 but Operating Costs decreased by 20%	5.99
11	As 1 but Output increased by 20%	7.44
12	As 1 but Output achieved 1 year early	4.85
13	As 1 but Expatriate Costs not included	3.73
14	As 1 but Capital and Operating Costs increased by 10% and Output delayed 1 year	-0.60

Note: (1) Exchange rate taken as SoSh 9.5 = US \$ 1.00

Models 5 to 8 all reduce the performance of the project, by increasing costs or decreasing or delaying returns. The effect naturally is to bring the IRR very close to zero. A 20% decrease in output has the greatest effect.

Conversely, Models 9 to 12 improve the economic IRR by assuming lower costs or increased yields. Again, the IRR is most sensitive to a 20% increase in output, rising to 7.5%.

Model 13, omitting expatriate costs, has been included to examine the effect on the project if the substantial expatriate salary costs were paid by an external agency, rather than the project. The effect, however, is small, raising the IRR by 0.5% to 3.7%.

6.3 Additional Benefits

The Consultants have recognised, but not attempted to quantify, extra benefits to Somalia resulting from the implementation of the project. These would include increased employment in addition to the project labour force, improved health, hygiene and nutritional standards locally, increased agricultural and livestock extension efforts and an increase in the levels of skill of the population.

6.4 Conclusion

The rate of return of the base case project, as originally specified and analysed, is positive but very low. Sensitivity tests show that the IRR might rise above 6%, given a 20% decrease in capital or operating costs or increase in output, but it is felt that this condition is not likely to occur.

The inherent economic weakness of the base case is that the project, starting with an essentially undeveloped site, must bear very heavy initial development costs. In order to recoup these costs, five alternative cases have been examined. These all aim for a more profitable project, by reducing the area of land which is expensive to develop, by omitting low value crops, or by delaying implementation until water is available from Bardheere dam.

The cases are specified, analysed and discussed in Chapter 7.

CHAPTER 7

COMPARISON OF ALTERNATIVE CASES

7.1 Introduction

Five cases, all alternatives to the base case, have been studied.

The six cases are :-

- Base case - No Bardheere dam at any time. Basin and levee soils developed. Reduced flood protection costs.
- Case 2 - No Bardheere dam at any time. Only the basin soils developed. Reduced flood protection costs.
- Case 3 - Only the basin soils developed, after Bardheere dam in effect. No flood protection costs.
- Case 4 - Base case but delayed until Bardheere dam implemented, and with bananas replacing maize on the levee soils. No flood protection.
- Case 5 - As case 4, but basin soils developed before Bardheere dam, levee soils developed after. Reduced flood protection.
- Case 6 - Base case, but after Bardheere dam is introduced bananas replace maize on levee soils.

In those cases where Bardheere dam is assumed to become operational during the life of the project, year 8 is taken as the first full year of controlled water supply.

Since the analysis of the base case revealed little difference between models at financial and economic values, the five additional analyses below have been carried out at economic values only.

7.2 Engineering Costs of Alternatives

7.2.1 Introduction

The engineering costs for the base case are given in Chapter 8 of Annex 5. In order to analyse the alternative cases the engineering costs have been estimated as described below.

7.2.2 Case 2

In view of the higher costs of the sprinkler irrigation system it was decided to investigate the economics of a project which only included those areas which could be irrigated by surface methods (case 2). For this case it is assumed that some marginal areas could be included in the surface irrigation system (which would otherwise have been under overhead irrigation) giving a total net area of 3 600 ha.

The engineering construction costs for this case have been based on those for the base case, with suitable modifications, as described below.

(a) Land Preparation

Bush clearance is required over an area of 4 000 ha, land planing over 3 600 ha, land levelling over 3 600 ha and a detailed land levelling survey over 3 600 ha. Costs have been calculated on a per hectare basis.

(b) Earthworks

The earthwork requirements for canals and drains are less than those for the base case but the reduction is not proportional to the reduction in area irrigated since the sprinkler irrigation would take place at night. The canal capacities for the base case are in fact determined by the requirements for the surface irrigation, particularly those for paddy rice.

An estimate of the earthworks has been made, based on assumptions regarding the distribution system required. The earthworks for flood protection will also be less since the area to the north of the flood relief channel would not require protection.

(c) Canal Structures

The majority of the canal structures as detailed for the base case are required for surface irrigation only. It has therefore been assumed that the costs for canal structures for case 2 are the same as for the base case.

(d) Drain Structures

A number of drain structures included in the base case designs are not required for case 2. These are :

- 4 Nr drain underpasses
- 5 Nr road culverts
- 4 Nr junction culverts
- 4 Nr drain culverts under flood bund.

To obtain a cost estimate for case 2 the costs of the structures listed above were subtracted from the cost of drain structures for the base case.

(e) In-field Structures

The cost of in-field structures for case 2 is greater than the cost for the base case because of the increased area of surface irrigation. The increased cost has been calculated in proportion to the increase in area irrigated.

(f) Pump Stations

An assessment of water requirements for 3 600 ha of paddy rice gives the same peak irrigation requirement as for the base case. The main pump station for case 2 will therefore be as for the base case.

No sprinkler pump stations are required.

The number of drainage pump stations required is reduced to four.

(g) Sprinkler Equipment

No sprinkler equipment is required.

(h) Primary Road

The 2 km of surfaced road from the main road to the project headquarters, and 18 km of compacted earth road are required.

(i) Buildings

The base case included buildings for the project headquarters and at four project villages. For case 2 only 2 project villages and a slightly smaller project headquarters have been allowed for.

(j) Services and Equipment

Potable water supply and power supply for 2 project villages and project headquarters are required. The cost of miscellaneous items has been assumed to be 80% of that for the base case.

(k) Engineering Design and Supervision of Construction

The estimated costs of design and supervision of construction have been scaled down in proportion to the capital costs of the engineering works.

The estimated construction costs for case 2 have been divided into 3 years in similar proportion to those for the base case.

Operation and maintenance costs for case 2 have been estimated as follows :-

(i) Vehicles and Machinery

It has been assumed that the cost for operation and maintenance vehicles and machinery is 70% of that for the base case. This is because much of the maintenance works are associated with the canalisation and drainage system.

(ii) Fuel and Oil

The following assumptions have been made :-

Annual fuel costs for main pump station are the same as for the base case.

Annual fuel costs for the drainage pump stations are 80% of the annual cost for the base case because only four drainage pump stations are required.

Annual fuel costs for vehicles and machinery are 70% of the costs for the base case.

(iii) Spare Parts and Materials

It has been assumed that the annual cost for spare parts and materials is 70% of the cost estimated for the base case.

Table 7.1 gives the estimated engineering cost schedule for case 2.

TABLE 7.1

Case 2: Engineering Cost Schedule (SoSh ' 000)

Year	Construction and replacement	Operation and maintenance vehicles and machinery	Fuel and oil	Spare parts and materials
1	43 411	64	110	-
2	78 580	3 414	326	381
3	61 178	1 595	1 006	906
4	-	2 896	2 666	1 797
5	-	22	2 668	1 993
6	525	-	2 668	1 993
7	355	995	2 668	1 993
8	1 540	1 090	2 668	1 993
9	22	141	2 668	1 993
10	90	881	2 668	1 993
11	1 771	1 040	2 668	1 993
12	7 121	2 912	2 668	1 993
13	4 735	1 108	2 668	1 993
14	-	1 515	2 668	1 993
15	-	3	2 668	1 993
16	525	-	2 668	1 993
17	6 291	1 559	2 668	1 993
18	1 665	1 971	2 668	1 993
19	-	1 618	2 668	1 993
20	-	880	2 668	1 993
21	1 771	18	2 668	1 993
22	7 121	2 032	2 668	1 993
23	4 735	1 090	2 668	1 993
24	-	1 515	2 668	1 993
25	22	67	2 668	1 993
26	615	881	2 668	1 993
27	1 455	2 035	2 668	1 993
28	1 540	1 970	2 668	1 993
29	-	96	2 668	1 993
30	-	-	2 668	1 993

7.2.3 Case 3

Case 3 considers the implementation of the basin soils only after the construction of Bardheere dam. Therefore the engineering cost schedule for case 3 is the same as for case 2 except that less extensive flood protection works are necessary.

After the construction of Bardheere dam some flood protection works (190 000 m³ of bund) are still required but no flood relief channel is necessary and therefore no siphon for the main canal is required.

The engineering cost schedule for case 3 is therefore the same as case 2 except for a reduced construction cost in Year 1.

7.2.4 Case 4

Case 4 considers the full implementation (base case) after the construction of Bardheere dam but with 1 173 ha of bananas included in the cropping pattern instead of maize and upland rice/maize.

Delaying the project until the completion of Bardheere dam eliminates the need for extensive flood protection works, in particular the flood relief channel and the main canal siphon under it are not required.

The inclusion of bananas on 1 200 ha in the cropping pattern necessitates increases to the canal capacities to meet the increased water requirements. These increases have been estimated and the appropriate cost increases over the base case are given below.

Main pump station	-	+ 6%
Main canal head reach	-	+ 4%
Main canal siphon under road	-	+ 2%

These changes to the capital costs have been assumed to be effective in year 1.

The construction costs for years 2 and 3, the capital costs for operation and maintenance vehicles, the replacement costs and the costs for spare parts and materials have been assumed to be the same as for the base case. The annual fuel and oil costs for case 4 are greater than for the base case because of the increased capacity of the main pump station.

7.2.5 Case 5

Case 5 considers the implementation of the basin soils initially followed by the introduction of sprinkler irrigation after the construction of Bardheere dam.

The following programme for construction has been assumed :

Year 1	-	start construction for surface irrigation
Year 3	-	complete construction for surface irrigation
Year 6	..	start construction for sprinkler irrigation system
Year 7	-	Bardheere dam completed
Year 7	-	complete construction for sprinkler irrigation.

The engineering cost schedule for case 5 is as follows :

Years 1 to 5	-	same costs as for case 2
Years 6 and 7	-	sprinkler construction costs
Years 8 to 30	-	same costs as for base case

7.2.6 Case 6

Case 6 considers the full implementation (base case) before the construction of Bardheere dam but with a subsequent change to the cropping pattern to include 1 173 ha of bananas when Bardheere dam is operational.

The higher water requirements of the bananas necessitate an increased capacity of the main pump station, the head reach of the main canal and the two siphon underpasses. These increases, which will be incorporated during the construction period as it is impracticable to make the changes subsequently, have been assumed to be effective in year 1.

The construction costs for years 2 and 3, the capital costs for operation and maintenance vehicles and machinery, the replacement costs and the costs for spare parts and materials are the same as for the base case.

The annual fuel and oil costs for the main pump station are assumed to be 8% greater than for the base case.

7.3 Case 2

It is unfortunate that at Mogambo the levee soils are more expensive to irrigate and can support lower valued cropping patterns than the basin soils. Case 2 analyses the effect of not developing the levee soils at all.

Bardheere dam is assumed not to be introduced at all, so costs of flood protection works have been included. Only 40% of these costs have been charged to Mogambo, the rest being assumed to benefit downstream farmers.

At full development the cropping pattern comprises :

gu	3 600 ha paddy rice
der	2 500 ha surface irrigated maize

These areas are slightly above those for the base case, and assume that all possible land has been cultivated.

Table 7.2 shows the 30 year cash flow at economic values for case 2. The internal rate of return has been calculated at 4.07%.

The fact that this is little higher than the IRR for the base case is due to the greater intensity of production being offset by the loss of some economies of scale. Gross annual incremental returns per hectare at full development are SoSh 12 715 as opposed to SoSh 10 689 for the base case. However, total capital costs per hectare over the first 10 years rise from SoSh 56 922 in the base case to SoSh 66 807 in case 2. Full development operating costs per hectare also rise from SoSh 5 565 in the base case to SoSh 6 548 in case 2. The increase in capital costs is due to less than proportional reductions in overhead and infrastructural costs, and to the basin soils not all lying together in one block. Higher operating costs are due to the more intensive cropping pattern.

7.4 Case 3

Case 3 takes the same basic form as case 2 - only the basin soils are developed but it is assumed that the project is not completed until Bardheere dam is in operation.

In fact, the controlled availability of water from Bardheere makes no difference to the cropping patterns or returns on the basin soils, although the likelihood of being able to perform field operations on time is increased. The capital and operating costs are the same as for case 2, except that there is now no need for any flood protection works (see Appendix V).

The internal rate of return of case 3, based on data in Table 7.2, has been calculated at 4.20%, i.e. very little higher than case 2.

7.5 Case 4

Case 4 represents the situation if the base case were developed but not until after Bardheere dam is onstream. As in cases 2 and 3, the basin soils are unaffected by the presence of controlled water from Bardheere, but bananas can now be grown on the levee soils. The potential banana area is not unlimited, however, since labour requirements are high, and the export market must be limited (see Annex 3). Bananas have been grown on just under 1 200 ha, a similar area to cotton, and the remaining hectares of levee soils are double cropped with upland rice and maize.

At full development, the cropping pattern is :

Crop	Basin soils (ha)		Levee soils (ha)	
	Gu	Der	Gu	Der
Paddy rice	3 321			
Upland rice			974	
Maize		2 295		974
Cotton				962
Bananas			- 1 173 -	

There is a reduced cost for flood protection works, since the project would start after Bardheere is implemented.

The 30 year cash flow is shown in Table 7.3. The internal rate of return has been calculated at 6.16%.

Table 7.3 shows that, at full development, incremental project revenues at SoSh 88 million per year are nearly double the level of operating costs. The rate of return is still low for the same reasons as in the base case, i.e. that discounted subsequent production can hardly offset high initial capital costs.

