DEMOCRATIC REPUBLIC OF SOMALIA

JUBA RIVER VALLEY DEVELOPMENT STUDY

VOL. V

ASSOCIATED DEVELOPMENT

ECONOMIC ANALISYS OF THE SCHEMES

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ECONOMIC ANALISYS OF THE SCHEMES

TECHNITAL S.p.A.

INTERNATIONAL GENERAL ENGINEERING

OVERSEAS BRANCH - ROME

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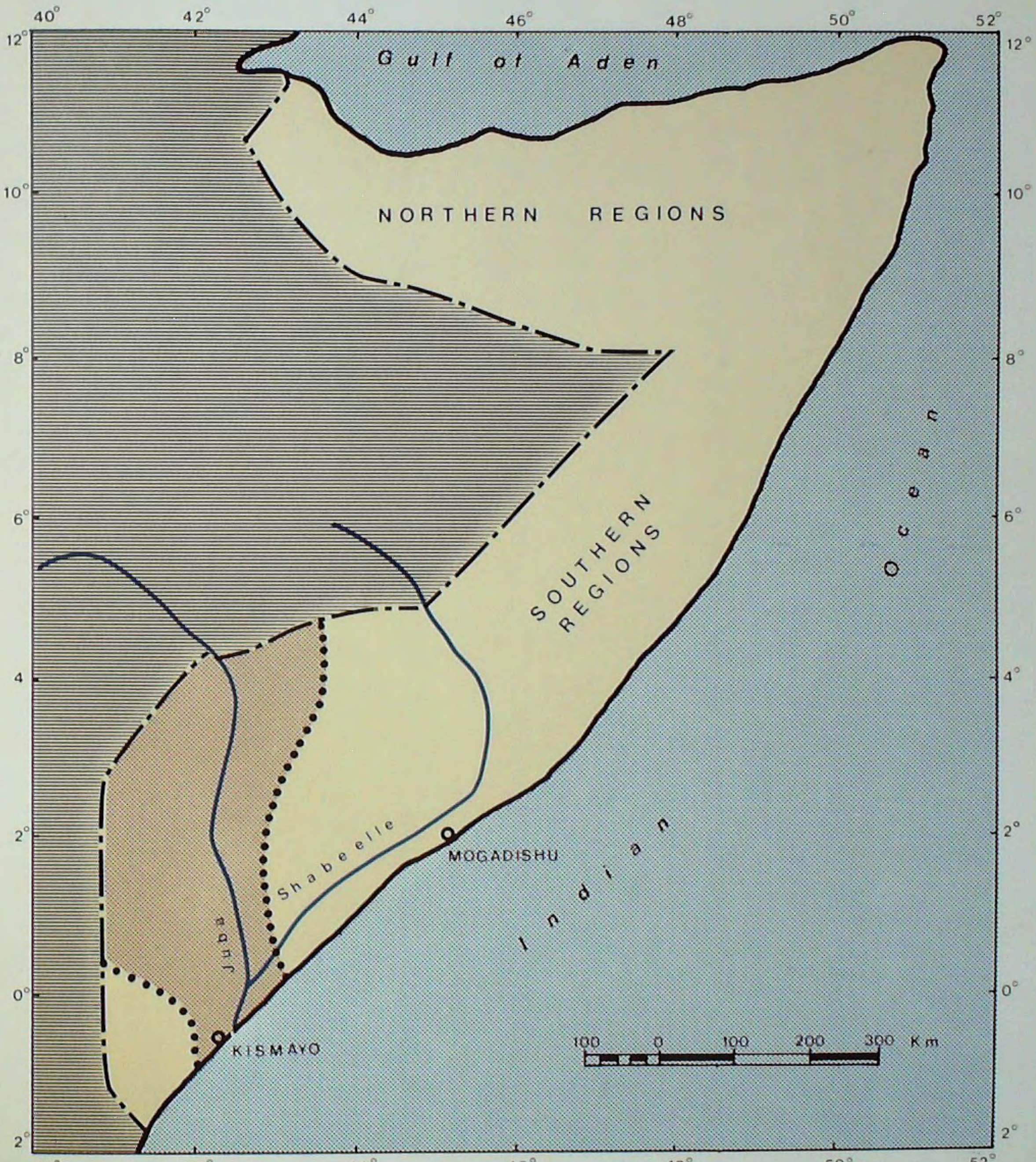


THE PROJECT AREA

L'AREA DI PROGETTO

PART I

INFRASTRUCTURE, REGIONAL STRUCTURE AND ENVIRONMENTAL PROBLEMS

CHAPTER 1.

PRESENT SITUATION

1.1 PRESENT STRUCTURE OF REGION

As regards development which has occurred to date in the Regions of the Upper and Lower Juba (Gedo, Bay, Bakool and Lower Juba), it can be considered that a certain type of balance has been achieved. There are probably two main reasons for this. First, the two traditional sectors of the economy -- subsistence stockraising and agriculture - have attained their maximum extension compatible with the resources that can be exploited without a completely new approach to the whole question of production. This, in turn, has limited the demographic pressure per unit of usable land (the movements of the seminomads being dictated by the need to make best possible use of water and grazing resources). Second, the function of Mogadishu as the only national pole, and that of Kismayo as the export pole, have led to the creation of finalized dependencies, which the distinction between Upper and Lower Juba faithfully reflects. It thus ensues that some areas that are inserted in a market economy serve to drain the surpluses from all other origins and to channel them to Mogadishu or to the export market, while receiving in exchange what few goods or basic necessities are needed to maintain the labour force. Meanwhile the rest of the country has remained out of the picture, still marginally exploiting the available natural resources, progress being hindered by the lack of goods and services from outside.

The keynote of the new economic policy guidelines is that of severing the dependence of the rural areas on the major urban poles, of changing the present equilibrium and of jolting the country out of its stagnation.

A new balance within the Juba region and between that region and the rest of the country will thus necessitate changes in the infrastructure there.

1.2 TRANSPORT SYSTEM IN SOMALIA AND THE JUBA REGION

The Somali transport situation can be succintly summarized thus:

- Foreign trade occurs almost exclusively by sea.
- Domestic trade occurs almost exclusively by road, there being no railway and coastal sea traffic being negligible and badly organized.
- There is little domestic or international air traffic.
- The mobility of the Somalis is very low.
- There is little demand for goods transport.
- At the present time there appears to be no imbalance between the supply of transport and the demand.

The situation covered by the last three points could change rapidly as a result of integration among the various sectors of the economy and differentiation of the production of the various parts of Somalia, which is so necessary.

The situation covered by the first three points, instead, will only change to the extent that it is possible to ensure better integration and organization where the different modes of transport are concerned.

Tables 1, 2, 3 and 4 provide an outline of sea and air movements. As will be noted, the latter concerns passenger traffic almost exclusively, less than 0.1% of the country's foreign trade being by air.

Table 1 - Somali Airline Traffic

	1972	1973
Passengers	27,524	30,355
Tons of freight	380	388
Passenger-km	17,732,233	19,522,645
Ton-km	316,186	281,295

Table 2 - Traffic at Mogadishu Airport (1972)

	Arrivals	Departures
Passengers	10,400	9,700
Freight (tons)	940	260

Table 3-Freight movements at main Somali Ports (average of 1970,1971 and 1972)

	Baardheere	Mogadishu	Mekka	Kismayo	Total
Freight loaded 000 tonnes	165	25	48	79	317
Freight unloaded 000 tonnes	84	199	9	31	322
Passengers embarking	1,798	52	73	131	
Passengers disembarking	2,139	54	57	128	

Source : Statistical Yearbook (data processed by Technital)

Table 4 -Movements in 1973 and 1974 at Kismayo Port (in tonnes)

	1973	1974
Imports	36,985	38,140
Banana exports	66,028	69,264
Other exports	22,695	5,176
Total exports	88,723	74,440
Shipping movements	173	126

Considering the country's long coastline and its general shape and size, much of the domestic trade could well be carried by coasters, but so far there has been no attempt to foster this idea. At the present time the ports make no distinction between domestic and foreign traffic, both being subject to Customs controls.

Somalia's cargo fleet consists of five motor vessels, two of which are banana boats of over 2,000 tons, equipped with cold stores (plying mainly with the Persian Gulf). Another two are 1,000-ton cargo boats plying between Mombasa and the Somali ports, while the remaining one is a cargo boat capable of carrying 600 head of cattle or 1,000-1,200 head of sheep to the Persian Gulf ports.

The fishing fleet consists of ten motor vessels, averaging 600 tons, equipped with cold storage.

The situation at the main ports is satisfactory at the moment. Kismayo was recently improved. It has an L-shaped quay, the two arms being 280 and 340 m long. Depending on the state of the tide, water depth is 28 to 34'. Two 20,000-ton ships can be alongside at the same time. There are no cranes, bunkering or ship-repair facilities, as yet.

The construction of a completely-equipped port at Mogadishu is under way. There will be five quayside berths (seven after future extensions) three for handling general cargo, one for livestock and one for bananas. The port will be capable of dealing with around 440,000 tons/year of imports and 270,000 tons/year of exports.

The port of Baardheere is large enough to cope with the present demand. However, the possibility of increasing capacity and of improving facilities should be studied in the immediate future. The number of smaller ports around the coast should be increased and facilities improved, so as to favour coastal traffic and fishing. Adequate Customs and Excise control is lacking and there is a lot of smuggling. The 1974-1978 Plan provides for studies on how to improve the port situation, but little has been done so far in this respect.

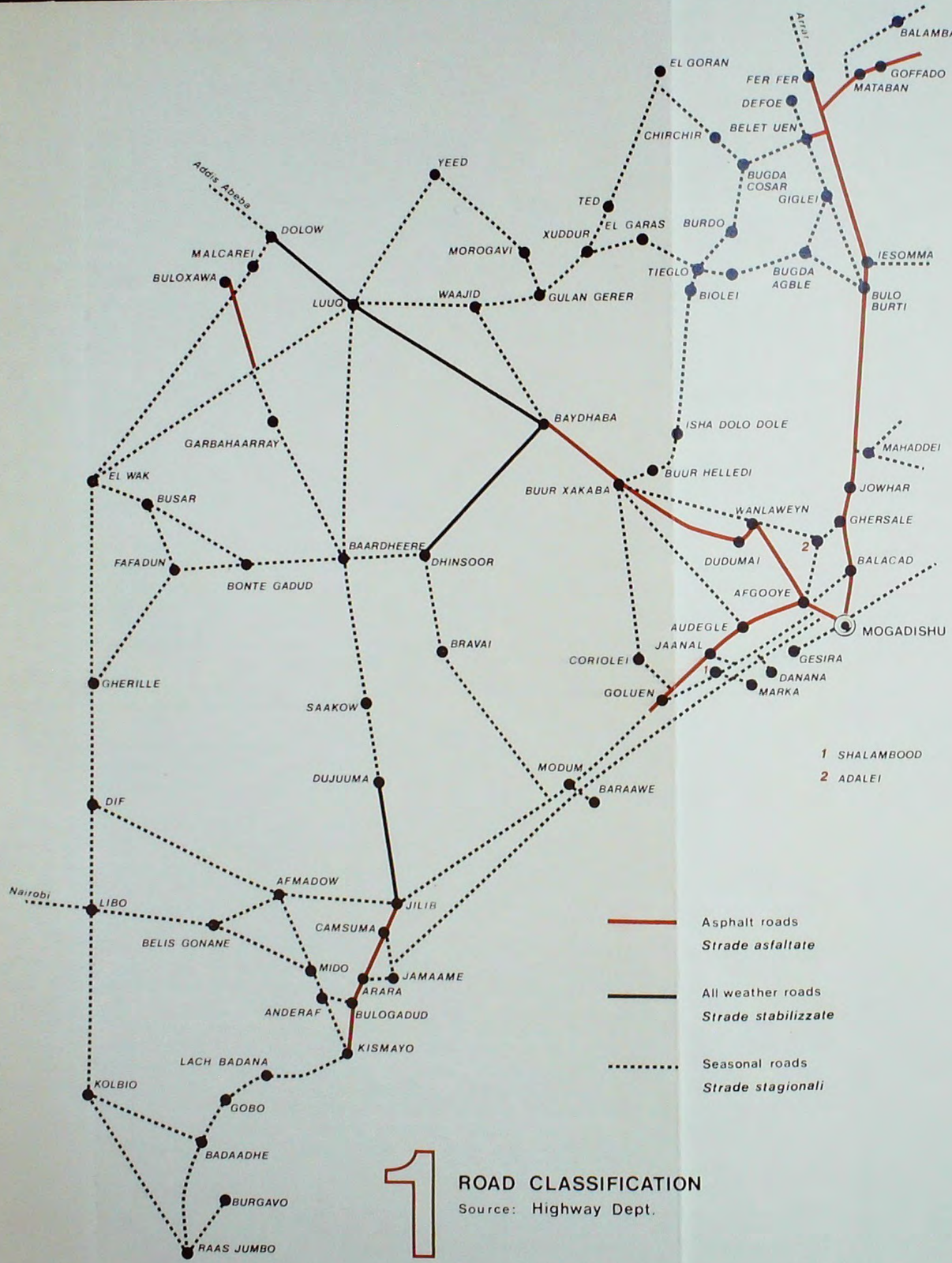
The country's air fleet consists of three DC3s, two Viscounts, one rented B707 and two Cessna. The airports linked by scheduled flights are Mogadishu, Haigheisa, Kismayo, Berbera, Galkayo, Garoe, Gardo, Bosaso, Aluca, Condela, Erigavo, Las Koreh and Burao. The new airport at Kismayo was completed recently, as provided for in the 1971-1973 Plan, while the 1974-1978 Plan envisages improvement of Hargheisa Airport and a study for the construction of a new airport for Mogadishu, the present one being too near the built-up area and of too low a standard.

It is estimated that the road network is 18,500 km long, 6,500 km being all-weather road. In 1971, Fiat estimated that Somalia had about 3,000 cars and 3,150 trucks, while recent estimates put the numbers at around 10,000 trucks and 15,000 cars, of which 5,000 owned by the government. Some 80% of the country's vehicle fleet is concentrated in the Benadir region.

Most of the country's road transport services are run by small businessmen who own one or two vehicles. There are few larger concerns and the public sector is not very active in this field.

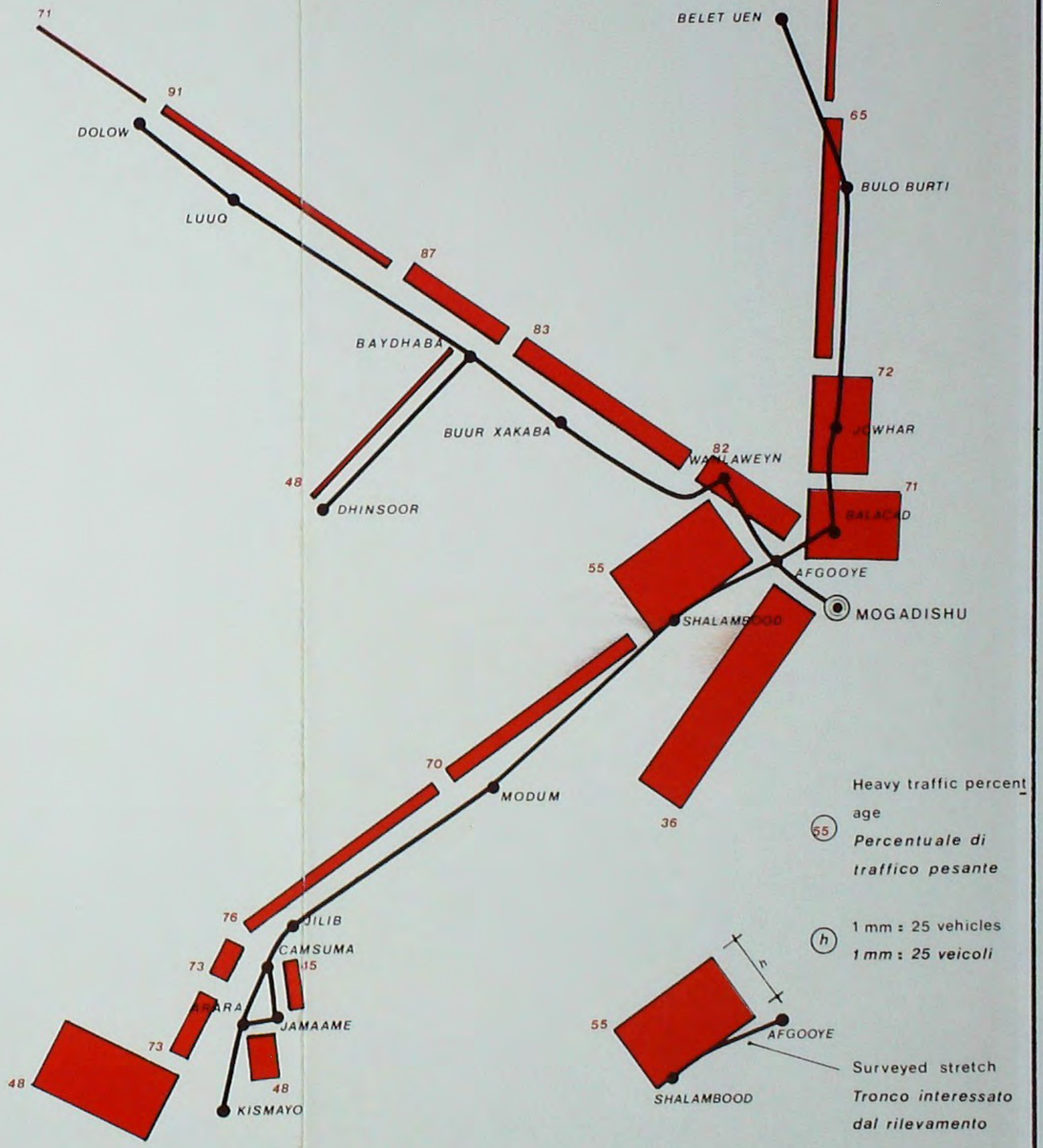
If the public sector took a greater part in the running of road transport services, these could become more continuous and provide greater coverage: this would certainly stimulate mobility.

In the Juba region the transport infrastructure is best developed in the areas between Jilib and Kismayo and around Baydhaba. Throughout the whole



1 ROAD CLASSIFICATION

Source: Highway Dept.



2 TRAFFIC FLOWS

Technital surveyed network

1975 estimate

TECHNITAL SpA

ROAD CLASSIFICATION – TRAFFIC FLOWS

CLASSIFICAZIONE STRADE – FLUSSI TRAFFICO

fig. 1 & 2.1

of the Juba basin the infrastructure consists only of tracks, motorable solely during the dry weather. Fig.1.I,shows the country's road network north, west and south of Mogadishu.

Fig.2.I,shows the traffic flows, based essentially on the data of the 1967, 1968 and 1969 traffic counts increased by 4% per annum to provide a more up-to-date estimate. There are no data on hand regarding the traffic which presently occurs in the Juba basin, but there can be no doubt that the amount involved is very low. Animals sold in Kismayo for export or which are sent to the meat-packing plant there come from the upper reaches of the basin in some cases, but they are not trucked in. The only commodity of any importance that is traded is onions; these are grown in Baardheere and are transported on the Baardheere-Baydhaba road.

There are few river crossings; the ones that do exist are assured by ferries at Baardheere, Saakow and Jilib.

1.3 TRANSPORT POLICY

During the pre-revolutionary decade of the sixties, transport policy was dictated essentially by the need to lower the cost of transport for export products. Consequently, improvements were made to the road links between Kismayo, Mogadishu, Baardheere and Marka and the more productive areas. There was no attempt to integrate development of the areas having a traditional type of economy (subsistence stockraising and agriculture) with those already inserted in the cash economy. This fact is borne out by the virtual absence of penetration roads, which are a basic prerequisite for achieving a balance between rural and urban development.

This policy resulted in increased urbanization, with the population of Mogadishu rising from 100,000 in 1963 to 300,000 or so in 1973 (annual rate of increase about 12%). This growth has disproportionately boosted the demand for consumer goods, thus throwing the economy even farther out of balance.

However, there have been changes in the transport policy since the revolution. The approach now is to use the transport and communications sector as an instrument for bringing development to the areas which do not have so many resources and to the most backward sectors of the economy. This policy was outlined in the 1971-1973 Plan and has been developed in greater detail in the current Five-Year Plan.

Table 5 summarizes the investment situation in the transport and communications sector as conceived in the various National Plans made since 1963, while Table 6 indicates the length of road at the end of the various Plan periods.

It is apparent from the figures given in the tables that though the transport sector still remains very high on the list of investment commitments, it has been redimensioned in the current Development Plan. The primary reason for this is the policy aim of reaching self-sufficiency in food commodities and of gradually shifting the balance from a subsistence to a cash economy. So the main commitment in the ongoing Plan is towards investments that will stimulate activity in the primary sector. Thus the transport in-

Table 5 - Investments made or planned in the communications sectors during various development plans

Plan	Road construction		Port construction		Airport construction		Total inv. in comm. infrastructure	Annual investment	Comm.inv.as % of total Plan investment
	a	b	a	b	a	b			
63-67	210	...	146	...	54	...	426	85	30.7
68-70	191	132	145	40	12	1.3	380	127	53.9
71-73	195	72.5	76	32	21	16	353	118	35.3
74-78	686	-	133	-	28	-	944	188	24.5

a. Investments Planned
b. Investments Made

Table 6 - Road construction in Somalia (Kilometres)

Year	Asphalted	All-weather non-asphalted	Dry weather	Total
1963	600	2,400	9,000	12,000
1968	860	3,000	11,000	14,800
1971	915	4,000	12,000	16,500
1974	1,500	4,000	13,000	18,500

frastructure is assigned an auxiliary role to be assessed in the frame of regional reorganization.

Turning to the Juba region, the 1974-1978 Plan provides for the construction of the Jilib-Golweyn road, while the Arara-Jamaame-Camsuma road and Kismayo Airport, inherited from the previous Development Plan have already been completed. The sectoral investments for the development of the Juba Valley in keeping with the basic policy objectives, have still to be identified. This task forms part of this Study.

1.4 SOCIAL INFRASTRUCTURE

The social infrastructure is quite inadequate and the various components are badly distributed throughout the Study Area. The concentration of facilities in the larger towns only serves to accentuate the regional imbalances already mentioned. Table 7 summarizing the hospital situation has no need for comment. As is apparent, the number of persons per bed ranges from a maximum of 4,166 in the Gedo Region to a minimum of 761 in the Lower Juba, where nearly all the hospitals are concentrated in Kismayo.

The smaller hospitals, like that at Baardheere, for instance, have no doctors, only nurses. There are only 17 dispensaries in Lower Juba, 10 in the Gedo Region, 5 in the Bakool Region and 14 in the Bay Region (1). The only leprosarium for the whole Valley is at Jilib. In April 1975 it had 280 patients. The director of the hospital estimates that between 2 and 4.9% of the population suffers from this disease.

Most of the schools are concentrated in the main towns. In the Lower Juba Region, for instance, 30 of the 40 elementary schools are in Kismayo and only 2 in Jilib, despite its relative size and importance. The general situation is summarized in Table 8. Except for Kismayo, there are no secondary or vocational schools in the Juba Valley.

The veterinary situation is little better. The only resident veterinary surgeon lives in Kismayo. There is a veterinary centre run by a technician in each district capital, but these centres operate under very great difficulties owing to the lack of a supporting infrastructure and a shortage of medical supplies.

Table 7 - Hospital Beds

Region	Hospital beds	Total population	Persons per bed
Gedo	36	150,000	4,166.6
Bakool	68	100,000	1,470.58
Bay	125	293,000	2,344
Lower Juba	310	236,000	761.29

(1) This administrative breakdown has now changed but it was not known in exactly what manner, at the time of writing.

Table 8 - Schools, pupils and teachers (1973-1974)

District	Number schools	Pupils			Teachers						
					Somali			Total			
		Total	M	F	T	M	F	T	M	F	
Kismayo	19	4,009	2,835	1,174	95	86	9	95	86	9	Elementary schools
Jamaame	11	1,702	1,360	342	42	42	-	42	42	-	
Jilib	2	439	330	109	9	8	1	9	8	1	
Afmadow	2	411	330	81	11	11	-	11	11	-	
Badlado	6	366	283	83	12	12	-	12	12	-	
Regional total	40	6,927	5,138	1,789	169	159	10	169	159	10	
Garbahaaray	3	178	142	36	8	8	-	8	8	-	
Saakow	1	125	100	25	6	6	-	6	6	-	
Buloxawa	1	122	89	33	7	7	-	7	7	-	
Luuq	1	393	293	100	9	9	-	9	9	-	
Ceel Waaq	1	101	87	14	4	4	-	4	4	-	
Dolow	2	144	106	38	6	6	-	6	6	-	
Baardheere	4	484	367	117	12	12	-	12	12	-	
Regional total	13	1,447	1,184	263	52	52	-	52	52	-	
Dhinsoor	1	330	270	60	8	8	-	8	8	-	
Qansaxdhere	2	248	193	55	7	7	-	7	7	-	
Regional total	3	578	463	115	15	15	-	15	15	-	
Total		8,952	6,785	2,167	236	226	10	236	226	10	
Kismayo	4	1,020	796	224	33	33	-	33	33	-	Middle schools
Jamaame	1	280	241	39	11	10	1	11	10	1	
Jilib	1	88	72	16	6	6	-	6	6	-	
Afmadow	2	138	112	26	5	5	-	5	5	-	
Badlado	-	-	-	-	-	-	-	-	-	-	
Regional total	8	1,526	1,221	345	55	54	1	55	54	1	
Garbahaaray	-	-	-	-	-	-	-	-	-	-	
Saakow	1	16	16	-	-	-	-	-	-	-	
Buloxawa	1	10	6	4	-	-	-	-	-	-	
Luuq	1	96	69	27	5	5	-	5	5	-	
Ceel Waaq	1	29	22	7	3	3	-	3	3	-	
Dolow	1	31	24	7	3	3	-	3	3	-	
Baardheere	1	162	149	13	7	7	-	7	7	-	
Regional total	6	344	286	58	18	18	-	18	18	-	
Dhinsoor	1	119	110	9	6	6	-	6	6	-	
Qansaxdhere	1	26	23	3	2	2	-	2	2	-	
Regional total	2	145	133	12	8	8	-	8	8	-	
Total	16	2,015	1,640	375	81	80	1	81	80	1	
Kismayo	2	272	239	33	11	11	-	21	20	1	Second. schools
Total	2	272	239	33	11	11	-	21	20	1	

Note: No data available on population of school age and percent of pupils.

fig. 3.1

REGIONAL STRUCTURE

ASSETTO TERRITORIALE

Well defined limits on the use of the region stem from the definition of the resources available, their location and the schemes singled out for their development. Others derive from the development policy aims. It is not within the terms of reference of this Study to prepare a physical country planning for the Juba. However, we have endeavoured to define the criteria for organizing the region, so as to remain within the limits set by the implementation of the proposed investment plan, while ensuring effective regional balance. It would seem that two conditions must be respected:

- The first is to make sure that urban settlement and development of the primary sector are complementary. To permit the transition from traditional society to modern statehood and from subsistence economy to monetary economy it is necessary to render the relationships between citizen and society easier and more frequent, and to make a massive effort to produce a viable infrastructure. Thus it is essential to achieve population agglomerations by means of "poles" and "areas of influence". The function of towns and villages as centres for promoting and not only supporting development is therefore very evident.

- The second condition stems logically from the basic policy aims and from the de-facto situation. It consists in the need to assign special functions to the various parts of Somalia so as to create unity in the country through exchanges which should result in links being forged between them. If the age-old isolation and selfsufficiency encountered in the two traditional sectors of the economy are to be overcome, this need for special functions cannot be ignored in Somalia's planning of regional organization. In other words, it is necessary to replace the present basically static regional equilibrium by a dynamic equilibrium obtained by the juxtaposition of diverse spaces developed and equipped with equal force.

These two conditions are essential for obtaining social equality and for ensuring that all the relevant forces are harnessed in the country's development process. Thus a regional structure must be sought that is capable of differentiating and maximizing two-way exchanges between the various regions and within each region. At the same time it is necessary to create as extensive a network as possible of urban centres that live in symbiosis at the various levels of exchange and size.

From what is said in Chapter 2, when the proposed schemes are fully operational, about 58% of the population of the "economic area" of the Valley will be employed in the primary sector, 8% in the secondary and 34% in the third.

If it is aimed to have 90% of the population living in centres of more than 2,000 inhabitants by that time, then around 80% of the population employed in the primary sector will be "urbanized" in centres whose functions will be to promote primary development beyond to provide for tertiary services as usual. The political function of this scheme has already been dealt with in Para 1.1.1 of the Summary Report set forth in Vol. I.

The search for the most appropriate kind of regional organization must be based on these considerations to arrive at the best network of urban centres and the interrelations thereof. Our aim at this juncture is to indicate the general guidelines involved.

The choices must be made in such a way as to:

- Avoid territorial segregation of the sectors, seeking specialization of the areas within each sector.
- Concentrate the population as far as possible, taking due account of distances between home and place of work, services and infrastructure.
- Concentrate services and the infrastructure to the greatest possible extent (economies of scale).

As the irrigation districts constitute by far the largest part of the proposed investment schemes and are, in any case, the conditioning factor, the regional structure is bound up with their configuration as a narrow strip on both sides of the river. Thus the trend is essentially lengthwise, the centres of habitation and the points of convergence of the interregional flows of exchanges being along the axis of the Valley (see Fig. 3.I).This makes it more difficult and costly to respect the conditions indicated (in a unit whose width and breadth are similar, the length of the average route would be much reduced).

The known resources outside this narrow longitudinal strip consist almost exclusively of natural rangelands. The form of the schemes for making best use of these rangelands changes nothing in the regional organization, at least as far as is of interest at this stage of the Project.

The towns which are certainly destined to become the most important centres of the "developed valley" are Kismayo, Dujuuma and Baardheere. These will accommodate the regional-scale services and activities, while the other centres (for which three orders of size may be considered: 30,000, 15,000 and 3,000 inhabitants) will be mainly "district-style"towns. Kismayo and Baardheere will also have important functions as external trade poles. The former is already one of Somalia's most important cities, with a considerable infrastructure. Its function as a meeting point of trade flows to and from abroad and Mogadishu is irreplaceable and requires no justification.

The following points may be made regarding Baardheere:

- It will become a pole of attraction as a result of the construction of the dam, which will generate considerable traffic during the building stage. The dam will also form a major waterway upstream on the reservoir that will extend as far as Luuq, and downstream too, since it will ensure an adequate minimum flow. Baardheere will also become a centre for the processing of primary sector products, because of the availability of power from the dam. Then there is the fact that the dam will favour such activities as fishing and the planting and exploitation of forests for lumber.

- It is geographically well placed to form a point of intersection for traffic flows along and across the basin. Furthermore, it is the easiest point in the north to connect with Mogadishu (via Dhinsoor and Baydhaba).

Dujuuma is the capital of the recently established Dujuuma Region. It now has 60,000 nomads who were transferred there during the course of the emergency drought programme. Dujuuma is also centrally placed with respect to very important development schemes (Saakow, Dujuuma and Afmadow Districts) and as such it is destined to become the second-largest town in the Valley. It will certainly come to have a guiding role for the rest of the Valley, as the first organizational model of a new social and economic structure.

In view of the preliminary nature of the proposals in this part of the Report, it is not possible to define and decide on the dimensions of the

infrastructural elements required in the towns of various classes. However, it is possible to make the following points:

- The main urban centres must have a regional hospital, vocational training institutes, regional markets, regional collection and distribution centres, produce processing facilities and transport enterprises; while the secondary and tertiary centres must have vocational training schools, dispensaries, health control centres, stores, markets, centres for the distribution of inputs for the development of agriculture and livestock, community centres, etc.

  Villages must have elementary schools, collection depots for agricultural products, community centres and dispensaries.

- It will not be possible to create a complete network of services and infrastructures of this kind covering the whole region in a very short space of time. Cost and shortage of skilled personnel will limit what can be done. Thus it will be necessary to establish priorities. These will be linked more to the investment plans for the productive sectors of the economy and to the functional use to be made of the various parts of the region and the volume of flows it is wished to promote (in the sense indicated earlier) rather than to hierarchy of nodal points. It would seem that the most rational approach would be to build the various infrastructural works on a modular basis.

- The facilities in the nodes and the infrastructure between these nodes must be allocated regionally, so as to stimulate flows compatible with the general pattern of the productive and functional use to be made of the various parts of the Valley.

The following estimates give some broad idea as to the services that will have to be constructed:

a. Housing

Assuming that each person living in an urban centre, with 2,000 and more inhabitants, will require 20 m^3 of accommodation, the total requirement in 2010 will be about 40 x 10^6 m^3, which will involve an overall investment of around Sh So 15,000 million.

b. Services

Schools, health services, religious buildings, administrative buildings and commercial centres: allowing 9 m^3/head, the total requirement will be around 20 x 10^6 m^3, with an overall investment of Sh So 7,000 million.

c. Water supplies, sewerage and electricity

The drinking water requirements of urban centres in 2010 can be estimated at 100 litres/head/day or 200,000 m^3/day. It may be taken that 80% of this quantity will find its way into the sewers, namely 160,000 m^3/day. Where electricity is concerned, allowing 30 Watt/head, it is estimated that the installed capacity will have to be around 60,000 kW.

CHAPTER 3.

TRANSPORT NETWORK

3.1 DEFINITION OF LINKS

In the proposed communications scheme, Kismayo and Mogadishu are the entry and exit points for foreign flows, while Baardheere and Baydhaba are the nodal points for flows to and from the three northern regions (Bay, Bakool and Gedo) (Fig. 3.I). Exchanges between the Juba region and the rest of Somalia will take place via sea through the ports of Kismayo and Mogadishu, by land via Mogadishu and to a very limited extent by air via the airports of Kismayo and Mogadishu; a small airport must be envisaged for Baardheere by 1985 with a 6,000' runway, capable of extension to 10,000'.

