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(R) INDUSTRIAL MISSION TO THE SOUTHERN SUDAN*

SI/SUD/77/802

THE DEMOCRATIC REPUBLIC OF THE SUDAN

Addendum

Terminal Report

Prepared for the Government of the Democratic Republic of the Sudan

by the United Nations Industrial Development Organization,

executing agency for the United Nations Development Programme

Based on the work of an Industrial Survey Mission consisting of Stanislaw R. Gajowski, industrial planner and team leader, Ahmed A. Rasheed, agro-industry specialist, and Dina N. Saraf, small-scale industry specialist

United Nations Industrial Development Organization

Vienna

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1. INTRODUCTION

This annex covers general characteristics of the Southern Sudan, its area, population, resources infrastructural facilities as well as detailed information regarding specific industries and other aspects of the industrial survey in the terms of reference of the mission. General conclusions from this survey and recommendations are presented in the main part of the report.

2. BASIC INFORMATION ON THE SOUTHERN REGION

2.1. Area and Population

Sudan is the largest country of the African continent with an area of 2.5 m. sq. km. It is the nineth largest country in the world - a land of vast potential and great future promise. Its population, according to 1973 census, was 14.8 m. ; an estimate in 1977 places is at 16.4 m.

The Southern Region of the Sudan comprises of six provinces; East Equatoria, West Equatoria, Bahr El Ghazal, Upper Nile, El Buheyrat & Junglei. It covers an area of 648,051 sq. km with a population of nearly 3 million people in 1973, according to the census conducted in that year. The present estimate of the population is over 3.5 millions; nearer to 4 million, according to a report prepared by Mr. L. D. Mills (ILO).

The Southerners belong to an assortment of some 500 tribes and sub-tribes and who speak 80 dialects. They are African in culture while some are Christian in belief. The Dinka (population 1 million) is largest of the tribes in the South.

Of the total population of the Southern Region 4% are below the age of 15 years. The number of males and females seems to be balanced, on the whole. The 1973 population census estimated 30% of the total population of this region as economically active. (The economic activity, however, as defined by the census excluded most rural women). As regards the level of formal education it has been estimated that a little more than 10% of the total active population have attended school - even if only for one year at the most elementary level. Of the 80,000 who had received at least one year of formal education, most had left at primary level. Only 15,000 had passed through secondary education level, and only 4,300 had been to universities or some other centres of higher training.

The area covered by the Southern Region forms the major part of an irregular shaped basin with an elevated perimeter from which drainage lines descend to one outlet in the North - the White Nile, which with its tributaries, notably the Bahr El Ghazal and the Sobat rivers form a large river system in the Region. This system is important to the whole economy of the region.

2.2. Economy

The economy of the Sudan is based on agriculture which accounts for 40% of the GDP, 95% of exports and over 50% of Government revenues. The economy of the Southern Region too is predominantly agrarian - mainly one of subsistence agriculture. Over 90% of the Southerners reside in rural areas; 2/3rd of the rural population own some cattle in addition to their crop land. The pattern of activities range from almost complete reliance on animal husbandry and gathering of forest products are subsidiary economic activities. Development of a cash economy among people practicing the traditional economic activities of shifting cultivation and nomadic animal husbandry has been slow due to unsatisfactory communication facilities, poor marketing organization, shortage of capital and limited supply of labour. Intensity of crop production, except in government sponsored farms and in a few farms operated by private enterpreneurs is limited by the traditional cultivation by hand using a limited range of implements. The scale of operation is therefore often limited by the size of household since the household labour should clear the bush and heavy weed for cultivation and provide all the labour required for cultivation.

New social practices like establishment of urban centres as well as increasing educational facilities are slowly but affecting the traditional pattern of land use. The introduction of improved methods of cultivation like those in Northern areas, using irrigation and mechanisation has begun demostrating the possibilities of modernisation of traditional agricultural practice, which, however, by far and large persists strongly. The Southern provinces are the poorest in Sudan. The per capita income in this region is about half the national average, and perhaps only one quarter that of the more prosperous provinces of Kassala and Khartoum. The Southern Region is, indeed, different from the rest of the country, culturally, socially and economically. Here self contained tribal units with a structure and organization based on traditional African usage and belief are still dominant.

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2.3 RESOURCES

Land - 48,500 sq. km. out of a total area of 648,0,1 sq.km which constitutes the entire area of the Southern region is suitable for crop cultivation or as grazing land for livestock. More area will become cultivable with the Jonglei canal project. Much larger acreages than hitherto will be put under cotton, coffee, tea and tobacco and by the end of the plan period coffee will be grown on 8,500 acres, tea on 40,000 and tobacco on 45000. Mechanized cultivation of rice will be on 30,000 acres.

Water - Water is in abundance in the form of rivers, lakes, streams and underground water.

Forests - Roughly 80% of all the Sudan forests are in the South. About 49% of the Region's area is covered by forest vegetation of various types ranging from savannah woodlands and swamps in the North and Central zones to the gallery forests in the mountains and uplands. The total standing volume of forests and woodlands may be assumed today to be approximately 300 million m^3. (Forestry Development in the Southern Region, FAO 1978, DP/SUD/76/200)

Livestock - is reared by all household in the Region, except those in areas infected by tsetse flies. An IBRD economic Mission in 1975 place the total livestock population at 9.6 million heads as under :

	(million heads)
Cattle	5.1
Sheep	1.8
Goats	2.7

Fisheries - The total inland water surface of the Region is estmated at 2 million hectares. Production potential in the Region is estimated to be between 140,000 and 150,000 tons per annum.

Wildlife - Of great variety - elephants, rhinoceros, leopards, lions, gazelles, giraffes, hippopotamis, crocodiles, antelopes, zebras, buffalos and various types of birds, besides reptiles - constitutes an important national natural wealth of the Southern Region. It is the policy of the Regional Government to conserve this natural wealth for the benefit and enjoyment of all in accordance

with accepted principles of ecologically based management and ensure and encourage all forms of rational utilization of wildlife resources as a source of revenue and employment of the people. Presently ivory worth about £s150,000 per annum is sold annually, besides skins of various types for £s15 to 20,000.

Minerals - In 1976 a British Company together with the Regional Ministry of Commerce, Industry and Supply carried out a preliminary survey to establish priority areas. Based on the interpretation of satelite imagery and rapid field reconnaissance, the highest potential of various types of minerals and metals was in the Kapoeta district with about average potentials in the Torit and Juba districts, North of Kigille, east of Alfiji and in the area of high Qoz south - south east of Raga, adjacent to the Central African Empire border. However, exact area quantities will be known when exploration proceeds.

Oil - The announcement regarding availability of large oil quantities on a high commercial scale in Bentiu district by the Chevron Company (USA) which is prospecting oil in the area, is reported (Nile Mirror dated September 30th 1978) to have been made by Chevron Company in San Francisco USA, on September 26th, after a meeting with the President of the Republic Ga'far Mohamed Nimeiri, during his tour of the United States of America. The Chevron Company, according to the Sudan News Agency will spend $200 million in the prospecting operations. They would build a refinery and a pipeline from Bentiu to Port Sudan. With substantial quantities of oil the economy of the Sudan in general and the Southern Region, in particular, will receive a great boost.

2.4. Education

It was as late as 1942 that the Government opened the first ever public two year post-intermediate (Juba Training Centre) school, and 1944 when Primary schools were opened at Tonj and Awong, and in 1948 that Rumbek Senior Secondary school was opened.

Since the year 1972 - 73 the Regional Government is entrusted with the responsibility of provision, control and administration of primary, secondary senior secondary and teacher training education within the overall national education policy.

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The number of students in 1975 - 76 is given as under :

	1975 - 76	
	Boys	Girls
• Primary Schools	72181	24938
• Junior Secondary Sch.	8824	2388
• Senior Secondary Sch.	3140	2035

NOTE : 50,000 children in private schools.

In Primary level, besides Government schools there are a number of Government aided Self help schools, and self-help schools totally supported by the local parents councils. All Junior level schools are Government supported with the exception of one in Torit and one in Wau which are partly supported by the Catholic Church as Junior Seminaries. All Senior level education is Government supported there being three types of establishments - Academic Senior Schools, Technical Senior Schools and Primary Teacher Training in Wau (supported totally by the Catholic Church).

The number of schools of various types are as follows:-

a) 9 Senior Secondary Schools - (Academic)
b) 5 Primary Teachers Training Colleges.
c) 3 Senior Technical Schools

Tertiary (University) Education

So far, the Universities of Khartoum, Omdurman, Cairo (Khartoum Branch) and other higher national and international institutions have been supplying the economy with high level manpower.

Recently the University of Juba has been opened in the Southern Region. It starts with three main colleges: Natural Resources and Environmental studies; Economic and Social studies and Education and Adult Education and Training.

The College of Natural Resources will cover specialized courses in General Science, Agriculture, Forestry, Fisheries, Wildlife management and Veterinary Science while Mining and Geology shall be added later.

The college of economic and social studies is to run courses in Mathematics and humanities, history, languages, social studies and science subjects.

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The college of education's functions include training of teachers for the Sudanese school system - 4 year's degree course - for senior secondary teachers, at the same college of adult education shall offer certificate courses in adult education and business management subject.

2.5. Regional Government and its Budget

The Southern Regional Government and the High Executive Council were formed in early 1972. There is People's Regional Assembly with 110 members.

The President of High Executive Council is assisted by Ministers, heading various Ministries, besides a Minister for High Executive Council Affairs.

There are at present 14 Ministries:

- Provincial and Local Administrations, Police and Prisons
- Finance and Economic Planning
- Cooperative and Rural Development
- Commerce, Industry and Supply
- Agriculture, Animal Production, Forestry and Irrigation
- Housing and Public Utilities
- Public Service and Administrative Reform
- Communication, Transport and Roads
- Education
- Youth and Sports
- Legal Affairs
- Information and Culture
- Health and Social Welfare
- Wildlife Conservation and Tourism.

Each Ministry has a Director as the Chief Executive. He is assisted by one or more Deputy Directors and Assistant Directors. Each Department has also Senior Inspectors and Inspectors.

The Region has 6 Provinces which now comprise of 51 districts. Each province has a Commissioner (of the rank of a Minister) appointed by the President of the High Executive Council. He is assisted by an Executive Director and Assistant Commissioners heading groups of districts under him.

Each Province also has Senior officers of various Departments such as Health, Education, Agriculture, Forestry, Veterinary seconded by the Regional Ministeries who together with some nominated public representatives constitute

people's Executive Council, presided by the Commissioner. Each of the Six councils have about 30 members including ex-official government officers. Each council has its expenditure and revenue budget.

Each district has an Inspector of Local Government, and Executive officer. There is a Local council for the district, with 24 or more members, including officials and non-official elected members. Down the line there are village council, some Urban councils (Juba, Wau, Malakal and Yambio). The concept of area councils is also developing.

At the provincial level, two Provinces - Bahr El Ghazal and Upper Nile each have a department of Commerce, Industry and Supply, while in other Provinces this work is handled by a Section of Administration Department. However, their major attention and time goes to matters connected with 'supply'. It is suggested that in order first to create climate and facilities for development of cottage and small scale industries, each province may have a small but live Industry Department. Bright graduates one each from the province may be trained in the country and abroad as future Industries officers in the Provinces.

BUDGET: The Regional Government has its expenditure budget comprising chapters:

I Personnel II Services III Stores and equipment

Their expenditure and revenue budget for 1978 - 79 as reported in the 6-yr Development Plan £s37.4 million and £s16.4 million respectively. The difference is covered by the Central Government. Each Provincial Council, as stated above, has its own budget. The overall deficit in their expenditure and income is met from the Regional Government Budget, as 'Transfers to Provincial Governments'. For instance, in the budget of 1978-79 a provision of about £s9.3 million is made for it.

There is a separate Development Budget drawn by the Regional Government every year. For first year of the Six Year Plan the provision was £s32.5 million against which the actual expenditure for the year may come to about £s8 million. For the year 1978-79 the provision is £s22.50 million, but the amount was reduced to £s 15 million. The correct figure should be 10,1 million as pointed out by the Ministry of Administration. The position of money resources in the country generally and the Southern Region particularly is rather weak.

The whole of the Regional Development budget, except for a small national contribution by the Regional Government, is financed by the Central Government

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2.6. The Six-Year Plan of Economic and Social Development - 1977/78 - 1982/83.

While 1970 - 75 Plan of the Democratic Republic of the Sudan achieved a growth rate of 4 to 5% with a total investment of £s385m, the Six Year Plan - 1977/78 - 1982/83 aims at a growth rate of 7.5% a year, and envisaged a total investment of £s2675m - 1570m in Public sector and 1100m in private sector. This investment will be financed 48% from domestic resources and 52% by external resources.

The growth of 7.5% is ahead of the World Bank projections of 5.5% and could well be too ambitious in view of transport and communication bottleneck which affects all Sudanese projects. And the projects themselves are often delayed in implementation because they place such strains on available planning capacity, management and technical expertise.

The country has 18 years prospective plan - 1977/78 - 1994/95 - the main objectives of this plan are:

To lift the economy from the preconditions of take-off to the stage of self sustained growth and to achieve a regionally balanced, self reliant and accelerated economic development that would triple real per capita income by 1955.

The contribution of 'manufacturing and mining' in the GDP is expected to rise from 9.5 (1976-77) to 15.5% in 1994-95.

The document on the prospective plan admits that 'only the fullest mobilization of people and institutions to speed up the harnessing and optimum use of the abundant physical resources of the country would make them (the objectives) concrete realities.

The Six Year Plan 1977/78 - 1982/83 is the first phase of the prospective plan extending over eighteen years. Among its main features are:

- Concentration on agriculture as the key sector for future development; the development and modernisation of the traditional agricultural sector.
- Development of industry to complement agriculture, emphasising agro-industries and food processing.
- Expansion of basic infrastructure in transport, communications, power, marketing and storage.
- Encouragement of the private sector, both local and foreign.
- Central development planning based firmly on regional planning to reflect the potential and needs of each region.

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The plan envisages the investment in various sectors as under:

30% for agriculture
26% for industry and mining
28% for transport
16% for services.

£s425m is earmarked for regional investment, with £s180m going to the Southern Region.

Foreign Financial Assistance

The Kuwait based Arab Fund for Economic and Social Development (AFESD) has chosen the Sudan - because of the size of the country's untapped natural resources - as the first country to benefit from a new financing policy emphasising coordinated investment in both straight commercial and infrastructure projects. The AFESD decision follows a series of studies.

AFESD prepared a ten year basic agricultural development programme. As an institutional framework, the Arab Authority for Agricultural Investments and Development (AAAID) was set up in Khartoum in November 1976. The basic programme includes some 100 projects in agriculture and agroindustries, transport, water, electricity and supporting services, with an investment of about £s2,200 million, over 25 years. This comprises three types of projects.

- 31 commercially viable projects suitable for joint Sudanese and non-Sudanese financing, costing (46% of the total) £s1,043.
- 25 projects aimed at developing and modernizing traditional agricultural and agroindustries - £s573 (25% of the total)
- 44 Projects connected with infrastructure and services necessary to productive projects (29% of the total) - £s671

The investment envisaged in the Six Year Plan is £s375m. Besides, a number of Arab countries individually have been helpful; Saudi Arabia has been Sudan's major source of financial assistance.

Assistance is also flowing from many other countries as bilateral sources, and the multilateral sources like the World Bank, UNDP, ILO, FAO, UNICEF, WHO, etc.

A number of voluntry agencies are also in the field.

THE SOUTHERN REGION SIX YEAR PLAN - 1977/78 - 1982/83-

The six Year plan of Economic and Social Development for the Southern Region forms an integral, complementary part of the National Six Year Plan. The Regional Plan excludes programmes and projects which will be directly implemented by the Central Government in the Southern Region, also development programmes and projects of the parastatal organisation in the Region, as well as the private sector.

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The projected rate of growth is 4.5 to 7%, against 7.5% for the National Plan.

The objectives of the Six Year Plan are a part of the long term strategy of development which postulates mainly:

- maximising of resource utilisation in the production of both commodities and services;
- mobilising and utilising internal resources, including labour force to the maximum, eliminating the heavy dependence of the Region on external assistance in development efforts, in as short a time as possible;
- establishing economic organization in line with the socio-economic requirements and political philosophy of the country, namely to achieve the aims of socialism.

The strategy of develoment has presumed the need for strengthening the organization of production and management in all sectors of activity and has consequently recognized the need for giving due importance of private sectors' role in regional development, cooperative movement will be expanded, especially for accelerating integrated rural development.

Highest priority is given to development of agriculture, animal production, forestry and fisheries. The plan also gives top priority to the development of transport and communication facilities in the Region, since this is the essential pre-condition for the development of all other sectors, including agriculture.

The Six Year Development Plan incorporates projects requiring a total outlay of £s.288, 267, 874. This investment is proposed to be financed through:

A. Regional resources: £S231,310,000 (including Central)

B. Central Government contribution £s 35,872,154 (of £s180m.) (Govt. subvention)

C. External assistance 21,085,720

The total plan allocation for all Ministeries is £s231, 310,000-

Since 1977-78 represents the first year of the plan, it would be interesting to review the allocation and expenditure :

Approved allocation 1977-78	£s.32,490,000
Expenditure upto May 78 (including unallocated to Ministries)	5,687.119 (17.5% of the total)

(NOTE: The Financial Year Closes in July).

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The proposed allocation for 1978-79 is £s22,500,000 divided in sectors as:

Agriculture	2,5:3,124
Industry	4,0:7,017
Transport	2,143,330
Services	13,806,529

External assistance is also being received by the Southern Region from the multilateral, bilateral sources and voluntary organisations. Besides, the assistance of about £s5.65million in cost and materials, for reconstruction, resettlement and rehabiliatation purposes (M. '72 to April '74), a number of agencies have their planned activities in the socio-economic developmet of the Region running into the current six Year Plan period.

The total credit of £s21,085,720 taken as assistance from external resources is made up of the following components:

i) International Organizations	£s 14,312,751
ii) Bilateral assistance	3,845,000
iii) Voluntary organizations	2,927,969

The assistance from these sources is commited to specific projects. Implementation has already started on most of these projects, but will continue into the Plan period. In many cases the implementation will be completed within first two years of the plan period. Even though additional assistance from all three sources is likely to be available, no estimates of these are made for in the Plan. Any amounts received will be included in the respective annual plans.

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3. INFRASTRUCTURE

3.1. Energy and Water supply

Public Utilities

The Department of Public Utilities, Regional Ministry of Housing and Public Utilities supervises and coordinates water and electric services provided by the Central Electricity and Water Corporation (CEWC). It is also responsible for the development of electricity and water services in the major towns of the region.

3.1.1. Electric Power Supply

The main source of electricity in the Southern Region has been generated through thermal power plants with the exception of a small hydroelectric generating plant at Katire which is used to power the sawmill there. Meanwhile, there are no rural electricity supply installations in the Region. The systems at Juba, Wau and Malakal are overloaded and require expantion in both generating and distributing capacities. The installed capacities and number of units in the above-mentioned towns are as follows:

Location	No. Units	Capacity (KW)
Juba	8	920
Wau	6	600
Malakal	5	840

According to official information, new generating units have been installed in Rumbek, Yambio and Bor the three new provincial towns in the Region. The Ministry also plans to expand the capacity at the old installations.

Development Prospects

The sum of Ls.315,000 has been allocated by the Regional Government for implementation of projects for the improvement of electric power supply where old installations are located in addition to supplying of electric power to Yambio, Bor and Rumbek. It is also proposed to install two additional power stations: one at Renk (450 KVA) and another at Aweil (500 KVA) within the six year Plan period.

Central Government allocations for project implementation in the Southern Region provide for the expansion of the Juba power station, to be financed from a loan from the World Bank, and an increase in the Capacity of the Malakal power station.

Another project under consideration is the Bedden Rapids Dam (Bahr el Jebel) to be constructed in two phases: phase one, which is estimated to cost about Ls4,170,000 will generate 5 megawatt and will be located 35 km upstream of Juba town. The second phase which will consist of increasing the height of the dam, so as to control the torrential higher flows, will also increase power generating capacity to 15 megawatt.

The provision of hydroelectric power, if economically feasible, would alleviate some of the constraints, namely fuel shortages, and curtail the uncontrolled exploitation of forests for fire wood, used as fuel in many traditional industries (bakeries, oil extraction), as well as in some industrial establishments utilizing locomobile steam engines (Nzara oil mill, furniture factory number 1 in Juba).

Consideration may be given to investigating wind power for small scale electricity power units in rural areas with the assistance of ITDG (UK) or ATDA (India) in cooperation with WMO of the United Nations.

3.1.2. Water Supply

The Regional Ministry of Housing and Public Utilities is responsible for supplying good drinking water to 23 towns designated as urban centres. In 1974, only Juba, Wau and Malakal had some piped drinking water. New water plants have been installed in Bor and Yei.

Providing good drinking water in rural areas is the responsibility of the Rural Water Department, Regional Ministry of Cooperatives and Rural Development. Several bore-wells have already been dug by the said Department with the assistance of voluntary agencies such as LWF, NCR/SP and SCC. A project for rural water supply was just completed by WHO (SUD/75/013), while a similar project in WAU by UNICEF (Special Assistance) will continue through 1978/79. Total cost of each project amounted to Ls.29,087 and Ls.646,000, respectively. A SIDA-funded UNDP project for establishment of water supply programme in the Southern Region was initiated in 1976/77 and will continue through 1978/79 at a total cost of Ls.70,194.

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Development Prospects

The Regional Government has allocated the sum of LS. 45,000 for implementation of the following projects within the Six Year Development Plan period:

- Increasing the capacities of the water treatment plants in the towns of Juba, Wau, Malakal, Torit, Yei, Maridi and Renk.
- Installation of water treatment plants and distribution systems in Yambio, Rumbek and Bor which have become provincial headquarters.
- Centrally-supplied water systems have been proposed for the district towns of Aweil, Kapoeta, Torit, Tonj, Bentiu and Akobo.

No allocations have been made for water development in the Southern Region in the Six Year National Development Plan.

It should be brought to the attention of the responsible authorities that no mention was made of including such potential industrial centres as Mongalla and Melut among areas to be supplied with water systems. Apart from the water systems to be provided for the factories, the anticipated community development around those large scale industries would warrent immediate attention in this important public service.

3.2. TRANSPORT AND COMMUNICATIONS

3.2.1. Road Transport

The Regional Ministry of Communications, Transport and Roads is responsible for the construction and maintenance of trunk roads. The Ministry also supervises work carried out by foreign companies and maintenance work of secondary and feeder roads by rural communities. The Ministry maintains road repair camps every 6-10 miles on the main routes, however, road maintenance is normally carried out at the beginning of the dry season.

According to 1975/76 Statistical Year Book, Department of Statistics, Ministry of National Planning (1978), there are no paved roads in the Southern Region, only 2300 km of gravel roads and 4390 Km of earth tracks. Information received from the Regional Government indicates that all roads in the Upper Nile Province are seasonal (Example, Malakal/Renk), while those in Bahr El Ghazal, Eastern and Western Equatoria Provinces are considered all season roads. Among the major problems responsible for delays in road improvement and maintenance by the Regional government are shortage of fuel lack of adequate road equipment and machinery and difficulties in obtaining spare parts.

Develo ent Prospects

Several projects for improvement of roads in the Southern Region are being financed through for ign loans and are carried out by foreign companies with most of construction and maintenance operations being conducted during the dry season specially when some roa portions are under water (Shambe/Yirol). Following is a list of road construction and/or, improvement projects:

1- Juba/Nimule road, covering a distance of 120 miles, financed by the Dutch Government; about 55 miles have been completed from Nimule end.

2- Juba/Mongalla, to be made into an all-season road about 35 miles long, is also financed by the Dutch Government, and is carried out by De Groot (constractors for ILACO consultants). The project was begun at the end of 1976 and covers a period of 2½ years.

3- Mongalla/Bor: this portion will be undertaken by the same company working on the Juba/Nimule road when the latter is completed, and also when the rainy season is over.

4- Juba/Torit/Kapoeta with a combined distance of 199 miles (84+115) will undergo improvement as follows: the Juba/Torit portion will be improved by the Regional Government while the Torit/Kapoeta portion is receiving some assistance fro. NCR; in addition, several feeder roads are receiving assistance from the Norwegian Church Relief Sudan Program.

5- JUBA/Torit/Ishukio (on the Kenyan border): by by-passing Kapoeta, a direct route from Juba to Ishuki via Torit would reduce the distance to the Kenyan border to 120 miles instead of 259 miles (Juba/Torit/Kapoeta then to Kenyan border). A Norwegian company, NORAT is at present conducting a feasibility study regarding the proposed short-cut.

6- Juba/Meridi/Wau road covering a combined distance of 643 miles (243+400) is being financed by a West German loan. The project began in 1976 but was discontinued for 8-months due to "Marble disease" incident. The project covers a period of 2½ years and already about 69 miles have been completed on the Juba/meridi Portion.

7- Juba/Yambio/Nzara, covering a distance of 352 miles is also included in the German Assistance progra with the first phase costing D.M. 10 million.

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8- Nzara/Wau, covering a distance of 315 miles is also included in the improvement program to be financed by the German loan.

9- Shambe/Yirol/Rumbek/Tonj/Wau (El Buheyrat Province), with a combined distance of 241 miles (33+70+75+63) is a Central Government project which faces such problems as fuel shortages, lack of equipment and spare parts. Meanwhile, construction and maintenance operations are suspended during the wet rainy season when certain sections become under water. The Juba/Yirol portion, however is under Regional Government jurisdiction.

Regional government allocations for road construction and improvement in the Six Year Developmet Plan can be summarized in the following table:

PROJECT	RESOURCES	
	Regional	Foreign
Juba - Bor road (127 miles)	Ls. 500,000	Ls.14,500,000
Torit - Kenya border road (120 miles)	413,000	1,700,000
Shambe - Rumbek - Wau road (275 miles)	2,003,000	
Bor - Malakal road (260 miles)	5,120,000	
Bor - Pibor road (125 miles)	750,000	
Upgrading Lainya - Yei road part of Juba-Yei road)	312,000	
Mundri - Nvolo - Rumbek road (152 miles)	1,429,000	
Wau - Gogrial-Wunrok - Akyei road (260 miles)	480,000	
Wunrok - Abiemhom - Bentiu road (150 miles)	480,000	
Malakal - Renk road (204 miles)	1,226,779	
Paloich - Maban - Jokou road (210 miles)	1,260,000	
Amadi - Terekaka road (112 miles)	702,000	

In connection with the road improvement program the Regional government is embarking on a program for the construction and/or, repair of some damaged and inadequate short span bridges on all roads within the Region. Examples: Baily bridge over river Kit; Pongo bridge at Malek, river Lol bridge (Wunrok); Mussere bridge; Khor-Adar bridge; Khor Fulus bridge; and Payii river bridge. Other ancillary projects related to road maintenance, road equipment repairs and workshops have also been included for implementation within the Plan period.

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The completion of all afore-mentioned road construction and improvement projects along with the implementation of a maintenance program to keep most truck and feeder road open for traffic would undoubtedly have a positive impact on the economical, social and industrial development of the Region. This would be more evident in the case of interdependent projects with examples given in another section . Meanwhile, for the proper implementation of such large scale road improvement program adequate training will be required for all categories of personnel involved in the various aspects of the project when the required numbers are recruited, at present a serious constraint.

3.2.2. River Transport

The River Transport Corporation, a state owned organization administered as a Public Corporation is solely responsible for passengers and cargo river transport throughout the country. At present, services are far below existing demand (in the case of dura, capacity is about 1/4 the demand).

There is more cargo going upstream(about 90%) such as dura, petroleum products, edible oils, building materials, cement, iron etc., than that going downstream (about 10%) such as coffee, tea, wood, being more of a oneway traffic. Originally, trips upstream required 9 days compared to 7 days downstream, however, at present about 15 and 12 days are necessary, respectively. Traffic is continuous all year.

In the Southern Region storage facilities and river transport berths are available in two locations:

- Malakal: with 2 storage facilities (total capacity 50 tons), and berth capacity for 1 steamer and 5 barges.
- Juba: with 2 storage facilities (total capacity 200 tons), open-air storage space (capacity 1500 tons), and berth capacity for 1 steamer and 5 barges. There is also an oil station with berth space for 2 barges.

Number of passengers on the Southern reach was 216,268 for the year 1975/76 according to the statistical year book (1978), and the number is increasing. It can be said that river transport is the main means of transport between the Southern Region and Central Sudan and in some places it is the only means of transport.

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Constraints:

- Some boats are quite old and date back to 1930
- Spare parts are unavailable or hard to obtain.
- Slow speed of craft and lack of communication facilities on board.
- Inefficiency of workshops.
- Heavy maintenance can only be done in Khartoum, while light maintenance can be carried out in Kosti. No maintenance facilties are available at present in the Southern Region.

Due to lack of proper handling facilities, inadequate harbours and shortage of crafts, the existing capacity is limited to 120,000 tons per year, according to a report by the River Transport Corporation. The estimated, demand, however, is approximately 400,000 tons for the Southern Reach: Kosti/Juba, about 1436 km.

With all present and future development programs, both agricultural and industrial, in the Southern Region, there will be a heavier demand on river transport than at present. This would necessitate improvement of present port facilities at Juba and Malakal and the establishment of permanent or floating harbours in various locations along the river for loading or unloading of cargo. Storage facilities will be required at the new harbour sites & well equipped maintenance workshops in Juba and other strategic locations which should also be properly equipped with communication facilities for emergencies.

Development Prospects

During 1978/79, the River Transport Corporation expects to accomplish the following:

- Operate 4 new passenger boats, each with a capacity of 272 passengers
- Convert 4 cargo barges into fuel oil barges each with 120 tons capacity
- Convert 10 cargo barges into self-propelled barges
- The sum of Le 1.5 million has been allocated for the purchase of spare parts and rehabilitation of old boats.

If the West German Government DM22.5 million loan/grant/aid package deal goes through the River Transport Corporation would be in a position to scrap most of the old fleet and replace it with some new units comprising self-propelled barges, cargo barges, tugboats, flat barges, oil barges, floating docks and inspection boats.

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Negotiations are also in progress for a 4.5 billion Yen Japanese loan which could provide some additional self-propelled cargo barges, cranes as well as dredging and lifting equipment.

Central Government allocations for River Transport projects in the Southern Region for implementation during the National Six Year Plan amount to Ls.4.9 million. This would cover the purchase of passenger ships, pusher tugs and various types of barges. Allocations by the Regional Government for the Plan period amount to Ls.2,571,934.

There is no doubt that implementation of the above-mentioned programs for the rehabilitation of the River Transport system would be a substansive asset to the development of the Southern Region which has suffered tremendously from transport bottlenecks including delays in delivery, damage to equipment from improper handling and poor storage facilties among other things. The completion of the Jonglei Canal project will improve this means of transport by reducing travel time in both directions and by-pass hyacinth-conjested areas. However, this will require improvement in all supporting systems: maintenance, workshops, proper and adequate storage and handling facilties for freight, loading and unloading harbour facilties and proper communication facilities. This will necessitate the training of personnel in all aspects related to the various operational activities of a harbour with all its ancillary department and supporting systems.

3.2.3. Rail Transport

The rail transport network is a single line system with a 3' 6" gauge covering 5,493 route Km. It is state owned and is run by the Sudan Railway Corporation.

In the Southern Region the present railway line connects Wau and Aweil in Bahr el Ghazal Province with Babanusa in Southern Kordofan and from there to various parts of the Northern Region. Commodities shipped by rail from Port Sudan to Wau via Haiya, Kassala, Sennar, El Obeid and Babanusa cover a distance of 2,158 km. Commodities shipped by rail from Khartoum to Wau via Sennar, Kosti, El Obeid and Babanusa cover a distance of 1,423 km. Travelling time according to schedule is about 67 hours and 40 minutes from Khartoum to Wau. However, according to Transport Statistical Bulletin of 1976, average actual time for that trip came to 132 hours.

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From the same report, the cost of shipping a full wagon of rice from Aweil to Port Sudan came to L.615, for a distance of 1565 km.

It has been reported (Six Year Regional Paln) that poor storage facilities in Wau prevent the efficient operations of the line and smooth distibution of goods from Wau to other parts of the Region. This fact can be substantiated by the condition of machinery and other materials intended for such projects as Tonj Kenaf and Lulu nut Oil mill for Wau.

Development Prospects

There is no reference in either the National or Regional Six Year Developments Plans to any projects for the improvement and/or, development of the railway transport service in the Southern Region.

Until river and road transport systems are improved to the point they could handle the bulk of inter-regional freight, it is felt that some consideration in the perspective plans of the railway system might be given to the establishment of railway lines to connect Bahr El Ghazal Province with Western Equatoria as well as some line in Eastern Equatoria

It is felt that a feasibility study for some railway lines in areas with agricultural and industrial potential in the Southern Region may prove that additional and more economical routes may be plausible with possible connections with some neighboring countries, i.e. Zaire, Uganda and Kenya.

3.2.4. Air Transport

Sudan Airways with a fleet of about ten planes (2 Boeing 707, 2 Boeing 737 and 6 Fokkers) handles all domestic scheduled flights. Several unscheduled charter planes operate in the country, including the Southern Region. Air service in the Southern Region is as follows:

a) Khartoum/Juba/Khartoum, 6 days/week excluding Sundays
b) Khartoum/Malakal/Juba/Malakal/Khartoum, twice a week
c) Khartoum/Wau/Juba/Wau/Khartoum, twice a week

Shortage of fuel often interruptsthe above schedules, consequently priority is given to passengers over air cargo which suffers, accordingly.

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Existing Conditions in the Southern Region:

At present, only Juba airport (with one runway, covered with bitumen) can handle B-737 aircraft. Both Malakal (with two runways, asphalt pavement) and Wau (one runway, gravel runway) airports handle F-27 with the former airport also capable of handling DC-6 aircraft. In addition to these three major airports, there are about 21 landing strips which are used for unscheduled flights, mostly by small aircraft.

The three major airports provide air service only during the daytime due to lack of proper communication equipment and navigational aids and instruments. At present, non of these three airports have suitable airstrips to accomodate B-707's.

Major constraints at most Southern Region airports are: irregular supply of fuel, minimum, if any, storage facilities for handling airfreight, and as in the case of Wau airport, parts of the runway may become waterlogged after heavy rains. Juba town suffers mostly from interrupted scheduled flights when there is shortage of fuel.