TABLE 7.3
CASE 4
FULL AREA IMPLEMENTED AFTER BARRIÈRE DAM ONSTREAM, BANANAS REPLACE MATRIZ ON 1173 HA

ITEM	So. Sh. x 1000																													
	(1)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
RETURNS																														
Value of Proposed Agricultural Production	-	3416	12246	38403	71699	70295	93777	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	89076	
Value of Present Production Foregone	364	739	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	1103	
VALUE OF INCREMENTAL PRODUCTION	(364)	2677	11143	37300	70596	78192	84674	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	87973	
OPERATING COSTS																														
Agriculture	-	1043	6643	14657	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	16805	
- Inputs	-	1651	4240	8171	11080	10898	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	10340	
- Labour	-	73	844	2854	5478	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	7064	
- Machinery																														
Engineering (1)	1399	2112	2822	2771	1771	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	1456	
- Labour (4)	240	550	2000	5200	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	5242	
- Fuel & Oil	-	559	1359	2637	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	
- Spares & Materials																														
Overheads/Admin - Labour (4)	692	2445	2817	3176	3321	2252	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	1643	
TOTAL OPERATING COSTS	2204	9304	22705	42090	48207	46441	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	45474	
CAPITAL & REPLACEMENT COSTS																														
Agricultural Machinery	516	5893	10195	12392	7886	0	1477	4324	8505	12579	7193	2773	3353	6440	6164	5063	9102	7602	5808	5468	2302	5235	7610	9098	8133	3501	4114	6705	7417	5130
Engineering (1) (2) (4)	59643	127059	98325	4237	551	1296	4897	5118	995	2155	4028	16602	10539	2936	776	1296	10539	6502	3083	2028	2568	15345	10513	2936	889	2680	6381	6375	948	771
TOTAL CAPITAL COSTS	60179	132852	108520	16629	8437	1296	6374	9442	9500	14734	11221	19375	13892	9376	6940	6359	19641	14104	8891	7496	4870	20580	18123	12034	9022	6181	10697	13080	8325	5901
TOTAL ANNUAL COSTS	62383	142256	131225	58719	56644	47737	51848	54916	54974	60208	56695	64849	59366	54850	52414	51833	65115	59578	54365	52970	50344	66054	63597	57508	54496	51655	56171	58554	53799	51375

(1) Includes Civil Works, Irrigation, Workshops, Power, Buildings and Processing Plant
 (2) Includes Design and Supervision
 (3) 1986 in Calendar Years
 (4) As for Base Case

7.6 Case 5

Case 5 assumes that the basin soils are developed immediately, and the levee soils are brought into production after Bardheere dam is operational, i.e. in year 8 of the project. The cropping pattern is thus an amalgam of case 2 until year 7 and case 4 thereafter.

The 30 year economic cash flow is shown in Table 7.4, supported by data in Appendix VII. The internal rate of return has been calculated at 3.94%.

It is to be expected that the IRR for case 5 would be less than case 4, owing to the restricted area in years 1 to 7, but higher than case 2 owing to the later inclusion of the levee soils.

7.7 Case 6

Case 6 assumes that the cropping pattern and development schedule of the base case are adopted until year 8. At that time, Bardheere dam is assumed to commence operation, so 1 200 ha of levee soils are taken from single-cropped maize and planted to bananas.

The 30 year economic cash flow is shown in Table 7.5, supported by data in Appendix VIII. The internal rate of return has been calculated at 5.38%, i.e. significantly higher than the base case, but less than case 4 owing to lower valued crops in years 1 to 7.

7.8 Conclusion

Table 7.6 summarises the different cases and their results.

All the alternatives yield a higher rate of return than the base case but none is so outstanding that the choice can be made simply on economic grounds. Cases 2 and 3 - implement the basin soils only - have been rejected since the rate of return is little higher than the base case, only a proportion of the area would be developed, the viability of the project would be entirely dependent on successful rice production, and the direct and indirect benefits to Somalia would be limited.

Case 4 shows slightly the highest rate of return, but adoption of this choice would mean that the project could not start until Bardheere dam was built. In view of the urgent need to increase agricultural production in Somalia, this option is not recommended.

Of cases 5 and 6, case 6 is the most attractive option. The IRR is only slightly higher than case 5, but the whole area at Mogambo can be developed at once, instead of just the basin soils. The project would still be viable and significant even if further delays occur in the construction of Bardheere dam.

Case 6 is therefore recommended as the preferred form of the project. Financial and sensitivity analyses of case 6 are detailed in Chapter 8.

TABLE 7.6

Summary of Different Cases

Case	Cropping pattern (ha)				Flood protection (%)	IRR			
	Before Bardheere		After Bardheere						
	Basin	Levee	Basin	Levee					
Base	P.rice Maize	3 321 2 295	U.rice Maize Cotton	998 2 006 1 103	No change	Yes 3.05			
2	P.rice Maize	3 600 2 500	- -	- -	No change	Yes 4.07			
3	-	-	-	-	P.rice Maize	3 600 2 500	- -	No 4.20	
4	-	-	-	-	P.rice Maize	3 321 2 295	U.rice Maize Cotton Bananas	974 974 962 1 173	No 6.16
5	P.rice Maize	3 321 2 295	- -	- -	P.rice Maize	3 321 2 295	U.rice Maize Cotton Bananas	855 855 1 081 1 173	Yes 3.94
6	P.rice Maize	3 321 2 295	U.rice Maize Cotton Bananas	998 2 006 1 103 -	P.rice Maize	3 321 2 295	U.rice Maize Cotton Bananas	856 937 1 080 1 173	Yes 5.38

CHAPTER 8

FURTHER ANALYSIS OF RECOMMENDED OPTION - CASE 6

8.1 Introduction

Table 7.5 has detailed the 30 year cash flow for case 6 in economic terms. This chapter shows the result of the same analysis in financial terms, calculates various economic indicators and discusses the results of the sensitivity analyses.

8.2 Financial Results

The 30 year financial cash flow is presented in Table 8.1, supported by data in Appendix VIII. The internal financial rate of return has been calculated at 4.09%.

The similarity between the financial and economic results has already been discussed in Chapter 6, and is due to a forecast increase in financial prices in real terms being offset by increased costs when taxes and duties are included and unskilled labour is no longer shadow priced. In case 6 the financial model is slightly worse than the economic whereas in the base case it was slightly higher. This difference is due to the inclusion of an area of bananas requiring a much higher level of unskilled labour, and for which there is no substantial price rise expected.

8.3 Break-even Point

From data in Table 7.5 It can be shown that the economic break-even point of the project occurs in year 18, assuming no loan repayments or interest charges.

8.4 Benefit - Cost Ratio

The Small Development Bank charges 6% interest on long term loans to agriculture, 6.5% to industry and 7.5% to other sectors. The 6% rate has been used to calculate the economic indicators on the assumption that capital, if not allocated to the Mogambo project, would be used elsewhere in the agricultural sector.

The economic benefit stream discounted at 6% = SoSh 8 705 410

The economic cost stream discounted at 6% = SoSh 8 438 200

The benefit-cost ratio = 0.974

8.5 Net Present Worth

Using 6% as the opportunity cost of capital again, the net present worth of the project after 30 years is minus SoSh 23 279 000.

8.6 Value Added

Defining 'value added' as the 30 year, non-discounted, benefit stream net of all costs except loan and interest repayments, the project yield SoSh 419 million.

8.7 Balance of Payments

The fact that all project output is either for export or acts as an import-substitute will have a significant effect on the balance of payments situation. Over 30 years, the net non-discounted value of the project in foreign exchange terms (from Table 8.2) comes to SoSh 1 387 million, or US \$ 220 million. The derivation of Table 8.2 is detailed in Appendix VIII.

8.8 Sensitivity Analyses

A range of sensitivity analyses have been performed, with the results presented in Table 8.3.

The results take the same form as for the base case, discussed in Chapter 6. The project is more sensitive to changes in output than to changes in either capital or operating costs. Advancing or retarding implementation has little effect; nor does a change in the date when Bardheere dam becomes operational.

The most encouraging analysis is the very favourable relationship between foreign exchange earned and spent, due to the fact of all products having a high foreign exchange component. Accepting the view that the Somali shilling is effectively overvalued by 50% by virtue of being tied to the US dollar gives a true rate of return to the project of 9.1% when foreign exchange is valued correctly.

TABLE 8.3

IRR of Case 6 under Various Assumptions

Model Nr	Assumption	IRR (%)
1	Economic values - Table 7.5	5.38
2	Financial values - Table 8.1	4.09
3	Relationship of Foreign Exchange flows - Table 8.2	16.47
4	As 1 but Foreign Exchange upvalued by 50%	9.09
5	As 1 but Capital Costs increased by 20%	3.88
6	As 1 but Operating Costs increased by 20%	2.93
7	As 1 but Output decreased by 20%	0.31
8	As 1 but Output delayed 2 years	2.98
9	As 1 but Capital Costs decreased by 20%	7.78
10	As 1 but Operating Costs decreased by 20%	8.09
11	As 1 but Output increased by 20%	9.63
12	As 1 but Output achieved 1 year early	7.51
13	As 1 but Bardheere dam 1 year early	6.08
14	As 1 but Bardheere dam 2 years late	5.18
15	As 1 but Capital and Operating Costs increased by 10% and Output delayed by 1 year	1.84

The value added to the project by the implementation of the Bardheere dam, i.e. the difference between the base case and case 6, amounts to SoSh 189 million over 30 years. Discounted at 6%, the net present value of the benefits totals SoSh 56 millions. Averaged over 30 years, the non-discounted benefits came to SoSh 1 000, and the discounted to SoSh 300 per hectare of the project per year.

8.9 Financing Requirements

Cost and price data were collected in mid 1979. Assuming that year 1 of the project is 1981, the following table shows the actual financial costs which will be incurred in the first four years, assuming inflation of 15% per year from 1979 onwards. After the fourth year, project revenues exceed annual costs.

	Uninflated annual costs (SoSh)	Inflated annual costs (SoSh)
Year 1	71 960	95 167
Year 2	159 309	242 289
Year 3	128 130	224 100
Year 4	18 078	36 361
Total	377 477	597 917

CHAPTER 9

COMPARISON WITH PREVIOUS REPORT

9.1 Introduction

The internal economic rate of return of the project specified in previous chapters, at 6%, is considerably less than the IRR of 16% achieved by the project proposed by TAMS/FINTECS (1977). This change is mainly due to a rise in costs whereas product prices have changed very little. The following sections discuss specific differences.

9.2 Production Pattern

Table 9.1 summarises the production patterns proposed in the two reports.

TABLE 9.1
Comparison of Production Patterns

Enterprise	Annual production	
	TAMS/FINTECS	This report
Maize	2 405 ha	3 232 ha
Sesame	1 450 ha	0 ha
Paddy rice	955 ha	3 321 ha
Upland rice	0 ha	856 ha
Clover	1 910 ha	0 ha
Legumes	4 350 ha	0 ha
Cotton	1 450 ha	1 080 ha
Bananas	0 ha	1 173 ha
Cattle sales	28 500 ha	0 head
Total area	6 260 ha	6 430 ha
Cropping percentage	200 %	153 %

The differences are that rice is now very much more emphasised, with an increase in maize and the introduction of bananas. Sesame is now omitted, as are the 5 800 ha of fodder crops and legumes.

9.3 Product Prices

Economic product prices have changed considerably in some instances in the two years between the two reports.

Although the present financial prices are close to those adopted by TAMS/FINTECS, the economic prices are considerably different. Sesame and seed cotton have dropped in price slightly, maize has risen, and rice has increased considerably.

TABLE 9.2

Product Prices Used (economic)

	TAMS/FINTECS (SoSh)	This report (SoSh)
Rice	215 per quintal	346 per quintal
Seed Cotton	380 per quintal	316 per quintal
Maize	107 per quintal	120 per quintal
Sesame	378 per quintal	335 per quintal
Cattle Purchases	2.5 per kg	5.3 per kg
Cattle Sales	3.5 per kg	5.9 per kg

Cattle purchase prices were 70% of sales prices, but have now risen to 90% and the general price level has nearly doubled.

9.4 Project Revenues

At full development, incremental project revenues are reasonably similar in each case. They are:

TAMS/FINTECS	SoSh 86 830 000
This report	SoSh 87 728 000

This is due to a reduction in cropped area being compensated for by an overall increase in unit prices, and substitution of slightly higher valued crops.

9.5 Operating Costs

Operating costs are compared in Table 9.3.

TABLE 9.3

Comparison of Operating Costs

Cost	TAMS/FINTECS (SoSh '000)	This report (SoSh '000)
Engineering	1 195	8 166
Agriculture	9 091	23 632
Livestock	24 630	-
Labour	7 821	13 225
Total	42 737	45 023

The two totals are in the same order of magnitude. The agricultural costs in this report are considerably higher, but include substantial increased machinery costs. For example, TAMS/FINTECS quote a global figure of SoSh 17 per hour for tractors and combines, whereas costs in this report range from SoSh 34 per hour for small tractors to SoSh 150 per hour for combine harvesters. This disparity in machinery operating costs also occurs in the engineering section where costs rise from SoSh 1.2 to 8.2 million between the two reports. Labour costs are

perceptibly higher in this report, because wage rates have risen slightly, number have increased, and positions have been upgraded to attract skilled labour.

9.6 Capital Costs

The incremented project returns and operating costs in the two reports lie at similar levels, although the deviation of the data is substantially different in each case.

However, the major difference between the two reports lies in the capital costs. The different cost constituents are shown in Table 9.4.

TABLE 9.4
Comparison of Capital Costs

Item	TAMS/FINTECS (SoSh '000)	This report ⁽¹⁾ (SoSh '000)
Land preparation, Irrigation and drainage	105 158	211 418
Roads	13 370	3 458
Buildings, housing and services	35 995	70 636
Machinery - Irrigation	1 106	12 179
- crop production	22 973	36 284
- feedlot	2 336	-
Total	180 938	333 975

Note: (1) Engineering capital costs in years 1 to 3 only. Agricultural machinery capital costs years 1 to 5.

The difference in agricultural machinery costs is due to a change in specifications, in numbers required, and in unit costs.

The major difference between the capital costs given in two reports lies in the construction costs for the Irrigation and drainage works.

	SoSh
TAMS/FINTECS	105 158 000
This report	211 418 000

The reasons for this substantial difference are summarised below:-

(a) Canal Earthworks

The estimated volume of fill required for the distributary canal embankments as given in this report is 794 000 m³. The estimated volume of fill required for the laterals as given by TAMS/FINTECS is only 378 000 m³.

The estimated volume of fill required for the main canal embankments is 751 000 m³ from this report and 209 800 m³ from TAMS/FINTECS.

Two unit rates for earthworks are given by TAMS/FINTECS:- SoSh 8.45 per m³ for excavation and SoSh 6.30 per m³ for compacted fill. This report gives three rates for excavation and formation of embankments depending of three different haulage distances:- SoSh 12 per m³, SoSh 17 per m³ and SoSh 22 per m³.

Both volumes of earthworks and the unit rates quoted by TAMS/FINTECS are thought to be very low and unrealistic.

(b) Canal and Drain Structures

The estimated cost of construction of canal structures as given in this report is SoSh 22 543 000 and as given by TAMS/FINTECS is SoSh 6 168 000. The figure quoted by TAMS/FINTECS is thought to be a gross underestimate.

The estimate cost of construction of drain structures as given in this report is SoSh 16 263 000; no allowance has been made for drain structures by TAMS/FINTECS.

(c) In-field Structures

The estimated cost of in-field structures as given in this report is SoSh 2 874 000; no allowance has been made for in-field structures by TAMS/FINTECS.

(d) Pump Stations

The estimated costs of construction of the main pump station as given in this report is SoSh 6 470 000 and as given by TAMS/FINTECS is SoSh 2 257 400.