The building of Kismayo Airport was recently completed. The facility appears adequate for traffic up to 1985 and, with a few improvements, to 1995. The seaport at Kismayo will have to cope with a very big increase in traffic. As 30% of the agricultural production of the projects proposed for the Juba will probably pass through the port, exports may be running at 250,000 tons in 1985 and 600,000 tons in 1995, against the present 110,000 tons of imports and exports combined. The present capacity should suffice to 1985, when adequate cranes and warehouses will have to be made available as well as cold stores for meat and holding grounds for animals on the hoof. After 1985 it will be necessary to study how to increase the capacity of the port.

On an interregional scale, overland links at the present time all pass through Mogadishu owing to lack of other alternatives. Moreover, the Five-Year Plan provides for the completion of the Jilib-Modun road which, together with the Baydhaba-Mogadishu road, will further accentuate concentration on the capital. The situation could be corrected by a road connecting Baydhaba directly with Belet Uen; this would have the following advantages:

- It would provide a trunk road between Baardheere, Baydhaba, Belet Uen, Galcaio and Bosaso, which does not pass through Mogadishu, thus helping to restore the necessary balance, as some of the flows between the Juba region and the rest of Somalia would be shifted to this route, producing differentiation of the areas crossed and better organization of trade.

- Between Baardheere and Belet Uen the road would traverse the whole northern part of the region between the Juba and Shebeli rivers, enabling it to be developed and thus integrating it with the development of the southern part with the richer soils. The Dhinsoor-Baydhaba stretch of this road already exists, while some remarks on the Baardheere-Dhinsoor stretch are given below. The possibility of building this link and the advantages thereof should be studied in detail within the general context of investments for the development of the Juba and Shebeli Valleys and for the development of the area between the two rivers. Suffice it here to draw attention to the existence of the situation.

At the regional level it is necessary to construct links between the main, secondary, tertiary and quaternary centres, and also to ensure that they are connected to their hinterland. It will not be possible to build all these links at the same time and an order of priority must be worked out. The following links will be required on the basis of the regional organization assumed:

Main links

These are of national importance, i.e. they connect centres of regional importance. Interregional flows pass along these links which, together, form the main network for supporting the country's development.

Secondary links

These connect the most important centres of each part of the region. In particular, they interconnect the various Districts and, together with the primary links, form the development axes.

Tertiary links

Within each District these connect the smaller urban centres with the most important ones.

Quaternary links

These complete the network of communications at District level, providing connections between the outlying production units and villages of less than 5,000 inhabitants.

Penetration roads

These connect centres outside the "economic area" of the Valley, enabling resources there to be developed.

An initial examination of the situation indicates that the following links appear to be needed:

- Main links: Baardheere-Kismayo; Baardheere-Baydhaba; Baydhaba-Mogadishu; Kismayo-Mogadishu.
- Secondary links: Baydhaba-Luuq; Luuq-Dolow; Garbahaaray-Baardheere; Luuq-Garbahaaray; Kismayo-Afmadow; Afmadow-Faanoole.
- Tertiary and quaternary links: inside the Districts according to the programme to be studied.
- Penetration roads: Dolow-Buloxawo-Ceel Waaq; Ceel Waaq-Garbahaaray; Yeed-Luuq; Xudur-Baydhaba; Xudur-Vegit-Luuq; Badhaadhe-Kismayo; Dif-Afmadow.

A very rough preliminary estimate has been made of possible requirements as regards tertiary and quaternary links, taking account of the configuration of the Districts and of the probable resident population, when the schemes are fully operational. The results are given in Table 9.

Table 9 - Total tertiary and quaternary links requirements

District	Tertiary links km	Quaternary links km
Luuq	20	80
Baardheere	130	160
Saakow	80	100
Dujuuma	30	50
Afmadow	30	70
Faanoole-Jilib	50	60
Jamaame	40	70
Baardheere-Ionte	40	60
State Farms	10	30
Uamo	20	20
Total	450	700

3.2 TYPE OF LINKS

A. Baardheere-Kismayo

The link will essentially be by road. The possibility of building a railway to link the Upper and Lower Juba is rejected for the following reasons:

- The type, quality and frequency of traffic would not justify the construction of a rail line, especially over a distance of about 300 km. In this regard, the line would have to be inserted in a railway network or at least the links between important poles such as Mogadishu and Baydhaba would have to be by rail (1).
- A railway line is a very inflexible structure and it would be difficult to adapt it to the transport situation that emerges during the course

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(1) The possibility of providing a rail link between the Juba Valley and Mogadishu is dependent on there being mineral finds of some importance in the Inter River area (Buur Area). In this case the breakdown of traffic between the various modes of transport could be studied. In particular, the cheaper transport rates possible with a railway could make some industrial development schemes viable, which would otherwise have to be rejected.

of development. Moreover, it would not stimulate flows between all the various areas, which is one of the main development objectives.

- A road has the advantage that it can be used by everyone at all levels and it thus has a greater impact on the spontaneous integration of the population and the different production sectors. This also seems to us to be a decisive factor in eliminating the present static, unproductive equilibrium referred to earlier.

- A railway cannot be stage-built like a road. Thus it involves bigger initial investments and utilizes less labour.

Some traffic could use the river, especially when the flow regulation structures have been completed and a constant minimum flow is guaranteed throughout the year. However, only relatively small volumes of traffic would be carried by water, since the technological levels of this mode of transport will be limited by the low standards of the river characteristics as an inland waterway and the high investments needed to effect improvements.

So considering the link as being constituted by a road, the transport demand has been assessed by dividing it into four stretches: Baardheere-Saakow; Saakow-Dujuuma; Dujuuma-Jilib and Jilib-Kismayo. Certain assumptions have been made for initial evaluation of traffic generated by the export of agricultural and livestock products, with reference to the development projects proposed.

Table 10 indicates the traffic that originates to the north of Baardheere and Table 11 that which originates in the areas served by the various stretches of the road. Table 12, shows the traffic generated by the development of agriculture on the various lengths of the road in 10th and 20th years, assuming that:

- The load factor will be 6 ton/vehicle in the 10th & 20th years.
- Total traffic will be double export traffic to allow for import traffic, empty trips and local traffic.
- 80% of the traffic on one stretch also affects the stretch immediately downstream.

Traffic resulting from the import and export of industrial products and materials, passenger traffic and traffic generated by the construction of the various engineering works envisaged for implementing the individual projects must be added to the traffic shown in Table 12.

Construction proposal

It is evident from the foregoing traffic forecasts that by the 10th year of the Project the Baardheere-Kismayo road should be completely built. It should have two 3-m lanes plus two 1.5-m shoulders (two 3.5-m lanes plus two 2-m shoulders in the Dujuuma-Kismayo stretch) with asphalt pavement (double surface treatment to Dujuuma and possibly an asphalt concrete wearing course from Dujuuma to Kismayo) and base and subbase of variable thickness depending on the bearing properties and the traffic in the various stretches. The horizontal and vertical alignments should be such as to ensure a design speed of 50 to 80 km/h.

The Kismayo-Jilib stretch already exists as a good standard asphalt road, while the Jilib-Faanoole stretch was recently upgraded to all-weather

Table 10 - Preliminary assumptions on traffic in the tenth and twentieth years of the project (in tons) ✱

	Productions		Traffic on the Baardheere-Kismayo Road	
	10th year	20th year	10th year	20th year
Gedo ✱	30,000	60,000	20,000	35,000
Bay	600,000	1,000,000	50,000	100,000
Bakool	15,000	30,000	1,500	3,000
Total	645,000	1,090,000	71,500	138,500

✱ Only for part north of Baardheere

Table 11 - Agricultural production exported by stretch of the Baardheere-Kismayo road (in tons)

Stretch	10th year	20th year
North of Baardheere	71,500	138,500
Baardheere-Saakow	15,000	40,000
Saakow-Dujuuma	75,000	150,000
Dujuuma-Jilib	300,000	800,000
Jilib-Kismayo	500,000	1,200,000

Table 12 - Vehicular traffic on each stretch of the Baardheere-Kismayo road

Stretch	10th year	20th year
Traffic which meets in Baardheere from and to the north	24,000	46,000
Baardheere-Saakow	27,000	53,000
Saakow-Dujuuma	37,000	93,000
Dujuuma-Jilib	130,000	340,000
Jilib-Kismayo	270,000	672,000

standard, though the exact characteristics are not known; however, it is felt that by the 6th year of the Project it should be completed to the above standard. Thereafter only maintenance would be needed until the 15th year.

The Faanoole-Saakow stretch should be improved immediately, with the construction of a subbase and a granular mix base having CBR of at least 25% and 85%, respectively. The wearing course should be built together with that of the Dujuuma-Jilib stretch. The need for immediate improvement of this stretch stems from the necessity of constructing the Saakow Barrage without delay and of initiating the Saakow or Dujuuma irrigation schemes.

The first stage of construction of the Saakow-Baardheere road could be started towards the fourth year, with the laying of the subbase and base courses, so as to ensure that the Kismayo-Baardheere link is motorable throughout before completion of the Baardheere Dam (in the interim, the Baardheere-Baydhaba link will ensure communications with the northern part of the Gedo Region and allow produce to be trucked out). The wearing course could be laid after dam construction is complete.

B. Baardheere-Baydhaba link (road and bridge on the Juba)

According to the assumptions that have been made, Table 10 indicates that as a result of agricultural exports this road will be carrying 50,000 tons of traffic in the 10th year and 100,000 tons in the 20th. Thus there would be 17,000 and 33,000 movements, respectively, plus traffic generated by trade between the two poles as a result of the businesses and industries there.

Construction programme

The Baydhaba-Dhinsoor stretch has recently been improved to all-weather standard, with the construction of a granular-mix stabilized layer. If the Baardheere-Dhinsoor stretch is completed right away it would provide a low-cost link between Baardheere and the existing road network, thus bringing the whole of the Gedo Region out of its isolation. To this end, a bridge needs to be built over the Juba. In any case the road and the bridge must be built by the time work starts on the Baardheere Dam. It is therefore proposed that the Baardheere-Dhinsoor stretch be constructed right away. It is considered, in first approximation, that the road should have a 6-m carriageway plus 3-m for shoulders. The pavement could consist of a subbase and base in the areas with a silty-clayey subgrade and a single granular-mix course where the subgrade is rocky.

C. Luuq-Baardheere and Dolow-Luuq-Baydhaba links

According to the traffic forecasts indicated above, the first of these links will have to carry goods traffic equivalent to 20,000 movements/year by the 10th year and 25,000 by the 20th, while the second can be estimated at 15,000 and 20,000 movements/year, respectively, plus passenger traffic.

Construction proposal

The Baydhaba-Luuq-Dolow road exists but in many stretches it is badly in need of maintenance and improvement works; it is proposed that these be done immediately. This will enable a start to be made on development of the area between Dolow and Luuq.

It is also proposed that a start be made without delay on an all-weather road between Luuq, Garbahaaray and Baardheere, skirting the reservoir on the left-hand side. The road will cross the river by a bridge at Baardheere, to join up with the Baardheere-Baydhaba and Baardheere-Kismayo roads. It would be possible to build the Baardheere-Garbahaaray stretch first and to leave the Garbahaaray-Luuq stretch until after 1980. This would be in line with the development rate envisaged for the part of the basin to the north of Baardheere.

When the reservoir is complete, part of the traffic could be carried by water. This is particularly suitable for lumber. It would not seem that this stretch of road would need asphalting for the first twenty years.

D. Kismayo-Afmadow and Afmadow-Faanoole links

The first of these will enable the Uamo District to be developed along with the accompanying schemes for livestock in the Trans Juba Development Project. It will also open up the area between Afmadow and Dif, enabling a National Park to be set up and used for tourism. It is roughly estimated that goods traffic in the 10th and 20th years may be 20,000 and 60,000 tons respectively, equivalent to 7,000 and 20,000 movements. It is proposed that an all-weather road be built by 1985.

The Afmadow-Faanoole road will link the Afmadow District and complete the Uamo area link. It could be built at the same time as the one above.

3.3 GENERAL PROGRAMME AND INVESTMENT COSTS

An indicative programme for the next ten years has been drawn up on the basis of the foregoing, and the order-of-magnitude investment costs indicated. The results are shown in Table 13.

Table 13 - Road construction programme in first ten years of project and the investment costs thereof

	Link	km	Years									
			1	2	3	4	5	6	7	8	9	10
Primary links	1. Baardheere-Kismayo	-										
	Baardheere-Saakow	85				(70)					25	
	Saakow-Faanoole	120	(120)									
	Faanoole-Jilib	35				35						
	Jilib-Kismayo	120								(36)		
	2. Baydhaba-Dhinsoor	120			(36)							
	3. Dhinsoor-Baardheere	80	56				(32)					
Secondary links	4. Dolow-Luuq-Baydhaba	230	(40)					(20)				
	5. Luuq-Garbahaaray	70									(45)	
	6. Garbahaaray-Baardh.	120			(65)							
	7. Kismayo-Afmadow	115					(90)					
Tertiary links	District No 9	40		20								
	" " 3	80					40					
	" " 1	20		5								
	" " 8	40							20			
	" " 4	20									10	
Quaternary links	District No 9	70						20				
	" " 3	100							30			
	" " 1	60				15						
	" " 8	60								10		

a. Broken lines indicate special maintenance.

b. Numbers in brackets are investment costs in millions of shillings.

4.1 ELECTRICITY DEMAND FORECAST IN THE ECONOMIC AREA OF THE VALLEY

While there would appear to be no great difficulty in estimating the electrical power demand for irrigation use in the Districts, municipal and industrial consumption remains much more hypothetical. The only preliminary approach possible is to utilize a per-capita consumption figure, fixed by reference to regions with similar economic characteristics. This figure has been applied to the population on the date when the Project will be fully operational. It is considered impracticable to apply this approach to the intervening years, owing to the variability of the factors in play.

4.1.1 Energy Requirements for Municipal and Industrial Use

District	2010	
	Total inhabitants (No)	Energy requirement (kWh)
Luuq-Dolow	130,000	130×10^6
Baardheere-Saakow	450,000	450×10^6
Saakow	290,000	290×10^6
Dujuuma	140,000	140×10^6
Dufalach-Afmadow	150,000	150×10^6
Faanoole-Jilib	220,000	220×10^6
Touta Island	160,000	160×10^6
Baardheere-Ionte	230,000	230×10^6
Jamaame	160,000	160×10^6
State Farms	60,000	60×10^6
Descek Uamo	50,000	50×10^6
Kismayo (pole)	160,000	160×10^6
Total	2,200,000	$2,200 \times 10^6$

The per-capita demand used in this table is 1,000 kWh/year.

4.1.2 Energy Requirements for Agricultural Use

District	Total annual energy requirements kWh		
	1985	1995	2010
Luuq-Dolow			21,932,400
Baardheere-Saakow		4,605,804	23,029,020
Saakow	4,934,790	4,934,790	9,869,580
Dujuuma		4,167,156	4,386,380
Dufalach-Afmadow			1,096,620
Faanoole-Jilib		657,972	1,096,620
Touta Island		986,958	1,096,620
Baardheere-Ionte	191,154	2,083,578	2,193,240
Jamaame	1,875,220	3,125,367	3,289,860
State Farms		1,096,620	1,096,620
Descek-Uamo			2,193,240
Total	7,001,164	21,658,245	71,280,200
%	10%	30%	100%

The annual use figure considered in the table is 3,500 hours.

4.2 HYDROELECTRIC ENERGY SUPPLY FORECASTS

4.2.1 Dam between Buloxawa and Dolow

- Discharge (peak) 14 m^3/s
- Head available 30 m
- Useful power 3,000 kW
- Useful energy 9,300,000 kWh/year

4.2.2 Dam north of Baardheere

- Discharge (constant) 100 m^3/s
- Head available 45 m
- Useful power 35,000 kW
- Useful energy 309,000,000 kWh/year

- Discharge (peak) 50 m^3/s
- Head available 45 m
- Useful power 18,000 kW
- Useful energy 93,000,000 kWh/year

4.2.3 Dam north of Saakow

- Discharge (peak) 100 m^3/s
- Head available 10 m
- Useful power 8,000 kW
- Useful energy 61,000,000 kWh/year

4.2.4 Faanoole Dam

- Discharge (peak) 100 m^3/s
- Head available 6 m
- Useful power 5,000 kW
- Useful energy 19,000,000 kWh/year

4.3 DIVERSIFICATION OF TYPES OF USE

The uses to be examined are:

- Municipal
- Rural
- Industrial
- Agro-industrial.

The main characteristics of municipal use are the high energy demand, on the one hand and the concentration of all consumers in a narrow belt of territory on the other.

Rural uses, on the contrary, are spread over a wide area and the energy demand by the individual consumers is small.

Industrial and agro-industrial uses constitute the same type of energy demand, namely there is no differentiation in consumption, but the former are generally located in the big towns, while the latter are in the country.

4.4 CONCLUSIONS

It is apparent from the foregoing that there is a marked lack of data on which to frame an energy plan. The following points are of a decidedly preliminary nature.

It emerges from inspection of the hydroelectrical energy supply forecasts that the Baardheere Dam will be able to satisfy a continuous energy

demand, typical of municipal and industrial uses, while the other dams can satisfy a discontinuous demand typical of agricultural uses. It is unlikely, however, that the power supply and demand from agriculture will be "in phase"; indeed, it is highly probable that the maximum demand will occur at moments when there is no supply available.

Thus it is envisaged that in an initial phase of development of the Juba Valley Electrification Plan, use will be made of small independent generators to supply isolated consumers having a good level of demand, while for concentrated consumption in small areas and with higher demand levels, the difference between the demand and supply will be satisfied by larger thermoelectric stations complete with distribution networks.

CHAPTER 5.

ECOLOGY - INDUCED EFFECTS AND PROTECTIVE MEASURES

The following analysis reflects the Consultants' views. An integrate Plan for wildlife resources management and for touristic development is in preparation by the Government.

5.1 THE ENVIRONMENTAL PROBLEM

The Juba Valley Development Project is such a vast undertaking that there are bound to be major ecological and scientific problems. Indeed, any profound change in the environment involves a fairly wide margin of uncertainty as regards the indirect results and, to some extent, direct results too. This is precisely why the Food and Agricultural Organization recommends that Development Plans be preceded by a complete study of environmental conditions, performed, whenever possible, by a team of expert ecologists. However, it often happens that the investigations are conducted hurriedly, under great pressure, and it is hoped that everything will turn out for the best. But without proper planning, it is more than likely that everything will turn out for the worst.

In the case of Somalia, with its serious supply problems, there is every justification for trying to exploit the country's production potential to the maximum possible extent, especially in the cereal-growing sector. At the same time, population pressures on the northern provinces must be lessened, as there the environment has been seriously damaged in recent decades as a result of excessive grazing and cropping. Yet for all this, environmental problems must still receive priority.

Among the adverse environmental effects stemming from the development of irrigation are the inevitable big increases in the amount of malaria and bilharzia, as shown in other parts of Africa. Other negative aspects concern particularly the natural environment, the fauna and flora of the region which may be dealt a death-blow by the development project.

Development has already been proceeding for at least a century. One of the most marked negative effects, though difficult to define, is the decrease in rainfall. The great variations in rainfall that have affected the whole of Africa during the Pleistocene have continued into relatively recent times. At least twice in the last 10,000 years rainfall has certainly been much higher than it is now; and these periods have been followed by dry spells the last of which was decidedly drier than it is at the present time. These variations are attested to by the abandoned river beds that are clearly evident on air photos because of their coverage of vegetations, which is so different from that in the vicinity. The old beds of the Juba that it has been possible to examine, clearly show that the discharge of the Juba today is perhaps one fifth of what it was during earlier wet periods. In this regard it must be pointed out that the intensive deforestation that has occurred in Ethiopia in recent centuries has certainly decreased rainfall over the plateau-lands there: without doubt, the action of man has been partially instrumental in preventing the reinitiation of the pluvial cycle.

Thus it must be expected that the present situation will either continue or perhaps get worse rather than better. It is interesting to note, in this context, that the areas suitable for irrigation development occur exclusively along old river beds. Geologists and paleontologists all agree that even at the very height of the pluvial cycle, rainfall in Somalia was only such as to permit development of thick bush or tree-covered savannah, at best. This kind of vegetation requires - and maintains - soils that are generally thin, lateritic, and very poor in organic matter (extremely poor in some cases) at least where the surface horizons are concerned. On the other hand, the alluvial soils deposited in the past by the Juba and the Shebeli, have a

very different structure and composition, and are the only ones with favourable prospects for agricultural development.

It is therefore clear that the full development of the Juba Valley's agricultural possibilities would call for the sacrifice of most of the plant associations which occupy the alluvial lands (1). This destruction is not envisaged solely by the present projects, but is already at a fairly advanced stage, especially where the gallery forest is concerned. Indeed it started a century or more ago with the settlement of the first agricultural peoples in parts of the Jilib-Touta zone, where conditions over a largish area most closely resemble potential forest, which are the most characteristic of equatorial agriculture. Subsequently, the increase in the country's population favoured the destruction of increasingly larger areas of natural vegetation, with the spread of subsistence agriculture. Then the acquisition of the Port of Kismayo in 1924 led to the creation of the important agricultural development of Jamaame (Margherita)-Ionte, in the hinterland.

Every planning project must take account of the existing realities, not because it would not be possible to eventually get the vegetation and fauna back to their original state in areas where it is wished to return to natural conditions, but simply because: 1) since it is necessary that the survivors of the biotic community destined for destruction should move or be moved, to Nature Reserves, a long time would be required (that necessary to restore original conditions is at least seventy years) during which use of the lands to be reconverted to natural areas would have to be abandoned; while until this moment it would also be necessary to renounce utilization of the surviving natural areas, and this would be very costly, 2) it is patently less costly to ensure the conservation of what exists, than to rebuild what has been destroyed.

Having arrived at this conclusion, the first thing to do is to discuss the advisability of conserving samples of the existing ecosystems in the lands of alluvial origin. The question of the possible use of the riparian areas of the lakes it is proposed to create is dealt with later.

Destruction of a natural environment generally leads to the elimination of many animals that live there, but not all of them. There is also the fact that some will find satisfactory or even ideal conditions in the new man-made environment, but it is exceptional to find a whole food chain that can be adapted. For instance, to take a case that is familiar throughout Africa, including Somalia: weaver birds of the genus Pleoceopasser, Hyphantormis, etc. (Somali names: Agarow, Bulugwen, Gurta, etc.), which are mainly seed eaters and can use relatively small trees for nesting, are birds which in the natural state form small scattered colonies, owing to the difficulty of finding food in the forest, the savannah and the bush, where seeds of graminaceous plants are available only for short periods. When the lands are cropped, huge quantities of such foods become available; this permits the

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(1) In order to avoid an ecological disaster of unpredictable and disturbing proportions, the coefficient of use of the lands suitable for irrigated agriculture has been set very low: 70-90% for Class I lands, 50-60% for Class 2, 30% for Class 3, and 10-20% for Class 4, as indicated in Vol. IV, Part I, Chapter III, Para 3.2.

formation of large colonies of birds which cause great damage. This population explosion cannot be controlled by the birds' natural enemies. Indeed, the Widows which prey on the nests cause but negligible damage that is more than offset by the young born in unaffected nests. Moreover, the small hawks, especially the Accipiters, do not tend to increase, as they nest only in the shadiest parts of the forest in very large trees, so their numbers gradually decrease.

We have chosen this example, not because it is the most typical or sensational of those noted, but because it is extremely apparent and familiar to any Somali. Agricultural development tends to favour damaging species, while useful, or non-damaging species tend to die out. The possibility of such things happening in the Valley must be borne clearly in mind. This being the case, it would be as well to bring relatively small areas into cultivation at a time, while ensuring strict conservation of other natural areas, in order to make a comparative study of developments in the two systems. This approach is essential if it is wished to avoid the risk of big trouble. Indeed, it must be expected that the adoption of irrigation systems over vast areas with crops other than bananas will create an entirely new environment. It is impossible at the moment to foresee what species may establish themselves there, especially as regards insects which presently occupy the gallery forest and the swamp (descek) vegetation that occurs here and there on the sides of the river.

The case of the plant associations which cover the old river beds is somewhat different, as is that of the fauna living there. In this case, while some species will disappear or at least become rarer, others will certainly invade the farmed lands, though the numbers here will be smaller. While in the case of the forest formations and water-covered areas it will be necessary to take necessary measures for the conservation of important species of large animals, where the special bush in the old river beds is concerned it will be necessary to ensure protection of small areas both for purely scientific reasons and as natural laboratories for applied studies in the agrarian field. In the first case, as will be seen ahead, it will be essential to have one large reserve, while in the second it would be advisable to have one or more smaller reserves measuring a few hundred hectares.

5.2 SPECIES TO BE SAVED

Though the wildlife in the gallery forest along the Juba has been reduced enormously in recent years, it is still amongst the richest and most typical of that found anywhere in the world. Much less well known is the equally interesting flora.

The list of animals is as follows: rhinoceros (Uhil) existed at least up to 1955 between the Descek Uamo and the Juba, but nothing has been reported recently in the literature; Burchell's zebra (Damar Feru) was fairly common up to 1935 and there may still be a few around; giraffe (Gheri) are very rare; gerenuk (Elo Gedud) and Grant's gazelle (Hidi) are also very rare; Guenter's and Kirk's antelopes (Sagar Guslei) occur, as does Citerni's dikdik (Guyo) which is found only in Somalia; there is the grey duiker (Furuk) and

the red duiker (Sagar gedud), which is the rarest in Somalia, belonging to the Cephalopus Harveyi bottegoi, found only in the gallery forest north of Jilib; the kudu (Der-dir); the bushbock (Dol), which is the largest bushbock in Africa; oryx (Beit), which is certainly found in the bush on the western fringe of the Juba gallery forest, were once common and extended farther west; topi (Sig, Aucen), which are very local in the Republic, had decreased markedly by 1965, when they were found only in a few areas on the western bank of the Juba and in some parts near Avai; Hunter's hartebeest (Irole) a very large antelope unique to Somalia and the Tana area of Kenya, were once generally found in the Afmadow-Belcogani area and farther south, occasionally as far as the Bushbush Reserve, but can also be seen sometimes near the western edge of the gallery forest on the Juba; waterbuck (Balanka); buffalo (Lowgessi) are found locally, the Juba Forest from Mansur northwards being among the few places they are known; then there are hippopotamus (Ger), warthog (Donfar) and bushpig (Genzil, Gomme), as well as elephant (Morodi), lion (Libah) and leopard (Shebel), these being seen only rarely, at least in 1965; other animals include the serval cat (Muk Shebel), the Caracel lynx (Gududanch) and the wild cat (Mukilel Dur); various kinds of mongoose and genet cats (Dib Medu, Songur, Corshir, Daba Ad, Zivet, Mululel zebat) also occur, as do the spotted hyena (Waraba, Duruah), the grey jackal (Daua) and the black-backed jackal (Dua delmedow); the lesser bushbaby (Getriss) and the greater bushbaby (Gumbo) only in the Juba Forest; green ververt (Coro); the white-throated guenon (Coro medaw); and many species of rodent. It is probable that aaedwark (Unfo) occur too.

It is apparent from this list just how important and varied are the fauna of the gallery forest. It will be necessary to consider what the effect of agricultural development will be on the fauna in the Juba basin, especially on game animals and crocodiles, which are very important from the economic and tourism aspects.

It would thus seem that two general principles should be accepted for any development scheme in the Juba area: 1) It is worthwhile preserving fairly vast tracts of land purely for wildlife; 2) The development schemes must keep pace with scientific evaluation of the area's ecological situation, balance and evolution; they should first be concentrated on limited areas and extended only gradually under strict control.

5.3 DEFINITION OF A RESERVE

There is a definite minimum size limit for a Nature Reserve, as it must provide living space for a sufficient number of animals to ensure the survival of each species. Genetic laws dictate that a minimum of two hundred large animals is required, while smaller animals call for a higher minimum because of high juvenile mortality. The minimum space is that needed for the most demanding species, in this case, the elephant, with a minimum population of two hundred. This area is quite adequate for all the other species.

During the dry season elephants depend exclusively on the gallery forest for food and shelter. As these animals never wade the river except in very rare cases when the water is extremely low, the minimum space must ensured either all on one side or on both sides of the river. Considering the potential biomass of the fringing forest, this mean leaving forty or so kilometres aside as a Nature Reserve along the river, plus the adjacent areas of bush and savannah.

Regarding the siting of the Reserve, it is clear that:

- it must be in an area that is not affected by development schemes, or at least to but a minor extent
- it must be sparsely populated; if there are very few people they will not need to be moved but can be employed as scouts, to open up tracks, etc.
- there must be little cultivation, to avoid contact with game and keep farm raids to a minimum.

Human settlements and Reserves should always be separated by natural obstacles or by a protective strip at least five kilometres wide, kept under control.

5.4 CONSEQUENCES OF DEVELOPMENT SCHEMES

As indicated, a Reserve covering a fairly large area will have to be set up to protect the typical wildlife and vegetation of the Juba gallery forest. Not enough is known about the flora, as yet, to be able to expound thereon with even the slightest degree of certainty, but as regards animals, the following will certainly be doomed to extinction if the whole of the Juba Forest is given over to farming:

- Mammals: the Red Duiker (Latin: Cephalophus harveyi bottegoi; Somali: Sagar gedud), the White-Throated Guenon (Latin: Cercopithecur mitis zammaranoi; Somali: Coro Medo), both these live exclusively in Somalia in the true forest. The Topi (Latin: Damaliscus lunatus; Somali: Awcen) which lives only in the wet rangeland on the fringes of the forest could not survive the expansion of cultivation (as shown by the fact that while these animals were found everywhere along the Juba and Shebeli back in the nineteen twenties, they lived only in two areas by the seventies: on the right bank of the Juba north of Kaitoi and in a small area on the right of the Shebeli south of Awai). The Bushbock (Latin: Tragelaphus scriptus fasciatus; Somali: Dol) would certainly be eliminated by the farmers because they tend to invade the farmlands. The same is true of the African Buffalo (Latin: Synceros coffer; Somali: Low Gessi). Damage caused to crops directly and by the fact that the lands would be crossed by animals in search of water would doubtless lead to the elimination of the Elephant (Latin: Loxodonta africanus; Somali: Morodi), the Waterbuck (Latin: Kohes ellipripymnus; Somali: Balanka) and the Bushpig (Latin: Potamochoerus porcus; Somali: Ganzil). Even the rare Greater Bushbaby (Latin: Galago crassicaudatus; Somali: Gumbo) would probably have difficulty in surviving in a very narrow strip of forest. It is likely that the Hippopotamus (Latin: Hippopotamus amphibius; Somali: Ger) would tend to cause severe damage and have to be eliminated.

- Birds: Narina's Trogon (Latin: Trogon narina; Somali name unknown) and Fischer's Turaco (Latin: Tauraco fischeri) are already very rare and would

probably disappear along with several species of forest doves and many species of small birds.

Not enough is yet known about the forest reptiles and amphibians to make any prognostications. Where fish are concerned, it should be recalled that the Descek, which are periodically flooded, are the only place where the East-African Lungfish (Latin: Protopterus aethiopicus; Somali: Bugule) are found; these fish may be considered virtually as "living fossils". There is also the giant catfish (Pardiglanis Tarabinii) an extraordinary creature discovered in the Juba in 1972, only two examples of which have been reported. The Juba also has various other exclusive species.

There are also various rarities among the invertebrates in the Juba Forest which have not yet been properly studied and which we shall not list here.

It is apparent from the foregoing that the complete development of the gallery forest along the Juba for agriculture would not only be a tragedy from the scientific aspect, but would also mean throwing away all chances of developing the area from the game-animal tourism aspect.

It would be possible to create a National Park along the Juba taking in not only the forest species just described but also almost all the species of large mammals living in Somalia if the Park were extended to embrace bush and savannah areas too: something which can be done without difficulty.

Careful examination of the air photos would appear to indicate that in order to maintain all the species at a minimum but vital level of population - i.e. to avoid the risk of species being wiped out by inbreeding, epidemics and the like - the National Park will have to be at least 40 km long (crow-flight distance). It could well be that a good place for this would be along the river between Faanoole and Dujuuma. Not only does the vegetation appear better preserved here, but also there are few people and they could easily be moved out. Furthermore there is minimum contact between the forest area to be preserved and the agricultural lands, so it should be easy to stop the game getting into the farms. There is also the fact that this reach offers the best conditions for crocodile breeding. The presence of crocodiles is essential for keeping up the fish population in African rivers, as has been proved elsewhere.

The limited areas of land presently cultivated in the area indicated for a National Park would return to their natural equilibrium within a period of 50 to 70 years, it is estimated, if left alone.

5.5 MAN-MADE LAKES

Another matter to be assessed is the possible evolution of the environments around the shores of the two projected lakes, and the use to be made of these areas.

It should be made clear at the very outset that forecasts of this description are very difficult to make, especially when no on-site study has been made. However, a number of fairly plausible hypotheses can be put forward.

Unlike the situation in the reach of river south of Dujuuma, where

all the land consists of fairly recent sediments and alluvial deposits laid down by the river in the last 10,000 to 15,000 years, examination of the air photos shows there to be little recent alluvium and even this will be drowned by the lakes. All the surrounding lands are erosion areas. From what can be made out, the vegetation at the present time consists of scattered bush, savannah with characteristics approaching those of steppe and, very probably, areas with frutices.

The strange layout of the vegetation over vast tracts of country would appear to indicate quite clearly that the rocky substratum is often exposed in some areas, alternating regularly with vegetation-covered areas of considerable extent. It would also seem that when there are soils, these are thin, and are probably underlain by a hardpan so characteristic of many parts of Africa and of much of the Mudugh, Migiurtinia, etc., in Somalia.

