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PRE-FEASIBILITY STUDIES ON AGRO-BASED INDUSTRIES FOR PREFERENTIAL TRADE AREA OF EASTERN AND SOUTHERN AFRICAN STATES

PROJECT N° DP/RAF/88/074

FINAL REPORT

ANIMALFOOD SECTOR
EDIBLE OIL SECTOR
GRAIN MILLING SECTOR
SUGAR SECTOR

SEPTEMBER 1991

INTER G

GENERAL TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
PART A - ANIMAL FOOD SECTOR	
1 - Introduction	A2
2 - Country Overview	A4
3 - Main Agricultural resources	A10
4 - Foodstuff Market Survey	A20
5 - Project description and recommendations	A26
PART B - EDIBLE OIL SECTOR	
1 - Project Background	B3
2 - Market Survey	B4
3 - Industry and Plant Size and Capacity	B13
4 - Project Engineering	B15
5 - Plant organization	B29
6 - Financial and Economic Analysis	B37
PART C - GRAIN MILLING SECTOR	
1 - Project Background	C4
2 - Market survey	C8
3 - Industry and plant size and capacity	C16
4 - Project Engineering	C22
5 - Plant organization	C30
6 - Financial analysis	C36
PART D - SUGAR SECTOR	
1 - Project Background	D3
2 - Market survey	D7
3 - Location of the project	D17
4 - Project Engineering	D18
5 - Financial and economic analysis	D22

1 - INTRODUCTION -

TABLE OF CONTENTS

	Page
1 - INTRODUCTION	A2
2 - COUNTRY OVERVIEW	A4
2.1 - GEOGRAPHIC LOCATION	A4
2.2 - POPULATION	A4
2.3 - ECONOMY	A4
2.4 - FOREIGN TRADE	A5
3 - MAIN AGRICULTURAL RESOURCES	A10
3.1 - GENERAL OVERVIEW	A10
3.2- ASSESSMENT OF RAW MATERIAL FOR THE FOODSTUFF INDUSTRY	A11
3.2.1- Traditional raw material	A11
3.2.2- Potential substitute raw material:cassava	A15
3.2.3- Industrial sub-products	A17
3.3 - PRICES	A18
3.3.1- Raw material prices	A18
3.3.2- Sub-products prices	A18
4 - FOODSTUFF MARKET SURVEY	A20
4.1 - LIVESTOCK POPULATION	A20
4.2 - LIVESTOCK PROJECTIONS	A21
4.2.1- Domestic market	A21
4.2.2- Markets within P.T.A. countries	A21
4.3 - ANIMAL FOOD DEMAND ASSESSMENT	A22
4.3.1- Local production	A22
4.3.2- Imports	A22
4.3.3- Projected requirements	A22
4.4 - OVERVIEW OF FEED PRODUCERS	A22
4.4.1- Alcovit	A23
4.4.2- Production centers	A23
4.5 - PROJECT IDENTIFICATION	A25
5 - PROJECT DESCRIPTION AND RECOMMENDATIONS	A26
5.1 - PROJECT DESCRIPTION	A26
5.1.1- Sales and production	A26
5.1.2- Technical description and appraisal	A28
5.1.3- Financial analysis	A34
5.2 - RECOMMENDATIONS	A37
5.2.1- Raw material supply	A37
5.2.2- Technical measures	A38
5.2.3- Training level	A39
5.2.4- Proposal for a technical assistance mission	A39

1 - INTRODUCTION

By virtue of contract DP/RAF/88/074 signed by the french INTER G compagny and the UNIDO, INTER G has in charge a study on five agro-based industrial sectors : animal foodstuff, edible oil, grain, sugar, pulp and paper.

The overall aim is to assist the PTA secretariat and its members countries in taking technologically, economically, financially and environmentally sounds decisions on the establishment of sub-regional agro-based industries.

According to the terms of reference, the focus is on projects which must be sound in all respects and which must be such as to promote economic cooperation between the PTA countries and to contribute to the sustained transformation of the production structures of national economies.

This sectorial study progressed on three stages :

FIRST STAGE :

A preliminary selection to identify some specific countries for further industrial and economic investigation, in order to come up with the proper projects identification.

For this preliminary selection, assessment criteria adopted were classified in three categories :

- Market
- Raw material available ressources
- Environment

Given the regional framework of the study, it was estimated necessary insofar as compatible with technical contraints, that the projects be geographically distributes so as to exploit the advantages of the various countries concerned.

This consideration led to define the following principle : during the preliminary study, any given country should be visited for at most 3 sectors (excluding the paper sector, given the special nature of that project).

On the basis of this principle and the results of the multicriterion analysis (weighted or not) , we proposed, and PTA and UNIDO authorities accepted, selecting the following countries for the preliminary study :

Oil and fat : Zimbabwe, Tanzania, Uganda, Malawi
Grain : Kenya, Zimbabwe, Tanzania
Animal feed : Tanzania, Ethiopia, Kenya
Sugar : Kenya, Zimbabwe.

This selection took into account the PTA authorities observations.

SECOND STAGE

For each sector a project identification study within the selected countries, the aim being to identify the project most worthwhile for a prefeasibility study after an analysis of opportunities and requirements.

After the multicriterion analysis performed on the basis of the project identification study, following recommendations were suggested to PTA authorities (with a ranking resulting from the multicriterion analysis).

ANIMAL FOODSTUFF SECTOR

1 - KENYA = Fishmeal production
2 - KENYA = Animal waste processing
3 - TANZANIA = Soya bean processing
4 - ETHIOPIA = Ruminant blocks

EDIBLE OIL SECTOR

1- ZIMBABWE = Multipurpose oil factory
2- TANZANIA = Rehabilitation program

GRAIN MILLING SECTOR

1- TANZANIA = Project to upgrade products such as millet and sorghum as a substitute for wheat imports.
2- = Project designed increase maize milling capacity.
3- KENYA = Composite flour production.

SUGAR SECTOR

1- ZAMBIA = Nakambala
2- KENYA = Chemelil
3- KENYA = Munias
4- KENYA = Sony

THIRD STAGE

A profeasibility study for the projects selected by PTA authorities among recommendations selected above.

ANIMALFOOD SECTOR

PTA authorities asked INTER G to perform the animal food study on a cassava project upgrading in Burundi. This country was not selected in the first stage, and consequently there was no project identification study in this country.

The animal food expert went to Burundi in order to collect the required technical and economical data to perform the prefeasibility study but he also was in charge of identifying the project itself during this appraisal mission.

The expert mission appraisal showed that current situation in Burundi did not enable to plan any significant investment in the animalfood sector for different reasons : a current processing overcapacity, a significant lack of raw material, a low increase of local animal foodstuff denied.

So the expert taking into account these local conditions suggested recommendations in order to improve the operation of the main production unit = ALCOVIT.
These recommendations lead to the implementation of a technical assistance mission to enable the unit to increase the current production at the level of 50% of installed capacity.

EDIBLE OIL SECTOR

PTA authorities communicated us in November 1990 that selected project was a multipurpose oil factory in Zimbabwe. When the project technical mission was conducted in December 1990. The technical expert observed that, in comparison with data collected during first mission in November- December 1989, poor climatic conditions generated a strong decrease of cotton seeds and most of raw material production.

Therefore, this pre-feasibility study was conducted considering the CMB's willingness to foster the cotton production (which is a valuable cash crop for the national economy), and that these poor climatic conditions were temporary.

It is obvious that, currently, edible oil demand is not met and that if the CMB's decision of implementing this project was postponed, the oil local expressors would under-take relevant actions to increase their oilseeds expressing capacity in order to supply national market.

CMB authorities should be prompt with their decision regarding this project investment where they will entirely be involved, failing that their contribution could occur with a joint-venture project with one of the local oil expressors.

The prefeasibility study has been achieved on this basis. The proposed project has a capavcity of 88.000 T/year of oil seeds (cotton, seeds, soyabeens, sunflower seeds).

GRAIN MILLING SECTOR

The selected project identified for the pre-feasibility (third stage) was communicated to us at the end of 1990 = TANZANIA = Project to upgrade products such as millet and sorghum as a substitute for wheat imports.

The project technical mission was conducted in TANZANIA in June 1991. The expert was in charge of updating data collected in 1989 in order to perform the feasibility study for the identified project. When conducting the infield mision, the expert identified the need for a pilot project of mix flour production, a project which could be reproduced in various areas of the country to meet local populations needs through medium scale industrial production of mix flour.

The preasibility study has been achieved on the following basis.

A contemplated production capacity is estimated at 2 to 3000T/year for the bassic option, at 5000T/year for the double option.

SUGAR SECTOR

PTA authorities selected Nakambala project in Zambia.