APPENDIX I
COSTS AND PRICES OF INPUTS AND OUTPUTS (SoSh)

Seed		Financial price	Economic price
Rice	per quintal	465	465
Sesame	per quintal	267	267
Malze	per quintal	97	97
Cotton	per quintal	55	55
Banana suckers	each	1.50	1.50

No difference between financial and economic costs since seed would not be imported for the project. Any improved seeds would first be multiplied at Afgoi.

Fertiliser		Financial price	Economic price
N - Urea	cost per tonne	1 315	1 315
	cost per kg of N	2.86	2.86
P - Triple Superphosphate	cost per tonne	1 509	1 509
	cost per kg of P ₂ O ₅	3.14	3.14
K - Potassium sulphate	cost per tonne	1 435	1 435
	cost per kg of K ₂ O	2.87	2.87

No taxes or duties imposed.

Chemicals (per litre)

		Financial price	Economic price
Basodin	60 EC	67.2	60.5
Dimecron	250 ULV	33.6	30.2
Diuron		53.0	47.7
Furadan	10 G	19.7	17.7
Gesapax		42.7	38.4
Gesapax/Gepiron		45.6	41.0
Nogos	50 EC	49.0	44.1
Novacrom Combi	ULV	36.7	33.0
Primagram	500 FW	61.4	55.3
Preforan	30 EC	34.9	31.4
Propanil	36 EC	43.2	38.9
Reglone		60.4	55.0
Treflan		55.0	49.5

10% duties charged.

Aerial application, excluding materials, SoSh 35 per ha

Fuel (per litre)

	Financial price	Economic price
Diesel fuel	1.65	1.16
Petrol	2.44	1.42

Product prices (per quintal)

	Financial price	Economic price
Rice (Indica)	465	346
Maize	97	120
Cotton	286	316
Sesame	267	335
Bananas	67.5	83.2

See Chapter 3 for derivation of prices

APPENDIX II

MACHINERY PRICES AND OPERATING COSTS

TABLE II.1

Agricultural Implement Costs (SoSh/ha)

Item	Cost/ hour ⁽²⁾	Basin		Hours/hectare ⁽³⁾			Upland rice
		Rice	Maize	Cotton	Levee Sesame	Maize	
Chisel rip	4.5	0.77	-	0.77	-	-	0.77
Soil saver	5.3	-	1.11	-	1.11	1.11	-
Disc harrow	5.8	0.56	0.56	0.56	0.56	0.56	0.56
Land plane	28.4	0.56	-	-	0.56	-	-
Fertiliser	21.5	0.24	0.24	0.24	0.24	0.24	0.24
Light harrow	5.8	0.56	0.56	0.56	0.56	0.56	0.56
Planter	24.8	0.48	0.48	0.48	0.48	0.48	0.48
Inter-row cultivator	6.8	-	0.83	0.83	-	0.83	
Ridger	9.0	0.25	0.25	-	-	-	-
Trailer 10 tonne	10.6	1.0	1.0	1.0	1.0	1.0	1.0
5 tonne	5.2	0.5	0.5	1.0	-	0.5	0.5
Flall	12.4	0.69	0.69	0.69	0.69	0.69	0.69
Total (cost/ha) ⁽¹⁾		66.9	59.1	53.8 M ⁽⁴⁾ 57.0 H	64.5	56.8	48.8

Notes: (1) Implement costs are both financial and economic since no taxes and duties are involved

(2) Based on data from Table III-2.

(3) Equipment requirements per hectare based on Annex 3.

(4) M - machine harvested
H - hand harvested.

TABLE II.2

Prime Mover Costs (per hour)

Item	Financial price (SoSh/h)	Economic price (SoSh/h)
150 hp crawler	126.3	112.6
110 hp 4 wd tractor	64.3	56.5
75 hp 2 wd tractor	39.0	34.1
Rice combine	179.9	172.9
Maize combine	192.9	185.9
Cotton combine	166.0	160.0

TABLE II - 3 MACHINERY COST DATA (Excluding Operators and Depreciation)

Machine Type	(1) Base Price	Life (years)	Hours use per year	Repairs Annual % of Base Price	Repairs Annual Cost	Hourly Fuel Consumption (litre)	Annual Allowance For Tax. Ins.	Annual Fuel Cost (Fin) (2)	Annual Op. Costs (Fin) (3)	Hourly Op. Costs (Fin)	Annual Fuel Cost (Econ) (3)	Annual Op. Costs (Econ)	Annual Op. Cost (Econ)
150 HP Crawler Tractor	590 900	7	1500	20	118 200	28	2000	69 000	189 500	126.3	48 700	168 900	112.6
110 HP 4WD Wheeled Tractor	217 300	6	1200	20	43 500	16	2000	31 700	77 200	64.3	22 300	67 800	56.5
75 HP 2WD Wheeled Tractor	125 000	6	1200	20	25 000	10	2000	19 800	46 800	39.0	13 900	40 900	34.1
Base Combine - 2/3 wheeled at 364 200 1/3 on tracks at 445 200	391 200	5	600	20	78 240	14	2000	13 900	94 140	156.9	9 700	89 940	149.9
Maize Conversions	108 000	5	600	20	21 600	-	-	-	21 500	36.0	-	21 600	36.0
Rice Conversions	69 000	5	600	20	13 800	-	-	-	13 800	23.0	-	13 800	23.0
Cotton Stripper Harvester	345 200	5	250	10	34 500	12	2000	5 000	41 500	166.0	3 500	40 000	160.0
Chisel Ripper 13 ft	36 400	7	800	10	3 600	-	-	-	3 600	4.5	-	3 600	4.5
Soil Saver Plough 10 ft	42 300	7	800	10	4 200	-	-	-	4 200	5.3	-	4 200	5.3
Disc Harrows 15 ft	38 600	6	1000	15	5 800	-	-	-	5 800	5.8	-	5 800	5.8
Land Plane 12 ft	141 800	8	500	10	14 200	-	-	-	14 200	28.4	-	14 200	28.4
Fertiliser Broadcaster, 10 tonne	114 500	5	800	15	17 200	-	-	-	17 200	21.5	-	17 200	21.5
Combine Drill	99 200	6	600	15	14 900	-	-	-	14 900	24.8	-	14 900	24.8
Inter-row Cultivator 12 ft	36 000	6	800	15	5 400	-	-	-	5 400	6.8	-	5 400	6.8
Border Discs	35 700	10	400	10	3 600	-	-	-	3 600	9.0	-	3 600	9.0
Fiall Slasher	49 500	6	800	20	9 900	-	-	-	9 900	12.4	-	9 900	12.4
10 Tonne Trailer	53 300	10	500	10	5 300	-	-	-	5 300	10.6	-	5 300	10.6
5 Tonne Trailer	25 600	10	500	10	2 600	-	-	-	2 600	5.2	-	2 600	5.2
Landrover LMB Station Wagon (Petrol)	100 130	8	18 000ks	10	10 000	6km/1	1000	7 320	18 320	-	4 260	15 260	-
Landrover SWB Station Wagon (Petrol)	82 900	8	18 000ks	10	8 300	6km/1	1000	7 320	16 620	-	4 260	13 560	-

Notes (1) Prices are C + F Mogadishu, plus 10% for insurance, unloading, storage, handling, preparation and transport.

(2) Financial costs of petrol = SoSh 2.44/litre diesel = SoSh 1.65/litre

(3) Economic costs of petrol = SoSh 1.42/litre diesel = SoSh 1.16/litre

(4) No tax or duties are applied to machinery imported for agricultural purposes

TABLE II.4

Banana Machinery Requirements (per hectare)

Tractor	Implement type	Cost hour (SoSh)	Hours/hectare	
			Plant crop	Ratoon crop
150 hp	chisel rip	4.5	2.0	-
150 hp	disc harrow	5.8	3.0	-
150 hp	fertiliser spreader	21.5	1.0	1.0
75 hp	border disc	9.0	1.5	1.0
110 hp	flail slasher	12.4	2.0	-
75 hp	5 t trailer	5.2	5.0	15.0
150 hp	bulldozer	-	4.0	-
Total hours - 150 hp			9.0	-
- 110 hp			3.0	1.0
- 75 hp			6.5	16.0
Implement costs (SoSh)			112.2	108.5

TABLE II.5

Costs for Machinery Depreciation and Operator's Labour

Machine	Depreciation/ hour (SoSh)	Paddy rice	Basin maize	Sprinkler maize	Upland rice	Sesame	Cotton (hand)	Cotton (machine)	Bananas	Hours per hectare	
										Cotton (hand)	Cotton (machine)
Chisel ripper	6.07	0.77	-	-	0.77	-	0.77	0.77	0.33	-	-
Soil saver	7.05	-	1.11	1.11	-	1.11	-	-	-	-	-
Disc harrow	6.43	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.5	-	-
Land plane	35.45	0.56	-	-	-	0.56	-	-	-	-	-
Fertiliser	38.17	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1.0	-	-
Light harrow	6.43	0.56	0.56	0.56	0.56	0.56	0.56	0.56	-	-	-
Planter	24.80	0.48	0.48	0.48	0.48	0.48	0.48	0.48	-	-	-
Inter-row cultivator	7.20	-	0.83	0.83	-	-	0.83	0.83	-	-	-
Ridger	8.93	0.25	0.25	-	-	-	-	-	1.08	-	-
10 t trailer	10.66	1.0	1.0	1.0	1.0	1.0	1.0	0.80	-	-	-
5 t trailer	5.12	0.5	0.5	0.5	0.5	-	1.0	0.80	13.33	-	-
Flail	9.90	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.33	-	-
150 hp tractor	56.28	1.89	2.23	2.23	1.89	2.23	1.89	1.89	1.5	-	-
110 hp tractor	30.18	2.97	2.41	2.41	2.41	2.47	2.41	2.41	0.67	-	-
75 hp tractor	17.36	0.75	1.56	0.33	0.50	0.50	1.83	1.83	14.42	-	-
Combine (rice)	159.24	0.91	-	-	0.91	-	-	-	-	-	-
Combine (maize)	160.80	-	1.25	1.25	-	-	-	-	-	-	-
Harvester	138.08	-	-	-	-	-	-	2.5	-	-	-
Total depreciation (SoSh)		429	491	484	386	282	272	614	480		
Operator hours		6.52	7.45	7.22	5.71	5.20	6.13	8.63	16.59		
Operator costs ⁽²⁾ (SoSh)		39	45	43	34	31	37	52	100		

Notes: (1) Derived from Table II.3 as base price divided by life in hours
(2) At SoSh 6 per effective hour worked

APPENDIX III
COSTS OF CROP PROCESSING
(for use with Crop Budgets)

		(SoSh ' 000)	
		Financial	Economic
A	(1) Depreciation		
	Capital cost of plant	5 295	4 814
	Annual charge over 15 year life	353	321
	Capital cost of buildings, services etc.	5 271	4 411
	Annual charge over 30 year life	176	147
	(2) Labour (at full development)	221	196
	(3) Running costs (fuel and oil)	509	359
	(4) Maintenance costs (spares & repairs)	265	241
	Total annual cost at full development	1 524	1 264
B	Rice (accounts for 90% of costs)		
	Annual cost attributable	1 372	1 138
	Annual production = 16 777 tonnes, (unmilled)		
	Cost per tonne	81.8	67.8
	Cost per hectare @ 4.0 tonnes/ha (paddy)	327	271
	Cost per hectare @ 3.5 tonnes/ha (upland)	286	237
C	Maize (accounts for 10% of costs)		
	Annual costs attributable	152	126
	Annual production = 17 204 tonnes		
	Cost per tonne	8.8	7.3
	Cost per hectare @ 4 tonnes/ha	35	29

APPENDIX IV

SUPPORTING DATA FOR ANALYSIS OF BASE CASE

Table	IV - 1	Implementation Schedule
Table	IV - 2	Volume of Agricultural Production
Table	IV - 3	Value of Agricultural Production
Section	IV - 4	Value of Present Production
Table	IV - 5	Agricultural Direct Input Costs
Table	IV - 6	Agricultural Labour Costs
Table	IV - 7	Agricultural Machinery Operating Costs
Table	IV - 8	Engineering, Irrigation and Processing Labour Costs
Table	IV - 9 A & B	Engineering Capital, Operation and Maintenance Costs (Economic and Financial)
Table	IV - 10	Administration and Overhead Labour Costs
Table	IV - 11	Agricultural Machinery Capital and Replacement Costs
Section	IV - 12	Assessment of Foreign Exchange Components of Flows.

TABLE IV - 1

Base Case Agricultural Implementation Schedule (hectares)

Crop	Year							
	2		3		4		5	
	Gu	Der	Gu	Der	Gu	Der	Gu	Der
Paddy rice	243	-	1 107	-	2 538	-	3 321	-
Upland rice	-	-	-	-	724	-	998	-
Maize - surface	-	648	-	1 620	-	1 620	-	2 295
Maize - sprinkler	-	-	-	-	-	1 173	-	2 006
Cotton - hand	-	-	-	449	-	838	-	1 003
Cotton - machine	-	-	-	-	-	100	-	100

TABLE IV - 2
Volume of Agricultural Production

Crop	Yield level (q/ha)	Year							8 onwards	
		2	3	4	5	6	7	8		
(a) Hectares at each Yield Level										
Paddy rice	25	243	864	1 431	783	-	-	-	-	-
	30	-	243	864	1 431	783	-	-	-	-
	35	-	-	243	864	1 431	703	-	-	-
	40	-	-	-	243	1 107	2 538	5 321	-	-
Upland rice	20	-	-	724	274	-	-	-	-	-
	25	-	-	-	724	274	-	-	-	-
	30	-	-	-	-	724	274	-	-	-
	35	-	-	-	-	-	724	998	-	-
Maize-surface	25	648	972	-	675	-	-	-	-	-
	30	-	648	972	-	675	-	-	-	-
	35	-	-	648	972	-	675	-	-	-
	40	-	-	-	648	1 620	1 620	2 295	-	-
Maize-sprinkler	25	-	-	1 173	833	-	-	-	-	-
	30	-	-	-	1 173	833	-	-	-	-
	35	-	-	-	-	1 173	833	-	-	-
	40	-	-	-	-	-	1 173	2 046	-	-
Cotton (hand harvested)	12	-	449	309	165	-	-	-	-	-
	16	-	-	449	309	165	-	-	-	-
	20	-	-	-	449	309	165	-	-	-
	25	-	-	-	-	449	830	1 005	-	-
Cotton (machine harvested)	10	-	-	100	-	-	-	-	-	-
	15	-	-	-	100	-	-	-	-	-
	20	-	-	-	-	100	100	100	100	100
(b) Volume of Production (quintals)										
Unmilled rice		6 075	28 890	84 603	126 045	146 425	162 485	167 770		
Milled rice		4 253	20 223	59 276	88 232	102 498	113 740	117 439		
Maize		16 200	43 740	81 165	132 830	151 095	164 500	172 040		
Seed cotton		-	5 300	12 852	18 684	23 645	26 250	27 075		

TABLE IV - 3

Value of Agricultural Production (SoSh ' 000)

Crop	SoSh/q	Year							8 onwards
		2	3	4	5	6	7		
(a) Financial									
Milled rice	465	1 978	9 404	27 563	41 028	47 662	52 889	54 609	
Maize	97	1 571	4 243	7 873	12 885	14 656	15 957	16 688	
Seed cotton	286	-	1 541	3 676	5 344	6 726	7 508	7 743	
TOTAL		3 549	15 188	39 112	59 257	69 080	76 354	79 040	
(b) Economic									
Milled rice	346	1 472	6 997	20 509	30 528	35 464	39 354	40 634	
Maize	120	1 944	5 249	9 740	15 940	18 131	19 740	20 645	
Seed cotton	316	-	1 703	4 061	5 904	7 472	8 295	8 556	
TOTAL		3 416	13 949	34 310	52 372	61 067	67 389	69 835	

SECTION IV - 4

Value of Present Production

Present agricultural production is described in Annex 3. A range of crops is grown, but, for the purpose of estimating the value of present production, it will be assumed that the area is down to maize in the gu season and sesame in the der season.