The progressive filling of the lakes could lead to the creation of a strip of territory where conditions are favourable for the development of agricultural vegetation, provided that: A) as a consequence there is a change of the precipitation regime, including dew, in the surrounding area, B) the lake waters can seep into the surrounding soils, forming a kind of shallow aquifer, and C) the seasonal variations in lake levels lead to the periodic inundation of large areas for a short space of time.

It is considered unlikely that Condition A will occur. Indeed the mass of water which will be accumulated will be relatively small and hence it will have but a limited effect on local air currents.

Where Condition B is concerned, it is to be presumed that this too will occur only occasionally. Indeed, it cannot occur at all where the river channel is deeply entrenched and hence any rise in levels is contained between two steepish rock cliffs. Even where the lake will be broader, the soils are so thin that it is unlikely that the waters will penetrate any great distance into the banks except where the rock is highly fractured and the fractures are filled with sufficiently consistent soils. In short, the effects of Condition B will only be marked over limited areas where temporary tributaries run into the mainstream.

Condition C may be of some interest. Because of the river's natural regime it is to be presumed that the abstraction of waters for irrigation during the Gilal season and to some extent during Hagai, will cause marked fluctuations in the storage level. It is evident that these fluctuations will be very noticeable especially in the northern half of Lake Baardheere, for two reasons: 1) the lake is not boxed in here but spreads over gently rolling terrain; 2) the deposition of silt owing to a reduction in the velocity of the water will be considerable, especially in the upstream reaches, and this will lead to the development of environmental conditions similar to those in the large Deschek. Initially strips of prairie will form, and then areas of thick bush, reeded areas, etc., and perhaps even some very small areas of true forest. It is thought unlikely that the formation of large areas of real forest will occur, at least in less than a century or two, since the soils are lacking and their formation is extremely slow. More probable instead, especially if the right steps are taken, is the formation of gallery forest 10 to 50 m wide, both in the southern half of Lake Baardheere and in Lake Saakow. However, this depends to a large extent on the size of the level fluctuations of the lake: the smaller these fluctuations, the easier it will be for such a development to take place.

Once the lakes have been filled, unless appropriate measures are taken, the evolution of the vegetation will be very slow, as it will depend on the chance sprouting of seeds that happen to be carried in from outside, since the present riparian vegetation will be totally destroyed when the lakes are filled. Indeed, it would only be able to recede as the lake rises provided that this occurs at a rate of a few centimetres per year. Hence the only way to promote vegetal cover on the shores of the new lakes will be to plant seeds collected in the descek and forests along the Juba and the lower reaches of the Shebeli. It is certain that the creation of balanced vegetal cover will take some dozen years, but it is not possible to make any predictions on this aspect at the present stage of the study.

Some of the effects the creation of lakes will have on wildlife can be foreseen quite clearly, while others cannot be made out with any certainty. As regards the game in the bush and savannah in the vicinity of the lakes, the situation will not change. The main species of antelope such as the oryx, lesser kudu, greater kudu, gerenuk, etc., are not in the habit of going to drink regularly. However, the situation may improve immediately for the zebra and Hunter's hartebeest may be able to survive there within a very short space of time. A detailed study would be required to provide any fuller information. What is to be feared, however, is that fluctuations in lake levels may permit the formation of wet rangelands which would attract the herders; but we are convinced that the condition of the vegetation in the nearby areas is not such as to permit any increase in the number of head of stock. We shall return to this matter again later.

It is certain that if descek type vegetation were to form around the shores of the lakes, conditions favourable for the following large mammals would exist: African Buffalo, Topi, Waterbuck and probably Elephant (in small numbers), Tragelaph and Leopard. It is possible that hippos may move to the lake, but it will take some time for this to occur, as abundant submerged vegetation will have to form first, since the vegetation in the surrounding areas will be too poor to enable large numbers to feed.

As regards truly aquatic fauna, while there is no doubt that some kinds of fish will be able to live in the lake, it is quite impossible to forecast what consequences the changes in the river regime may have on fish-life in general, as a result of differences in turbidity in the lake areas themselves and below the dams. In view of the great interest attaching to fish-life in the Juba and the potential economic aspects thereof, the way the situation develops should be carefully watched.

Finally, as regards crocodiles, though the creation of the lakes will potentially favour an increase in numbers, the real possibilities of an upswing in the crocodile population will depend upon three things: 1) sufficient fine sand on the shores to permit the beasts to lay their eggs; 2) the presence of laying areas upstream of the lakes, strictly controlled, so that the young can make their own way down to the water; 3) the presence of similar beaches downstream of the dams, some of the young being transferred to the lakes when the eggs hatch.

5.6 THE NATIONAL PARK

A mere thirty years ago it would have been possible to create an extraordinary Reserve between the Deschek Uamo and the river, but now the environment appears to be irremediably affected by human settlements.

The area to the south of Jilib must be completely excluded from consideration because of the high population and the destruction of much of the original fringing forest.

It does not seem that the area to the north of Dujuuma can be recommended, both because of the great number of agricultural settlements envisaged and because of the interest in creating irrigation districts there.

The area north of Baardheere and around Luuq is interesting because it is so sparsely peopled and because of the non-agricultural nature of the soils. But the ecological changes introduced by a large man-made lake upstream of Baardheere will perhaps impoverish the environmental and food resources available to wildlife for several years to come. However, this area must be kept free of development because of its great interest from the tourism aspect, as already indicated, and because of the possibility of creating one or more Parks in the non-too-distant future of great interest as tourist amenities (while their interest as regards wildlife has still to be determined).

Thus there remains the area to the north of Saakow and that between Dujuuma and Faanoole. The former is of no interest from the agricultural aspect, but it does have much gallery forest. Again, as there will be a man-made lake at Saakow in the future, there is also the drawback mentioned in the case of Baardheere, plus the same tourist advantages.

The area between Dujuuma and Faanoole would thus appear to be one of the best for the creation of a Reserve. Considering how small and fragmented possible irrigation districts would be here, and the fact that irrigation would be feasible only by pumping, we feel that the area could better be used as a Nature Reserve. A strip some 35-40 km long would only mean sacrificing a total of about 5,000 ha of irrigable land, because the belt of good agricultural soils is so narrow here. This length of 40 km (as the crow flies) is the minimum that can be considered reasonable if the Reserve is to be viable. The area of influence of the nomad settlement to the south of Dujuuma must therefore be defined as a matter of urgency to ensure it does not spill over into the area needed for the Park. Expansion of the nomad settlement should be to the north.

To the north the area could join up with the Saakow Lake region via a broad strip of land on the right bank far from the river, of no economic interest, thus permitting the lake to be included in the confines of the Reserve (Fig. 4.I).

So it is recommended that a large area be protected, taking in two stretches on the left of the river to the north of Saakow and of Kaitoi, plus the broad strip on the right (generally far from the banks). In course of time the Park proper could be defined within the 3,000 km^2 area scheduled for protection.

The area suggested has natural connections. Therefore the strips in contact with the agricultural areas to the north and south can be planned in such a way as to be limited to about 5 km on each bank. This is certainly the shortest and most favourable possible along the whole length of the river. It also has a very small population.

A special aspect regarding this area which - among other things - merits proper consideration, is that it can boast the biggest strip of sandy banks anywhere along the river. This is quite apparent from the air photos. Sandy banks are a necessary condition if crocodiles are to breed, so this would appear to be one of the best for ensuring the survival and multiplication of this species too. Studies have revealed that in order to ensure that African rivers remain adequately stocked with fish the crocodile population must be kept high. Indeed, these reptiles are a major factor in maintaining the balance of the fluvial ecosystem, so their main breeding grounds must be considered to be of prime importance. The commercial value of crocodile skins is also a factor that cannot be ignored.

Hence the reasons for choosing this stretch of land for the National Park appear to be very sound indeed. A Park here would provide an immediate sanctuary for all the large Somali mammals except the Wild Ass, the Dibatugh, Speke's Gazelle, the Klipspringer, the Beira and Soemmering's Gazelle. As far as can be ascertained, at the present time there are no Zebra, Rhinocerus or Hunter's Hartebeest, but their introduction could be attempted without delay.

Mention must be made of the possibility of setting up another National Park between Afmadow and the Kenya border, along Laag Dheere and between the Afmadow-Dif and Afmadow-Belescogoni-Liboi tracks. The natural environment here is the same as that found in Kenya up to the Tana River and there was an equal wealth of wildlife when the last systematic observations were made (1970). In particular one can find Grant's Gazelle, Oryx, Lion, Giraffe, Hunter's Hartebeest and Wart Hog. The 2,000 km^2 area could readily be used by the tourist trade, since with the typical savannah vegetation it is easy to view the animals. However, account must also be taken of the fact that the natural grazing is among the best found in the Juba Basin and every 4 or 5 hectares is capable of supporting one head of cattle. So by using 2,000 km^2 as a National Park, there would be a reduction of 40,000 head of potential stock.

Thus, while it will almost certainly be advisable to create a protected area, with very definite limits placed on what man can do there, the real possibilities of setting up a National Park will only be ascertained through more thorough studies.

In any case, steps must be taken to ensure complete preservation of the fringing forest along the Laag Dheere.

5.7 PARK LIFE AND MANAGEMENT

The Nature Reserve proposed on both sides of the river south of Dujuuma should be capable of remaining in natural equilibrium, i.e. it should not be necessary to crop the animals except perhaps elephant occasionally. Even if the Reserve should extend from Kaitoi to Dujuuma, it is apparent that overpopulation could occur in the case of these pachyderms because it will not be easy for them to disperse. However, the full import of this problem can only be ascertained by a field study.

Various ideas may be put forward for the use of the areas around the lakes. It has already been mentioned that when the plant cover on the shores

fig. 4.1

WILDERNESS PRESERVATION PLAN

DIFESA DELL' AMBIENTE NATURALE

has reached adequate consistency and composition, it is to be expected that other wildlife such as the African Buffalo, the Topi etc. will move in to join the savannah and bush species of game now present; it is unlikely, however, that the area will be capable of supporting forest species in the strict sense of the term. So we may ask ourselves what would be the best way of using the existing and potential resources.

In our opinion the Juba Valley should be divided into four classes: 1) Completely Protected Reserves and National Parks; 2) Hunting, fishing and grazing reserves; 3) Nomadic grazing areas; 4) Irrigated agriculture areas.

In the first class of area the aim should be to conserve the natural habitat or integrally rebuild the environment as it would have been if man had not interferred. These areas will be for scientific, educational and tourist use. Three or four completely protected reserves should be set up, each covering a few hundred hectares, for a total of around 3,000-3,500 ha. They should be on both banks of the Juba at or downstream of Jilib, there purpose being to protect several stretches of the old beds of the Juba for thorough study, which would extend to the geological, paleontological and pedological aspects of these peculiar formations. As it has been mentioned, there is every reason to think that these "natural laboratories" will be essential for the scientific development of the agricultural areas. The National Park, instead, could be set up as a single block of land hinging around the gallery forest between Faanoole and Dujuuma and stretching out on both sides of the river into the savanna and bush areas. To the east of the river the boundary of the Park would, of necessity, be the Dujuuma-Jilib road (as a National Park intersected by a main road is difficult to control). To the west, instead, the boundary would have to be fixed after a field study, bearing in mind that most African National Parks need to cover some 200,000 ha to be attractive to tourists, while not forgetting the need to interfere as little as possible with the normal lines of migration of domestic animals.

The possibility of the Park being extended northwards, swinging around in a semicircle to take in a second reach of the river banks at Lake Saakow merits careful study. This is because while it is not possible to provide any major tourist facilities near the river in the stretch to the south of Dujuuma (where complete protection is needed because of the narrow width of the forest and the other wet areas), this aspect presents no difficulties at Saakow. Most of the land suggested for the Park is flattish and so it should not be difficult to open up tracks that can be used by light vehicles for exercising control operations and for sightseeing.

There are other problems where the areas around Lake Baardheere are concerned. Apart from the possibilities of there being Greater Kudu here (the nearby Matu Arba Hills is one of the very few places in Somalia where this species has been found), the area offers nothing that cannot be found in the proposed National Park, for larger animals, while on the other hand the broken nature of the terrain means that access is not easy. It is not known at present what the wildlife position is here, but even if game were relatively light on the ground, it is reasonable to suppose that with a shortish period of complete protection it would reach levels such as to permit the area to be opened up for shooting.

Meanwhile the area could fulfil a useful function as a "grazing reserve". This would mean that herders would not normally be allowed to use it. However, in case of prolonged drought they would be allowed in so as to take some of the pressure off the surrounding areas generally grazed. It is a known

fact that unlike domestic animals wildlife does not produce any adverse effects on rangelands, since in a natural ecosystem, when all the species that constitute the fauna are present, a system of checks and balances exists, which tends to keep the Park in the best condition.

As stated earlier, it is not possible at this juncture to make any forecasts on fishlife. However, it seems likely that once the lake has reached equilibrium, fish production should be good. The use of this resource will therefore need careful planning.

It ensues from the foregoing that the area between Saakow and Kaitoi, shown on Fig.4.I should be reserved for subsequent blocking out of a National Park, while the area around Lake Baardheere would be a Nature Reserve and should be used to foster tourism and big-game hunting.

5.8 ACTION PROPOSED

At this point it is evident that the following questions must be answered and the relevant investigations performed in order to pass on to the actual planning of the region:

1. What are the natural features of the potential irrigation areas in the old beds of the Juba and Shebeli where Completely Protected Reserves may be set up on small stretches of land?

2. What minimum extension of riparian formations must be included in the proposed National Park between Dujuuma and Faanoole to ensure the natural balance of the ecosystem?

3. Where should the western and northern boundaries of the National Park be?

4. What is the potential of the Lake Baardheere area from the big-game hunting aspect and its real interest as a grazing reserve? What should be the limits of the reserve?

5. What are likely to be the times required for the emergence of riparian vegetation on the shores of the new lakes and for the subsequent introduction of animals that do not presently live there?

6. The area between Kaitoi to about 6 km south of Dujuuma, chosen for the Park should be temporarily scheduled as a Nature Reserve on both banks of the river (on the east the Reserve should be bounded by the Dujuuma - Jilib road, and on the west it ought to extend about 40-50 km from the river). This plan should be considered temporary and the area itself should be considered as the last of the priorities in the Development Plans.

7. It is essential to make as complete an inventory as possible of the flora and fauna in the development areas before any development takes place. It is strongly recommended that the Somali Government should request a complete biological survey of these areas, to be made by experts who would collect all species for future reference, so as to evaluate the impact of development on the biological equilibrium of these areas.

PART II

INDUSTRIAL DEVELOPMENT OPTIONS

CHAPTER 1.

INDUSTRIAL DEVELOPMENT SECTORS
JUSTIFICATION OF PRIORITY CHOICES

The general philosophy regarding the industrial sectors to be developed and the guidelines therefor are covered in another part of the Study. The proposed projects and the sectors concerned are listed in the Summary Report (Volume I - Chapter 3). A short description and justification of some schemes is given below.

1.1 DURABLE CONSUMER GOODS AND CAPITAL GOODS

Factors bearing on sectoral development are: 1) The country's dependence on imports of such goods; 2) Its structural backwardness in the technological field; 3) The need to train process and maintenance personnel; 4) The necessity of making more widely available the indispensable elementary capital goods required to modernize the economy.

The complete lack of basic industry, i.e. heavy industries such as steelmaking, chemicals and petrochemicals, is a decided impediment to such development. Nor are there any particularly favourable raw materials, energy or infrastructural situations which decidedly favour many products.

The substitution of local craft-made products will have to be postponed to a later stage of development since, in any case, productivity is a matter of no great concern in a planned economy with the accent on selfsufficiency, while serious balance of payments problems exist.

In the Juba region, the only indications regarding raw materials availability are the gypsum deposits in the north and the clayey materials that occur here and there. We have also considered the possibilities of cement, asbestos and timber, where the building materials sector is concerned.

In the matter of import substitution, in particular, there is a lot of room for many products, especially machinery of all kinds (especially agricultural), domestic appliances, crockery and kitchenware, and means of transport and locomotion. There is also enough room still for textiles.

It is apparent that the engineering sectors of greatest interest will be those with the lowest investment per employee, while being the least affected by territorial constraints, perishability of stocks and supply difficulties. Regarding the engineering sector, it is apparent that the very considerable fleet of machinery and vehicles that will be needed for agricultural development will also necessitate a large maintenance and support organization (maintenance centres, erection shops, repairshops, toolshops, heat-treatment shops, paintshops, etc.). Such an organization inherently includes many of the basic elements of the engineering and manufacturing industries. Hence it is very natural to consider this as the hinge on which to hang a production structure. In this regard it should be observed that certain jobs which up to a few years ago seemed overly ambitious (e.g. parts for the automotive industry) have been found to fit in quite easily with nascent industry, both from the economic and technical aspects, partly because their low "applied research content" makes them increasingly uneconomic for highly developed countries.

At the present time the development of this sector in Somalia is very limited, while in the Juba region it is virtually nil. The Plan pointers have been borne in mind when framing proposals for development.

The following Table indicates the sectoral situation in 1972. There have been few changes since then apart from a cardboard box factory, a ceramics factory and a foundry already built or planned.

The suggested plants (already listed in Volume I) are as follows:

A. Consumer durables or capital goods presently imported

A.1 Decidedly of immediate interest

a. Gypsum pilot plant at Luuq.
b. Factory for the production of agricultural implements, with its own foundary, at Kismayo.
c. Plant making ceramics for household use.
d. Factory making nails and the like.
e. Repair and maintenance workshops (3).
f. Shipyard at Kismayo.
g. Fertilizer blending and bagging plant at Kismayo.

A.2 To be studied in detail, being of general interest

h. Textile factory in the Baardheere area.
i. Glassworks and porcelain factory.
l. (1) Truck and tractor assembly plant.
m. Bicycle factory.
n. Electric motor and pump factory.
o. Engineering works and foundry at Baardheere.
p. Furniture factory.

The reasons for selecting the most important of the foregoing items are dealt with below, while the "industrial profiles" are given in Chapter 2.

a. Gypsum pilot plant

The north Juba region is certainly rich in unexplored gypsum deposits. Not only is gypsum (and anhydrite) used in building and in various manufactured products, it is also one of the raw materials for cement-making and for chemicals. It can be produced economically by small, independent plants either as the semihydrate or as anhydrous $CaSO_4$. Its value is sufficiently high to make transportation worthwhile (overland, within a certain radius), which would not be possible with the raw material, whose commercial value is very low (around US $ 30.00/ton).

b. Factory for making agricultural implements, with its own foundry at Kismayo

This plant could be designed to turn out 500 to 1,000 ton/year of machine-tool work and a further 500 tons of foundry work. A similar, but smaller plant, to handle nonferrous metals too, is already at an advanced stage of study for Mogadishu.

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(1) The Italian alphabet is used for the index, as in the original. This has no j or k, so these do not appear in the English version either.

Sectoral situation in 1972

Items	Public Sector		Private Sector				Total	
			Factories		Traditional			
	No. of units	No. of employees	No. of units	No. of employees	No. of units	No. of employees	No. of units	No. of employees
1. Manufacture of Textiles	1	761	6	33	932	1,683	939	2,477
2. Leather + Footwear	1	150	10	139	256	352	267	641
3. Printing, Publishing, etc.	1	106	7	105	5	12	13	277
4. Other chemicals	1	34	8	125	4	7	13	166
5. Metal products	1	20	9	85	240	411		516

Plants of this kind can advantageously be coupled with vehicle and machinery maintenance and repairshops and constitute the basic nucleus for the training of personnel and the development of a local engineering industry.

c. Ceramics industry (see Para 1.3)

l. Truck and tractor assembly plant

There are many examples in Africa, even in the developing countries, of medium-sized assembly lines, which permit a great saving in costs. Big advantages as regards the fob price often derive from the fact that some major components (bodywork, for instance) are often made in Europe by firms other than those making the rest of the vehicle. When the product is well received on the market, there is almost always a very rapid increase in the number of locally-made components that are easiest to manufacture, and more use is made of local labour (upholstering and internal finish, plastics parts, electrical parts, bodywork parts). This process then gradually extends to increasingly more complex parts. Assuming that rational standardization of models makes the demand for medium-sized wheeled tractors or a light cross-country vehicle sufficiently interesting, a production line of a thousand a year would become feasible (1). The accessories industry almost always hinges around small plants operating on a semi-craft scale and providing work for a fair number of people (see Chapter 5).

m. Bicycle factory

The generally flat lie of the settlement areas, the climate and the organization of population aggregates (with radii of 6 to 12 km) all favour the use of the bicycle as the best individual means of transport to reach one's place of work or for other trips in general. In many advanced rural areas (northern Europe, the Po Valley in Italy and S.E. Asia) the widespread use of the bicycle has certainly had an influence on the regional organization, ensuring that it is "to the measure of man".

The production of 10,000 bicycles/year would seem to be perfectly possible within a decade or so, with the expected rise in living standards. Kismayo appears to have the best development conditions in this case.

o. Engineering works and foundry at Baardheere

This could supplement that proposed for Kismayo, being built some 7 or 8 years later, to the same standards or perhaps slightly lower.

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(1) The use of one medium-sized wheeled tractor every 400 ha, envisaged by the agricultural sector planners - which meets the need for a good intensity of labour - would produce a demand for no more than a few dozen tractors per year. But the diffusion of the tractor as a means of transport, coupled with trucks, and the possibility of serving other parts of the Somali market are all factors which help support our idea.

1.2 PROCESSING OF AGRICULTURAL PRODUCE

There is no need to justify the inclusion of the agricultural produce processing sector, as the raw materials will be available and the domestic and foreign markets too. The choice of priorities and the size of the enterprises also emerge quite naturally, being directly bound up with the type and quantity of agricultural produce planned. The six most important of the fourteen plants envisaged as being of "immediate interest" are examined below, tying these in with the choice of production programmes in Part IV of this Volume. For the "profiles", the reader should consult Chapter 3.

a. Expansion of the meat packing plant at Kismayo and new plant in the Middle Juba (Baardheere or Dujuuma-Saakow)

There will be a big upswing in animal production (see Vol. IV, Part IV), and in the amount of exports (Vol. II, Part II). The best prospects in this field are for the products with the biggest value-added component.

The use of byproducts (so far wasted) will become important as soon as the domestic market grows (feedstuffs, chemicals and - later on - foods and pharmaceuticals) enough to permit the output to be placed.

b. Two sugarmills in the Lower Juba (in the Ionte and Jamaame areas) and an alcohol production unit

The two areas will be among the first to go into production, within the context of the huge Faanoole-Jilib system linked to the Faanoole Dam and the associated irrigation schemes. Both will grow about 500,000 tons/year of cane (some 50,000 tons of sugar), sufficient for a medium-sized industrial plant (big enough for needs and the infrastructure). The investment, energy consumption and the amount of human or organizational effort are all quite high, but the domestic demand alone will absorb the whole output of one of the two plants immediately (by 1980) and of both by 1990. There are also good hopes of there being a satisfactory foreign demand too. Indeed, this could be such as to make a third mill at Baardheere a matter of priority (this is only considered as being a distant prospect at the moment) or, alternatively, of doubling up the capacity of one of the above plants.

c. Sugarcane-pulp (bagasse) for papermaking

Kismayo or Jilib would be the best site for such a unit, the raw material coming from the Ionte and Jamaame sugar mills.

d. Two medium-sized slaughterhouses with cold stores, one in the Middle Juba and the other at a site to suit livestock development

The advisability or otherwise of equipping the two slaughterhouses to process byproducts or of coordinating operations with the Kismayo meat-packing plant will be dictated by market trends in the initial years. The two units should have a mixed function - commercial and industrial - at least half the meat being for the cold-store trade and the remainder being deep-frozen or processed.

The complete list of plants suggested for the agricultural products processing sector (already presented in Vol. I) is as follows:

B. Agricultural products processing industry

B.1 Decidedly of immediate interest

a. Expansion of the meat-packing plant at Kismayo and possibility of building a new plant in the Middle Juba (also processing byproducts such as bones, blood, etc.).
b. Sugarmills (2) in the Lower Juba (Ionte and Jamaame areas) one to process 500,000 tons of cane per year, the other 1,000,000 tons, complete with alcohol production unit.
c. Sugarcane-pulp industry for papermaking.
d. Slaughterhouses with cold stores (2) one in the Middle Juba (6,000 tons carcases/year, possibly utilizing byproducts as well, to be coordinated with Point a) and one in the Luuq area (5,000 tons carcases/year).
e. Hides and skins units in the Middle Juba and/or at Kismayo.
f. Cotton ginnery.
g. Oilseed expressing plant (soya, cotton, sesame, groundnuts and sunflower) in the Luuq area (35,000 tons seed).
h. Sisal fibre and banana fibre industry at Kismayo.
i. Dairy and milk-processing centre at Kismayo.
k. Three tomato conserve units in the Lower Juba with capacities of between 7,000 and 15,000 tons/year.
l. Grain mills in the Baardheere area for 5,000 tons/year wheat and 20,000 tons soya.
m. Mills and feedingstuffs plants.
n. Rice and maize treatment plants in the Faanoole area (various small units).

B.2 To be studied in detail, being of general interest

o. General fish treatment and canning plant at Kismayo with fishmeal and fishoil units.
p. General fish treatment and canning plant at Merile.
q. Fruit and vegetable processing and canning plant at Baardheere.
r. Tobacco drying plant.
s. Ricepaper factory.
t. Gelatine and gum factory.
u. Oilseed expressing plant in the Faanoole-Jilib area (20,000 tons).
v. Banana processing and dehydration plant.
w. Sugarmill at Baardheere (400,000 tons/year of cane).
z. Rice and maize processing plants in the Baardheere-Saakow area (various small plants).

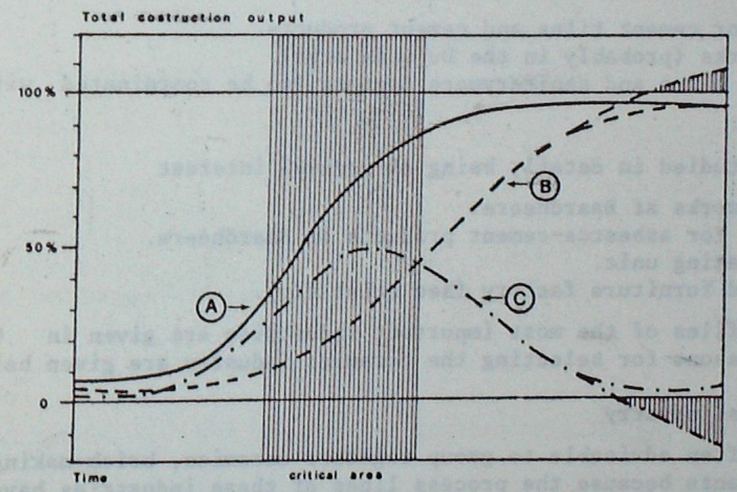
1.3 CONSTRUCTION MATERIALS

It is envisaged that demand here will be fairly high. Apart from the large and small public works described in Part I of this Volume, there is also the building sector. Here it is reckoned that the Valley will need one to two thousand modern houses per year (plus seven or eight thousand traditional houses, which demand very little from the construction materials industry).

All this will mean that the domestic industry will be called upon to make a very considerable effort, since, excluding the labour element, over 60% of the cost of houses in African countries with an income of around $ 100/head consists of imported items at the present time (around 40% if the labour cost is included). The dependence of the construction industry on outside sources during the different phases of development is shown in the graph here below (source: UNIDO 1969).

The sectors where a big saving could be attempted are cement, certain mechanical items and the maintenance thereof, bricks and tiles, asbestos-cement products, panels, timber and glass.

In the case of the Juba Valley, the cement works calls for separate consideration. The size of such a plant is generally too large for its function to be limited purely to the region where it is located, but is location, as such, is bound up with the location of the limestone deposits. For the moment the only real quarrying possibilities in the Valley are those in the Baardheere and Buur regions. However it would seem that the Mogadishu region, which is the biggest consumer area, could well be served advantageously from Berbera. The deciding factor could well be some marked development in the region or a big improvement of the transport infrastructure (waterways, railways).



A development profile for the construction industry

Key
A Output of construction in the monetary sector
B Local supply of modern factors of production
C Imports

Of decided interest, however, is a plant making precast elements and tiles from cement at Kismayo. This unit could obtain its cement by sea. A brick and tile works could be set up in one of the many places where there is

an abundance of good clay, e.g. Dujuuma. The same holds good for one or more ceramics plants, where the clays are of the very best quality. The output from the ceramics plants could perhaps also be placed outside the region, unlike the production from the brick and tile works. The same probably holds good too for a plant making asbestos-cement products (pipes and sheets) to be sited perhaps at Baardheere. The prospects for mining asbestos in the Bay Region seem good, and in this instance it is not necessary for the mines to be near the plant.

The demand generated by public works in the Valley will be very high in the case of precast concrete products. However, in many instances it may be advisable to produce them in temporary yards on the job. What we have in mind here are slabs for lining some conveyance canals, precast concrete flume elements and canal outlet structures, as well as some walkways across canals, roadworks structures, etc.. It may well be advantageous, however, to produce certain items in a central plant (spun pipes and piles, asbestos-cement pipes, small beams, etc.).

The plants suggested for this sector (already listed in Volume I) are therefore as follows:

C. Construction materials industry

C.1 Decidedly of immediate interest

a. Plant for cement tiles and cement products.
b. Brickworks (probably in the Dujuuma area).
c. Ceramic tiles and sanitaryware factory (to be coordinated with A.c and A.i).

C.2 To be studied in detail, being of general interest

d. Cement works at Baardheere.
e. Factory for asbestos-cement products at Baardheere.
f. Panel-making unit.
g. Wood and furniture factory (see Point A.p).

The profiles of the most important industries are given in Chapter 4, while the reasons for selecting the ceramics industry are given below.

c. Ceramics industry

It is often advisable to group together ceramics, brick-making and glass-making plants because the process lines of these industries have much in common. Some raw materials (clay, quartz and kaolin) are common to two of the three and the processing principles are essentially alike and involve the same categories of skilled workers.

Clay, which is the main raw material of all these industries except glass-making, is found in many places in the Valley. There are sure prospects of quartz in the Hayheisa-Berbera region and kaolin may also be present there (perhaps in the Valley too), while felspars have been identified in that part of Somalia, as well. Thus, as far as can be made out at present, it would be right to site a brickworks in the Valley (at Kismayo?), while the site of the ceramics factory and glassworks will depend on the study of comparative feasibility here and at Berbera. It can, however, be mentioned that because of the high unit value of kaolin and felspar, they can be shipped at considerable distances. As it is apparent, geological investigations to cover this aspect are a matter of some urgency.

PROFILES OF THE MOST IMPORTANT INDUSTRIES IN THE CONSUMER DURABLES AND CAPITAL GOODS SECTOR

2.1 FACTORY MAKING CERAMIC PRODUCTS FOR HOUSEHOLD USE, CERAMIC TILES, SANITARYWARE AND BRICKS (A.1.c; C.1.c; C.1.b)

2.1.1 Data

- Raw materials

Clay, kaolin, quartz, felspar and glazes.

- Products

1. Tableware and crockery for domestic and agricultural use.
2. Sanitaryware (bathroom and kitchen sinks, etc.).
3. Wall and floor tiles.
4. Bricks and tiles.

2.1.2 Specific production lines

Tableware, crockery and sanitaryware, with production of 2,000 pieces/day crockery and 200 pieces/day sanitaryware (washbasins, toilets, etc.)

FOB cost of line (approx.)	US $ 2.6 million
Cost of buildings and local expenses (approx.)	US $ 2.8 million
Raw materials consumption:	
- Kaolin	40 t/month
- Quartz	30 t/month
- Felspar	40 t/month
- Clay	45 t/month
Glaze consumption (raw)	25 t/month
Fuel oil consumption	50 t/month
Petrol consumption	1.5 t/month
Electric energy consumption	100,000 kWh/month
Labour	120 factory hands
	30 claypit hands

Ceramic wall and floor tiles (producing 1,200 m^2/day glazed floor or wall tiles)

FOB cost of line (approx.)	US $ 3.5 million
Cost of buildings and local expenses (approx.)	US $ 2.0 million
Raw materials consumption:	
- Biscuit material (clay base)	600 t/month
Glaze consumption (raw)	35 t/month
Ink consumption	2 t/month
Fuel oil consumption	150 t/month
Petrol consumption	1.5 t/month

Bricks, hollow bricks, tiles and the like (production of 1,500 t/month of ware, net of breakage)

FOB cost of line (approx.)	US $ 0.7 million
Cost of buildings and local expenses (approx.)	US $ 0.9 million
Raw materials consumption (clay)	2,000 t/month
Fuel oil consumption	50 t/month
Electric energy consumption	3,500 kWh/day
Labour	40 factory hands

PROFILES OF THE MOST IMPORTANT INDUSTRIES IN THE AGRICULTURAL PRODUCTS PROCESSING SECTOR

3.1 MEAT-PACKING INDUSTRIES (B.1.a)
SLAUGHTERHOUSE WITH COLD STORE (B.1.d)

3.1.1 Size of installations

When the Project is fully operational, it is envisaged that the Valley will produce about 35,000 tons of standard beef carcases per year. However, in 1995, which is the year in which we are interested from the industrial forecasts aspect, production will be around 25,000 t.

Because of the distribution of the stock and to facilitate movement of the animals, it has been considered advisable to think in terms of smallish slaughtering facilities, though none the less large enough to be technically and economically viable and to permit use of byproducts. There should really be a packing unit for each slaughterhouse and cold store, but it is apparent that the industrial side would then be too small. It will be important to ascertain what quantity of cold and frozen meat the market can take on the medium term. In the short term there will be little room for frozen meat because of the lack of a complete cold chain (transport and stores) though this could be provided in the longer term to facilitate meat marketing and exports.