Nakambala estate, produced in 1990, 124 600 tons of sugar. This factory has a nominal level of 160 000 tons but due to shortage of foreign exchange in the last 80's serious deterioration led to a decline of sugar production.

Without urgent rehabilitation, factory and estate performances will continue to decline.

Most of the sugar production is sold on domestic market. Due to forecast exchanges of the domestic market, Nakambala will need to increase its production.

Booker-Tate (ex Tate Lyle) and ZSC considered different options and retained the option which would enable to reach a production level of 170 000 tons of commercial sugar.

This prefeasibility study has been performed on this basis with data collected by the technical expert during his project appraisal mission in Zambia.

This project, during the 1990's will aim at supplying 25 to 35 000 tons of sugar per year on the intra-PTA sugar trade .

PART A - ANIMALFOOD SECTOR

1 - INTRODUCTION :

Recommendations suggested to the PTA authorities on March 1990, were :

1 - Fishmeal production (Kenya)
2 - Animal waste processing (Kenya)
3 - Soya bean processing (Tanzania)
4 - Ruminant blocks (Ethiopia)

Nevertheless, PTA authorities asked INTER G to perform the animal food study on a cassava project upgrading in Burundi. This country was not selected in the first stage, and consequently there was no project identification study in this country.

Third stage :

A prefeasibility study was supposed to be performed.
The animal food expert went to Burundi in order to collect the required technical and economical data to perform the prefeasibility study but he also was in charge of identifying the project itself during this appraisal mission .

The expert mission appraisal showed that current situation in Burundi did not enable to plan any significant investment in the animal food sector for three reasons :

- A current animal food processing overcapacity

There already is a major animal food producer in Burundi and several local centers with little production capacity.

The total production is of 7 000 T/year of which 35%, are produced by ALCOVIT.
ALCOVIT capacity (12 000 T/Y) is largely under utilized (30%) the main reason being a significant lack of raw material. In fact this plant was designed to use bran and issues produced by the MURAMVYIA MILL, but this one has not been working regularly for the last three years. This situation has led the expert to recognize that the purpose was not to identify a new project but to study the opportunity to improve the ALCOVIT position through a production increase linked to additional raw material supply.

- A significant lack of raw materials

To overcome the lack of traditional raw materials (maize, bran ...) cassava supply conditions were studied within this framework in Burundi. Cassava is a food crop processed within traditional farms. The national production of 600 000 T is dedicated to rural households consumption There are no intensive farming methods, attempts to improve yields are underway but are still to be implemented in the traditional sector.
In the Fifth plan, there is no specific project for cassava intensive production, the authorities considering that "cassava is a crop which acts as a buffer in case of lack of food crops. It is limited to the household level". Annual and local production irregularity leads to periodic surpluses which often are poorly upgraded.

However, surpluses random availability (location and period) hamper the implementation of permanent equipment to process those surpluses for later upgrading of foodstuff production.
Current and potential cassava production does not enable to supply, regularly, the ALCOVIT plant and therefore to set up a specific program for cassava upgrading in the animal foodstuff sector.

In addition, it is relevant to emphasize that in less developed country like Burundi, which suffers from food self-sufficiency, animal foodstuff can not compete with local population needs.
The upgrading of industrial sub-products not consumed by local population is of course very suitable, for this industry.

- A low increase of local animal foodstuff demand

Compound foodstuffs are mainly used for pigs, poultry and fish farming due to the productivity level of ruminant breeding is still too rudimentary to make the use of costly foodstuffs profitable.

In Burundi, due to high to population density and land scarcity, animal foodstuff demand for cattle is a little more important than in other African countries.

Nevertheless the major animal foddstuff consumers are poultry, fish and ruminants. The demand will be therefore heavily tied to this livestock development.

Consequently, the current capacity will be sufficient enough on a medium term basis.

During his mission, the expert taking into account local conditions, attempted to suggest a few recommendations in order to improve the production unit operation at three levels (raw material, technical recommendations and staff training). These recommendations lead to the implementation of a technical assistance mission which aim at enabliny the unit to increase its current production level up to 50 % of installed capacity and pursue its operation with a significant cut in production costs. Later on, the unit will, eventually, when raw material supply become large-enough, integrate cassava within its production with very limited investments.

2 - COUNTRY OVERVIEW

2.1 - GEOGRAPHIC LOCATION

The country is located in Eastern Africa and surrounded by Zaire on the west side. Tanzania on the east side. It is also sided by the TANGANYIKA lake where is located the IMBO plain.
Burundi is a landlocked country and is one of the two French speaking country with Rwanda within the P.T.A area.

The country is at the border of the Rift valley, the highest peaks are at 2.600 m of altitude.

The climate is temperate and different from the neighbouring countries like Zaïre with a smaller rainy season due to its altitude.

See Map.n°1, n°2, n°3 and n°4 on the following pages.

2.2 - POPULATION

Population in 1990 was estimated to 5.356 266 with a growth rate of 2.5% per year.

Population density is pretty high compared of other African countries with 191 Inh/KM² and is related to the small area of country.

Population break down

Males: 48.8%
Females: 51.2%

Rural Population is of 90%

The capital is Bujumbura with 250, 000 Inhabitants.

2.3 - ECONOMY

The GDP per capita in 1989 was US$ 220 which is low compared to the average figure for African countries (US$ 580).
Burundi is one of the poorest nation of the world.

Sectoral composition of the GDP in 1988:

Agriculture: 56%
Industry: 15%
Services: 29%

The national currency is the Franc Burundi
1FF= 0.30 Fr Bu

The lanck locked position of the country hampered its economic development and gets dearer imports as well as exports.

Shipments of imports and exports through the principal outlets via Tanzania have encountered delays due to bottlenecks in the port of Dar es Salaam, poor operation of the railway link between Tabora and Kigoma.

2.4 - FOREIGN TRADE

Exports total US$ 123 millions in 1988

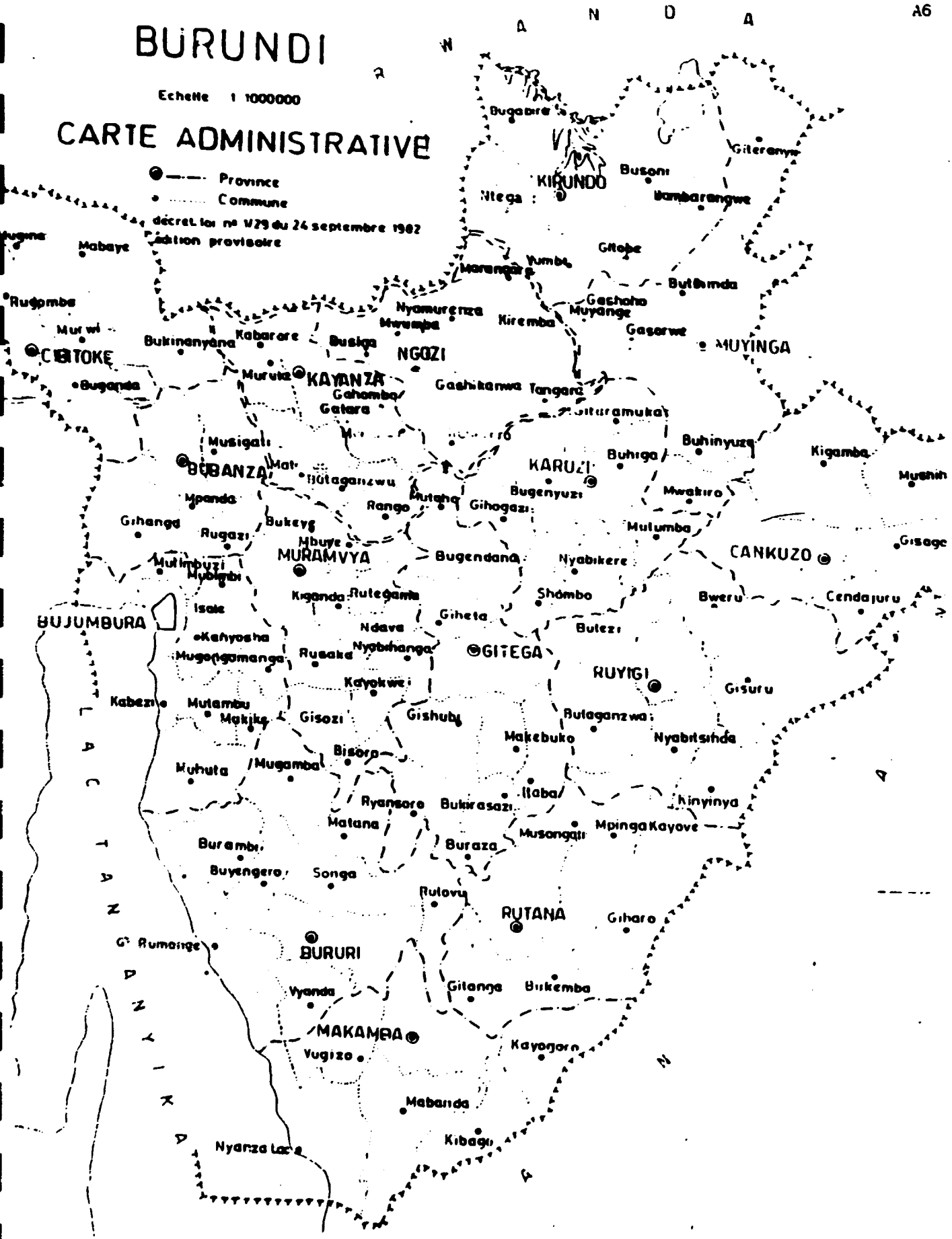
Main Exports are:

Coffee
Tea
Cotton
Animal Skins

Agricultural Imports total US$ 165 millions in 1988

Main imports are:

Sugar
Wheat
Milk products
Vegetable oil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Yumba
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Kiremba
Gasorwe
MUYINGA
Rugombo
Murwi
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Kabarore
Buisiga
NGOZI
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KAYANZA
Gahomba
Gatara
Gashikanwa
Tangara
Musigati
BUBANZA
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Butaganzwu
Buhiga
KARUZI
Buhinyuza
Kigamba
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Mwakiro
Mpanda
Rango
Mutaho
Gihogazi
Gihanga
Bukeye
Rugazi
Mbuye
Mulumba
MURAMVYA
Bugendana
Nyabikere
CANKUZO
Gisage
Mutimbuzi
Kiganda
Ruteganira
Shombo
Bweru
Cendajuru
BUJUMBURA
Isale
Giheta
Ndava
Butezi
Kanyosha
Nyabiharga
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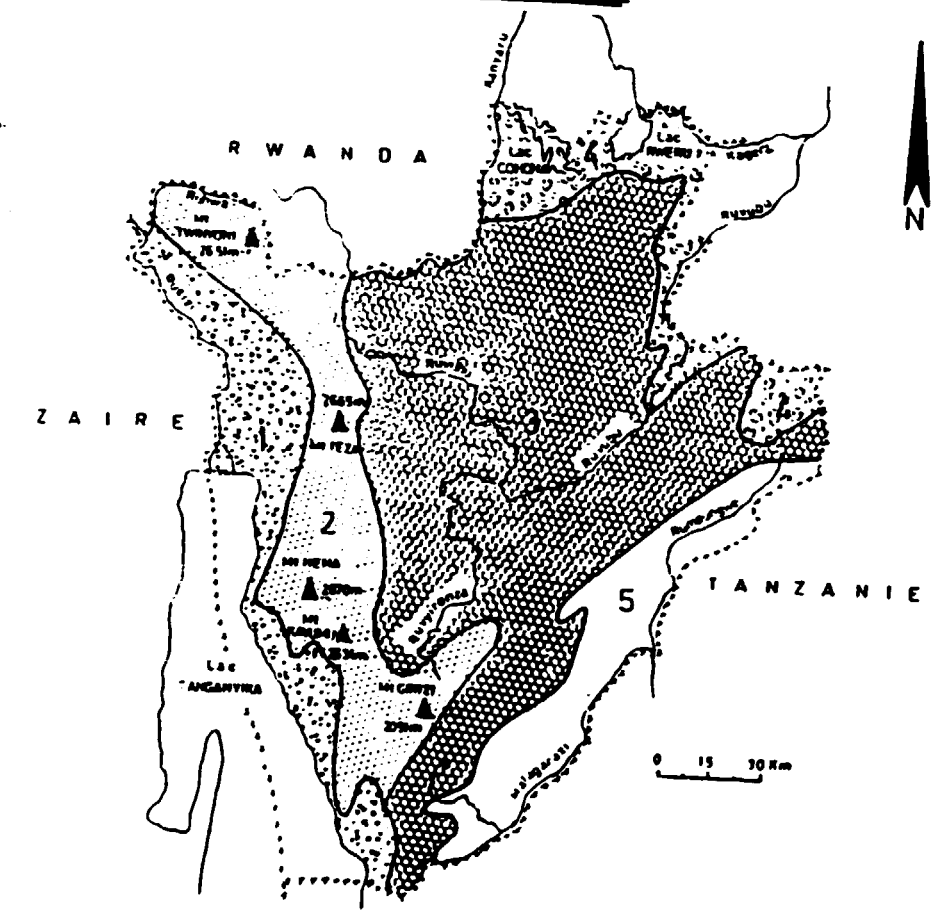
Nyabitsinda
Bisoro
Muhuta
Mugamba
Ryansore
Bukirasazi
Itaba
Kinyinya
Matana
Musongati
Mpinga Kayove
Buraza
Burambi
Buyengero
Songa
Rutovu
RUTANA
Giharo
G. Rumonge
BURURI
Vyanda
Gitanga
Burkemba
MAKAMBA
Vugizo
Kayogoro
Mabanda
Nyanza Lac
Kibago

CARTE N° 1

CARTE PHYSIQUE (Relief) DU BURUNDI

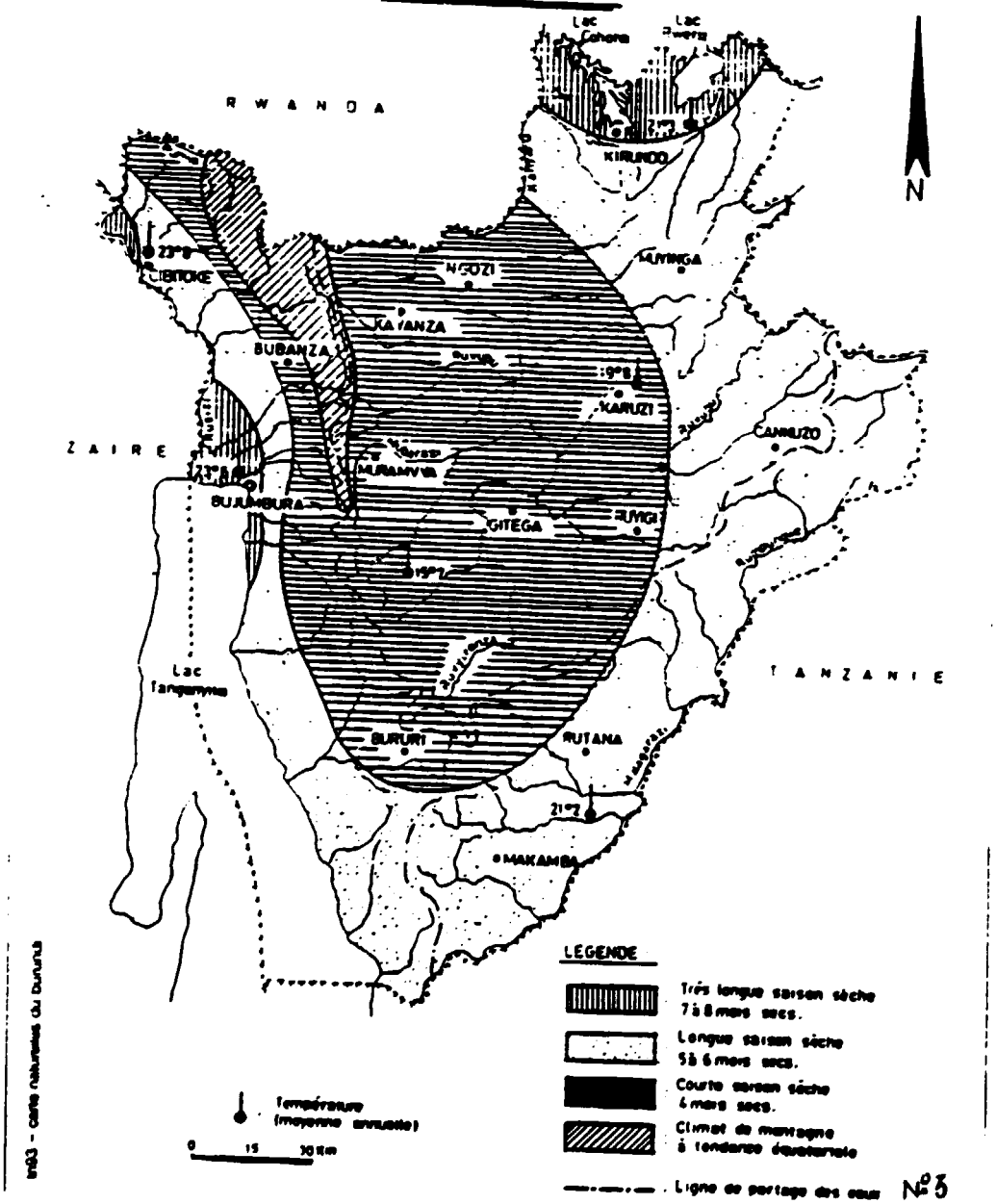


N°	CLASSIFICATION	ALTITUDE	PLUIE
1.	La plaine de l'Imbo	774 à 1000m	< 900 mm
2.	La crête Zaire-Nil	2000 à 2670m	1600 - 2000 mm
3.	Le plateau central	1500 à 2000m	± 1200 mm
4.	Les dépressions du Nord-Est	± 1300 m	800 - 1200 mm
5.	La dépression du Moyen	1200 à 1400m	900 - 1200 mm