Due to difficulties in other means of transportation, including; long travelling distances (roads, river and rail), seasonality of main trunk roads, poor facilities there is a high and promising demand for cargo air-freight. Present conditions allow for the air transport of 12 tons of cargo (6 tons each way, Khartoum/Juba - Juba/Khartoum), per week. This capacity covers only about 50% of the demand for cargo airfreight. The demand for cargo airfreight from Juba to Wau and from Juba to Malakal is much lower, about 50-100 kg. probably because of the lower cargo space on the scheduled Fokker-27 flights, which would discourage potential shippers. Main commodities shipped from Juba to Khartoum include: tea, coffee (imported from Uganda), bananas, pineapples, mangoes, oranges and grapefruit. These shipments from Khartoum to Juba are mostly commercial cargo such as clothes, textiles, chemicals and all other goods for trade in Juba. Cost of cargo airfreight is relatively low amounting to 20-pt/kg for one shipment exceeding 45-kg (26-pt/kg for shipment less than 45-kg). Special reduced rates are offered for tea and coffee shipments at 8-pt/Kg for minimum quantities of 500-kg. The degree of utilisation of air transport for cargo is, at present, negligible in proportion of the freight traffic in the Southern Region because of low carrying capacity of airplanes, inadequate freight handling and storage facilities and irregularity of scheduled flights.

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Development Prospects

The Six Year National Development Plan provides for the development of Juba, Wau and Malakal airports at a total cost of Ls.19,597,036. About US$29 million is expected to be provided by IDA/WB to improve Malakal airport and to construct a new one at Wau. A grant from EEC amounting to 16 million units of account (equivalent to US$18 million) will be used to finance the improvement of Juba airport. In the latter case, tenders are expected to be awarded by May 1979 with start of construction around August 1979 and expected completion by the end of 1980. It is expected that the local component will amount to 25% of total cost. Following the above-mentioned improvements, the three major provincial airports would be equiped to to handle B-707 and will be considered international airports with navigational aids to handle night flights when necessary.

Plans by the Civil Aviation Department include, expansion of freight handling and storage facilities at major airports; improvement of Port Sudan airport construction of airports in such provincial capitals as Bor, Rumbek, Torit and Nzara.

A helicopter feeder service, using 44-passenger Chinooks, is also being considered for the Southern Region in provincial towns with no regular landing strips even for light aircraft.

The Six Year Development Plan of the Southern Region provides for the development of a regional feeder airline based on a market survey conducted by Sudan Airways which proved feasible. The project would provide air connections between provincial capitals and districts not serviced at present by Sudan Airways. The sum of Ls.5,986.252 has been allocated for implementation of the project within the plan period.

If the above-mentioned development plans can be successfully implemented and financial assistance provided, it will significantly improve that particular component of transport systems between the Northern and Southern Regions as well as within the Southern Region. Such plans would contribute significantly to the economic development of the Region and help the industrial sector, for example, by speeding up delivery of urgently needed spare parts and machinery as well as transport of various valuable commodities.

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Since such improvement are of a long term nature, their results can only be expected by the end of the Six Year Development Plan. Until such development plans are completed, the services of charter planes will remain indispensable.

3.2.5. Post and Telecommunications Services

Postal services in the Southern Region are run by the Posts and Telecommunications unit, Central Government. There are three first class post offices in Juba, Wau and Malakal. There are also twenty five circular offices with postal and telecommunications activities throughout the region. Distribution of mail suffers from lack of vehicles, fuel and scarcity of servicing units.

The telephone system is poorly developed in the region and exists only in Juba, Wau and Malakal with authomatic exchanges in the first two towns with respective capacities of 1200 and 600 connections. However, only 400 telephones are working due to lack of underground cables while half of Wau's capacity is being used (Regional Six Year Plan)

Juba is provided with telex service and one wireless line to Khartoum which has not functioned satisfactorily. In addition, there are 20 radiotelephone stations throughout the region.

Development Prospects

Central Government projects for implementation in the Southern Region during the Six Year Plan period (1977/78-1982/83) in the area of telecommunications include the following:

- SUDOSAT system to provide the major towns, and later on, most of the rural areas with radio broadcasting service and telephone system.
- Juba and Wau will be provided with automatic telephone services.

The Regional Ministry of Information and Culture has allocated the sum of Ls.291,814 to set up five telex units in Wau Malakal, Bor, Rumbek and Yambio for rapid transmission and reception of news and messages. The present telex unit in Juba will be improved for both international and national use since its present facilities are inadequate for the needs of the Region. With improved telex services, administrative functions and services will be facilitated. Cost of equipment and installation will be provided by the Central Government.

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Another sum of Ls 275,288 has been allocated for the establishment of a communications network of wireless and radio-telephones to connect the districts of each province with provincial headquarters and the regional headquarters in Juba.

For each of the above-mentioned projects extensive training of personnel for: the operation of equipment, their maintenance and repair; management; radio station operation and programing, among other activities, will be needed and should receive high priority by the Ministry of Information and Culture.

During 1976 and 1977, 50 and 80 students, respectively were sent from the Southern Region for training at the Telecommunication Institute in Khartoum where courses for technicians and engineers are provided.

3.3. FINANCIAL INSTITUTIONS

BANK OF SUDAN:

The Central Bank of Democratic Republic of the Sudan has its headquarters in Khartoum and 10 branches in other parts of the country. One of them is in Juba. It handles only governmental transactions besides being a bankers' bank. For remittances on Government account in the Region outside of Juba, it utilise the services of the branches of the Unity Bank.

UNITY BANK:

This is the only one of the five major nationalised banks of the Sudan which operates in the Southern Region. It has branches in six provincial headquarters plus two more - one each at Renk and Yei. It is also proposed to open a branch in Torit shortly. The Loan deposit ratio of the Bank is quite low. The Manager of the Bank said that they would welcome establishment of industries in the Southern Region and extend to them the normal banking facilities. At present only a few traders are availing of their services.

The manager of the Bank of Sudan mentioned about the three specialised Banks, which are subsidiaries of the Bank of Sudan, and are expected to cover the whole country:

- Agriculture Bank
- Industrial Bank
- Estate Bank

Agriculture Bank is planning to open a branch in Juba, but accommodation is stated to be the problem.

Regarding the Industrial Bank, the Team had met its Deputy Director at Khartoum and suggested to him to open a branch in the Southern Region. At present it is very difficult for entrepriseers and even public sector enterprises to reach Khartoum every time they need to contact the Bank. Moreover, with the development of the new industries, especially small scale ones, the existance of the Industrial Bank in the Region would be great help. Its presence even, even in the form of a small branch, will greatly help in encouraging private sector to undertake manufacturing and service industries projects. The Bank can help them with feasibility studies, too.

During discussions with the Director, Regional Ministry of Finance it is learnt that the Regional Government is very keen to have, as soon as possible, th the branches of the Agricultural Bank and the Industrial Bank working in the Region.

It is also learnt that the Regional Government has decided to set up a Regional C Cooperative Bank with £s1.5 million as the contribution of the Regional Government. (Mr. Hans Shulz, ILO Adviser on Cooperative, who is currently in Juba on a short Mission is advising the Regional Government on preparation of a project of the Regional Cooperative Bank).

The Finance Ministry of the Regional Government have a Banking, Currency and Loan Department with a budget of about £s.4 million. Its function is to advance loans to Government employees for housing and purchase of motor vehicles, motor cycles and bicycles. This department is likely to be converted into an Estate Bank.

3.4. TRAINING FACILITES TECHNICAL AND VOCATIONAL TRAINING

There are at present the following avenues for technical and vocational training in the Southern Region:

1) Multi-service Training Centre (MTC)

The MTC was established in Juba in 1972/73, haveing been built, equipped and staffed by IACOD (the International Agency for Cooperation in Development, now known as ACORD - Agency for Coordination of Research and Development) representing a group of voluntary agencies who joined their resources

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for that purpose. In December 1975 the centre was handed over to the Ministry of Public Service and Administrative Reform, who have since been running it with assistance of UNDP/ILO as a bridging operation Phase I of which is scheduled for completion at the end of 1978. A Phase II project document is now under consideration, for reorganisation and expansion of this centre at a total cost of :

Government Inputs	Rs500,859 in kind,	for a period of 3 years beginning January 1979
UNDP Inputs	$1,695,392	

Since 1973, the MTC has given training to about 300 persons each in Commercial/Administrative (classified Staff) and technical (unclassified staff), as under :

(A) Classified Staff:

i) Clerks:	136
ii) Secretaries:	15
iii) Book Keepers:	52
iv) Junior Local Govt.:	78
v) Journalists:	20
	301

(B) Unclassified staff:

i) Carpenters:	69
ii) Mechanics:	141
iii) Electricians:	33
iv) Plumbers:	30
v) Leathercraft:	26
	299

Currently the following are under training in the technical lines:

- Auto-mechanic - 22
- Electrical - 11
- Plumber - 13
- Carpentry and joinery - 14
- Building construction - 9
- Metal fabrication - 9

TOTAL - 78

In most of the lines in-service training is provided, for 22 weeks each and the candidates are expected to have 2 years experience, as in the case of automechanics, basic carpentry and plumbing. There are 24 instructors. Some of them are trained while others are under training. They are guided, and helped by 3 ILO experts. The Centre has an ILO Chief Technical Adviser who was also the director of the centre up until October 1978.
The expansion scheme provides further development of skilled - worker upgrading courses and the introduction of pre-service courses, of 2 to 3 years duration in various trades including refrigeration and air-conditioning.

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A very important aspect is the introduction of instructor training at MTC. This centre could indeed provide instructors to other institutes and schools engaged in training in craft skills. There is need of having medium sized ploytechni in the six Provincial headquarters - to meet the growing needs for skilled workers, in relevant crafts/industries, and the MTC could act as an umbrella for the technical training programmes in the region. Even the original concept - as postulated in the first report of IACOD on Multipurpose Service and Vocational Training Centre (May 1972) - stressed the urgent need for establishment in each of the (then) three provincial headquarters 'of well equipped workshop facilities, and establish spare parts banks for all the varied technical equipment. A training element was also included in the project. The idea was adopted but confined initially at least to one such centre, sited in Juba; training became the main aim. It was also the original idea to establish one or more Mobile Repair Units.

(2) Ministry of Education (Central) has at present two Senior Secondary Technical Schools at Torit and Tonj, which started in 1976. They offer 4-years courses in masonry and carpentry. (Mechanical and electrical training have still to be introduced. Funds for equipping the two schools are being provided by EEC). Each school has about 300 students.

Two more such schools at Illyanroi and Lainya are in the process of being opened. Another two new technical schools in the planning stages, one at Wau (mechanical) and one at Bor (civil). There is also one Senior Secondary Commercial School at Juba, and another at Wau.

As learnt from the Manpower Advisor UNDP/IBRD planning assistance project, Ministry of National Planning, Khartoum, and confirmed with the Regional Ministry of Education under the Second IDA Educational Project, it is proposed to start 30 integrated rural education centres which will include basic education. Location and sites for these schools are being determined; the construction work on some of them may start next year. Students from these schools could be potential candidates for further technical training. (Perhaps the need of setting up some junior technical schools may be felt, in due time).

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(3) Department of Labour in the Ministry of Public Service and Adm.Reform is concerned with the two other training schemes:

May Vocational Training Centre at Wau was established in 1969 (financed mostly by Germany and partly by World Bank). It offers 3-years courses for apprentices (50 a year) in the mechanical and construction trades. In the beginning the school was run by the Central Government. It was originally meant for workers without skills or academic qualifications. However, it has now been converted into an apprenticeship school, to which selected graduates of Junior Secondary School are admitted.

The problems of the Centre, as stated by the assistant Director Labour Department, are the shortage of instructors, transport and accommodation. An amount of about £s39,000 has been provided in the Six Year Plan for accommodation of students, experts and instructors.

The Malakal Agro-Mechanical Training Institute (AMTC)

In June 1975, the Regional Govt. and ILO concluded an agreement to establish an agricultural machinery training centre in Malakal. The Regional Government is to provide non-expendable equipment, engines, transmissions, implements, etc, for which it has made a Plan Provision of £s51,000. The institute is now expected to open in the end of October 78, and would offer courses, from several months to three years duration for agricultural mechanics and operators (upto 200 a year). It is designed to provide the Region with skilled agricultural machinery mechanics. In view of the present agricultural and forestry project in the Region, the Institute will play a major role in supplying technicians to the agricultural sector. According to a rough estimate made by the MTC, about 2000trained persons, 1200 'technical' and 800 'commercial' - would be required during the Six Year Plan. This does not include requirements of some of the major public sector institutions such as Mongalla Complex, Mongalla Weaving Factory, etc. The likely requirements of the private sector have also not been taken into account. With the improvement in infrastructural facilities and and intensification of efforts at industrial development many more technical hands and skilled workers would be needed. It is recommended that :

Early approval and implementation of the MTC, Juba expansion project.

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b) Establishing polytechnics in five other provincial headquarters.
c) Special arrangements should be made for training of workers needed for factories such as the Mongalla Complex, etc.
d) Also, planning some mobile training cum repair units.
e) Introducing technical education in more schools, and providing facilities for further specialized training to those who want to enter technical lines.

Regarding handicrafts, apprenticeship training under selected master craftsmen is suggested. Training in crafts imparted to the prison inmates, which helps them to be integrated into the society as skilled workers, after they have been released, also needs to be diversified and intensified.

In conclusion, the most important point regarding technical and vocational training - including training in management - is the need of:

a) an early overall assessment of the requirements of trained persons, especially for the projects to be completed/implemented, under different corporations and Ministries, Regional as well as Central; and
b) a co-ordination of all the training facilities available, as well as those to be organised, in order to meet the requirements of trained persons.

At present this co-ordination does not seem to exist between the various Ministries - the Ministry of Industry and the Ministry of Public Service and Administrative Reform included.

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4. INDUSTRIAL SURVEY

4.1. Food Processing Industries

In the Southern Region of the Sudan, Food Processing on an industrial scale is limited to the one factory located in Wau, Bahr El Ghazal Province. A survey carried out by Mefit (1978), indicated that traditional processing of fish and meat (by salting and/or, sun drying) as well as drying of some vegetables (okra, chili) is common all over the region.

4.1.1. Processing of Fruits and Vegetables:

4.1.1.1 Existing Industry

Wau Fruit Canning Factory

The factory was built in 1963 with a loan from the USSR and production began in 1967. The choice of location was carried out apparently without benefit of a feasibility study. For the last few years the factory has been operating at a loss and some of the reasons given were as follows: shortage of raw materials for processing, shortages in the supply of fuel, lack of spare parts for machinery, inadequate transport facilities, and difficulties in the marketing of processed products.

The capital invested (between 1964 to 1968) amounted to Le.1,051,580 and the plant's installed capacity was: 8 million cans of tomato paste (90-gm each) over a period of 4-6 months on a 3-shifts daily basis; 2½ million cans of other products; and, 500 tons of fresh fruit. From the very start, tomato concentrate was imported from Turkey and Bulgaria to be diluted and repacked at the plant. Because tomatoes growing in Wau are subject to root knot nematode infestation and suffer from lack of irrigation water, no efforts have been made to overcome these difficulties either by the Factory Management or by the Provisional Agricultur Department. Meanwhile, a study carried out by the Food Research Center, Khartoum (Attiya, 1973), in which nematode resistent tomato varieties were planted a few miles from Wau and some success was achieved. The team from the Food Research Center suggested the establishment of 1500 feddan state owned farm and that 8050 tons of tomatoes, out of 800 feddans could be provided to the Wau Factory over a 5-months period using high yielding varieties resistent to root knot nematodes. This could be accomplished if irrigation water could be provided during the dry growing season along with some assistance from the Plant Protection Department.

Pineapples for canning have to be shipped by truck from Ngara, 200 miles away (2 day trip) and about 3-truckloads are needed for a 5-day factory operation. Other than tomato paste and sliced pineapples, the following products have been canned: mango slices, jam and juice; orange juice and marmalade, peas, Foul Mudri, beans, various vegetables, meat and meat with vegetables. Table 1 shows the annual production and sales of various factory products for the years, 1970/71 through 1974/75. According to the Deputy Director of the Food Research Center, present plant capacity is as follows: 600 tons of tomato paste; 300 tons of jam; 300 tons of fruit juices; and 1000 tons of canned vegetables. An earlier report (AGS:SF/SUD 43, Technical Report 3, Rome, 1972) put the plant capacity then at 576 tons tomato paste, 150 tons canned fruit; 420 tons jams and marmalades; 900 tons canned vegetables, 240 tons meat products; and, 467.5 tons fruit juices.

4.1.1.2. Development Prospects:

a) Wau Fruit Canning Factory:

The Food Research Center is investigating the possibility of introducing some new products along with expanding the meat canning and processing department. Among the proposed products: Okra and egg plant with meat; sausages, Bastirma and corned beef. Other suggestions include (1) the introduction of modern machinery for processing pineapple, instead of cutting, trimming and packing by hand, (2) the establishment of 2000 feddan farm (Meiram) between Wau and Baharsalam, located near the railway line. Rainfed and based on mechanized farming, the farm will produce waterrelons, pumpkins and karkadih. Two UNDP/UNIDO experts, one canning expert and the other a can-manufacturing expert have been requested by the Food Industries Corporation for assistance at the Wau Plant. The request has been approved. However, unless some of the recommendations made by the various missions to the Wau Fruit Canning Factory are implemented, it is doubtful that those temporary remedial measures could turn it into a successful and profitable enterprise. It is, therefore, strongly recommended to review all previous reports of missions and experts, retrain the managerial and technical staff as well as the skilled labour, and to seriously consider the establishment of a stable source of raw material supply, be it fruit, vegetables, pulses or meat animals.

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Fruit Processing Plant, Western Equatoria

This project is included in the Six Year Development Plan, the first phase of which will be a feasibility study to determine location, type of plant, capacity among other factors including raw material availability. Accurate statistics should be collected regarding present and future potential of existing plantations and proposed ones for expansion, seasonality of production, suitability of fruit varieties for various processes (with special reference to mangoes, which also have a short season of about one month), as well as alternative raw materials to keep the factory operating in the most efficient and economical way. Technical assistance in carrying out such a feasibility study is recommended.

4.1.2. Edible Oil Industry

4.1.2.1. Existing Oil Industries in the Sudan

The oil industry in the Sudan is one of the oldest food industries in the country. Average production of oil seeds (cottonseed, ground-nuts, sesame and castor seeds) amounts to 1,615,000 tons per year. There are at present 79 oil mills operating at a capacity of about 875,000 tons per year, according to statistics from the Food Research Institute in Khartoum. The establishment of 90 new oil mills with a total capacity of 540,000 tons per year was approved. Additional 116 mills with a total capacity of 696,000 tons annually are under consideration or awaiting approval. When approved, the total production of the oil industry will exceed 2 million tons per year. The existing capacity of oil mills is not at present fully utilized due to shortage of raw material, in particular cotton seeds, lack of advanced processing technology, technical know-how and transport difficulties. It is estimated that cottonseed oil mills are operating at 57 - 85% of the installed capacities, and groundnuts mills at 65 -75%.

The amount of oil produced in the country is about 54,300 tons per year of which about 50,000 is edible oil. The export of sesame seeds and groundnuts during 1977 was 92,989 and 143,267 tons, respectively. During the same year 115 and 25571 metric tons of sesame oil and groundnuts oil respectively, were also exported, (18th Annual Report, Bank of Sudan, 1977).

The main existing potential of industrial oil production in the Sudan is located in the Northern Region. In the Southern Region only two oil mills exist which can be considered as industrial units; in Nzara, with the installed capacity of 750 tons per year, and in Yirol with the initial capacity of about 500 tons.

The two oil mills in the Southern Region suffer from various operational difficulties such as: lack of spare parts, need for replacement of certain units, shortage of raw materials and fuel and transport problems. For these reasons both mills are operating at about 10 - 15% of their installed capacities and sometimes even less.

Oil Resources and their Utilization in the Southern Region:

Several oil seeds are grown in the Southern Region and are used for edible oil extraction. These include cotton seeds, groundnuts and sesame. Other sources of oil palm and lulu nut (a fruit of a tree that grows wild). Oil extraction is mostly traditional and primarily from sesame, groundnuts and lulu nut. Production on idustrial basis is carried out primarily using seed and oil palm in the Nzara oil mill, and using mostly groundnuts in Yirol oil mill.

Table 2 shows areas (in feddans) under cultivation with sesame and groundnuts, along with other crops, throughout the Southern Region according to Provinces. Total areas under sesame and groundnuts amount to 180,144 and 219,664 feddans, respectively (Regional Ministry of Agriculture). There are no official estimates on the production potential of the above areas under cultivation. No statistical data are also available regarding the potential of lulu nuts, however some estimates put the total production of lulu oil at 1,944 tons (Mefit, 1978). Areas under cultivation of oil seeds are mainly farmed by small holders and the crops are utilized locally and only small quantities are marketed. With no accurate statistics on actual production, utilization and marketing of all above-mentioned oil seeds, it would be difficultat present to estimate the raw material potential for edible oil industrial manufacturing. Other sources of oil such as from oil palm and lalub also lack statistical data regarding quantities and distribution. General information describes the presence of oil palm in Renk, Kodok, Nasir, Yambio and Torit districts while lalub is widespread in Bahr El Ghazal, Lakes and Jonglei Provinces (MEFIT, 1978). The total

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value of traditional oil extraction was estimated, in the above report at Ls.7301.

Industrial Production:

a) Nzara Oil Mill: The mill was established in 1959, as an integral part of the Nzara Industrial Complex. It is equiped to extract oil from cotton seeds, sesame, groundnuts and oil palm. The installed capacity of the mill, based on 250 days operation per year is about 1250 tons tons of seed out of 1875 tons of seed cotton. The present capacity of the mill is estimated at 75% of installed capacity. The poor state of the equipment results in considerable losses in crude oil and corresponding high oil retention in the seed cake whcih affects the quality of stores cake as animal feed (susceptible to rancidity in the hot-climate and-high humidity). In this respect, the Team observed that 2½ year old cottonseed cake provided to the Rotun Dairy and Poultry Farm near Juba was unacceptable for feeding cattle because of its very poor quality.

The refining capacity of the mill based on 250 working days is about 750 tons of oil per year, equivalent to 5769 tons of seed cotton. During the period 1951/52 to 1961/62 the quantity of oil expressed from cotton seed ranged between 38 - 115 tons of oil while the amount of seed cake ranged between 149 - 618 tons. Table 3, shows the amounts of oil and cake produced during the three seasons from 1974/75 to 1976/77 and it is evident that both quantity and value of production went down over that period, cottonseed oil, from 1950 to 477 tins; cottonseed cake, 172, 875 to 79,750 kilos; oil value, Ls.12,675 to Ls.3,100; cottonseed cake value, Ls5,186 to Ls 2,392, respectively.

During the Team's visit to the Complex (August, 1978), the oil mill was not operating due to shortage of raw material. According to the manager, the main constraints affecting the efficient operation of the oil mill are: lack of adequate quantities of cotton seeds due to shortage of supply and transport difficulties for collecting seed cotton from growers; poor road conditions and high cost of transporting cotton seed from Mongalla ginnery which is a supplementry sour e of raw material to the Complex. However, the main constraint is the shortage of fuel and irregularity of supply.

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To put both the oil mill and refinery into their original installed capacities would require repair or replacement of certain units of equipment and provision of spare parts as well as retraining of the operating and maintenance crew. According to the report of CDM Mission (1978), the total cost for the rehabilitation of the oil mill and refinery to put them back to their installed capacities will amount to Ls.25,168. The projected revenue from oil production after the rehabilitation would amount to Ls.49,100 in 1981/82, and Ls.65,700 in 1982/83 (the last two years of the six year plan). The above capital investment in the oil mill and refinery covers only direct expenditures needed for repair and replacement of equipment. It does not include overhead cost and technical assistance. The latter costs are included within the overall investment expenditure for the rehabilitation of the entire EPAPC project. Meanwhile, FAO submitted a project for the rehabilitation of this mill and refinery at a total cost of $100,000 (TCP/S/SUD/03/T).

According to the report by Faure (1977), oil cake produced at Nzara was not sold or utilized. Since Nzara is located in an area infested with tsetse flies no substantial numbers of cattle exist to make use of the cake while transportation to other areas is prohibitive. Consideration should be given to this problem by utilizing trucks bringing in cotton lint and seeds from Mongalla to Nzara to transport, on their return to Juba and Mongalla, cottonseed cake. This cake could be used for the feeding of cattle and poultry in the existing dairy and poultry farms (Rotun and Belinyan farms), and the proposed beef cattle ranch near Mongalla associated with the Agro-Industrial Complex financed by the Danish Government Loan. During the Team's visits to MAFAC Farm at Belinyan and the RDC Farm at Rotun shortage of animal feed was one of the main constraints, more so in the latter farm. The Team feels that proper coordination should be established between industrial and agricultural projects.

<u>Oil Palm</u> : there are 423 acres of oil palm trees grown on EPAPC estates located in five areas. Because this crop is out of its climatic environment, production averages 0.5 tons per acres which is far below the economical range of 4 tons per acre. At present, palm oil expression using very simple means is applied only to the pulp and not to the kernels because no crackers are available. This results in an oil to fruit ratio of 6% which

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is far below a potential of 16 - 20%. Weight of fruit processed annually at Nzara oil mill is approximately 136 tons producing about 23 tons of crude oil or 21.8 tons boiled oil. Kernels obtained, about 60 tons, are used as fuel along with cotton hulls for the refinery boilers.

The mill can also produce groundnut oil at about 800 kg/hour utilizing the hulling equipment, husk separator and grinder. In addition, the mill can process sesame seed but the equipment has never been used although it is kept in good working condition.

The 1977/78 Agricultural Statistical data, presented in table 4.1.2.1 shows that 14,850 feddans are cultivated under sesame while 36,300 feddans are under groundnuts in Western Equatoria. A study is recommended to identify major areas of sesame and groundnuts production and their commercial potential for oil extraction in the existing unit at the Nzara Complex. Otherwise, consideration should be given to the relocation of the equipment for sesame and groundnuts oil extraction to other areas with more raw material production and industrial potential, i.e. Bahr El Ghazal or Eastern Equatoria Provinces (groundnuts) or Bahr El Ghazal or Upper Nile Provinces (sesame). Reference is made to table 4.1.I. This suggestion agrees with plans set in the six year plan for the establishment of groundnuts oil mills in Aweil (Bahr El Ghazal) and in Western Equatoria, at a total cost of Ls 248,684.

b) Yirol Oil Mill (El Buheyrat Province): The mill was established in the early 1950's with the installed capacity of about 500 tons per year. Following the 1972 Addis Ababa agreement production was reduced due to lack of spare parts, poor maintenance and repair work on the obsolete machinery. During 1975/76 season the production was 43 tons of oil and 25 tons of cake, according to the MEFIT study (1978).

During the Mission visit to the oil mill (November 1978) it was not operating. Accoring to the information provided by the manager of the mill, the lack of operational funds is the main constraint. If these funds were provided the factory could start the production during the present season.

In order to rehabilitate this mill and to bring it up to its installed capacity a feasibility study is being carried out by the Engineering and

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Transport International Limited (Consulting Engineers, Khartoum). The study will determine the possibility of recommissioning of the existing equipment, availability of spare parts and economical viability of the project under the present circumstances, in particular, the availability of raw material.

4.1.2.2. Development Prospects:

At present there are no accurate statistical data on sources of edible oil supply and its consumption in the Southern Region. Traditional extraction of oil appears to satisfy local needs in the rural areas. The local industrial production of edible oils by the Nzara oil mill is marketed mostly in Western Equatoria Province, according to the manager of the complex, primarily because of transport difficulties and low productivity. Other urban areas of the Southern Regions along with Juba are supplied by imports of oil from the Northern Region. No accurate data was provided by the Regional Ministry of Commerce, Industry and supply regarding annual imports of oil to the Region and its distribution among the six Provinces. Throughout the period of the Team's residence in Juba and visits to urban areas in the ohter Provinces (August/September/October, 1978), it was observed that there was continuous shortage of oil on the market. The Team was informed that oil shortages were due to irregular supply from the Northern Region because of transportation difficulties. Long distances from the North to the South and poorly developed and organized road, railway and river transport facilities partly contribute to this irregularity of oil supply and resulting shortages on the local urban markets of the Southern Region. Such a situation is a prerequisite for serious consideration by the Regional Government for the establishment of suitable oil mills in strategic locations such as: areas of potential oil seed production, with good communication and transport facilities to the urban centers of consumption, taking into account present and future road improvement programs. In support of this consideration it can be stated that the oil industry is characterized by its flexibility of location being suitable either in areas of production or consumption. The establishment of oil mills of suitable capacities in areas where oil seed are grown and exhibit potential for extenison may also encourage farmers to increase the output. As mentioned earlier the six year

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development plan provides for establish ment of two groundnut oil mills; one in Aweil (B.E.Ghazal) and one in Western Equatoria. The equipment for another oil mill suitable for lulu nut oil extraction as well as for sesame and groundnuts has been obtained at a cost of Ls.28,000 and is to be installed in Wau. No feasibility study has been carried out concerning the choice of mill capacity, location and raw material supply, in each of the above cases. The machinery for the Wau mill is still stored in boxes since the civil works have not been started. The Team has been informed by the Industrial Bank in Khartoum that approval has been given for the establishment of a small scale oil unit in Renk for groundnut oil extraction.

The following suggestions to the future development plan of oil industry in the Southern Region are presented taking into account raw material potential resources and the existing oil mill industrial capacities with their prospects for rehabilitation:

a) First priority should be given to the rehabilitation of the Nzara oil mill and refinery with the supporting ancillary departments as has been mentioned earlier about the approval of FAO project for the rehabilitation of the Nzara Oil Mill at total cost of $100,000. This project in pending funding by UNDP. Mean hile, the Team was informed that there is a good possibility of ODM funding for the complete rehabilitation of the Nzara Complex including the oil mill and refinery. The cost of rehabilitation of the oil mill and refinery has been estimated in the report of the ODM Mission at Ls.25,166 (spare parts and new replacements). This investment does not include technical assistance expenditure, capital overhead and operatings which were calculated for the entire Nzara rehabilitation project at the total cost of Ls. 1,916,360. The Team strongly supports the implementation of oil mill and refinery rehabilitation either according to the FAO proposal or the ODM's, since it plays an important role in the provision of the much needed oil in the Southern Region. The Team is also in favour of supporting the rehabilitation of the entire complex if the proper financial resources are made available.

b) Since the feasibility study for the rehabilitation of Yirol Oil Mill is already being carried out by ETI, Ltd., it is suggested to take action after proper evaluation of the study by the respective authority.

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c) A feasibility study is proposed by the Team to identify the most suitable locations for the establishment of new oil extraction mills in the Southern Region. Special attention should be given to the choice of the proper economic size of the units with simplicity of operation and maintenance. Consideration should also be given to investigate the availability and feasibility of mobile small scale units which could be located in certain areas of production of raw materials or consuption where no oil mills are available at present. At present, Regional transportation conditions, dispersal of production areas of oil seeds, managerial and maintenance capabilities as well as fuel shortages makes its necessary to consider a strategy of oil industry development based on small-scale and medium-scale units to be located in potential production areas in the various Provinces.

d) As a project identification, the extraction of oil from rice bran milled in large scale schemes, for example Aweil should be considered. Production of rice in this scheme was at 3500 tons of paddy rice in 1976/77 and is expected to reach 9000 tons in 1981. The necessary extraction unit could be incorporated with the proposed groundnuts oil mill in Aweil. In addition, a feed mill, utilizing rice milling by-products plus oil seed cake could be established to provide animal feed for the suggested dairy cattle and poultry farms in Wau (reference to the six year development plan). The viability of this proposal should be checked in a pre-feasibility study with the assistance of UN Specialized Agencies.

4.1.3. Meat and Dairy Industries

In the Southern Region, livestock are reared by all rural household except those in areas infested with tsetse flies (ironstone plateau, the green belt and a large part of the central hills, south eastern hills and moutaines). Cattle play an exceptionally important part in the social and ritual life of the people in the Region, a fact that should be kept in mind embarking on large scale animal improvement programme in rural communities.

There is practically no scientific data concerning the various economic aspects of animal production on which large scale production projects should be based: growth rate, feed efficiency, mortality rate, calving

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intervals, milk production and composition to mention a few.

4.1.3.1. **Statistics**

There is no accurate data regarding the number of domestic animals or their distribution throughout the Southern Region. Estimates based on: an aerial survey conducted during 1976; data from the JP15 vaccination campaign; trading in hides and skins (1973); and other reports, indicate a total livestock population of around 9.6 million. More recent estimates (Agriculture Statistics, Ministry of National Planning), place the total number of animals at about 11 million of which 5.7 million are cattle, 3.2 are sheep, 2.0 million are goats and 33 thousand are camels. The following table shows distribution of animals among the six provinces:

Province	Cattle	Sheep	Goats	Camels
Eastern Equatoria	798,000	915,000	240,000	28,000
Western Equatoria	229,000	1,000	20,000	-
Bahr El Ghazal	1,227,000	718,000	604,000	-
El Buheyrat	700,000	333,000	304,000	-
Upper Nile	1,428,000	1,047,000	376,000	5,000
Jonglei	1,404,000	175,000	401,000	-
	5,786,000	3,189,000	2,005,000	33,000

TOTAL = 11,013,000

Fresh and Processed Meat

Reports on the number of animals slaughtered for their meat throughout the Southern Region differ in their estimates since no accurate data are available regarding annual slaughter of animals in rural areas. Based on government-operated slaughter-house records about 70,000 heads of cattle were slaughtered during 1976. Figures reported by Mofit (1978), for the year 1975/76 indicated that 54,459 heads of cattle were slaughtered along with 18,961 heads of sheep and goats. The report also states that 31 slaughter-houses are government-operated in the Region. Rate of slaughter according to province during the study period (1975/76) was as follows:

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Province	Heads of Cattle
Eastern Equatoria	15,084
Western Equatoria	3,509
Behr el Ghazal	15,371
El Buheyrat	4,065
Upper Nile	13,587
Jonglei	2,843

From the survey conducted by Mefit (1978), traditional processing of meat by salting and drying is common all over the Region. According to estimates in that report, conserved meat valued at Ls 6,532,900, of which 42% is commercialized, was processed in the rural areas. Based on the calculated rough estimate of Ls 56 per head of cattle, the number of animals from which meat is processed would amount to 115,840 which would appear somewhat exaggerated in our opinion. However, it is felt that proper investigations and more factual information in this regard should be carried out and collected, respectively, by the Department of Animal Production, Regional Ministry of Agriculture, Animal Production, Forestry and Irrigation.

On the other hand, meat processing on an industrial scale has been carried out in the Southern Region at the Wau Canning Factory, originally established for the processing of fruits and vegetables. Canned meat and vegetable products have been produced on a moderate scale:

Year	Quantity, Kilos	Value, LS.
1970/71	44,949	36,828
1971/72	86,399	257,316
1972/73	64,235	60,741
1973/74	-	1,531
1974/75	-	740

No data was available regarding the production of canned meat and other meat products for the last three years. The Team was informed by the manager of the Food Corporation, Khartoum that plans are in progress for the manufacture of other meat products at Wau: sausages, corned beef and Bastrina, in addition to some meat and vegetable products. Meat processing

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on large scale would require proper slaughtering and meat chilling facilities with high hygienic standards but one of the more serious constraints for such venture would be fuel shortages, or breakdown of refrigeration facilities. It is also felt that technical assistance in processing of the proposed meat products would be required.