It is estimated that approximately 1 000 ha are cropped with maize, and sesame follows on 60% of this area. Yields have been taken at 5 quintals/ha for maize and 2.5 quintals/ha for sesame. The gross value of crop production is approximately SoSh 885 500 per year at financial prices, or SoSh 1 102 500 at economic prices.

Only very restricted use is made of purchased inputs - seeds, fertiliser or chemicals. Machinery is occasionally used, but is usually owned by banana plantations and made available to holdings belonging to the plantation workforce. Family labour is used almost invariably and no opportunity cost is involved.

Thus, for the purpose of this analysis, the net value of agricultural production in the project area has been taken the same as the gross value.

There is some livestock production in the project area, but herds and flocks would be relocated rather than destroyed if the project were implemented, so no loss in production should occur.

There is no evidence to suggest that the value of present production would increase during the project life if the project were not implemented.

The original value of present production is assumed to reduce by one third in each of years 1 to 3 of project implementation.

TABLE IV - 5
Agricultural Direct Input Costs
Including Aerial Spraying
(SoSh '000)

Crop	Cost/ha	Year			
		2	3	4	5 onwards
(1) Financial					
Rice-paddy	1 789	435	1 980	4 540	5 941
Rice-upland	1 867	-	-	1 352	1 863
Maize	1 009	654	1 635	2 818	4 340
Hand picked cotton	1 563	-	702	1 310	1 568
Machine picked cotton	1 732	-	-	173	173
Total		1 089	4 317	10 193	13 885
(2) Economic					
Rice paddy	1 733	421	1 918	4 398	5 755
Rice upland	1 807	-	-	1 308	1 803
Maize	960	622	1 555	2 681	4 129
Hand picked cotton	1 474	-	662	1 235	1 478
Machine picked cotton	1 624	-	-	162	162
Total		1 043	4 135	9 784	13 327

Source: Crop Budgets

TABLE IV - 6

Agricultural Labour Costs

Rate (SoSh/year)	Grade	Year						
		1	2	3	4	5	6	7 onwards
		Numbers						
380 000	Senior executive (Expatriate)	-	2	3	3	3	1	-
21 600	Junior executive (Somali)	-	5	10	15	20	22	23
10 800	Technician/ personal assistant	-	33	82	152	190	190	190
9 600	Supervisor	-	14	31	50	66	66	66
8 400	Clerical	-	2	4	6	8	8	8
6 000	Skilled labour	-	3	6	9	12	12	12
Total cost, excluding unskilled labour (SoSh ' 000)		-	1 394	2 609	3 690	4 397	3 680	3 322
3 750	Unskilled labour at financial prices (Nr)	-	8	367	773	1 074	1 122	1 122
Total Financial Cost (SoSh ' 000)		-	1 724	3 985	6 589	8 425	7 888	7 530
2 500	Unskilled labour at economic prices (Nr)	-	88	367	773	1 074	1 122	1 122
Total Economic Cost (SoSh ' 000)		-	1 614	3 527	5 625	7 082	6 485	6 127

TABLE IV - 7

Agricultural Machinery Operating Costs

Crop	Cost per ha		Hectares				
	Financial	Economic	Year 1	2	3	4	5
Paddy rice	690	631	-	243	1 107	2 538	3 321
Upland rice	627	572	-	-	-	724	998
Surface maize	798	731	-	648	1 620	1 620	2 295
Sprinkler maize	787	721	-	-	-	1 173	2 006
Cotton (hand harvested)	797	743	-	-	449	838	1 003
Cotton (machine harvested)	1 154	1 085	-	-	-	100	100
Unit	Cost per year		Nr per year				
Land Rover-LWB	18 320	15 260	3	8	11	11	11
Land Rover-SWB	16 620	13 560	2	7	9	9	9
Total Costs (financial)	(SoSh ' 000)		88	948	2 766	5 555	7 593
Total Costs (economic)	(SoSh ' 000)		73	844	2 506	5 067	6 934

Source: Crop Budgets

TABLE IV - 8

Engineering/Irrigation/Processing Labour Costs

Rate (SoSh/year)	Grade	Year						
		1	2	3	4	5	6	7 onwards
		Numbers						
380 000	Senior executive (Expatriate)	1	2	3	3	1	-	-
250 000	Junior executive (Expatriate)	4	4	4	2	-	-	-
21 600	Junior executive (Somali)	-	2.5	5	5	5	6	6
10 800	Technician/ personal assistant	1	18	37	65	81	85	85
9 600	Supervisory	-	1	2	3	4	4	4
8 400	Clerical	1	3	3	4	5	5	5
6 000	Skilled labour	-	8	15	28	35	35	35
TOTAL cost, excluding unskilled labour			1 399	2 091	2 782	2 688	1 661	1 715
3 750	Unskilled labour at financial prices	-	8	16	33	44	44	44
TOTAL Financial Cost		1 399	2 122	2 843	2 812	1 826	1 511	1 511
2 500	Unskilled labour at economic prices	-	8	16	33	44	44	44
TOTAL Economic Cost		1 399	2 112	2 822	2 771	1 771	1 456	1 456

TABLE IV - 9A Base Case Engineering Capital and Operating Costs (Economic)

ITEM	SO. SH. x 1000																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
CAPITAL COSTS																																
Major construction works (Bills 1 to 8)	40278	77735	77269	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Replacement of pumps, engines and miscellaneous items	-	-	-	100	520	1296	3476	3561	793	896	2542	12442	8056	771	771	1296	8312	3686	771	771	2542	12442	8956	771	793	1421	3476	3561	771	771		
Buildings (Bill 9)	14258	29409	9154	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Services and Equipment (Bill 10)	3522	6965	2627	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Operation and maintenance vehicles and machinery	91	4877	3043	4137	31	-	1421	1557	202	1259	1486	4140	1583	2165	5	-	2227	2816	2312	1257	26	2903	1557	2165	96	1259	2907	2814	137	-		
Engineering design and supervision (Bill 11)	4414	7993	6233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sub-total (1)	62564	127059	98325	4237	551	1296	4097	5118	995	2155	4028	16602	10539	2936	776	1296	10959	6502	3083	2028	2568	15345	10513	2936	889	2680	6381	6375	9008	771		
OPERATION AND MAINTENANCE COSTS																																
Fuel and oil	213	633	1952	5175	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	5176	
Spare parts and materials	-	559	1329	2637	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	2924	
Sub-total (2)	213	1192	3281	7812	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	
TOTAL (1) + (2)	62777	128251	103606	12049	8651	9396	12997	13218	9095	10255	12128	24702	18639	11036	8876	9396	18639	4602	11183	10128	10668	23445	18613	11036	8969	10780	14483	14475	9008	8071		

(1) Only 40% of flood protection costs charged to Rogambo.

TABLE IV - 10

Administrative/Overhead Labour Costs

Rate (SoSh/year)	Grade	Year						
		1	2	3	4	5	6	7 onwards
		Numbers						
380 000	Senior executive (Expatriate)	1	4	4	4	4	1	-
250 000	Junior executive (Expatriate)	-	1	1	1	1	1	-
30 000	Senior executive (Somali)	1	1	1	1	1	3	3
21 600	Junior executive (Somali)	0.5	8	10	13	16	16	17
10 800	Technician/ personal assistant	1	19	33	47	48	49	49
8 400	Clerical	1	6	9	16	20	20	20
6 000	Skilled labour	7	29	49	63	69	69	69
Total cost, excluding unskilled labour		482	2 402	2 742	3 101	3 246	2 177	1 568
3 750	Unskilled labour at financial prices	4	17	30	30	30	30	30
Total Financial Cost		497	2 466	2 855	3 214	3 359	2 290	1 681
2 500	Unskilled labour at economic prices	4	17	30	30	30	30	30
Total Economic Cost		492	2 445	2 817	3 176	3 321	2 252	1 643

TABLE IV - II
Agricultural Machinery Capital and Replacement Costs

Item	Unit price (SoSh)	1	2	3	4	5	6	7	8	9	10	11	12	13
Cotton Harvester	345 200	0	0	0	1	0	0	0	0	1	0	0	0	0
Basic Combine	391 200	0	2	4	6	0	0	2	4	6	6	0	2	4
Maize attachments	108 000	0	2	3	5	4	0	2	3	5	4	0	2	3
Rice attachments	69 000	0	2	4	6	0	0	2	4	6	6	0	2	4
110 hp tractor	217 300	0	3	7	9	5	0	0	3	7	9	5	0	0
75 hp tractor	125 000	0	2	1	4	2	0	0	2	1	4	2	0	0
150 hp crawler	590 900	0	2	4	5	3	0	0	0	2	4	5	3	0
Flail slasher	49 500	0	2	2	3	2	0	0	2	2	3	2	0	0
Chisel ripper	36 400	0	1	1	2	1	0	0	0	1	1	2	1	0
Soil saver	42 300	0	2	2	2	2	0	0	0	2	2	2	2	0
Disc harrow	38 600	0	2	2	2	2	0	0	2	2	2	2	0	0
Land plane	141 800	0	1	1	2	1	0	0	0	0	1	1	2	1
Fertiliser spinner	114 500	0	1	1	2	0	0	1	1	2	0	0	1	1
Drill	99 200	0	2	2	3	2	0	0	2	2	3	2	0	0
Border disc	35 700	0	1	1	2	0	0	0	0	0	0	0	1	1
Cultivator/fertiliser	36 000	0	1	2	3	1	0	0	1	2	3	1	0	0
10 tonne trailer	53 300	0	2	6	4	2	0	0	0	0	0	0	2	6
4 tonne trailer	25 600	0	2	2	2	2	0	0	0	0	0	0	2	2
Hand spray	600	0	10	20	10	0	0	10	20	10	0	0	10	20
LWB Land Rover	100 100	3	5	3	0	0	0	0	0	3	5	3	0	0
SWB Land Rover	82 900	3	5	2	0	0	0	0	0	2	5	2	0	0

ANNUAL TOTALS (SoSh '000) 549 5 123 7 883 10 700 7 134 0 1 257 3 604 7 743 9 822 5 467 3 628 2 840

TABLE IV - II Cont.
Agricultural Machinery Capital and Replacement Costs

Number purchased per year	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
	6	6	0	2	4	6	6	0	2	4	6	6	0	2	4	6	6
	5	4	0	2	3	5	4	0	2	3	5	4	0	2	3	5	4
	6	6	0	2	4	6	6	0	2	4	6	6	0	2	4	6	6
	3	7	9	5	0	0	3	7	9	5	0	0	3	7	9	5	0
	2	1	4	2	0	0	2	1	4	2	0	0	2	1	4	2	0
	0	0	2	4	5	3	0	0	0	2	4	5	3	0	0	0	2
	2	2	3	2	0	0	2	2	3	2	0	0	2	2	3	2	0
	0	0	1	1	2	1	0	0	0	1	1	2	1	0	0	0	1
	0	0	2	2	2	2	0	0	0	2	2	2	2	0	0	0	2
	2	2	2	2	0	0	2	2	2	0	0	0	2	2	0	2	0
	0	0	0	0	1	1	2	1	0	0	0	0	1	1	2	1	0
	2	2	0	1	1	2	0	0	1	1	2	0	0	1	1	2	0
	2	2	3	2	0	0	2	2	3	2	0	0	2	2	3	2	0
	2	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0
	1	2	3	1	0	0	1	2	3	1	0	0	1	2	3	1	0
	4	2	0	0	0	0	0	0	2	6	4	2	0	0	0	0	0
	2	2	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0
	10	0	0	10	20	10	0	0	10	20	10	0	0	10	20	10	0
	0	0	0	3	5	3	0	0	0	0	0	3	5	3	0	0	0
	0	0	0	2	5	2	0	0	0	0	0	2	5	2	0	0	0
	5 530	5 444	4 390	5 955	6 460	6 383	4 789	2 235	4 537	5 748	6 702	6 929	4 263	3 958	5 662	5 770	4 496

SECTION IV - 12

Assessment of Foreign Exchange Components of Flows

(a) Crop Prices

As shown in Chapter 3, the foreign exchange costs of project crops (i.e. landed but no handling or transport charges) at 1985 projected prices, in 1978 constant currencies are:-

Milled rice	SoSh	296	per quintal
Maize	SoSh	113	per quintal
Seed cotton	SoSh	361	per quintal
Sesame	SoSh	335	per quintal

(b) Value of Proposed Agricultural Production (SoSh ' 000)

Crop	Year						
	2	3	4	5	6	7	8 onwards
Milled rice	1 259	5 986	17 546	26 117	30 339	33 667	34 762
Maize	1 831	4 943	9 172	15 010	17 074	18 589	19 441
Seed cotton	-	1 945	4 640	6 745	8 536	9 476	9 774
TOTAL	3 090	12 874	31 358	47 872	55 949	61 732	63 977

(c) Value of Present Production Foregone (SoSh)

Year 3 loss of maize	=	5 000 quintals	=	565 000
Year 3 loss of sesame	=	1 500 quintals	=	502 500
Total				1 067 500

(d) Agricultural Inputs

Foreign exchange is assessed at 90% of the economic costs of fertiliser, herbicides and pesticides and 100% of aerial spraying.

Crop	FE cost/ha	Year			
		2	3	4	5 onwards
Paddy rice	1 072	260	1 187	2 721	3 560
Upland rice	1 142	-	-	827	1 140
Maize	858	556	1 390	2 396	3 690
Hand picked cotton	1 346	-	604	1 128	1 350
Machine picked cotton	1 475	-	-	148	148
TOTAL		816	3 181	7 220	9 888

(e) **Agricultural Engineering and Administrative Labour Costs**

The only foreign exchange element is 70% of expatriates salaries, it being assumed that 30% is paid locally.