The minimum size of the units should not be less than 3-4,000 t/year (standard carcase), while the maximum unit compatible with the production and sales structure will be around 10-15,000 t/year.

The essential data for a unit having a capacity of 8,000 t/year cattle and 1,500 t/year sheep and goats which we recently designed for a West African Project (two-shift basis) are as indicated in the following paras.

3.1.2 Production line and costs

Slaughtering line and byproducts treatment (tripery, abattoir, blood)	
Cold-store equipment	US $ 1,800,000
200 m^2 frozen meat store	
Two refrigerated trucks, two other trucks	
Erection, buildings and local costs	US $ 1,200,000

3.1.3 Other technical data

Installed power	200 kW
Electric energy consumption	25 kWh/year x 10^3
Petrol and fuel oil consumption	9 t/year

3.2 SUGARMILL (B.1.b)

3.2.1 Production data

Sugar produced		50,000 t
(Possible other products:	Alcohol	600,000 l
	Syrup	10,000 t)
Cane consumption		470,000 t
(Bagasse reused to raise steam)		

3.2.2 Production line and costs

FOB cost of line	US $ 20,000,000
Buildings and local costs	US $ 5,000,000
Family installations and services	US $ 3,000,000
Fuel consumption (Fuel oil)	12,000 t/year
Electricity consumption	70,000 kWh/year

3.2.3 Other technical data

Production cost (excluding cane cost)	US $ 110/t
Labour requirement (process & serv.)	600 people
Installed electrical capacity	7,000 kW

4.1 CEMENT FACTORY (C.2.d)

4.1.1 Production data

350,000 t/year Portland cement (dry process)

- Raw materials

  Calcareous marls and limestone

4.1.2 Production line and costs (including management)

FOB cost of complete production line	US $ 16,000,000
Fixed structures and local costs	US $ 14,000,000
Fuel oil consumption (or coal equiv.)	3,000 t/month
Electric energy consumption	2,500,000 kWh/month
Labour (white and blue collar)	600
(80 of which in the quarry)	

4.1.3 Other technical data

Paper bag consumption	120 t/month
Refractory brick consumption	20 t/month
Average economic life of various parts of the investment	7 years
Installed electric power	9,000 kW
Minimum economically viable prod.	40%

4.1.4 Alternative

Lower production (index of 150,000-200,000 t/year) would render the investment cost and the production cost much higher. The break-even point would rise from 40 to at least 50%, which, considering the inevitable stoppages and technical downtimes in the initial years of life would definitely appear to be too high. The production indicated or at least a production of 250,000-300,000 t/year would thus appear to be the minimum that can be recommended from the technical aspect.

CHAPTER 5.

NOTES ON OTHER SCHEMES

5.1 EXTRACTIVE INDUSTRY AND MINERAL USAGE

A big mineral find would certainly be the one factor that would make the greatest changes in the industrial and hence the economic prospects of the region. While it may still occur that there will be major discoveries of oil, gas or radioactive minerals, on which prospecting has already been done, as stated the limestones are of interest for lime and cement, the gypsums are also of interest, as are the very widespread clays and quartzes, kaolins and felspars. Also present are asbestos, bauxitic laterites and iron ores, building stone and rare earths.

5.2 SMALL INDUSTRY

Mention was made in Volume I of the advantages and the custom of treating these industries as a separate sector, because of the many characteristics they have in common, quite apart from what they may produce. Mention has also been made of the benefits of not replacing, at this phase, the cottage industries and national semi-industrial activities by modern industries, but rather of protecting them and using investment funds for other sectors where import substitution is more urgently needed (e.g. footwear and other leathergoods, many foodstuffs that will be cooked -namely not particularly demanding from the hygienic aspect- cosmetic items, costume jewellery, furniture and household goods made of wood). An astute protectionist policy can help promote these activities at the cottage-industry level. Then there are the more modern small industries, generally dependent on larger industry for the supply of semi-finished goods (or for special supplies), and those concerned with the fabrication of metals and of their recovery (carpentry, machining of metal sheet and profile, small foundries), the production of materials for the building industry (blocks, bricks, lime, gypsum, plaster, fixtures, pipes) and the manufacture of small objects starting from standard parts (pens, eyeglasses, lamps, toys, etc.).

The small businessman usually relies on the support of public agencies for such things as power, stocks, accounting, finance know-how and marketing. In some developing countries (India, Tanzania, Colombia, etc.) satisfactory results have been obtained by grouping small industries in "Industrial Estates" where the community provides the utilities and where the proximity of many small industries and a few larger ones acts as a spur to development.

Each of the urban centres in the Valley should have an infrastructure of this kind. It is not possible to indicate all the specific details at this stage, but the general characteristics have been deal with at length in many publications of the UNIDO Small Scale Industries Division.

PART III

ECONOMIC ANALYSIS OF THE SCHEMES

CHAPTER 1.

ANALYSIS OF THE ECONOMIC RESULTS

1.1 COST-BENEFIT ANALYSIS

1.1.1 Project cost

The investment costs for the eleven schemes considered are estimated to amount to So Sh 4,900 million or about US $ 770 million (1). Adding in the running costs (staff, operation and agricultural production), the total rises to over So Sh 37,000 million (US $ 5,900 million), including contingencies and taking account of the life of the individual schemes (fifty years) (2). When the industrial development costs are also taken into consideration, the total moves ahead to So Sh 55,400 million (US $ 8,800 million) (Table 1).

The foreign exchange component accounts for 63% of the total cost (Table 1). This is so high because of the fact that most of the industrial products have to be imported (fuel, lubricants, cement, steel, etc.) both for the Project and for agricultural operations (fuel, machinery, fertilizers, pest-control chemicals, etc.).

The investment on land reclamation amounts to So Sh 3,100 million (US $ 490 million), the breakdown being as follows:

	Breakdown %	Cost per gross ha So Sh
Preliminary operations (clearing and levelling)	23.3	2,700
Farm irrigation network	20.8	2,410
Drainage network	17.1	1,980
Farm roads	9.3	1,080
Windbreaks	2.1	235
Contingencies	27.5	3,190
Total	100.0	11,595

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(1) So Sh 1 = US $ 0.15816; US $ 1 = So Sh 6.3227

(2) All estimates are for landed costs at Kismayo or Mogadishu, depending on which port is nearest to the scheme concerned. Official wage rates have been adopted for local labour, albeit use of shadow prices could be justified, broadly estimated at between 60 and 75% of current rates, depending on qualifications.

Table 1 - Project costs and foreign currency component during economic life of Project (50 years)

	Project cost		Foreign curr. cost	
	Million So Sh	Million US $	Million US $	% of total cost
1. Land reclamation	3,095	490	245	50
2. Farm infrastructure	1,155	183	72	40
3. Materials	440	70	63	90
4. Personnel	1,985	314	-	-
5. Running cost	11,435	1,808	1,085	60
6. Cost of inputs	21,010	3,323	2,825	85
7. Contingencies (a)	2,850	450	360	80
8. Industrial processing (b)	13,480	2,132	850	40
Total	55,450	8,770	5,500	63
Total invest. cost (c) (1 - 3)	4,850	768	395	51
Total running cost (c) (4 - 6)	37,120	5,870	4,255	73

(a) 10% of the investments for farm infrastructure and materials and running costs, renewals and inputs.

(b) Processing of sugar cane and rice; handling and conditioning of bananas.

(c) Including contingencies.

The average land reclamation cost is around So Sh 11,600 per ha (gross) (1), ranging from So Sh 10,000 to 15,000 for the individual schemes. The investment for farm infrastructure is about So Sh 1,200 million (US $ 183 million), some 80% of this figure being accounted for by buildings to house machinery, fertilizers, etc., and stores for the harvest. The cost per ha averages around So Sh 435 and varies little over all eleven schemes.

Running costs at So Sh 11,400 million (US $ 1,800 million) account for approximately 21% of the total for the schemes, while inputs at So Sh 21,000 million (US $ 3,300 million) account for about 38%. The high figure is explained by the fact that most of the equipment and raw materials have to be imported, so it has been necessary to estimate the costs at foreign-market prices, with all the repercussions this involves, in view of the current world situation. The veracity of this is borne out by the level of the foreign currency component (over 76%), which is considerably above that usually encountered in similar projects. In order to eventually reduce this high percentage, it is planned to replace the import of ready-to-use fertilizers by bulk fertilizer imports, giving a foreign-currency saving of 40%. This will entail the construction of a fertilizer mixing and bagging plant, which will provide the added advantage of being able to vary the composition of the product to suit local needs.

The very low figures for personnel costs (5% of the running costs) stems from three things:

- Exclusion of foreign consultants for bringing the individual schemes into production.
- Inclusion of engineering costs in the land reclamation costs.
- Adoption of a cooperative system for the State Farms. This system has been chosen because the use of wage labour is not very rational. Indeed, the policy of opting for labour-intensive solutions means that the employment curve varies markedly over the year, being very high at harvest time and quite low in other months. Thus, the use of wage labour would lead to rather a high level of underemployment, even if the hands were used on maintenwork.

To conclude, the average cost per net hectare cultivated (2) in the fifty years of the Project life is around So Sh 260,000 (US $ 40,000) being about 22% higher on State Farms than on Family Farms (So Sh 266,000 and So Sh 218,000, respectively).

As might be expected, the differences become considerably greater when the individual schemes are examined. They are attributable, particularly, to the presence of highly capital-intensive crops on the State Farms (bananas, grapefruit, sugar cane). It should, however, be pointed out that it has been possible to reduce the difference because economies of scale help keep down costs on State Farms, particularly running costs.

It should be observed that the main difference in cost per hectare concerns equipment (mainly agricultural machinery), with the Family Farms running at half the State Farms figure. Indeed, on the former the only cultural operation that is mechanized is ploughing, while many more are mechan-

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(1) 264,595 ha

(2) 215,250 ha (221,500 ha - 6,225 ha already under cultivation).

Table 2 - Investment and running costs per net cultivated hectare on Family and State Farms, and overall during the life of the Project (50 years)

Costs	Investment and running costs					
	Family Farms		State Farms		Overall	
	Total Million So Sh	per ha 000 So Sh	Total Million So Sh	per ha 000 So Sh	Million So Sh	per ha 000 So Sh
a. Investment (1)	515	21.3	4,335	23.0	4,850	228
Land reclamation	375	15.5	2,720	14.4	3,095	14.5
Farm infrastructure	100	4.1	1,175	6.2	1,275	6.0
Materials	40	1.7	440	2.4	480	2.3
b. Running (1)	4,750	196.3	45,850	243.4	50,600	238.0
Personnel	281	11.6	1,700	9.0	1,981	9.3
Operation	1,369	56.6	10,670	56.6	12,039	56.6
Production	3,100	128.1	20,000	106.2	23,100	108.7
c. Industrial development	-	-	13,480	71.6	13,480	63.4
Total	5,265	217.6	50,185	266.4	55,450	260.8

(1) Including contingencies.

ized on the latter, including crop spraying from the air, something that is absolutely essential because of the double cropping season and the shortage of time.

Unit costs for personnel on the Family Farms are higher, because of the need to ensure that all the farmers receive expert aid, this being essential if they are to be taught how to make proper use of the agricultural techniques adopted. These are limited to fertilization and pest control, and there are no very demanding crops involved.

It is estimated that when the Project is fully operational, running costs, including personnel will be around So Sh 3,400 per hectare, which will account for some 39% of the gross product. The individual figures for Family and State Farms are So Sh 2,900 and 3,500 (45 and 38% of the value of the gross product). The expenditure level for Family Farms might be considered somewhat high, but it is partly attributable to the fact that it includes the costs of staffing and running the service cooperatives for the supply of inputs, the marketing of production and the provision of technical aid.

1.1.2 Benefits

When the Project is fully operational, it is expected that the gross additional benefits (1) will be So. Sh. 2,100 million (US $ 340 million).

Table 3 - Value of gross agricultural product when the Project is fully operational

	Value of gross agricultural product					
	Overall			Per net cultivated hectare		
	Million So Sh	Million US $	%	So Sh	US $	Indexes (tot = 100)
Family Farms	170.2	26.9	8.0	7,033	1,112	70.1
State Farms	1,961.9	310.3	92.0	10,404	1,645	103.8
Total	2,132.1	337.2	100.0	10,025	1,585	100.0

Ninety-two percent of the benefits derive from the State Farms, with an average value per hectare of over So Sh 10,000, while that of the Family Farms is around So Sh 7,000. However, the overall range is much broader, being as high as So Sh 20,000 in Scheme 8 and as low as So Sh 2,000 in Scheme 1.

(1) The benefits are net of re-use of seeds. For products controlled by the ADC, the official 1975 prices have been used; for bananas the prices are those recently agreed by the Somali Government and EFIM; other prices are cif Mogadishu.

1.1.3 Economic justification

The net benefits of the schemes as a whole when the Project is fully operational will be around So Sh 1,000 million (US $ 160 million, approx.). This value has also been adopted for the following years, to be on the sage side, though it is more than likely that the net benefits will continue to increase, at least during the following decade, assuming there is no change in the technological level. This presumption is justified by the fact that in the first twenty years not all the effects of the technological jump will have been felt, especially owing to the unavoidable slowness with which the technology will be absorbed and applied by the farmers.

On the basis of these assumptions, the internal rate of return of the schemes will vary over a very wide range, running from a maximum of 19% to a minimum of 4%.

Scheme	Internal rates of return	
	Family Farms	State Farms
1	7.0%	4.5%
2	13.5%	11.5%
3	7.0%	12.2%
4	7.5%	-
5	-	5.0%
6	8.1%	9.0%
7	-	11.0%
8	-	12.9%
9	-	19.0%
10	-	4.0%
11	-	16.0%

2.1 EVALUATION OF COSTS

2.1.1 Land reclamation

The costs are obtained from consideration of the surface area placed under cultivation every year and from the costs for the following five categories of intervention : preliminary works (clearing, removal of stumps, bushes, stones, breaking and levelling, in a preliminary and final way, of the ground); farm network of irrigation canals, drainage network; penetration and farm roads network; perimetral, secondary and tertiary windbreaks.

As is shown by the following Table 1 the costs per hectare of surface area served (1) present for each category of intervention and with the single exception of those in respect of the irrigation network, a fairly differentiated range or values in the 11 schemes considered; as shown by the levels of average costs per hectare for each scheme.

This differentiation derives :

a. in the case of the preliminary works, from the different surface area compared to the total one of each scheme, affected by such a type of intervention (see Vol. IV, Part III, Chapter 6), from the different extent to which the works of land reclamation are required in each scheme and consequently from the different incidence with which the individual costs (2) come to from the average one;

b. in the case of drainage, from the placing under cultivation, especially with rice, of land of 3rd and 4th class (cfr. Vol. IV, Part I, Chapter 3, and more particularly Table 1);

c. in the case of the road network, from the present situation which requires, for certain schemes, almost exclusively the building of the farm system, for others the setting up of connecting roads for regional viability, whose features presuppose much higher costs;

d. in the case of the windbreaks, from their length and the presence or not of secondary and tertiary belts, on the basis of the local intensity and frequency of winds.

It would be well to point out that the level of costs is influenced by the possibilities to use, at least in part, in land reclamation works (3), the agricultural manpower itself, which in certain months is underemployed to a considerable extent (cfr. Para 2.1.4).

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(1) Contingencies (20% of cost) and engineering (15%) included

(2) More particularly, the cost of the levelling of land, on the basis of the topography, presents a very wide range (between 1,300 and 3,000 Sh/hectare)

(3) With the exception of preliminary works for which special equipment and specialised manpower are required.

Table 1 - Unit costs (per hectare of gross area) for land reclamation works (So.Sh.) including engineering and contingencies

Scheme	Preliminary works	On-farm irrigation network	Drainage network	On-farm viability	Windscreen	Average cost per hectare
1	4,332.5	3,654.5	1,771.4	2,057.1	807.8	12,623.4
2	3,280.7	3,570.2	2,124.6	1,435.1	291.2	10,701.8
3	5,266.6	3,075.7	4,801.1	1,506.2	382.5	15,032.1
4	5,125.1	3,465.2	1,793.8	3,188.2	593.7	14,166.0
5	3,851.6	3,419.2	1,800.3	2,449.5	608.3	12,124.9
6	2,025.7	3,103.7	3,899.0	735.9	108.0	9,882.2
7	4,293.0	2,508.9	1,793.0	1,345.9	237.3	10,178.0
8	4,161.9	3,487.5	1,848.6	1,198.7	163.4	11,160.3
9	5,799.0	4,565.0	2,407.0	1,679.5	278.3	14,728.8
10	346.7	3,394.3	7,626.0	970.7	202.0	12,539.8
11	2,742.5	3,430.6	1,799.5	2,280.1	527.9	10,748.3
Average	3,718.1	3,318.0	2,727.2	1,482.4	320.8	11,566.5

The timing of the intervention has been estimated as follows :

a. as starting, in the case of the preliminary works, two years (or one year) ahead of the beginning of the putting under cultivation : and, for the other interventions, one year ahead;

b. as being carried on, in the case of the preliminary works, at a rate of 5,000 hectares per year and, for the other interventions, according to the rate of the annual placing under cultivation foreseen for each scheme (see Appendix Chapter 2, Table 1). The concentration of the preliminary works can be made possible by using contractors with big equipment for the removal of bushes and for clearing (bulldozers), ground levelling (scrapers) and partially breaking up the ground.

2.1.2 Farm infrastructures

Their dimensions derive from the storage requirements, from the requirement of technical inputs (mainly fertilizers, since the use of phytopharmaceutical is limited) of agricultural machines (including also maintenance workshops and office buildings). (1).

In order to estimate the tonnage of products to be stored, the following criteria were adopted :

a. for rapidly perishable products, such as vegetables, their immediate forwarding has been hypothesized towards the centres of consumption in the Juba Valley itself and the remaining territory of Somalia. The construction of a network of permanent links towards Baydhaba and Mogadishu guarantees their timely clearance throughout the year. For tomatoes, apart from the quantity required by direct consumption, their rapid transfer has been foreseen to the canning factory, which should be provided with the appropriate infrastructures of storage, for the whole time required by its potentiality of processing;

b. for rice, cotton, jute and sugar cane, their transportation has likewise been hypothesized, at the same time as picking, towards the respective transformer industries: rice mills, cotton mills, sack and sugar mills.

Accordingly, the requirement of storehouses for the storage of productions is limited to those basic food products which directly concern the ADC: maize, sorghum, wheat and oil seed products (2).

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(1) Housing for the managerial staff has not been taken into consideration, since included in the general programme. However this omission does not affect calculation of the rate of internal return since, on the basis of the organisation foreseen (cfr. Par. 2.1.4), the number of houses be built is extremely limited.

(2) For bananas no storehouses have been foreseen since their picking, spaced over the year, generally takes place in accordance with the requirements of exportation. In schemes 7, 8 and 9 only special centres for their handling and packing have been foreseen.

The capacity of such storehouses has been dimensioned on the hypothesis that they should allow the storage of products for a maximum of six months, i.e. for a crop season. The area to be covered has been estimated by adopting a useful height of 2 metres and considering the tonnages of each product to be stored according to their specific weight (1).

The storehouses will have extremely simplified structures: substantially, sheds with concrete flooring and columns and iron or asbestos sheet roofing. In fact their function should be the temporary storage of products pending the collection by the ADC. The cost has been estimated at 1,000 to 1,500 So.Sh. per sq. m.

For the storage of manures and phytopharmaceuticals, covered stores have been considered necessary, whose capacity hes been established on the basis of the demand for fertilizers limited to a single crop season, with a 10% contingency increase. The cost per sq. m. has been estimated at 2,000 So.Sh.

As for shelters for machines, the type of construction preferred is a shed, the whidth of which varies between 7 and 9 metres and its height between 3 and 4 metres, whether it houses a combine harvester or not. The covered surface area has been established bearing in mind the following surface areas occupied :

-	Track tractors	7 - 10	sq.m
-	Wheeled tractors	6.5	sq.m
-	Manure spreaders	6 - 8	sq.m
-	Seeders	12 - 16	sq.m
-	Combine harvesters	20 - 26	sq.m
-	Ploughs	1.5 - 3	sq.m
-	Harrows	6 - 10	sq.m
-	Tank lorries	6 - 8	sq.m
-	Lorries	15 - 18	sq.m
-	Trialers	8 - 12	sq.m

The cost per sq.m has been estimated as 1,500 So.Sh.

The surface area of the workshop has been established as follows: 30 sq.m for scarsely mechanised schemes (Family Farms), 80 sq.m in mechanised ones (State Farms). The workshop will be provided with a paved washing area, with a covered area for maintenance, with a storehouse for spare parts and with a covered store for fuel in drums and lubrificants.

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(1) Specific weights of the main agricultural products :

maize	680 - 800 kg/cu.m
sorghum	670 - 800 kg/cu.m
wheat	740 - 850 kg/cu.m
groundnuts (unshelled)	315 - 345 kg/cu.m
groundnuts (shelled)	610 - 620 kg/cu.m
sunflower	320 - 480 kg/cu.m
castor	620 kg/cu.m
soya	670 - 770 kg/cu.m

Reference should be made to the hangars for the aircrafts having the task, in the State Farmsn of pesticide spraying. The volume required has been estimated as 450 cu.m for a cost of 200 So.Sh./cu.m.

2.1.3 Materials

These consist of agricultural equipment (machines and tools), pumps for irrigation, lorries and trailers for the transportation of goods (products and technical inputs) as well as vehicles (cars and motorcycles) for the movement of staff.

It should be pointed out that the number of track and wheeled tractors has been estimated on the basis :

a. of the hours required for the individual cultivation operations: substantially, ploughing and harrowing, for the Family Farms; ploughing, harrowing, manuring, ridging, combine harvesting and transportation for the State Farms (1);

b. of the presence of very limited critical periods within which it is necessary to complete cultivation operations (for example, that of ploughing between the picking of Gu and the sowing of Der is limited to 60 - 80 days (2) according to the crops);

c. of the greather or lesser concomitance of more than one operation.

Prices (So.Sh.) C.I.F. Kismayo

		Weight (kg)	Price
Track factors	of 90 HP	2,500	287,970
Wheeled tractors	of 70 HP/2RM	2,300	50,930
Wheeled tractors	of 70 HP/4RM	2,630	57,820
Manure spreaders	working width 1.5 - 2 m	140	3,500
Seeders	working width 110 cm	400	8,495
Ridgers	working depth and width 40 cm	3,765	235
Combine harvesters	working width 2.25 - 2.45 m	3,300	235,600
One-share ploughs	working depth 65 cm width 48 - 55 cm	1,430	20,435
Two-share ploughs		1,440	21,360
Harrows		945	10,110
"		455	6,965
Miscellaneous equipment		-	20
Lorries	capacity 40- 60 quintals	-	95 - 120,000
Trailers	capacity 40 quintals		12,075
Land Rover-station wagons		-	55 - 85,000
Range Rovers		-	110,000
Motorcycles		-	2,000

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(1) The hours of machine work required by the various operations of cultivation for the individual crops are given in Vol. IV, Appendix C, Chapter 2.

(2) Since 2.5 hours are required to plough one hectare, a tractor can work in the 500 hours available about 200 hectares.

The above prices have been raised by the cost of transport on the basis of 0.22 So.Sh. per km/ton and assuming the following average distances for the individual schemes : 5th - 11th, km 90 - 150; 4th, km 250; 3rd km 375; 2nd, km 450 (via Mogadishu - Baydhaba); 1st, km 470 (via Mogadishu - Baydhaba). Registration and road taxes and insurance have also been added.

The machinery capital has finally been raised by 10% for spare parts.

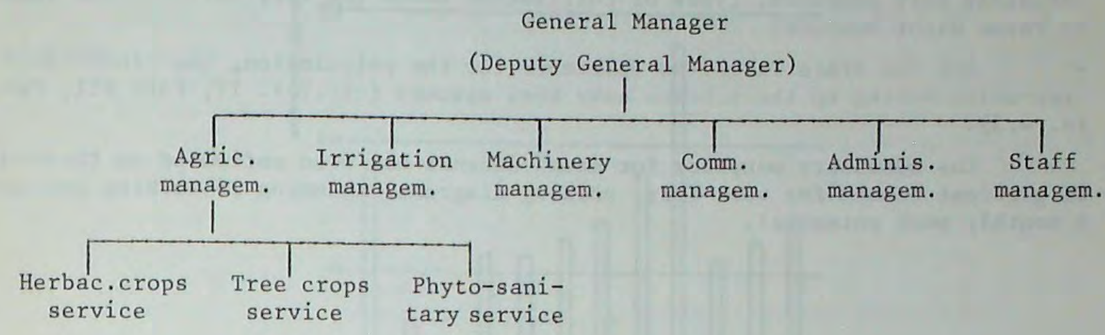
As far as antiparasites sprays are concerned on the State Farms, carried out by plane, the use of Piper single-engined craft has been foreseen;estimated price 210,000 So.Sh..

2.1.4 Staff

The qualified and non-qualified managerial staff is different on the Family Farms and on the State Farms, in relation to the very nature of the management itself. In fact this presents the characteristics of a cooperative society of services and commercialisation in the former, of production in the latter.

For the Family Farms its extremely simple structure is centred on a commercial division divided into two branches: for carrying out the basic workings (ploughing and harrowing) and for the sale of products, and on an administrative division. Other tasks, such as for example the regulation of irrigation and supervision will be performed directly by the farmers, just as it will be their direct responsibility to bring up to date the various procedures of cultivation in accordance with the technique required to achieve the foreseen yields per hectare. From this point of view, in Vol. IV, Part III, Chapter 7 special stress was laid on the need to prepare, at a first stage, the professional training of the farmers, and subsequently their technical assistance. But, in order for such interventions to be effective, it is necessary for them to be capillary and in continuous contact with those concerned; so that for each scheme a certain number of extension agents have been foreseen, directly dependent from the Regional Office. It has been considered that in the first stage an extension agent is able to carry out his task effectively having a load of not more than 50 Farms, equivalent, on the basis of an average extension of 3 hectares, to 150 hectares. Subsequently their number will be reduced, even considerably however this second stage will develop progressively, so that the number of public relations agents will only be stabilised, as a general rule, after some ten years. Thus, in scheme 4 (11,100 hectares), which it is foreseen will be completely placed under cultivation in 6 years, the 75 extension agents foreseen for that year will be reduced to 25 only by the 16 th year.

The organization chart of the State Farms is much more complex since it has to ensure the entire Farm cycle, from production to the placing of the products on the market. Generally speaking, it may be outlined thus :



Of course this model, from scheme to scheme, undergoes considerable variations depending on the complexity of the cycle of cultivation and the extension of each of these. The first factor will influence the division into services (for example, in the 2nd plan the tree crops service will be missing), but it will prove decisive above all as an effect of the number of plots under specific cultivation into which each scheme is divided. When, as in the second scheme, as many as 15 are foreseen (sorghum, maize, rice, oil-seeds, textiles, vegetables, legumes), the Directions for agriculture, for irrigation, for machinery and for commercialisation should be provided with relevant services.

The second factor; scheme dimension, will, on the other hand, influence above all the number of staff responsible for each direction. More particularly, as regards the machinery pool, the following parameters have been adopted: for tractor drivers, 1.2 units per tractor; for car drivers, 1 unit per car (1.2 in the case of lorries); for mechanics, 0.2 units per tractor or means of transport (person or goods); for assistant mechanics, 0.2 units; for the head of workshop, 0.01 unit. In order to ensure irrigation 1 unit has been adopted per 250 hectares, bearing in mind the fact that those responsible will be provided with motorcycles (1). As for supervision, it was considered necessary first of all (generally speaking in the first ten years) to ensure a fairly numerous group of watchmen: 1 unit every 150 hectares, with the possibility as time goes on of being reduced, bringing it to 1 every 300-400 hectares according to the cycle of production.

Finally it remains to specify the method employed to determine the labour force. This is initially based on the working diagram required by the types of cultivations foreseen for each scheme, bearing in mind the following clarification :

- for the Family Farms we proceeded to the overall calculation of the working days required each month by the various crops foreseen (cfr. Vol.IV,Appendix C, Chapter 2). In view of the degree of approximation of the present study it was in fact considered superfluous to single out the most frequent, but

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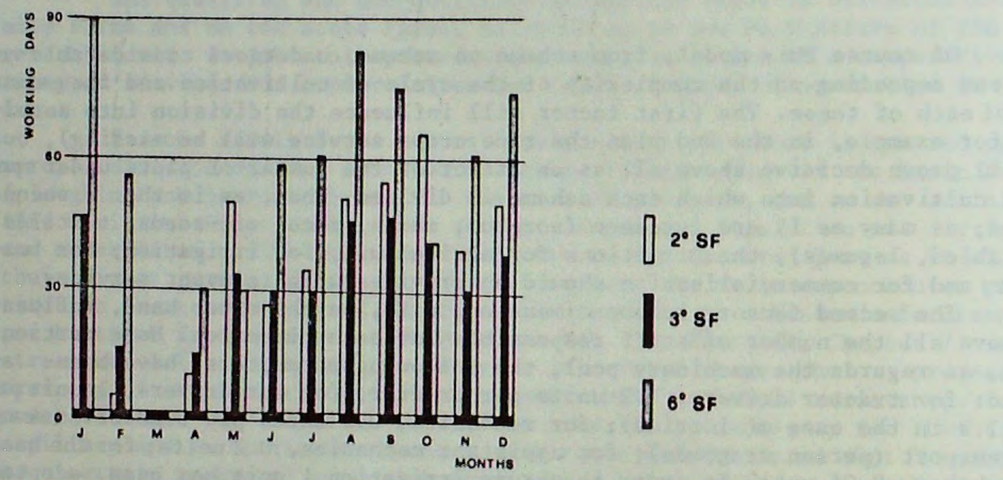
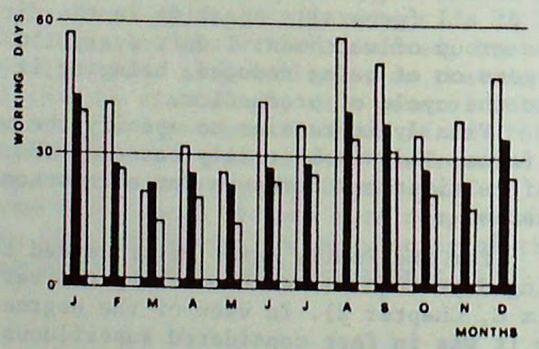
(1) In fact 1 unit per 500 hectares was foreseen, however, in order to ensure irrigation throughout 24 hours a day at least a double shift is required

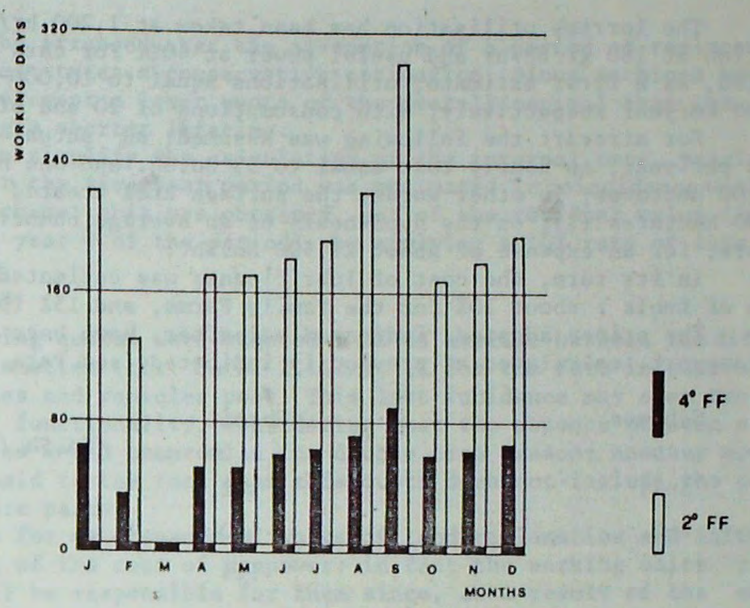
certainly very numerous, types of cultivation which the very nature of the Family Farms might suppose;

- for the State Farms, as reference for the calculation, the individual crop units making up the schemes have been assumed (cfr.Vol. IV, Part III, Para. 4.3).

The necessary manpower for each schemes has been estimated on the month of greatest demand for work (cfr. working diagrams) assuming 25 working days as a monthly work potential.







2.1.5 Running costs

a. Operating

The calculation of fuel consumption for cars and vehicles (for goods and staff transport) has been made as follows. For tractors the hours of utilisation were multiplied by the unitary consumption (gr/HP/hr), bearing in mind the power utilised; for vehicles the number of kilometres covered yearly by the relative consumption per kilometre.

The number of hours of utilisation derives from the time required by the operations for which the tractor is intended in relation to the various crops (ploughing and threshing for the track tractor and harrowing, seeding, ridging, transportation of products with trailer for the wheeled tractor) multiplied by the number of hectares to be worked in the case of each crop. The standard times are given in Vol. IV, Appendix C, Chapter 2 (Machinery and labour requirements according to crops). In its turn, gasoil consumption per HP/hr was estimated as 180 gr.; the useful power fixed equal to 70% for the track tractor (1), and to 50% for the wheeled tractor.

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(1) The useful power was lowered to 40% when the tractor is used on a pulley basis for threshing.

The lorries utilisation has been taken at 1,200 hr/year, gasoil consumption at 180 gr/HP/hr and useful power at 40%. For cars and motorcycles we adopted, as a first estimate, utilisations equal to 10,000-15,000 and 30,000 - 40,000 km/year respectively; with consumptions of 20 and of 5 litres per 100 km.