Milk and Other Dairy Products

No scientific data is available on the milking abilities of the native cows.

From the scanty information gathered at the RDC operated Dairy Farm at Rotun, near Juba, their native cows produce an average 5-7 lbs of milk per dairy with a maximum lactation period of around 170 days. Milk fat content is assumed at 5% but evidently no testing is being carried out. It is felt, however that the information obtained is not too reliable because of the poor nutritional status of the herd and disorganized feeding program at the time of the Team's visit (August, 1976).

4.1.3.2. Projects in Progress

At present there are no large scale, commercial type operations for production of meat (from cattle, sheep, poultry) or milk. A few projects were initiated, some with the assistance of international organizations and are described below:

1. Juba Dairy Farm, UNDP/FAO: Located at Belinyan, it was started in 1976 as a joint project of UNDP/FAO and the Regional Ministry of Agriculture, Animal Production, Forestry and Irrigation,. The project involves the introduction of exogenous dairy breeds in the Region and, according to the Director of Agriculture, the dairy farm is essentially an experimental one and not for large scale production. Previously, the Team was informed that the Belinyan Dairy Farm would supply the milk pasteurizing plant with its initial needs once it starts operating.

2. Rotun Dairy Farm: Established by RDC a few years ago with the purpose of introducing exotic dairy cattle into the Region. The present herd is comprised of 55 native cows; 165 cross-bred from Uganda; 24 purebred Freizians from Kenya plus 11 bulls from Uganda. Other exotic breeds

include Sahewal and Barana. A few pigs and some 498 New Hampshire birds are also maintained on the farm.

At present there are 56 milking cows with average daily production of about 380 lbs. An all automatic milking parlour with room for 800 cows per day is planned. Farm records indicate that average lactation periods are: 170 days for native cows; 180-270 days for purebreds and 170-180 days for cross-breds. Average milk production amounts to 5-7 lbs/day for native cows; 10 lbs for cross-breds; and 24 lbs for the pure-bred.

Provision of adequate supplies of good quality feed for animals and birds appears to be the major constraint in this project. The production of maize and sorghum was poor this year due to poor rainfall. Cattle graze on Sudan and elephant grass while pigs and birds are fed a mixture of cooked blood, rice and rice bran, cottonseed cake ($2\frac{1}{2}$ years old) when available and local brewery waste (from grains). Projected plans are for the cultivation of 300 feddans of maize and 300 of sorghum to provide grain and silage. A small grain mill is located on the farm for use in the preparation of feed mixes. It is felt that both managerial and technical assistance is required for the successful implementation of this project.

3. Kapoeta Sheep Improvement Project: Started in 1976 by the Regional Ministry of Agriculture, Animal Production, Forestry and Irrigation, its main purpose was to introduce sheep ranching and improve meat production potential of native Toposa sheep through crossing with Kenyan Doper rams. The project area of 4000 feddans is completely fenced and a maximum flock size of 4000 sheep will be maintained. At present, only 1336 sheep are on the ranch and one major problem is drinking and irrigation water. The rainy seasons extends from March to November and the rest of year water has to be pumped. When the project is in full production it is expected to provide about 1416 heads of sheep for slaughter in Kapoeta and/or, Juba markets. According to the Director of Agricultur the project was originallyplanned for another location, more suitable than its present one, with its single advantage of being close to Kapoeta. The Team was informed by the project manager that annual expenditures amounted to Ls 20,000 to

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cover cost of fuel, water, transportation to Juba and salaries. It is suggested that an annual evaluation of this project be made to determine the degree of its success, both technically and economically.

Other projects such as the Rumbek Cattle Ranch, established in 1975, and the Livestock Improvement Center at Marial Bai near Wau, established in 1976, do not appear to have had much of an impact on the animal industry although expenditures, so far, amounted to Ls 14,040 and Ls 60,714 for the two respective projects. The sum of Ls 233,503 has also been allocated for the Rumbek Cattle Ranch project in the Six Year Development Plant, indicating interest on the part of the Regional Government for developing the beef industry. Since a number of experts specialized in the area of animal production are serving in the country at present, their assistance could be called upon to evaluate and advise on the implementation, modification and possible technical assistance requirements. It may be necessary to train or retrain the technical and managerial staff at some of these projects, as well as organize annual seminars and short courses under the auspices of Juba University in cooperation with Agricultural Technical Training Institute at Yambio.

4.1.3.3. Development Prospects

From table 4, it is evident that the Regional Government in the Southern Region is embarking on quite an ambitious program to develop the animal industry through extension service, the establishment of demonstration cattle and sheep ranches and providing veterinary service. In most cases, no pre-feasibility or feasibility studies were carried out to determine such basic points as suitability of project location with respect to grazing, land productivity, type of irrigation and average rainfall, housing facilities and availability of trained staff and veterinary service among other things. The Team feels that feasibility studies should be carried out for individual projects, or for a group of projects with identical circumstances to avert the possibility of failures and wastages. In addition, the execution of projects should be carried out according to planned schedules specially when communications, various means of transport and fuel shortages are major constraints. Circumstances prevailing at the Rotun Dairy Farm at the time of the Team's visit is a case in point. The choice of Nicor as a site for the Sheep Ranch near

Kapoeta with its severe shortage of water even for the local people is another example. Therefore, it is hoped that serious consideration be given to the need for feasibility studies for each of the proposed projects. At present, FAO is in the process of carrying out a feasibility study (TCP/S/SUD/01/I) entitled "Siting of a pilot Cattle ranch", in the Southern Region to demonstrate the feasibility of economic livestock production in tsetse infested areas in the Region. The same principle should apply also to proposed poultry production projects listed in table 4.

Beef Cattle Ranch and the Danish Poultry Plant: Two projects, integrated with the Mongalla Agro-Industrial Project, to be financed by the Danish Government, will undergo feasibility studies according to a recent agreement. When cattle ranch is in full production it should provide the Mongalla slaughter-house, also an integral part of the proposed Complex with 15,000 heads of cattle, annually. On the other hand, the poultry plant will have an installed capacity of 1-2 million eggs and 500,000 broilers, annually. It is assumed that the project will include, among other things, the training of personnel for the various activities of the entire complex, both technical and managerial if the success of such a large-scale enterprise is anticipated.

Mongalla Slaughter-house

This is an integral part of the proposed Mongalla Agro-Industrail Complex to be financed by a Danish Loan amounting to D.Kr. 68 million. Installed capacity will be for 20-30 heads of cattle (300-500 kg each)/hour, and for 10-20 heads of sheep and goats (30-40 kg each)/hour. Initial annual capacity is estimated at 6000 heads of cattle and 3000 heads of sheep and goats. When the planned cattle ranch becomes operational at full capacity it would provide the slaughter-house with 15,000 heads of cattle, annually which will necessitate the operation of the slaughter-house 24 hours/daily. A poultry slaughter-house is also included capable of processing 500 birds per hour. Facilities connected with the slaughter-house will include: 5 chill rooms (capacity of 12 tons each); cutting and boning departments, dry rendering of fat; and the preparation of blood, meat and bone meals. When fully implemented and if efficiently and successfully operated, such a project should set a precedent for future large scale agro-industrial

complexes. However, it will take the concerted effort of several government agencies and ministries to make a success of such a venture, possibly through the establishment of a committee made up of representatives of the respective governmental bodies to coordinate activities.

Milk [illegible] pasteurization Plant, Juba:

This is another project, integrated with the Mongalla Agro-Industrial Complex and financed through a Danish Loan. Equipment has already arrived in Juba (1976) but delays in the construction of buildings have held back the implementation of this much needed processing plant. The plant is expected to be supplied from the Dairy and Poultry Farm at Belinyan near Juba. The capacity of the plant is expected to be around 700 gallons per day according to official sources. Butter, cheese and ghee will also be manufactured.

No detailed information is available concerning the other dairy and poultry farms proposed in the Six Year Development Plan for Wau, Malakal and Yambio. It is assumed that their produce of milk, eggs and chicken would be sold directly to the public since no feasibility studies have been indicated in each case. It is recommended, however, to evaluate the viability of each of the proposed projects through feasibility studies especially when foreign components are envisaged.

Since there was no evidence available on the completion of, or the proposal for feasibility studies for each of the beef, dairy cattle or poultry projects suggested for implementation during the Six Year Development Plan it is recommended herewith that, as a basic and essential strategy for the implementation of such projects to observe the following:

1. Selection of the project site, taking into consideration suitability of soil for cultivation, rainfall or availability of a source of irrigation water, presence of predatory animals, freedom from tsetse flies, preferably near an all-weather road, and closeness to marketing outlets.

2. Availability of good grazing land with possible potential for fodder cultivation in rainfed areas or through irrigation. Serious consideration should be given to unpredictable droughts by providing proper storage facilities for emergency feed supplies (hay, straw, grain, cake).

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3. Availability of supplementry protein feed and concentrates (grains, milling by-products, seed cake), preferably from close-by oil mills and rice or grain mills.

4. Availability of a year-round supply of potable water for the animals in adequate quantities.

5. Provision of year-round veterinary service, and finally

6. Recruitment of well trained project manager, assistant managers and supervisor if a project is to succeed.

4.1.4. **Fishery Industry**

Statistical data concerning total inland water surface, Sudd or swamp area, fish production potential, actual quantities of fish landed, quantities of fish processed and marketed, number of fishermen (licenced or those involved with subsistence fishing), are many and in some instances, conflicting.

4.1.4.1. **Statistics:**

Total surface area of rivers, lakes, marches and flooded land is estimated at 20,000 - 28,600 km^2. The swamp areas, covering about 17,000Km^2, are said to produce half the total country production of 22,000 tons annually. During 1976, production of fish in the Southern Region amounted to 11,000 tons with about 2,200 tons landed in private and government fishing camps. More intensive fishing activities are reported in Lake No and near Malakal where fish salting and drying is carried out.

About 50,000 persons are believed to be engaged in subsistence fishing not including those indirectly connected with fishing (boat building and net making). Accordingly about 1.5 - 2.0% of the inhabitants of the Southern Region are dependent directly or indirectly on fishing for survival. Based on figures obtained from the Fishery Department of the Regional Ministry of Aricultura, there are 2000 licenced fishermen in the Region.

According to several reports by UN Missions (FAO/IBRD, 1975; FAO/World Bank, 1975, 1976) and through bilateral agreements (USSR, 1963, 1964; DANAGRO, 1977), average production potential estimates ranged between 50 and

100-kg/hectare/year with total production placed at 140-150 thousand tons/annum. The main sources of supply, however is believed to be swampy (Sudd) area which is expected to be affected by the Jonglei Canal Project. Starting at Jonglei north of Bor and reaching Sobat river below Malakal it has been assumed that the project will result in the reduction of fishing area, affecting fish migration and breeding as well as the livelihood of inhabitants. Meanwhile, the more conservative production potential of 75,000 tons per annum in the Southern Region (or, 57,600 tons when the Jonglei project is completed) is believed to be well above immediate exploitation possibilites due to marketing constraints.

4.1.4.2. Constraints

The Southern Region is characterized by its vast size, sparse population, poor communication and marketing facilities and few significant urban centers to offer market outlets for commercial surplus. In addition, there are at present tremendous transport problems and unpredictable fuel shortages which would make the utilization of cold storage facilities a risky venture. All-weather roads are very limited at present and the Nile remains the principal means of communication between North and South. Road and river links, however with the main fishing grounds and camps are poor and, at certain times of the year, completely disrupted.

4.1.4.3. Present State of Industry:

Currently, caught fish in excess of fresh consumption needs, is salted (when salt is available), sun-dried and in some cases, smoked. Seasonal camps, set up during the dry season of approximately four months (December/April), are mostly operated by entrepreneurs from Kosti and Khartoum. Meanwhile, there is no industry in the Southern Region based on the industrial processing of fish or its by-products.

4.1.4.4. Development Prospects:

a) Regional Government Targets:

In an effort to provide adequate protein in the diet of rural population, improve the standard of living and to create fish surpluses for internal and external trade, two main points have been emphasized:

(1) Increase fish production from 6000 tons/year (1977) up to 18,500 tons/year by the 6th year of the Plan.

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(2) Implementation of fish farming especially in areas of the Southern Region falling within the tsetse fly belt in Western Equatoria. This will involve reactivation of 52 government and private fish farms and development of new ones at the rate of 50 farms/annum to a total of 300 within the Six Year Development Plan, from which about 1200 tons of fish should be landed.

b) Regional Government Projects:

With the assistance of the Danish Government, a fish receiving terminal, an integral part of the Mongalla Industrial Complex, is to be established with facilities to handle 3 tons of fish daily in addition to cold and freezer storage (1-ton). According to the report by DANAGRO, there is no significant fishing in the Mongalla area and that the fish terminal will function only when integrated in a total infra-structure including:

(1) fish camps in more productive areas; Terakeka, Gemeiza about 30-40 miles from Mongalla, (2) development of a fish distribution system, and setting up of fish marketing outlets. Improvement of the Juba/Mongalla road to an all-season one is necessary, From information received from the Fishery Department, Regional Ministry of Agriculture the fish receiving terminal would be best located in Mongalla. It was understood that upon completion the project would be turned over to cooperatives (fishermens') or to the private sector.

The manager of the Mongalla Industrial Complex informed the Team that the Ministry of Cooperatives and Rural Development plans to assist in building marketing outlets for holding and sale of fresh fish. However, the entire Mongalla Agro-Industrial Complex is to be reviewed by a Danish Consulting group by request of the Regional Government.

Within the framework of the Six Year Development Plan there are no projections for the establishment of an industrial fish processing plant. However, the 1963 and 1964 USSR Missions had selected two possible sites for the establishment of a fish canning factory: Jebel Aulia and Malakal, but nothing materialized thereafter. The FAO/IBRD Mission (1975), concluded that, without improvement of river and road communications in the Southern Region, fisheries alone would not justify any development investment. Meanwhile, the FAO/World Bank Mission (1975,1976), viewed the development of fisheries in the Region as long term process primarily

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because of the lack of infra-structure and marketing opportunities and that the exploitation of fish resources should rely large y on small scale technology. The presence of hyacinths, apparently, makes fishing in some areas impossible and the use of mechanized equipment difficult (FAO/IBRD, 1975). The Six Year Development Plan provides funds for projects related to fisheries activities, namely:

- Fish Resources Development with an outlay of Ls.1,903,385 (Ls.1000 external assistance).
- Fish Farming, with an outlay of Ls.699,840 (Ls.131,200 external assistance) and with UNDP/FAO technical assistance.
- Fisheries Training Institute at Malakal with an outlay of Ls.734,582 (Ls 274,244 external assistance); this project would provide inservice training for 85 staff members and the training of 235 fishermen (boat building, boat and net maintenance, etc) during the six year plan period. It will also provide trained fishermen with necessary equipment.

Central Government contribution towards projects serving the whole country are as follows:

- Fishery Survey, Ls 165,000 (Ls 133,000 local + Ls 32,000 foreign component),
- Fisheries Training Institute, Ls 200,000 local + Ls 100,000 foreign component),
- Training Fisherment Trainees, Ls 211,000 (Ls 204,000 Local + Ls 7,000 foreign component).

It would appear from the above programme, proposed for implementation during the six years of the plan period, that primary attention will be give for surveying resources and development cadres of trained fisheries officials and fishermen. In other words, emphasis will be on production from inland waters and future fish farms.

In view of the fact that no accurate statistics concerning actual landings at the various known camp sites or in locations exploited by commercial fishermen throughout the year, a program for the collection of exact data should be initiated as soon as suitable numbers of trainees from the Malakal Fisheries Training Institute become available. Identification of fish species caught and recording of weight from random samples

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would also be desirable. Accurate data should also be collected about quantities of fish processed seasonally by drying and salting with advice provided by representatives of the Fisheries Department for improved methods of processing. It has been reported (FAO/IBRD, 1975) that the quality of sun dried fish was very poor.

The entire Mongalla Agro-Industrial Complex, including the proposed fish receiving terminal will undergo a feasibility study in the very near future. No comments are necessary at present pending the outcome of this study. However, if it is decided to have the terminal in Mongalla, it is strongly recommended for the Regional Government to comply with DANAGRO's proposals, referred to earlier under 4.1.4.4 -b, regarding the proper functioning of the Fish Terminal. An important, integral part to the above project would be a fleet of suitably built and equiped collection boats to transfer freshly landed fish, properly chilled with flake ice from the Terminal, from fish camps to the receiving station at Mongalla. The latter will be provided with one flake-ice plant with a capacity of 2.2 tons/24 hours. The fish terminal will also consist of one chilled room (capacity, 12-tons); one freezing-tunnel (capacity, 1000-kg frozen fish/day); and, one freezer-storage room (capacity, 11-tons). In this regard, it is felt that freezing of fish (unless meant as a temporary means of holding fish for later consumption), may be considered premature at this time. There is no way of dispatching it in a proper manner unless suitable means of transportation and appropriate means of handling the fish at its destination, are made available, either within the country or outside, fish being a very perishable commodity.

As long range project, and following the implementation of fishermens' cooperatives for trained, well equiped fishermen graduating from the Malakal Fisheries Training Institute, the Regional Government may consider carrying out another feasibility study for the establishment of Fish cannery in and area where suitable fish could be supplied throughout the year.

4.1.5. Cereal Processing and Bakeries

4.1.5.1. Cereal Processing

4.1.5.1.1. Grain Production

Among the cereal grains grown in the Southern Region, dura (sorghum) is the main staple food crop and is grown all over the Region. Other cereal crops

grown include millet, maize, dukhn and rice. Cultivation of most of the grains is on subsistence basis with the exception of some mechanized dura production in parts of Upper Nile Province (Renk). Mixed cropping is favored against some crop failures but only rice is planted in pure stance. Table 2 show areas of land under cereal crops by Provinces for the season, 1977/78, according to statistics from the Regional Ministry of Agriculture, Animal Prodution, Forestry and Irrigation.

No accurate statistical data could be obtained regarding annual production, by province, of dura and other cereal grains. A survey by Mofit provided an estimated value of ground flour (no season given) as follows: Dura flour, Ls 49,164,891; Dukhn flour, Ls 779,700; other grain flour, Ls 1,788,700. Their survey indicated that almost 99.4% of the grain flour was consumed in the home.

The Regional Government is embarking on several diversified agricultural Development programmes to (1) improve grain production through the use of improved, resistent varieties, application of improved methods of cultivation; implementation of plant protection programs and extension service; provision of improved agricultural implements; and introduction of ox-ploughing, and (2) Developing of schemes to increase dura and other grains specially in areas vulnerable to shortages or famine resulting from drought (Lakes Province) and floods (Aliab area). A list of current schemes and those proposed for implementation during the Six Year Development plan is presented in table 5.

Renk Dura Scheme: This scheme in the Upper Nile Province is the largest for dura production in the Southern Region where mechanization of grain cultivation is implemented and production is carried out on commercial scale. The project consists of 438 individual owner schemes of 1500 feddans each covering an area of 6 Km^2 each. Additional 48 schemes of similar size are projected in the near future. The yield per feddan ranges from 5 to 10 sacks of dura (220-lbs each sack), and maximum production from the entire project reached one million sacks of dura (approximately 100 thousand tons) per season.

According to information obtained from the district authorities at Renk 70% of dura production is shipped to the various provinces of the Southern Region while 25% only is sent to the Northern Region. River and road

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transport is used for shipping dura. The Team feels that such high commercial production at present and the anticipated increase in the near future warrants consideration for the establishment of grain storage facilities (silos) in Renk and other potential consumption areas (i.e. Melut, where about 20 thousand workers would be employed upon completion of the sugar project). The need for such storage facilities was expressed and strongly supported by local authorities at Renk.

The program of storage facilities for dura and other grains in the Southern Region should be integrated with the project involving the construction of three silos in the Region to be implemented in cooperation with a French company. This would necessitate a feasibility study for the selection of most suitable locations, capacities, etc.

Since most rural production of dura, the main staple, and other grains is on a subsistence level, its utilization is confined mainly to farmers who grind their grains singly or in combination with cassava, maize or other grains at privately owned grain mills. Such mills are operated either by electricity or by diesel motors (about 12-15 hp) and average charges run about 1 - 1½ pt/kg grain with somewhat higher rates for maize or mixtures of maize and cassava. From the Mefit survey (1978), grain mills charge 50-70 pt /sack of cassava or 70-80/sack of dura (with no reference to the weights of such sacks). During the survey, the Team observed that old gasoline cans holding approximately 30 kg of dura cost the owner about 35 pt for grinding.

4.1.5.1.2. **Existing Grain Mills**

From the survey conducted by Mefit, a total of 45 mills were identified; 17 in Juba, 17 in Malakal and 11 in Wau. Their report (1978) also stated that the present number of mills was not sufficient to handle the demand, as indicated by the long waiting lines also noticed by the Team, suggesting good potential for such an industry in the Region. The mills are run on oil or electricity, both types being subject to irregularity of fuel and power supply as observed by the Team.

Several mills were visited by the Team in Juba and the ones operating at that time were using oil to run their diesel engines which powered various types of grinding mills. Because of the high demand, and the fact that

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the electrically-operated mills were shut down because of power failure in their section of town, the diesel operated mills were running two, 12-hour shifts/day. They appeared to be well organized and efficiently run.

4.1.5.1.3. Development Prospects:

Small Scale Grain Mills: As mentioned earlier most production of grain in the Southern Region is on a subsistence level except in Renk area where mechanized agriculture is implemented. Under these circumstances consideration should be given to the establishment of only small scale grain mills in various provinces of the Region. Such units have the advantage that they are low capital investments and could be organized through cooperatives or by the private sector. The Team's visits to such small units supported the view that such units are more suitable and successful in their operation and in providing the necessary services for the surrounding communities.

For the success of the proposed new small scale units to be located in all provinces it would be advisable to provide for the potential investors (cooperatives or otherwise), technical, organizational and economic advice by the extension industrial service discussed under separate heading. Government support would be required for the provision of adequate fuel supply for these units (4-gallons of oil/one engine of 12-Hp combined with one grinding mill/10 working hours/day). In addition, financial support (loan) from the Industrial Bank would be necessary specially for units to be established by cooperatives or private investors with limited capital.

Medium Scale Grain Mills: Such mills appear to be feasibly viable only in the main urban areas (Juba, Wau, Malakal) where consumption of dura is in large quantities and grain is imported from Renk and the Northern Region. Establishment of such a mill should be integrated with grain storage facilities. The choice of location and economical capacity of a mill as well as power supply should be based on a combined feasibility study covering all three mills proposed for the above-mentioned locations. Identical types of machinery for the three mills should be encouraged to facilitate repair and provision of spare parts. An example of such a medium scale type mill can be found in the Food Research Centre, Shambat, Khartoum North where all technical data on this type of machinery, capacity

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and power consumption can be obtained (SUD/75/009).

Where wheat flour is preferred for breadmaking, it is recommended to establish, in the Southern Region, wheat mills for local milling of wheat instead of importation of wheat flour as practiced today. This proposal can be justified by the following:

- The wheat grain is easier to handle than flour and less subject to damage. At present, wheat flour is imported to the Southern Region from El-Gezira mills or from USA, Australia and Europe via Port Sudan.
- The Southern Region could very well utilize by-products of wheat milling (depending on the degree of extraction), for animal feeding in the existing animal projects and those proposed for implementation within the Six Year Development Plan.

The Team was informed that a negotiated agreement with a French company for the establishment of three grain silos in the Southern Region might be finalized soon. The integration of the proposed wheat mills with the silos project should be given serious consideration. Development of wheat milling industry in the Region should help in alleviating present constraints of all bakeries which face continuous shortages and interrupted supplies of wheat flour mainly due to transport difficulties from the Northern Region and from Port Sudan. It should be mentioned that the milling industry should preferably be located in areas of flour consumption especially in the Southern Region's geographical situation and infra-structure condition.

The choice between building one large capacity wheat mill or three mills for example in the larger provincial towns should be determined by a feasibility study which would include marketing survey, cost of transport apart from all necessary technical details. As a rough estimate of the demand for wheat flour needed for breadmaking in ten provincial towns the following calculated figures are presented:

- 46 tons of flour/day during 1977/78
- 60 tons of flour/day during 1982/83

both above estimates based on the lowest rate of consumption of 200 gm of bread/person/day.

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The establishemnt of wheat milling industry in the Southern Region would reactivate many existing bakeries that are operating at present between 3 to 6 months/year due to shortage of flour, and encourage the development of new bakeries in areas where breadmaking is not commercialized and bread is not available on the market.

4.1.5.2. Bakeries:

4.1.5.2.1. Existing Bakeries

In the urban areas wheat flour is mostly used for breadmaking while in rural areas flour used for baking is usually from durra or from a mixture of durra and other grains as well as with cassava.

In the urban areas of the Southern Region 34 bakeries have been identified in the Mefit survey (1978), of which 11 establishments are in Juba, 14 in Wau, 6 in Malakal and 3 in Kumbek. No exact data are available regarding their daily output and number of employees. Some bakery owners informed the Team daily output and number of employees. Some bakery owners informed the Team that there are more than 11 bakeries in Juba and gave an estimate of 35 such units. All bakeries operating in the Southern Region are traditional with the exception of one unit in Malakal which can be classified as semi-mechanized.

Six bakeries were visited by the Team: four in Juba, one in Malakal and one in Renk. Of the six bakeries, five had more than 15 workers. The semi-mechanized bakery in Malakal is equiped with one mixing machine with a capacity of one flour sack of 70 kg at one time. Baking is carried out in an oil-burning oven which is electrically controlled. It produces about 16,000 pieces of bread (150 gm each) per day, when there is an adequate supply of flour, which was not the case at the time of the Team's visit. Usually, this bakery operates at half capacity.

The other five bakeries visited (Juba and Renk) use wood as fuel. Their primary constraint is irregularity as well as shortage of flour supply. Since wood is used as fuel there is normally no shortages in this regard. Traditional bakeries differ in size and capacity with production varying between 2000 to 10,000 pieces of bread/day. Weight and shape of bread pieces differ among the bakeries but the prevailing shape in the loaf

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loaf weighing about 4½ to 6 oz. All operations are carried out by hand without benefit of any machinery. Most ovens are simply constructed of red bricks. Storage and pre-baking facilities are very poor especially from the hygienic point of view.

Shortages of bread supply were noticed by the Team at several occasions in Juba and in other visited towns. It is felt that this is due to inadequate and irregular supplies of flour mostly because of transport difficulties essentially by rail and river apart from inadequate capacities of existing bakeries in most major towns. In some smaller district provintial towns there are no commercial bakeries and bread is not available at any time.

4.1.5.2.2 Development Prospects:

The need for development of bakery industry was stressed on several occasions during discussions with government officials, bakery entrepreneurs and with ordinary citizens who face bread shortages on the market. In order to estimate the needed capacities of bakeries in three main provintial towns of the Souther Region and seven other district towns the following calculations were made using the formula:

$$D = \frac{(P.C)\ 365}{290}$$

where,

D = capacity of bakeries needed in certain period.

P = population of the town

C = rate of bread consuption in grams/person/day

365= number of consumption days/year

290= number of working days of bakeries/year based on two shifts/day.

The above formula applies to bakery production based on 200 gm loaves of bread.

The population of towns for which calculations were made, was estimated for the years 1978 and 1983 on the basis of studies carried out by Mills (1977). Since the said report showed the population of certain towns only for 1973 it was necessary to calculated the expected population in 1978 and 1983 for each town utilizing the index of population growth of 1.7%

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which was assumed by Mills for the entire population of the Southern Region. However, the population growth index for Juba was estimated at 3-0% for the period 1973-1977 then at 2.0% from 1979 to 1983 due to migration to the capital town. The Team realizes that assumptions based on such rough calculations and not supported by deeper analysis of migration and other demographic aspects should be considered as approximations only for minimum requirements.

The consumption index of bread was estimated on the basis of interviews with bakery owners and observations made during the field studies in various areas of the Region. No marketing studies in this field have been made to date. For this reason three alternatives of consumption indices have been implemented in the calculations of bread demand and needed capacities of bakeries:

Alternative I - 200 grams/day/person
Alternative II - 300 grams/day/person
Alternative III - 400 grams/day/person

The present index of consumption is presumably lower than that indicated in the first alternative due to shortage of bread in the market resulting from inadequate supply of flour to the bakeries. For this reason the abovementioned consumption indices should be treated as potential consumption estimates if flour is supplied regularly and in adequate quantities and when the combined capacities of all bakeries are compatible with the actual demand for bread.

Using the afore-mentioned formula and assumptions, the needed capacity of bakeries in the three main and largest towns in the Southern Region can be estimated as follows:

Town	Consumption Index Grams/day/person	Daily Capacity of Bakeries (2 shifts		
		1978	1983	
Juba	200	17.5	20.0	tons
	300	26.0	30.0	tons
	400	35.0	40.0	tons
Wau	200	14.5	18.0	tons
	300	22.0	24.0	tons
	400	29.0	32.0	tons
Malakal	200	10.0	11.0	tons
	300	15.0	17.0	tons
	400	20.0	23.6	tons

Similar calculations were made for other provincial towns (Nzara, Rumbek, Aweil, Torit, Yirol, and Yei). Taking the middle index of bread consumption of 300 grams/day/person, the following capacities would needed for the above-mentioned towns:

Town	1978	1983
Nzara	7.0	7.7 tons
Rumbek	7.5	8.0 tons
Aweil	7.0	7.7 tons
Torit	6.0	6.6 tons
Yirol	5.5	6.0 tons
Yei	4.5	5.3 tons

Without marketing surveys it is difficult to assess exactlut to assess exactly how much the present market demand is covered by the production from the existing bakeries and how much additional opacities would be needed in all above-mentioned towns.

It is felt that in Juba town, apart from the extension of production in the traditional bakeries, the establishment of new mechanized bakeries is needed with the total capacity of about 10 - 15 tons/day in order to cover the demand for bread by the end of the Six Year Year Plan (1982/83). Similar bakeries would be feasible also in Wau with a total capacity of 10-12 tons/day. On the other hand, consideration should be given to the establishment of new bakeries in provincial towns, where needed, or extension of the capacities of existing ones. In these smaller towns, traditional bakeries would be more suitable under existing infra-structural conditions. Where potentially possible, semi-mechanized bakeries would also be preferable if capital, entrepreneurship and skilled labour exist as well as availability of fuel.

Semir-mechanized bakeries using ovens fired by oil are especially preferable in areas where wood supply difficulties exist, example; Renk, Malakal.

As conclusions, the following suggestions are made:

a) Consideration should be given to the development of bakery industry in the Southern Region in order to improve the supply of bread which is the basic food product in all urban towns. Preparation of a long term development plan for this industry is needed to accompany the growing demand for bread due to population growth and industrialization of urban and surrounding areas.

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b) Preparation of standard model projects for various types of bakeries that would be suitable for location in various towns should be considered. It will help the potential investors to implement the most appropriate technology and type of equipment according to the local conditions and capital availability. This would facilitate repair work and supply of spare parts.

c) Special attention should be given to the establishment of new bakeries in towns and areas where now large scale industrial and other projects are being implemented, examples: Tonj, Mongalla, Malut, where large numbers of workers will be employed and new population centres will be created.

4.1.6. **Beverages: Alcoholic and Non-Alcoholic**

Country imports of alcoholic and non-alcoholic beverages for the years 1973 through 1977 were as follows:

	Year	Quantity (Litre)/M.T.	Value Ls.000's
Alcoholic:	1973	--	259.00
	1974	161,870 litre	339.00
	1975	689,397 "	502.00
	1976	692,635 "	491.00
	1977	1,231,177 "	722.00
Non-Alcoholic:	1973	--	105.00
	1974	15 M.T.	55.00
	1975	20 "	41.00
	1976	31 "	110.00
	1977	57 "	154.00

Meanwhile, production of beer during the period 1972/73 to 1976/77 was: 8,697.7; 8,579.4; 9,634.3; 9,579.1 and, 8,788.4 (000's) litres, respectively

4.1.6.1. **Present Status in the Southern Region**

Alcoholic Beverages

These can be divided into (a) Traditional, and (b) industrial.

Traditional: two alcoholic beverages, Merisa and Waragi, are produced all over the Southern Region both in towns and rural areas according to the Mofit survey (1978). Merisa, made from cereal, sugar or honey plays an important social role. Waragi, an illigal product, is a distilled beverage with about 25-50% alcohol.

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Industrials: White Nile Brewery: Located in Wau, construction of this brewery started in May, 1974 and completion was expected in 1976 with an installed capacity of 20 million bottles (123,000 hectolitres). Investments upto 30 June, 1978 came to about Ls 7 million of which Ls 1,675,170 equivalent from a Belgian Loan, Ls 705,960 from Euro-Arab Bank Loan (primarily for water and silos) and Ls 5 million, Central Government.

Transport difficulties and congestion of goods at Port Sudan have been partly responsible for the delay in completion of the project. About 90% of equipment and machinery has already been installed by SYBETRA/ Belgium. A new agreement is being negotiated with the Belgian government for a new loan (Ls 320,000 equivalent) for the completion of the project, replacement of certain parts (value at B.Fr.3,920,000) and extension of technical assistance. The Central Government would provide Ls 960,000 from local budget to cover fuel requirements, plastic crates, chemicals, civil works (disposal system) and construction. No date has been set for completion of the project.

The Team visited the site during September, 1978 and learned that 1000-tons of malt, valued at $285,000 arrived in Port Sudan in 1976 and was received and stored at the complex since 1977. It is felt that serious consideration should be given to the speedy completion of the brewery to recover losses incurred by non utilization of invested capital, continuous depreciation of equipment and buildings, losses in quality of stored malt in addition to monthly salaries of Ls.15,000.

4.1.6.2. **Development Prospects**

-White Nile Brewery

When in full operation, the brewery will require the following:

a) 8000 tons of malt/year at Ls 200/ton
b) Hops valued at Ls 20,000/year
c) Chemicals (including $CaCl_2$ for refrigeration) valued at Ls 10,000/year
d) Bottle caps
e) Bottles which can be purchased from the Northern Region.

Items (a) to (d) will require hard currency for their importation and for this reason the Sugar and Distillery Corporation has been considering feasibility studies for the growing of hops and suitable barley in the

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Southern Region. The Team feels that such a study is warranted under the abovementioned circumstances and would definitely suggest technical assistance to help in carrying out such a study.

It is assumed that the training of brewery technicians and administrators would be part of the agreement drawn with the Belgian firm undertaking the completion of the project, in addition to providing technical assistance during the first phase of the project. The brewery is expected to employ 438 persons when operating at full capacity.