(f) **Agricultural Machinery Operating Costs**

Since these exclude operators and maintenance labour, the foreign exchange component is taken as a straight 90% of the economic price.

(g) **Fuel and Oil Spares and Materials**

90% foreign exchange.

(h) **Agricultural Machinery Capital Costs**

90% foreign exchange.

(i) **Engineering Capital and Replacement Costs**

From Annex 5 for years 1 to 3; 90% for replacements.

APPENDIX V

SUPPORTING TABLES FOR CASES 2 and 3 (ECONOMIC VALUES)

Table	V - 1	Agricultural Implementation Schedule	- Case 2
Table	V - 2	Areas of Agricultural Production	- Case 2
Table	V - 3	Volume of Agricultural Production	- Case 2
Table	V - 4	Value of Agricultural Production	- Case 2
Table	V - 5	Agricultural Direct Input Costs	- Case 2
Table	V - 6	Agricultural Machinery Operating Costs	- Case 2
Table	V - 7	Engineering Costs	- Case 2
Table	V - 8	Agricultural Labour Costs	- Case 2
Table	V - 9	Engineering Labour Costs	- Case 2
Table	V - 10	Overhead/Administrative Labour Costs	- Case 2
Table	V - 11	Agricultural Machinery Capital Costs	- Case 2
Section	V - 12	Costs Differences for Case 3	

TABLE V - 1

Agricultural Implementation Schedule (hectares)

Crop	Year	2	3	4	5 onwards
Paddy rice	- Gu	250	1 200	3 000	3 600
Surface irrigated maize	- Der	650	2 200	2 500	2 500

TABLE V - 2

Areas of Agricultural Production

(hectares at each yield level)

Crop	Yield (q/ha)	Year							
		1	2	3	4	5	6	7	8 onwards
Paddy rice	25	-	250	950	1 800	600	-	-	-
	30	-	-	250	950	1 800	600	-	-
	35	-	-	-	250	950	1 800	600	-
	40	-	-	-	-	250	1 200	3 000	3 600
Surface irrigated maize	25	650	1 550	300	-	-	-	-	-
	30	-	650	1 550	300	-	-	-	-
	35	-	-	650	1 550	300	-	-	-
	40	-	-	-	650	2 200	2 500	2 500	2 500

TABLE V - 3

Volume of Agricultural Production (quintals)

Crop	Year							
	1	2	3	4	5	6	7	8 onwards
Unmilled rice	-	6 250	31 250	82 250	112 250	129 000	141 000	144 000
Milled rice	-	4 375	21 875	57 375	78 575	90 300	98 700	100 800
Maize	-	16 250	58 250	76 750	89 250	98 500	100 000	100 000

4-2

TABLE V - 4

Value of Agricultural Production

(Economic prices SoSh '000)

Crop	Price (SoSh/q)	Year							
		1	2	3	4	5	6	7	8 onwards
Paddy rice	346	-	1 514	7 569	19 921	27 187	31 244	34 150	34 877
Maize	120	-	1 950	6 990	9 210	10 710	11 820	12 000	12 000
TOTAL	-	-	3 464	14 559	29 131	37 897	43 064	46 150	46 877

TABLE V - 5

Agricultural Direct Input Costs, including Aerial Spraying

		Year				
Area (ha)		1	2	3	4	5 onwards
Crop						
Paddy rice		-	250	1 200	3 000	3 600
Maize		-	650	2 200	2 500	2 500
Economic Costs (SoSh '000)						
Crop	SoSh/ha	Year				
		1	2	3	4	5 onwards
Paddy rice	1 733	-	433	2 080	5 199	6 239
Maize	960	-	624	2 112	2 400	2 400
Total		-	1 057	4 192	7 599	8 639

TABLE V - 6

Agricultural Machinery Operating Costs (economic values)

		1	2	3	4	5 onwards
Crop	SoSh/ha	H e c t a r e s				
Paddy rice	631	-	250	1 200	3 000	3 600
Surface Maize	731	-	650	2 200	2 500	2 500
Item	Rate (SoSh)	N u m b e r s				
Land Rover LWB	15 260	3	6	7	7	7
Land Rover SWB	13 560	2	5	6	6	6
Total costs (ShSh '000)	73	792	2 554	3 909	4 287	

TABLE V - 7

Engineering Capital, Fuel and Oil, Spares and Materials Costs

(ScSh '000)

Year	Capital and replacement costs	Fuel and oil	Spares and materials
1	38 481 ⁽¹⁾	110	-
2	81 994	326	381
3	62 773	1 006	906
4	2 896	2 668	1 797
5	22	2 668	1 993
6	525	2 668	1 993
7	1 350	2 668	1 993
8	2 630	2 668	1 993
9	163	2 668	1 993
10	971	2 668	1 993
11	2 811	2 668	1 993
12	10 033	2 668	1 993
13	5 843	2 668	1 993
14	1 515	2 668	1 993
15	3	2 668	1 993
16	525	2 668	1 993
17	7 850	2 668	1 993
18	3 636	2 668	1 993
19	1 618	2 668	1 993
20	880	2 668	1 993
21	1 789	2 668	1 993
22	9 153	2 668	1 993
23	5 825	2 668	1 993
24	1 515	2 668	1 993
25	89	2 668	1 993
26	1 496	2 668	1 993
27	3 496	2 668	1 993
28	3 510	2 668	1 993
29	96	2 668	1 993
30	-	2 668	1 993

Note: (1) Only 40% of flood protection works charged to Mogambo

TABLE V - 8
Agricultural Labour Costs - Economic

Rate (SoSh/year)	Grade	Year					
		1	2	3	4	5	6 onwards
		Numbers					
380 000	Senior executive (expatriate)	-	2	2	2	-	-
250 000	Junior executive (expatriate)	-	-	-	-	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	5	9	11	13	13
10 800	Technician/ personal assistant	-	36	98	140	163	163
9 600	Supervisory	-	8	18	28	33	33
8 400	Clerical	-	1	2	3	4	4
6 000	Skilled labour	-	3	5	7	8	8
2 500	Unskilled labour	-	84	316	569	642	642
Total Cost (SoSh '000)		-	1 570	3 022	4 268	4 045	4 045

TABLE V - 9

Engineering and Processing Labour Costs - Economic

Rate (SoSh/year)	Grade	Year					
		1	2	3	4	5	6 onwards
		Numbers					
380 000	Senior executive (expatriate)	1	2	3	2	-	-
250 000	Junior executive (expatriate)	2	3	3	1	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	2.5	5	6	6	6
10 800	Technician/ personal assistant	1	17	28	44	45	49
9 600	Supervisory	-	1	2	3	3	3
8 400	Clerical	1	3	3	4	4	4
6 000	Skilled labour	-	5	9	18	18	18
2 500	Unskilled labour	-	8	14	28	30	30
Total Cost (SoSh '000)		899	1 832	2 434	1 855	861	904

TABLE V - 10

Overhead/Administrative Labour Costs - Economic

Rate (SoSh/year)	Grade	Year					
		1	2	3	4	5	6 onwards
		Numbers					
380 000	Senior executive (expatriate)	1	4	4	2.5	-	-
250 000	Junior executive (expatriate)	-	1	1	1	-	-
30 000	Senior executive (Somali)	1	1	1	1.5	3	3
21 600	Junior executive (Somali)	0.5	8	8	11	12	12
10 800	Technician/ personal assistant	1	14	21	29	30	30
9 600	Supervisory	-	-	-	-	-	-
8 400	Clerical	1	6	8	9	11	11
6 000	Skilled labour	5	17	29	34	39	39
2 500	Unskilled labour	4	9	15	15	15	15
Total Cost (SoSh '000)		480	2 299	2 478	2 113	1 037	1 037

TABLE V - II

Agricultural Machinery Capital and Replacement Costs

Item	Unit price (SoSh)	1	2	3	4	5	6	7	8	9	10	11	12	13
Cotton harvester	397 000	0	0	0	0	0	0	0	0	0	0	0	0	0
Basic combine	465 400	0	2	4	6	3	0	2	4	6	3	0	2	4
Maize attachments	124 200	0	2	6	1	0	0	2	6	1	0	0	2	6
Rice attachments	79 400	0	2	4	6	3	0	2	4	6	3	0	2	4
110 hp tractor	250 000	0	2	7	5	1	0	0	2	7	5	1	0	0
75 hp tractor	143 800	0	2	2	1	1	0	0	2	2	1	1	0	0
150 hp crawler	679 500	0	3	3	2	2	0	0	3	3	2	2	0	0
Flail slasher	56 900	0	2	2	1	1	0	0	2	2	1	1	0	0
Chisel ripper	41 900	0	1	1	2	0	0	0	0	1	1	2	0	0
Soil saver	48 600	0	2	2	2	0	0	0	0	2	2	2	0	0
Disc harrow	44 400	0	2	2	2	0	0	0	2	2	2	0	0	0
Land plane	163 000	0	1	1	2	1	0	0	0	0	1	1	2	1
Fertiliser spinner	131 700	0	1	1	0	1	0	1	1	0	1	0	1	1
Drill	114 080	0	2	2	2	0	0	0	2	2	2	0	0	0
Border disc	41 100	0	1	1	2	0	0	0	0	0	0	0	1	1
Cultivator/fertiliser	41 400	0	1	2	1	0	0	0	1	2	1	0	0	0
10 tonne trailer	61 400	0	2	6	2	2	0	0	0	0	0	0	2	6
5 tonne trailer	29 400	0	2	2	1	2	0	0	0	0	0	0	2	2
Hand spray	700	0	10	10	10	0	0	10	10	10	0	0	10	10
LWB Land Rover	115 100	3	3	1	0	0	0	0	0	3	3	1	0	0
SWB Land Rover	95 300	2	3	1	0	0	0	0	0	2	3	1	0	0

ANNUAL TOTALS (SoSh '000) 536 5 931 8 634 7 309 3 920 0 1 477 6 361 8 665 5 867 2 364 2 025 3 694

TABLE V - 11 Cont.

Agricultural Machinery Capital and Replacement Costs

Number purchased per year	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	3	0	2	4	4	6	3	0	2	4	6	3	0	2	4	6	3
1	0	0	2	6	6	1	0	0	2	6	1	0	0	2	6	1	0
6	3	0	2	4	4	6	3	0	2	4	6	3	0	2	4	6	3
2 ^c	7	5	1	1	0	0	2	7	5	1	0	0	2	7	5	1	0
2	2	1	1	0	0	0	2	2	1	1	0	0	2	2	1	1	0
3	3	2	2	0	0	0	3	3	2	2	0	0	3	3	2	2	0
2	2	1	1	1	0	0	2	2	1	1	0	0	2	2	1	1	0
0	0	1	1	1	2	0	0	0	0	1	1	2	0	0	0	0	1
0	0	2	2	2	2	0	0	0	0	2	2	2	0	0	0	0	2
2	2	0	0	0	0	0	2	2	2	0	0	0	2	2	0	0	2
0	0	0	0	0	1	1	2	1	0	0	0	0	1	1	2	1	0
0	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	0	1
2	2	2	0	0	0	0	2	2	2	0	0	0	2	2	0	0	2
2	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0
1	2	1	0	0	0	0	1	2	1	0	0	0	1	2	1	0	0
?	2	0	0	0	0	0	0	0	2	6	2	2	0	0	0	0	0
1	2	0	0	0	0	0	0	0	2	2	1	2	0	0	0	0	0
10	0	0	10	10	10	10	0	0	10	10	10	0	0	10	10	10	0
0	0	0	3	3	3	1	0	0	0	0	0	3	3	1	0	0	0
0	0	0	2	3	3	1	0	0	0	0	0	2	3	1	0	0	0

6 933 6 537 3 307 3 961 4 038 3 773 5 390 4 753 4 867 5 480 3 774 2 665 4 092 6 440 6 557 5 373 1 905

Section V - 12 Cost Differences for Case 3

Case 3 is essentially the same economic model as case 2, i.e. development is only on the 3 600 ha of basin soils, but implementation is assumed to be delayed until Bardheere dam comes on stream. In case 3, there is therefore no need for any flood protection works, and the engineering capital costs drop from SoSh 38 481 000 to SoSh 35 011 000 in year 1. The remainder of the costs and benefits are the same as for case 2.

APPENDIX VI

SUPPORTING TABLES FOR CASE 4

Table	VI - 1	Agricultural Implementation Schedule
Table	VI - 2	Areas of Agricultural Production
Table	VI - 3	Volume of Agricultural Production
Table	VI - 4	Value of Agricultural Production
Table	VI - 5	Agricultural Direct Input Costs
Table	VI - 6	Agricultural Machinery Operating Costs
Table	VI - 7	Engineering Costs
Table	VI - 8	Agricultural Labour Costs
Table	VI - 9	Engineering Labour Costs
Table	VI - 10	Overhead/Administrative Labour Costs
Table	VI - 11	Agricultural Machinery Capital Costs

TABLE VI-1

Agricultural Implementation Schedule (hectares)

Crop	Year 2 ⁽¹⁾	3	4	5 onwards
Paddy rice	243	1 107	2 538	3 321
Upland rice	-	-	523	974
Surface maize	648	1 620	1 620	2 295
Sprinkler maize	-	-	523	974
Cotton - hand	-	-	415	862
Cotton - machine	-	-	-	100
Bananas	-	449	1 173	1 173

Note: (1) Year 2 of the project, i.e. calendar year 1988.

TABLE VI - 2

Areas of Agricultural Production

Crop	Yield (q/ha)	Year							8 onwards
		2	3	4	5	6	7		
		Hectares at each Yield Level							
Paddy rice	25	243	864	1 431	783	-	-	-	-
	30	-	243	864	1 431	783	-	-	-
	35	-	-	243	864	1 431	783	-	-
	40	-	-	-	243	1 107	2 538	3 321	-
Upland rice	20	-	-	523	451	-	-	-	-
	25	-	-	-	523	451	-	-	-
	30	-	-	-	-	523	451	-	-
	35	-	-	-	-	-	451	523	974
All maize	25	648	972	523	1 126	-	-	-	-
	30	-	648	972	523	1 126	-	-	-
	35	-	-	648	972	523	1 126	-	-
	40	-	-	-	648	1 620	2 143	3 269	-
Cotton (hand harvested)	10	-	-	415	447	-	-	-	-
	14	-	-	-	415	447	-	-	-
	17	-	-	-	-	415	477	-	-
	25	-	-	-	-	-	415	862	-
Cotton (machine harvested)	10	-	-	-	100	-	-	-	-
	15	-	-	-	-	100	-	-	-
	20	-	-	-	-	-	100	-	-
Bananas	300	-	-	449	724	-	-	-	-
	300	-	-	-	449	1 173	1 173	1 173	-

TABLE VI - 3

Volume of Agricultural Production (quintals)

Crop	Year							
	1	2	3	4	5	6	7	8 onwards
Paddy rice	-	6 075	28 890	70 200	102 465	117 855	128 925	132 840
Upland rice	-	-	-	10 460	22 095	26 965	31 835	34 090
Milled rice	-	4 253	20 223	56 462	87 192	101 374	112 532	116 851
Maize	-	16 200	43 740	64 915	103 780	116 885	124 130	130 760
Cotton	-	-	-	4 150	11 280	14 813	19 974	23 550
Bananas	-	-	-	134 700	351 900	351 900	351 900	351 900

TABLE VI - 4

Value of Agricultural Production (Economic prices, SoSh '000)

Crop	Price (SoSh/q)	Year							
		1	2	3	4	5	6	7	8 onwards
Milled rice	346	-	1 472	6 997	19 536	30 168	35 075	38 436	40 430
Maize	120	-	1 944	5 249	7 790	12 454	14 026	15 016	15 691
Cotton	316	-	-	-	1 311	3 564	4 681	6 312	7 442
Bananas	72.5(1)	-	-	-	9 766	22 513	25 513	25 513	25 513
TOTAL	-	-	3 416	12 246	38 403	71 699	79 295	85 777	89 076

Note: (1) Average of 250 quintals for export at SoSh 83 plus 25 quintals home sales at SoSh 20.