▲ Les points culminants

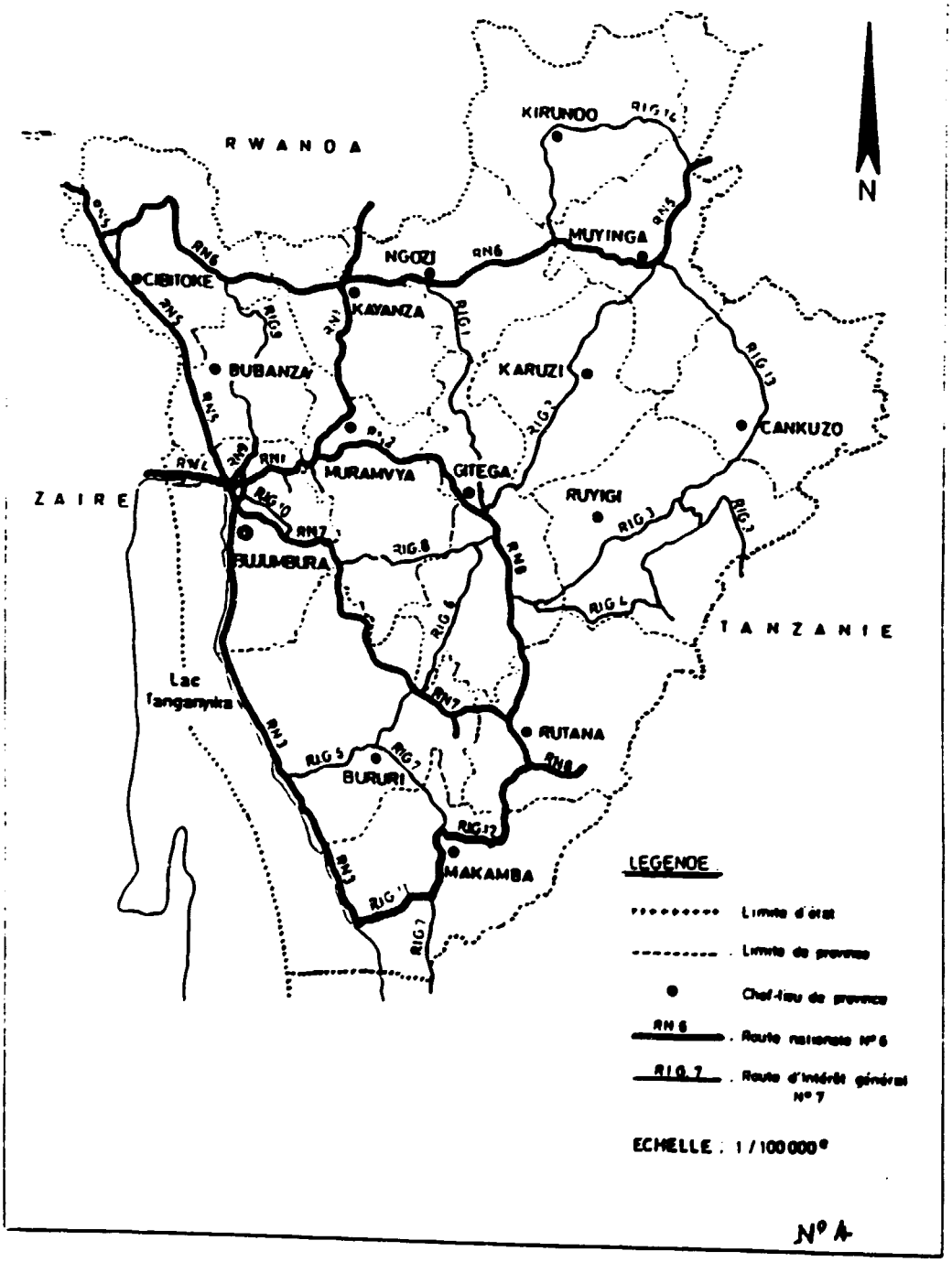
N° 2

CARTE DES REGIONS CLIMATIQUES DU BURUNDI



in63 - carte naturelles du burundi

CARTE ROUTIERE DU BURUNDI



3 - MAIN AGRICULTURAL RESOURCES

3.1 - GENERAL OVERVIEW

Burundi is essentially an Agricultural Economy relying on subsistence farming and coffee as its main export crop and other cultures such as sugar cane, maize, sorghum.

Food self-sufficiency is barely attained in Burundi, and nutritional needs are just covered. Main resources are found in the IMBO plain.

Due to the poor agro-based industry in Burundi, food surpluses deteriorate rapidly during storage. Food products are very expensive since there is no emergency stock and remain too costly for the average population.

Overall, the agricultural sector faces serious constraints:

- the scarcity of arable land and the small size of the farm, problems which are compounded by the high rate of population growth which increases pressures on lands.

- the low level of farmer income, which limits their ability to purchase fertilizers, pesticides and other inputs.

- the soil erosion and degradation caused by cultivation of steep slopes, inadequate anti-erosion measures, burning of agricultural residues and grass, overgrazing.

By law, all land belongs to the government but in practice tenure is regulated by a combination of traditional laws and modern regulations. There are about 900, 000 farming units with the average farm size below one hectare. The small size of the farms has a negative impact on crops development since it is made difficult to mechanise and lower production costs.

Because of the limited quantity of surplus production and the lack of organised market facilities less than 20% of food crop are marketed by private traders in traditional markets.

About one quarter of the farmers rise livestock. Cattle are bred extensively, more for traditional then for economic and nutritional reasons. Due to land scarcity in Burundi there is competition between grazing and cultivation.

Modern agriculture techniques are used:

- in the settlement schemes called paysannats,
- in industrial plantations
- in irrigations schemes

Industrial plantation are rather dedicated to cash crops such as coffee, tea, and to alesser extent cotton.

Agriculture Services

The Ministry of Agriculture and Livestock is responsible for the Direction and Coordination of all activities in the agricultural and livestock sector.

The Ministry of Rural Development is responsible for Rural Housing, Water Supply and Electricity and Cooperatives.

Agricultural Research is carried out by the Burundi Institute of Agricultural Sciences (ISABU).

ISABU has started to conduct studies on local potentialities and on production systems. The extension department pursues the finalization of extension messages which seems to give satisfactory results. Nevertheless, the services need to work on better cooperation with local developers in the field. This is a requirement for a better contribution to design food-processing policies.

3.2 - ASSESSMENT OF RAW MATERIAL FOR THE FOODSTUFF INDUSTRY

The animal food industry is characterized by the use of raw material such as grain rejects (maïze, sorghum, rice,...), and screenings,as well as by-products from grain mills (maïze bran and wheat bran) from oilseed mills (palm kernel cakes) from abbatoirs (meat, and bone meal) and salt, limestone and vitamin premixes.

The study will carefully look at traditional raw material availability in Burundi such as grains and oil seeds and other resources such as cassava roots.

3.2.1 - Traditional raw material

Essential raw materials available in Burundi for the animal food industry are rice, maïze, wheat, sorghum and palm kernels. Starchy products are maïze, sorghum, rice.

Maïze and sorghum account for the largest amounts and represent respectively 51% and 26% of this local production.

Production figures are illustrated in Table 1

Table 1

('000 Tons)

Products	1986	1987	1988	1989	1989
Rice	23	28	28	28	10.96%
Maïze	164	174	180	135	52.84%
Wheat	8	8	7.6	7.3	2.86%
Sorghum	61	63.5	64.4	68.7	26.89%
Palm Kernels *	2.4	2.5	2.7	2.5	0.98%
Groundnuts (Shelled)	14	14.8	14	14	5.48%
Total	272.4	290.8	296.7	255.5	100%
Cassava Roots	554	580	623	642	

Source: ISABU March 1991
* FAO Estimates

Maïze is used essentially in the poultry feeds. Maïze crops locations are spread out in various locations of the country with the largest areas located in the western side. According to figures presented in Table 1, maize production after a slight and regular increase arount 4% per year since 1986 which follows the local population growth (about 3 % year) is much lower in 1989. 1990 figures are not currently available and the low figure of 1989 can be considered as limited.