Alcoholic Beverages from Molasses

A feasibility study was carried out in this respect by Duncan, Gilbey, Matheson International Distillers which was completed in 1976. For such a project about 5000 tons/year of molasses would be required to produce 1.5 million litres. No action was taken at the time by the RDC which requested the study and the Team was informed that RDC plans to update that study. It is assumed that such a project would be associated with the on-going Melut Sugar Project and/or, the proposed Nongalla Sugar Project. Another by-product also associated with the Melut Sugar project, under consideration by RDC is an alcohol distillery also utilizing molasses.

The establishment of an Alcoholic Beverage Industry, as with the case of the White Nile Brewery will contribute towards the saving of valuable hard currency, meanwhile utilizing molasses, a by-product of the sugar industry. Only when an adequate supply of molasse is assured on a regular basis should the implementation of such projects be considered.

Non-Alcoholic Beverages:

At present, there is no established non-alcoholic or soft-drink beverages operating on an industrial scale in the Southern Region.

A licence was issued in 1976 to the Rejaf Mineral Water and Squash, Juba which the Team was unable to visit since it was closed. No information is available regarding capital investment, number of employees, type of equipment or production capacity and quality of product. From limited visual observations, the Team assumes that this factory operates on a very small scale. Another licence was issued in 1976 to the Mineral Water Factory, Malakal, while the Jur Mineral Water and Squash Factory at Wau has been operating since 1974.

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According to information provided by the Ministry of Commerce, Industry and supply, Southern Region licences have been issued for the establishment of factories for both alcoholic and non-alcoholic beverage manufacture but so far non have been established and no substantial reasons given.

Apparently there is no system of follow-up of implementation of projects by the private sector and the only action taken by the respective Ministry is to withdraw the issued licence after two years if the project is not implemented. It is felt that the government, in its efforts to encourage the private sector's investment in industrial development, should take more positive action by investigating the reasons for delays in implementation of report if such approved projects had been based on properly conducted feasibility studies. As recommended in another section of this report, such activities should be handled by the proposed Industrial Development Centre.

4.1.7. Coffee, Tea and Tobacco Processing :

Coffee, tea and tobacco, considered by local authorities as strategic crops have been introduced into the Region as cash crops.

4.1.7.1. Coffee :

Table 6 indicates quantities and corresponding values of coffee imports into the Sudan. Since coffee growing has been shown to succeed in some areas of the Southern Region are being made to expand its production to cover part if not all of the present, and possibly future demand.

According to one source (Six Year Plan), present area under cultivation is around 3000 feddans of which 350 are under irrigation.

EPAPC Estates:

Acreage under coffee in the Equatoria Province Agricultural Production Corporation totals 1,295 feddans of which 1183 of mature and 112 of imature trees. Distribution among estates is as follows:

Nzara	160 feddans
Singbi	505
Sakure	125
Ringasi	65
Yambio	45
Uzo	50

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Maridi/Ibba/Nagumbo	75
[illegible]	[illegible]
Ezo/Li[illegible]/[illegible]	7[illegible]

The following table shows total production from the various estates during the seasons 1974/75 through 1977/78 (OLM Report, 1978).

<u>Production of Clean Green Coffee Beans (lbs)</u>

	1974/75	1975/76	1976/77	1977/78
Total Quantity	74,[illegible]9	27,60[illegible]	93,588	210,889
Total Value, Ls.	14,839.80	6.072.66	27,311.00	84,355.60

Source: Street, P R et al, 1978. Tropical Products Institute, A Rehabilitation Strategy for the Equatoria Province Agricultural Production Corporation (EPAPC), Southern Region.

<u>Ngara Complex:</u>

Two coffee hulling machines powered by 7-HP electric motors can hull 50 sacks each of 180-lbs (82 Kg) of cherries in 12 hours or about 375-lbs/hour. Present processing season runs from December through April/May. When operating 2[illegible]0 days/year on the basis of 7-8 hour/day. the plant could process 280 tons of coffee [illegible] annually.

Coffee is normally sun-dried on the farms/estates prior to transferring to a small storage facility [illegible] near the Ngara unit.

In a report by Nehru (1975), it is claimed that approximately one third of the coffee plants need to be replaced. It is also reported that average production of clean coffee during 1974/75 averaged 1[illegible]7-lbs/feddan compared to a normal yield of 500lbs. A later report by Faure (1977), indicated that coffee production by Ngara Complex plantation was 34 tons of clean coffee in 1975/76, 42-tons in 1976/77 and about 68-tons in 1977/78. The report also adds that plantations were poorly maintained yield were low and renewal rate was slow. Hullers have been adjusted to hull rice when necessary with 20% broken rice. However, lack of standard screens and cyclone results in broken rice going with husks. None of the by-products (bran, husks or broken rice) are utilized, and it is suggested that consideration be given to such by products along with cottonseed cake

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produced in the Complex in the manufacture of animal and poultry feed, either at the Complex or in some of the proposed feed mills.

Development Prospects:

3000 feddans were planted as part of the 10 year plan (1961/62 - 1971/72) however, 75% of the area was damaged, later. A program to grow 23,000 feddans was included in the 5-year plan (1970/71 - 1974/75) with later targets set at 75,000 feddans for self-sufficiency plus 25,000 feddans for export; by the end of 1975 only 2% of the target was achieved. The Six-Year Development Plan 1977/78 - 1982/83) provides for the establishment of 15,000 feddans of which: 11,000 feddans of small holders; 2,000 feddans of private plantations; and 2,000 feddans of government estates, with a Regional Government layout of Ls 2.5 million over the period of the plan.

To increase the space of coffee development, the World Bank provided assistance to the private sector to establish 3,150 feddans over a 4-year period ending 1977/78. World Bank assistance was also given the FDU to raise seedlings to supply one-acre small-holder farmers. A long range, 15-year plan, involves the establishment of 100,000 feddans of coffee in which about 70,000 farmers are likely to participate. Cost of investment per feddan was estimated at LS 126.00 for establishment plus about LS 90.00 variable cost/year. However, many problems have been shown to confront the implementation of cooperative coffee farms.

Areas designated as suitable coffee production, depending on the type of irrigation are as follows:

a) Rain-fed areas which require no supplementary irrigation: Nzara/Yambio.

b) Areas requiring supplementary irrigation and adjacent to streams flowing from Acholi hills in Eastern Equatoria, and adjacent to Yei river in Mundri/Maridi area (rainfall, 1300-1600 mm from April to November, with severe dry season extending to 100 consecutive days without rain, from December to March). Trials in Nzara/Yambio with Robusta coffee showed promise.

EPAPC:

In its proposal for the rehabilitation of the Equatoria Province Agricultural Production Corporation, the ODM Mission (1978), submitted a plan

which includes (a) bringing production on the present estates up from just under 100 tons to over 250 in no less than 5–6 years with good management and adequate transport, (b) expansion through plantings to start in 1980/81, preferably at Nangume/Birisi (Yambio), and Mvamundo (Meridi) and Ezo, since, apparently, there is no room for expansion at Nzara or Sakure and limited expansion at Singbi. The report also indicated that when planting of an additional 1600 acres commences in 1980, total estate production should reach 606 tons of clean coffee beans by 1992. Proposed capital investment was Le.55,596 (1979/80); technical cooperation Le50,320 (over the period 1979/80 through 1982/84).

Haggar Company: Private sector

The first coffee and tea plantation was established in 1937, in Iwatoka 30 miles from Yei. The plantation was destroyed, later, by fire. Presently, the company operates 600 feddans in Iwatoka (of which, 120 are under tea), and 343 feddans in Kabengore, employing 1000 persons of whom 60% are permanent. About 24 local farmers cultivate 189 feddans of coffee and tea; the Haggar company offers them aid, technical advice, loans and supervision when necessary.

The company plans to increase the coffee plantation up to 1000 feddans and the Team was informed that 200 kg. of dry coffee beans can be obtained from one good feddan.

4.1.7.2. TEA:

Data presented in table 6 shown quantities of tea imported and corresponding values. Tea has been grown for a number of years with a certain degree of success in some areas of the Southern Region. Efforts are being made to increase production to meet part of the local demand.

At the time the Six Year Development Plan was prepared it was estimated that about 200 feddans of tea plantations were already established. These probably included areas under tea operated by Haggar Company in Iwatoka and Kabengore in addition to those among the 189 feddans operated by some 24 farmers in the same areas.

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Information obtained from the Haggar Company indicated that irrigation of tea plantation is required during the dry season, from December through April if production is to be kept up. Average production amounts to 10-12 tons/month.

Development Prospects :

The Regional Government has allocated the sume of Ls 1.5 million for developing of tea production covering an estimated area of 2,800 feddans during the Plan period.

The Haggar Company also has plans to extent their present tea plantations up to 200 feddans. The Company plans to improve tea processing and has ordered new equipment which has not arrived yet from Uganda. One problem, however, raised by the Company was to find suitable permanent staff for their estates. At present, an expatriate manages the tea and coffee estate. At a meeting with EDF staff in Khartoum it was learned that their budget allocations for the Southern Region covers (1) tea project of 250 feddans in the Imatong Mountain area, and (2) Small holder cooperative coffee project near Yei (80 + 70 Feddans).

4.1.7.3. Tobacco and Tobacco Processing:

Data presented in table 6 shows imports of tobacco and tobacco products including cigarettes and cigars for the years 1973 through 1977, along with the respective value in Ls. Country production is shown in table 6 Tobacco is grown in the Southern Region and, according to the Mofit survey (reported in 1978), raw tobacco is consumed mostly in the country.

Traditional Processing: this refers to the pressing and drying of tobacco leaves then marketed in the form of blocks (or koms), placed inside special skin or wooden containers (Mofit, 1978). The product is either chewed or smoked in locally made pipes. Estimate by Mofit for 1975/76 production come to Ls 2,756,200 of which 39.8% is claimed to have been commercialised. No actual quantities representing annual production or processing were reported by Mofit or government agencies.

Industrial Processing :

The present Haggar Tobacco Factory located in Juba was established in 1948 and at present it produces 15 million cigrattes/month. The number of

factory employees is 48 males plus 41 females. The factory also manufactures cigars and pipe tobacco, however, the latter product is not manufactured due to shortage of vacuum sealed metal containers. At present the area under tobacco amounts to 500 feddans owned by farmers who either have a contract with the company, or the company provides chemicals, agricultural machinery, technical supervision as well as financial assistance to be paid back in the form of tobacco. Average production per feddan is around 250 kg flu cured or 300 kg air cured tobacco. Areas under cultivation are located in Yei, Kajo Kaji and Kerripi.

Factory production during 1975/76 was 200 tons processed tobacco worth Le 1,080,000 according to Mefit (1978).

Development Prospects:

Plans by the Haggar Tobacco and processing Plant include the establishment of a new factory near Gumbo (east bank of the White Nile) on a 30,000 m^2 lot with an installed capacity of 1800 tons redried processed tobacco. Projections are for increasing the area under tobacco from 1000 feddans (200 ton production) to 9000 feddans (1800 tons production) during the next five years. Cost of new machinery is estimated at $4.5 million. Cost of transportation by truck from Khartoum to Juba is about Le 600.

4.1.8. The Sugar Industry

4.1.8.1. Present status

Industrial production of sugar in the Sudan is, at present, confined to the Northern Region where three sugar mills are located in Guneid, Khashm El Girba and Sennar. While consumption of sugar has increased rom 169,919 tons in 1967/68 to 295,915 tons in 1976/77, production at its best covered only 55% of demand. Table 7 shown prodution and consumption of sugar during the period 1967-1977.

At present, there is no sugar production in the Southern Region and all of the Region's needs are provided from Northern Region. No statistical data were provided concerning imports of sugar into the region or rate of consumption, however, there appears to be constant shortage of this commodity throughout the region most probably as a result of transportation difficulties.

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4.1.8.2. Development Prospects in the Southern Region

Two sugar factories, one in Melut and another in Kongalla are to be financed by the Central Government at a combined cost of Ls 84 million during the Six Year Development Plan.

Melut Sugar Project:

Work on sugar factory, located about 17 kilometers from Melut town, began in November 1977 although the contract was signed in 1974 and some of the equipment arrived in 1976. Because of bad weather and other delays only 3 months of actual construction work has been completed to date and this amounts to less than 10% of all civil work. About 75% of the Factory equipment has reached the Sudan with 15% on the site, 45% at Port Sudan and 15% at Kosti. According to the representative of UCMAS, Civil Engineering Contractors, factory capacity will be 6500 tons of sugarcane crushing/24 hours and that 50 qualified technicians would be needed for the factory. The contract provides for 1-5 years of technical assistance to the project the cost of which was estimated at Ls 28 million. The Central Government however, has allocated the sum of Ls 50 million for the project in the Six Year Development Plan, which includes the agricultural component. The area available for the project is 44,000 feddans with about 20,000 feddans to be cultivated annually, according to the manager of the Sugar and Distillery Corporation, Khartoum. Expected completion of the project is around October 1981, barring unnecessary delays and, based on 3 shifts per day, seasonal production of white sugar would be about 110,000 tons. It has been estimated that about 6000 workers will be needed for cane cutting and for factory. Meanwhile, the population of Melut is stated to be about 2000. The project does not provide for housing for labour, a matter which requires immediate attention before it developes into a major constraint for theproper operation of the entire project with its agriculture as well as its industrial components.

In order to guarantee the success of this large scale project and full utilization of its projected installed capacity in the scheduled time serious consideration should be given to the setting up of all infrastructural facilities which are closely integrated with the industrial and agricultural sectores. Since the project is located far from the major

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population centers and in an area of sparse population, it will be necessary to build up a new community settlement with all its necessary components and services for about 10-15 thousand inhabitants. This means that the following basic components will be needed for this community:

- Standard housing for about 100-150 persons of the managerial, technical and administrative staff and their families.
- Building materials for housing for about 4-6 thousand workers' families according to local accommodations traditions.
- Building for schools, dispensaries, trade shops, handicraft shops, etc.
- Building for government administrative offices and other services needed for such a community.
- Industrial workshops for local manufacturing of construction materials and equipment as well as repair and maintenance workshops.
- Such a community may require also other industrial units such as bakeries, grain mills, etc.

For the above-mentioned reasons, the preparation of an urban master plan for this settlement should be carried out as soon as possible with implementation, preferably alongside with the implementation of the sugar project. Consequently, there should be no difficulties in recruiting staff and labour which would be reflected in the efficient utilization of the capacity of the entire project.

Mongalla Sugar Project:

According to the manager of the Sugar and Distillery Corporation, Khartoum the feasibility study for the Mongalla Sugar Project has been completed and the estimated total cost is about L.E 34 million. The agricultural component covers 30,000 feddans with cultivation at the rate of 10,000 feddans/year. The sugar mill will have an installed capacity for crushing 3000 tons of sugar cane/ day and annual production of white sugar is estimated at 50,000 tons.

Upon signing the contract with the executing company for this project consideration should be given to the recommendations regarding all infrastructural facilities as proposed for the Melut Project. It should also be taken into account the integration of Mongalla Sugar proposed facilites with those required for the other large scale industrial projects which

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are under implementation in Mongalla (Mongalla Weaving Mill, Agro-Industry Complex, Woodworking factory). For this reason, the preparation of an urban master plan for Mongalla is also needed.

4.2 Textile and Clothing Industries (ISIC 31)

4.2.1 Textile Industry

4.2.1.1 Cotton Production

Cotton is the only plant fiber used in the existing textile industry in the Southern Region. Cotton cultivation on a commercial basis is limited to Eastern and Western Equatoria Provinces. It started in 1951/52 when the Zande Scheme was launched. Records of cotton production for the seasons 1974/75, 1975/76 and 1976/77 were: 117.1, 532.2 and 517.7 tons, respectively (Table 8) . Estimated production for 1977/78 is 562.0 tons out of 11,711 acres, owned by 14,087 cotton farmers. A revised estimate puts the 1977/78 cotton production at 711.4 tons, (Table 9).

Prior to the civil disturbances the area under cotton cultivation in the Equatoria Province, before its recent division into East and West, was much higher. Maximum cotton production of 3527 tons was obtained from 22,700 acres, cultivated by 41,340 farmers. It is clear that present production of cotton is far below that during the period 1953 - 1959 because of the smaller number of cotton farmers and lower cultivated area. Present average yield of cotton per acre is estimated at 136 lbs compared to a maximum yield of 340 lbs and a minimum yield of 170 lbs during the 1950's. These figures explain the reason why the only existing weaving and spinning mill of the Nzara Complex is not operating at full capacity apart from other technical operational and managerial reasons.

The cotton acreage and cotton production by districts and provinces are shown in Table 8.

4.2.1.2 Existing Textile Industry.

For cultivated cotton in the Southern Region the only outlet for processing are two operating factories:

I. Nzara Industrial Complex with its ginnery, spinning and weaving mills in addition to the oil mill and refinery.

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II. Ginnery in Mongalla

The new Weaving Mill in Mongalla is still under construction and is expected to be commissioned in early 1979.

Nzara Industrial Complex:

This Complex was established in 1952 as a major component of the Zande Scheme. The main objective of this scheme was to develop one of the remote areas of the Southern Region by initiation of cotton cultivation under suitable climatic and soil conditions and its local industrial processing. The Complex was officially opened in 1952. Its facilities included:

(a) Ginnery
(b) Spinning Mill
(c) Weaving Mill
(d) Oil Mill and Refinery
(e) Soap Factory
(f) Saw Mill and Wood Working Shop
(g) Ancillary Departments.

The ginnery was completed in 1959 and can produce 43 bales each of 430 lbs of lint cotton in one 8-hour shift. The covered area of the ginnery building amounts to about 540 m^2. It is equiped with the following basic machinery:

Murray inclined cleaner (6 cylinder); Murray 80 saw gins (4 units); Murray linter with seed wighing device; Murray condenser; Murrey baling presses and other transport and ancillary equipment.
During the Team's visit to the Complex (August 1978) the ginnery was not operating due to shortage of raw material and fuel. Its maximum installed capacity amounts to 6640 tons of seed cotton based on 3 shifts and 120 days season (Street, P.R. et al, 1978).

No accurate data on seed cotton quantities processed in the ginnery are available. It is mentioned in some reports (Nehrt, L.C., 1975) that the amount of seed cotton produced and processed by the Nzara Complex was 78 tons in 1973/74 season and 458 tons in 1974/75 season.

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From the report by Street et al (1978), purchases of seed cotton from cotton farmers by the Complex were:

Season	Quantity (tons)
1974/75	117.1
1975/76	532.2
1976/77	517.7
1977/78	562.0 1st estimate

It has been reported by various missions which visited the Nzara Industrial Complex that the equipment of the ginnery was in fairly good condition and requires minimum amount of repair and materials. According to the latest report of the ODM Mission (Street, P.R. et al, 1978) minor repair electricalwork and replace drive belts work and spare parts are required. The total cost of this repair work including cost of spare parts, freight and transport to Nzara amount to LS.4510.

Spinning and Weaving Mills: The main raw material for the spinning mill was provided from the ginnery of the Complex. Some amount of lint was also supplied in 1977/78 season from the Mongalla ginnery. The available amount of lint for spinning was as follows: (Street, P.R. et al 1978):

Season	Quantity
1974/75	154,575 lbs (69.0 tons)
1975/76	552,251 lbs (246.5 tons)
1976/77	544,103 lbs (242.9 tons)

The machinery and equipment of the spinning mill has been amply described in the reports of the UNDP/UNIDO Mission (1973) and ODM Mission (1978). Major repair work and spare parts as well as replacement of some machinery is required. The total cost of rehabilitation of the spinning mill was calculated by the latter Mission at LS.71,936. This investment cost will bring the capacity of the mill up to 900 tons of lint per year (200 working days, 3-shifts basis) producing 806 tons of 16's count yarn.

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The building housing the weaving mill has a covered area of about 1470 m^2. The installed capacity of the mill is around 575 tons of yarn/annum but it is unlikely that the mill can achieve this tonnage at present condition due to shortage of cotton and power. Quantity and value of production of the Nzara Weaving Mill amounted, during the previous three years, to:

Season	Quantity (yards)	Value, Ls.
1974/75	1,426,270	241,661.15
1975/76	787,139	132,741.30
1976/77	323,623	63,351.40
1977/78	132,805	26,487.05 from 1 July 1977 to 15 April 1978)

The above figures were from EPAFC statistics presented in the ODM Mission report (1978). The quantity and value of production include the following cloths: Domoria A and B, Coating A, Sample A and Gauze A and B. As shown in the above table, the highest production was during the season 1974/75. The production went down during the following seasons due to shortage of raw material (seed cotton), technical and managerial difficulties, lack of spare parts and shortage of fuel. During the Team's visit to the Nzara Complex (August 1978), the weaving mill as well as all other departments of the Complex were not operating due to shortage of fuel. The Team was again informed by the manager of the Complex that up till October, 1978 there was still shortage of fuel at the Complex.

Most of the machinery in the weaving mill is about 30 years old and needs repair work, spare parts and some require replacement. Detailed information about the present technical state of the machinery and scope of the refurbishing work needed has been reported by previous missions including UNDP/UNIDO Mission (1973). The overall picture of the present conditions of the mill and ancillary departments, the capacity of the mill and ancillary departments, the capacity of the mill and its utilization as well as technical and investment requirements for its rehabilitation are presented in the latest report of the ODM Mission(St.P.R.et al, 1978)

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According to this report the total cost of spare parts for rehabilitation of the weaving mill amounts to LS.9680.

The total estimated capital costs including refitting, installation and commissioning of the ginnery, spinning and weaving mills amount to:

Ginnery	LS. 4,507
Spinning Mill	LS.81,906
Weaving Mill	LS. 9,680
Total	LS.96,093

The above total amount is part of the overall capital investment for the entire industrial division of the Complex at LS.720,039. This includes rehabilitation and extension of certain sections such as: power generation, motor transport and communication, oil mill and refinery, general workshop, sawmill and carpentry shop and water tank.

The capital investments in the ginnery, spinning and weaving mills as well as in other ancillary departments of the Nzara Complex will enable to get rehabilitated outturn of 5.8 million yards of Dunuria A cloths (16/13's NE count) and 98 tons of spinning waste and 24 tons of weaving waste. The total value of outturn was calculated in the above-mentioned study (Street, F.E. et al 1978) at LS.1,201,544 per annum from the 1981/82 onwards.

The quantity and value of production to be achieved after the proposed rehabilitation of the textile departments, according to the ODM report, would be more than four times higher than the peak production on of 1974/75 season. Such production after the rehabilitation of the textile

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sections can only be achieved in coordination with the proposed agricultural program as follows:

	1977/78	1981/82
- Number of cotton farmers	14,087	14,577
- Acreage under cotton	11,711	12,217
- Total production (long tons)	711	1,224
- Yield per acre (lbs)	136	224

The capital cost of cotton extension and marketing amounts to LS.167,326 from the year 1979/80 to 1982/83. The recurrent cost of cotton extension and marketing from the period of 1979/80 to 1983/84 amounts to LS.50,320, and operating costs in the period of 1979/80 until 1981/82 amounts to LS.219,219.

The Mongalla Ginnery:

The ginnery at Mongalla, 35 miles north of Juba, processes seed cotton grown in Torit area. Since there is no spinning mill in Eastern Equatoria Province the lint and seeds are usually transported to Nzara Complex for further processing. The distance of 355 miles between Mongalla and Nzara takes at least two days of transport on a bumpy road especially between Juba/Meridi/Nzara. The long distance and difficult road conditions in particular during the rainy season increase the cost of raw material supplied from this area to Nzara. The cost of transport in 1976/77 was estimated at LS.200, one way, for a 7-ton truck. Such transport difficulties resulted in the accumulation of about 94,000 lbs of cotton lint and 171,000 lbs of cotton seed at Mongalla ginnery. It should be mentioned that at the Mongalla ginnery no pre-ginnery storage facilities are available. During the Team's visit to the Ginnery (November 1978), the factory was not operating because of the possibility of the collapse of the wall separating the engine room from the ginning machine hall.

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Lack of cement is delaying the civil repair work. The following information was provided by the manager and staff at the ginnery:

- Cotton for the ginnery is supplied from Kaji Kaji, Yei, Lulubeh, Nimule, Madi area and Acholi area. Every season, about 3000 sacks of seed cotton are supplied to the ginnery. More cotton could be supplied if the ginnery is operated at full capacity. During the 1977 season (March/November), the ginnery produced 110 bales 1st grade and 35 bales 2nd grade of cotton lint. During 1976, the ginnery started in May and produced 183 bales 1st grade and 11 bales 2nd grade of lint cotton until October when they stopped because of the dangerous building condition.

The last time cotton lint and cotton seed was transported to Nzara Complex was in August 1978 following which no further trucks were provided. For this reason, 37 bales from last year's production and 194 bales from this year's are stored in the ginnery hall and in one office room. Two stores are completely filled with cotton seed with no further space for additional seed available. No less than 10-15 trucks are needed to clear the ginnery from cotton seeds alone. More than 15, 7-ton trucks will be needed to transfer the stored cotton bales of lint to Nzara to make room for the coming cotton season.

- The ginnery employs 34 workers including the foreman and runs on one, 12-hour shift with a 2-hour break. About 18-20 bales are processed/ shift. About 7-8 sacks of seed cotton make one bale of cotton lint which averages 125-130 kgs.

- Present constraints are shortage of fuel and transport facilities.

To overcome the present constraints affecting the ginnery and extend its capabilities the following suggestions are made:

a) As immediate priority, repair of the civil work should be carried out by providing a few sacks of cement. The assistance of the civil engineer at the site of the Mongalla woodwork shop should be considered.

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The early completion of civil work is essential for the ginnery to be in operational condition for the coming cotton season.

b) If the Nzara Complex management is incapable of providing transport for the unloading of cotton bales of lint and cotton seeds stored in the ginnery efforts should be made in cooperation with the responsible ministry to rent commercial trucks to clear the storage areas for the coming cotton season (January/March 1979).

c) Additional storage facilities are badly needed for cotton seeds and bales. These can be implemented by using local building materials (Bricks, stones, lime, timber, etc.)

As medium and long term proposals, the establishment of an oil mill and a spinning mill, respectively, should be considered for the integration of the existing ginnery and almost-completed weaving mill in Mongalla. Such an investment would allow, as mentioned later (development prospects of the textile industry), the closure of the processing cycle from the raw material to the finished product (the same principle on which Nzara Complex was initiated). In this way, costly and non-dependable transport of cotton lint and cotton seed to Nzara (about 570 km), and yarn from Hag Abdullah in the North to Mongalla (1700 km) would be avoided. In addition, this proposed integrated complex will create new incentives for the expansion of cotton growing in Eastern Equatoria Province and neighboring accessible areas. The large scale road construction and improvement schemes already under implementation should facilitate transport of raw material to Mongalla.

For the above-mentioned reasons, a comprehensive feasibility study is strongly recommended for this proposed integrated agro-industry complex.

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4.2.1.3. Development Prospects.

Mongalla Weaving Mill:

Construction of the Mill and installation of machinery and equipment has been completed. It is expected to be commissioned in the early part of 1979 and the initial production should start in the season 1979/80. The project is partly financed from a Belgian Loan. The investment cost is estimated at LS.5 million of which 50% is covered from the Central Government budget. The mill is equiped with 256 looms on which grey cloth will be produced. The capacity of the mill will amount to 6.5 million yards of grey cloth (20's NE count), according to the information provided by the Textile and Weaving Corporation, Khartoum (September 1978).

The factory will require the supply of 900 - 1000 tons of yarn annually to be transported from Hag Abdullah, El Gezira Province by rail or trucks to Kosti then by river to Juba or Mongalla. The total distance of transportation of yarn is around 1700 km. Storage facilities at the Mongalla plant are for three month supply. The factory will need also 600 tons of starch annually and 70 tons of fuel oil per month for 3-shifts daily production. It is anticipated that at the initial year of operation of the project some difficulties in regularity of supply of yarn and fuel may occur due to present poor transport conditions of the rail, river and road connections from the Northern Region to Mongalla. Because of limited storage facilities at the Mongalla mill transport difficulties may result in low efficiency of production. Long distance and high cost of transport of yarn and fuel may affect the economy of production. The rough estimate of transport costs of yarn from Hag Abdullah to Kosti by train, and from Kosti to Juba or Mongalla by river are as follows:

- Rail transport: from Hag Abdullah to Kosti
  1000 tons, yarn X LS.40/ton = LS.40,000
- River transport: from Kosti to Mongalla
  1000 tons, yarn X LS.17.1/ton = LS.17,100
- Total cost of transport, ... = LS.57,100 (excluding handling & loading charges)

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- Charges of LS.0.270/ton are added for handling at Kosti and Juba. The same rate probably will be applied in Mongalla if the yarn is unloaded there, making LS 0.540/ton for loading and unloading.

The Team was informed by the Director of the Textile and Weaving Corporation that the Mongalla project seems to be uneconomical and was not market-oriented although the report of the ODM Mission (1978) assumes that the production of 7.2 million yards at Mongalla and 5.8 million yards at Nzara of 16's NE count cloth will amount to 74% of the total consumption of grey cloth in the Southern Region in 1990. However, if Mongalla mill will produce only 5 million yards of 30's NE count, the total production of grey cloth in the Southern Region will amount to 10.8 million yards which will cover 61% of the total consumption of this cloth for 1981. Meanwhile, data provided by the Textile and Weaving Corporation indicates that the production of 16's NE count will be 9 million yards; of 20's NE count, 6.5 million yards; or, of 30's NE count, 5 million yards/annum.

The Team feels that under these circumstances a feasibility study for Mongalla Weaving Mill is essential since, to the Team's knowledge, no previous study had been carried out before the establishment of the factory. This study should cover, in particular, economic aspects of the project and future development of the mill.

Consideration should also be given to the establishment of a spinning mill at Mongalla in order to utilize cotton lint from the existing ginnery thereby reducing complete dependence on importation of yarn from Hay Abdullah. Such an extension would reduce cost of transport of yarn to the weaving mill and eliminate transportation difficulties and irregularity of material supply which are expected under present poor transport conditions. As part of the proposed feasibility study, consideration should also be given to added storage capacity even in the form of temporary inexpensive sheds. The proposed study should

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keep in mind the comprehensive work and projected plans made for the Nzara Complex by the ODM Missi n (1976). If the suggested feasibility study for Mongalla Weaving Mill will recommend the establishment of an economic spinning unit in Mongalla, which would probably have a comparatively higher capacity than the demand for yarn by the newly constructed weaving mill, consideration should be given to the posibility of doubling of the present number of looms as the second phase of the Mongalla Weaving Mill project.

The establishment of a spinning mill at Mongalla will create an integrated complex in the Eastern Equatoria Province comparable to the Nzara Complex in the Western Equatoria Province. This would encourage cotton farmers in Torit and Yei areas to cultivate more cotton once there would be an outlet for their crops. It will also solve the problem of lint produced by Mongalla ginnery which, otherwise must be transported to Nzara, 355 miles away at an estimated cost of more than LS.200 for a 7-ton truck, one way. It should be made clear that the capacity of the existing ginnery has to be coordinated with the capacity of the proposed spinning mill.

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4.2.2. **Industrial Processing of Natural Plant Fibers other than Cotton:**

Imports of jute and sacks into the Sudan for the years 1973 through 1977 were as follows:

Year	Quantity No.	Value, LS 000's
1973	—	4,255
1974	48,681,925	6,064
1975	36,726,630	7,663
1976	15,699,550	2,395
1977	26,565,487	3,577

Production of sacks at the Alu Khana Kenaf Factory (Northern Region) came to 1,200,000 during 1976/77 which is far below the annual demand. To meet some of the demand for sacks another kenaf factory was started in 1973 at Tonj, in the Southern Region.

4.2.2.1. **Toni Kenaf Project:**

The project is made up of two sectors: Agricultural and Industrial.

a) Agricultural Sector: When completed that sector would operate 40,000 rainfed feddans on a rotational basis at a ratio of 50:50, kenaf and groundnuts. Clearing the land by hand started in 1973 and almost 3000 feddans have been cleared so far. Projection for the coming dry season is to have 10,000 feddans cleared. Two major constraints are fuel and transportation. Delay in the implementation of this sector is also due to delay in the shipment, from Port Sudan, of about 130 tractors along with 70 tippers plus the shortage of bulldozers and graders.

b) Industrial Sector: Construction of the kenaf plant began in 1974 and up to the time of the Team's visit (September, 1978) only the steel structure of the main building was built and

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partly roofed. Delay in construction work and installation of machinery and equipment resulted from interruptions in delivery of material from Port Sudan to the construction site. The machinery and equipment shipped from Italy reached Port Sudan in 1974. From that time until the present between 70 and 90% of the shipment reached Khu by rail then to Tonj by trucks. Many of the boxes were severely damaged and some of the machinery checked by the Team were broken and rusted from long exposure to rain and wetness without protection. Since the four years old contract has expired, a new one is to be negotiated with the Italian Government which provided the original loan. Total project cost was estimated at LS.17 million with LS 3 million for the factory which will be equiped with 60 looms for the production of 10-million sacks/year on a 3-shift/day basis. According to the original contract, the Italian Company, Adriano Gardella, would be responsible for: construction and installation work of the factory; establishment of the plantation through initial production; and, providing technical assistance during the first five years of project operation. Expected date for first testing has been moved up to November 1979, provided the required amount of cement (1200 tons) was delivered in time. The project will require 650 technicians and workers on a 3-shifts/day basis; 400 permanent farm workers; and, 4000 seasonal farm laborers.

Development Prospects.

The Team was unable to obtain information from representatives of the Gardella Company or from the manager of the Kenaf Project, Khartoum about housing facilities for the large staff expected to operate the factory and kenaf estate, along with all other needed amenities. Based on information provided by the construction firm, about 30 engineering and technical staff will be needed along with 50 maintenance and general services workers.

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This issue should be given proper attention since it was understood that problems in recruiting for the Abu Naama Kenaf project were due to similar reasons.

Other projects under consideration by the project manager are based on the utilization of kenaf cortex for chipboard manufacture and rettening water for establishing a 1200 feddan coffee plantation. Present field trials indicated an average yield of 0.7 tons kenaf/ feddan, or approximately 1/,000 tons when the proposed estate is in full production. Percent cortex is about 50-70%, thus a rough estimate of the annual quantity of raw material for chipboard manufacture would amount to 7000 - 10,000 tons. Feasibility studies should be considered before investing in such projects with respect to utilization, marketing and transportation aspects, among other factors. However, it is felt that at present such projects may be somewhat premature when no accurate estimates could be predicted by the time the entire agricultural and industrial sectors are in actual operation under full capacity. It is, therefore, recommended that such projects be considered for medium or even long term implementation under present circumstances.

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4.2.3. Clothing Industry.