For aircraft the following was assumed: an actual utilisation of 500 hours per year, an hourly cost equal to 55 So.Sh. and one hour of flight for every 100 hectares; in other words, the surface area treated is in the region of 10,000 hectares (1), on the hypothesis of an average number of 5 treatments per hectare, for an expense of about 27,500 So.Sh..

In its turn, the cost of lubrificants was estimated as a quota of the value of fuels : about 10% for the Family Farms, and 15% for the State Farms.

The prices adopted, indicated hereafter, have been raised by the cost of transport, calculated as previously indicated (see Para. 2.1.3) :

Schemes	Gasoil	Petrol
	(So.Sh./hl)	
5-11	102	58
2-5	110	66
1	114	70

Another item considered is that of the requirement of sacks. This has been dimensioned on the tonnage of certain productions : cereals, oil-seeds, cotton, and a two-yearly turnover has been considered. Price adopted : 3 So.Sh.per sack.

b. Renewal

In view of the degree of approximation required it was not considered advisable to proceed to a calculation of renewal for the individual types of machinery, but a single life period was adopted: 5 years, namely that considered normal and the hours worked per year, the average life is shown to be as follows :

	Hours of life	Family Farms (years of life)	State Farms
- Track tractors	6,000	6	5
- Wheeled tractors	6,000	8	5
- Manure spreaders	1,500	-	3
- Seeders	3,000	-	3
- Ridgers	2,000	-	4
- Combine harvesters	12,000	-	12
- Ploughs	3,000	3	3
- Harrows	2,000	3	3
- Lorries	6,000	5	5
- Trailers	8,000	12	8
- Cars	-	5	5
- Planes	4,000	-	8

(1) Considering the double crop season, the useful surface area treated by an aircraft should be dimensioned over the 5,000 hectares per year.

It should be stressed that the assumption of a period of replacement of 5 years in fact constitutes a conservative estimation, since machines having a longer lifetime represent a lower quota of the overall capital than the quota for machines having a shorter lifetime.

Finally, to simplify the calculation of the internal rate, yearly quota of replacement over the five-year period was estimated in coincidance with cruising year of each scheme; this was obtained, net of the residual value (equal to 10%, discounted at year 1 of the period), by applying a 10% rate of interest.

c. Maintenance

The following quotas were adopted : 2% as average between the different works of land raclamation (cfr. Para. 2.1.1.); 1% for the Farm infrastructures; 10% for the machines and vehicles pool. This last incidence may seem too low to guarantee its full functionality, considering that the absence of even a small part of the machines would compromise the double crop season; however consideration should be paid to the fact that this quota does not include the cost of manpower or of spare parts.

The quotas for maintenance of works of land reclamation and infrastructures are also net of the cost of manpower: in fact the working units present in State Farms will be responsible for them since, as a result of the employment of labour on a monthly basis required by the types of crops (cfr. working diagram in Para. 2.1.4) considerable degrees of unemployment are present in certain months of the year.

2.1.6 Technical inputs

On the basis of the doses per hectare foreseen for the individual crops the tonnage of fertilizers has been calculated for each scheme. The prices C.I. F. of manures are as follows: nitrogen-rich (urea), 161 So.Sh./quintal; phosphate-rich, 238 So.Sh/quintal; potassium-rich, 152 So.Sh./quintal. The cost of transport as previously indicated has been added to these prices.

As far as pesticides are concerned, generally two treatments by plane (1) based on chlorine derivates have been hypothesized : for cotton, treatments with Sevin type pesticides have been added, and for tobacco with Sevin and Zineb type pesticides. The respective prices are equal to 21,000 So.Sh./ton, 64,925 So.Sh./ton and 9,500 So.Sh./ton.

In addition the disinfestation of seeds has been foreseen by means of treatments based on organic chloride and organic mercury preparations.

Another technical input considered in seeds, foreseeing the progressive replacement of re-utilisation with selected seeds originating from a special selection and multiplication centre, for which the central Authority is responsible. The difficulty of establishing the relative sale prices, since it would not seem advisable to refer to the international market, has been overcome by adding arbitrarily to the value of the seeds deriving from re-utilisation a surprice equal to 25% of said value.

(1) For cotton from 6 to 8.

2.1.7 Contingencies

These have been calculated out of the investments for company infrastructures and for materials, and not out of those of land reclamation, since already included in these. Within the framework of the running costs contingencies for the costs of operation, of renewal and for technical inputs have been calculated. The incidence of contingencies was estimed at 10%;however it should be borne in mind that such a level should be considered as a pondered average between lower incidence, such as for the farm infrastructures and for the costs of operation, and higher incidence for the other items.

2.2 EVALUATION OF BENEFITS

The necessary rather long times required in order to achieve the foreseen final unitary yields have been obtained by applying to the yearly progression of the putting under cultivation of land (cfr.Appendix to Chapter 2-Table 1) the trend of unitary yields. Since the putting under cultivation of the entire net surface area of each schema (including rest periods) takes, with a few excetions (1) from 5 to 10 years (cfr.Appendix to Chapter 2 - Table 1), and since the period required to pass from the unitary yield of departure to the final unitary yield is, as a rule, 6-7 years, the cruising year is reached in the big irrigation schemes (State Farms) some time between the 11th and the 17 th year. For the Family Farms an even longer number of years was prudentially considered necessary (cfr. Appendix to Chapter 2 - Table 3).

For the calculation of the value of the gross product the quantities re-utilised as seeds were substracted from the tonnages obtained (cfr. Appendix to Chapter 2 - Table 3) and the prices determined on the basis of the following criteria were applied:

a. for the food productions (maize, sorghum and oilseeds) controlled by the ADC through pool board (cfr. Vol. II, Chapter 2) the prices paid to producers by ADC once more in 1975 were adopted, namely: 550 So.Sh/ton for maize; 550 So.Sh/ton for sorghum (2); 1,000 So.Sh/ton for groundnut and sunflower seed oil; 2,000 So.Sh/ton for sesame seed oil. For cotton, although controlled by the ADC, a pondered price was calculated, hypothesizing that 2/3 of the production were of 1st quality (price: 2,000 So.Sh/ton) and the remaining 33% of 2nd quality (price: 1,600 So.Sh/ton) (3): resulting in a price of about 1,870 So.Sh/ton;

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(1) Less, schemes 2, 3 and 6 of the Family Farms; more; the scheme 2 of the State Farms: for the former the period is shortened to 4, 3 and 2 years respectively; for the latter it is lengthened to 14.

(2) Price obtained by weighing the prices desumed from those fixed by the ADC for the 4 varieties of pooled sorghum: 1,100 So.Sh/ton for C/Jaamac; 500 So.Sh/ton for M/Cadday; 450 So.Sh/ton for M/Aburcas; and 400 So.Sh/ton for M/Moordi.

(3) These are the same proportions adopted by Hendrikson Assozierte Consultants GmbH and Co. for the cotton project (Feasibility Study of a Major Cotton Production Project in Somalia, July 1974), which represents a clear improvement compared to the present situation.

b. for the typical production intended for exportation: bananas and grapefruit, or for those whose exportation is only foreseeable as time goes on, that is, once the internal demand has been covered, such as rice and tobacco (1), prices FOB Kismayo were adopted for bananas (1,090 So.Sh./ton),as laid down in the agreement between the Somali Government and EFIM and for grapefruit (1,070 So.Sh./ton), as fixed by the CITACO study (2); those CIF Mogadishu for rice : 2,250 So.Sh./ton (3) and for tobacco : 12,445 So.Sh./ton. No attempt was made to replace these prices with those for exportation, since it would have been very difficult to foresee the date of the reversal of tendency (from imported products as they are today to exported products) and risky to apply the present FOB price to a hypothetical future annual supply in the not very near future.

Furthermore it should be pointed out that the FOB prices indicated for bananas and grapefruit regard respectively 80% and 60% of foreseen productions, while the remaining quotas, which are supposed to be absorbed by the internal market, were estimated at 250 and at 450 So.Sh./ton. This second quotation was adopted also for the fruit productions of the Family Farms, on the assumption that they were entirely intended for supplying the Somali consumption centres;

c. for productions which it is presumed will not be destined for export, since they are scarcely sufficient to cover internal demand or even remain below the latter, prices CIF Mogadishu were considered; in particular, for sugar 2,055 So.Sh./ton (4); for lesser textiles (substantially jute, to meet the demand for sacks) 2,650 So.Sh./ton and for soya oil 1,800 So.Sh./ton; for wheat 1,425 So.Sh./ton;

d. for vegetables and grain pulses, finally, although productions exist, no certain reference to prices at origin are forthcoming, with the single exceptions of tomato and onions. For the former it was not considered, in view of the nature of the present study, advisable to proceed to an analytical evaluation of the possible price of the main productions (through, for example, calculation of their production cost per hectare); it was preferred to prudentially assume, on the basis of a study carried out in 1972 (5), and updated on the basis of information acquired, the price of tomatoes estimated at 500 So.Sh./ton. However for the Family Farms, in which already today the onion occupies an important place, this has been raised to 900 So.Sh.

For pulses, we adopted the price CIF Mogadishu, determined at 900 So.Sh./ton.

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(1) Cfr. Vol. II, Part II (Internal and international demand of products of the Valley).

(2) RDS. Ministry of Agriculture. EEC-FED, Executive plan of a grapefruit plantation, by CITACO, 1974

(3) Since only the quotations for rice (and not paddy) are available on the international market, the productions of paddy foreseen in the individual schemes undergo application of the coefficient of 0.67, since this was shown to be, generally speaking, the yield of worked rice.

(4) Coefficient of yield of sugar cane equal to 0.10 of the productions indicated in Appendix to Chapter 2, Table 3.

(5) S.D.R. - Ministry of Planning and Coordination, Feasibility Study on a Tomato Paste Factory in Somalia, by the German Planning and Economic Group,Dr. Hendrikson, Mogadishu, april 1972.

CHAPTER 3.

ANALYSIS OF EFFECTS ON THE BALANCE OF PAYMENTS, ON EMPLOYMENT AND ON THE BALANCE OF THE STATE

As indicated in the Summary Report, the programme of agricultural valorisation, spread over 11 schemes, will involve altogether a cost of 39 billion shillings for the whole of the period of time of its realisation. Of this sum, some 7 billion shillings constitute the costs of investment, and 32 billions the costs of running and implementation of the schemes. The component in foreign currency of the total costs will be in the order of about 26 billion shillings (3.6 billions for investments and 22.4 billions for runnings).

It is interesting to examine in detail what will be the effects expected from the programme on Somali's balance of payments, on employment and on the balance of the State.

3.1 BALANCE OF PAYMENTS

In the face of the costs of the programme in foreign currency, an evaluation should be made of the positive results which should be produced on the balance of payments.

The positive effects are of two orders :

a. Increase of the value of goods exported.

b. Saving in the payments in foreign currency as a result of the replacement of goods imported at present.

If we examine separately the two series of benefits we obtain the following results :

- as far as exports are concerned, their value would reach the order of about 1,275 million shillings per year at cruising speed of the programme;

- as regards the replacement of goods at present imported (practically speaking, all foodstuffs except vegetables), the saving in payments to be made in foreign currency would be, that year, in the order of over 680 million shillings per year.

The overall cumulative value of these two effects on the balance of payments would be about 85.3 billion shillings at current prices to be compared with the overall cumulative cost in foreign currency of the order of 26 billions of shillings. However this comparison is not very meaningful, bearing in mind the different periods in which external credits and debits are recorded.

Any programme of implementation of the schemes should in fact be followed, and thus, whatever the real distribution in time of costs and benefits, it is possible to obtain an objective indication of the effects on the balance of payments by the sum-total of the updated values of costs and of benefits in foreign currency obtained for the individual schemes. In fact it may be seen that most of the costs - consisting of costs of running and implementation - will be allocated the same year in which the benefits will be acquired.

The results of this analysis are given hereafter.

Discounted value of costs and benefits in foreign currency (billions of So.Sh.).

Discount rate	Costs	Benefits	Balance
6%	9.4	21.0	+ 11.6
10%	6.3	11.2	+ 4.9
12%	5.5	8.6	+ 3.1
15%	4.6	6.0	+ 1.4

As it is seen a positive balance is obtained between the costs and benefits in foreign currency varying between 1.4 billion shillings and 11.6 billion shillings according to the different hypotheses of the discount rate. It should be noted that the balance continues to be positive even when adopting the decidedly high rate of 15%.

If into this calculation we introduce, on the side of benefits, only the goods exported - and according without bearing in mind substitutive effect of imports - we obtain the following results :

Discount rate	Costs	Benefits (exports only)	Balance
6%	9.4	13.7	+ 4.3
10%	6.3	7.3	+ 1.0
12%	5.5	5.6	+ 0.1
15%	4.6	3.9	- 0.7

Even in this hypothesis which drastically reduces the actual benefits of the balance of payments, the balance continues to show a credit for the first three rates and only becomes a debit at the rate of 15% and for a sum of less than one billion shillings.

Thus it may be concluded that the net discounted effect on the balance of payments will undoubtedly be highly positive. This statement is also borne out by a further remark: at cruising speed, the recurrent annual costs of the programme will be in the order of 500 million shillings in foreign currency, while the annual flow of benefits in foreign currency will be in the order of 1,300 million shillings for goods exported and 700 million shillings for imports replacement, i.e. for a total of about 2 billion shillings of annual benefits in foreign currency.

In résumé, the programme will contribute to substantially improve Somalia's position towards the rest of the world.

3.2 EFFECTS ON EMPLOYMENT

From the strictly agricultural and technical point of view, bearing in mind the technological levels assumed in the various development plans, the programme could require the employment of about 155,000 working units in the State Farms and about 15,000 units in the livestock activities of the schemes, for a total of 190,000 working units.

In fact, as already indicated, the working force which should be utilised in the different schemes - even if at given levels of underemployment in the initial phases of the programme - will amount altogether to some 275,000, thus with an excess of 85,000 units. This will lead to a lower degree of working productivity - if measured as a ratio between production and number of employees - but will not in any case imply a variation in the objectives of production fixed by the programme.

3.3 EFFECTS ON PUBLIC FINANCE

In a centrally planned economy, the effect of a development programme on the balance of the State are difficult to quantify for various reasons.

First of all, the function of fiscal drainage is already implicit in the system of political prices which is finalised on speeding up of the rate of accumulation. In addition, unlike the other developing countries, where the taxing of agriculture takes place preferably by means of taxation on the value of the land (land tax), in Somalia this could not be hypothesized, since the land belongs to the collectivity. It should also be stressed that the fiscal system, which in market-economy countries is used as an instrument for the redistribution of wealth, would not be required in Somalia for this purpose.

In the light of the previous considerations, it would seem difficult to assume that the level of taxation of agriculture could, hypothetically, be assimilated with those of the other developing countries (in which the level of taxation, measured in relation to the gross national product varies between 9% and 20% approximately (1).

Insofar as the activities of the Juba programme require considerable incentivation, in view of their strategic importance for the development of the Somali economy, it will according be more probable that the level of taxation (both in the form of income tax and of export tax) is fixed, in future too, at relatively low levels.

If we were to assume an average level of 10% of taxation compared to the gross product of Juba, the effects of the programme on public finance would be in the order of approximately 200 million shillings per year for the cruising year. The overall fiscal drainage, evaluated on the basis of the cumulative annual sum-totals compared to the development of the gross product, would in that case be, for the whole period covered by the programme, in the order of 8-9 billion shillings.

This is a purely indicative figure and should be taken as an order of magnitude of the estimate of a fiscal taxation.

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(1) Jørgen R. Lotz and Elliot R. Morss, "Tax Effort" in developing countries, in Finance and Development, No. 3, 1969. See also Richard M. Bird, Public Finance and inequality, in Finance and Development, No. 1, March 1974.

STATISTICAL APPENDIX

TO CHAPTER 2

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Table 6 - Investments F.F. + S.F. ('000 So.Sh.)

Table 7 - Management costs F.F. + S.F. ('000 So.Sh.)

Table 1 - Areas for crops at the assessment year (ha)

Crops \ Schemes	1°		2°		3°		4° (FF)	5° (SF)	6°		7° (SF)	8° (SF)	9° (SF)	10° (SF)	11° (SF)	As a whole	
	Total	SF	Total	SF	Total	SF			Total	SF						Total	SF
Maize	2250	1150	8900	8500	535	-	1955	2365	3220	3000	2300	3505	1000	2575	-	28605	24395
Sorghum	1200	1200	7000	6600	410	-	1370	-	2705	2475	1950	3300	-	-	-	17935	15525
Rice	-	-	950	950	18000	18000	1100	-	5180	5000	-	-	-	-	1840	27070	25790
Wheat	2100	1200	2220	1900	305	-	-	-	-	-	-	-	-	-	-	4625	3100
Oil seeds	5400	3400	10580	9400	1240	-	4450	3120	4510	3840	2675	4720	-	2925	-	39620	30080
Cotton	1100	1100	950	950	-	-	-	390	365	365	650	-	2400	1950	-	7805	7805
Minor textiles	1100	1100	1425	1425	-	-	-	-	545	545	-	1700	-	-	-	4770	4770
Tobacco	-	-	950	950	-	-	-	-	730	730	500	950	585	-	-	3715	3715
Vegetables	250	-	1270	950	150	-	500	300	455	365	250	475	645	-	775	5070	3760
Grain pulses	1100	850	1590	1430	2900	2750	615	650	4140	3960	1065	1900	-	1565	300	15825	14470
Annual crops	14500	10000	35835	33055	23540	20750	9990	6825	21850	20280	9390	16550	4630	9015	2915	155040	133410
Sugar cane	-	-	6375[a]	6375[a]	-	-	-	-	-	-	-	6375[a]	6375[a]	-	6375[a]	25500	25500
Banana	-	-	-	-	-	-	-	-	-	-	2000	4000	5000	-	400	11400	11400
Fruits	-	-	100	-	-	-	-	-	50	-	600	200	200	-	-	1150	1000
Pluriannual crops	-	-	6475[a]	6375[a]	-	-	-	-	50	-	2600	10575[a]	11575[a]	-	6375[a]	38050	37900
Total areas	14500	10000	42310[a]	39430[a]	23540	20750	9990	6825	21900	20280	11990	27125[a]	16205[a]	9015	9690[a]	193090	171310
Fallow	1900	1400	5040	4720	3060	2750	1110	975	4500	4320	1310	2350	320	1285	310	22160	19740
Total area	16400	11400	47350[a]	44150[a]	26600	23500	11100	7800	26400	24600	13300	29475[a]	16525[a]	10300	10000[a]	215250	191050

(a) of which 125 in nursery

Table 2 - Production at the assessment year (tons)

Crops \ Schemes	1°		2°		3°		4°	5°	6°		7°	8°	9°	10°	11°	As a whole	
	Total	SF	Total	SF	Total	SF	(FF)	(SF)	Total	SF	(SF)	(SF)	(SF)	(SF)	(SF)	Total	SF
Maize	22,960	11,960	94,260	90,100	5,970	-	21,450	24,595	34,785	32,400	25,300	47,550	20,880	30,900	-	328,650	283,685
Sorghum	12,060	9,200	41,840	39,600	2,325	-	8,250	-	16,245	14,850	13,650	21,120	-	-	-	115,490	98,420
Rice	-	-	7,600	7,600	176,250	176,250	7,700	-	68,400	67,500	-	-	-	-	11,040	270,990	262,390
Wheat	13,080	7,680	13,450	11,400	1,860	-	-	-	-	-	-	-	-	-	-	28,390	19,080
Oil seeds	14,200	8,950	27,485	24,630	2,975	-	12,015	9,485	11,065	9,725	7,760	12,750	-	9,945	-	107,680	83,245
Cotton	1,925	1,925	3,420	3,420	-	-	-	1,325	1,315	1,315	2,470	-	4,320	7,800	-	22,575	22,575
Minor textiles	2,145	2,145	5,700	5,700	-	-	-	-	2,180	2,180	-	5,020	-	-		15,045	15,045
Tobacco	-	-	2,850	2,850	-	-	-	-	2,190	2,190	1,600	2,850	1,990	-	-	11,480	11,480
Vegetables	21,000	-	70,300	51,300	13,020	-	40,000	17,400	18,000	13,140	19,100	39,600	48,375	-	24,000	310,795	212,915
Grain pulses	4,600	3,400	8,300	7,435	12,495	11,750	3,075	2,600	11,205	10,340	5,965	9,120	-	6,435	4,650	68,445	61,695
Annual crops	91,970	45,260	275,205	244,035	214,895	188,000	92,490	55,405	165,385	153,640	75,845	138,010	75,565	55,080	39,690	1,279,540	1,070,530
Sugar cane	-	-	500,000	500,000	-	-	-	-	-	-	-	500,000	500,000	-	500,000	2,000,000	2,000,000
Banana	-	-	-	-	-	-	-	-	-	-	64,000	128,000	160,000	-	-	352,000	352,000
Fruits	-	-	2,500	-	-	-	-	-	1,500	-	18,000	6,000	5,000	-	12,000	45,000	41,000
Pluriannual crops	-	-	502,500	500,000	-	-	-	-	1,500	-	82,000	634,000	665,000	-	512,000	2,397,000	2,393,000
General total	91,970	45,260	777,705	744,035	214,895	188,000	92,490	55,405	166,885	153,640	157,845	772,010	740,565	55,080	551,690	3,676,540	3,463,530

Table 2bis - Oil seeds area and production

Crops \ Schemes	1°		2°		3°	4°	5°	6°		7°	8°	10°	As a whole	
	Total	SF	Total	SF	(FF)	(FF)	(SF)	Total	SF	(SF)	(SF)	(SF)	Total	SF
A) Areas (ha)														
Groundnut	2,190	1,250	3,500	3,000	500	1,000	1,570	970	970	1,000	1,370	-	12,100	9,160
Sunflower	-	-	2,000	2,000	-	1,000	750	1,000	1,000	1,000	-	-	5,750	4,750
Ricinus	-	-	700	700	-	1,000	-	-	-	675	1,100	1,750	5,225	4,225
Sesame	2,190	1,250	3,180	2,500	740	1,000	-	1,670	1,000	-	1,500	-	10,280	6,250
Soya	1,020	900	1,200	1,200	-	450	800	870	870	-	750	1,175	6,265	5,695
Total	5,400	3,400	10,580	9,400	1,240	4,450	3,120	4,510	3,840	2,675	4,720	2,925	39,620	30,080
B) Production (tons)														
Groundnut	6,000	3,750	10,730	9,230	1,500	3,770	4,990	3,140	3,140	3,135	4,200	-	37,465	28,445
Sunflower	-	-	4,740	4,740	-	2,530	1,955	2,580	2,580	2,505	-	-	14,310	11,780
Ricinus	-	-	910	910	-	1,215	-	-	-	2,120	3,300	5,945	13,490	12,275
Sesame	4,000	2,500	6,355	5,000	1,475	2,700	-	3,500	2,160	-	3,000	-	21,030	12,660
Soya	4,200	2,700	4,750	4,750	-	1,800	2,540	1,845	1,845	-	2,250	4,000	21,385	18,085
Total	14,200	8,950	27,485	24,630	2,975	12,015	9,485	11,065	9,725	7,760	12,750	9,945	107,680	83,245

Table 3 - Value of single productions at assessment year ('000 So.Sh.)

Schemes / Crops	1°		2°		3°		4°	5°	6°		7°	8°	9°	10°	11°	As a whole	
	Total	SF	Total	SF	Total	SF	(FF)	(SF)	Total	SF	(SF)	(SF)	(SF)	(SF)	(SF)	Total	SF
Maize	13850	7550	64515	62435	3270	-	11770	13430	19095	17785	14370	25985	11445	16955	-	194,415	169,955
Sorghum	5030	5030	27865	26635	1235	-	4500	-	8905	8140	7340	11580	-	-	-	66,455	58,725
Rice	-	-	17730	17730	265955	265955	11520	-	112430	110835	-	-	-	-	17505	425,140	412,025
Wheat	21360	13350	23030	20520	2650	-	-	-	-	-	-	-	-	-	-	47,040	33,870
Oil seeds	21510	14330	44785	40965	4420	-	18990	12275	15075	12425	9960	17725	-	14220	-	158,960	121,900
Cotton	5510	5510	7940	7940	-	-	-	2425	2400	2400	4270	-	7885	14635	-	45,065	45,065
Minor textiles	5680	5680	19080	19080	-	-	-	-	5775	5775	-	13300	-	-	-	43,835	43,835
Tobacco	-	-	44800	44800	-	-	-	-	27255	27255	19910	35465	24765	-	-	152,195	152,195
Vegetables	8920	-	35195	27535	5535	-	28000	7395	7650	5585	8105	16830	20570	-	10200	148,400	96,220
Grain pulses	5140	4060	14780	8200	10200	9530	2690	2250	9720	8965	5235	7970	-	6445	4090	68,520	56,745
Total of annual crops	86730	55510	299720	275840	293265	275485	77470	37775	208305	199165	69190	128855	64665	52255	31795	1,350,025	1,190,535
Sugar cane	-	-	102750	102750	-	-	-	-	-	-	-	102750	102750	-	102750	411,000	411,000
Banana	-	-	-	-	-	-	-	-	-	-	59010	118015	147520	-	-	324,545	324,545
Fruits	-	-	1830	-	-	-	-	-	1280	-	15335	5120	4260	-	10200	38,025	34,915
Total of pluriannual crops	-	-	104580	102750	-	-	-	-	1280	-	74345	225885	254530	-	112950	773,570	770,460
General total	86730	55510	404300	378590	293265	275485	77470	37775	209585	199165	143535	354740	319195	52255	144745	2,123,595	1,960,995
Value of gross production S.F. (So.Sh.)	5290	4870	8540	8575	11025	11725	6980	4845	7940	8095	10790	12035	19315	5075	14475	9,865	10,265
Value of gross production F.F. (So.Sh.)	-	6245	-	8035	-	5735	6980	-	-	5785	-	-	-	-	-	-	6,720

Table 4 - Value of gross production in Family Farms and in State Farms

Years / Schemes	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 1 to 50
F.F.																							1,351.5
1°	1.0	3.7	7.1	11.3	16.2	18.5	20.3	23.3	24.2	25.5	26.5	27.4	28.3	29.0	29.7	30.4	30.8	31.1	31.2	→			1,168.0
2°	1.8	6.7	12.5	16.7	18.9	20.5	20.9	21.3	23.7	24.5	24.8	25.1	25.4	25.7	→								805.4
3°	1.5	5.6	9.7	11.3	12.1	12.8	13.7	14.6	15.5	16.2	16.8	17.2	17.6	17.8	→								3,321.2
4°	1.9	6.6	15.2	23.5	33.5	44.7	48.7	52.2	56.1	59.8	63.0	66.6	69.8	72.0	74.8	75.9	76.9	77.5	→				470.4
6°	1.4	4.2	5.9	6.1	6.5	7.0	7.8	8.4	8.9	9.4	9.8	10.2	10.4	→									
Total F.F.	7.6	26.8	50.4	68.9	87.2	103.5	111.4	119.8	128.4	135.4	140.9	146.5	151.5	154.9	158.4	160.2	161.6	162.5	162.6	→			7,116.5
S.F.																							2,348.5
1°	1.0	2.8	4.8	6.8	13.3	24.9	31.6	34.5	37.9	42.5	46.6	50.1	53.7	55.5	→								15,123.1
2°	1.0	7.2	34.6	62.7	91.8	123.3	153.3	164.3	178.7	193.8	210.3	229.5	270.9	304.9	329.9	339.3	348.6	358.0	367.0	375.0	378.2	378.6	11,544.6
3°	5.4	17.4	33.8	51.9	71.9	94.4	120.2	148.3	177.1	205.9	227.6	241.0	252.9	262.1	270.5	272.7	275.5	→					1,690.1
5°	0.9	5.5	13.8	18.4	23.2	24.6	28.9	31.0	33.9	35.7	37.8	→											8,101.8
6°	1.1	4.7	9.3	15.6	33.2	53.8	85.8	100.6	117.7	127.4	138.1	155.7	168.8	170.7	177.8	184.5	189.9	194.4	197.2	198.7	199.2	→	6,199.5
7°	1.0	9.8	21.0	37.9	57.0	74.7	85.2	99.5	114.2	130.2	133.8	135.7	136.5	140.5	143.5	→							15,399.3
8°	1.1	15.7	56.1	103.0	139.9	179.6	226.9	261.8	301.5	324.2	334.9	341.7	347.3	352.0	353.8	354.7	→						14,003.1
9°	6.4	29.3	84.8	124.8	164.2	193.2	229.9	249.5	268.3	285.3	289.5	295.2	302.6	310.0	317.3	319.2	→						2,316.1
10°	3.3	8.8	14.1	21.7	29.1	33.9	37.1	40.6	44.3	47.3	49.7	51.3	52.1	52.3	→								6,485.9
11°	1.2	5.4	35.8	59.5	83.9	107.4	131.4	135.4	138.8	143.5	144.7	→											
Total S.F.	22.4	106.6	308.1	502.3	707.5	909.8	1130.3	1265.8	1412.4	1535.8	1613.0	1682.7	1767.3	1830.5	1883.1	1904.2	1921.7	1935.6	1947.4	1956.9	1960.6	1961.0	83,212.0

Table 4 (continued)- Value of the total gross production (FF + SF) (million So.Sh.)

Years / Schemes	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 1 to 50
1°	2.0	6.5	11.9	18.1	29.5	43.4	51.9	57.8	62.1	68.0	73.1	77.5	82.0	84.5	85.2	85.9	86.3	86.6	86.7	→			3,700.0
2°	2.8	13.9	47.1	79.4	110.7	143.8	174.2	185.6	202.4	218.3	235.1	254.6	296.3	330.6	355.6	365.0	374.3	383.7	392.7	400.7	403.9	404.3	16,291.1
3°	6.9	23.0	43.5	63.2	84.0	107.2	133.9	162.9	192.6	222.1	244.4	258.2	270.5	279.9	288.3	290.5	293.3	→					12,350.0
4°	1.9	6.6	15.2	23.5	33.5	44.7	48.7	52.2	56.1	59.8	63.0	66.6	69.3	72.0	74.8	75.9	76.9	77.5	→				3,321.2
5°	0.9	5.5	13.8	18.4	23.2	24.6	28.9	31.0	33.9	35.7	37.8	→											1,690.1
6°	2.5	8.9	15.2	21.7	39.7	60.8	93.6	109.0	126.6	136.8	147.9	165.9	179.2	181.1	188.2	194.9	200.3	204.8	207.6	209.1	209.6	→	8,572.2
7°	1.0	9.8	21.0	37.9	57.0	74.7	85.2	99.5	114.2	130.2	133.8	135.7	136.5	140.5	143.5	→							6,199.5
8°	1.1	15.7	56.1	103.0	139.9	179.6	226.9	261.8	301.5	324.2	334.9	341.7	347.3	352.0	353.8	354.7	→						15,399.3
9°	6.4	29.3	84.8	124.8	164.2	193.2	229.9	249.5	268.3	285.3	289.5	295.2	302.6	310.0	317.3	319.2	→						14,003.1
10°	3.3	8.8	14.1	21.7	29.1	33.9	37.1	40.6	44.3	47.3	49.7	51.3	52.1	52.3	→								2,316.1
11°	1.2	5.4	35.8	59.5	83.9	107.4	131.4	135.7	138.8	143.5	144.7	→											6,485.9
Total (FF + SF)	30.0	133.4	358.5	571.2	794.7	1013.3	1241.7	1385.6	1540.8	1671.2	1753.9	1829.2	1918.8	1985.4	2041.5	2064.4	2083.3	2098.1	2110.0	2119.5	2123.2	2123.6	90,238.5

Table 5 - Investments and management costs F.F. + S.F. (million So.Sh.)

Schemes \ Years	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 1 to 50
F.F.																									
1°	-	31.3	16.4	21.1	25.7	31.1	21.8	18.1	17.6	17.3	17.3	16.8	17.7	17.6	→										921.0
2°	-	18.9	22.1	17.9	14.8	9.6	8.4	11.1	11.9	13.8	14.1	13.6	15.1	→											745.1
3°	-	27.5	23.4	28.0	12.9	9.4	9.4	11.0	11.1	11.3	9.3	9.3	10.6	10.5	→										572.2
4°	30.2	50.2	42.1	44.9	51.1	57.6	59.8	44.6	44.1	39.3	39.9	39.4	41.3	→		41.2	41.2	41.1	41.0	→					2143.6
6°	-	12.5	13.9	7.6	5.8	→		7.7	7.1	5.8	→		6.7	→											344.9
Total	30.2	140.4	117.9	119.5	110.3	113.5	105.2	92.5	91.8	87.5	86.4	84.9	91.4	91.2	91.2	91.1	91.1	91.0	90.9	→					4726.8
S.F.																									
1°	25.4	40.6	44.3	42.9	49.5	50.0	33.0	31.3	30.5	33.9	35.3	28.6	35.0	35.4	35.3	35.2	→								1818.2
2°	13.6	36.4	124.2	112.7	126.5	131.5	139.6	156.4	149.4	161.9	165.5	178.4	197.4	200.7	205.7	205.6	188.8	195.7	191.3	189.5	189.5	188.9	195.8	195.5	9119.0
3°	32.6	83.9	105.8	103.9	88.1	98.8	124.1	117.6	124.9	131.1	145.5	123.0	125.4	124.8	126.0	126.5	126.7	130.2	130.1	130.0	→				6309.0
5°	-	45.1	44.5	38.1	51.4	19.1	29.8	29.2	26.3	24.9	22.5	25.5	25.8	→											1359.7
6°	15.6	39.1	66.5	70.1	66.3	89.0	97.6	122.6	107.3	124.2	82.5	89.6	99.3	101.4	105.2	105.8	105.3	109.2	106.0	109.5	109.6	109.7	109.8		5215.6
7°	25.3	49.0	51.3	60.7	64.9	71.4	80.8	72.3	69.3	74.2	78.5	82.3	85.1	82.0	83.9	83.7	82.5	84.7	→						4077.0
8°	27.3	68.0	129.5	136.5	157.5	150.3	168.7	176.9	196.8	204.5	198.1	210.5	214.7	217.7	214.2	209.2	211.0	216.8	216.8	216.6	→				10256.2
9°	35.3	95.5	101.3	96.5	92.0	101.9	110.8	136.2	145.4	147.0	150.7	151.8	171.1	163.6	178.2	168.9	174.8	180.0	→						8341.0
10°	-	41.7	63.1	62.1	62.9	68.2	34.1	39.0	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→									1799.8
11°	22.7	30.4	63.8	58.3	69.4	67.5	77.1	75.5	81.2	81.1	81.2	79.3	80.9	81.7	→										3973.0
Total	197.8	529.7	794.3	781.8	828.5	847.7	875.6	957.0	962.5	1014.3	991.5	997.6	1071.7	1066.6	1089.3	1075.7	1065.1	1092.6	1084.9	1086.3	1086.4	1085.9	1092.9	1092.6	52268.5

Table 5 (Cont.d) - Total investments and management costs (F.F. + S.F.)