TABLE VI - 5

Agricultural Direct Input Costs, including Aerial Spraying

Area (ha)	Year				
	1	2	3	4	5 onwards
Crop					
Paddy rice	-	243	1 107	2 538	3 321
Upland rice	-	-	-	523	974
Maize	-	648	1 620	2 143	3 269
Cotton - hand	-	-	-	415	862
Cotton - machine	-	-	-	-	100
Bananas - plant	-	-	449	724	196
Bananas - ratoon	-	-	-	449	977

Economic Costs (SoSh '000)

Crop	SoSh/ha	1	2	3	4	5 onwards
Paddy rice	1 733	-	421	1 918	4 398	5 755
Upland rice	1 807	-	-	-	945	1 760
Maize	960	-	622	1 555	2 057	3 138
Cotton - hand	1 474	-	-	-	612	1 271
Cotton - machine	1 624	-	-	-	-	162
Bananas - plant	7 061	-	-	3 170	5 112	1 384
Bananas - ratoon	3 415	-	-	-	1 533	3 335
			1 043	6 643	14 657	16 805

TABLE VI - 6

Agricultural Machinery Operating Costs (economic values)

		1	2	3	4	5 onwards
Crop	SoSh/ha	H e c t a r e s				
Paddy rice	631	-	243	1 107	2 538	3 321
Upland rice	572	-	-	-	523	974
Surface maize	731	-	648	1 620	1 620	2 295
Sprinkler maize	721	-	-	-	523	974
Cotton - hand	743	-	-	-	415	862
Cotton - machine	1 085	-	-	-	-	100
Bananas - plant	1 517	-	-	449	724	196
Bananas - ratoon	712	-	-	-	449	977
Item	Rate (SoSh)	N u m b e r s				
Land Rover LWB	15 260	3	8	11	11	11
Land Rover SWB	13 560	2	7	9	9	9
Total costs (ShSh '000)		73	844	2 854	5 478	7 064

TABLE VI - 7

Engineering Capital, Fuel and Oil, Spares and Materials Costs
(SoSh '000)

Year	Capital and replacement costs	Fuel and oil	Spares and materials
1	59 643	240	-
2	127 059	650	559
3	98 325	2 000	1 329
4	4 237	5 200	2 637
5	551	5 242	2 924
6	1 296	5 242	2 924
7	4 897	5 242	2 924
8	5 118	5 242	2 924
9	995	5 242	2 924
10	2 155	5 242	2 924
11	4 028	5 242	2 924
12	16 602	5 242	2 924
13	10 539	5 242	2 924
14	2 936	5 242	2 924
15	776	5 242	2 924
16	1 296	5 242	2 924
17	10 539	5 242	2 924
18	6 502	5 242	2 924
19	3 083	5 242	2 924
20	2 028	5 242	2 924
21	2 568	5 242	2 924
22	15 345	5 242	2 924
23	10 513	5 242	2 924
24	2 936	5 242	2 924
25	889	5 242	2 924
26	2 680	5 242	2 924
27	6 383	5 242	2 924
28	6 375	5 242	2 924
29	908	5 242	2 924
30	771	5 242	2 924

TABLE VI - 8

Agricultural Labour Costs (economic values)

Rate (SoSh/year)	Grade	Year						
		1	2	3	4	5	6	7 onwards
		Numbers						
380 000	Senior executive (Expatriate)	-	2	3	3	3	1	-
250 000	Junior executive (Expatriate)	-	-	-	-	-	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	5	10	15	20	22	23
10 800	Technician/ personal assistant	-	38	104	185	240	240	240
9 600	Supervisory	-	14	31	50	66	66	66
8 400	Clerical	-	2	4	6	8	8	8
6 000	Skilled labour	-	3	6	9	12	12	12
2 500	Unskilled labour	-	81	557	1 650	2 457	2 591	2 591
TOTAL cost (SoSh '000)		16 515	4 240	8 171	11 080	10 698	10 340	

TABLE VI - 9

Engineering Labour Costs (economic values)

Rate (SoSh/year)	Grade	Year					
		1	2	3	4	5	6 onwards
		Numbers					
380 000	Senior executive (expatriate)	1	2	3	3	1	-
250 000	Junior executive (expatriate)	4	4	4	2	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	2.5	5	5	5	6
10 800	Technician/ personal assistant	1	18	37	65	81	85
9 600	Supervisory	-	1	2	3	4	4
8 400	Clerical	1	3	3	4	5	5
6 000	Skilled labour	-	8	15	28	35	35
2 500	Unskilled labour	-	8	16	33	44	44
Total Cost (SoSh '000)		1 399	2 112	2 822	2 771	1 771	1 456

TABLE VI - 10

Overhead/Administrative Labour Costs (economic values)

Rate (SoSh/year)	Grade	Year						
		1	2	3	4	5	6	7 onwards
		N u m b e r s						
380 000	Senior executive (Expatriate)	1	4	4	4	4	1	-
250 000	Junior executive (Expatriate)	-	1	1	1	1	1	-
30 000	Senior executive (Somali)	1	1	1	1	1	3	3
21 600	Junior executive (Somali)	0.5	8	10	13	16	16	17
10 800	Technician/ personal assistant	1	19	33	47	48	49	49
9 600	Supervisory	-	-	-	-	-	-	-
8 400	Clerical	1	6	9	16	20	20	20
6 000	Skilled labour	7	29	49	63	69	69	69
2 500	Unskilled labour	4	17	30	30	30	30	30
TOTAL cost (SoSh 000)		492	2 445	2 817	3 176	3 321	2 252	1 643

TABLE VI - II

Agricultural Machinery Capital Costs
(SoSh '000)

Item	1	2	3	4	5	6	7	8	9	10	11	12	13
Unit price (SoSh)													
Cotton harvester	0	0	0	0	1	0	0	0	0	1	0	0	0
Basic combine	0	2	4	7	5	0	2	4	7	5	0	2	4
Maize attachments	0	2	4	2	3	0	2	4	2	3	0	2	4
Rice attachments	0	2	4	7	5	0	2	4	7	5	0	2	4
110 hp tractor	0	3	5	8	6	0	0	3	5	8	6	0	0
75 hp tractor	0	2	4	7	7	0	0	2	4	7	7	0	0
150 hp crawler	0	2	6	5	1	0	0	0	2	6	5	1	0
Flail slasher	0	2	2	2	1	0	0	2	2	2	1	0	0
Chisel ripper	0	1	1	3	0	0	0	0	1	1	3	0	0
Soil saver	0	2	1	1	2	0	0	0	2	1	1	2	0
Disc harrow	0	2	1	3	2	0	0	2	1	3	2	0	0
Land plane	0	1	1	2	1	0	0	0	1	1	1	2	1
Fertiliser spinner	0	1	1	2	1	0	1	1	2	1	0	1	1
Drill	0	2	1	2	2	0	0	2	1	2	2	0	0
Border disc	0	1	1	2	0	0	0	0	0	0	0	1	1
Cultivator/fertiliser	0	1	1	2	1	0	0	1	1	2	1	0	0
10 tonne trailer	0	2	4	6	4	0	0	0	0	0	0	2	4
5 tonne trailer	0	1	3	5	5	0	0	0	0	0	0	1	3
Hand spray	0	10	10	10	10	0	10	10	10	10	0	10	10
LWB Land Rover	3	5	3	0	0	0	0	0	3	5	3	0	0
SWB Land Rover	2	5	2	0	0	0	0	0	2	5	2	0	0

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TABLE VI - II Cont.

Agricultural Machinery Capital Costs
(SoSh '000)

Number purchased per year		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
0	7	2	7	3	5	3	2	0	0	0	0	0	1	0	0	0	0	1
5	3	5	5	4	0	0	1	0	0	2	2	6	5	1	0	4	7	5
3	5	8	7	0	0	0	0	2	0	0	7	0	0	2	2	4	2	3
5	5	7	6	5	1	0	0	0	0	8	6	0	0	3	5	8	6	0
0	2	2	1	0	0	0	0	2	2	7	7	0	0	2	4	7	7	0
2	0	1	1	2	0	0	0	0	0	0	2	6	5	1	0	0	0	2
0	0	2	1	3	0	0	0	0	0	0	1	0	0	2	2	2	1	0
0	0	2	1	0	2	1	2	2	1	3	2	1	1	0	0	0	0	1
2	1	3	2	0	0	0	0	0	0	0	2	0	0	2	1	3	2	0
0	0	0	0	1	0	1	1	2	1	0	0	0	0	1	1	2	1	0
2	1	0	2	0	0	0	0	0	1	2	2	0	1	0	1	1	2	1
2	1	2	0	0	0	0	0	0	2	2	1	2	0	0	1	2	2	0
1	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
6	4	0	0	0	0	0	0	0	1	2	4	6	4	0	0	0	0	0
5	5	0	0	0	0	0	0	0	0	1	3	5	5	0	0	0	0	0
10	10	0	10	10	10	10	10	10	0	10	10	10	10	0	10	10	10	10
0	0	0	3	5	3	0	0	0	0	0	0	0	3	5	3	0	0	0
0	0	0	2	5	2	0	2	0	0	0	0	0	2	5	2	0	0	0

6 440 6 164 5 063 9 102 7 602 5 808 5 468 2 302 5 235 7 610 9 098 8 133 3 501 4 314 6 705 7 417 5 130

APPENDIX VII

SUPPORTING TABLES FOR CASE 5

Table VII - 1	Agricultural Implementation Schedule
Table VII - 2	Areas of Agricultural Production
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Table VII - 5	Agricultural Direct Input Costs
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Table VII - 11	Agricultural Machinery Capital Costs

TABLE VII-1

Agricultural Implementation Schedule (hectares)

Crop	2	3	4	5	6	7	8	9	10
Paddy rice	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321	3 321
Upland rice	-	-	-	-	-	-	748	855	855
Surface maize	648	1 620	1 836	2 295	2 295	2 295	2 295	2 295	2 295
Sprinkler maize	-	-	-	-	-	-	748	855	855
Cotton - hand	-	-	-	-	-	-	190	981	981
Cotton - machine	-	-	-	-	-	-	-	100	100
Bananas	-	-	-	-	-	449	1 173	1 173	1 173

TABLE VII - 2

Areas of Agricultural Production

Crop	Yield (q/ha)	Year											
		2	3	4	5	6	7	8	9	10	11	12	
Hectares at each Yield Level													
Paddy rice	25	243	864	1 431	783	-	-	-	-	-	-	-	-
	30	-	243	864	1 431	783	-	-	-	-	-	-	-
	35	-	-	243	864	1 431	783	-	-	-	-	-	-
	40	-	-	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321	3 321
Upland rice	20	-	-	-	-	-	-	748	107	-	-	-	-
	25	-	-	-	-	-	-	-	748	107	-	-	-
	30	-	-	-	-	-	-	-	-	748	107	-	-
	35	-	-	-	-	-	-	-	-	-	748	107	855
Maize	25	648	972	216	459	-	-	748	107	-	-	-	-
	30	-	648	972	216	459	-	-	748	107	-	-	-
	35	-	-	648	972	216	459	-	-	748	107	-	-
	40	-	-	-	648	1 620	1 836	2 295	2 295	2 295	3 043	3 150	-
Cotton (hand harvested)	10	-	-	-	-	-	-	190	791	-	-	-	-
	14	-	-	-	-	-	-	-	190	791	-	-	-
	17	-	-	-	-	-	-	-	-	190	791	-	-
	25	-	-	-	-	-	-	-	-	-	190	791	-
Cotton (machine harvested)	10	-	-	-	-	-	-	-	100	-	-	-	-
	15	-	-	-	-	-	-	-	-	100	-	-	-
	20	-	-	-	-	-	-	-	-	-	100	-	-
Bananas	300	-	-	-	-	-	449	1 173	1 173	1 173	1 173	1 173	

TABLE VII - 3

Volume of Agricultural Production (quintals)

Crop	Year												
	1	2	3	4	5	6	7	8	9	10	11	12	
Paddy rice	-	6 075	28 890	70 200	102 465	117 855	128 925	132 840	132 840	132 840	132 840	132 840	132 840
Upland rice	-	-	-	-	-	-	-	14 960	20 840	25 115	29 390	29 925	
Milled rice	-	4 253	20 223	49 140	71 726	82 499	90 248	103 460	107 576	110 569	113 561	113 936	
Maize	-	16 200	43 740	57 240	77 895	86 130	89 505	91 800	91 800	91 800	91 800	91 800	
Cotton	-	-	-	-	-	-	-	1 900	11 570	15 804	20 197	26 525	
Bananas	-	-	-	-	-	-	-	134 700	351 900	351 900	351 900	351 900	

TABLE VII - 4

Volume of Agricultural Production (economic prices, SoSh '000)

Crop	Price (SoSh/quintal)	Year										
		2	3	4	5	6	7	8	9	10	11	12
Milled rice	346	1 472	6 997	17 002	24 817	28 545	31 226	35 797	37 221	38 257	39 292	39 422
Maize	120	1 944	5 249	6 869	9 347	10 336	10 741	11 016	11 016	11 016	11 016	11 016
Cotton	316	-	-	-	-	-	-	600	3 656	4 994	6 382	8 382
Bananas	72.5(1)	-	-	-	-	-	-	9 766	25 513	25 513	25 513	25 513
Total		3 416	12 246	23 871	34 164	38 881	41 967	57 179	77 406	79 780	82 203	84 333

Note : (1) Average of 250 quintals for export at SoSh 83 and 50 quintals for home sales at SoSh 20