According to the MEFIT (1975) report, four small-scale factories for manufacturing of ready-made wearing apparels started their operations between 1974 and 1976. They employed during that period about 90 workers (from 16 to 25 workers in each unit). However, out of the four establishments only two are at present operating intermittently and appear ready to close down completely due to various constraints, primarily because of raw material supply and transport difficulties as well as irregular electrical power supply. During the Team's visit to one of the units all machines powered by electricity were stored and not used.

More attention should be given and all efforts should be made by respective government authorities for promotion of the clothing industry in the Region since its development can be based on low capital investments and provide new jobs in various backward areas of the Region. Development of this industry would partly substitute import of wearing apparels for which foreign currency is required.

The establishment of clothing cooperatives in Juba and various provincial towns of the Region should also be considered as a means of industrialization, particularly in areas where such industry exists at present and no industrial plans are proposed there.

4.3. Leather Industry.

The main marketing centres for hides and skins in the Sudan are in Khartoum and Omdurman. Tanneries in the Northern Region handle about 20% of all hides and skins produced in the country. The number of hides and skins processed in the three main tanneries are estimated at one million hides, three million sheep skins and two million goat skins of which 60% are dry salted, 30% are semi-dried (mainly from the Southern Region), and 10% are fresh or wet dried. Maximum capacities of the

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three main tanneries in the Northern Region are as follows:

Tannery	Capacity/Day	
	Hides	Skins
Khartoum	550	1200
White Nile	400	3000
Abd Medani	900	2500

During 1977, some of the above tanneries were operating at only 20% capacity.

4.3.1. Resources in the Southern Region.

Regional Government sources estimated the number of hides and skins produced in 1976 at 1,0,835 pieces distributed among the six provinces. These would include hides and skins from animals slaughtered in government slaughter-houses or by private households. In the survey made by Moffit (1978), the number of animals slaughtered in the 31 slaughter-houses during 1975/76 came to 5[illegible],159 cattle and 18,961 sheep and goats.

When there is a shortage of salt, hides are frame-dried using bamboo frames if no wood is available. Sheep skins are suspension dried while goat skins are case-dried. When salt is available, either dry salting or wet salting is applied.

The poor quality of hides and skins, especially in the Southern Region is due to many factors: poor flaying technique, damage from scratching and branding, and poor drying (with salt or with frames) and storage facilities. Yet it is estimated that about 40,000 pieces of hides and skins are exported annually. Through efforts of the Hides and Skins Division of the Department of Animal Production, Regional Ministry of Agriculture it is claimed that better hides (38,515 pieces) and skins (2451) were produced during 1975.

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Information gathered by the Team along with observations made during the field visits there appears to be no organized leather industry on any industrial scale in the Southern Region. Some leather handicrafts using skins from pythons, crocodiles, lizards, and some wild animals are known to exist based, in some cases, on illegal hunting of such animals.

4.3.2. Development Prospects.

The Regional Government has included in the Six Year Development Plan an extensive program for the improvement of hides and skins in all six provinces with an outlay of LS.511,960 covering the six year period. This will be accomplished through the building of better slaughter-houses and stores, and by introducing to the farmer through an extension service, improved methods for upgrading the quality of hides and skins through the use of improved traditional frame drying techniques.

Some simple training in hide and skin tanning and leather manufacturing is offered at the Multi-Training Centre, Juba as part of their training program. Special programmes could be organized for the training of extension service personnel with the Hides and Skins Division, Ministry of Agriculture. Several animal improvement and production project already in existance or included in the Six Year Development like such as Kapoeta Sheep Improvement Projects, Juba Dairy Farm at Belinyang, Bhd Dairy Farm at Rotum and the proposed Beef Cattle Ranch in conjunction with the Mongalla Industrial Complex, will contribute to the meat supply in Juba area. The projected daily capacity of the Mongala slaughter-house is about 20-30 heads of cattle/hour and 10-20 sheep and goats/ hour and with an initial annual capacity of 6000 heads of cattle and 3000 heads of sheep and goats. When the sheep ranch at Kapoeta and the beef ranch near Juba are in full production they will provide Juba with about 1,416 sheep and 15,000 cattle, respectively per annum. This would necessitate the operation of the Mongalla slaughter-house 2½ hours/day and a large supply of hides and skins will be available in Juba from this as well as from other sources.

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For the above-mentioned reasons it is felt that the establishment of a tannery in Mongalla suitably located near the Agro-Industrial Complex would be justified. This project could be carried out in two stages.

Stage I: Since the number of hides and skins made available from the slaughter-house during its first phase of operation will not be too high only a small-scale, semi-mechanized tannery should be adequate. The minimum economic capacity of this kind of tannery is estimated at 100 hides per day and 400 skins. Assuming 200-250 working days per year the annual capacity would be 20 to 25 thousand hides and 80 to 100 thousand skins. To keep the tannery operating at full capacity a supplimentary quantity of hides and skins should be supplied from the surrounding rural areas. During this first stage only half-finished hides and skins would be prepared and marketed for export.

Stage II: When the slaughter-house reaches its full operating capacity and the supply of skins and hides from rural areas becomes well organized and in large quantities and the tannery operators gain more experience, a second stage of the project could be implemented. In this stage, full mechanization of tannery operations and introduction of the finishing process would be feasible.

Assuming that the Mongalla slaughter-house becomes operational by the end of the present Six Year Development Plan, implementation of Stage I of the project can take place in 1982/83. Stage II could be considered after 5-6 years, or approximately during 1987/88. It is, therefore, recommended to prepare a feasibility study for the suggested tannery along with the feasibility study to be carried out for the Agro-Industrial Complex in Mongalla in order to coordinate all technical factors of both projects.

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4.4. Wood Working Industry.

4.4.1 Forest Resources and their Utilization

No exact comprehensive data regarding the present forest and woodland areas, standing wood volume and percentage of this volume that represents industrial timber in the Northern and Southern Region are available. Some estimates were made in several studies and reports which are listed in the attached bibliographical sources (Terminal Report, Appendix IV).

In the FAO report (1978), it was mentioned, on the basis of previous studies, that indigenous forests and woodlands in the Sudan had been estimated in 1950's to cover the surfaces of 455,000 km^2 with the volume of 1300 million m^3.

The standing volume in the Southern Sudan was assumed in the above report to be, at present, 700 million m^3 or about 40% of the total Sudanese stock existing 25 years ago. It was stated also that the percentage of this volume that represents the industrial timber available in the Southern Region was hard to estimate without forest survey and extensive inventories. The quoted data from the report by Jackson (1960) about annual yields of sawn timber from the potential available resources in the Sudan are as follows:

Northern Sudan	17,200 m^3
Southern Sudan	137,000 m^3
Total	154,200 m^3

The above data were reduced in the FAO report (1978), by 25% in order to get more realistic estimations.

Plantation forests, according to the FAO study (1978), were assumed to cover over 20,000 hectares distributed as follows:

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	E/N Equatoria	Lakes/ B.E. Ghazal	U.Nile/ Jonglei	Total
Hardwood	8250	4460	4100	16150 hectares
Soft Wood	550	-	-	550 "
Fuel/Poles	3350	140	650	4140 "
Total	12150	4600	4750	21500

In 1976/77, a study on the existing forest resources in the Imatong sub-region and its development had been conducted by the ODM and a report from this study was submitted to the Regional Government in 1978.

4.4.2 Existing Wood Working Industries.

4.4.2.1 Sawmills:

There are 15 sawmills in all six provinces of the Southern Region. Their location, capacities, production and number of employees are shown below:

A- Imatong sawmills (Eastern Equatoria Province)

Location	Installed Capacity m^3	Annual Output m^3	No. of Employees	Source of Power
1- Katire	2400	1000	74	Water turbine
2- Gilo	800	600	64	Steam boiler
3- Khlesoni	1000	N.A.	75	Diesel engine

Source: Above data for 1977/78 provided by the Manager of the sawmills during the Team's visit in August 1978.

The main headsaws of these mills are circular. Machinery of Gilo and Katire sawmills are in poor technical conditions. The timber is transported and marketed in Juba, mainly, over a distance of 122-132 miles.

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Both sawmills are included in the ODM forestry development project of the Imateng Forest Reserves. According to the information provided by the manager of the project the Katire sawmill will be rehabilitated. In the ODM report (1977), it was mentioned that if the Katire sawmill were rehabilitated and adequate fuel and vehicles to bring logs into the mill were available, at least 100 logs/month could be sawn. The yearly input after rehabilitation was assumed at 13,400 m^3. According to the study, if only the identified landwoods are sawn up, there is enough timber in the enumerated forest to last approximately two years. But if the identified hardwood and 50% of the others are sawn up, there is enough timber in the enumerated forest to last five years. After this, the sawmill could be supplied from the fringe of forest outside the enumerated area, from the Tolenga forest between 5-11 years depending upon how much of the whole areas can be economically logged (ODM report, 1978). According to the manager of the Katire group sawmills, there are no plans for rehabilitation of the Gilo sawmill due to inaccessible location. The Team feels that this opinion is fully justified due to poor state of equipment and transportation road conditions. The third mill in Kolosoni was established in 1977 where new equipment was installed powered by diesel engine. Due to shortage of fuel this sawmill has not been running continuously since the date of its commissioning.

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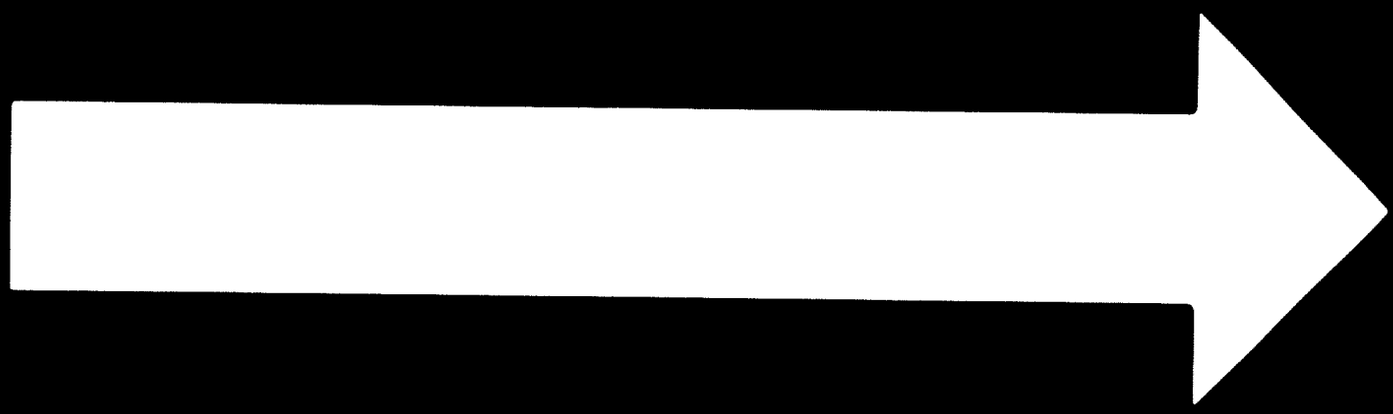

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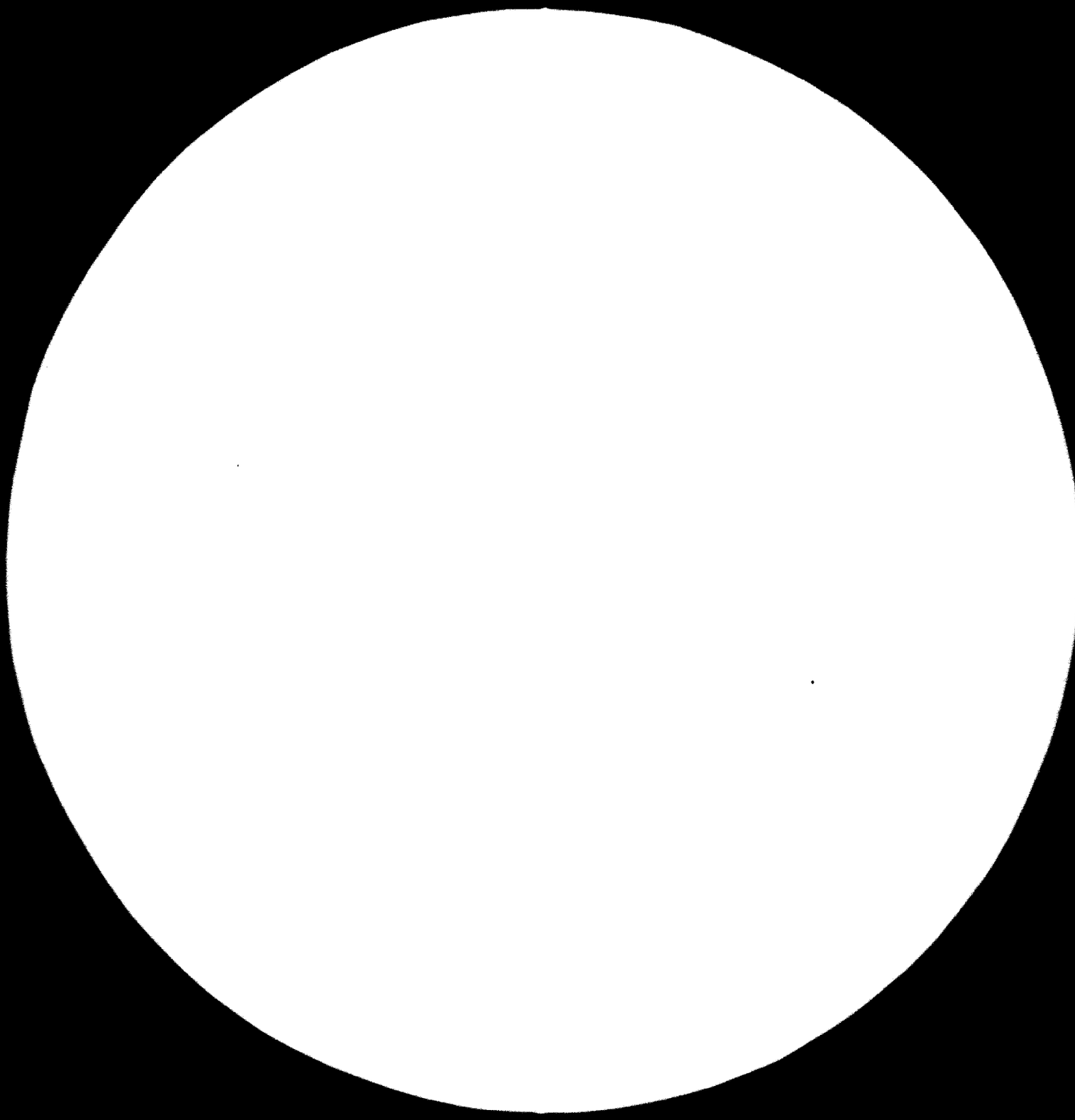

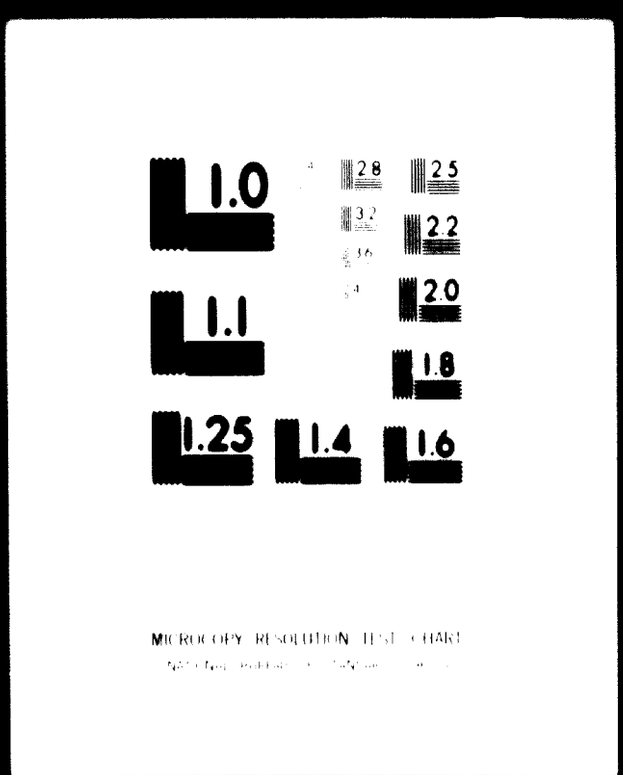

B- Loka Group mills (Eastern Equatoria)

Location	Installed Capacity m3	Annual Output m^3	No. of Employees	Source of power
1- Nuni	960	410	100	Steam engine
2- Kawulo	1000	N.A.	59	Diesel tractor engine
3- Ture	1200	under construction	-	Diesel engine
4- Tongbeeli	960	"	-	Diesel engine
5- Loka(integrated with the carpentry work shop)	1200	N.A.	20	Electrical engine
6- Kagelu	960	N.A.	10	Diesel/electrical generator

All above data were provided by the managerial staff of the Loke sawmill and carpentry workshop during the Team's visit on 31 August, 1978. However, the information about the Kagelu sawmill was provided by the expatriate manager of the project.

The Nuni sawmill, powered by steam, produced between 1973-1977 mainly railway sleepers at 200-400/year. Its capacity was utilized at 20-40%. It suffers many operational difficulties. The Kawulo mill located to the west of Nuni was completed in 1977 and its production amounted in the initial period to about 75 m^3/month. It can be increased to about 95 m^3 if fuel were regularly supplied. The two sawmills in Ture and Tongbeeli were under construction in August 1978. The Loka sawmill is equiped with one bandsaw and one circular saw which are used for wood cutting needed by the carpentry workshop. Cutting of timber is carried out also for outside clients.

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The Kagelu sawmill is equiped with a mobile circular saw powered by mobile electrical generator-diesel engine. During the visit to this mill it was not operating at full capacity due to lack of orders for timber, and inadequate marketing. It appeared to the Team that there is lack of communication between areas of timber demand and sawmills activities.

The total capacity of Loka group sawmills amounts to over 6600 m^3/year. Due to shortage of fuel, transport and technological operational difficulties this capacity is utilized at 40-50%, based on the information provided by the managerial staff of the sawmills. No exact records on production during the past years and last financial year were available for the Team.

O- Nzara Sawmill (Western Equatoria):

The only sawmill which has been identified in Western Equatoria Province. It is integrated with the Nzara Industrial Complex. The mill is equiped with one large diameter circular saw and two medium sized ones. The mill is powered by combined two steam engines of which one unit is out of action. The operating engine needs repair work and cannot run two saws at the same time. The capacity of the sawmill at its present technical condition is at about 480 m^3 of sawn timber and 360 m^3 of fire wood/year. No internal transport equipment is installed and all log handling is manual.

The suggested rehabilitation of this sawmill is included in the program proposed by ODM (1978) for the complete rehabilitation of the Nzara Industrial Complex. The capital investment cost were calculated at LS 3670 and included only purchasing of saw benches and saw motors. Other repair work is supposed to be done by the general maintenance and repair workshop of the Complex.

The total revenue after the rehabilitation of the sawmill was estimated in the above-mentioned proposal at about Ls 6000/year. However, no data was given in this report regarding the rehabilitated capacity of the mill. Since the Nzara sawmill is the only one in the Western Equatoria Province the extension of its capacity should be considered if the marketing studies prove it feasible.

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D- Bahr El Ghazal Group of Sawmills

Location	Capacity per year m^3	Annual output m^3	No. of Employees
1- Wau Sawmill	4000	700	170 (including transport workers
2- Mathiang sawmill at Aweil	no exact data available	174	-
3- Pongo Aweil sawmill	in 1961/62 the production reached 8000 m^3	826	
4- Pongo Nuor sawmill		603	
5- Bahr Geil sawmill		330	
Total	13000	3335	= 500

Sources: Wau sawmill - information provided by the managerial staff of the mill in September 1978.

Sawmills 2 - 5, on the basis of FAO report (1978)

The Wau sawmill was erected in 1968 and equiped with USSR machinery. It started operating again in 1974 after the civil disturbances. One 6-blade vertical frame saw and one circular saw are installed. Transport of logs to the bandsaw is mechanized. There is on the site a drying room with the capacity of 50 m^3 of dry timber/cycle. Two steam boilers

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are installed near the drying chambers but have never been used since the establishment of the mill. No reasonable explanation has been given by the management for not utilizing the drying chambers. It should be mentioned that the neighboring furniture factory uses green timber and some manufactured products show evidence of warping due to lack of drying before woodworking process. Logs are supplied to the sawmill from the surrounding forests at distances of 10-30 miles. In view of forest resources of the Wau area it was stated in FAO report (1978), that if the mill's capacity were fully utilized (4000 m^3/year), industrial wood would be presumably exhausted around Wau within a period approximately 3-years minimum, and the mill should then be moved to an area with higher potential, example, Yei area. However, the acting conservator of the forest, who met the Team in September 1978, explained that the forest resources of the area around Wau are enough to supply the mill with logs during the next 20-25 years. No substantiating data were provided to the Team regarding the volum of this wood resources and for which yearly production of the mill the data was calculated. A mechanical workshop is attached to the sawmill and is equiped with basic machine tools needed for repair and maintenance work of the mill. Equipment for manufacturing of bandsaws is also installed. The mechanical workshop is utilized at a very low rate. In order to utilize the installed machine tools and trained labor, repair services and mechanical work should be carried out for other public sectors in the area. At the time of the Team's visit to Wau the sawmill was not operating due to shortage of fuel for which reason the sawmill was idle about 100-120 days during the current year. Many technical constraints, namely lack of spare parts as well as shortage of fuel do not allow for utilization of all other sawmills in Bahr El Ghazal Province.

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The peak production of four mills existing in this area (No. 2-5 in table) was in 1961/62 about 8-9 thousand m^3. Due to the above-mentioned reasons and technical and managerial difficulties the production fell down from the year 1973 to 1975 to about 2000 m^3/year. In 1976/77, it was higher at about 2600 m^3. In 1977/78, the shortage of fuel was even more serious. No data regarding the numbers of working days of all sawmills in Bahr El Ghazal Province are available.

According to FAO report (1978), the present sites of Pongo Awil mill and Pongo Nuer mill as well as Bahr Geil mill will allow saw milling operations to continue presumably for a further 10 years at the present production rate of about 2500 m^3. Mathiang sawmill is badly situated (site of the mill is flooded after heavy rain). It was suggested in the FAO report to transform the mill into secondary work, carpentry manufacturing.

Conclusions:

The following conclusions and suggestions for consideration are made regarding the sawmills in the Southern Region:

- The total input capacity of all sawmills in three provinces where they are located can be estimated at about 24,000 m^3. However, the real productive capacity of these sawmills is such lower at the present state of their equipment due to old age of some machinery, their exploitation without regular maintenance and repair work, lack of spare parts, and operational difficulties. Without detailed technological studies and mechanical expertise it is difficult to estimate their present productive potential and capacities which could be rehabilitated.
- It is suggested to carry out the above-mentioned study since some sawmills need renovation work which, presumably, might cost less than the installation of new machinery.

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4.4.2.2 Carpentry Workshops.

As industrial manufacturing units seven carpentry workshops have been identified in the Southern Region. They produce mainly furniture and joinery.

1- Juba Furniture Factory No.1: The factory was established in 1959 and started operation in 1973 after the Addis Ababa agreement. Two open-sided crudely built sheds constructed of wooden beams and poorly roofed, house the wood-working machinery and assembly department. The total covered area of these two sheds amounts to 800 m^2. The third building, better constructed, is used as a store for ancillary material and finished products (covered area of about 500 m^2). A small office building is attached to the fourth store shed.

The factory is equiped with ten basic woodworking machine tools about 30 years old such as circular and band saws, planning machines, surfacing-centre wood-turning lathe, tonning machine, multi-purpose wood working machine, etc. Machinery is powered by locomobile boiler (fire wood and waste wood used as fuel). Ancillary tractor diesel engine powers part of the machine tools as a supplementary power unit. The factory produces various kind of furniture such as cupboards, tables, office and hon desks, folding drying racks, beds and chairs and other furniture used at home, offices and schools. More than twenty different types of products are manufactured. The factory employs 84 skilled workers (machine operators and carpenters). Total number of employees amounts to about 100 persons. The manufactured furniture are better constructed and more modern in shape than those produced in other visited workshops. Hard solid woodboards are mainly used while plywood is used for the backsides of cupboards.

The two crudely constructed sheds should be substituted by more appropriate buildings due to the poor construction state and possibility of collapse.

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The factory gained quite good experience in manufacturing of furniture but badly needs rehabilitation work of machinery and buildings. Some new woodworking machines should be installed to substitute the most used and old equipment for which spare parts are not available. There are no conditions for the extension of the factory due to limited site. Shortage of fuel, furniture fittings, shellac, glue and other chemicals does not allow to utilize the capacity of the workshop. Some of these materials are purchased on the free market since they are not supplied through official channels. Revenue from wood working services are the only financial sources for the intermittent supply of these materials. The factory needs technical assistance for its rehabilitation apart from financial investment capital which is not allocated in the financial plans of the Regional Ministry of Agriculture.

2- Juba Furniture Factory No.2: The factory was established as the West Germany aid project in 1973. After three years of operation under expatriate technical supervision, it was taken over by the Ministry of Agriculture and supervised by the local technical staff. The workshop is equiped with 15 basic and modern wood working machines which are housed under opensides sheds, constructed of steel beams and covered by corrugated metal sheets. Tw sheds are used as productive departments while the third is partly utilized. The factory was not operating during the Team's visit (October 1978) due to shortage of timber and fuel, although the sawmill at Kagelu was unable to market its sawn timber. Due to shortage of fuel and organizational difficulties the capacity of the factory is less than 50% per one shift. For this reason the efficiency of work is very low and 49 workers are partly involved during the day in productive work. The workshop is equiped with electrical generator. Four barrels of fuel (44 gal/each) are needed per month to run the factory at full capacity. In order to overcome many technical and organizational difficulties, according to the Team's knowledge, German technical assistance will be provided for the workshop.

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The suitable site of the factory, its modern equipment and appropriate open-sided sheds are good potential for the extension of production and manufacturing of modern products if adequate raw materials and improvement of furniture design were provided.

3- Katire Furniture Workshop: The workshop is integrated with the sawmill and employs 30 workers. Various furnitures such as cupboards, desks, tables, beds and armchairs, etc. are produced in old-fashioned and heavy style. Only solid hardwood is used. The workshop is equiped with three circular saws of small diameter. No other machines are installed and all other wood work is done manually using hand tools only. Since the sawmill is to be rehabilitated (ODM project), it is suggested to include the carpentry workshop into this project in order to utilize the gained experience of workers and to increase production for local market in the Eastern part of the Province. This can be carried out by installation of several basic wood working machines and appropriate hand tools. Introduction of more modern designs of light furniture with less wasteful utilization of valuable hardwood should be considered as part of the rehabilitation program of the workshop.

4- Loka Carpentry Workshop: The workshop is integrated with the sawmill and 26 carpenters are employed. Only one circular saw is installed and all wood work is carried out manually. Various types of furniture are produced. As in other furniture workshops, only solid hardwood is used in excessive quantities due to heavy old style of products. The timber if not seasoned and results in warping of finished furniture. Mahogany, teak and cedrillo are utilized mainly as raw material. Since the workshop is integrated with the sawmill and located on the same site with a tool room and mechanical workshop there are good conditions for extension of modern furniture production. Installation of basic wood working machines, housed under a new shed should be considered expecially when the entire complex has its own power supply.

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5- Kagelu Carpentry Workshop: A temporary shed constructed of wooden beams covered by thatched roof houses the workshop where 7-10 workers are employed. Joinery (windows, doors) and some furniture items are produced in limited quantities. Electrical hand tools powered from the mobile generator are used in order to reduce manual work and improve efficiency. It is a good example of small scale but modern operation which can be implemented in many small towns without the infra-structure facilities usually required for larger scale operations.

6- Nzara Carpentry Workshop: The covered area of the carpentry shop which is integrated with the Nzara Industrial Complex amounts to about 150 m^2. As in other workshops solid furniture made of hardwood are produced. All wood work is carried out manually; only one planer machine is installed. Hand saws are used for cutting of timber since no circular saws are available. In the rehabilitation program of the Nzara Industrial Complex proposed by the ODM Mission (1978), very limited improvements have been suggested for the wood workshop; purchasing of 4 saw benches and spare parts for the planer. Since the carpentry workshop is the only one in the Nzara/Yambio area, consideration should be given for the extension of its activities by installation of some basic machines and purchasing of modern hand tools, to provide the needs for the developing public sector and possibly the local market.

7- Modern Carpentry Workshop in Maridi: The factory was established in 1976/77 with a total invested capital of about Ls 60,000, of which Ls 19,000 was provided by the Industrial Bank in Khartoum as 6-year loan at 10% interest. Total value of production during the last six months prior to the Team's visit in September 1978 amounted to LS 60,000. The factory employs 160 workers of which 85 are skilled carpenters, operators and wood carvers. All skilled workers were trained at the factory during a period of 1-2 years. At present, 20 persons are being trained in handicrafts on a private training programme organized by the owner.

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The following products are produced in the factory: wooden tables, desks, chairs, cupboards and souvenirs made of wood, ivory and ebony. Skins are used in making native musical instruments. Some metal furniture are being introduced in the production programme. Furniture items and souvenirs are marketed partly in a display shop in Wau organized by the owner while the major part of production is marketed in Khartoum where there is a bigger demand. The factory is connected to the municipal electrical network, however, at present no power supply is provided during the daytime due to fuel shortage. For this reason, two mobile circular saws powered by diesel engines operate in the factory. All other woodwork machine tools equipped with electrical motors are not utilized under present circumstances. These include band-saws, lathes, milling and planning machines, drilling and polishing machines. The total demand of electrical power is about 50 KV minimum. Due to lack of power all wood work is done manually. Timber used for wood products (teak, mahogany, etc) is only seasoned for a short period under sheds but not dried. In order to reduce the utilization of high quality timber plywood is used in the construction of some furniture items. It is felt that some of the handicraft souvenirs made in the factory have some artistic value and could be marketed easily abroad. It is suggested that the Central Government Trade companies and Southern Region Tourism Department should provide assistance in the promotion and marketing of such products in the country and overseas.

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The major constraints in the operation of the factory are as follows:

- Shortage of ancillary materials and fittings (nails, locks, plastic and metal handles, glue, polishing chemicals, etc.), as well as the delay in delivery of essential items due to transport difficulties by rail.
- Difficulties in obtaining fuel needed for transport (trucks) and for installed diesel engines.
- Lack of municipal power supply during normal working hours which does not allow to operate the existing wood machines to speed up production, and delays installation of new machine tools to fully mechanize factory operations. Some machine tools in the mechanical workshop cannot be operated for this reason which affects the proper maintenance of woodwork hand tools.

To overcome the present power supply difficulties, the entrepreneur is considering the installation of his own electrical generator if an import license can be obtained along with a regular supply of fuel. The entrepreneur, also intends to establish on a site next to his existing workshop a metal workshop for maintenance and general repair work of machinery and equipment and manufacturing of some spare parts for vehicles and machine tools. The total estimated capital which he plans to invest is about Ls 100-150,000 including a loan from the Industrial Bank. Again this project would be realized if the problem of fuel and electrical power supplies are solved.

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4.4.3 Development Prospects.

The wood processing industry is one of the oldest industries in the Southern Region and has good potential for its future development. No complete and accurate data on the entire existing forest resources in the Southern Region and its programme of extension through afforestation are available. Much already is being done in the area of inventory of the existing forest resources and afforestation activities, examples ODM afforestation project in the Ibating Central Mountain area, German afforestation project in Yei area and several Regional government projects in certain provinces. All of these projects are being carried out in prospective areas for future development of wood resources. However, they cover a relatively limited area and are concentrated mainly in Eastern Equatoria Province. In order to obtain a comprehensive picture of the entire wood resources in the Southern Region and the demand for timber in the long range prospects, long term technical assistance from UN Specialized Agencies and from other countries on bilateral agreements is needed. Such assistance should include:

- Determination of entire existing wood resources and their distribution throughout the six Provinces.
- Outline plans for long term afforestation program in all areas.
- Assessment of actual present and future demands for hard and soft wood needed for construction, railway (sleepers), wood processing industries and fire wood (including charcoal).
- Outline the strategy of wood processing industry development in order to utilize, in the most economical way, the existing and future wood resources.

In some previous studies and reports this subject has been analyzed and general assessment of sawn wood demand has been outlined (FAO report, 1978).

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In this report it was estimated that around 40,000 m^3 of timber and 10,000 m^3 of sleepers/year would be required from production in the Southern Region by the end of the present decade. However, it was stressed in this report that the above-mentioned quantities are only general assumptions not supported by accurate calculation of the demand by various sectors, and a comprehensive study is needed for determining wood products demands and the strategy of wood processing industry development.

4.4.3.1 The Six Year Development Plan (1977/78-1982/83) for the Southern Region.

The following wood processing projects are allocated in the Six Year Development Plan for the Region apart from the afforestation and training projects in the forestry sector.

a) Re-equipment of sawmills (Eastern Equatoria Province):

Regional Government Resources	LS 326,348
External Assistance (West Germany)	LS 960,000
	Ls 1,285,348

b) Re-equipment of sawmills (Bahr El Ghazal Province):

Regional Government Resources only	Ls 458,879

c) Establishment of sawmills (Upper Nile Province):

Regional Government Resources	Ls 563,387

d) Establishment of sawmills in Yambio and Maridi (Western Equatoria Province):

Regional Government Resources	Ls 489,270

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Apart from the above-mentioned projects the outlay for the establishment of the Woodwork Shop in Mongalla is allocated in the Six Year Development Plan as a part of total outlay of Mongalla Agro-Industry Project. Machinery for this factory has been received in 1976 and is stored near the site.

The civil work is in progress and the steel structure and roofing is completed. Since no feasibility study for the entire Complex including this wood workshop has been carried out no exact data on production capacity, employment, type of production, supply of raw material and marketing of products are available. The only available information about this project was obtained from the tender prepared by ATLAS, Danish Consulting Company (1975). Some data extracted from this tender and other information obtained from the responsible ministry are presented below:

- Consumption of timber, one 9-hour shift/day basis 20 m^3/day
- Factory output expressed:
  a) Dinning room chairs - 400 pieces/day, or
  b) Seats for sitting rooms - 300/day , or
  c) Beds, 200/day. or
  d) Bookshelves sections, 50/day
- Total number of employees, about 175
- Timber supply: from various sawmills.
- Furniture wood will be stocked in the drying kilns, for a period of 10-15 days to reduce moisture content to 6-8%.
- The boards of the furniture will be made of laminated solid wood. Laminating process will be carried out in the factory.
- Upholstery will be made in the factory.
- The total covered area of buildings amounts to about 5400 m^2.