Currently, in the foodstuff compounds, there is no way to substitute maïze by sorghum, rice or cassava which are also expensive and irregularly available .

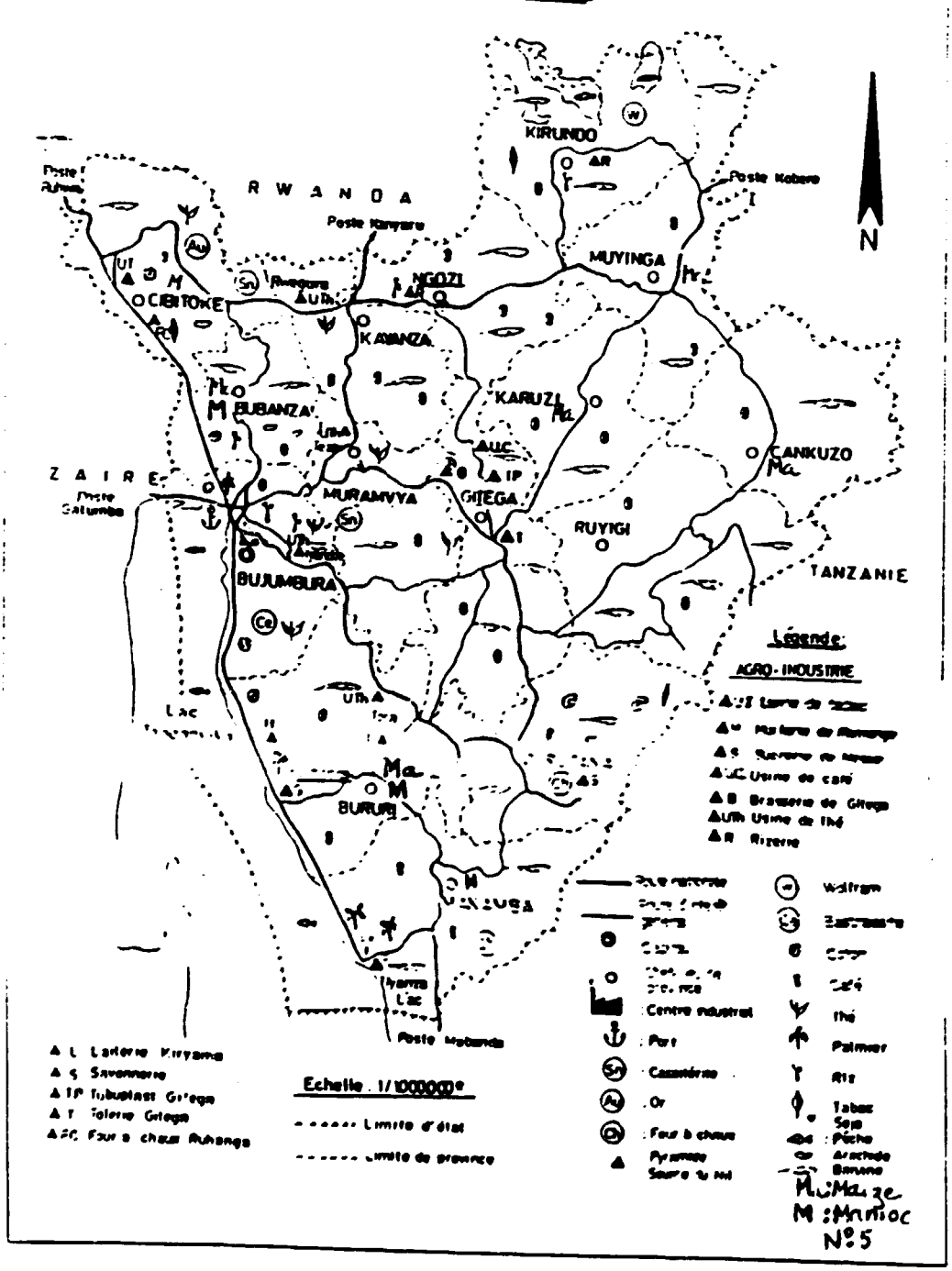
Rice

Rice production is essentially concentrated in the IMBO plain but suffers from periodical floodings. Rice production is very limited and remains steady over the past few years.

Wheat

Wheat production is very low due in particular to climatic conditions. Even with some development projects from the Vth plan, the yields level remain very low.

CARTE ECONOMIQUE DU BURUNDI



Sorghum

Sorghum is the second food crop in Burundi, its production level barely follows the population growth and some development projects from the Vth plan are underway. Sorghum accounts for 25% of the raw material production dedicated to animal feed.

Palm kernels

Palm kernels production is linked to the palm plantations development. Plantations are essentially located in the southern part of the TANGANYIKA lake coast. They are some development projects in the Vth plan to increase local production and reduce edible oil imports. Palm kernels account for 1% of the raw material production dedicated to the animal feed.

Groundnuts

Groundnuts production is very low and is generally self-consumed by the local population. Oil cakes production is not available locally.

Molasse

Since 1988, the sugar cane farming has developed in the MOSO area. Potential crops output are very optimistic and are likely to be confirmed for the coming years around 15,000 tons/year.

Molasse, with good calories value, is rather used for stock feeding (and account for up to 15% of total animal feed compounds and for other animal kinds less than 10%). Unfortunately, due to the IMBO area location, transport costs are high (bulk in trucks or with 200 Liter drums).

In addition, molasse output is produced from June to November and molasse storage capcity is of 1,500 tons for 4,000 produced as illustrated in Table 2 below.

Molasse is consumed by the cattle from the area and left over is most of the time lost. It should be useful to consider a storage increase of about 1,500 tons, which will enable a better sales distribution along the year.

TABLE 2

PRODUCTS	1988	1989	1990	1991
Sugar	4,657	8,476	10,310	14,500
Molasse	665	2,401	2,678	4,000

Source: ISABU March 1991

As in other countries where food self-sufficiency is barely attained, animal food raw material competes with agriculture resources dedicated to human consumption.

Moreover, the country encounters a major problem with the irregular operation of the flour mill of MURAMVYA in the past few years. This flour mill built in 1982 is capable of processing:

	Installed capacity	Annual production	Animal foodstuff
Wheat	35 T/24 h	10 000 T/y	2500 T/y
Maïze	30 T/24 h	9 000 T/y	1800 T/y

The plant was not operating when the expert was in the field. It seems that the operation of wheat milling started again last July with imported wheat.

Brans potentially produced by the installed capacity representing respectively (25% and 20% of initial weight) are large enough to supply the animal food industry. However, due to the shortage of grains availability, the mill can not regularly supply the animal food industry.

3.2.2 - Potential substitute raw material:cassava

Cassava is another agricultural resource, largely processed for human consumption and usable as raw material in the animal food industry and can replace starchy products if surpluses are available and affordable.

Cassava is traditionally processed in Burundi. It is cultivated essentially in the Southern and Western part (along the lake coast) of the country. The farming season goes from October to April in alternance with another production (Maïze, Cotton...)

There are two types of cassava:

- sweet with is easily consumed by the local population,
- bitter with 150 varieties

The sweet kinds are the easiest to be processed since they do not need to be heated at a high temperature. Local statistics available do not differentiate between sweet ans bitter types.

Cassava traditionally processed (with a process period from 12 to 15 days) is mainly dedicated to human consumption with a preservation period for the finished product of about one month. Therefore,the preservation of the basic product made directly in the soil with the use of rudimentary silos is poor and about 30% of the grain is spoilt by the rodents and the germination.

Cassava Production is estimated to 600 to 660, 000 tons in 1990 by the Ministry of Agriculture and follows aprroximately population growth with an average growth rate of 3% as shown in Table 1 (1990 official figures are not yet available).

ISABU takes care of cassava deseases which are cochineal, mosaic and cariose.

ISABU owns some pilot centers to improve cassava yields/ha, yields are from 30 to 40 T/ha instead of 8/10 tons by ha in the other areas of the country. These results are got by natural fertilization.

There is a FAO project to process cassava into GARI. The project started two years ago, than by the opening of five other centers. The FAO is involved in the project through its expertise for the center setting up, the equipment selection, and local staff training. Currently, six centers are operating and they are four additional centers to be opened. The production is of about 80 kg of Gari per day on a four days basis which is about 100 tons of Gari per year. Taking into account that the ratio to GARI is from 4 to 1, is used approximately 400 tons of fresh cassava per year in those centers.

Table 3 illustrates the availability of raw material for the animal food industry. Raw material production is stationary and available resources after human self-consumption are very limited.

Table 3

(tons)

Products	Production 1989	Householders Consumption	Available Surpluses
Rice	28,000	23,000	5,000
Maize	135,000	132,820	2,180
Cotton Cakes	557	0	557
Rice Bran	176	0	176
Wheat Bran/Maize	0	0	0
Palm Kernels *	2,500	0	2,500

Source: ISABU 1989
* FAO estimates

Available statistics do not accurately estimate cassava households consumption since cassava is traditionally processed and self-consumed by the local population.