Schemes \ Years	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 1 to 50
1°	25.4	71.9	60.7	64.0	75.2	81.1	54.8	49.4	48.1	51.2	52.6	45.4	52.7	53.0	52.9	52.8	→								2739.2
2°	13.6	55.3	146.3	130.6	141.3	141.1	148.0	167.5	161.3	175.7	179.6	192.0	212.5	215.8	220.8	220.7	203.9	210.8	206.4	204.6	204.6	204.0	210.9	210.6	9864.1
3°	32.6	111.4	129.2	131.9	101.0	108.2	113.5	128.6	136.0	142.4	154.8	132.3	136.0	135.3	136.5	137.0	137.2	140.7	140.6	140.5	→				6881.2
4°	30.2	50.2	42.1	44.9	51.1	57.6	59.8	44.6	44.1	39.3	39.9	39.4	41.3	→		41.2	41.2	41.1	41.0	→					2143.6
5°		45.1	44.5	38.4	51.4	19.1	29.8	29.2	26.3	22.9	22.5	25.5	25.8	→											1359.7
6°	15.6	51.6	80.4	77.7	72.1	94.8	103.4	130.3	114.4	130.0	88.3	95.4	106.0	108.1	111.9	112.5	112.0	115.9	112.7	116.2	116.3	116.4	116.5	→	5560.5
7°	25.3	49.0	51.3	60.7	64.9	71.4	80.8	72.3	69.3	74.2	78.5	82.3	85.1	82.0	83.9	83.7	82.5	84.7	→						4077.0
8°	27.3	68.0	129.5	136.5	157.5	150.3	168.7	176.9	196.8	204.5	198.1	210.5	214.7	217.7	214.2	209.2	211.0	216.8	216.8	216.6	→				10,256.2
9°	35.3	95.5	101.3	96.5	92.0	101.9	110.8	136.2	145.4	147.0	150.7	151.8	171.1	163.6	178.2	168.9	174.8	180.0	→						8341.0
10°		41.7	63.1	62.1	62.9	68.2	34.1	39.0	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→									1799.8
11°	22.7	30.4	63.8	58.3	69.4	67.5	77.1	75.5	81.2	81.1	81.2	79.3	80.9	81.7	→										3973.0
Total	228.0	670.1	912.2	901.3	938.8	961.2	980.9	1049.5	1054.3	1101.8	1077.9	1082.5	1163.1	1157.8	1181.8	1166.8	1156.2	1183.6	1175.8	1177.2	1177.3	1176.8	1183.8	1183.5	56,995.3

Table 6 - Investments F.F. + S.F. ('000 So.Sh.)

Years / Schemes	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	Total investments
F.F.																			
1°		31.3	13.3	14.9	16.9	18.7	6.0	-											101.1
2°		18.9	20.2	14.1	9.2	2.4	-												64.8
3°		27.5	21.7	22.9	4.1	-													76.2
4°		30.2	49.6	37.2	33.1	32.1	33.4	29.7	3.9	3.8	-								253.2
6°		-	12.5	12.3	3.0	-													27.8
Total		30.2	139.8	104.7	88.0	62.3	54.5	35.7	3.9	3.8									522.9
S.F.																			
1°	25.4	40.1	40.8	35.3	37.3	33.2	12.7	2.8	-										227.6
2°	13.6	36.1	117.6	95.3	88.0	74.5	65.7	49.8	31.5	35.5	30.0	33.9	———			26.7	4.2	-	804.1
3°	32.6	83.3	98.7	87.3	59.7	59.5	53.9	46.3	46.4	40.6	40.6	10.4	-						659.3
5°	-	45.1	41.0	29.0	35.6	-	8.8	-											159.5
6°	15.6	38.8	63.3	62.4	52.7	68.5	66.5	76.4	46.2	54.5	5.4	3.3	3.3	1.8	-				558.7
7°	25.3	48.5	45.4	42.5	34.1	28.5	26.7	8.8	0.9	0.6	0.9	0.5	-						262.7
8°	27.3	67.5	122.0	109.4	106.6	74.5	67.0	47.4	40.3	33.2	10.0	8.2	-						713.4
9°	35.3	94.8	93.5	71.4	42.6	31.8	20.7	29.5	22.8	11.9	9.9	-	11.9	-	8.8	-			484.9
10°		41.7	57.8	49.7	45.4	44.8	7.2	3.3	-										249.9
11°	22.7	29.5	57.1	39.2	36.7	22.7	20.7	3.9	2.2	-									234.7
Total	197.8	525.4	737.2	621.5	538.5	438.0	349.9	268.2	190.3	176.3	96.8	56.3	49.1	35.7	42.7	26.7	4.2	-	4,354.8

Table 6 (Cont.d) - Total investments F.F. + S.F.

Years / Schemes	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	Total investments
1°	25.4	71.4	54.1	50.2	54.2	51.9	18.7	2.8	-										328.7
2°	13.6	55.0	137.8	109.4	97.2	76.9	65.7	49.8	31.5	35.5	30.0	33.9				22.0	4.2	-	868.9
3°	32.6	110.8	120.4	110.2	63.8	59.5	53.9	46.3	46.4	40.6	40.6	10.4	-						735.5
4°	30.2	49.6	37.2	33.1	32.1	33.4	29.7	3.9	3.8	-									253.2
5°		45.1	41.0	29.0	35.6	-	8.8	-											159.5
6°	15.6	51.3	75.6	65.4	52.7	68.5	66.5	76.4	46.2	54.5	5.4	3.3	3.3	1.8	-				586.5
7°	25.3	48.5	45.4	42.5	34.1	28.5	26.7	8.8	0.9	0.6	0.9	0.5	-						262.7
8°	27.3	67.5	122.0	109.4	106.6	74.5	67.0	47.4	40.3	33.2	10.0	8.2	-						713.4
9°	35.3	94.8	93.5	71.4	42.6	31.8	20.7	29.5	22.8	11.9	9.9	-	11.9	-	8.8	-			484.9
10°		41.7	57.8	49.7	45.4	44.8	7.2	3.3											249.9
11°	22.7	29.5	57.1	39.2	36.7	22.7	20.7	3.9	2.2	-									234.7
Total	228.0	665.2	841.9	709.5	601.0	492.5	385.6	272.1	194.1	176.3	96.8	56.3	49.1	35.7	42.7	26.7	4.2		4,877.7

Table 7 - Management costs F.F. + S.F. (million So.Sh.)

Schemes \ Years	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 0 to 50
F.F.																								
1°	-	3.1	6.2	8.8	12.4	15.8	18.1	17.6	17.3	17.3	16.8	17.7	17.6	→										819.9
2°	-	1.9	3.8	5.6	7.2	8.4	11.1	11.9	13.8	14.1	13.6	15.1	→											680.3
3°	-	1.7	5.1	8.8	9.4	9.4	11.0	11.1	11.3	9.3	9.3	10.6	10.5	→										496.0
4°	0.6	4.9	11.8	19.0	24.2	30.1	40.7	40.3	39.3	39.9	39.4	41.3	→	41.2	41.2	41.1	41.0	→						1890.6
6°	-	1.6	4.6	5.8	→		7.7	7.1	5.8	→		6.7	→											317.1
Total F.F.	0.6	13.2	31.5	48.0	59.0	69.5	88.6	88.0	87.5	86.4	84.9	91.4	91.2	91.2	91.1	91.1	91.0	90.9	→					4203.9
S.F.																								
1°	0.5	3.5	7.6	12.2	16.8	20.3	28.5	30.5	33.9	35.3	28.6	35.0	35.4	35.3	35.2	→								1590.6
2°	0.3	6.6	17.4	38.5	57.0	73.9	106.6	117.9	126.4	135.5	144.5	163.5	166.8	171.8	178.9	184.6	195.7	191.3	189.5	189.5	188.9	195.8	195.5	8314.9
3°	0.6	7.1	16.6	28.4	39.3	50.2	71.3	78.5	90.5	104.9	112.6	125.4	124.8	126.0	126.5	126.7	130.2	130.1	130.0	→				5649.7
5°	-	3.5	9.1	15.8	19.1	21.0	29.2	26.3	24.9	22.6	22.5	25.8	→											1200.2
6°	0.3	3.2	7.7	13.6	20.5	31.1	46.2	61.1	69.7	77.1	86.3	96.0	99.6	105.2	105.8	105.3	109.2	106.0	109.5	109.6	109.7	109.8	→	4656.9
7°	0.5	5.9	18.2	30.8	42.9	54.1	63.5	68.4	73.6	77.6	81.8	85.1	82.0	83.9	83.7	82.5	84.7	→						3814.3
8°	0.5	7.5	27.1	50.9	75.8	101.7	129.5	156.5	171.3	188.1	202.3	214.7	217.7	214.2	209.2	211.0	216.8	216.8	216.6	→				9542.8
9°	0.7	7.8	25.1	49.4	70.1	90.1	106.7	122.6	135.1	140.8	151.8	159.2	163.6	169.4	168.9	174.8	180.0	→						7856.1
10°	-	5.3	12.4	17.5	23.4	26.9	35.7	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→									1549.9
11°	0.9	6.7	19.1	32.7	44.8	56.4	71.6	79.0	81.1	81.2	79.3	80.9	81.7	→										3738.3
Total S.F.	4.3	57.1	160.3	289.8	409.7	525.7	688.8	772.2	838.0	894.7	941.3	1022.6	1030.9	1046.6	1049.0	1060.9	1092.6	1084.9	1086.3	1086.4	1085.9	1092.9	1092.6	47,913.7

Table 7 (Cont.d)- Total management costs (F.F. + S.F.) (million So.Sh.)

Schemes \ Years	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°→50°	Years from 0 to 50
1°	0.5	6.6	13.8	21.0	29.2	36.1	46.6	48.1	51.2	52.6	45.4	52.7	53.0	52.9	52.8	→								2,410.5
2°	0.3	8.5	21.2	44.1	64.2	82.3	117.7	129.8	140.2	149.6	158.1	178.6	181.9	186.9	194.0	199.7	210.8	206.4	204.6	204.6	204.0	210.9	210.6	8,995.2
3°	0.6	8.8	21.7	37.2	48.7	59.6	82.3	89.6	101.8	114.2	121.9	136.0	135.3	136.5	137.0	137.2	140.7	140.6	140.5	→				6,145.7
4°	0.6	4.9	11.8	19.0	24.2	30.1	40.7	40.3	39.3	39.9	39.4	41.3	→	41.2	41.2	41.1	41.0	→						1,890.6
5°	-	3.5	9.1	15.8	19.1	21.0	29.2	26.3	24.9	22.6	22.5	25.8	→											1,200.2
6°	0.3	4.8	12.3	19.4	26.3	36.9	53.9	68.2	75.5	82.9	92.1	102.7	106.3	111.9	112.5	112.0	115.9	112.7	116.2	116.3	116.4	116.5	→	4,974.0
7°	0.5	5.9	18.2	30.8	42.9	54.1	63.5	68.4	73.6	77.6	81.8	85.1	82.0	83.9	83.7	82.5	84.7	→						3,814.3
8°	0.5	7.5	27.1	50.9	75.8	101.7	129.5	156.5	171.3	188.1	202.3	214.7	217.7	214.2	209.2	211.0	216.7	216.8	216.8	216.6	→			9,542.8
9°	0.7	7.8	25.1	49.4	70.1	90.1	106.7	122.6	135.1	140.8	151.8	159.2	163.6	169.4	168.9	174.8	180.0	→						7,856.1
10°	-	5.3	12.4	17.5	23.4	26.9	35.7	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→									1,549.9
11°	0.9	6.7	19.1	32.7	44.8	56.4	71.6	79.0	81.1	81.2	79.3	80.9	81.7	→										3,738.3
Total	4.9	70.3	191.8	337.8	468.7	595.3	777.4	860.2	925.5	981.1	1,026.2	1,114.0	1,122.1	1,139.1	1,140.1	1,152.0	1,183.6	1,175.8	1,177.2	1,177.3	1,176.8	1,183.8	1,183.5	52,117.6

ANALYTICAL TABLES (1)

(1) The first number of the title indicates the Scheme; S.F. the State Farms; F.F. the Family Farms.

Table 1 F.F./1 - Area under cultivation (ha)

Crops \ Years	1°	5° (Total)	Gu	Der	6°	9°
Maize	120	1,100	11	11	1,100	1,100
Sorghum	120	900	9	9	650	-
Wheat		-	(9)	(9)	250	900
Oil seeds	240	2,000	40	40	2,000	2,000
Vegetables	30	250	5	5	250	250
Grain pulses	30	250	5	5	250	250
Fallow	60	500	10	10	500	500
Total	600	5,000	100	100	5,000	5,000

Table 2 F.F. / 1 - 2 - Area (ha)

Crops \ Years	Under cultivation				Actually under production	
	1°	4° (Total)	Gu	Der	1°	5° → 50°
Maize	85	400	15	10	85	800
Sorghum	80	400	10	15	80	800
Wheat	65	320	10	10	65	640
Oil seeds	255	1,180	37	37	255	2,360
- groundnut	(-)	(500)	-	-	(-)	(1,000)
- sesame	(255)	(680)	-	-	(255)	(1,360)
Vegetables	65	320	10	10	65	640
Grain pulses	35	160	5	5	35	320
Fruits	-	100	3	3	-	100
Fallow	65	320	10	10	65	640
Total	650	3,200	100	100	650	6,300

Table 3 F.F. / 1 - 2 - Area (ha)

Crops \ Years	Under cultivation				Actually under production	
	1°	3° (Total)	Gu	Der	1°	4° → 50°
Maize	90	535	20.-	15.-	90	1,085
Sorghum	90	410	10.-	15.-	90	775
Wheat	60	305	10.-	10.-	60	620
Oil seeds	240	1,240	40.-	40.-	240	2,480
- groundnut	(-)	(500)	-	-	(-)	(1,000)
- sesame	(240)	(740)	-	-	(240)	(1,480)
Vegetables	30	150	5.-	5.-	30	310
Grain pulses	30	150	5.-	5.-	30	310
Fallow	60	310	10.-	10.-	60	620
Total	600	3,100	100.0	100.0	600	6,200

Table 4 F.F/1 - Area under cultivation (ha)

Crops \ Years	1°	5°	6° (Total)	Gu	Der
Maize	180	1,550	1,955	20.0	15.0
Sorghum	180	1,150	1,370	10.0	15.0
Rice	120	900	1,100	10.0	10.0
Oil seeds	480	3,600	4,450	40.0	40.0
Vegetables	50	400	500	4.5	4.5
Grain pulses	70	500	615	5.5	5.5
Fallow	120	990	1,110	10.0	10.0
Total	1,200	9,000	11,100	100.0	100.0

Table 6 F.F. / 1 - 2 - Area (ha)

Crops \ Years	Under cultivation				Actually under production	
	1°	2° (Total)	Gu	Der	1°	3° → 50°
Maize	110	220	15	10	90	450
Sorghum	115	230	10	15	130	450
Non irrigated paddy	90	180	10	10	90	360
Oil seeds (sesame)	340	670	38	38	340	1,340
Vegetables	50	90	10	10	50	180
Grain pulses	90	180	5	5	90	360
Fruits	20	50	2	2	20	50
Fallow	90	180	10	10	90	360
Total	900	1,800	100	100	900	3,550

Table 1 S.F. / 1 - Area under cultivation (ha)

Crops \ Years	1°	5°	6° (Total)	Gu	Der
Maize	-	1,150	1,150	20	-
Sorghum	-	650	1,200	20	20
Wheat	-	1,200	1,200	10	10
Oil seeds	900	3,400	3,400	30	30
Cotton	-	300	1,100	-	10
Minor textiles	-	350	1,100	-	10
Grain pulses	-	850	850	5	10
Fallow	100	1,100	1,400	15	10
Total	1,000	9,000	11,400	100	100

Table 2 S.F/1 - Area under cultivation (ha)

Crops \ Years	1°	3°	5°	9°	10°	11°	13°	14°	15° (Total)	Gu	Der
Sugar cane	125(a)	2625 (b)	5125(b)	6375(b)	→	→	→	→	6375 (b)	-	-
Maize	200	2050	3475	6470	7220	7970	8500	→	8500	27.5	17.5
Sorghum	175	1575	2525	4525	5025	5775	6600	→	6600	15.-	20.-
Wheat					-	300	1050	1400	1900	5,-	5.-
Rice							-	400	950	-	5.-
Oil seeds	500	2500	4500	6500	7000	7500	8920	9400	9400	25.-	25.-
Cotton			-	365	730	950	→	→	950	-	5.-
Minor textiles						-	570	1070	1425	2.5	5.-
Tobacco			-	75	150	255	950	→	950	2.5	2.5
Vegetables						-	200	600	950	2.5	2.5
Grain pulses						-	210	655	1430	5.-	2,5
Fallow	125	875	1500	2565	2875	3250	4000	4375	4720	15.-	10.-
Areas for annual crops	1000	7000	12000	20500	23000	26000	32000	35000	37775	100.-	100.-
Areas for annual and plurian. crops	1125(b)	9625(b)	17125(b)	26875(b)	29375(b)	32375(b)	38675(b)	41375(b)	44150(b)	-	-

(a) Nursery - (b) of which 125 in nursery

Table 3 S.F. / 1 - Area under cultivation (ha)

Crops \ Years	1°	5°	10° (Total)	Gu	Der
Rice	1,500	8,625	18,000	50	100
Grain pulses	-	1,190	2,750	25	-
Fallow	-	1,185	2,750	25	-
Total	1,500	11,000	23,500	100	100

Table 5 S.F./1 - Area under cultivation (ha)

Crops \ Years	1°	2°	3°	5° (Total)	Gu	Der
Maize	450	950	1500	2365	33.-	27.5
Oil seeds	425	1050	2000	3120	40.-	40.-
Cotton	-	-	190	390	-	10.-
Vegetables	-	150	300	300	4.-	4.-
Grain pulses	-	300	650	650	8.-	8.5
Fallow	125	350	660	975	15.-	10.-
Total	1000	2800	5300	7800	100.-	100.-

Table 6 S.F./1 - Area under cultivation (ha)

Crops \ Years	1°	2°	4°	5°	6°	10° (Total)	Gu	Der
Maize	475	975	2005	2530	3000	3000	25.-	17.5
Sorghum	400	800	1600	2035	2475	2475	15.-	20.-
Oil seeds	-	420	2090	2720	3170	3840	25.-	25.-
Cotton			-	65	130	365	-	5.-
Minor textiles			-	95	195	545	2.5	5.-
Tobacco			-	185	410	730	5.-	5.-
Vegetables				-	65	365	2.5	2.5
Grain pulses			-	250	710	1460	10.-	10.-
Fallow	125	305	805	1115	1440	1820	15.-	10.-
Total	1000	2500	6500	9000	11600	14600	100.-	100.-
Rice farm								
Rice		-	250	1000	1750	5000	- (a)	100.-
Grain pulses		-	60	250	440	1250	25.-(a)	-
Fallow		-	190	750	1310	3750	75.-(a)	-
Total		-	500	2000	3500	10000	100.-	100.-
Area of scheme	1000	2500	7000	11000	16100	24600	-	-

(a) From the 13th year the area distribution varies as follows: rice 50%, pulses 25%, fallow 25%.

Table 7 S.F./1 - Area under cultivation (ha)

Crops \ Years	1°	2°	3°	4°	5°	10° (Total)	Gu	Der
Banana	200	400	500	8400	1000	2000	-	-
Fruits	150	300	450	600	→		-	-
Maize	400	950	1450	1650	2000	2300	27.5	17.5
Sorghum	500	850	1250	1650	1950	1950	15.-	20.-
Oil seeds	-	415	1115	1865	2315	2675	25.-	25.-
Cotton			-	300	350	650	-	10.-
Tobacco		-	150	300	500	500	5.-	5.-
Vegetables				-	100	250	2.5	2.5
Grain pulses			-	385	685	1065	10.-	10.-
Fallow	100	285	535	850	1100	1310	15.-	10.-
Areas for annual crops	1000	2500	4500	7600	9000	10700	100.-	100.-
Areas for annual and pluriannual crops	1350	3200	5550	8400	10600	13300	-	-

Table 8 S.F. / 1 - Area under cultivation (ha)

Crops \ Years	1°	2°	3°	5°	6°	8°	10° (Total)	Gu	Der
Banana	400	800	1200	2000	2400	3200	4000	-	-
Fruits	40	80	120	200	→			-	-
Sugar cane	125(a)	1375(b)	2625(b)	5125(b)	6375(b)	→		-	-
Maize	475	1290	2090	3480	→		3505	23.-	18.5
Sorghum	400	900	1400	3300	→			15.-	20.-
Oil seeds		-	450	1530	2530	4170	4720	25.-	25.-
Minor textiles				-	400	1415	1700	4.5	9.-
Tobacco				-	200	650	950	5.-	5.-
Vegetables					-	100	475	2.5	2.5
Grain pulses				-	585	1750	1900	10.-	10.-
Fallow	125	310	560	1190	1505	2135	2350	15.-	10.-
Areas for annual crops	1000	2500	4500	9500	12000	17000	18900	100.-	100.-
Areas for annual and pluriannual crops	1565(b)	4755(b)	8443(b)	16825(b)	20975(b)	26775(b)	29475(b)	-	-

(a) Nursery - (b) of which 125 in nursery

Table 9 S.F./1 - Area under cultivation (ha)

Crops \ Years	1°	2°	3°	5°	10°	15° (Total)	Gu	Der
Banana	400	800	1200	2000	4000	5000	-	-
Fruits	50	100	150	200	→		-	-
Sugar cane	125(a)	1375(b)	2625(b)	5125(b)	6375(b)	→	-	-
Maize	400	700	1000	→			40,-	40,-
Tobacco	-	140	585	→			20.-	25.-
Vegetables	345	645	→				25.-	25.-
Fallow	95	215	320	→			15.-	10,-
Total	850	1700	2550	→			100,-	100,-
Cotton	800	1600	2400	→			-	100,-
Maize	-	(800)	(1600)	→			66.7	-
Fallow	-	(800)	→				33.3	-
Total	800	1600	2400	→			100.-	100.-
Areas for annual crops	1650	3300	4950	→			-	-
Areas for annual and pluriannual crops	2225(b)	5575(b)	8925(b)	12275(b)	15525(b)	16525(b)	-	-

(a) Nursery - (b) of which 125 in nursery

Table 10 S.F. / 1 - Area under cultivation (ha)

Crops \ Years	1°	5° (Total)	Gu	Der
Cotton	390	1,950	-	75
Maize	260	1,300	50	-
Grain pulses	260	1,300	25	25
Fallow	130	650	25	-
Total	1,040	5,200	100	100
Oil seeds	600	2,925	40	75
Maize	265	1,275	25	25
Grain pulses	55	265	10	-
Fallow	130	635	25	-
Total	1,050	5,100	100	100
Total of scheme	2,090	10,300	-	-

Table 11 S.F./1 - Area under cultivation (ha)

Crops \ Years	1°	2°	5° (Total)	Gu	Der
Sugar cane	125(a)	1,375(b)	6,375(b)	-	-
Fruits	100	200	400	-	-
Rice	300	710	1,840	39.5	79.5
Vegetables	100	275	775	20.5	20.5
Grain pulses	50	120	300	20.-	-
Fallow	50	120	310	20.-	-
Areas for annual crops	500	1,225	3,225	100.-	100.-
Areas for annual and pluriannual crops	625(b)	2,800(b)	10,000(b)	-	-

(a) Nursery - (b) of which 125 in nursery

Table 1 F.F. / 2 - Area actually under production (ha)

Crops \ Years	1°	5°	6°	9° ⟶ 50°
Maize	120	2,100	2,200	2,200
Sorghum	120	1,660	1,300	-
Wheat		-	500	1,800
Oil seeds	240	3,760	4,000	4,000
- groundnut	(120)	(1,880)	(1,880)	(1,500)
- sesamé	(120)	(1,880)	(1,880)	(1,500)
- soya		-	(240)	(1,000)
Vegetables	30	470	500	500
Grain pulses	30	470	500	500
Fallow	60	940	1,000	1,000
Total	600	9,400	10,000	10,000

Table 4 F.F./2 - Area actually under pròduction (ha)

Crops \ Years	1°	5°	7° → 50°
Maize	180	2,910	3,900
Sorghum	180	2,130	2,750
Rice	120	1,680	2,200
Oil seeds	480	6,720	8,900
- groundnut	-	(2,000)	(2,000)
- sunflower	-	(1,800)	(2,000)
- ricinus	-	(620)	(2,000)
- sesame	(480)	(2,000)	(2,000)
- soya	-	(300)	(900)
Vegetables	50	750	1,000
Grain pulses	70	930	1,230
Fallow	120	1,680	2,220
Total	1,200	16,800	22,200

Table 1 S.F. / 2 - Area actually under production (ha)

Crops \ Years	1°	5°	6° → 50°
Maize	-	2,300	2,300
Sorghum	-	1,950	4,600
Wheat	-	2,400	2,400
Oil seeds	900	6,800	6,800
- groundnut	(500)	(2,500)	→
- sesame	(400)	(2,500)	→
- soya	-	(1,800)	→
Cotton	-	300	1,100
Minor textiles	-	350	1,100
Grain pulses	-	1,700	1,700
Fallow	100	2,200	2,800
Total	1,000	18,000	22,800

Table 2 S.F./2 - Area actually under production (ha)

Crops \ Years	1°	3°	5°	9°	10°	11°	13°	14°	15° → 50°
Sugar cane	-	1250	3750	5000	→				
Maize	225	3925	6775	12265	14265	15765	17000	→	
Sorghum	175	2975	4875	8875	9875	11375	13200	→	
Wheat					-	600	2200	3000	3800
Rice							-	800	1900
Oil seeds	500	4500	8500	13000	14000	15000	17840	18800	→
. groundnut	(500)	(2500)	(4500)	(6000)	→				
. sunflower			-	(2000)	(3000)	(4000)	→		
. ricinus						-	(1040)	(1400)	→
. sesame	-	(2000)	(4000)	(5000)	→				
. soya						-	(1800)	(2400)	→
Cotton			-	730	1460	1900	→		
Minor textiles						-	1140	2140	2850
Tobacco			-	150	300	510	1900	→	
Vegetables						-	400	900	1900
Grain pulses						-	120	1310	2860
Fallow	100	1600	2850	4980	5600	6350	7850	8600	9440
Areas for annual crops	1000	13000	23000	40000	45500	51500	63550	69550	75550
Areas for annual and pluriannual crops	1000	14250	26750	45000	50500	56500	68550	74550	80550

Table 3 S.F. / 2 - Area actually under production (ha)

Crops \ Years	1°	5°	10°	11° → 50°
Rice	1,500	15,750	34,500	35,250
Grain pulses	-	2,375	5,500	5,875
Fallow	-	2,375	5,500	5,875
Total	1,500	20,500	45,500	47,000

Table 5 S.F./2 - Area actually under production (ha)

Crops \ Years	1°	2°	3°	5°→50°
Maize	450	1450	2550	4730
Oil seeds	450	1700	3600	6240
- groundnut	(450)	(900)	(1800)	(3140)
- sunflower	-	(500)	(1000)	(1500)
- soya	-	(300)	(800)	(1600)
Cotton		-	380	780
Vegetables	-	300	600	⟶
Grain pulses	-	600	1300	⟶
Fallow	100	550	1170	1950
Total	1000	4600	9600	15600

Table 6 S.F./2 - Area actually under production (ha)

Crops \ Years	1°	2°	4°	5°	6°	10°	13°→50°
Maize	500	1500	3560	4620	5560	6010	⟶
Sorghum	400	1200	2800	3670	4550	4950	⟶
Oil seeds	-	840	4180	5440	6340	7680	⟶
- groundnut		-	(1540)	(1940)	⟶		
- sunflower		-	(640)	(1500)	(2000)	⟶	
- sesame	-	(840)	(2000)	⟶			
- soya				-	(400)	(1740)	⟶
Cotton			-	130	260	730	⟶
Minor textiles			-	190	390	1090	⟶
Tobacco			-	370	820	1460	⟶
Vegetables				-	130	730	⟶
Grain pulses			-	500	1420	2920	⟶
Fallow	100	460	1460	2080	2730	3630	⟶
Total	1000	4000	12000	17000	22200	29200	⟶
Rice farm							
Rice		-	500	2000	3500	10000	15000
Grain pulses			-	375	750	2500	2500
Fallow			-	1125	2250	7500	2500
Total		-	500	3500	6500	20000	20000
Area of scheme	1000	4000	12500	20500	28700	49200	⟶

Table 7 S.F./ 2 - Area actually under production (ha)

Crops \ Years	1°	2°	3°	4°	5°	6°	10°→50°
Banana	-	200	600	600	800	800	1600
Fruits					-	150	600
Maize	400	1500	2500	3200	3600	4600	→
Sorghum	500	1200	2000	2800	3400	3900	→
Oil seeds	-	830	2230	3730	4630	5350	→
- groundnut	-	(830)	(1500)	(2000)	→		
- sunflower		-	(730)	(1500)	(2000)	→	
- ricinus			-	(230)	(630)	(1350)	→
Cotton			-	300	700	1300	→
Tobacco		-	300	600	1000	→	
Vegetables				-	200	500	→
Grain pulses			-	770	1370	2130	→
Fallow	100	470	970	1600	2175	2620	→
Areas for annual crops	1000	4000	8000	13000	17075	21400	→
Areas for annual and pluriannual crops	1000	4200	8600	13600	17875	22350	23600

Table8 S.F. / 2 - Area actually under production (ha)

Crops \ Years	1°	2°	3°	5°	6°	8	10°→50°
Banana	-	400	800	1,600	1,600	2,400	3,200
Fruits				-	40	120	200
Sugar cane		-	1,250	3,750	5,000	→	
Maize	500	2,130	3,730	6,510	7,170	7,680	7,925
Sorghum	400	1,400	2,400	6,200	6,600	→	
Oil seeds		-	900	3,060	5,060	8,340	9,440
- groundnut			-	(1,000)	(1,500)	(2,400)	(2,740)
- ricinus			-	(500)	(1,000)	(2,000)	(2,200)
- sesame		-	(900)	(1,560)	(2,060)	(3,000)	→
- soya				-	(500)	(940)	(1,500)
Minor textiles				-	600	2,130	2,510
Tobacco				-	400	1,300	1,900
Vegetables					-	200	900
Grain pulses				-	1,170	3,500	3,800
Fallow	100	470	970	2,230	3,000	4,250	4,725
Areas for annual crops	1,000	4,000	8,000	18,000	24,000	34,000	37,800
Areas for annual and pluriannual crops	1,000	4,400	10,050	23,350	30,640	41,520	46,200

Table 9 S.F./2 - Area actually under production (ha)

Crops \ Years	1°	2°	3°	5°	6°	10°	15°→50°
Banana	-	400	800	1600	1600	3200	4000
Fruits				-	50	200	→
Sugar cane		-	1250	3750	5000	→	→
Maize	420	1020	1620	2000	→	→	→
Vegetables	345	945	1290	1290	→	→	→
Tobacco	-	280	1170	1170	→	→	→
Fallow	85	305	515	640	→	→	→
Total	850	2550	4595	5100	→	→	→
Cotton	800	1600	2400	2400	→	→	→
Maize	-	(800)	(1600)	(1600)	→	→	→
Fallow	-	(800)	(800)	(800)	→	→	→
Total	800	1600	2400	2400	→	→	→
Areas for annual crops	1650	4150	6995	7500	→	→	→
Areas for annual and pluriannual crops	1650	4550	9045	12850	14150	15900	16700

Table 10 S.F./2 - Area actually under production (ha)

Crops \ Years	1°	2°	5°	6°→50°
Cotton	780	1,560	3,900	3,900
Maize	-	520	2,080	2,600
Grain pulses	260	780	2,340	2,600
Fallow	-	260	1,040	1,300
Total	1,040	3,120	9,450	10,400
Oil seeds	785	1,995	5,435	5,850
- ricinus	(785)	(1,995)	(3,500)	(3,500)
- soya		(-)	(1,935)	(2,350)
Maize	265	790	2,285	2,550
Grain pulses	-	105	420	530
Fallow	-	260	1,010	1,270
Total	1,050	3,150	9,150	10,200
Area of scheme	2,090	6,270	18,600	20,600

Tablell S.F. / 2 - Area actually under production (ha)

Crops \ Years	1°	2°	3°	5°	6°	9°→50°
Sugar cane	-		1,250	3,750	5,000	⟶
Fruits				-	100	400
Non irrigated paddy	380	1,200	2,340	3,680	⟶	⟶
Vegetables	-	140	320	600	⟶	⟶
Grain pulses	120	470	950	1,550	⟶	⟶
Fallow	-	140	340	620	⟶	⟶
Areas for annual crops	500	1,950	3,950	6,450	⟶	⟶
Areas for annual and pluriannual crops	500	1,950	5,200	10,200	11,550	11,850