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In addition to the above-mentioned projects an offer of a Romanian Export Company for the establishment of a wood complex in Juba is being considered by the Central and Regional Government. Since no written information regarding the project has been provided the Team, concerning the capacity of the complex, production programme, employment, etc, it would be difficult to present constructive views on the feasibility of such a project. According to some general information obtained from the Industrial Department of the Ministry concerned the complex would include:

a) Sawmill with the capacity of 20,000 m^3/year.
b) Particle board factory with the capacity of 5000 tons/year.
c) Furniture factory for manufacturing of 60,000 pieces.
d) Pre-fabricated houses manufacturing = 500 units/year.

4.4.3.2 Conclusions and Suggestions for the Development Programme of Wood Processing Industries.

a) First priority should be given to the rehabilitation projects of the existing sawmills. A study of the technical state of all saw mills should be carried out which would include: mechanical expertise of the equipment, demand for spare parts and saw blades taking into consideration the possibility of their manufacture in the local mechanical workshops, area of timber supply, marketing disposal of timber, economic evaluation of investments and profitable operation of individual sawmills.

b) The Team is of the opinion that extension of new sawmilling capacity should be implemented by the establishment of medium-sized, mobile sawmills (similar to the Kagelu unit), rather than stationary mills. This opinion is justified by the following reasons:

- The existing sawmills, located in areas rich in wood resources, are not fully utilized.

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- Mobile sawmills can be located in areas where limited wood resources exist and cutting of wood is needed for rational reforestation activities; then, the units can be moved to new areas.
- Mobile sawmills are efficient in operation and are low capital investment. They can be integrated with small carpentry workshops in order to cover local demand for furniture and joinery. They can initiate small scale industry development in the remote areas.

For this reason a concept for the establishment of a sawmill in Juba as an integrated part of the proposed wood complex (Romanian offer) should be carefully approached in the pre-feasibility of the entire complex.

e) In order to utilize in the most economical way the existing wood resources and to supply wood processing industries and other sectors (construction industry, boat building, etc.), with new products commonly used in other countries, manufacturing of plywood, veneer, particle board, wood wool cement slabs and wood chip/cement slabs should be introduced.

Regarding the Romanian offer for the establishment of a wood complex in Juba, a pre-feasibility study should be carried out, which would outline the kind of products most needed for furniture and construction industries, appropriate capacity of the complex at the present infrastructural Regional conditions.

The Team feels that the establishment of a particle board factory should have priority in the above Romanian offer if accepted. A medium scale veneer manufacturing unit should also be considered for implementation.

Particle boards and veneer can be used in the existing furniture factories in Juba and other areas of the Region in addition to the new Mongalla wood workshop which is under construction at present. Such products can partly

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replace and thereby reduce, the excessive utilization of costly hardwoods at present used exclusively. No reference for the utilisation of particle board at the Mongalla woodwork shop was made in the original project plan, or brought to the attention of the Team.

Part of the above-mentioned products can be transported to the Northern Region and even exported to neighboring countries if this can be proven feasible.

Manufacturing of fiber boards using kenaf plant cortex, a by-product of the Kenaf Factory in Tonj, should be seriously considered since approximately 7000-10,000 tons of cortex would be available annually when the plantation and factory are operating at full production capacity.

d) There exists in the Southern Region good potential for the development of furniture industry as well as construction joinery. In the development programme of this industry priority should be given to rehabilitation of some of the existing carpentry workshop as well as upgrading technical and managerial know-how. Special attention should also be given to the improvement and modernization of furniture designs. It is felt that with the rehabilitation of the existing furniture factories and the completion of the Mongalla workshop the demand for furniture, which is mostly in the public sector, presumably will be satisfied for a few years to come. The demand for household furniture appears to be very limited due to relatively small amount of population financial capabilities.

Export of furniture to the Northern Region and to other countries would be feasible if manufacturing experience is increased in the existing factories and good quality, modern type products are produced at competative prices. This also applies to the Mongalla wood work factory which is under construction.

For those reasons the concept of the establishment of a new furniture factory as a part of a wood complex in Juba should be carefully examined.

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e) The Romanian offer includes also a department for manufacturing of pre-fabricated wooden houses. It seems that there would be some limited demand for such houses which could be used as emergency accommodations facilities especially for the new development projects. However, the cost of such pre-fabricated houses might be higher than houses constructed in the traditional way because of the relatively high cost of timber. The experimental production of such houses can be carried out in the existing factory number 2 in Juba if additional machinery and space are provided. If such production proves successful and feasible from the economic point of view, industrial production of pre-fabricated houses may be justified.

f) Carpentry manufacturing in small scale units have prospects for development in all six provinces, where a limited demand for carpentry products exist (mostly furniture for schools, offices, dispensaries, and joinery for construction). These units can be organized by the cooperative and private sector through the assistance of the Industrial Bank.

i) UN Technical Assistance may be requested by the Regional Government to outline development strategy of wood processing industry including rehabilitation and modernization programmes for the existing factories.

4.3. Chemical Industry.

Soap Manufacturing Industry.

At present, there is no industrial manufacturing of soap in the Southern Region of the Sudan. Likewise, there is no information of statistical data regarding the traditional manufacture of soap from vegetable oils in either rural or urban areas of the Region. Most of the soap found on the local markets is imported from the southern neighboring countries or from Northern Sudan.

4.3.1. The existing Soap Processing Unit at Nzara Complex.

The Zande Scheme, set up in 1946, was based on agro-industrial projects which included processing of cotton through to gray cloth, oil production and refining from cotton seed and palm oil, and soap manufacture, among other things.

The installed capacity of the cottonseed oil mill, based on 250 operating days/year is about 1250 tons of seed.

Its present capacity is about 70-75% according to estimates made by ODM Mission (1976). Considerable loss of crude oil with high oil content of cake results from the poor condition of oil mill equipment. Oil refinery capacity is roughly 750 tons of oil/year based on 250 working days. The ODM report indicates that, apparently, no serious soap processing had ever been carried out; even soap stock from the oil refinery was always discharged to waste.

The existing soap plant was intended for the manufacture of good quality toilet soap from a mixture of vegetable oils, according to the ODM report (1976). Even if the proposed rehabilitation programme of the Complex is carried out, the report of ODM Mission states that the soap plant is far too large for the small quantities of cotton seed oil soap stock which will be available. It has also been suggested

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to utilise wood burning coppers adjacent to the soap factory since they would be more appropriate, as well as utilisation of soap stock derived from the refinery. Drying off the cut soap can be carried out in the soap factory which has a well ventilated area. The cost of rehabilitation of the existing units has been estimated at Ls 1000 with labor and materials provided locally. From the aforementioned report, there was no indication about the possibility of soap manufacture on an industrial level.

4.3.2. Development Prospects:

Although the Southern Region suffers from a shortage of soap in general and household soap in particular, present conditions and for some time to come, do not lend themselves to the establishment of an industrial soap manufacturing enterprise for the following reasons:

- Raw Materials: Household and toilet soaps are usually made from blends of coconut or palm kernel oil and tallow or similar hard fat. Both mentioned oils are unavailable in the Sudan and tallow is virtually unavailable because of the lean condition of most slaughtered cattle. In the Sudan, household soap is almost exclusively made from cottonseed oil, and according to the Crown Agent's report (1970), possible techniques are available to permit the use of 100% cottonseed oil for soap manufacture. It has been mentioned that one major manufacturer in Northern Sudan could not use groundnut oil instead of cottonseed oil for soap manufacture, possibly because of a higher content of saturated fatty acids (27%) in the latter oil compared to the former (16%). Based on this assumption, sesame oil (14%) would be even less suitable than groundnut oil in this respect. No information is available about the fatty acid composition of Lulu nut oil which is found in abundance in the Southern Region and is used for cooking, soap

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soking and as an ointment according to the MEFIT report (1978). At the time of the survey conducted by MEFIT, lulu oil production was estimated at 11,3[illegible] tins (19[illegible] tons) equivalent to about 6,[illegible]00 tons of gathered nuts, and based on an average 30% oil extraction. More accurate analysis provided by Engineering & Transport International Co., Ltd., of Khartoum showed an oil content of 50-52%. A detailed analysis of the fatty acid content of this oil may be useful in identifying better and/or, alternative uses of this oil, possibly on an industrial basis.

Since no accurate statistical data are available regarding the quantities of oil seeds produced, their utilization or their major centres of production by district and Province, there would be no way of evaluating the potential for establishing soap manufacturing units even on a small scale, especially if priority for utilization of oil is for cooking. According to the MEFIT survey (19[illegible]), production of oil in the Southern Region is 99% traditional and percentages of production that are commercialized were as follows:

Sesame (Simsim) oil	93.9%
Lulu oil	20.2%
Lalub, palm, groundnut oil	88.4%

Based on the Crown Agent's report, both groundnut and sesame oils, with highest figures for commercialization, are not best suited for soap manufacture when compared with cottonseed oil. Production of cottonseed oil in the Southern Region has been presented in Table 3, with production declining during the last four seasons. With the present limited production of seed cotton and difficulties encountered in the processing of cottonseed it is doubtful that, for the near future, there will be an adequate supply of cottonseed oil to cover

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consumption needs with enough surplus to operate a small scale soap manufacturing unit.

Another raw material needed for soap manufacture is tallow, an animal fat which, at present, would be difficult to obtain in the Southern Region because of the lean condition of most cattle. However, when some of the proposed beef cattle (fattening) projects are implemented, it would be possible to collect adequate quantities of animal fat with the facilities provided for in the proposed Mongalla slaughter-house. Such tallow could be either utilized locally or shipped to the North where soap manufacturing industries import the necessary tallow for toilet soap processing.

- Caustic Soda.

An essential chemical for soap manufacturing, this product is imported and is also used for the soda refining of cottonseed oil. Although caustic soda can be produced from salt, which is at present exported, such production does not appear to be practical in the Sudan according to the Crown Agent's study (1976). Prices of caustic soda quoted in the above report amounted to £.62 Sterling/ton f.o.b., UK, equivalent to Ls 75-80/ton, Rebak, Sudan.

- Salt.

Since Sudan is a net exporter of salt from solar works on the Red Sea, there should be no problem securing the needed quantities if soap manufacturing in the Southern Region becomes feasible on an industrial scale.

Conclusion.

From the afore-mentioned presentation, the establishment of a much-needed soap factory in the Southern Region is, at present, not justified.

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However, consideration should be given to the establishment of small scale units in suitable locations both rural or urban where oil seeds are produced and commercialised on a large scale or where local people would be willing to learn soap manufacturing for their own use. Such units could be developed with the help of Appropriate Technology Development Association of India or some similar or voluntry organisations. Implementation can also be achieved through cooperative organisations.

4.6. Ceramic Industry and other Building Materials Industries.

4.6.1 Ceramic Industry.

4.6.1.1 Clay Deposits.

The Southern Region of the Sudan is rich in resources for ceramic industry. Clay is the most common raw material used for construction purposes and manufacturing of pottery in many areas of the Region. According to the METIT regional studies (Report, 1978), quarrying of clay for pottery making as traditional activity, has been found in Eastern Equatoria, Bahr El Ghazal and El Buheyrat Provinces. Clay for manufacturing of smoking pipes is used in the Upper Nile Province. The Team also noticed the manufacture of clay smoking pipes while on tour in East Equatoria Province.

Quarrying of clay for brick manufacturing is located mostly in the urban areas of the main towns: Juba, Wau, Yambio, Nzara, Yei, Malakal, Torit and Kapoeta, and in three small towns in the Upper Nile Province. The utilization of clay in brick manufacturing is carried out using traditional technology. Deposits of clay in the above-mentioned areas of quarrying have not been geologically surveyed or quality tested. The only area where raw material investigation has been made and laboratory testing of clay carried out, is located in the outskirts of Juba town southwest of Juba airport. This investigation was made by the Regional Ministry of Housing and Public Utilities in cooperation with Berenschot-Bosboom BV, Management Consultants for Development, Netherland (1975/76). The survey concluded that deposits of clay in that area are of good enough quality and quantity for industrial manufacturing of ceramic products.

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4.6.1.2 Existing Ceramic Industry.

In the Southern Region 40 small-scale brick-making units have been identified by MEFIT (1978). According to this source they are located in three provinces, only:

- Eastern Equatoria - 27 kilns of which 22 are in Juba, 5 in Torit and Kapoeta.
- Bahr El Ghazal - 5 kilns in Wau.
- Upper Nile - 3 kilns: in Kako, Nasir and Adong

During the field studies, the Team identified other brick kilns in Western Equatoria: 3 in Yambio (production of 140,000 bricks/year), 1 in Tambura (60,000 bricks/year) and 1 in Maridi (100,000 bricks/year.) It was observed that many buildings in Nzara and Yambio areas were constructed of bricks in addition to those under construction. Even some of the farmers' tukuls (huts) in these areas were built with bricks. Bricks were also used for construction of some buildings in Rumbek, Tonj and Bor. Most of the brick kilns are privately owned. In the public sector five units are operated in Juba (RDC), two kilns in Torit were built and run by the Foreign Aid Agency (NCR), and three in Yambio are operated by the local prison. All visited kilns were located close to clay deposits. No mechanical equipment is used for quarrying of clay and its transport to the kilns after moulding. Clay mixed with water is formed in wooden moulds; only in Torit steel moulds have been introduced.

Different types of kilns have been observed during the Team's visits to some of these units. All of them are traditional and were constructed by local craftsmen. As fuel, only fire wood is used which is exploited from the surrounding woodland areas. Brick manufacturing is normally carried out during the dry season from October to April, intermittently. During the remainder of the year, production proceeds if weather conditions permit. No accurate statistical data are available on the

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quantity and value of production carried out in the various areas.

The MEFIT report (1978) estimates the total production of bricks at 6 million per year in all provinces. However, no reference is made about efficiency of traditional kilns, wood utilization rate and percentage of broken bricks due to low clay quality and technological reasons. Of all the brick making units visited by the Team, only the one in Gumba (Bricks and Tiles Factory, MDC) may be considered as an industrial unit. This factory was established in 1976 with the assistance of the Foreign Agency, Intermediate Technology Development Group Ltd. The present output is at around 20,000 bricks per month and should go up to 40,000 bricks by extension of the existing shed. The factory at Gumba was located in a swampy area near the White Nile. No investigation of the amount of clay deposits and no laboratory testing of its quality were carried out before setting up of the factory. The clay is dug out using hand tools and transported by wheel barrows to the moulding shed. Wooden moulds are used for forming of bricks. Due to very wet and heavy clay mud dug from the swampy area, the air drying of the formed raw bricks takes several days. After drying, the bricks are burned in a simple kiln built of bricks and covered by brick roof and metal sheets. The rate of fire wood utilization is at 1.25 - 1.50 m^3/1000 brick (stacked wood). The total amount of wood used for firing is at 45 m^3/month if the production reaches 30,000 bricks in the same period. The green wood is transported from the surrounding woodland areas where it is exploited by hired workers. The royalty paid to the Forestry Department is at a symbolic rate of LS 1.00 /m^3 wood. Due to the low quality of clay the rate of wastages (broken bricks) to the number of burned bricks is very high, about 50%. In comparison at the other brick making unit belonging to the same company at Kit (12 miles away from Gumba), the rate of wastages is only 15% mostly due to better quality clay.

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The present average monthly output of the factory at Kit is at 30,000 bricks and the plan is to increase it up to 40.000 bricks (approximately 500,000/year). In this unit the technological process is also traditional and no simple mechnisation has been applied

The poor quality clay in Gumba and the flooding of the clay pits with rain water or water from the river makes the location of this factory questionable and its manufacturing activities should be considered as temporary. In the meantime, to improve production capability and overcome present difficulties some simple technical improvements should be applied. In order to relieve the work hardship of the laborers implementation of the system of rail and tipper trucks from the pits to the moulding shed then rack trolleys to the kiln should be considered. Implementation of multiple brick moulds made of metal instead of wood could also be implemented to increase the efficiency of work. If the factory at Gumba reaches its target production of 500,000 bricks per year with only 20% of wastages the value of production would be at around Ls 13,000 per year. The same production target is planned for the factory at Kit with the quantity of 500,000 bricks per year. The present numbers of employees are as follows:

At Gumba - 35 workers plus a manager

At Kit - 25 workers plus a manager

With the extension of production to about 500.000 bricks per year in each factory the number of employees will increase to about 45 in Gumba and 35-40 in Kit. The Gumba factory started also to produce flat roof tiles on an experimental scale. The shape and quality at present is not satisfactory, and it needs technical improvement.

In other traditional units only bricks are manufactured. Only at Torit the manufacture of roofing tiles has been started recently (NCR Project).

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It should be mentioned that there is a high demand for ceramic tiles on the local market since metal roofing sheets are imported and not easily available and are quite expensive.

4.6.1.3 Development Prospects.

Although the local traditional bricks manufacturing has a great importance for the country economy since it covers some part of the demand for construction materials its present potential and technical stage cannot satisfy the future needs of construction industry. The future demand can only be accomplished by the establishment of new units with more advanced and efficient technology which should be based on proper identification of the quality of clay resources. Only industrial manufacturing of bricks and other ceramic building materials such as load bearing bricks, roofing tiles, flooring tiles, ceramic blocks, wall tiles, as well as drainage pipes can meet the increasing demand of contruction and public utilities and agricultural sectors.

Another important factor which supports the need for the development of industrial ceramic manufacturing in more advanced technology is the rate of fire wood utilization which is at present relatively high(1.5-2.0 m^3 per 1000 bricks equivalent). Since wood is the major firing fuel used mostly in households (as fire wood and charcoal) and some industrial enterprises and services (bakeries, restaurants, etc), uncontrolled exploitation of woodlands and forests may well defeat the forest program of preservation and afforestation activities. Conservation of fire wood utilized for ceramic manufacturing can best be accomplished through implementation of advanced industrial technology where the rate of wood consumption is about 2/3 lower per production unit in comparison with the existing traditional ceramic manufacturing methods.

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The need for the development of the ceramic industry in the Southern Region has been recognized in the Six-Year Development Plan. The project for manufacturing of bricks and ceramic tiles has been allocated in the plan at the total amount of Ls 1,203,000. Works on the project were expected to commence towards the end of 1977/78 financial year and the actual production of bricks and tiles should have started in the later part of 1978/79. However, this project will be postponed since no technical project preparations have been carried out so far.

In May 1976 a proposal for the establishment of a brick making unit in Juba area (Luri) was submitted by the Netherland International Technical Assistance Department to the Regional Government, Ministry of Housing and Public Utilities, Juba. This proposal was based on studies carried out during 1975/76 by Beranschot-Moret-Bosboom, Management Consulting for Development. In this study it was proposed to establish in Luri, on the outskirts of Juba town, a brick making plant with a capacity of about 2.0-2.5 million bricks equivalent per year. The factory would produce two types of wall bricks, paving bricks and flooring solid quarries. The proposal suggested to implement in the factory so-called soft mud moulding process, drying of raw bricks on racks in the open air and firing in specifically designed intermittent kilns where wood would be used as fuel. It was stated in the study that the choice of intermittent kilns over a continuous kiln was based on the small output, proposed at 2.5 million brick equivalent per year. This output was based on the assumed market potential estimated by this company at:

About 9.5 million brick equivalent	1977
About 10.0 million brick equivalent	1983
About 10.5 million brick equivalent	1985
About 11.9 million brick equivalent	1990

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It was estimated also that 77% of the total potential requirements would be covered by all existing productive units, industrial and traditional including the proposed factory at Luri.

As an integral part of the project the study suggested the establishment of a plantation of fire wood nearly the factory covering an area of about 3,300 hectares. This plantation would satisfy the needs of the factory for fire wood at the rate of about 2 m^3 stacked wood per 1000 D.E. The plantation would be productive after seven years of its establishment.

During this period the demand for fire wood should be covered by planned collection of fire wood out by the forest department. The investment cost of the project was estimated at Ls 267,000 (1976 year prices) of which machinery installation, transport equipment and tools amount to Ls 80,000. The above cost does not include capital plantation expenditures. The project was proposed with following sources of finance:

- Share capital Ls 140,000
- Loan at 5% interest - Ls 140,000
- Short term credit at 8% interest rate - Ls 16,500.

It was mentioned in the report (1976) that after 2-3 years from the start of production and when the demand for bricks would increase an extraction process and continuous kiln would be implemented. No accurate data on the cost and economic evaluation of this second stage of investment were presented in the proposed manufacturing concept. It was also stated in the report that implementation of more advanced technology (extraction process and continuous kiln) would reduce the use of fire wood as fuel to $\frac{1}{2}$ in comparison to the rate of consumption in the brick manufacturing unit utilizing intermittent technology proposed for the first stage in the report.

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The intentional delay in the implementation of the advanced technology unit was based on the assumption that the high projected output of such a unit at 7.5 million brick equivalent (the minimum economic size of the factory), was far above the market needs during the first few years from the implementation of the project.

The Team feels that under present changed circumstances in the year 1978, two years after the above study was completed, in view of new industrial, agricultural and the multitude of construction projects, both private and public (extension of the University of Juba, Agro-Industrial Complex at Mongalla, small and medium scale projects initiated by RDC and ETC in addition to several private industrial projects for which licences have already been issued), urgent re-evaluation of the Netherland proposal is necessary. For this reason it is recommended to give priority to the second stage of the proposal, namely, to start with more advanced technology for speeding up production with efficient utilization of fire wood. By implementing this suggestion other urgently needed ceramic products such as ceiling elements, high quality roofing tiles, sewage pipes, draining pipes (agricultural) could be made available at an early stage than previously proposed. For this reason a feasibility study for the factory with more advanced technology is highly recommended. This study should include a realistic market survey which would take into account actual construction needs in all sectors of the economy of the Juba area and accessible surrounding vicinity. Special Attention should also be given to the large scale agricultural projects where ceramic products might be needed (example, Jonglei Rice Scheme, Panyikou Project and other proposed beef, dairy and poultry projects).

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4.6.2 Lime Burning

4.6.2.1 Lime Deposits:

Limestone deposits suitable for construction purposes and production of cement have been identified in Kapoeta area, seven kilometers outside the town. Geological survey of this deposit has been carried out in 1977 by a German investigation team. Samples of marble were taken from several dozen drillings for laboratory testing. The preliminary investigation and results of testing indicated that the quality of this deposit and quantity would be suitable for manufacture of cement. At present the marble from this deposit is quarried and used for lime manufacturing in two small, privately owned traditional kilns.

Traces of lime discovered in some of the boreholes and veins in the Basement Complex underlying the southern area of the Region could mean that economically exploitable lime deposits exist in other areas than Kapoeta. In some bibliographical sources plus information provided by the Ministry of Housing and Public Utilities indicate that lime deposits can be found in area near Lanya ( ) miles from Juba on the way to Amadi) and in Liria (40 miles from Juba on the road to Torit). During the visit to Yambio district traces of lime were shown the Team nearby the road between Nzara and Yambio. The geological team of the Ministry of Commerce, Industry and Supply felt that deposits located in the above-mentioned areas other than Kapoeta are not so rich for large scale industrial quarrying but they could be utilised for small and medium scale lime burning operations.

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4.6.2.2. Lime Burning Activities.

The only unit for burning of lime has been found in the Southern Region. It is located in the outskirts of Kapoeta town. Two kilns were built a few years ago for burning of limestone by a private firm. The following data indicates the scale of production and activities of this unit based on information provided by the owner (13 September 1978):

- Number of kilns (made of bricks)	2 units
- Capacity of both kilns	250 tons of limestone
- Wood utilisation per one burning in both kilns	50 trucks each of about 3 tons.
- Burning period	7-10 days
- Efficiency of kilns in lime production	500 sacks/one burning each of about 80 kilos.
- Total production per annum(4-5 burnings during the dry season	250 tons (40 tons per one burning)
- Ex-factory price per sack(80 kilos)	Ls 4.00
- Cost of production per sack	Ls 3.50

The owner informed the Team that the lime is easily marketed in Juba and Kapoeta with part of production sold to Khartoum. The quality of pure lime powder is good due to high purity of raw material which is transported by trucks from deposit site to the kilns. Transportation difficulties do not allow expansion of production.
The product marketed in Juba and in other areas is used mostly as component of mortar and for painting of walls but its utilisation is rather modest due to lack of knowledge of its various utilisation capabilities.

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4.6.2.3 Development Prospects.

The financial sources allocated in the Six Year Development Plan for extension of lime production amount to Le 225,000 during the period 1977/78 - 1982/83. The Plan estimates that 57,000 tons of good quality lime should be produced. The start of industrial production of lime in newly built kilns in Kapeeta and Lenya has been planned towards the end of 1977-78 financial year. Up to the date of writing of this report no detailed feasibility study has been carried out to the Team's knowledge. Serious efforts should be considered by the Government to conduct a feasibility study to identify the potential of limestone deposits in various areas by intensive geological investigations possibly with external technical and financial assistance. On the basis of such investigations a feasibility study for industrial manufacturing of lime should be prepared to determine the most suitable locations to establish lime burning units. Special attention should be given to the selection of the most economical and efficient size of units and utilisation of fire wood as fuel which seems to be the most acceptable source of energy at present and for some years to come. In this respect consideration should also be given to the establishment of fire wood plantations nearly the proposed locations for lime burning units in order to preserve existing forest reserves. To achieve the target production of 57,000 tons of lime per annum an advanced technology should be implemented in the proposed units with continuous kilns for burning of lime. Technical assistance from specialised agencies would be required during the preparation stage of the project and initial implementation and production.

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4.6.3. Prospects for Development of Cement Production in the Southern Region

A lot of emphasis has been placed in the Regional Development Plans on the establishment of a cement factory in Mpoeta area as an essential project for development of construction industry.

The concept of local cement manufacturing originated after identification of rich marble deposits in Mpoeta area which is the main component for cement production. Its main aim is to relieve the chronic shortages of cement in the Region due to low quantities of supply from the Northern Region caused by transport difficulties. Cement shortages are one of the main constraints for implementation of many industrial and non-industrial projects badly needed in the Region.

The implementation of cement project would depend on the availability of financial resources and is usually connected with large scale infrastructural investments. For this reason it would appear that such a cement project is a long term prospect covering a period of one decade.

On the other hand, the establishment of modern lime burning units could provide a good joining material for construction in relatively shorter period of time and with comparatively lower capital investments. For this reason the Team strongly recommends to start a feasibility study for development of lime manufacturing in the Region to meet the urgent need for construction and to relieve the shortages of cement supply.

4.6.4 Stones and Aggregates Utilization

Deposits of stones of various geological origin are mainly located in the mountain areas of the Southern Region. Stones are used for construction of administrative buildings and houses. Aggregates are used

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for construction and improvement of roads in areas where deposits are available.

The quarrying of stones is carried out occasionally for specific projects. No industrial quarrying of stones as commercial activity is carried out and no crushing equipment is implemented. Commercial quarrying of aggregates is carried out by two private businessmen in Juba area who charge an average of Ls 35.00/ lorry of 5-6 m^3. No allocation has been made in the Regional Development Plan for quarrying of stones and their crushing on an industrial scale. More consideration should be given to this type of building material which would extend the range of building materials for construction industry. As a project identification it is suggested also to use crushed stone for manufacturing of mosaic tiles. At present, in many construction projects flooring is made mostly of cement (in housing, administrative and social buildings). Mosaic tiles are not utilised in industrial projects where their implementation would be practical from the technological point of view (i.e. food processing, brewery, slaughter-houses, dairy processing, etc.) Mosaic tiles are commonly used in many countries and, in particular, in the Middle East Countries since they are very suitable in tropical climate in particular from the hygienic point of view. Mosaic tiles manufacturing is usually a low capital investment and can be carried out even in small scale units equipped with stone crusher and few polishing machines. Due to the relatively low capital investment mosaic tiles manufacturing can be operated by the private sector. The Team recommends consideration of this proposal by the Government with the provision of technical assistance needed for development of this industry in connection with the construction development plans.

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4.7 Prefabricated Metal Products, Repair of Machinery and Engineering Industry.

4.7.1 Existing Industries:

4.7.1.1 Prefabricated Metal Products:

The only prefabricated metal products manufactured in the Southern Region are metal furniture. According to MEWIT (1978) there existed, two years ago, 8 small-scale units (with 4-10 workers each) in Malakal (6), Wau (1) and Juba (1). They produce various metal furniture items such as tables, chairs, and shelves. All these units can be classified as small-scale establishments using only welding equipment.

4.7.1.2 Maintenance and Repair Workshops:

As specialized medium-scale units, 16 workshops for maintenance of road transport vehicles have been identified in the public sector and 18 small-scale shops in the private sector. In the public sector, 4 units in Juba and 6 in provincial towns are supervised by the Ministry of Communication, Transport and Roads; the remaining 6 units belong to various ministries. One of the visited units, the Central Repair and Maintenance Workshop in Juba, which employs 425 workers is involved mostly in repairing heavy lorries, road building equipment, tractors and different types of field cars as well as passenger cars. It does not have any machine tools, testing and electrical equipment except one battery charger and one lathe which was broken down. All repair work is done in an open yard; two sheds are used as stores and one as electrical workshop, equipped with above-mentioned battery charger. About 100 heavy lorries and other vehicles brought in for

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repair have been off the road for extended periods of time due to shortage of spare parts. Similar difficulties have been observed in the second visited workshop (MTD) which employs about 90 workers. More than fifty vehicles of over 30 types and makes were awaiting repair if spare parts could be provided. Out of about 10 machine tools, only two were in working condition. The remainder needed repair work and/or, spare parts. Shortage of fuel does not allow testing of repaired engines. The electrical power was supplied from the municipal power intermittently, a few hours during some days. Similar constraints are experienced by other workshops in Juba and in provincial towns. In the latter, apart from shortage of spare parts and lack of basic mechanical and testing equipment, shortage of well trained mechanics and other skilled workers as well as accommodation facilities for workers recruited from vocational training centres are the main operational constraints. The only workshop, STEYR maintenance workshop in Juba, which is relatively well equipped, has better operational conditions, well designed buildings, own power supply (65 KVA generator) and 65 reasonably trained workers. It specializes in the repair of STEYR cars and trucks only. However, shortage of spare-parts and technical supervisory staff are also among major constraints. Although financial allocations have been made in the Six Year Development Plan for purchase of spare parts, tools and equipment the shortage of foreign currency and the reduction of the 1978/79 Development Budget will hinder the alleviation of the present constraints.

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Apart from the urgent need to provide some essential spare parts, various courses of action are needed to improve the critical situation in the maintenance and repair industry. As a first step a comprehensive study to determine all technical and rehabilitation measures should be carried out. The following proposals are presented for a pre-rehabilitation programme:

- to make a complete inventory of spare parts in stock in all existing workshops and determine their suitability for the present, late model cars; there are large stocks of spare parts for vehicles which were used over 15 years ago and will not fit present day cars;
- to investigate possibilities for manufacturing certain spare parts, locally, in some mechanical workshops in the Region or in Northern Sudan;
- to determine the kind and number of some basic machine tools, testing equipment and hand tools to be needed for the rehabilitation of the workshops;
- to set up a programme for up-grading of skilled automechanics and electricians and to train them in the use of new equipment when made available;
- to limit the number of imported car-makes specially in the public sector (more than 30 car makes are under repair at present), to facilitate repair and specialization of work.

4.7.2. **Development Prospects:**

There are three engineering industry's projects included in the Six Year Development Plan:

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a) Foundry - with a Regional Government outlay of Ls 25,000 for the preparation of a feasibility study. The feasibility for the establishment of a foundry and machine shop has been prepared by Engineering and Transport International Co. Ltd., in Khartoum in cooperation with Ensercon Ltd., Harpenden, Herts, U.K. (February 1976).

The basic data extracted from the above-mentioned study are as follows:

- The initial demand was estimated at 510 tons of casted iron and 74 tons of non-ferrous castings, 540 tons of spare parts and 52 tons of water, sewage and household fittings.
- It was stated that the foundry would be selected to have a capacity of 1000 tons of casting (4 tons/day assuming 250 working days/year) per 8/hour shift/day.
- Number of employees including foundry, machine workshop and ancillary departments was calculated at 174.
- The project requires in currency references: Pounds Sterling 1,067,000 and Ls 1,410,000 or total equivalent of Ls 2,147,000.

Since there is a project proposal for UNDP/UNIDO technical assistance for the establishment of a foundry with a mechanical workshop in Juba, it is suggested to submit to UNIDO the above-mentioned feasibility study for its evaluation and appraisal of UNDP/UNIDO technical assistance to be requested for the implementation of the project.

b) Bicycle and Motobicycle Assembly Plant - with a Regional Government outlay of Ls 15,000 for carrying out a feasibility study. This study is under preparation by the same companies which completed the foundry study.

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The assembly plant for bicycles in the Southern Region appears to be important because of transportati difficulties and fuel shortages. However, implementation of such a project should be approached carefully even if it is an assembly factory. The Mission feels that at p nt the concept of motobicycle assembly plant is premature due to highly skilled technical requirements and the need for imported spare parts which involve foreign custrency demand. A detailed market study including potential buying power in the Region and careful evaluation of the cost of products is essential.

e) Agricultural Implements Manufacturing Plant - a feasibility study has already been prepared by the same afore-mentioned companies (April 1978). Total finance required for this factory including cost of civil works, machinery, equipment and tools, interest d working capital was calculated at Ls 3,982,280 of which local currency Ls 2,889,000 (prices, 1978).

The production programme of the factory includes: pressed tools such as socket hoes, matchets, sickles, spades, etc. and forged items such as : round eye hoes, axes and picks. A imal drawn implements are also proposed to be manufactured. The total number of employees was estimated at 193 of which 21 technical and economic managerial staff, 21 clerks, 17 foremen and 87 skilled workers plus 47 unskilled workers.

The Team feels that a factory for manufacture of agricultural tools and implements is urgently needed since many large scale agricultural projects are under implementation where such tools will be needed.

4.8 Other Industries

Ferro-Cement Boat Building

This project was started in Juba in 1974, as part of SCC's development programme, with funding from Christian Aid, and operated by ITDG. A total sum of £.212,876 Sterling (equivalent to LS.138,369) was provided by Christian Aid as working capital and research and development funds for the project. Additional loans were provided by ITDG which amounted to £.77,358 Sterling.

A two year project for the construction of ten 40' boats began in mid-1975, however, due to shipping delays and the arrival of boat material to Juba in October, the programme started late.

The boatyard, located near Juba on the East bank of the river, was visited by the Team during October 1978. At present the ITDG management team consists of a Project Manager, Boatyard Manager and an Assistant Engineer recruited by Voluntary Service Overseas. The Sudanese workforce totals 36 and includes 5 carpenters, 4 welders, 3 metal workers, 2 electricians, 1 painter, 12 boat builders, 2 mechanics, 2 drivers, 2 store-keepers and 2 labourers plus a cook.