Cassava cultivation calls for the following comments:

- The Vth plan does not integrate intensive cultivation of cassava. The yields increase is linked to the use of fertilizers, and most of local farmers with a low purchasing power can not afford it.

Since cassava is directly consumed by the local population, farmers do not attempt, firstly, to produce surpluses to be sold on traditional markets, secondly, to preserve it on a long term basis to market it later.

According to the Vth plan: "cassava is a buffer crop used us case lack of food crop. It is limited to the house hold level".

- Development projects implemented with the Vth plan, are essentially dedicated to food crops such as wheat, sorghum and maize.

- Cassava surpluses fluctuate according to the yearly production and hampered the animal food industry development since the supply remain too irregular.

3.2.3 - Industrial sub-products

Industrial sub-products are locally produced besides premixes which are imported products. They account for over 50% of total inputs.

Cotton oil cakes :

Cotton oil cakes are sub-products from the cotton sector that Burundi has attempted to develop over the last few years.
However, cotton production has not reached the expected production level due to the producers price level. The Vth plan attempts to enforce required measures to develop this crop and over the coming years the production should increase significantly. Currently, produced cakes are of very good quality.

Palm-kernel cakes:

Palm kernel cakes are a very good quality product and are used mainly for cattle feeding. These cakes are a sub-product of the local soap industry. Quantities remain very low since the palm oil industry is not very developed in Burundi and palm kernels output is estimated to about 2.500 tons. Palm kernels cakes production with an extraction rate of about 18% is about 500 tons.

Rice Bran:

Rice production benefits from some development projects implemented in the Vth Plan. Rice is processed by the local unit SRDI. All the production of the paddy rice is dedicated to the human consumption. Rice bran is of good quality, but the output remain very low with less 200 Tons per year.

Wheat and Maïze Brans:

Wheat and Maïze brans are supposed to be processed by the existing flour mill of MURAMVYA in order to supply the animal food industry. However, this unit has not been operating regularly over the last three years and, therefore, wheat and maïze brans are not sufficiently available.

Bone:

Bone is supplied by the slaughter house and by the butcheries from BUJA, the quality and quantities of this sub-product are irregular. Bone is used in the traditional local cooking, therefore very limited surpluses are available.

Blood:

Blood is supplied from the butcheries and slaughter house and is integrated without any pre-treatment in the animal foodstuff compounds. There is a high risk of infection but drying is, at this stage, too costly.

Fish meal:

Fish meals are used in small and irregular quantities and are supplied with very poor hygienic conditions by the traditional fisheries.

Table 3 enables to point out that grain and oil seeds by-products available surpluses for the animal food industry are rather limited. Therefore, raw material survey will enable to better identify raw material supply in order to upgrade available quantities and also to identify non upgraded raw material resources as well as new raw material resources to be upgraded.

3.3 - PRICES

3.3.1 - Raw material prices

Traditional raw material such as maize, sorghum and wheat prices fluctuate significantly according to crops quantities. They are presented in Table 4. Listed prices are prices available at the largest crops location and do not include transports costs.

RAW MATERIAL PRICES — Table 4

FBU/kg

	1984-85		1985-86		1986-87	
	Minimum price	Maximum price	Minimum price	Maximum price	Minimum price	Maximum price
Maize	30	50	30	40	20	45
Sorghum	20	35	10	30	15	40
Cassava	40	120	20	70	8	50

Source: Ministry of Agriculture and Livestock

3.3.2 - Sub-products prices

Major sub-products prices are presented in Table 5. They are very fluctuating according to supply and the listed prices are dated as of July 1991.

INDUSTRIAL SUBPRODUCTS PRICES — Table 5

FBU/kg

	1991
Cotton oil cakes	23
Palm kernel cakes	20
Rice bran	10
Wheat bran	23
Maize bran	20
Maize germs	25
Bone	10
Blood	40
Fish meal	n.a.
Limestone	10
Cattle premix	560
Poultry premix	1680
Pig premix	1112

n.a.:not available

The table calls for the following comments:

Among all local industrial sub products prices, blood is the most expensive. Imported products such as premixes have prohibitive prices and their use is limited to small quantities (less than 1 %).

4 - FOODSTUFF MARKET SURVEY

4.1 - LIVESTOCK POPULATION

Livestock in Burundi is spread over domestic land with most of cattle breeding concentrated in the western part of the country in the IMBO plain.

Livestock is bred extensively by community overgrazing but grass regrowth is too weak. Fodder plants farming is not developed and only used by a minority of farmers. Due to soil overgrazing, livestock is becoming more goat oriented than cattle oriented.

Self-sufficiency is obtained for about 90% of the rural population, and the urban market which counts for about 500 000 people needs to be supplied by three sources:

- rural production surpluses which are unsufficient and irregular
- professional breeding production
- imports which are very expensive.

Livestocks statistics are not available and figures collected for 1987 and 1989 are only estimates. They are presented in Table 6.

Table 6

LIVESTOCK FIGURES

	1987	1989	Growth R.
Cattle	450,000	426,514	-5%
Goats + Sheeps	1,076,000	1,350,000	25%
Pigs			
Traditional breeding	70,000		
Modern breeding	3,000		
Total	73,000	112,000	53%
Poultry			
Traditional breeding	1,985,000		
Modern breeding	15,000		
	2,000,000	1,000,000	-50%
Rabbits	71,000	n.a.	

Source: Ministry of Agriculture and Livestock

n.a.: not available

These figures should not be considered as reliable statistics and are only estimates.

It is difficult to analyze those figures, but it seems that livestock growth is very limited. Poultry figures should be considered carefully, since they remain very difficult to estimate. Indeed poultry is generally integrated in traditional farming.

There are some fish ponds but they are still vey limited some fish development projects are integrated in the Vth plan program.

4.2 - LIVESTOCK PROJECTIONS

Livestock projections are made very difficult to assess and the Ministry of Agriculture and Livestock is aware of such constraints. Professional breeding is recent and has started with the Vth plan, it seems that the government policy is more poultry oriented which is relevant due to its rapid production maturity.

Livestock development is linked to the successfull implementation of specific projects such as poultry extension in the rural sector in order to "increase small farms profitability, diversify food production and improve human diets by consumption of animal proteins."

4.2.1 - Domestic market

The markets are essentially concentrated around Bujumbura with a significant urban population which enables the animal feed production to be marketed easily.

4.2.2 - Markets within P.T.A. countries

Animal foodstuff is a compounded food including, agro-based products and premixes.

Within the finished product premises represent around 1% of total ueight. Premixes are very expensive because imported. Food products and agro-based sub-products which account for approximately 85% of the finished product have a low cost.

Finished products have a low price and can not bear high transport costs otherwise they become non competitive. This is the main reason why animal foodstuff exports are very limited.

Exports or imports concern much more premixes which are quite expensive and can bear high transport costs. As an example, transport cost on 200 km/Ton gives an 25% additional charge to the product price.

Meanwhile, it is worth pointing out that ALCOVIT has exported several tons to border countries such as Zaïre and Tanzania.

1080 T in 1988
250 T in 1989
- T in 1990

Exports to neighbouring countries are very periodical. Therefore it is made difficult to take into account regular exports for the project development. The domestic market is considered to be the major out lay for animal foodstuff producers

4.3 - ANIMAL FOOD DEMAND ASSESSMENT

In 1990, stock feed local production is estimated to about 7000 tons and coresspond to the local actual consumption. It is limited by the raw material supply irregularity, expensive transport costs, the lack of distribution network and a low buying power of farmers.In 1985, local production was estimated to about 5,600 tons therefore, the average growth is about 4% par year.

4.3.1 - Local production

It accounts for about 20% of the potential consumption

10% is produced by ALCOVIT (3350 tons in 1990)
10% is produced by ten production centers.

Use of premixes and minerals is used in breeding projects such as State farms. Some stockbreeder have started to use those components for stock feeding but its remains very limited due, essentially, to a poor purchasing power.

4.3.2 - Imports

Official statistics are not available, and only some unofficial exchanges with Rwanda and Tanzania were identified.

4.3.3 - Projected requirements

It is difficult to assess stock feed requirements, since livestock production is unknown for the coming years.
Nevertheless, taking into account the population growth and graze scarcity for cattle, it seems that poultry products is likely to develop in traditional farms. In addition, poultry is rapidly mature for consumption compared to cattle and sheeps. Therefore, poultry foodstuff consumption should increase significantly.

4.4 - OVERVIEW OF FEED PRODUCERS

The total domestic production represent about 20% of the potential demand. The producers are limited to one recent industrial unit ALCOVIT and ten production centers spread out in various areas of the country. They share the total domestic production, and each of them produced about 3350 tons in 1990.