Table 1 F.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	5°	6°	10°	15°	19°→50°
Maize						
Area	120	2,100	2,200	⟶	⟶	⟶
Yield	2.5	2.88	3.12	4.35	5.0	⟶
Production	300	6,050	6,865	9,570	11,000	⟶
Sorghum						
Area	120	1,660	1,300	⟶	⟶	⟶
Yield	2.0	2.09	2.20	⟶	⟶	⟶
Production	240	3,470	2,860	⟶	⟶	⟶
Wheat						
Area		-	500	1,800	⟶	⟶
Yield		-	1.5	1.77	2,53	3,0
Production		-	750	3,185	4,555	5,400
Oil seeds						
Area	240	3,750	4,000	⟶	⟶	⟶
Yield	0.82	0,88	0,87	1,10	1,27	1,31
Production	200	3,300	3,480	4,400	5,080	5,250
Vegetables						
Area	30	470	500	⟶	⟶	⟶
Yield	25,5	29,3	31,5	40,9	42,0	⟶
Production	765	13,770	15,750	20,450	21,000	⟶
Grain pulses						
Area	30	470	500	⟶	⟶	⟶
Yield	1,6	1,76	1,87	2,34	2,4	⟶
Production	48	830	935	1,170	1,200	⟶

Table 2 F.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	5°	6°	10°	15°	16°→50°
Maize						
Area	85	800	→	→	→	→
Yield	2.5	3.03	3.33	4.54	5.2	→
Production	210	2,425	2,665	3,630	4,160	→
Sorghum						
Area	80	800	→	→	→	→
Yield	2.0	2.13	2.21	2.61	2.80	→
Production	160	1,705	1,770	2,090	2,240	→
Wheat						
Area	65	640	→	→	→	→
Yield	1.5	1.71	1.81	2.42	3.18	3.2
Production	95	1,095	1,155	1,550	2,035	2,050
Oil seeds						
Area	255	2,360	→	→	→	→
Yield	0.65	0.87	0.90	1.06	1.21	→
Production	165	2,055	2,125	2,500	2,855	→
Vegetables						
Area	65	640	→	→	→	→
Yield	20.0	25.2	27.4	30.0	→	→
Production	1,300	16,130	17,560	19,200	→	→
Grain pulses						
Area	35	320	→	→	→	→
Yield	1.85	2.28	2.48	2.70	→	→
Production	65	730	790	865	→	→
Fruits						
Area		-	20	100	→	→
Yield		-	10.0	22.75	25.0	→
Production		-	200	2,275	2,500	→

Table 3 F.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	5°	10°	15°→50
Maize				
Area	90	1.085	→	→
Yield	2.5	3.13	4.64	5.5
Production	225	3.395	5.035	5.970
Sorghum				
Area	90	775	→	→
Yield	2.0	2.16	2.65	3.0
Production	180	1.675	2.055	2.325
Wheat				
Area	60	620	→	→
Yield	1.5	1.75	2.50	3.-
Production	90	1.085	1.550	1.860
Oil seeds				
Area	240	2.480	→	→
Yield	0.65	0.88	1.08	1.20
Production	155	2.180	2.680	2.975
Vegetables				
Area	30	310	→	→
Yield	26,0	31.0	41.8	42.0
Production	780	9.610	12.960	13.020
Grain pulses				
Area	30	310	→	→
Yield	1,60	1,85	2,39	2,40
Production	50	575	740	745

Table 4 F.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	5°	10°	15°	18→50°
Maize					
Area	180	2,910	3,900 →		
Yield	2.25	3.22	4.27	5.08	5.50
Production	405	9,370	16,655	19,810	21,450
Sorghum					
Area	180	2,130	2,750 →		
Yield	1.8	1.88	2.97	3.0 →	
Production	325	4,005	8,165	8,250 →	
Rice					
Area	120	1,680	2,200 →		
Yield	1.30	1.87	2.47	3.22	3.50
Production	155	3,140	5,435	7,085	7,700
Oil seeds					
Area	380	6,720	8,900 →		
Yield	0.69	0.70	0.96	1.23	1.35
Production	260	4,710	8,545	10,945	12,015
Vegetables					
Area	50	750	1,000 →		
Yield	20.0	22.0	31.15	40.00 →	
Production	1,000	16,500	31,150	40,000 →	
Grain pulses					
Area	70	930	1,230 →		
Yield	1.7	1.85	2.30	2.5 →	
Production	120	1,720	2,830	3,075 →	

Table 6 F.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	5°	6°	10°	14°→50°
Maize					
Area	90	450 →			
Yield	2.5	3.27	3.59	4.75	5.30
Production	225	1,470	1,615	2,135	2,385
Sorghum					
Area	130	450 →			
Yield	2.0	2.21	2.31	2.71	3.1
Production	260	995	1,040	1,220	1,395
Rice					
Area	90	360 →			
Yield	1.5	1.8	1.9	2.3	2.5
Production	135	650	685	830	900
Oil seeds					
Area	340	1.340 →			
Yield	0.65	0.74	0.77	0.92	1.0
Production	220	990	1,030	1,235	1,340
Vegetables					
Area	50	180 →			
Yield	18.8	20.6	21.1	24.9	27.0
Production	940	3,700	3,800	4,480	4,860
Grain pulses					
Area	90	360 →			
Yield	1.30	1.6	1.70	2.11	2.4
Production	115	575	610	760	865
Fruits					
Area		-	20	50 →	
Yield		-	10.0	25.0	30.0
Production		-	200	1,250	1,500

Table 1 S.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	3°	4°	5°	10°	12°→50°
Maize						
Area		-	530	2,300	→	
Yield		-	2.5	2.6	5.05	5.2
Production		-	1,325	6,015	11,615	11,960
Sorghum						
Area			-	1,950	→	
Yield			-	1.25	1.80	2.0
Production			-	2,440	8,245	9,200
Wheat						
Area	-	730	2,400	→		
Yield	-	1.5	1.56	1.76	2.92	3.2
Production	-	1,095	3,745	4,225	7,010	7,680
Oil seeds						
Area	900	5,900	6,800	→		
Yield	0.85	0.91	0.95	0.98	1.28	1.3
Production	760	5,385	6,440	6,780	8,800	8,950
Cotton						
Area			-	300	→	
Yield			-	1.20	1.58	1.75
Production			-	360	1,735	1,925
Minor textiles						
Area			-	350	→	
Yield			-	1.2	1.70	1.95
Production			-	420	1,870	2,145
Grain pulses						
Area	-	400	1,700	→		
Yield	-	1.25	1.26	1.32	2.0	→
Production	-	500	2,115	2,250	3,400	→

Table 2 S.F./3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	3°	5°	9°	10°	11°	13°	14°	15°	20°	22°→50°
Sugar cane											
Area	-	1250	3750	5000	→						
Yield	-	80.0	80.0	100.0	→						
Production	-	100000	300000	500000	→						
Maize											
Area	225	3925	6775	12265	14265	15765	17000	→			
Yield	2.5	2.69	3.14	4.03	4.17	4.28	4.56	4.77	4.96	5.3	→
Production	565	10560	21275	49430	59485	67475	77520	81090	84320	90100	→
Sorghum											
Area	175	2975	4875	8875	9875	11375	13200	→			
Yield	2,-	2.09	2.24	2,54	2,59	2.63	2.71	2.79	2.86	3,0	→
Production	350	6210	10920	22540	25575	29915	35770	36830	37750	39600	→
Wheat											
Area					-	600	2200	3000	3800	→	
Yield					-	1.5	1.61	1.74	1.85	2.84	3.-
Production					-	900	3540	5220	7030	10790	11400
Rice											
Area							-	800	1900	→	
Yield							-	2.-	2.10	3.71	4.-
Production							-	1600	3990	7050	7600

Table 2 S.F./3 - Cont.d

Crops \ Years	1°	3°	5°	9°	10°	11°	13°	14°	15°	20°	22°→50°
Oil seeds											
Area	500	4500	8500	12500	13000	14000	17840	18800	18800	→	
Yield	1,-	0.88	0.92	1.13	1.16	1.16	1.18	1.18	1.21	1.31	→
Production	500	3950	7800	14125	15080	16240	21050	22185	22750	24630	→
Cotton											
Area			-	730	1460	1900	→				
Yield			-	1,2	1.25	1.29	1.42	1.59	1.69	1.8	→
Production			-	875	1825	2450	2700	3020	3210	3420	→
Minor textiles											
Area						-	1140	2140	2850	→	
Yield						-	1.2	1.25	1.28	2,-	→
Production						-	1370	2765	3650	5700	→
Tobacco											
Area			-	150	300	510	1900	→			
Yield			-	1,-	1.06	1.08	1.07	1.12	1.18	1.48	1.5
Production			-	150	320	550	2035	2130	2240	2810	2850
Vegetables											
Area						-	400	900	1900	→	
Yield						-	21.-	21.5	22.1	26.7	27.-
Production						-	8400	19350	42000	50750	51300
Grain pulses											
Area						-	120	1310	2860	→	
Yield						-	2.0	2.04	2.11	2.56	2.6
Production						-	240	2700	6035	7320	7435

Table 3 S.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	5°	9°	10°	15°	17°→50°
Rice								
Area	1,500	4,500	15,750	30,750	34,500	→	→	→
Yield	2.0	2.13	2.62	3.02	3.67	4.80		5.0
Production	3,000	9,585	41,250	92,865	126,600	169,200		176,250
Grain pulses								
Area	-	500	2,375	4,875	5,500	→	→	→
Yield	-	1,25	1.36	1.60	1.65	1.96		2.0
Production	-	625	3,220	7,810	9,060	11,495		11,750

Table 5 S.F./3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	5°	10°	11°→50°
Maize						
Area	450	1450	2550	4730	→	→
Yield	2.0	2.16	2.99	3.02	5.01	5.2
Production	900	3125	7625	14285	23700	24595
Oil seeds						
Area	450	1700	3600	6240	6240	→
Yield	1.0	0.96	0.98	1.04	1.34	1.52
Production	450	1625	3510	6520	8360	9485
Cotton						
Area		-	380	780	→	→
Yield		-	1.10	1.25	1.70	→
Production		-	420	975	1325	→
Vegetables						
Area	-	300	600	→	→	→
Yield	-	12.0	15.25	20.5	25.0	29.0
Production	-	3600	9150	12300	15000	17400
Grain pulses						
Area	-	600	1300	→	→	→
Yield	-	1,20	1,22	1,35	2,0	→
Production	-	720	1590	1750	2600	→

Table 6 S.F./3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	4°	5°	6°	10°	15°	21°→50°
Maize								
Area	500	1500	3560	4620	5560	6000	→	
Yield	2.5	2.75	3.16	3.37	3.64	5.08	5.4	→
Production	1250	4125	11145	15570	20240	30480	32400	→
Sorghum								
Area	400	1200	2800	3670	4550	4950	→	
Yield	2.0	2.05	2.19	2.26	2.34	2.85	3.0	→
Production	800	2460	6130	8295	10645	14105	14850	→
Oil seeds								
Area	-	840	4180	5440	6340	7680	→	
Yield	-	0.65	0.84	0.89	0.93	1.17	1.27	→
Production	-	545	2095	3510	4840	8985	9725	→
Cotton								
Area			-	130	260	730	→	
Yield			-	1.2	1.25	1.55	1.8	→
Production			-	155	325	1130	1315	→
Minor textiles								
Area			-	190	390	1090	→	
Yield			-	1,2	1,25	1,58	2,0	→
Production			-	230	485	1720	2180	→
Tobacco								
Area			-	370	820	1460	→	
Yield			-	1.0	1,06	1.22	1,5	→
Production			-	370	870	1780	2190	→
Vegetables								
Area			-	130	730	→		
Yield			-	12.5	15.19	18.0	→	
Production			-	1625	11090	13140	→	
Grain pulses								
Area			-	500	1420	2920	→	
Yield			-	1.25	1,27	1.60	2,0	→
Production			-	625	1805	4670	5840	→
Rice								
Area	-	400	2000	3500	10000	15000	→	
Yield	-	2,0	2,06	2,18	2,77	3,25	4,50	
Production	-	1000	4120	7630	27760	48750	67500	
Grain pulses (rice farm)								
Area			-	375	750	2500	2500	→
Yield			-	1,25	1,27	1,48	1,8	→
Production			-	470	955	3700	4500	→

Table 7 S.F./3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	4°	5°	6°	10°	15°
Banana								
Area	-	200	400	600	800	800	1600	1600
Yield	-	30.0	35.0	36.7	37.5	40.0	38.8	40.0
Production	-	6000	14000	22020	30000	32000	62080	64000
Fruits								
Area					-	150	600	→
Yield					-	10.0	27.5	30.0
Production					-	1500	16500	18000
Maize								
Area	400	1500	2500	3200	3600	4600	→	
Yield	2.5	2.58	2.84	3.07	3.52	4.02	5.4	5.5
Production	1000	3870	7100	8925	12670	18490	24840	25300
Sorghum								
Area	400	1200	2000	2800	3400	3900	→	
Yield	2.0	2.05	2,12	2,19	2.25	2.44	2.92	3.5
Production	800	2460	4240	6130	7650	9515	11390	13650
Oil seeds								
Area	-	830	2230	3730	4630	5350	→	
Yield	-	1.0	0.95	0.98	1,06	1,18	1,36	1.45
Production	-	830	2120	3655	4910	6315	7275	7760
Cotton								
Area			-	300	700	1300	→	
Yield			-	1,20	1.24	1,28	1.68	1.8
Production			-	360	870	1665	2185	2470
Tobacco								
Area		-	300	600	1000	→		
Yield		-	1,0	1,06	1,08	1,15	1,39	1,60
Production		-	300	635	1080	1150	1390	1600
Vegetables								
Area				-	200	500	→	
Yield				-	17.5	22.8	28.0	38.2
Production				-	3500	11400	14000	19100
Grain pulses								
Area			-	770	1370	2130	→	
Yield			-	1,75	1,78	1,84	2,54	2,8
Production			-	1350	2440	3920	5410	5965

Table 8 S.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	5°	6°	8°	10°	15°	16°→50°
Banana									
Area	-	400	800	1600	1600	2400	3200	3200	→
Yield	-	30	35	37.5	40	39	39.2	39.4	40 →
Production	-	12000	28000	60000	64000	93600	125450	126	128 →
Fruits									
Area					40	120	200	→	
Yield					10	20	24		30 →
Production					400	2400	4800		6000 →
Sugar cane									
Area			1250	3750	5000				
Yield			80	80	80		100	→	
Production			100000	300000	400000		50000	→	
Maize									
Area	500	2130	3730	6510	7170	7680	7925	→	
Yield	2,5	2,62	2,85	3,40	3,77	4.63	5,41	5.99	6.0
Production	1250	5580	10630	22135	27030	35560	42875	47470	47550
Sorghum									
Area	400	1400	2400	6200	6600			→	
Yield	2.-	2.04	2.11	2.20	2.33	2,99		3.2 →	
Production	800	2855	5065	13640	15380	17555	19735	21120 →	
Oil seeds									
Area			900	3060	5060	8340	9440	→	
Yield			0,65	0.83	0.88	0.93	1.05	1.33	1.35 →
Production			585	2540	4455	7755	9910	12555	12750 →
Minor Textiles									
Area					600	2130	2510 →		
Yield					1.2	1.28	1.46	2.0 →	
Production					720	2725	3665	5020 →	
Tobacco									
Area					400	1200	1900 →		
Yield					1.0	1.08	1.20	1.5 →	
Production					400	1295	2280	2850 →	
Vegetables									
Area						200	900 →		
Yield						22.5	28.5	44.0 →	
Production						4500	25650	39.600 →	
Grain pulses									
Area					1170	3500	3800 →		
Yield					1.6	1.75	2,06	2,40 →	
Production					1870	6125	7830	9120 →	

Table 9 S.F/3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	5°	6°	10°	15°	16°→50°
Banana								
Area	-	400	800	1600	1600	3200	4000 →	
Yield	-	30.-	35.-	37.5	40.-	38.8	39.5	40.-
Production	-	12000	28000	60000	64000	124000	158000	160000
Fruits								
Area	-	-	-	-	50	200	200 →	
Yield	-	-	-	-	2.5	21.25	25.- →	
Production	-	-	-	-	500	4250	5000 →	
Sugar cane								
Area	-	-	1250	3750	5000	→		
Yield	-	-	80.0			100.- →		
Production	-	-	100000	300000	400000	500000 →		
Maize								
Area	420	1020	1620	2000	→			
Yield	2.5	2.66	2,86	3.57	4.06	5.71	5.8 →	
Production	1050	2715	4635	7140	8120	11420	11600 →	
Vegetables								
Area	345	945	1290 →					
Uield	21.5	22.4	24.-	29.-	31.6	37.5 →		
Production	7420	21170	30960	37410	40765	48375 →		
Tobacco								
Area	-	280	1170 →					
Yield	-	1.-	1.02	1.22	1.32	1.7 →		
Production	-	280	1195	1430	1545	1990 →		
Cotton								
Area	800	1600	2400 →					
Yield	1.2	1,25	13.-	1.5	1.6	1.8 →		
Production	960	2000	3120	3600	3840	4320 →		
Maize(rice farm)								
Area	-	800	1600 →					
Yield	-	2.5	2.7	3.55	4.05	5.8 →		
Production	-	2000	4320	5680	6480	9280 →		

Table 10 S.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	5°	10°	13°→50°
	A) Cotton farms				
Cotton					
Area	780	1,560	3,900	→	
Yield	1.2	1.25	1.4	1.88	2.0
Production	935	1,950	5,460	7,330	7,800
Maize					
Area	-	520	2,080	2,600	→
Yield	-	2.5	3.25	5.38	6.0
Production		1,300	6,760	13,990	15,600
Grain pulses					
Area	260	780	2,340	2,600	→
Yield	1.25	1.27	1.39	2.02	2.2
Production	325	990	3,255	5,260	5,270
	B) Oil seeds farms				
Oil seeds					
Area	785	1,995		5,850	→
Yield	0.8	0.82	0.97	1.47	1.7
Production	630	1,635	5,270	8,600	9,945
Maize					
Area	265	790	2,285	2,550	→
Yield	2.5	2.66	3.4	5.55	6.0
Production	660	2,100	7,770	14,150	15,300
Grain pulses					
Area	-	105	420	530	→
Yield	-	1,25	1.36	1,97	2.2
Production	-	130	570	1,045	1,165

Table 11 S.F. / 3 - Area (ha), yield (ton/ha) and production (ton)

Crops \ Years	1°	2°	3°	5°	10°	11° → 50°
Sugar cane						
Area	-	-	1,250	3,750	5,000	→
Yield	-	-	80	80	100	→
Production	-	-	100,000	300,000	500,000	→
Fruits						
Area	-	-	-	-		
Yield	-	-	-	-	27.5	30
Production	-	-	-	-	11,000	12,000
Non irrig.paddy						
Area	380	1,200	2,340	3,680	→	
Yield	1.8	1.86	2.89	2.20	2.99	3.0
Production	685	2,235	6,765	3,105	11,000	11,040
Vegetables						
Area	-	140	320	600	→	
Yield	-	21.5	22.4	26.5	38.9	40.0
Production	-	3,010	7,170	15,900	23,340	24,000
Grain pulses						
Area	120	470	950	1,550	→	
Yield	1,75	1.78	1.84	2.12	2.95	3.0
Production	210	835	1,750	3,285	4,570	4,650

Table 1 F.F / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	6°	10°	15°	19° — 50°
A) Family Farms						
Maize	160	3,300	3,750	5,240	6,030	→
Sorghum	130	1,900	1,570	-	-	-
Wheat	-	-	1,040	4,520	6,710	8,010
Oil seeds	260	4,420	4,620	5,970	6,970	7,180
Vegetables	410	5,850	6,700	8,680	8,920	→
Grain pulses	40	750	840	1,050	1,080	→
Total	1,000	16,220	18,520	25,460	29,710	31,220
B) State Farms						
Maize	-	3,280	3,920	6,360	7,550	→
Sorghum	-	1,330	3,240	4,510	5,030	→
Oil seeds	970	6,450	8,300	11,410	13,330	→
Wheat	-	-	1,530	9,480	13,350	→
Cotton	-	650	2,420	3,160	5,510	→
Minor textiles	-	1,110	3,590	4,950	5,680	→
Grain pulses	-	450	1,900	2,580	4,060	→
Total	970	13,270	24,900	42,450	55,510	→

Table 2 F.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	7°	10°	15°	16° → 50°
Maize	114.6	1,324.9	1,602.7	1,990.4	2,279.2	→
Sorghum	87.6	933.3	1,010.3	1,142.3	1,227.6	→
Wheat	127.9	1,498.5	1,693.5	2,173.5	2,908.5	2,931.0
Oil seeds	325.4	2,943.2	3,191.5	3,651.0	4,117.4	→
Vegetables	552.4	6,852.3	7,882.9	8,159.2	→	
Grain pulses	562.9	6,368.4	7,313.4	7,583.4	→	
	-	-	170.4	1,938.3	2,130.6	→
Total	1,770.8	19,920.6	22,864.7	26,528.1	28,405.3	28,427.8

Table 3 F.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	10°	15° → 50°
Maize	122.8	1,858.1	2,754.6	3,271.6
Sorghum	98.5	878.6	1,087.6	1,236.1
Wheat	121.5	1,488.5	2,185.5	2,650.5
Oil seeds	782.8	3,241.4	4,028.6	4,417.4
Vegetables	331.5	4,079.6	5,507.6	5,533.1
Grain pulses	44.8	515.5	664.0	668.5
Total	1,501.9	12,061.7	16,227.9	17,777.2

Table 4 F.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	10°	15°	18° → 50°
Maize	220.7	4,104.0	8,017.3	10,209.1	10,574.8
Sorghum	177.8	2,224.0	3,372.9	3,977.9	4,068.6
Rice	266.7	4,218.5	7,156.5	8,596.4	8,710.0
Oil seeds	554.9	6,671.7	10,990.5	13,532.3	13,816.2
Vegetables	531.2	8,754.0	15,341.2	16,998.7	16,998.7
Grain pulses	103.6	1,489.4	2,469.5	2,690.0	2,690.0
Total	1,854.9	27,461.6	47,347.9	56,004.4	56,858.3

Table 6 F.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	6°	10°	14° → 50°
Maize	122.8	803.5	883.3	1,169.3	1,306.8
Sorghum	142.3	544.8	569.5	668.5	764.8
Rice	228.4	1,122.4	1,188.7	1,463.3	1,595.9
Oil seeds (sesame)	431.8	1,947.8	2,027.8	2,437.8	2,647.8
Vegetables	399.4	1,572.3	1,616.9	1,903.8	2,065.3
Grain pulses	97.8	495.0	526.5	661.5	756.0
Fruits	-	-	170.4	1,065.0	1,278.0
Total	1,422.5	6,485.8	6,983.1	9,369.2	10,414.6

Table 1 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	5°	6°	10°	15°	19° — 50°
A) Family Farms						
Maize	160	3,300	3,750	5,240	6,030	→
Sorghum	130	1,900	1,570	-	-	-
Wheat	-	-	1,040	4,520	6,710	8,010
Oil seeds	260	4,420	4,620	5,970	6,970	7,180
Vegetables	410	5,850	6,700	8,680	8,920	→
Grain pulses	40	750	840	1,050	1,080	→
Total	1,000	16,220	18,520	25,460	29,710	31,220
B) State Farms						
Maize	-	3,280	3,920	6,360	7,550	→
Sorghum	-	1,330	3,240	4,510	5,030	→
Oil seeds	970	6,450	8,300	11,410	13,330	→
Wheat	-	-	1,530	9,480	13,350	→
Cotton	-	650	2,420	3,160	5,510	→
Minor textiles	-	1,110	3,590	4,950	5,680	→
Grain pulses	-	450	1,900	2,580	4,060	→
Total	970	13,270	24,900	42,450	55,510	→

Table 2 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	3°	5°	9°	10°	13°	14°	15°	20°	22°– 50°
		20,550.0	61,650.0	102,750.0	→					
Maize	308.3	5,759.3	13,066.6	33,153,7	38,523,4	53,263,9	56,141.1	58,415.5	62,436.0	62,436,0
Sorghum	182,9	3,251.9	6,785.6	15,294.1	17,527,1	23,753.1	24,719,7	25,325,2	26,636.5	26,636,5
Wheat	-	-	-	-	-	6,120.0	9,075,0	12,240.0	19,395,0	20,520,0
Rice	-	-	-	-	-	-	3,599,1	9,111,5	16,404.4	17,730,4
Oil seeds	465.0	5,078.0	10,289.0	24,106,0	27,764.0	35,942.3	36,716.8	37,646.3	40,965.8	40,965,8
Cotton	-	-	-	1,578,8	3,297.7	6,186,1	6,951.5	7,399.5	7,940,8	7,940,8
Minor textiles	-	-	-	-	-	3,630.5	8,586,0	12,441.7	18,550.0	19,080.0
Tobacco	-	-	-	1,866,7	3,982.4	28,001.2	33,850.4	35,281.6	44,428.6	44,802.0
Vegetables	-	-	-	-	-	9,280.7	17,843,3	22,674.9	27,345,7	27,536.9
Grain pulses	-	-	-	-	-	1,980.2	4,628.4	6,590.7	8,107.2	8,197.2
Total	956.2	34,639.2	91,791.2	178,749.3	193,844.6	270,908.0	304,861.3	329,876.9	374,960,0	378,595.6

Table 3 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	5°	10°	15°	17° → 50°
Rice	5,398.6	16,906.5	69,112.8	198,046.8	261,183.4	265,956.9
Grain pulses	-	531.0	2,748.6	7,807.5	9,332.1	9,530.1
Total	5,398.6	17,437.5	71,861.4	205,854.3	270,515.5	275,487.0

Table 5 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	3°	5°	10°	11° → 50°
Maize	490	1,700	4,165	7,550	13,355	14,975
Oil seeds	420	1,670	3,700	6,980	9,905	10,745
Cotton	-	-	725	1,760	2,415	→
Vegetables	-	1,530	3,125	3,440	4,735	→
Grain pulses	-	610	1,350	1,495	2,275	→
Total	910	5,510	13,065	21,225	32,685	35,775

Table 6 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	4°	5°	6°	10°	15°	20°	21° → 50°
Maize	682.0	6,093.3	8,518.2	11,070.8	16,743.6	17,785.9	→	
Sorghum	437.8	3,361.6	4,544.8	5,821.5	7,730.5	8,140.3	→	
Rice	-	1,799.6	7,435.0	13,786.5	50,672.0	89,504.7	110,341.8	110,815.4
Oil seeds	-	4,372.6	6,128.5	7,443.6	11,472.3	12,426.2	→	
Cotton	-	-	279.6	587.3	2,064.5	2,400.5	→	
Minor textiles	-	-	609.5	1,285.2	4,571.2	5,777.0	→	
Tobacco	-	-	4,604.6	10,764.9	22,214.3	27,254.5	→	
Vegetables	-	-	-	690.5	4,712.3	5,583.6	→	
Grain pulses	-	-	1,042.9	2,342.8	7,204.9	8,964.4	→	
Total	1,119.8	15,627.1	33,163.1	53,793.1	127,445.6	177,837.1	198,674.2	199,147.8

Table 7 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	4°	5°	6°	10°	13° → 50°
Banana	-	5,532.0	20,284.0	27,660.0	29,504.0	57,164.0	59,008.0
Fruits	-	-	-	-	1,278.0	14,058.0	15,336.0
Maize	547.8	2,112.0	5,299.8	6,642.9	7,307.3	13,676.3	14,369.3
Sorghum	437.2	1,346.4	3,361.6	3,809.3	4,538.9	5,993.6	6,166.9
Oil seeds	-	771.9	3,450.6	4,498.2	5,547.2	7,196.9	8,127.1
Cotton	-	-	649.6	1,571.7	3,001.6	3,972.3	4,270.9
Tobacco	-	-	3,733.5	7,964.8	13,440.6	16,054.0	18,667.5
Vegetables	-	-	-	1,487.2	3,777.6	4,878.4	5,354.4
Grain pulses	-	-	1,166.5	2,105.2	3,384.9	4,730.4	5,234.4
Total	985.0	9,762.3	37,945.6	55,739.3	71,780.1	127,723.9	136,534.5

Table 8 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	3°	5°	6°	8°	10°	15°	16° → 50°
Banana	-	11,064.0	25,816.0	55,320.0	59,008.0	84,824.0	114,328.0	118,016.0	→
Fruits	-	-	-	-	340.8	2,044.8	4,089.6	5,120.0	→
Sugar	-	-	20,550.0	61,650.0	82,200.0	102,750.0	→		
Maize	682.0	3,042.8	5,811.0	12,094.3	14,785.0	19,479.0	23,420.1	25,939.1	25,983.1
Sorghum	437.8	1,565.3	2,775.3	7,076.1	8,436.4	9,629.9	10,806.9	11,579.7	→
Oil seeds	-	-	1,148.4	3,727.2	6,335.8	11,043.7	13,862.7	17,548.4	17,726.4
Minor textiles	-	-	-	-	1,908.0	7,247.7	9,937.5	13,303.0	→
Tobacco	-	-	-	-	4,978.0	17,547.5	27,379.0	34,721.5	35,463.2
Vegetables	-	-	-	-	-	1,912.5	10,837.4	16,829.9	→
Grain pulses	-	-	-	-	1,609.3	5,292.0	6,798.6	7,968.6	→
Total	1,119.8	15,672.1	56,100.7	139,867.6	179,6001.3	261,771.0	324,209.8	353,776.2	354,739.9

Table 9 S.F. / 4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	3°	5°	6°	10°	15°	16° → 50°
Banana		11,064.0	25,816.0	55,320.0	59,008.0	114,328.0	145,676.0	147,520.0
Fruits	-	-	-	-	426.0	3,621.0	4,260.0	→
Sugar	-	-	20,550.0	61,650.0	82,200.0	102,750.0	→	
Cotton	2,628.3	3,613.9	5,644.8	6,540.8	6,988.8	7,884.8	→	
Maize (cotton farm)	-	1,091.2	2,358.4	3,106.4	3,546.4	5,086.4	→	
Maize (annual crop)	572.9	1,084.8	2,375.8	3,899.5	4,449.5	6,253.5	6,358.0	→
Vegetables	3,153.1	8,974.8	13,152.1	15,893.4	17,338.4	20,568.4	→	
Tobacco	-	3,484.6	14,934.0	17,796.3	19,289.7	24,765.5	→	
Total	6,354.3	29,313.3	84,804.1	164,206.4	193,246.8	285,257.9	317,349.1	319,193.1

Table 10 S.F. 4 . - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	5°	10°	14 → 50°
Cotton	1732.3	3613.9	10154.7	13738.7	14634.7
Maize	-	709.3	3695.1	7693.1	8551.1
Grain pulses	289.6	911.9	3051.1	5023.8	5469.3
Total	2021.9	5235.1	16900.9	26455.6	28655.1
Oil seeds	893.4	2313.6	7429.7	12249.2	14218.3
Maize	354.6	1149.1	4259.3	7770.9	8403.4
Grain pulses	-	141.9	473.9	872.5	976.0
Total	1248.0	3604.6	12162.9	20892.6	23597.7
Global total	3269.9	8839.7	29063.8	47348.2	52252.8

Table 11 S.F./4 - Value of gross production ('000 So.Sh)

Crops \ Years	1°	2°	3°	5°	6°	10°	11°→50°
Sugar			20,550	61,650	82,200	102,750	
Fruits	-	-	-	-	850	9,370	20,220
Rice	1,045	3,420	11,020	12,590	13,500	16,580	16,885
Vegetables	-	1,280	3,050	6,760	7,390	9,920	10,200
Grain pulses	180	720	1,515	2,860	3,110	4,015	4,090
Total	1,225	5,420	32,285	83,860	107,050	142,635	144,150

Table 1 F.F/5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°→50°
1. Land reclamation works	31300	8750	9750	11650	12650	-														
2. On-farm infrastructures	-	2100	3150	3500	4200	4550	-													
3. Materials	-	2000	1500	1300	1300	900	-													
4. Personnel	-	600	750	900	1000	1100	→				1050	1000	950	900	→					
5. Management costs	-	1150	1650	2250	2900	3350	5400	4900	4700	4700	4300	5150	→							
5.1 operating	-	(300)	(500)	(700)	(950)	(1050)	→													
5.2 renewal	-					(-)	(200)	(1500)	(1300)	(1300)	(900)	(1750)	→							
5.3 maintenance	-	(850)	(1150)	(1550)	(1950)	(2300)	(2350)	→												
6. Production costs	-	1250	3400	5100	7600	10250	→													
7. Contingencies (b)	-	550	850	1050	1400	1700	1350	1300	1250	1250	1200	1300	→							
Total (million So.Sh.)	31.3	16.4	21.1	25.7	31.1	21.8	18.1	17.6	17.3	17.3	16.8	17.7	17.6	→						
Investment costs (c) (million So.Sh)	31.3	13.3	14.9	16.9	18.7	6.0	-													
Management costs (c) (million So.Sh)	-	3.1	6.2	8.8	12.4	15.8	18.1	17.6	17.3	17.3	16.8	17.7	17.6	→						
Gross benefits (mill.So.Sh)	-	1.0	3.7	7.1	11.3	16.2	18.5	20.3	23.3	24.2	25.5	26.5	27.4	28.3	29.0	29.7	30.4	30.8	31.1	31.2
Net benefits (mill.So.Sh)	-31.1	-15.4	-17.4	-18.6	-19.8	- 5.6	0.4	2.7	6.0	6.9	8.7	8.8	9.8	10.7	11.4	12.1	12.8	13.2	13.5	13.6
Internal rate of return : ~ 7%																				