TABLE VII - 5

Agricultural Direct Input Costs, Including Aerial Spraying

Area (ha)	Year								
	1	2	3	4	5	6	7	8	9 onwards
Crop									
Paddy rice	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	-	-	-	-	-	-	-	748	855
Maize	-	648	1 620	1 836	2 295	2 295	2 295	3 043	3 150
Cotton - hand	-	-	-	-	-	-	-	190	981
Cotton - machine	-	-	-	-	-	-	-	-	100
Bananas - plants	-	-	-	-	-	-	449	724	196
Bananas - rattoo:	-	-	-	-	-	-	-	449	977

Economic Costs (SoSh '000)

	SoSh/ha								
Paddy rice	1 733	421	1 918	4 398	5 755	5 755	5 755	5 755	5 755
Upland rice	1 807	-	-	-	-	-	-	1 352	1 545
Maize	960	622	1 555	1 763	2 203	2 203	2 203	2 921	3 024
Cotton - hand	1 474	-	-	-	-	-	-	280	1 446
Cotton - machine	1 624	-	-	-	-	-	-	-	162
Bananas - plants	7 061	-	-	-	-	-	3 170	5 112	1 384
Bananas - rattoo	3 415	-	-	-	-	-	-	1 533	3 335
TOTAL		1 043	3 473	6 161	7 958	7 958	11 128	16 953	16 651

TABLE VII - 6

Agricultural Machinery Operating Costs

Crop	SoSh/ha	Year								
		1	2	3	4	5	6	7	8	9 onwards
Paddy rice	631	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	572	-	-	-	-	-	-	-	748	855
Maize surface	731	-	648	1 620	1 836	2 295	2 295	2 295	2 295	2 295
Maize sprinkler	721	-	-	-	-	-	-	-	748	855
Cotton - hand	743	-	-	-	-	-	-	-	190	981
Cotton - machine	1 085	-	-	-	-	-	-	-	-	100
Bananas - plants	1 517	-	-	-	-	-	-	449	724	196
Bananas - ratoon	712	-	-	-	-	-	-	-	449	977
Item	Rate (SoSh)	Numbers								
Land Rover LWB	15 260	3	6	7	7	7	7	11	11	11
Land Rover LWB	13 560	2	5	6	6	6	6	9	9	9
Total costs (SoSh '000)		73	786	2 071	3 132	3 961	3 961	4 744	6 589	6 998

TABLE VII - 7

Engineering Capital, Fuel and Oil, Spares and Materials Costs
(SoSh '000)

Year	Capital and replacement costs	Fuel and oil	Spares and materials
1	43 475	110	-
2	81 994	326	381
3	62 773	1 006	906
4	2 896	2 666	1 797
5	22	2 668	1 993
6	52 177	4 000	2 500
7	55 778	5 176	2 924
8	5 118	5 242	2 924
9	995	5 242	2 924
10	2 155	5 242	2 924
11	4 028	5 242	2 924
12	16 602	5 242	2 924
13	10 537	5 242	2 924
14	2 936	5 242	2 924
15	776	5 242	2 924
16	1 296	5 242	2 924
17	10 539	5 242	2 924
18	6 502	5 242	2 924
19	3 083	5 242	2 924
20	2 028	5 242	2 924
21	2 568	5 242	2 924
22	15 345	5 242	2 924
23	10 513	5 242	2 924
24	2 936	5 242	2 924
25	889	5 242	2 924
26	2 680	5 242	2 924
27	6 383	5 242	2 924
28	6 375	5 242	2 924
29	908	5 242	2 924
30	771	5 242	2 924

TABLE VII-8

Agricultural Labour Costs

Rate (SoSh/Yr)	Grade	Year								
		1	2	3	4	5	6	7	8	9
		Numbers								
380 000	Senior executive (expatriate)	-	2	2	2	2	-	1	-	-
250 000	Junior executive (expatriate)	-	-	-	-	-	-	-	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	5	9	11	13	13	13	18	23
10 800	Technician/personnel assistant	-	31	78	118	140	158	185	207	223
9 600	Supervisory	-	8	18	28	33	33	33	47	66
8 400	Clerical	-	1	2	3	4	4	4	6	8
6 000	Skilled labour	-	3	5	7	8	8	8	10	12
2 500	Unskilled labour	-	79	257	464	581	831	1 894	2 488	2 609
	Total cost (SoSh '000)	-	1 504	2 659	3 768	3 644	4 463	7 792	9 406	10 201

TABLE VII-9

Engineering Labour Costs

Rate (SoSh/Yr)	Grade	Year								
		1	2	3	4	5	6	7	8	9
		Numbers								
380 000	Senior executive (expatriate)	1	2	3	2	-	2	1	1	-
250 000	Junior executive (expatriate)	2	3	3	1	-	1	2	1	-
30 000	Senior executive (Somali)	-	-	-	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	2.5	5	5	5	6	6	6	6
10 800	Technician/personnel assistant	1	17	28	44	45	50	50	65	87
9 600	Supervisory	-	1	2	3	3	3	3	4	4
8 400	Clerical	1	3	3	4	4	4	4	6	6
6 000	Skilled labour	-	5	9	18	18	18	18	24	35
2 500	Unskilled labour	-	8	14	28	30	30	30	36	44
	Total cost (SoSh '000)	899	1 832	2 434	1 834	839	1 925	1 795	1 784	1 478

TABLE VII-10

Overhead/Administrative Labour Costs

Rate (SoSh/Yr)	Grade	Year								
		1	2	3	4	5	6	7	8	9
		Numbers								
380 000	Senior executive (expatriate)	1	4	4	2.5	-	-	-	-	-
250 000	Junior executive (expatriate)	-	1	1	1	-	-	-	-	-
30 000	Senior executive (Somali)	1	1	1	1.5	3	3	3	3	3
21 600	Junior executive (Somali)	0.5	8	8	11	12	12	12	15	17
10 800	Technician/personnel assistant	1	14	22	29	30	30	30	37	49
8 400	Clerical	1	6	8	9	11	11	11	15	20
6 000	Skilled labour	5	17	29	34	39	39	39	53	69
2 800	Unskilled labour	4	9	15	15	15	15	15	22	30
Total cost (SoSh '000)		480	2 299	2 489	2 113	1 037	1 037	1 037	1 313	1 643

TABLE VII - 11

Agricultural Machinery Capital Costs

Item	Unit price (SoSh)	1	2	3	4	5	6	7	8	9	10	11	12	13
Cotton harvester	397 000	0	0	0	0	0	0	0	0	1	0	0	0	0
Basic combine	465 400	0	2	4	6	1	1	3	5	6	3	1	3	5
Maize attachments	124 200	0	2	6	1	1	1	2	7	1	0	1	2	7
Rice attachments	79 400	0	2	4	6	3	1	3	5	6	3	1	3	5
110 hp tractor	250 000	0	2	7	5	1	2	2	4	8	5	1	2	2
75 hp tractor	143 800	0	2	2	1	1	4	6	4	4	1	1	4	6
150 hp crawler	679 500	0	3	3	2	2	0	2	2	3	3	2	2	0
Fleil slasher	56 900	0	2	2	1	1	0	1	2	2	1	1	0	1
Chisel ripper	41 900	0	1	1	2	0	0	0	1	1	1	2	0	0
Soil saver	48 600	0	2	2	2	0	0	0	0	2	2	2	0	0
Disc harrow	44 400	0	2	2	2	0	1	0	3	2	2	0	1	0
Land plane	163 000	0	1	1	2	1	0	0	0	0	1	1	2	1
Fertiliser spinner	131 700	0	1	1	0	1	1	1	2	0	1	1	1	2
Drill	114 080	0	2	2	2	0	0	0	3	2	2	0	0	0
Border disc	41 100	0	1	1	2	0	0	0	0	0	0	0	1	1
Cultivator/fertiliser	41 400	0	1	2	1	0	0	1	1	2	1	0	0	1
10 tonne trailer	61 400	0	2	6	2	2	0	2	2	0	0	0	2	6
5 tonne trailer	29 400	0	2	2	1	2	3	2	0	2	0	0	2	2
Hand spray	700	0	10	10	10	0	0	20	10	10	0	0	20	10
LWB Land Rover	115 100	3	3	1	0	0	1	1	1	4	3	1	0	0
SWB Land Rover	95 300	2	3	1	0	0	1	1	1	2	3	1	0	0

ANNUAL TOTALS (SoSh 000) 536 5 931 8 634 7 309 3 920 2 219 5 241 7 804 9 773 6 547 3 165 5 056 5 956

TABLE VII - 11 Cont.

Agricultural Machinery Capital Costs

Units per year	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
	6	3	1	3	5	6	3	1	3	5	6	3	1	3	5	6	3
	1	0	1	2	7	1	0	1	2	7	1	0	1	2	7	1	0
	6	3	1	3	5	6	3	1	3	5	6	3	1	3	5	6	3
	4	8	5	1	2	2	4	8	5	1	2	2	4	8	5	1	2
	4	4	1	1	4	6	4	4	1	1	4	6	4	4	1	1	4
	2	2	3	3	2	2	0	2	2	3	3	2	2	0	2	2	3
	2	2	1	1	0	1	2	2	1	1	0	1	2	2	1	1	0
	0	1	1	1	2	0	0	0	1	1	1	2	0	0	0	1	1
	0	0	2	2	2	0	0	0	0	2	2	2	0	0	0	0	2
	3	2	2	0	1	0	3	2	2	0	1	0	3	2	2	0	1
	0	0	0	0	1	1	2	1	0	0	0	0	1	1	2	1	0
	0	1	1	1	2	0	1	1	1	2	0	1	1	1	2	0	1
	3	2	2	0	0	0	3	2	2	0	0	0	3	2	2	0	3
	2	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	2
	1	2	1	0	0	1	1	2	1	0	0	1	1	2	1	0	1
	2	2	0	2	2	0	0	0	2	6	2	2	0	2	2	0	2
	1	2	3	2	0	2	0	0	2	2	1	2	3	2	0	2	1
	10	0	0	20	10	10	0	0	20	10	10	0	0	20	10	10	0
	1	1	1	4	3	1	0	0	1	1	1	4	3	1	0	0	1
	1	1	1	2	3	1	0	0	1	1	1	2	3	1	0	0	1

7 807 6 648 5 086 5 489 7 440 7 049 4 298 5 411 5 672 7 171 7 539 5 600 5 240 5 672 7 481 5 870 5 274

APPENDIX VIII

SUPPORTING TABLES FOR CASE 6

Table VIII - 1	Agricultural Implementation Schedule
Table VIII - 2	Areas of Agricultural Production
Table VIII - 3	Volume of Agricultural Production
Table VIII - 4	Value of Agricultural Production - Economic
Table VIII - 5	Agricultural Direct Input Costs - Economic
Table VIII - 6	Agricultural Machinery Operating Costs - Economic
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Table VIII - 8	Agricultural Labour Costs - Economic
Table VIII - 9	Agricultural Machinery Capital Costs - Financial and Economic
Table VIII - 10	Value of Agricultural Production - Financial
Table VIII - 11	Agricultural Direct Input Costs - Financial
Table VIII - 12	Agricultural Machinery Operating Costs - Financial
Table VIII - 13	Foreign Exchange Component of Flows

TABLE VIII - 1

Agricultural Implementation Schedule (hectares)

Crop	2	3	4	5	6	7	8 onwards
Paddy rice	243	1 107	2 538	3 321	3 321	3 321	3 321
Upland rice	-	-	724	998	1 020	949	856
Surface maize	648	1 620	2 295	2 295	2 295	2 295	2 295
Sprinkler maize	-	-	1 173	2 006	2 084	1 445	937
Cotton - hand	-	449	838	1 003	979	1 008	980
Cotton - machine	-	-	100	100	100	100	100
Bananas	-	-	-	-	-	449	1 173

TABLE VIII - 2

Areas of Agricultural Production

Crop	Yield (quintals/ ha)	Year											
		1	2	3	4	5	6	7	8	9	10	11	
		Hectares at each yield level											
Paddy rice	25	-	243	864	1 431	783	-	-	-	-	-	-	-
	30	-	-	243	864	1 431	783	-	-	-	-	-	-
	35	-	-	-	243	864	1 431	783	-	-	-	-	-
	40	-	-	-	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	20	-	-	-	724	274	22	-	-	-	-	-	-
	25	-	-	-	-	724	274	22	-	-	-	-	-
	30	-	-	-	-	-	724	274	22	-	-	-	-
	35	-	-	-	-	-	-	724	998	1 020	949	-	856
Maize	25	-	648	972	1 173	1 508	78	-	-	-	-	-	-
	30	-	-	648	972	1 173	1 508	78	-	-	-	-	-
	35	-	-	-	648	972	1 173	1 508	78	-	-	-	-
	40	-	-	-	-	648	1 620	2 154	3 154	3 232	3 232	3 232	3 232
Cotton - hand	10	-	-	449	389	165	-	109	-	-	-	-	-
	14	-	-	-	449	389	165	-	109	-	-	-	-
	17	-	-	-	-	449	389	165	-	109	-	-	-
	25	-	-	-	-	-	425	814	871	871	980	-	980
Cotton - machine	10	-	-	100	-	-	-	-	-	-	-	-	-
	15	-	-	-	-	100	-	-	-	-	-	-	-
	20	-	-	-	-	-	100	100	100	100	100	100	100
Bananas	300	-	-	-	-	-	-	449	1 173	1 173	1 173	1 173	

TABLE VIII - 3

Volume of Agricultural Production (quintals)

Crop	Year											
	1	2	3	4	5	6	7	8	9	10	11 onwards	
Paddy rice	-	6 075	28 890	70 200	102 465	117 855	128 925	132 840	132 840	132 840	132 840	132 840
Upland rice	-	-	-	14 480	23 580	29 010	34 110	35 590	35 700	33 215	29 960	29 960
Milled rice	-	4 253	20 223	59 276	88 232	102 806	114 125	117 901	117 978	116 239	113 960	113 960
Maize	-	16 200	43 740	81 165	132 830	153 045	141 280	128 890	129 280	129 280	129 280	129 280
Cotton	-	-	4 490	11 176	16 229	21 548	26 245	25 301	25 628	26 500	26 500	26 500
Bananas	-	-	-	-	-	-	-	134 700	351 900	351 900	351 900	351 900

TABLE VIII - 4

Value of Agricultural Production (economic prices, SoSh '000)

Crop	Price (SoSh/quintal)	Year										
		1	2	3	4	5	6	7	8	9	10	11 onwards
Milled rice	346	-	1 472	6 997	20 510	30 528	35 571	39 487	40 794	40 820	40 219	39 430
Maize	120	-	1 944	5 249	9 740	15 940	18 365	16 954	15 467	15 514	15 514	15 514
Cotton	316	-	-	1 419	3 532	5 128	6 809	8 293	7 995	8 098	8 374	8 374
Bananas	72.5(1)	-	-	-	-	-	-	-	9 766	25 513	25 513	25 513
Total	-	3 416	13 665	33 782	51 596	60 745	64 734	74 022	89 945	89 945	89 620	88 831

Note: (1) Average of 250 quintals for export at SoSh 83 plus 25 quintals home sales at SoSh 20.