4.4.1 - Alcovit

The major feed producer is ALCOVIT located in BUJUMBURA
This plant has been built in 1982 by STOLZ and only started to operate in 1987, after a thorough animal feed market study, upstream and downstream.

The plant is 84% government owned, in accordance with the liberalization trend, the government is ready to cease its bonds to the private sector.

4.4.2 - Production centers

The 10 production centers are spread out in the country as illustrated in the map next page.

Their production counts for about 50% of the total national production and totals about 3350 tons in 1990

The centers are equipped with a crusher and a mixer and produce for their own needs, and sometimes for breeders cooperatives.

5 centers produce animal feed and act as breeding advisors:

1. RUMEZA, 2. BUTEZI, 3. MUTOYI, 4. NGOZI, 5. S.A.B. (which is going bankcrupt)

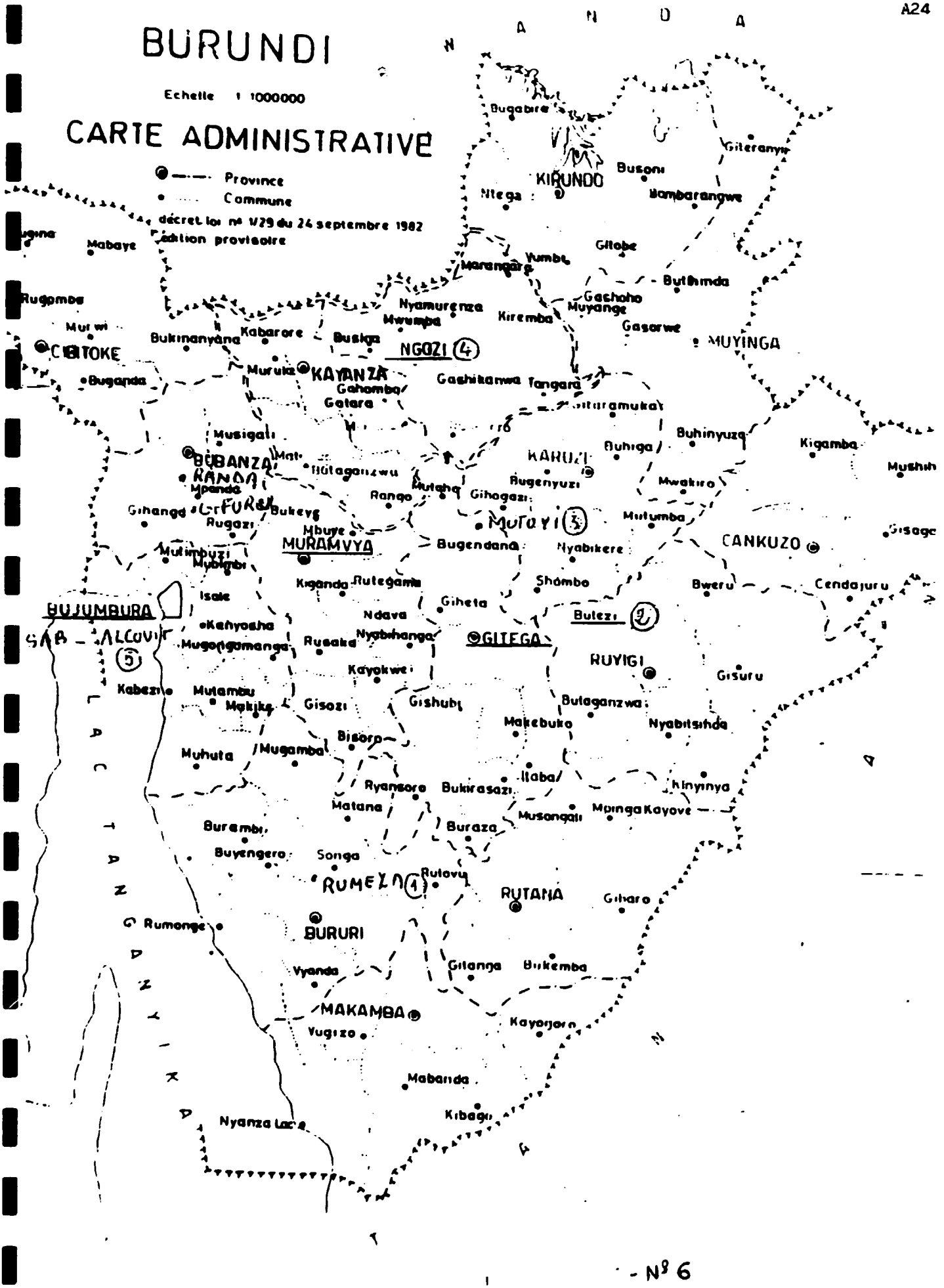
5 centers produce for self-consumption

6. RANDA,7. GIFURU, 8. MURAMVYA, 9. GITEGA, 10.MOSSO.

One example of these small centers is NGOZI which started in 1988.

This area (NGOZI-KAYANZA) has a large population and grazing space is very limited. Goats and poultry are bred with animal feed production and proper extension services.

SAB is an example of the problems encountered by the government farms. In most cases, they are not able to buy industrial animal foodstuffs due to prohibitive costs. In addition, they buy other sub-products from other suppliers such as brewer grains from local beer millers.


BURUNDI
Echelle 1 1000000
CARTE ADMINISTRATIVE
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Commune
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KIRUNDO
Busoni
Giteranyi
Ntega
Bambarangwe
Gitobe
Yumbe
Buthimba
Gashoho
Muyange
Kiremba
Gasorwe
MUYINGA
Nyamurenza
Mwumba
Kabarore
Busiga
NGOZI (4)
Bukinanyana
Murwi
CIBITOKE
Buganda
Mabaye
Rugombo
Muruta
KAYANZA
Gahomba
Getare
Gashikanwa
Fangara
Musigati
BUBANZA
RANDA
Mpanda
Gihanga
Rugazi
Bukeye
MURAMVYA
Mbuye
Mutimbuzi
Mubimbi
Isale
BUJUMBURA
SAB - ALCOVIT
Kenyosha
Mugongomanga
Kiganda
Rutegama
Ruseke
Nyabihanga
Ndava
Giheta
Kayokwe
Kabezi
Mutambu
Mpkike
Gisozi
Gishubi
Muhuta
Mugamba
Bisoro
Ryansoro
Bukirasazi
Matana
Buraza
Buremba
Buyengero
Songa
RUMEZA (1)
Rutovu
Rumonge
BURURI
Vyanda
Gitanga
Burkemba
MAKAMBA
Vugizo
Kayanjaro
Mabanda
Kibago
Nyanza Lac
RUTANA
Giharo
Musongati
Mpinga Kayove
Kinyinya
Makebuko
Nyabitsinda
Butaganzwa
Gisuru
RUYIGI
Bulezi (2)
GITEGA
Shombo
Bweru
Cendajuru
CANKUZO
Nyabikere
Mutumba
MUTAYI (3)
Bugendana
Rugenyuzi
Mwakiro
KARUZI
Buhiga
Buhinyuza
Kigamba
Mushish
Gisage
Rango
Gihogazi
Mutaho
Mutaganzwu
Mat
Kiturumuka

- Nº 6

4.5 - PROJECT IDENTIFICATION

The expert mission due to the local background has led him to concentrate its recommendations on production conditions improvement through the increase of raw material supply and cut in production costs.

The main three reasons are listed below:

- the overcapacity of the existing unit due in particular to raw material irregular supplies.

- the shortage of traditional raw material such as maïze, sorghum and wheat, cassava irregular and limited surpluses due to poor upgrading.

- the low increase in the animal food sector development.

Indeed, the unit currently operates at only 35% of installed capacity, and cassava limited and irregular available surpluses hamper the implementation of a new equipment which will not be profitable for the unit as a whole.

Consequently, a new project for processing cassava into animal foodstuff was not identified, but the study concentrated on the ALCOVIT unit in order to improve its production level and to cut down when possible production costs.

5 - PROJECT DESCRIPTION AND RECOMMENDATIONS

5.1 - PROJECT DESCRIPTION

The project description will include:

- an overview of the unit sales and production,
- a technical description and appraisal
- a brief financial analysis

5.1.1 - Sales and production

ALCOVIT sales are essentially made of products dedicated to the government breeding farms and are mainly made of animal foodstuff for cattle, goats, pigs, poultry and rabbits.
Currently, the unit sells all its production and does not face any problems regarding product outlays with a potential demand much higher than its output.

Sales presented in Table 7 have remained steady in volume over the last four years particularly in 1990. Export sales to Zaire and Tanzania in 1988 and 1989 were a good outlay for the unit.