(a) Unless otherwise indicated - (b) Related to points 2.3. 5.1,5.2 and 6 - (c) Including contingencies

Table 2 F.F/5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14→50°
1. Land reclamation works	18850	12100	7900	5150	-										
2. On-farm infra-structures	-	6000	4500	2000	1000	-									
3. Materials	-	1400	1150	1700	1200	-									
4. Personnel	-	400	650	900	1000	→				950	→		900	→	
5. Management costs	-	600	1150	1600	1900	2000	3500	3300	3950	3500	2350	3700	→		
5.1 operating	-	(100)	(200)	(300)	(350)	(450)	(550)	(600	(700)	(750)	(800)	→			
5.2 renewal	-					(-)	(1400)	(1150)	(1700)	(1200)	(-)	(1350)	→		
5.3 maintenance	-	(500)	(950)	(1300)	(1550)	→							→		
6. Production costs	-	800	1800	2800	3800	4800	5800	6800	7800	8600	9300	→			
7. Contingencies (b)	-	850	750	700	650	550	800	850	1000	1050	1000	1150	→		
Total (million So.Sh.)	18.9	22.1	17.9	14.8	9.6	8.4	11.1	11.9	13.8	14.1	13.4	15.1			
Investment costs (c) (million So.Sh)	18.9	20.2	14.1	9.2	2.4	-									
Management costs (c) (million So.Sh)	-	1.9	3.8	5.6	7.2	8.4	11.1	11.9	13.8	14.1	13.6	15.1	→		
Gross benefits (million So.Sh)	-	1.8	6.7	12.5	16.7	18.9	20.5	20.9	21.3	23.7	24.5	24.8	25.1	25.4	25.7
Net benefits(mill.So.Sh)	-18.9	-20.3	-11.2	-2.3	+7.1	10.5	9.4	9.0	7.5	9.6	10.9	9.7	10.0	10.3	10.6
Internal rate of return : ~ 13.5 %															

(a) Unless otherwise indicated - (b) Related to points 2,3,5.1.,5.2. and 6. - (c) Including contingencies

Table 3 F.F./5 - Investment and managament costs ('000 So.Sh.) (a) and internal rate of return

	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14→50°
1. Land reclamation works	27450	14500	15700	-											
2. On-farm infrastructures	-	5000	5000	2000	-										
3. Materials	-	1500	1550	1700	-										
4. Personnel	-	400	700	1050	→				1000	1000	950	950	900	→	
5. Management costs	-	800	1500	2200	2250	2250	3750	3800	3950	2250	2250	3400	→		
5.1 operating	-	(100)	(300)	(450)	(500)	→							→		
5.2 renewal	-					(-)	(1500)	(1550)	(1700)	(-)	(-)	(1150)	→		
5.3 maintenance	-	(700)	(1200)	(1750)	→								→		
6. Production costs	-	450	2650	5000	5500	→							→		
7. Contingencies (b)	-	700	950	900	600	600	750	750	800	600	600	700	→		
Total (million So.Sh.)	27.5	23.4	28.0	12.9	9.4	9.4	11.0	11.1	11.3	9.3	9.3	10.6	10.5		
Investment costs (c) (million So.Sh)	27.5	21.7	22.9	4.1	-										
Management costs (c) (million So.Sh)	-	1.7	5.1	8.8	9.4	9.4	11.0	11.1	11.3	9.3	9.3	10.6	10.5	→	
Gross benefits (million So.Sh)	-	1.5	5.6	9.7	11.3	12.1	12.8	13.7	14,6	15.5	16.2	16.8	17.2	17.6	17.8
Net benefits (million So.Sh)	-27.5	-21.9	-22.4	-3.2	+1.9	2.8	1.8	2.6	3.3	6.2	6.9	6.2	6.7	7.1	7.3
Internal rate of return : ~ 7 %															

(a) Unless otherwise indicated - (b) Related to point 2,3,5.1., 5.2. and 6 - (c) Including contingencies

Table 4 F.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°→50°
1. Land reclamation works	30150	49600	16000	19150	22350	25550	22350	-												
2. On-farm infrastructures	-		12500	8000	6500	5000	5000	3500	3500	-										
3. Materials	-		6800	4700	2350	2100	1700	-												
4. Personnel	-		550	800	1050	1250	1450	1650	1850	2000	→				1950	1900	1850	1800	1700	→
5. Management costs	-	600	2850	4300	5100	6300	7350	14850	12950	10600	10350	9950	11650	→						
5.1 operating	-		(550)	(1100)	(1400)	(1700)	(2000)	(2250)	(2400)	→										
5.2 renewal	-						(-)	(6800)	(4700)	(2350)	(2100)	(1700)	(3400)	→						
5.3 maintenance	-	(600)	(2300)	(3200)	(3700)	(4600)	(5350)	(5800)	(5850)	→										
6. Production costs	-		1300	6000	11500	15000	19200	21200	22500	23800	24600	→								
7. Contingencies (b)	-		2100	2000	2200	2400	2800	3400	3300	2850	2900	2850	3050	→						
Total (million So.Sh.)	30.2	50.2	42.1	44.9	51.1	57.6	59.8	44.6	44.1	39.3	39.9	39.4	41.3	→		41.2	→	41.1	→	
Investment costs (c) (million So.Sh)	30.2	49.6	37.2	33.1	32.1	33.4	29.7	3.9	3.8	-										
Management costs (c) (million So.Sh)	-	0.6	4.9	11.8	19.0	24.2	30.1	40.7	40.3	39.3	39.9	39.4	41.3	→		41.2	→	41.1	→	
Gross benefits (mill.So.Sh)	-		1.9	6.6	15.2	23.5	33.5	44.7	48.7	52.2	56.1	59.8	63.0	66.6	69.8	72.0	74.8	75.9	76.9	77.5
Net benefits (mill.So.Sh)	-30.2	-50.2	-40.2	-38.3	-35.9	-34.1	-26.3	0.1	4.6	12.9	16.2	20.4	21.7	25.3	28.5	30.8	33.6	34.8	35.9	36.5
Internal rate of return : ~ 7.5%																				

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on costs under points 5.1, 5.2 and 6 - (c) Including contingencies

Table 6 F.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°→50°
1. Land reclamation works	12450	6900	-											
2. On-farm infrastructures	-	3000	1500	-										
3. Materials	-	1900	1250	-										
4. Personnel	-	350	400	→					350	→				
5. Management costs	-	550	1000	1100	→		3000	2350	1100	→		1950	→	
5.1 operating	-	(100)	(250)	(350)	→									
5.2 renewal	-					(-)	(1900)	(1250)	(-)	(-)	(-)	(850)	→	
5.3 maintenance	-	(450)	(750)	(750)	→									
6. Production costs	-	950	2900	3900	→									
7. Contingencies (b)	-	700	500	400	→		450	450	400	→		500	→	
Total (million So.Sh.)	12.5	13.9	7.6	5.8	5.8	5.8	7.7	7.1	5.8	→		6.7	→	
Investment costs (c) (million So.Sh)	12.5	12.3	3.0	-										
Management costs (c) (million So.Sh)	-	1.6	4.6	5.8	5.8	5.8	7.7	7.1	5.8	→		6.7	→	
Gross benefits (mill.So.Sh)	-	1.4	4.2	5.9	6.1	6.5	7.0	7.8	8.4	8.9	9.4	9.8	10.2	10.4
Net benefits (mill.So.Sh)	-12.5	-12.5	-3.4	-0.1	+0.3	+0.7	-0.7	+0.7	2.6	3.1	3.6	3.1	3.5	3.7
Internal rate of return :~ 8.1%														

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on costs under points 5.1., 5.2. and 6
(c) Including contingencies

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15° → 50°
1. Land reclamation works	25400	40100	24500	24500	24500	20500	9400	-									
2. On-farm infrastructures	-		10000	5000	5000	5000	3000	2500	-								
3. Materials	-		4800	4800	6600	6550	-										
4. Personnel	-		550	950	1350	1650	1900	2050	———				2000	1950	1900	1850	1800
5. Management costs	-	500	2300	3850	5750	7700	8750	14100	14450	16550	16700	10150	15800	———			
5.1 operating	-		(300)	(1000)	(1700)	(2400)	(3000)	(3400)	(3700)	(4000)	(4200)						
5.2 renewal	-						-	(4800)	(4800)	(6600)	(6550)	(-)	(5650)	———			
5.3 maintenance	-	(500)	(1800)	(2850)	(4050)	(5300)	(5750)	(5900)	(5950)	———							
6. Production costs	-		550	2500	4500	6500	8500	10500	12000	13000	14000	14500	14800	15100	———		
7. Contingencies (b)	-		1600	1300	1800	2050	1450	2100	2050	2350	2500	1850	2450	2500	———		
Total (million So.Sh.)	25.4	40.6	44.3	42.9	49.5	50.0	33.0	31.3	30.5	33.9	35.3	28.6	35.0	35.4	35.3	35.2	
Total investments (c) (million So.Sh)	25.4	40.1	40.8	35.3	37.3	33.2	12.7	2.8	-								
Total management costs (c) (million So.Sh)	-	0.5	3.5	7.6	12.2	16.8	20.3	28.5	30.5	33.9	35.3	28.6	35.0	35.4	35.3	35.2	———
Gross benefits (mill.So.Sh)	-	-	1.0	2.8	4.8	6.8	13.3	24.9	31.6	34.5	37.9	42.5	46.6	50.1	53.7	55.2	———
Net benefits (mill So.Sh)	-25.4	-40.6	-43.3	-40.1	-44.7	-43.2	-19.7	- 6.4	+ 1.1	0.6	2.6	13.9	11.6	14.7	18.4	20.3	———
							Internal rate of return : ~ 4.5%										

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on management costs under points 5.1, 5.2 and 6 - (c) Including contingencies

Table 2 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22° → 50°
1. Land reclamation works	13600	36100	47250	47250	47250	39300	39300	27850	15800	19750	19750	23700	23700	23700	23700	21950	-							
2. On-farm infrastructures	-		50000	33000	28000	23000	15000	15000	10000	10000	5000	5000	5000	5000	5000	-								
3. Materials	-		14000	10650	9000	9000	9000	5000	4300	———							3850	-						
4. Personnel	-		700	1050	1550	2150	2800	3400	4100	4800	5400	6000	6500	6750	7000	7250	7500	———				7400	7250	7000
5. Management costs	-	250	3200	3850	9700	12800	15700	32150	30650	30650	32300	34150	46050	43950	43950	45900	47600	57700	53750	52100	52100	51650	58000	———
5.1 operating	-		(800)	(1400)	(2600)	(3600)	(4600)	(5600)	(6300)	(7100)	(7850)	(8800)	(9750)	(10750)	(11450)	(12450)	(13400)	(13500)	(13600)	———				
5.2 renewal	-						(-)	(14000)	(10650)	(9000)	(9000)	(9000)	(19000)	(14950)	(13300)	(13300)	(13300)	(23300)	(19250)	(17600)	(17600)	(17150)	(23500)	———
5.3 maintenance	-	(250)	(2400)	(2450)	(7100)	(9200)	(11100)	(12550)	(13700)	(14550)	(15450)	(16350)	(17300)	(18250)	(19200)	(20150)	(20900)	———						
6. Production costs	-		2350	11200	20000	28800	36350	44600	51300	58450	64600	70500	75500	80300	84500	88600	91850	———						
7. Contingencies (b)	-		6700	5650	5950	6450	6500	8400	8250	8900	9100	9750	11350	11550	11850	11850	12250	12850	12450	12300	12300	12250	12900	———
8. Transformation costs (c)	-			-	5000	10000	15000	20000	25000	———				25150	25400	25700	25750	———						
Total (million So.Sh.)	13.6	36.4	124.2	112.7	126.5	131.5	139.6	156.4	149.4	161.9	165.5	178.4	197.4	200.7	205.7	205.6	188.8	195.7	191.3	189.5	189.5	188.9	195.8	195.5
Total investment costs (d) (million So.Sh)	13.6	36.1	117.6	95.3	88.0	74.5	65.7	49.8	31.5	35.5	30.0	33.9	33.9	33.9	33.9	26.7	4.2	-						
Total management costs (e) (million So.Sh)	-	0.3	6.6	17.4	38.5	57.0	73.9	106.6	117.9	126.4	135.5	144.5	163.5	166.8	171.8	178.9	184.6	195.7	191.3	189.5	189.5	188.9	195.8	195.5
Gross benefits (million So.Sh)	-	-	1.0	7.2	34.6	62.7	91.8	123.3	153.3	164.3	178.7	193.8	210.3	229.5	270.9	304.9	329.9	339.3	348.6	358.0	367.0	375.0	378.2	378.6
Net benefits (million So.Sh)	-13,6	-36,1	-116.6	-88.0	-91.9	-68.8	-47.8	-33.1	+ 3.9	2.4	13.2	15.4	12.9	28.8	65.2	99.3	141.1	143.6	157.3	168.5	177.5	186.1	182.4	183.1
									Internal rate of return :		~ 11.5%													

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on management costs under points 5.1, 5.2, and 6 - (c) Relating to sugar cane and paddy. - (d) Including contingencies (e) Including contingencies and industrial transformation costs

Table 3 S.F./ 5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18° → 50°
1. Land reclamation works	32550	83250	56700	53000	30200	30200	30200	30200	30200	30200	30200	-								
2. On-farm infrastructures	-		30000	25000	20000	20000	15000	10000	10000	5000	5000	5000	-							
3. Materials	-		8200	6150	6800	6650	6550	4650	4700	4400	4500	4450	-							
4. Personnel	-		1200	1600	2000	2500	3000	3600	4000	4400	5000	5400	———				5300	5200	5100	5000
5. Management costs	-	650	3650	6250	8650	10750	12850	23000	23150	25550	27250	29500	36900	35700	36350	36300	36150	39250	———	
5.1 operating	-		(500)	(1050)	(1500)	(2100)	(2750)	(3500)	(4500)	(5100)	(5950)	(7100)	(8150)	(8950)	(9250)	———				
5.2 renewal	-						(-)	(8200)	(6150)	(6800)	(6550)	(6550)	(12850)	(10850)	(11200)	(11150)	(11000)	(14100)	———	
5.3 maintenance	-	(650)	(3150)	(5200)	(7150)	(8650)	(10100)	(11300)	(12500)	(13650)	(14750)	(15850)	(15900)	———						
6. Production costs	-		1650	7050	14500	21000	27500	34950	40450	46950	56400	59600	63000	———						
7. Contingencies (b)	-		4050	3900	4300	5000	5200	6150	6600	6850	7850	8300	8400	8300	8350	8350	8350	8650	———	
8. Transformation costs (c)	-		300	950	1600	2750	3800	5000	6350	7800	9300	10800	11700	12400	12950	13450	13850	14050	14100	———
Total (million So.Sh.)	32.6	83.9	105.8	103.9	88.1	98.8	104.1	117.6	124.9	131.1	145.5	123.0	125.4	124.8	126.0	126.5	126.7	130.2	130.1	130.0
Total investments (d) (million So.Sh)	32.6	83.3	98.7	87.3	59.7	59.5	53.9	46.3	46.4	40.6	40.6	10.4	-							
Total management costs (e) (million So.Sh)	-	0.6	7.1	16.6	28.4	39.3	50.2	71.3	78.5	90.5	104.9	112.6	125.4	124.8	126.0	126.5	126.7	130.2	130.1	130.0
Gross benefits (million So.Sh)	-	-	5.4	17.4	33.8	51.9	71.9	94.4	120.2	148.3	177.1	205.9	227.6	241.0	252.9	262.1	270.5	272.7	275.5	———
Net benefits (mill So.Sh)	-32.6	-33.2	-100.4	-86.5	-54.3	-46.9	-32.2	-22.5	- 4.7	+17.2	31.6	82.9	102.2	116.2	126.9	135.6	143.8	142.5	145.4	145.5
								Internal rate of return : ~ 12.2%												

(a) Unless otherwise indicated - (b) Related to points 2,3,5.1, 5.2 and 6 - (c) Relating to paddy - (d) Including contingencies -(e) Including contingencies and industrial transformation costs

Table 5 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°→50°
1. Land reclamation works	45050	17500	24300	24300	-							
2. On-farm infrastructures	-	15000	-	8000	-	8000						
3. Materials	-	6300	4300	2250	-							
4. Personnel	-	600	800	1000	1100	1200	———				1150	1100
5. Management costs	-	1800	3000	3950	4800	5100	11500	8800	7600	5400	5400	8400
5.1 operating	-	(250)	(550)	(800)	(1050)	(1350)	(1400)	(1500)	(1550)	(1600)	→	→
5.2 renewal	-					-	(6300)	(3500)	(2250)	-	-	(3000)
5.3 maintenance	-	(1550)	(2450)	(3750)	(3750)	(3750	(3800)	→	→	→	→	→
6. Production costs	-	1000	4800	9750	11900	13250	14350	→	→	→	→	→
7. Contingencies (b)	-	2250	950	2100	1300	2250	2200	1950	1800	1600	1600	1900
Total (million (So.Sh.)	45.1	44.5	38.1	51.4	19.1	29.8	29.2	26.3	24.9	22.6	22.5	25.8
Investment costs (mill.So.Sh)	45.1	41.0	29.0	35.6	-	8.8	-					
Management costs (mill. So.Sh)	-	3.5	9.1	15.8	19.1	21.0	29.2	26.3	24.9	22.6	22.5	25.8
Gross benefits (mill.So.Sh)	-	0.9	5.5	13.8	18.4	23.2	24.6	28.9	31.0	33.9	35.7	37.8
Net benefits (mill.So.Sh)	- 45.1	-43.6	- 32.6	-37.6	- 0.7	-6.6	-4.6	+2.6	6.1	11.3	13.2	12.0
	Internal rate of return : ~ 5 %											

(a) Unless otherwise indicated - (b) Related to points 2,3,5.1.,5.2 and 6. - (c) Including contingencies

Table 6 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°→50°
1. Land reclamation works	15550	38800	27000	29600	24000	45000	46000	58000	35300	44000	-												
2. On-farm infrastructures	-		30000	26000	21000	16000	12000	10000	5000	5000	-												
3. Materials	-		3050	3850	5050	5400	6600	6700	4900	4550	4950	3000	3000	1650	-								
4. Personnel	-		500	600	1250	1600	2150	2750	3400	3700	4150	4150	4300	4500	→	→	→	→	4250	4000	→	→	→
5. Management costs	-	300	1550	3300	5200	7150	9000	14300	16650	20500	22000	25050	28500	27200	28850	29300	28500	31700	28850	32000	→	→	→
5.1 operating	-		(600)	(1200)	(1800)	(2400)	(3000)	(3550)	(4050)	(4550)	(4950)	(5150)	→	→	→	→	→	→	→	→	→	→	→
5.2 renewal	-						(-)	(3050)	(3350)	(5050)	(5400)	(6600)	(9750)	(8250)	(9900)	(10350)	(9600)	(12750)	(9900)	(13050)	→	→	→
5.3 maintenance	-	(300)	(950)	(2100)	(3400)	(4750)	(6000)	(7700)	(9250)	(10900)	(11650)	(13300)	(13600)	(13800)	→	→	→	→	→	→	→	→	→
6. Production costs	-		1000	3300	6350	10350	17550	25200	35500	38850	43050	48250	53100	57000	59950	→	→	→	→	→	→	→	→
7. Contingencies (b)	-		3.450	3.450	3400	3400	3900	4850	5300	5800	5850	6350	7150	7050	7500	7550	7450	7800	7500	7800	→	→	→
8. Transformation costs (c)	-					100	400	750	1250	1800	2500	2800	3200	3900	4450	4500	4900	5250	5500	5750	5900	5950	6000
Total (million So.Sh.)	15.6	39.1	66.5	70.1	66.3	89.0	97.6	122.6	107.3	124.2	82.5	89.6	99.3	101.4	105.2	105.8	105.3	109.2	106.0	109.5	109.6	109.7	109.8
Total investments (d) (million So.Sh)	15.6	38.8	63.3	62.4	52.7	68.5	66.5	76.4	46.2	54.5	5.4	3.3	3.3	1.8	-								
Total management costs (e) (million So.Sh)	-	0.3	3.2	7.7	13.6	20.5	31.1	46.2	61.1	69.7	77.1	86.3	96.0	99.6	105.2	105.8	105.3	109.2	106.0	109.5	109.6	109.7	109.8
Gross benefits (mill.So.Sh)	-	-	1.1	4.7	9.3	15.6	33.2	53.8	85.8	100.6	117.7	127.4	138.1	155.7	168.8	170.7	177.8	184.5	189.9	194.4	197.2	198.7	199.2
Net benefits (mill.So.Sh)	-15.6	-39.1	-65.4	-65.4	-57.0	-73.4	-64.4	-68.8	-21.5	-23.6	+35.2	37.8	38.8	54.3	63.6	64.9	72.5	75.3	83.9	84.9	87.6	89.0	89.4
	Internal rate of return : ~ 9%																						

(a) Unless otherwise indicated - (b) Related to points 2,3,5.1, 5.2 and 6 - (c) Relating to paddy - (d) Including contingencies - (e) Including contingencies and industrial transformation costs

Table 7 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°→50°
1. Land reclamation works	25350	48450	12830	16300	16800	15300	15750	-										
2. On-farm infrastructures	-		25900	20200	10500	6800	5500	4500	-									
3. Materials	-		3700	3600	5200	5200	4500	3500	800	500	800	500	-					
4. Personnel	-		650	1250	1550	1800	2000	2300	2500	2650	2800	→	→	→	→	2700	2600	2500
5. Management costs	-	500	2400	3600	4950	6500	7550	11950	12400	14500	14300	13750	16450	13650	15350	15250	14250	16350
5.1 operating	-		(350)	(750)	(1150)	(1750)	(2000)	(2550)	(2650)	(2700)	(2850)	(2950)	→	→	→	→	→	→
5.2 renewal	-						(-)	(3700)	(3600)	(5600)	(5200)	(4500)	(7200)	(4400)	(6100)	(6000)	(5000)	(7100)
5.3 maintenance	-	(500)	(2050)	(2850)	(3800)	(4750)	(5550)	(5700)	(6150)	(6200)	(6250)	(6300)	→	→	→	→	→	→
6. Production costs	-		2500	9300	15200	20500	25650	28650	29150	29550	30000	30500	→	→	→	→	→	→
7. Contingencies (b)	-		3250	3400	3200	3450	3750	4300	3600	3850	3900	3800	4050	3800	3950	3950	3850	4050
8. Transformation costs (c)	-			3100	7500	11800	16100	17150	20850	23100	26650	30950	31300	→	→	→	→	→
Total (million So.Sh.)	25.3	49.0	51.3	60.7	64.9	71.4	80.8	72.3	69.3	74.2	78.5	82.3	85.1	82.0	83.9	83.7	82.5	84.7
Total investments (d) (million So.Sh)	25.3	48.5	45.4	42.5	34.1	28.5	26.7	5.8	0.9	0.6	0.9	0.5	-					
Total management costs (e) (million So.Sh)	-	0.5	5.9	18.2	30.8	42.9	54.1	63.5	68.4	73.6	77.6	81.8	85.1	82.0	83.9	83.7	82.5	84 7
Gross benefits (mill.So.Sh)	-	-	1.0	9.8	21.0	37.9	57.0	74.7	85.2	99.5	114.2	130.2	133.8	135.7	136.5	140.5	143.5	→
Net benefits (mill.So.Sh)	-25.3	-49.0	-50.3	-50.9	-43.9	-33.5	-23.8	+2.4	15.9	25.3	35.7	47.9	48.7	53.7	52.6	56.8	61.0	58.8
	Internal rate of return : ~ 11%																	

(a) Unless otherwise indicated - (b) Related to points 2, 3, 5.1, 5.2 and 6 - (c) Relating to preparation of banan as - (d) Including contingencies
(e) Including contingencies and transformation costs

Contingencies costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°→50°
1. Land reclamation works	27300	67500	53500	57600	58850	34400	34050	23800	23800	22150	-									
2. On-farm infrastructures	-		45500	35100	31400	28950	23000	15950	10000	5050	5050	5000	-							
3. Materials	-		16800	12000	12000	7500	7000	5500	5000	5000	4000	2400	-							
4. Personnel	-		650	1300	2050	2600	4000	4750	5400	6050	6650	6900	→				6850	6700	6600	6500
5. Management costs	-	550	4000	7650	11050	13500	16700	27350	32100	30600	30450	30300	37950	40650	37550	32950	34600	40100	→	
5.1 operating	-		(450)	(1350)	(2050)	(3250)	(3750)	(4100)	(4600)	(5000)	(5500)	(5600)	(5800)	(5850)	→					
5.2 renewal	-							(8850)	(12000)	(9000)	(7450)	(6900)	(14300)	(16950)	(13350)	(9250)	(10900)	(16400)	→	
5.3 maintenance	-	(550)	(3550)	(6300)	(9000)	(10250)	(12950)	(14400)	(15500)	(16600)	(17500)	(17800)	(17850)	→						
6. Production costs	-		2500	10500	16000	23400	30400	38000	46000	52800	60000	65100	67500	→						
7. Contingencies (b)	-		6550	5900	6150	6300	6400	7250	7750	7650	8250	8500	8750	9050	8700	8250	8450	8950	→	
8. Transformation costs (c)	-			6450	20000	33600	47150	54300	66700	75150	83700	92250	93600	→						
Total (million So.Sh.)	27.3	68.0	129.5	136.5	157.5	150.3	168.7	176.9	196.8	204.5	198.1	210.5	214.7	217.7	214.2	209.2	211.0	216.8	216.8	216.6
Total investments (d) (million So.Sh.)	27.3	67.5	122.0	109.4	106.6	74.5	67.0	47.4	40.3	33.2	10.0	8.2	-							
Total management costs (e) (million So.Sh.)	-	0.5	7.5	27.1	50.9	75.8	101.7	129.5	156.5	171.3	188.1	202.3	214.7	217.7	214.2	209.2	211.0	216.8	216.8	216.6
Gross benefits	-	-	1.1	15.7	56.1	103.0	139.9	179.6	226.9	261.8	301.5	324.2	334.9	341.7	347.3	352.0	353.8	354.7		
Net benefits (mill	-27.3	-68.0	-128.4	-120.8	-101.4	-47.3	-28.8	+ 2.7	30.1	57.3	103.4	113.7	120.2	124.0	133.1	143.9	142.8	137.9	137.9	138.1
Internal rate of return : ~ 12.9%																				

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on management costs under points 5.1, 5.2 and 6 - (c) Relating to sugar cane and preparation of bananas - (d) Including contingencies - (e) Including contingencies and industrial transformation costs

Table 9 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	- 1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°→50°
1. Land reclamation works	35300	94800	47200	36450	18500	18450	17400	17400	10900	-								
2. On-farm infrastructures	-		36000	25000	15000	10000	-	10000	10000	10000	9000	-	10000	-	8000	-		
3. Materials	-		9050	6750	6950	2150	3000	1000	800	800	-	-	800	-				
4. Personnel	-		850	1600	2450	2300	3600	3950	4150	4350	4450	4600	4700	→				4400
5. Management costs	-	700	4950	6800	9050	10100	11100	17700	19050	19850	15250	16250	20550	21050	21350	15800	16650	20650
5.1 operating	-		(550)	(1300)	(1900)	(2200)	(2450)	(2550)	(2650)	(2750)	(2850)	(3000)	(3100)	(3100)	(3100)	(3150)	(3150)	→
5.2 renewal	-						(-)	(6050)	(6750)	(6950)	(2150)	(3000)	(7050)	(7550)	(7750)	(2150)	(3000)	(7000)
5.3 maintenance	-	(700)	(3500)	(5500)	(7150)	(7900)	(8650)	(9100)	(9650)	(10150)	(10230)	(10250)	(10400)	(10400)	(10500)	→		
6. Production costs	-		2900	9500	16350	21950	25750	27450	29150	31850	33850	34850	36000	36950	37900	38750	39500	→
7. Contingencies (b)	-		4850	4250	4000	3650	3100	4700	4950	5250	4800	4100	5700	4750	5700	4400	4550	4950
8. Transformation costs (c)	-			6450	20000	33600	47150	54300	66700	75150	83700	92250	93600	96450	100850	105050	109700	110750
Total (million So.Sh.)	35.3	95.5	104.9	96.8	92.3	102.2	111.1	136.5	145.7	147.3	151.0	152.1	161.4	163.9	178.5	168.7	175.1	180.3
Investments costs (d) (million So.Sh.)	35.3	94.8	96.8	71.4	42.6	31.8	20.7	29.5	22.8	11.9	9.9	-	11.9	-	8.8			
Management costs (e) (million So.Sh.)	-	0.7	8.1	25.4	49.7	70.4	90.4	107.0	122.9	135.4	141.1	152.1	149.5	163.9	169.7	168.7	175.1	180.3
Gross benefits (mill.So.Sh)	-		6.4	29.3	84.8	124.8	164.2	193.2	229.9	249.5	268.3	283.3	289.5	295.2	302.6	310.0	317.3	319.2
Net benefits (mill.So.Sh.)	-35.3	-95.5	-98.5	-67.5	- 7.5	+22.6	53.1	56.7	84.2	102.2	117.3	133.2	128.1	131.3	124.1	141.3	142.2	138.9
Internal rate of return : ~ 19%																		

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on management costs under points 5.1, 5.2 and 6 - (c) Relating to sugar cane and preparation of bananas - (d) Including contingencies - (e) Including contingencies and industrial transformation costs

Table 10 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°→50°
1. Land reclamation works	41650	37450	36500	36550	36550	-										
2. On-farm infrastructures	-	12000	8000	5000	5000	4000	2000	-								
3. Materials	-	6500	4000	3000	2500	2500	1000	-								
4. Personnel	-	700	1150	1550	2000	2450	2500	→					2400	2300	2200	2100	2000
5. Management costs	-	2000	3650	5000	6400	7800	14600	10700	10850	10900	10900	15900	12750	→			
5.1 operating	-	(500)	(900)	(1150)	(1500)	(1900)	(2050)	(2100)	(2250)	(2300)	→						
5.2 renewal	-					(-)	(6500)	(2500)	(2500)	(2500)	(2500)	(7500)	(4350)	→			
5.3 maintenance	-	(1500)	(2750)	(3850)	(4900)	(5900)	(6050)	(6100)	→								
6. Production costs	-	2350	6850	9900	13500	15000	16100	→									
7. Contingencies (b)	-	2150	1930	1900	2250	2350	2750	2050	2100	2100	2100	2600	2300	→			
Total (million So.Sh.)	41.7	63.1	62.1	62.9	68.2	34.1	39.0	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→		
Investment costs(c) (million So.Sh)	41.7	57.8	49.7	45.4	44.8	7.2	3.3	-									
Management costs (c) (million So.Sh)	-	5.3	12.4	17.5	23.4	26.9	35.7	31.4	31.5	31.6	31.6	37.0	33.5	33.3	→		
Gross benefits (mill.So.Sh)	-	3.3	8.8	14.1	21.7	29.1	33.9	37.1	40.6	44.3	47.3	49.7	51.3	52.1	52,3	→	
Net benefits (mill.So.Sh)	-41.7	-59.8	-53.3	-48.8	-46.5	-40.6	-5.1	+5.7	9.1	12.7	15.7	12,7	17.8	18.8	19.0	→	
Internal rate of return : ~ 4%																	

(a) Unless otherwise indicated - (b) Related to points 2, 3, 5.1., 5.2. and 6 - (c) Including contingencies

Table 11 S.F./5 - Investment and management costs ('000 So.Sh.) (a) and internal rate of return

	-1	0	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°→50°
1.Land reclamation works	22650	29500	29600	22250	22250	11800	11800	-						
2. On-farm infrastructures	-		22000	12000	8000	5000	5000	2000	2000	-				
3. Materials	-		2900	3400	5100	4900	3100	1550	-					
4. Personnel	-		900	1200	1500	1800	2000	→				1900	1800	1750
5. Management costs	-	900	1750	3400	5000	6500	7550	11150	11850	13750	13750	12050	13600	14350
5.1 operating	-		(400)	(900)	(1450)	(1900)	(2400)	(2650)	(2800)	(3000)	(3200)	(3300)	(3500)	→
5.2 renewal	-						(-)	(2900)	(3400)	(5100)	(4900)	(3100)	(4450)	(5200)
5.3 maintenance	-	(900)	(1350)	(2500)	(3550)	(4600)	(5150)	(5600)	(5650)	→				
6. Production costs	-		3650	12900	18600	23300	28050	33650	35100	→				
7. Contingencies (b)	-		2900	2900	3300	3500	3850	4300	4350	4300	4300	4150	4300	4400
8. Transformation costs (c)	-		100	250	5700	10700	15800	20900	25950	26000	26100	→		
Total (million So.Sh.)	22.7	30.4	63.8	58.3	69.4	67.5	77,1	75.5	81.2	81.1	81.2	79.3	80.9	81.7
Investment costs (d) (million So.Sh)	22.7	29.5	57.1	39.2	36.7	22.7	20.7	3.9	2.2	-				
Management costs (e) (million So.Sh)	-	0.9	6.7	19.1	32.7	44.8	56.4	71.6	79.0	81.1	81.2	79.3	80.9	81.7
Gross benefits (mill.So.Sh)	-	-	1.2	5.4	35.8	59.5	83.9	107.4	131.4	135.7	138.8	143.5	144.7	→
Net benefits (mill.So.Sh)	-22.7	-30.4	-62.6	-52.9	-33.6	- 8.0	6.8	31.9	50.2	54.6	57.6	64.2	63.8	63.0
Internal rate of return : ~ 16%														

(a) Unless otherwise indicated - (b) 10% on investments under points 2 and 3 and on management costs under points 5.1.,5.2. and 6
(c) Relating to sugar cane - (d) Including contingencies - (e) Including contingencies and industrial transformation costs

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