The present boats differ in design from the original prototype. The speed of the standard boat is about 7 knots and fuel consumption about 2 gal/hour. Thus a journey to Malakal (1000 miles from Juba) will require only six 44-gallon drums of diesel fuel.

To date 4 boats have been sold, 2 are awaiting commissioning, 3 are under construction and 5 are on order; all boats are of 15 ton capacity.

The yard is equipped with 2 cement mixers, 2 poker vibrators, one lathe, electric circular saw, electric welding set, hand and power tools, and generator. In addition to the boatyard there are two stores, a slip way and a river area for mooring. Total assets are estimated at LS.42,236.

The present overall cost of one boat, assuming only four boats are produced per year amounts to LS.27,978 for which reason a

charge of LS.28,000 is made for the sale of each unit. Of the total cost mentioned about LS.10,791 (equivalent to £.16,600 Sterling) is in foreign currency for the purchase of structural steel (LS.368), mesh and wire (LS.1,040), Lister HR 4 engine and stern gear (LS.3,544), cement (7 tons at LS.662), steel (mild bar and angle, pipe, sheet, etc at LS.689), timber and plywood (LS.1,705), paints and glues (LS.509), hardware (LS.1,294) and other (LS.981). (prices 1978).

Other types of boats are being tested in the boatyard, for example, plywood fishing boat, 17' 6", and 20' ferro-cement launch with 26 HP diesel engine Prototype, built and sold to the University of Juba.

Constraints

Logistical and administrative problems were experienced during the first two years of project implementation. The project was endangered by lack of working capital caused primarily by inflation and devaluation of Sterling which occurred during the project period, and because recovery of initial expenditure via the sale of boats took longer than was expected. However, according to the project manager, production experience was shaping the project into a potentially self-supporting industry with good potential for future local management.

Development Prospects

The ITDG Management team has been implementing new plans for on-the-job training, ordering and storage of supplies and general organisation of the work force.

Funds amounting to LS.22,258 are required for development of the project site out of a total sum of LS.120,000 suggested as reserves needed to maintain the present operation economically; essentially they represent maximum requirements before income flows.

Although approximately 90% of the material used for construction of ferro-cement boats is imported, requiring foreign currency, which is not always available in the Southern Region, the Team feels that this project is a viable one and should have full Government support. It provides a type of craft suitable for the Nile and its tributaries especially under present rive transport difficulties. Although the project management feels that the market for the present 45' x 14' boats could be satisfied in 7-10 years, they have considered diversification of production: boats up to 70' overall length and 50 tons capacity. The project is also considering the construction of steel boats which are lighter in weight and would probably cost less than the present ferro-cement boats. A successful 20' launch, built and sold, has been mentioned earlier.

4.9 SMALL-SCALE AND COTTAGE INDUSTRIES

4.9.1 Significance and Policy

In recent years there has been a radical national realignment throughout the World, regarding the role and prospects of small industry. It is now well realized that there are large scale potentialities in small scale industries.

The advantages to a developing country giving more encouragement to small scale enterprises are not inconsiderable, whether they are in the 'modern manufacturing' non-manufacturing (construction, services etc.) or 'informal' sub-sectors such as traditional crafts and cottage industries. They can often create more jobs per unit investment than do large industries, and they create more unskilled jobs thus benefitting the urban and rural poor. Other benefits, though less quantifiable, are well known.

They include:

- In nurturing entrepreneurship,
- In-training and improving technical skills,
- As generators of savings,
- As sources of stability and coherence to communities,
- As means of reducing inequities of income distribution between regions and economic groups and
- As production system generally involving less adverse environmental impact. (The environment of the Southern Region of the Sudan so far is superbly pure!).

In Sudan, even though there is no clear cut definition of small scale industry either in terms of capital investment or labour employed - the contribution of this sector in the past has been approximately 2% of the total industrial production and amounts to 3% of the total contribution of the industrial sector to GDP.

The industrial policy of the Government of Sudan does not specify the role of small scale industries in the overall economic development of the national economy. However, development of small scale industries based on local raw-materials is one of the objectives of industrial development, as stated in their Six Year Plan 1977/78 - 1982/83 document. Policies for achieving this objectives includes 'develop and consolidate traditional and handicraft industries which will tend to increase income in rural areas'. And, the measures suggested include:

- 'Provision of machinery and equipment on hire-purchase basis'
- 'The creation of Central Marketting body for the marketting of the products of those industries'.

(Note: The quotations are from the Six Year Plan Document).

The Development and Encouragement of Industrial Development Act, 1974 enumerates certain concessions available to industries generally. This apparently covers small industries too as it is applicable throughout the country. While the terms of this Act are fairly wide the test of its effect on small industry development in the Southern Region of/Sudan particularly will be known only when this the sector becomes organized and demanding. The incentives should really spark capability, while criteria for selection of the beneficiaries should be sound. As it is, it seems the country needs special dispensation towards, and additional incentives/ facilities for small industries such as:

i) Concessional rate of interest;
ii) Preferential price for Government purchases;
iii) Provision of machinery on hire-purchase basis;
iv) Establishment of raw material depots; and
v) Organised marketting channels.

As regards the Southern Region specifically, small and cottage industry has hardly received any attention, nor there is any special emphasis placed on it in their Six Year Plan document. Under the heading 'Cottage and Handicraft Industry' the planned outlay for 1977/78 - 1982/83 of LS.100,000 has been earmarked, to preserve and encourage the traditional cottage and handicraft industry'. However, in the Regional Government Policy statement- March 1978 - H.E. Joseph Lagu, the President of the High Executive Council, has described the major goals of the Government in the field of industry as :

1) To establish agro-industries to manufacture goods that are currently imported into the Region and produce surplus for export;
2) To produce building materials locally; and
3) To promote handicrafts and small industries.

4.9.2 A Brief Picture of the existing Cottage Industries

Small scale industries are of two types - traditional crafts such as straw and palm leaf mats and baskets, blacksmithy, pottery, leatherwork, horn, ivory, and woodwork. Visits to various places - especially provincial town and village markets indicated that the Southern Region is not without its own tradition of simple, yet robust crafts. A fairly impressive array of some specimens of Southern crafts and cottage industries is seen in a collection organised by the Regional Ministry of Information and Culture at their secretariat in Juba. The collection is rather casual, resulting mostly from the gifts received by the President, during his visits to various places in the Region.

A systematic effort to explore, to identify and to collect craft products will, no doubt, be more revealing and rewarding.

According to MEIT (1978) traditional activities in the Region are as under:

1) Food products processing such as cereal products, baking, cutlery activities, production of vegetable oil.

2) Alcoholic beverages - like many other African countries the Southern Region has its own major indigenous alcoholic beverages - Merisa and Waragi (unlike merisa, waragi is illegal and therefore produced only privately)

3) Processing of Tobacco - The processing and consumption of raw tobacco is very common among many tribes. It is obtained by pressing and drying tobacco leaves. People chew it or smoke in locally made pipes

4) Textiles, Sewing Apparel and Leather Apparel
The few traditional activities such as tailoring, leather manufacturing, shoe making, mattress and pillow manufacturing are present in all urban towns and in some bigger villages.

There is no tradition of handlooms weaving. In some villages (such as Namumi in Mzimba district) women beat and press the bark, from certain trees, into strips which are then sewn together to form a sort of cloth, used as blanket or floor covering. (A sample of it was identified in the museum of the Ministry of Information and Culture).

Other traditional activities in this subsector are:

Embroidery: Women embroider bed sheets in Mzuzu, Mzimba and Karonga districts. Some women could be trained for commercial production.

Tailoring: The numbers of tailors identified by MEIT (1978):

Urban centres 600, Semi-urban areas 400,
Rural area 1,393.

They use manual sewing machines. Tailoring is the most common handicrafts in Juba and all provincial areas.

Sandal manufacture: The manufacture of rubber sandals from wornout tubes and tyres, is another activity with traditional features, carried out mostly in towns.

5) Leather and Tannery Products: The tanning methods used in villages/towns are still rather backward, basically letting the skins dry in the sun and, working them with primitive tools.

6) Clay Products: Pottery making is a very old tradition. The ware is made purely for functional purposes; the products are pots, containers for food and drinks, and pipe- bowls. Hand modelling is the common technique. A hope in the ground, covered with firewood forms the indigenous kiln handled skillfully by the potters.

7) Metal Products: Blacksmithy is widespread in many rural areas, providing weapons and indigenous agricultural tools for the population - arrows, spears, knives, hoes and axes, - made out of scrap, by melting and shaping in old, indigenous style. Tradition of production from iron ore continues, in a very small way, in the Nyepo, Kuku and Madi areas.

8) Wood products: Decorated objects of an artistic native are generally worked on a hand wheel with metal tools; the objects produced are mostly sticks, often with ivory and bone inlays, oil containers, mortas, ashtrays, plates, etc. Musical instruments, statues, pipes and small wooden seats-cum-neck supporters are normally carved by hand.

Objects for comparatively modern use such as tables, chairs and beds are made in simple forms.

The wood used is generally teak, mahogany and other species; no estimate of production is available.

9) Plant Fibre Products: These are made of elephant grass or other grasses, from beaten shrub fibres, from dura stalks and palm and leaves. The main technique is based on weaving, products made being mostly baskets and mats. Twilled work, usually done is very thin reed or bamboo strips is decorative in nature. Winnowers or sieves involve a little more complex operation. Braiding is used for local ropes of grass or plant fibres. These objects are generally made by women. It is mostly a spare time occupation.

10) Other traditional industries:

A very small quantity of ivory carving, mostly in Bahr el Ghazal, is at present done in the Region. A little of horn work is also done. Musical instruments like drums, are made by some woodworkers. A minor but colourful craft is the stringing of glass beads by tribal women in bands for wrist, arm and forehead. Some of them decorate their 'Mini' leather skirts with beads. Tribal men too, especially Dinkas decorate their bodies with necklaces and bands of beads, especially at the time of their community dances.

Sources: MEFIT study (1976) and Mission's observations during the field studies to the provincial areas of the regions.

4.9.1. Development Prospects:

The Six Year Plan of the Southern Region includes a specific Cottage and Handicraft Industry project, as already mentioned. The details of the project need to be properly worked, preferably with the advice of an expert in this field. Examples of the activities, currently being carried out, at subsistence level

mostly, and which need technical and financial support for improving and increasing production are given as under:

i) Pottery
ii) Fibre weaving: Making of baskets; mats, ropes etc;
iii) Leather works: handbags; wallets, belts etc;
iv) Carpentry and wood carving: canoes, and human, animal and bird statues, etc.
v) Iron -mongery: spear heads, hoes and axes;
vi) Home made yarns and building materials;
vii) Cheese making, and
viii) Musical instrument making.

The plan document further states that the Regional Government is also aware of encouraging private enterprise in handicrafts, cottage and small industry. 'Such industrial units require, during the initial stage of industrial development of the Region, various measures of assistance from the Government. Such assistance will be provided for pre-investment studies, financing, building sites and buildings, other basic infrastructural facilities through availability of common services, assistance for development of appropriate technology, labour skills, management organization and marketting'.

The question is which agency, how and when will provide the above mentioned measures of assistance. To translate such good intentions into action needs machinery as well as money. The Six Year Plan suggests no specific provision for these. May be some part of Industrial Projects reserve (LS.374,222) could be utilized for this purpose. Money, however, should not be a problem, since the Plan itself is flexible and it should be possible even to obtain financial assistance from multi-lateral and bi-lateral sources. While the Southern Region is already receiving substantial assistance, it seems it has not as yet fully explored certain sources including IBRD, UNIDO etc., from where assistance for the development of small scale industry could be suitably requested for.

As already stated the Southern Region is rich in natural resources. Its human resources, are also capable of conversion into skilled manpower. Whenever appropriate training is given, the evidence is that the locals have exhibited keenness to learn. The region offers a challenge as well as opportunities to all those interested in the development of industries in this unique area, unexplored in many respects.

Firstly, the villages need rural industries, with very simple technologies, to make use of natural resources around. Examples are:

i) Oil crushing with cattle power; groundnuts, sesame, cottonseeds, even lulu/mata (experiments have shown that sunflower has also possibilities.

ii) Sugar cane crushing by cattle power, and making jaggery.

iii) Tanning of hides and skins.

iv) Drawing of water from well-made wells, with the help of waterpullies - both for consumption and use of water wheels for grinding of grain.

v) Irrigation (use of persian wheel would also be a useful innovation in many areas.)

vi) Bio-gas of methane gas from animal and other organic wastes.

vii) Simple, unsophisticated low cost appliances for use of solar energy.

Effective demonstration and active participation of the tribal folks - through their chiefs - in some selected villages could open a vista of rural industrialization and rural development.

Secondly may be considered the existing native skills in handicrafts which could be developed, given some improved tools, new designs and product ideas. And, most importantly they would need market support. At present there is only one

organized production centre in handicrafts - Modern Carpentry - (Mau) Workshop run by Mr. Hassan Mohamed Morgan. More of such enterprises could be encouraged, besides individual, self-employed craftsmen. The Government could help them in securing raw-material, providing design ideas, introducing quality control, and placing orders for their products.

In important towns, emposia could be established to display and sell handicraft products. This will help, more than anything in encouraging and developing native skills in basketry and mat making, woodwork - lathed and covered, tribal wooden seats, ivory carvings, horn work, beadwork, metal-craft, musical instruments, etc. Workers could also be organized into cooperatives and given easy credit, without collateral.

At the same time, benefit could be had of the corresponding craft experience in other countries, by inviting some of the mastercraftsmen from there, as well as departing a few craftsmen to selected craft centres in those countries. Special reference is to ivory, woodcarving and artistic furniture.

Rare and expensive materials such as ivory, mahogany, bony, trophies of wild life, skins of crocodiles, lizards and reptiles are not at present being made the best use of. For instance 5 to 10 tons of raw ivory is exported annually besides about 5000 pieces of reptiles. Imaginative use of these materials especially with the help of foreign designer, can help in building up sizeable exports. Even simple items like baskets and mats made in proper sizes can have tremendous market; there is special interest in them in sophisticated markets of the West.

Thirdly: there is a need for introduction and promotion of some modern crafts such as: repair of electric household-appliances, repair of radio and TV sets, watch repairing, general mechanics, plumbing, welding etc. At present, most of these modern handicrafts are non-existent in Juba and other main provincial towns. Training of craftsmen in these activities could be organized through apprenticeships with craftsmen in Khartoum and/or through courses in the Multiservice Training Centre in Juba (Project No. SUD/74/002).

Table 1: ELU FOOD PROCESSING FACTORY: PRODUCTION AND SALES FOR THE PERIOD 70/71 through 74/75 Units: Kilogra

	1970/71		1971/72		1972/73		1973/74		1974/75	
	Prod.	Sold	Prod.	Sold	Prod.	Sold	Prod.	Sold	Prod.	Sold
Tomato Products	567677	397765	100348	920000	1373214	1141325	402850	237177	243467	599288
Mango Juice	201372	21326	995	97470	31085	14992	243571	14824	177761	62692
Jams	60096	420	136087	177540	838	3361	95310	75194	83544	103362
Citrus Juices	-	-	3412	-	523	705	6122	3500	2752	3715
Pulses	130708	167549	85650	30	57912	94496	55847	77857	73372	93880
Vegetables	21519	4755	129049	395100	126762	113623	75531	21040	23235	32104
Meat	44949	36828	86399	257316	64235	60741	-	1531	-	740
Total Production	1026321	628643	537940	1847456	1654569	1429324	879231	431123	604131	895781

TABLE 2 : AREAS IN FEDDANS UNDER MAJOR FOOD CROPS BY PROVINCE FOR THE SEASON 1977/78

	Eastern Equatoria	Western Equatoria	Bahr El Ghazal	Lakes	Upper Nile	Conglei	Southern Region
SORGHUM:							
Traditional	101723	34178	264542	121221	74285	52621	648570
Mechanized	-	-	-	-	299146	500	299646
Total	101723	34178	264542	121221	373431	53121	948216
DURRA	4302	943	34515	29710	-	-	69470
ELEUCINE	13664	34714	5679	-	-	-	57257
MAIZE	29317	35807	14609	6684	8427	4222	90719
RICE	1012	14143	1700	-	483	-	17338
SESAME							
Traditional	-	14850	70544	32128	18568	2606	155144
Mechanized	-	-	-	-	25000	-	25000
Total	16448	14850	70544	32128	43568	2606	180144
GROUNDNUTS	43524	36300	86577	39192	898	13173	219664
CASSAVA							
1977/78	10350	21690	19891	135	-	-	51984
1978/79	11856	27477	25387	321	-	-	65041
BEANS	17207	7543	15493	5013	1000	-	46256
SWEET POTATOES	9616	5893	3202	228	-	-	18939

Source: Ministry of Agriculture, Southern Region.

Table 3. Production of Cotton Seed Oil (Refined and Unrefined) and Cotton Seed Cake, 1974/75 to 1977/78

	1974/75	1975/76	1976/77	1977/78
Cotton Seed Oil(Refined) Quantity in tins	2290(1)	1130(1)	490(1)	
	1990(2)	1131(2)	477(2)	761(2)
Value Le	12,675.0(2)	7,351.5(2)	3,100.5(2)	4,946.5 (2)
Cotton Seed Cake Kilos	145000(1)	110000(1)	41000(1)	
	172875(2)	110000(2)	79750(2)	27000 (2)
Value, Le	5,186.25(2)	3,300.0(2)	2,392.5(2)	810.0 (2)
Cotton Seed Oil (Unrefined) tins	3,00(1)	1800(1)	566(1)	

(1) J. Bourne, 1977. Duty Travel Report

(2) F.R. Street et al., 1978. A Rehabilitation Strategy for the ETAPC, S. Region.

Table 4. Currently Active and Proposed Animal Production Projects: Beef, Dairy, Sheep and Poultry.

Project	Starting Date	Expenditures	Proposed Expenditures	
			6-Year Plan	External Resources
- Rumbek Cattle Ranch	1975	14,040	233,503	
- Livestock Improvement Centre, Mvrial Bai, Bhu	1976	60,714		
- Beef Ranch Associated with Mongalla Agro-Industry Complex				
- Juba Dairy Farm, MAFCO (UNDP/FAO)	1976		173,247	31,642
- Bhu Dairy Farm			91,719	
- Malakal Dairy Farm			164,935	2,800
- Yambio Dairy and Poultry Farm			135,000	
- Juba Central Poultry Farm (UNDP/FAO)	1975/76	35,714	179,777	4,200
- Bhu Poultry Farm			163,019	
- Malakal Poultry Farm			76,380	
- Danish Poultry Plant at Mongalla (Danish Loan, DK 10,025,552) Machinery received	1976		200,000	124,314 1,085,876
- Sheep Improvement Ranch - Kapoeta	1976		215,838	10,703
Ancillary Projects:				
Mongalla Slaughter-house (Agro-Industrial Complex) Danish Loan			500,000	1,281,193
Livestock Marketing	1976		106,000	
Milk Pasteurization Plant, Juba (Danish Loan) Equipment Received	1976		50,000	50,000

Table 5. : Established and proposed Agricultural Schemes for Grains and Rice Production.

Project Name	Participants	Project Implementation	Six Year Plan Regional C.	Layout External
Established:			Ls.	Ls.
- Awoil Rice Scheme (Land Development Project)	Regional Govt. UNDP/FAO, then EEC	1974-1979	1,375,900	77,500
		1979 - On		1,800,000
- Terghem Plain Pilot Project at Dor	Dutch Govt.	1975	2,340,830	5,998,500
- Mbiakol Rice Scheme	Regional Govt.	1976/77	2,866,536	400,000
Proposed for Implementation:				
- Tongtei Pilot Project	Central Govt/ Dutch Govt.			52,000
- Jebel Lado Dam Scheme	Regional Govt.		648,900	- -
- Miab Valley Dam Scheme	Regional Govt.		543,323	- -
- Anthodol Dam Scheme (Lakes P)	Regional Govt.		445,664	

Central Government Allocations:	Resources	
	Local	Foreign
- Awoil and Mbiakol Rice Schemes (Production)	5,500,000	1,900,000
- Mbiakol Rice Scheme (Irrigation)	3,000,000	400,000

Sources: Six Year Plan, Southern Region, 1977.

Table 6 Imports of Sugar, Tea, Coffee, Dairy Products, Tobacco and Tobacco Products (M.T.), and value in Ls 000's

Year		Sugar	Tea	Coffee	Dairy Products	Tobacco	Tobacco Products
1973	Quantity:	166,895	15,279	-	3,935	-	1,045
	Value, Ls	14,810	4,966	1,993	1,085	39	1,887
1974	Quantity:	140,476	19,488	8,594	1,995	183	1,462
	Value, Ls	33,392	6,247	2,680	822	167	2,635
1975	Quantity:	132,231	11,636	7,533	2,984	400	937
	Value, Ls	-	4,291	2,197	1,393	383	3,304
1976	Quantity:	143,693	11,744	4,925	3,0[illegible]	586	1,140
	Value, Ls.	21,951	3,875	2,095	1,379	627	3,023
1977	Quantity:	141,637	12,603	2,005	3,611	447	950
	Value, Ls.	13,240	6,551	1,695	1,712	446	4,650

Source: Bank of Sudan 18th Annual Report for the year ending 31 December 1977.

Table I Production and Consumption of Sugar (Tons), 1967/68-1976/77

Year	Local Production	Local Consumption
1967/68	93,284	169,919
1968/69	82,111	189,939
1969/70	75,317	210,342
1970/71	72,582	230,000
1971/72	91,380	241,000
1972/73	112,641	250,000
1973/74	120,571	269,754
1974/75	128,651	242,570
1975/76	113,949	274,149
1976/77	138,707	295,915

Source: Bank of Sudan 18th Annual Report, 1977

Table 8. PRODUCTION OF SEED COTTON (tons) for the seasons 1974/75 - 1976/77

Province and District	74/75	75/76	76/77
We Equatoria	39.7	126.5	74.6
Tambura	39.7	126.5	74.6
Yambio	51.7	235.5	110.2
Maridi	15.4	32.7	74.3
Total	106.8	394.7	259.1
Ea Equatoria			
Yei	4.8	18.8	50.4
Torit	5.5	118.7	208.2
Total	10.3	137.5	258.6
Ea & We Equatoria	117.1	532.2	517.7

Table 9 ESTIMATED PRODUCTION OF SEED COTTON (tons), 1977/78

Province & District	Cotton Farmers	Acreage	Estimated Production	Revised Estimate of production
Ma Equatoria	10,123	7,024	312	366.4
Tambura	4,710	2,355	89	111.9
Yambio	3,413	3,413	134	165.5
Maridi	2,000	1,256	89.0	89.0
Bh Equatoria	3,964	4,687	850	345
Yei	1,250	937		69
Torit	2,714	3,750		276
Ma & Mo Equatoria	1,087	11,711	562	711.4

Report by P.R. Street, L.D.C. Coward, A.M. Morgan Rees, D. Edwards, P.J. Fraser and E. Wilmot, July 1978. A REHABILITATION STRATEGY FOR THE EQUATORIA PROVINCE AGRICULTURAL PRODUCTION CORPORATION, SOUTHERN REGION. Vol.1 (R 745) : Tropical Products Institute, ODM.

Table 10. Tannery Production, Northern Region, Sudan 1972/73 - 1976/77

Type of Product	Unit	1972/73	1973/74	1974/75	1975/76	1976/77
Khartoum Tannery						
Upper Leather	000's sq ft.	1941.3	2260.6	2719.3	1648.0	1875.1
Sole leather	000's Kilos	150.8	125.6	112.6	36.3	105.0
Pickled Skins	000's pieces	61.6	173.1	166.5	83.3	105.3
White Nile Tannery						
Upper Leather	000's sq. ft.				1280.9	2239.8
Sole leather	000's kilos				100.5	73.7
Sheep leather	000's sq. ft.				155.4	125.8
Gezira Tannery						
Upper leather,						
Semi finished skins and sheep skin suede	000's sq. ft.					351.8

Source: Bank of Sudan, 18th Annual Report, 1978

Table II. Imports of Wheat, Wheat Flour and Rice (M.T.), 1973-1977

Commodity	1973	1974	1975	1976	1977
Wheat:					
- Quantity, M.T.	159,709	102,969	128,860	195,647	109,239
- Value, 000's L£	7,067	8,158	8,323	11,731	6,488
Wheat Flour:					
- Quantity, M.T.	—	7,126	8,061	7,360	12
- Value, 000's L£	—	418	659	636	2
Rice:					
- Quantity, M.T.	14,241	3,851	—	1,003	1,590
- Value, 000's L£	992 ?	1,495 ?	—	141	166

Source: Bank of Sudan 18th Annual Report for the year ending 31 December 1977

Note: Values marked (?) appear to be inaccurate and need checking.

Table 12 Imports of Some Processed Food Commodities, 1973 - 1977 (M.T.)

Year	Fruit & Fruit Products	Vegetable & V. Products	Meat & Meat Products	Fish & Fish Products
1973	4,324	2,957	—	1,023
1974	6,324	928	6	52
1975	8,262	587	2	1,319
1976	5,461	1,679	9	2;
1977	4,054	1,965	17	76

Source: Bank of Sudan 18th Annual Report for the year ending 31 December 1977.

Table 13 Exports of Oil Seeds, Seed Oil, Seed Cake and Meal (M.T.)

Seed Products		1973	1974	1975	1976	1977
Oil Seeds	Sesame	101,863	83,508	56,624	88,755	92,989
	Groundnuts	138,425	99,052	204,960	282,801	143,267
	Castor	7,620	1,116	13,513	10,799	2,664
	Cotton	14,987	4,562	—	—	296
Seed Oils	Sesame	183	1,434	1,289	565	115
	Groundnut	1,560	8,187	5,008	1,823	25,571
	Cotton Seed	19,802	—	10,700	—	—
Seed Cake & Meals						
	Sesame	17,210	2,525	31,714	34,578	24,129
	Groundnut	36,661	12,738	37,266	44,281	68,637
	Cottonseed	115,959	42,474	92,795	100,835	98,852

Source: Bank of Sudan 18th Annual Report for the Year ending 31 December 1977.

Table 14 Exports of Dura, Dukhn and Wheat Bran (M.T.), 1973-1977

Commodity	1973	1974	1975	1976	1977
Dura:					
- Quantity, M.T.	93,953	89,217	45,084	74,452	103,834
- Value, 000's L£	2,922	4,401	2,233	3,168	4,766
Dukhn:					
- Quantity, M.T.	5,545	3,602	2,765	5,158	2,315
- Value 000's L£	211	151	110	236	114
Wheat Bran:					
- Quantity, M.T.	13,711	10,972	9,508	17,798	16,203
- Value, 000's L£	307	211	170	378	297

Source: Bank of Sudan 18th Annual Report, 1977

Table 15 Export of Live Animals, Meat and Hides and Skins.

Product	1973	1974	1975	1976	1977
Live Animals: Heads					
Cattle	-	16,233	2,071	1,726	14,016
Sheep/Lambs	229,095	237,552	70,532	43,040	155,915
Camel	—	—	1,885	4,732	2,601
Goats	—	—	—	—	24,686
Meat (M.T.)	21,698	9,525	217	14	688
Hides and Skins: (No.)	8,159	5,276	6,040	6,029	8,018

Source: Bank of Sudan 18th Annual Report for the year ending 31 December 1977.

TABLE 16

Industrial Sectors

Number of Units and Employment

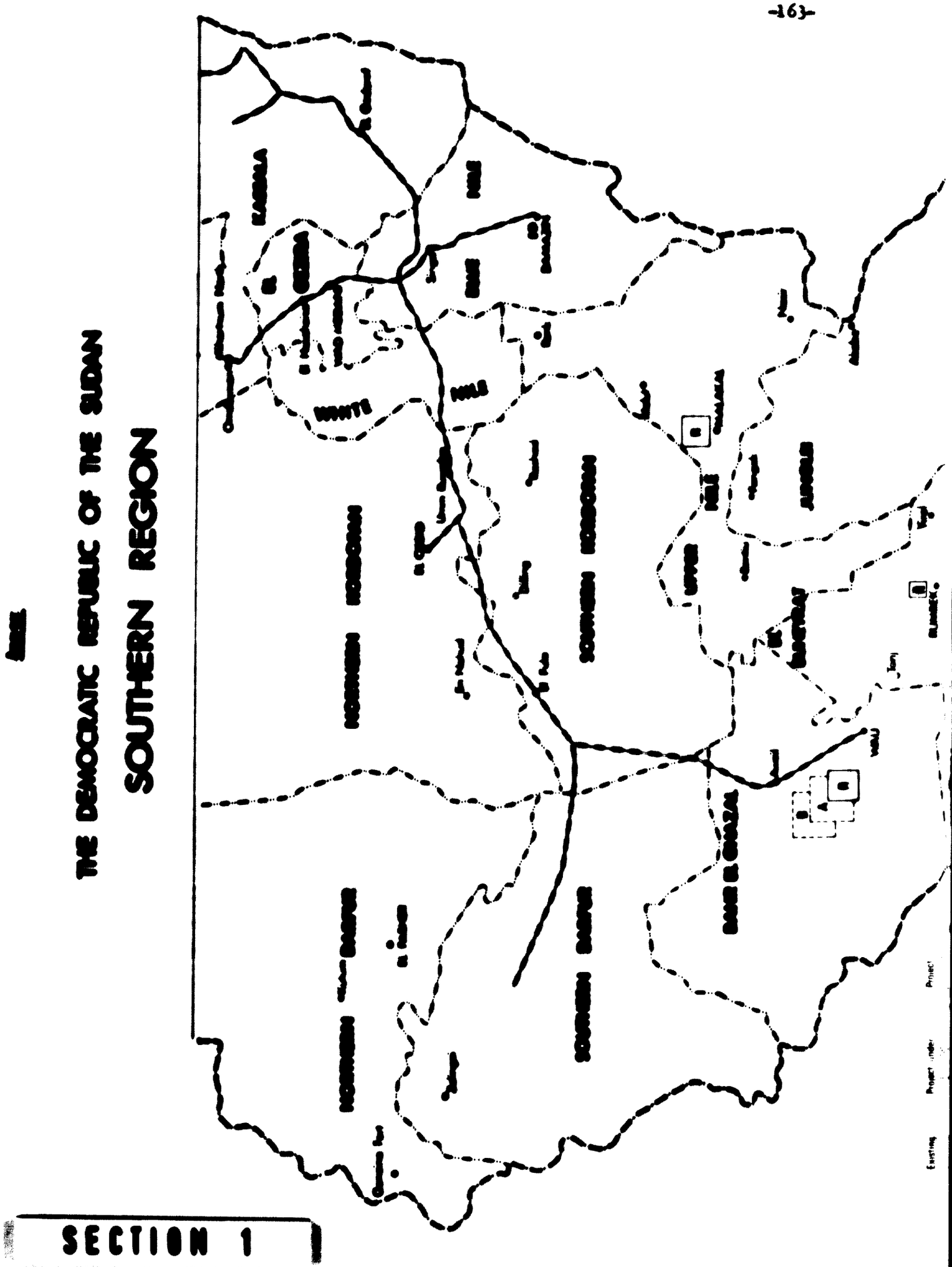
in 1975/76

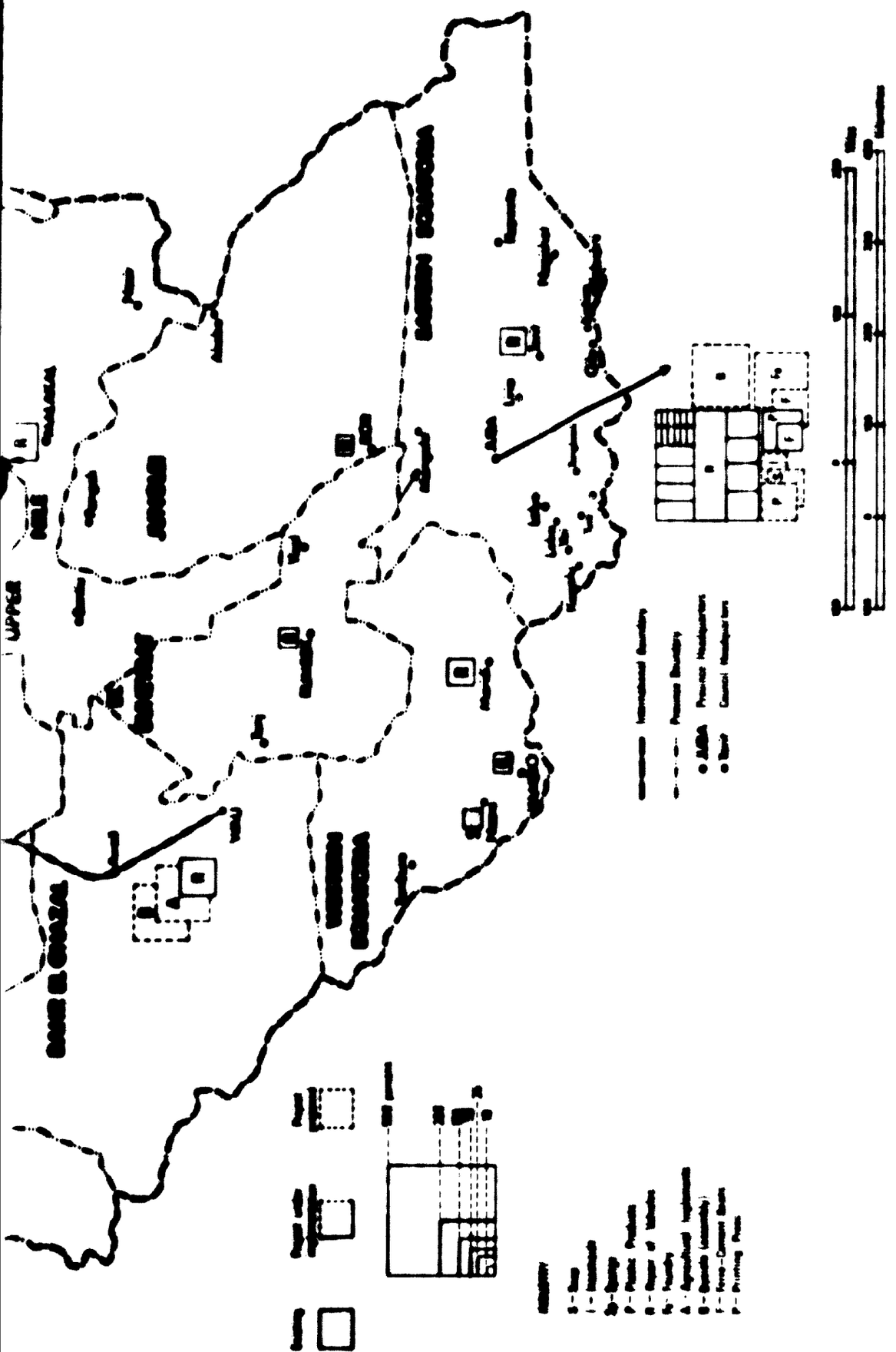
Industrial Sector		Productive Units	Employment
1. Food, beverages and tobacco	a)	3[illegible]	785
	b)	5[illegible]	366
2. Textile, Wearing Apparel and Leather products	a)	2345	2352
	b)	[illegible]	537
3. Quarrying and manufacture of non-metall-mineral products	a)	5259	5259
	b)	40	556
4. Mining basic metal Industries and metal products, machinery Equipment	a)	1101	1109
	b)	32	977
5. Production of timber and wood products	a)	10955	10955
	b)	30	3831
TOTAL	a)	19106	19950
	b)	166	6769

a) Subsistence traditional

b) Modern

Source: Regional Development Plan, Second Phase
Vol.4 - Industrial and Commercial activities
MEPIT, S.P.A., Rome 1973