TABLE VIII-5

Agricultural Direct Input Costs, including Aerial Spraying

Area (ha)	Year								
	1	2	3	4	5	6	7	8	9 onwards
Crop									
Paddy rice	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	-	-	-	724	998	1 020	949	856	856
Maize	-	648	1 620	2 793	4 301	4 379	3 740	3 232	3 232
Cotton - hand	-	-	449	838	1 003	979	1 088	980	980
Cotton - machine	-	-	-	100	100	100	100	100	100
Bananas - plant	-	-	-	-	-	-	449	724	196
Bananas - ratoon	-	-	-	-	-	-	-	449	977
Economic costs (SoSh '000)									
Crop									
Paddy rice	-	421	1 918	4 398	5 755	5 755	5 755	5 755	5 755
Upland rice	-	-	-	1 308	1 803	1 843	1 715	1 547	1 547
Maize	-	662	1 555	2 681	4 129	4 204	3 590	3 103	3 103
Cotton - hand	-	-	622	1 235	1 478	1 443	1 604	1 445	1 445
Cotton - machine	-	-	-	162	162	162	162	162	162
Bananas - plant	-	-	-	-	-	-	3 170	5 112	1 304
Bananas - ratoon	-	-	-	-	-	-	-	1 533	3 340
Total	-	1 043	4 135	9 784	13 327	13 407	15 996	10 657	16 574

TABLE VIII-6

Agricultural Machinery Operating Costs (Economic)

Crop	SoSh/ha	Year									
		1	2	3	4	5	6	7	8	9 onwards	
Paddy rice	631	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321	3 321
Upland rice	572	-	-	-	724	998	1 020	949	856	856	856
Surface maize	731	-	648	1 620	1 620	2 295	2 295	2 295	2 295	2 295	2 295
Sprinkler maize	721	-	-	-	1 173	2 006	2 084	1 445	937	937	937
Cotton - hand	743	-	-	449	838	1 003	979	1 088	980	980	980
Cotton - machine	1 085	-	-	-	100	100	100	100	100	100	100
Bananas - plant	1 517	-	-	-	-	-	-	449	724	196	196
Bananas - ratoon	712	-	-	-	-	-	-	-	449	977	977
Item	Rate (SoSh)	Numbers									
Land Rover LWB	15 260	3	8	11	11	11	11	11	11	11	11
Land Rover SWB	13 560	2	7	9	9	9	9	9	9	9	9
Total Costs (SoSh '000)		73	844	2 506	5 067	6 934	6 985	7 246	7 438	7 058	7 058

TABLE VIII - 7

Engineering Capital, Fuel and Oil, Spares and Materials Costs

(SoSh '000)

Year	Capital and replacement costs	Fuel and oil	Spares and materials
1	63 145 ⁽¹⁾	213	-
2	127 059	633	559
3	98 325	1 952	1 329
4	4 237	5 175	2 637
5	551	5 175	2 924
6	1 296	5 175	2 924
7	4 897	5 175	2 924
8	5 118	5 242	2 924
9	995	5 242	2 924
10	2 155	5 242	2 924
11	4 028	5 242	2 924
12	16 602	5 242	2 924
13	10 539	5 242	2 924
14	2 936	5 242	2 924
15	776	5 242	2 924
16	1 296	5 242	2 924
17	10 539	5 242	2 924
18	6 502	5 242	2 924
19	3 083	5 242	2 924
20	2 028	5 242	2 924
21	2 568	5 242	2 924
22	12 442	5 242	2 924
23	8 956	5 242	2 924
24	771	5 242	2 924
25	793	5 242	2 924
26	1 421	5 242	2 924
27	3 476	5 242	2 924
28	3 561	5 242	2 924
29	771	5 242	2 924
30	771	5 242	2 924

Note: (1) Only 40% of flood protection works charged to Mogambo

TABLE VIII-8

Agricultural Labour Costs (economic values)

Rate (SoSh/Yr)	Grade	Year								
		1	2	3	4	5	6	7	8	9 onwards
380 000	Senior executive (expatriate)	-	2	3	3	3	1	1	1	-
250 000	Junior executive (expatriate)	-	-	-	-	-	-	-	-	-
30 000	Senior executive (Somali)	-	-	-	-	-	-	-	-	-
21 600	Junior executive (Somali)	-	5	10	15	20	22	23	23	23
10 800	Technician/personnel assistant	-	33	82	152	190	190	190	207	223
9 600	Supervisory	-	14	31	50	66	66	66	66	66
8 400	Clerical	-	2	4	6	8	8	8	8	8
6 000	Skilled labour	-	3	6	9	12	12	12	12	12
2 500	Unskilled labour (economic)	-	79	329	768	1 067	1 126	1 417	2 285	2 579
Total cost (SoSh '000)		-	1 591	3 431	5 610	7 064	6 495	7 244	9 598	10 126
Plus unskilled labour at SoSh 1 280 to give financial cost of SoSh 3 750/per year		-	99	411	960	1 334	1 407	1 771	2 856	3 224
Total Financial Cost (SoSh '000)		-	1 690	3 842	6 570	8 398	7 902	9 015	12 454	13 350

TABLE.VIII - 9

Agricultural Machinery Capital Costs (financial and economic) (SoSh '000)

Item	Unit price (SoSh)	1	2	3	4	5	6	7	8	9	10	11	12	13
Cotton harvester	397 000	0	0	0	1	0	0	0	0	1	0	0	0	0
Basic combine	465 400	0	2	4	6	0	0	2	4	6	6	0	2	4
Maize attachments	124 200	0	2	3	5	4	0	2	2	3	4	0	2	2
Rice attachments	79 400	0	2	4	6	6	0	2	4	6	6	0	2	4
110 hp tractor	250 000	0	3	7	9	5	0	0	3	6	8	5	0	0
75 hp tractor	143 800	0	2	1	4	2	3	4	4	3	4	2	3	4
150 hp crawler	679 500	0	2	4	5	3	0	0	0	2	4	5	3	0
Flail slasher	59 900	0	2	2	3	2	0	0	2	1	2	2	0	0
Chisel ripper	41 900	0	1	1	2	1	0	0	0	1	1	2	1	0
Soil saver	48 600	0	2	2	2	2	0	0	0	2	1	2	1	0
Disc harrow	44 400	0	2	2	2	2	0	0	2	2	2	2	0	0
Land plane	163 000	0	1	1	2	1	0	0	0	0	1	1	2	1
Fertiliser spinner	131 700	0	1	1	2	0	0	2	1	2	0	0	2	1
Drill	114 000	0	2	2	3	2	0	2	2	1	2	2	0	0
Border disc	41 100	0	1	1	2	0	0	0	0	0	0	0	1	1
Cultivator/fertiliser	41 400	0	1	2	3	1	0	0	1	1	2	1	0	0
10 tonne trailer	61 400	0	2	6	4	2	0	1	1	0	0	0	2	6
5 tonne trailer	29 400	0	2	2	2	2	2	2	2	0	0	0	2	2
Hand spray	700	0	10	20	10	0	0	10	20	10	0	0	10	20
LWB Land Rover	115 100	3	5	3	0	0	0	0	0	3	5	3	0	0
SWB Land Rover	95 300	2	5	2	0	0	0	0	0	2	5	2	0	0

ANNUAL TOTALS (SoSh '000) 536 5 922 9 129 12 399 8 298 490 2 304 4 491 8 575 10 878 6 287 4 718 3 700

TABLE VIII - 9 Cont.

Agricultural Machinery Capital Costs (financial and economic) (SoSh '000)

Number purchased per year	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0
	6	6	0	2	4	6	6	0	2	4	6	6	0	2	4	6	6
	3	4	0	2	2	3	4	0	2	2	3	4	0	2	2	3	4
	6	6	0	2	4	6	6	0	2	4	6	6	0	2	4	6	6
	3	6	8	5	0	0	3	6	8	5	0	0	3	6	8	5	0
	4	3	4	2	3	4	4	3	4	2	3	4	4	3	4	2	3
	0	0	2	4	5	3	0	0	0	2	4	5	3	0	0	0	2
	2	1	2	2	0	0	2	1	2	2	0	0	2	1	2	2	0
	0	0	1	1	2	1	0	0	0	1	1	2	1	0	0	0	1
	0	0	2	2	2	1	0	0	0	2	1	2	1	0	0	0	2
	2	2	2	2	0	0	2	2	2	2	0	0	2	2	2	2	0
	0	0	0	0	1	1	2	1	0	0	0	0	1	1	2	1	0
	2	0	0	2	1	2	0	0	2	1	2	0	0	2	1	2	0
	2	1	2	2	0	0	2	1	2	2	0	0	2	1	2	2	0
	2	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0
	1	1	2	1	0	0	1	1	2	1	0	0	1	1	2	1	0
	4	2	0	1	1	0	0	0	2	6	4	2	0	1	1	0	0
	2	2	2	2	2	0	0	0	2	2	2	2	2	2	2	0	0
	10	0	0	10	20	10	0	0	10	20	10	2	0	10	20	10	0
	0	0	0	3	5	3	0	0	0	0	0	3	5	3	0	0	0
	0	0	0	2	5	2	0	0	0	0	0	2	5	2	0	0	0

6 493 6 180 4 646 7 083 7 918 7 712 5 889 2 396 4 920 6 549 7 935 8 637 5 200 4 660 6 108 6 482 5 695

TABLE VIII - 10

Value of Agricultural Production (financial prices, SoSh '000)

Crop	Price SoSh/quintal	Year										
		1	2	3	4	5	6	7	8	9	10	11 onwards
Milled rice	465	-	1 978	9 404	27 563	41 028	47 805	53 068	54 824	54 860	54 051	52 991
Maize	97	-	1 571	4 243	7 873	12 885	14 845	13 704	12 502	12 540	12 540	12 540
Cotton	286	-	-	1 284	3 196	4 641	6 163	7 506	7 236	7 330	7 579	7 579
Bananas	60(1)	-	-	-	-	-	-	-	8 082	21 114	21 114	21 114
Total		-	3 549	14 931	38 632	58 554	68 813	74 278	82 644	95 844	95 284	94 224

Note: (1) Average of 250 quintals for export at SoSh 67.5 and 50 quintals for home sales at SoSh 20.

TABLE VIII-11

Agricultural Direct Input Costs, Including Aerial Spraying (financial values)

Area (ha)	Year								
	1	2	3	4	5	6	7	8	9 onwards
Crop									
Paddy rice	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	-	-	-	724	998	1 020	949	856	856
Maize	-	648	1 620	2 793	4 301	4 379	3 740	3 232	3 232
Cotton - hand	-	-	449	838	1 003	979	1 088	980	980
Cotton - machine	-	-	-	100	100	100	100	100	100
Bananas - Plant	-	-	-	-	-	-	449	724	196
Bananas - Ratoon	-	-	-	-	-	-	-	449	977
Financial Costs (SoSh '000)									
Crop									
Price (SoSh/ha)									
Maize	-	435	1 980	4 540	5 941	5 941	5 941	5 941	5 941
Upland rice	-	-	-	1 352	1 863	1 904	1 772	1 598	1 598
Maize	-	654	1 635	2 818	4 340	4 418	3 774	3 261	3 261
Cotton - hand	-	-	702	1 310	1 568	1 530	1 701	1 532	1 532
Cotton - machine	-	-	-	173	173	173	173	173	173
Bananas - plant	-	-	-	-	-	-	3 310	5 338	1 445
Bananas - ratoon	-	-	-	-	-	-	-	1 641	3 571
TOTAL (SoSh '000)	-	1 089	4 317	10 193	13 885	13 966	16 671	19 484	17 521

TABLE VIII-12
Agricultural Machinery Operating Costs (financial)

Crop	SoSh/ha	Year								
		1	2	3	4	5	6	7	8	9 onwards
Paddy rice	690	-	243	1 107	2 538	3 321	3 321	3 321	3 321	3 321
Upland rice	627	-	-	-	724	998	1 020	949	856	856
Surface maize	798	-	648	1 620	1 620	2 295	2 295	2 295	2 295	2 295
Sprinkler maize	787	-	-	-	1 173	2 006	2 084	1 445	937	937
Cotton - hand	797	-	-	449	838	1 003	979	1 088	980	980
Cotton - machine	1 154	-	-	-	100	100	100	100	100	100
Bananas - Plant	1 696	-	-	-	-	-	-	449	724	196
Bananas - Ratoon	797	-	-	-	-	-	-	-	449	977
Item	Rate (SoSh)									Number
Land Rover LWB	18 320	3	8	11	11	11	11	11	11	11
Land Rover SWB	16 620	2	7	9	9	9	9	9	9	9
TOTAL COSTS (SoSh '000)		88	948	2 766	5 555	7 593	7 649	7 950	8 230	7 756

TABLE VIII - 13

Foreign Exchange Components of Flows

Foreign exchange components are calculated as detailed in Appendix IV.

(a)	Crop	Price SoSh/quintal	Year										
			2	3	4	5	6	7	8	9	10	11 onwards	
	Milled rice	296	1 259	5 986	17 546	26 117	30 431	33 781	34 899	34 921	34 407	33 732	
	Maize	113	1 831	4 943	9 172	15 010	17 294	15 965	14 565	14 609	14 609	14 609	
	Cotton	361	-	1 621	4 035	5 859	7 779	9 474	9 134	9 252	9 567	9 567	
	Bananas	135(1)	-	-	-	-	-	18 185	47 507	47 507	47 507	47 507	
	Total		3 090	12 550	30 753	46 986	55 504	59 220	76 783	106 289	106 090	105 415	

Note: (1) FOB Kismayo forecast price

(b)	Crop	Agricultural Inputs (SoSh 000)	FE cost/ha	Year								
				2	3	4	5	6	7	8	9	
	Paddy rice		1 072	1 187	2 721	3 560	3 560	3 560	3 560	3 560	3 560	3 560
	Upland rice		1 142	-	827	1 140	1 165	1 084	978	978	978	978
	Maize	858	556	1 390	2 396	3 690	3 757	3 209	2 773	2 773	2 773	2 773
	Cotton - hand		1 346	604	1 128	1 350	1 318	1 464	1 319	1 319	1 319	1 319
	Cotton - machine		1 475	-	148	148	148	148	148	148	148	148
	Bananas - plant		3 655	-	-	-	-	1 641	2 646	2 646	716	716
	Bananas - ratoon		3 073	-	-	-	-	-	1 380	3 002	3 002	3 002
	Total (SoSh 000)		816	3 181	7 220	9 888	9 948	11 106	12 804	12 804	12 496	12 496