THE DEMOCRATIC REPUBLIC OF THE SUDAN
SOUTHERN REGION
SECTION 1



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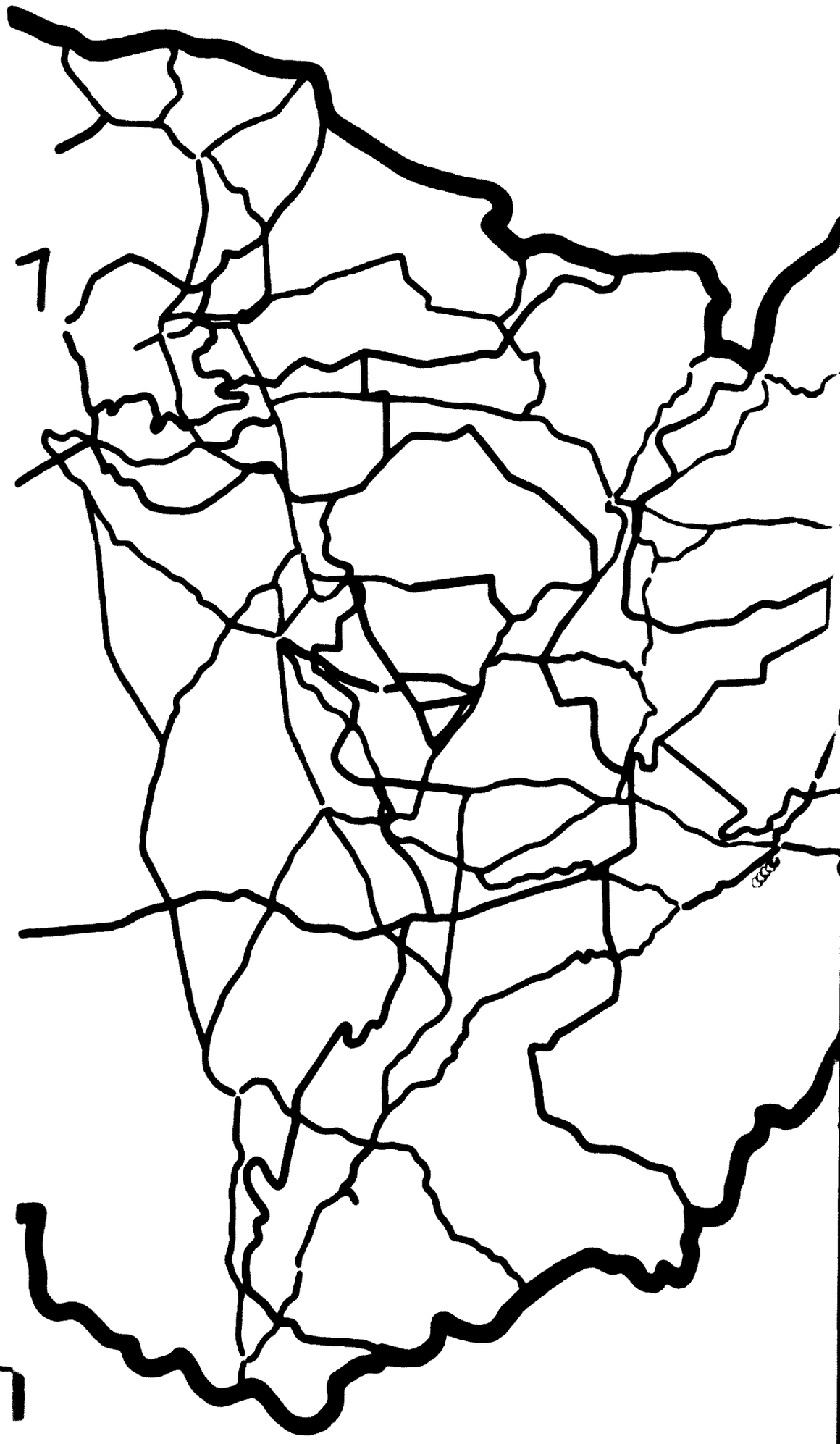

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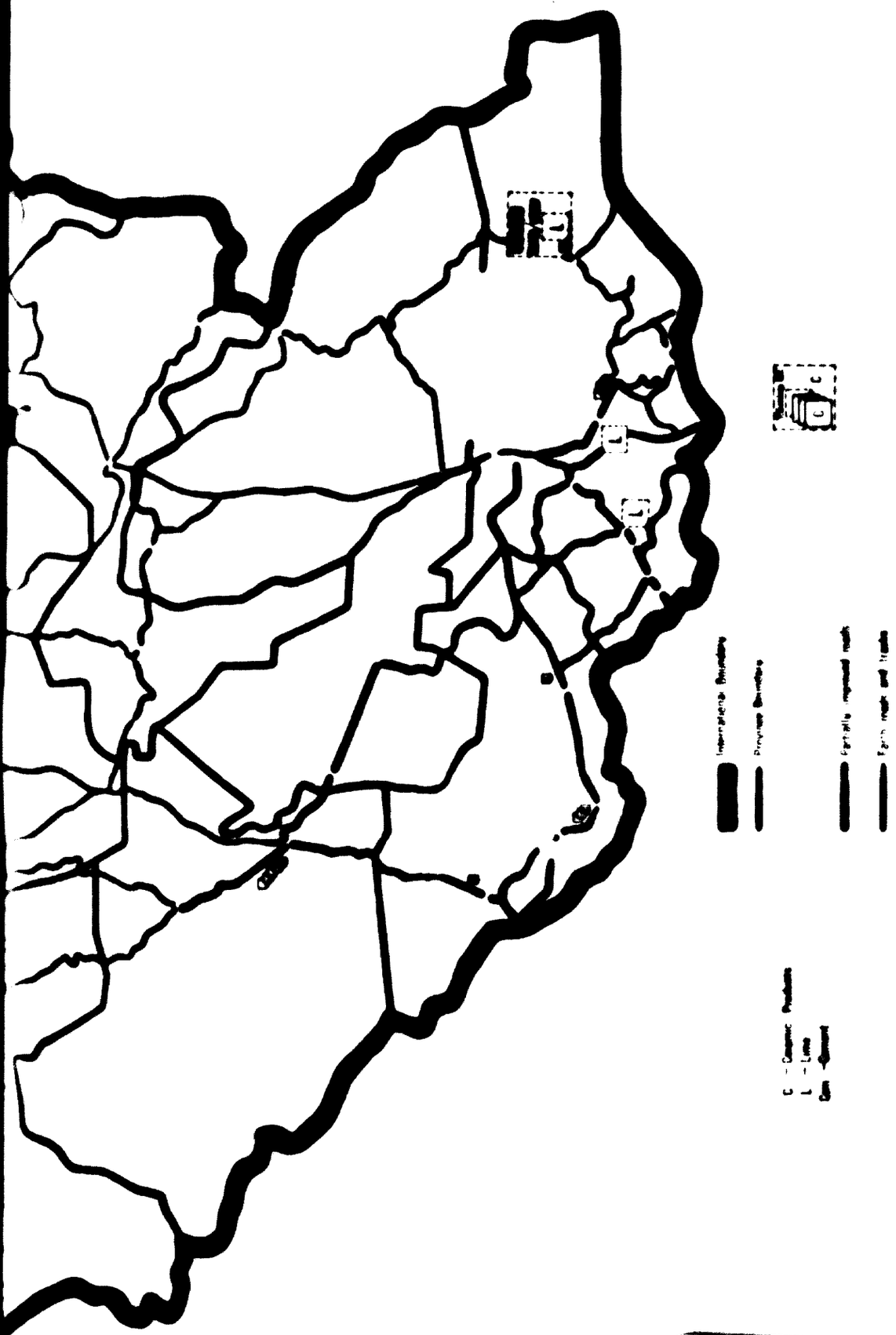

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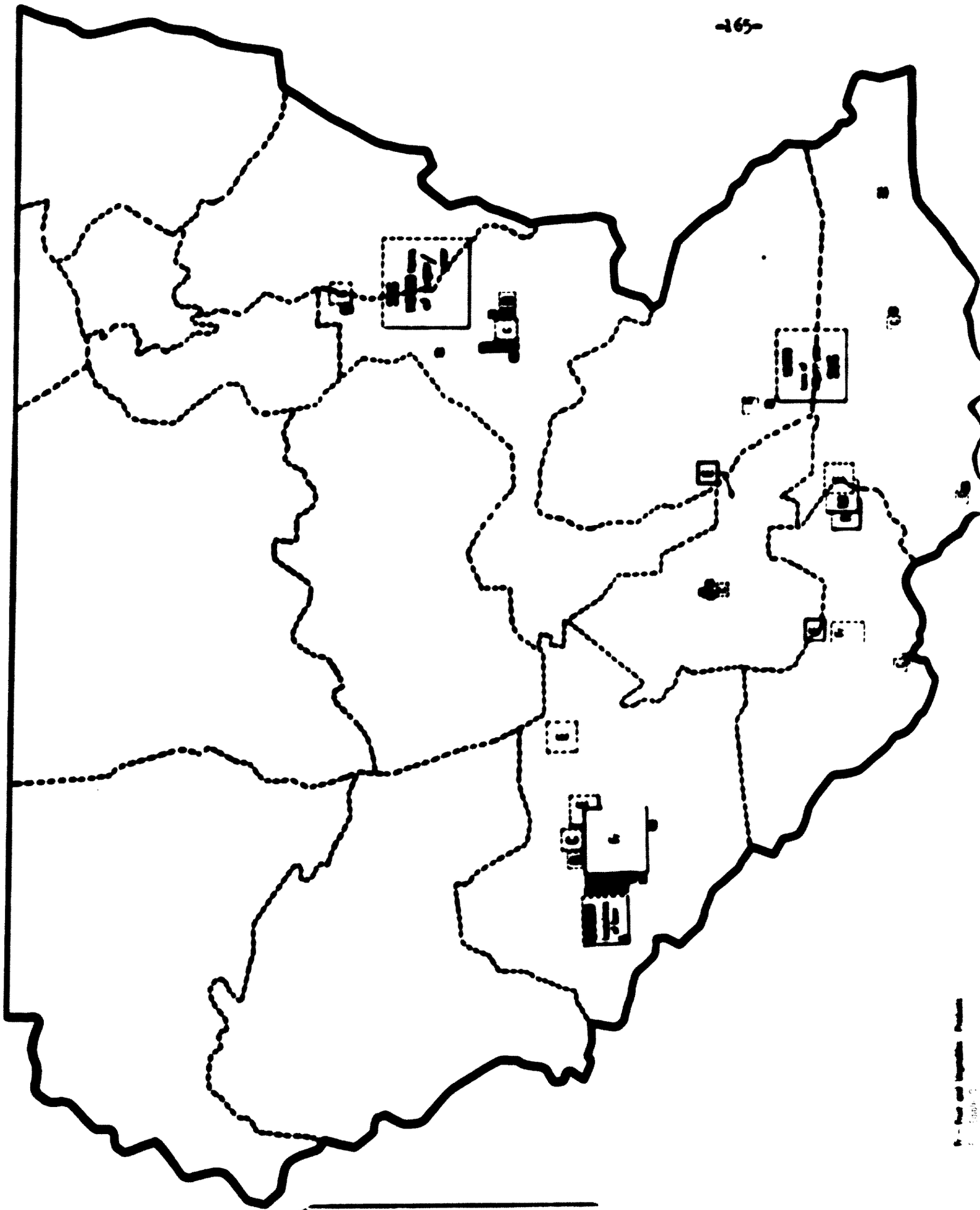

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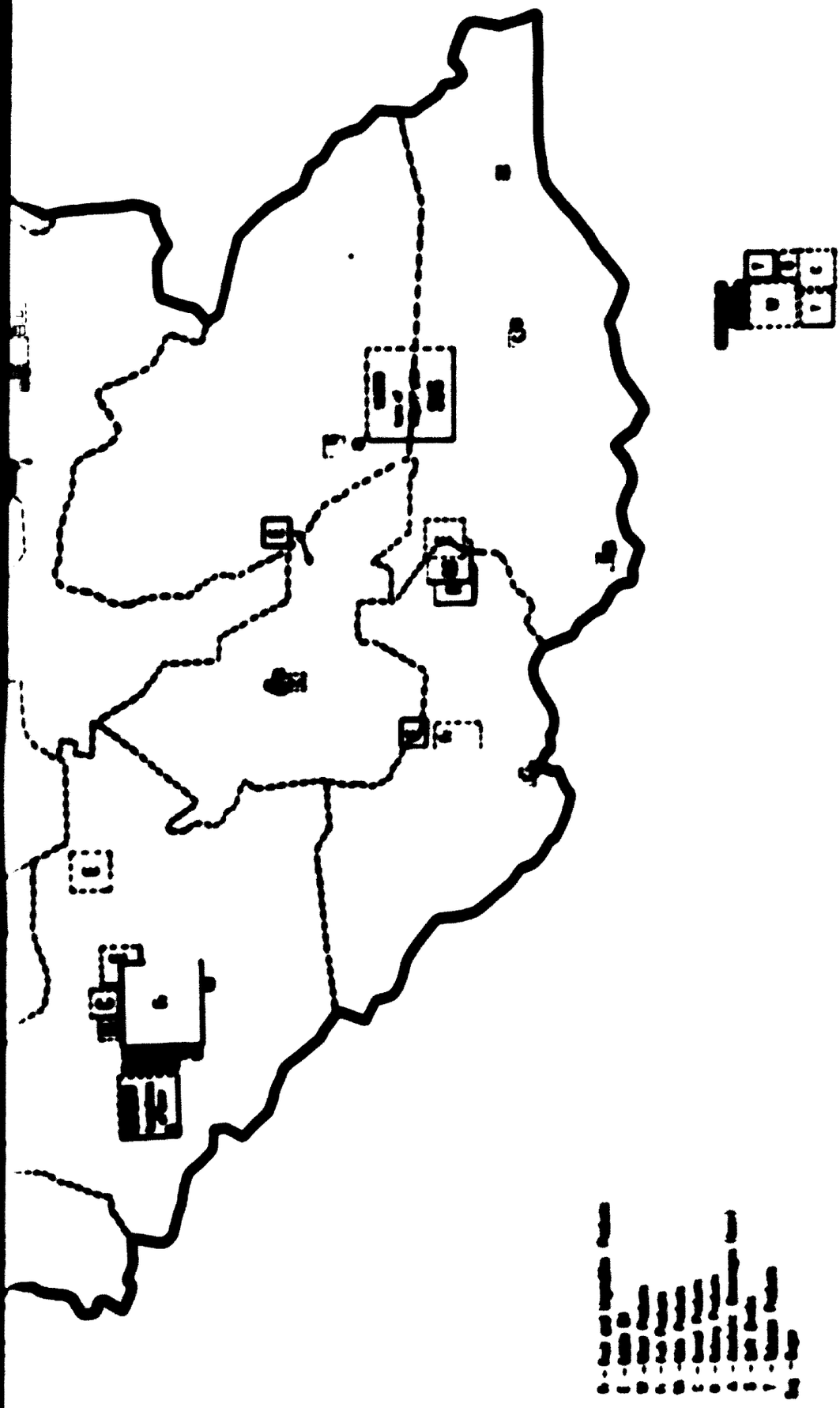

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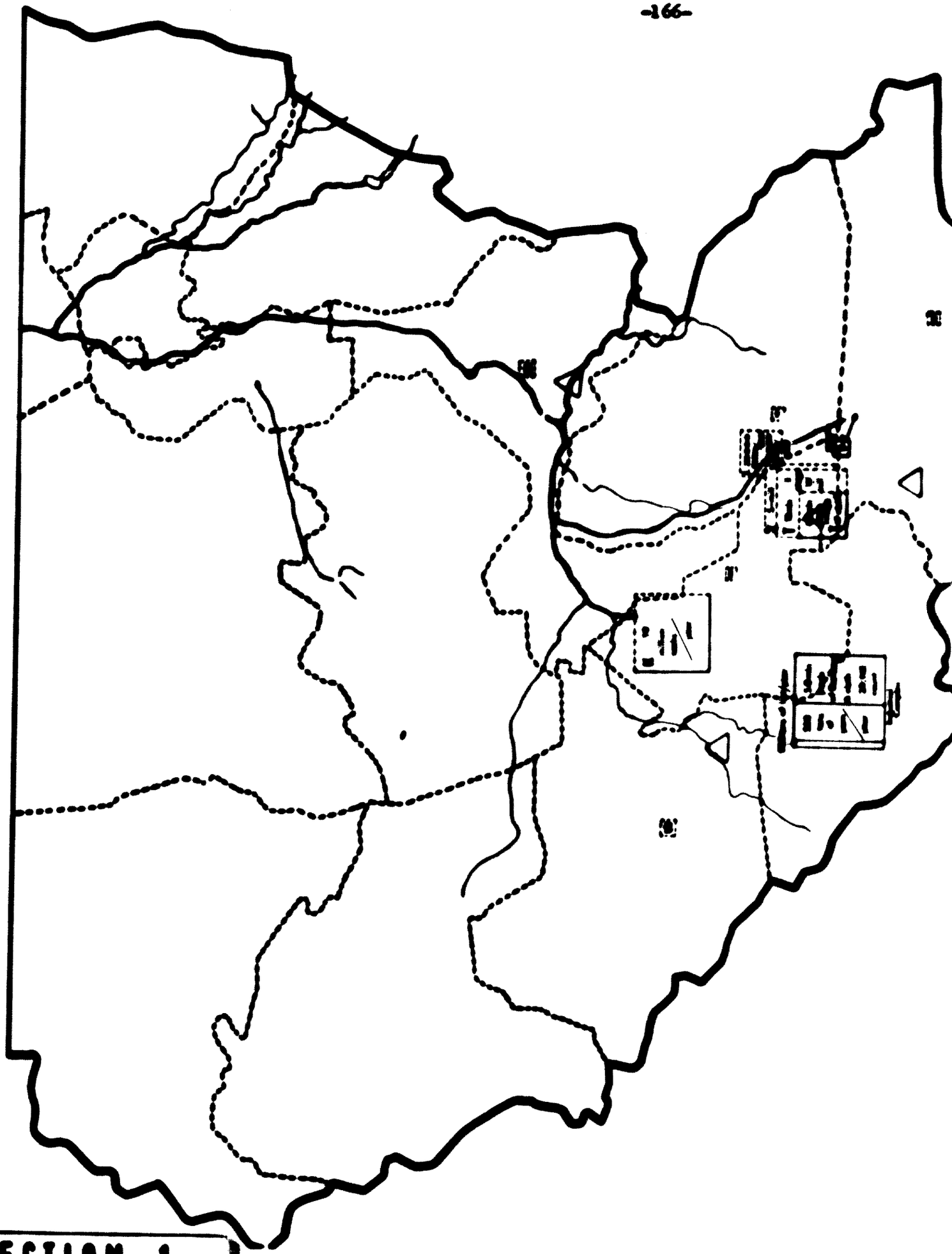

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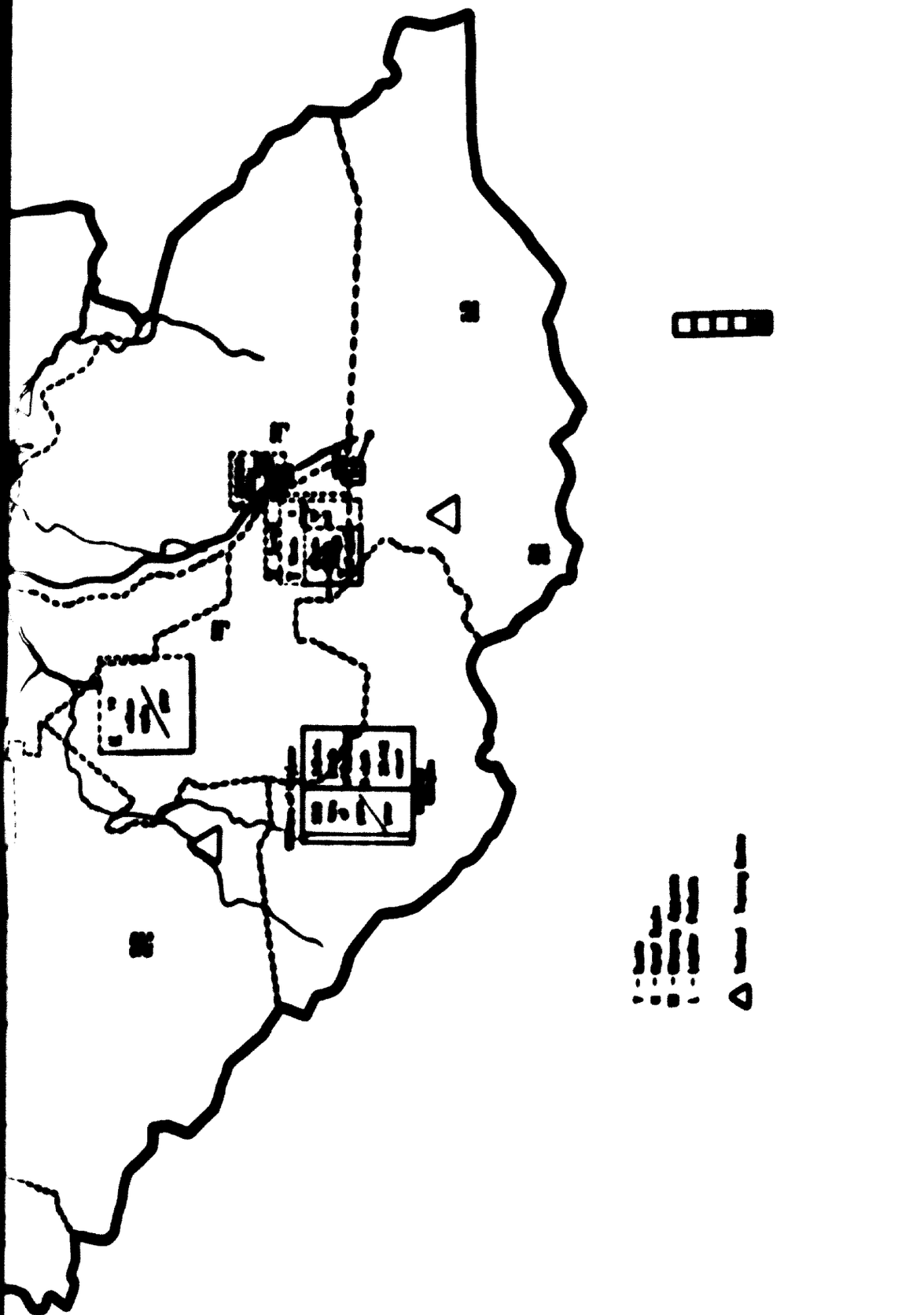

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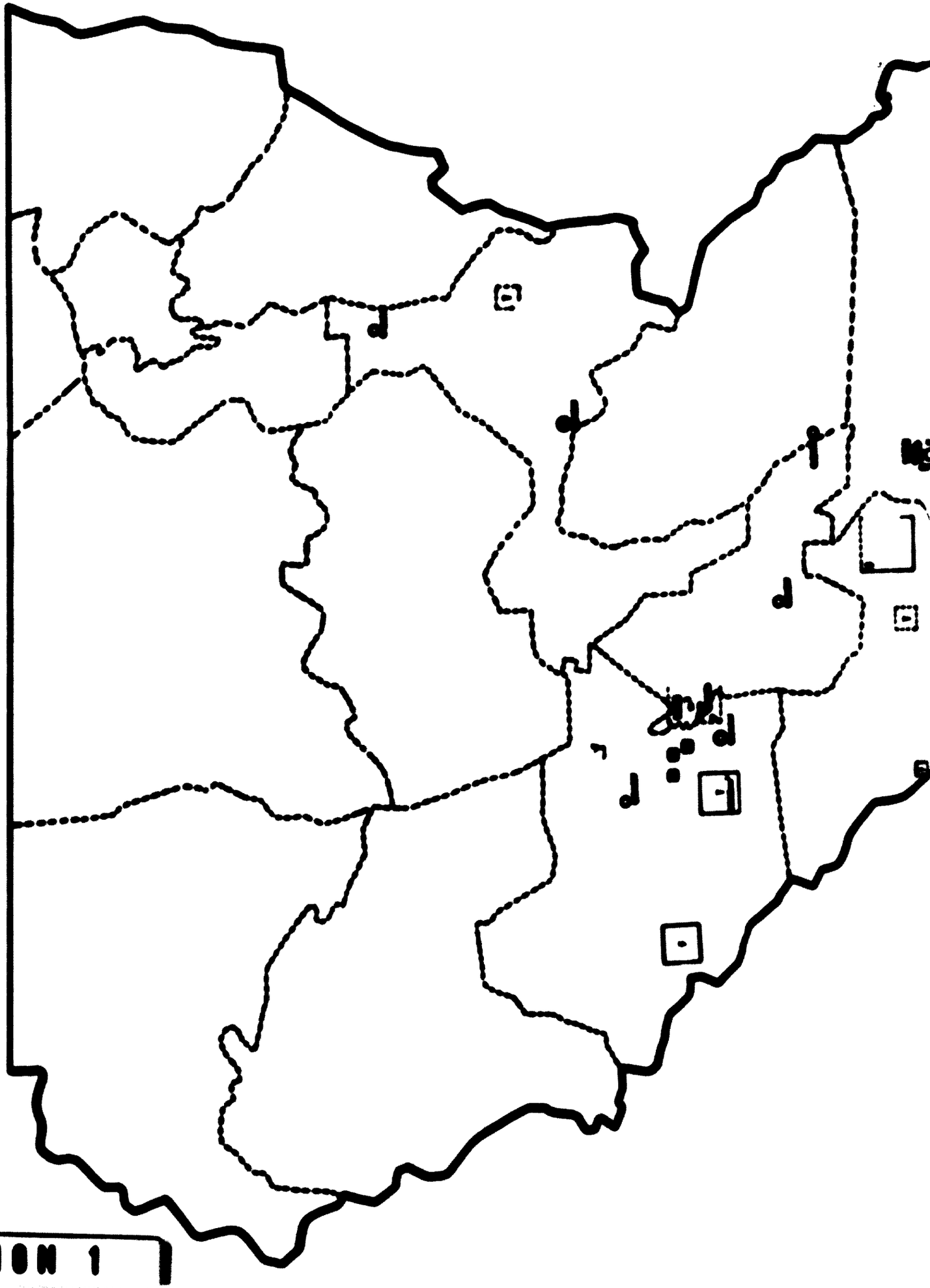

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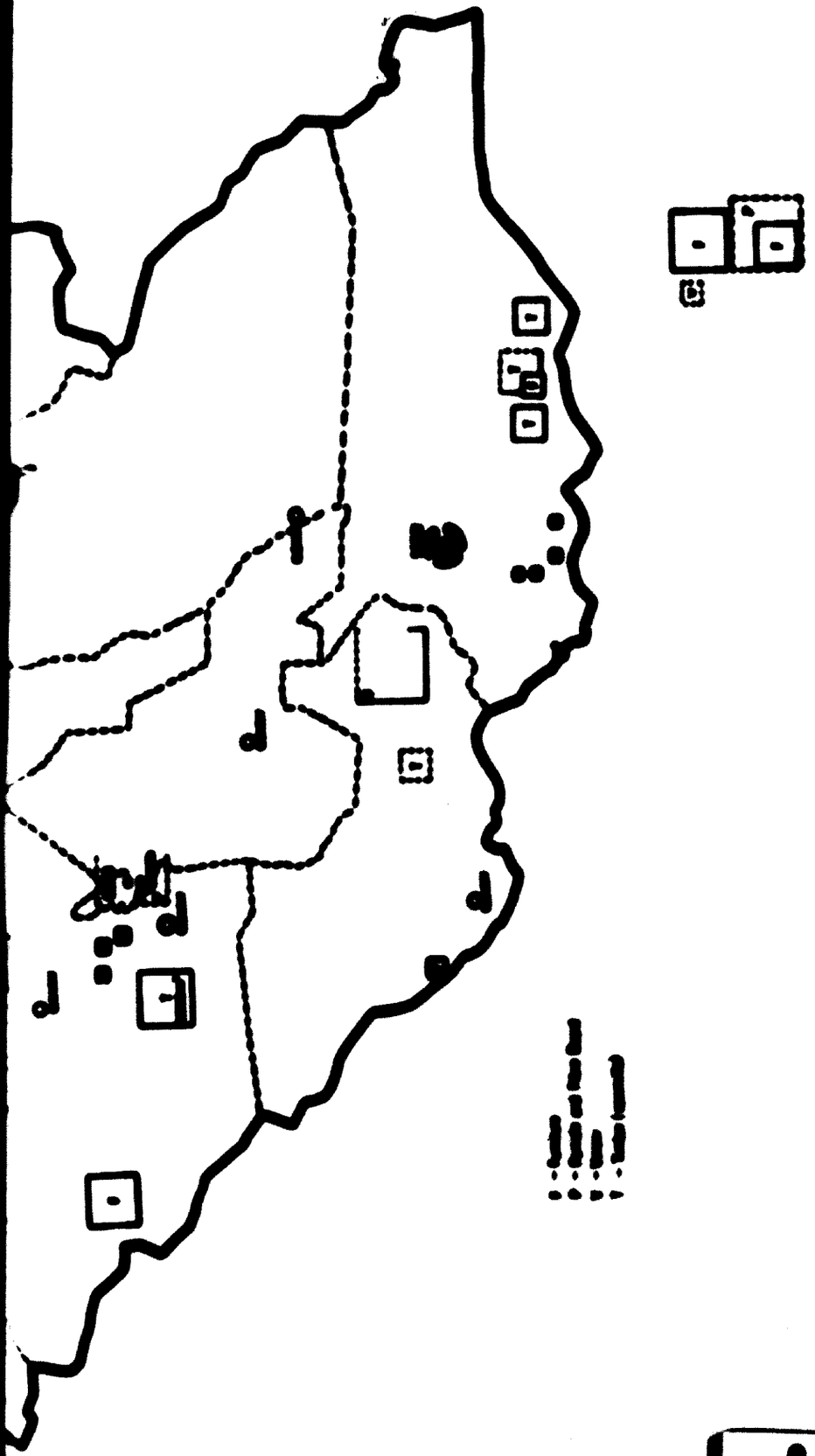

SECTION 2

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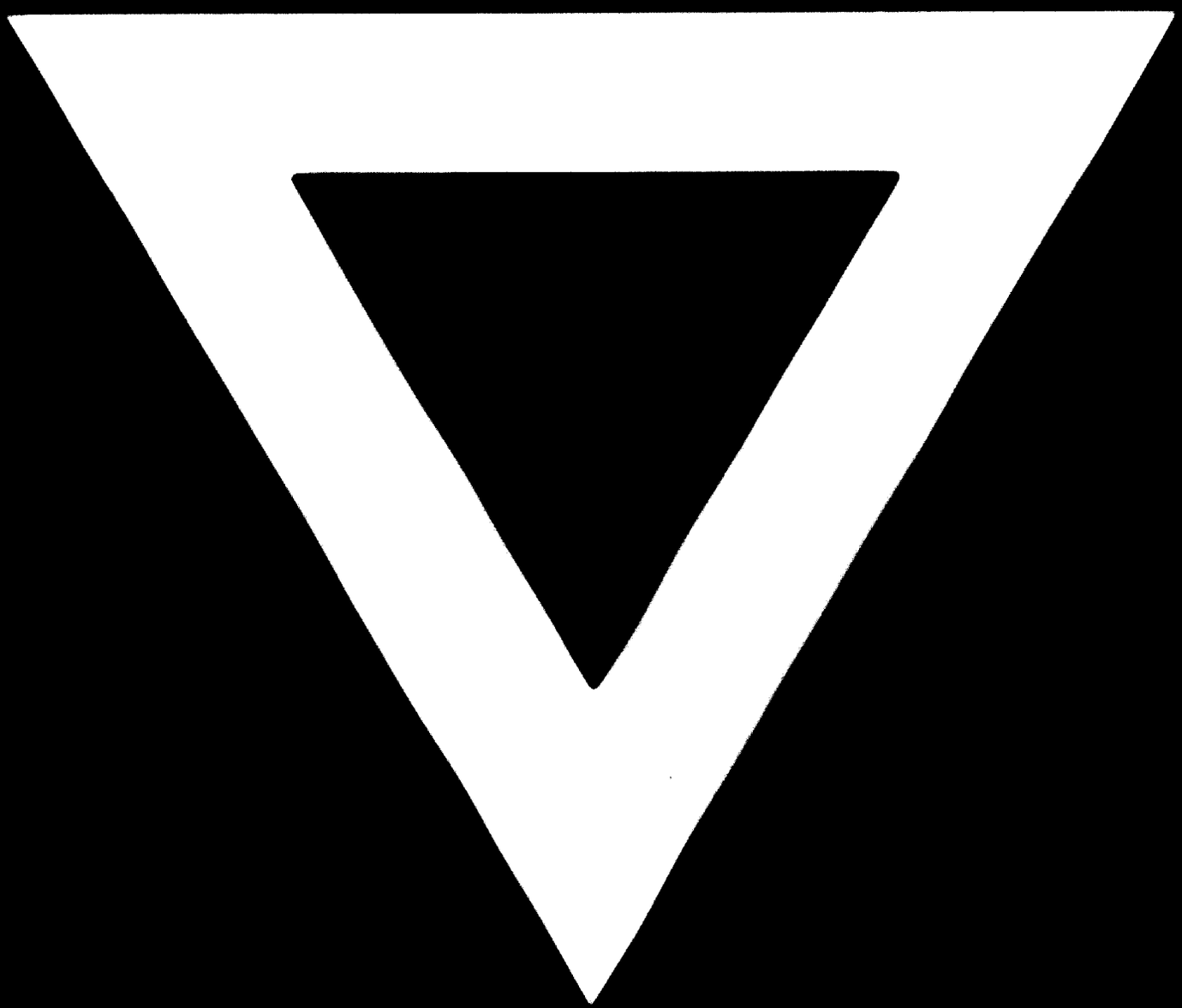

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