ALCOVIT PRODUCTION AND SALES — Table 7

(In kg)

	1987	1988	1989	1990
Production	822.890	2.527.900	2.629.167	
Sales	767.360	2.496.407	2.683.411	3.385.928
Exports				
Zaire		41.800	258.250	n.a.
Tanzania		1.000.000	-	n.a.

Source: ALCOVIT
n.a.: not available

The sales break down by animal categories emphasizes the significance of cattle and poultry animal foodstuff production which is linked to their dominating position in numbers as illstrated in table 8.

SALES BY ANIMAL CATEGORIES — Table 8

(In Kg)

	1987	1988	1989	1990	%
Cattle	322.570	685.418	1.197.852	1.512.268	44.66%
Goats	5.600	25.900	31.322	39.560	1.17%
Pigs	143.200	141.250	151.548	191.356	5.65%
Poultry	287.950	1.631.568	1.285.611	1.623.333	47.94%
Rabbits	8.040	12.270	15.380	19.420	0.57%
Horses		2.000	1.900	2.390	0.07%
Total	767.360	2.496.407	2.681.511	3.385.928	

Source: ALCOVIT

1990 Prices of ALCOVIT products are presented in table 9 on the following page.

PRICE LIST OF ALCOVIT FOODSTUFF EX FACTORY

Table 9

FBU

Foostuff	Prices 50 kg BAG
CATTLE	
Calf G	2100
Calf F	2000
Cattle	2000
Milk Cow F	2000
Milk Cow G	2100
GOATS	2000
Goat G	2000
Kid G	2000
PIGS	
Piglet	2100
Pig	2000
Sow	2000
POULTRY	
Chick	2500
Hens	2500
Good Layer F	2500
Good Layer G	2600
Chicken F	2500
Chicken G	2600
Milled maize	3000
RABBITS	
Rabbit	2000

Prices are ex factory

Transit and packaging prices are included in the selling price.

F:FLOUR

G:GRANULE

5.1.2 - Technical description and appraisal

The plant benefits from a good location, close to BUJUMBURA in the IMBO Plain where is concentrated the most significant potential clients (breeders) and suppliers of sub-products (from rice, cotton, maïze....).

The installed capacity of the plant is 50T/24h. Currently, the plant operates at only 35% of installed capacity with about 18T/24H.

On the technical level, the plant built according to French standards by STOLZ is of good standards , with a complete and solid equipment.The plant, well designed, is a little too sophisticated. At this stage, some pieces of equipment are not useful as it will be mentioned later on.

The plant equipment includes:

A Raw Material Storage equipment with bulk and bag receiving equipment and two silos for a cpacity corresponding to 1200 tons of maïze.

A Storage equipment for proportioning with:

- 4 storage silos

- automatic weighing equipment

- crushing equipment

A Mixing equipment (horizontal ribbon)

A Flour bagging equipment

A Pelletization equipment:

Pellet mill- Cooler- Crumbler- Sifter- Feed-Packaging Weigher

A Device for Bulk finish product :

- Three bins
- Truck scale

A Small Plant to mix medicated feed.

Products supply is provided by elevators and screws con veyors

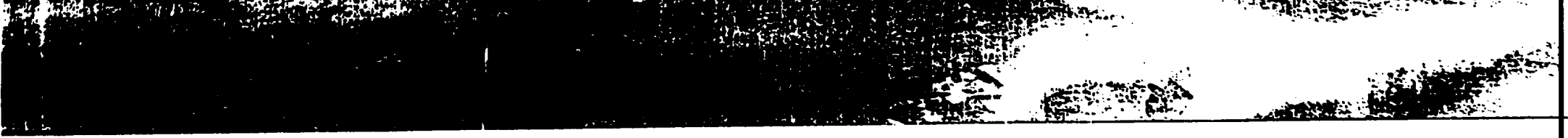
Laboratory:

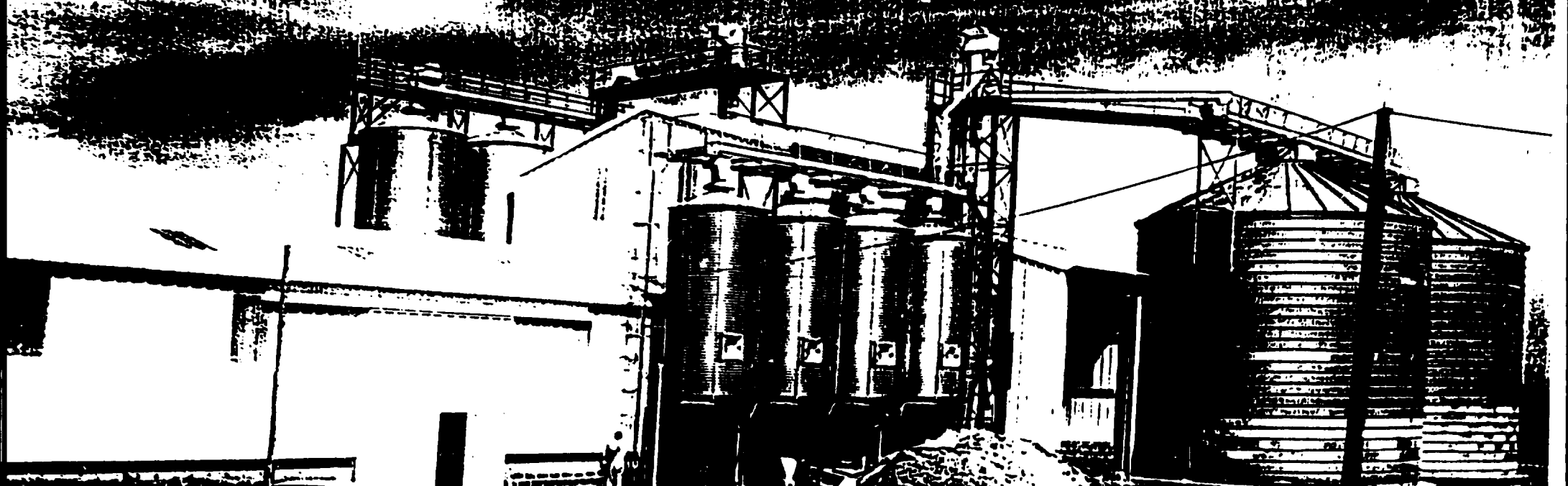
Currently, there is no laboratory equipment within the unit. Products can be tested by ISABU which has at his disposal the relevant equipment but it seems that there is no cooperation between ISABU and ALCOVIT.

A lay out of the plant is presented next page.

List of Technical Terms

Broyage: Grinding
Broyeur: Grinder
Chargement vrac Granules: Pellets Bulk Loading
Cyclone: Cyclone
Dosage: Proportioning
Elevateur: Bucket Elevator
Ensachage Farines: Mash Packaging
Ensachage Granules: Pellets Packaging
Fabrication Pre-Melange: Premixing
Farines en sac: Mash Bagging
Filtre: Filter
Granulation: Pelleting
Melange: Mixing
Melangeuse Verticale: Vertical Mixer
Peseuse: Weigher
Pont Peseur: Truck Scale
Presse: Pellet Mill
Refroidisseur: Cooler
Stockage: Storage
Tamis: Sifter
Turbo: Turbo Separator
Vapeur: Steam
Vis d'Archimede: Screw Conveyor





Raw Material supply

Raw materials consumption is presented in Table 10 in the following page. This table includes both actual figures for 1990 and projection figures until 1998. The major raw materials are maize, brans and cakes which account respectively for 27%, 30% and 22% of total compounds.

Raw materials prices were presented earlier in Table 5.

According to the formula used by ALCOVIT, the average price is as follows:

- 22 FBU for Calf food

- 34 FBU for Poultry food

Labour

The plant employs 24 people with 11 employees working at the technical level and 13 people working at the administrative level including the plant manager.

The plant staff is listed below:
Administrative staff :

Plant Manager	: 1
Accountant	: 1
Supply agent	: 1
Clerck	: 1
Administrative assistant	: 1
Secretary	: 1

Technical staff :

Production Manager	: 1
Process Engineer	: 1
Packers	: 8
Driver	: 1
Guards	: 5

Table 10

RAW MATERIAL NEEDS PROJECTIONS

in tons

QTY/YEAR TITLE	1990	1991	1992	1993	1994	1995	1996	1997
Maize	972.00	1215.00	1377.00	1539.00	1701.00	1863.00	2025.00	2187.00
Maize Germs	360.00	450.00	510.00	570.00	630.00	690.00	750.00	810.00
Brans	1080.00	1350.00	1530.00	1710.00	1890.00	2070.00	2250.00	2430.00
Cakes	792.00	990.00	1122.00	1254.00	1386.00	1518.00	1650.00	1782.00
Fish	36.00	45.00	51.00	57.00	63.00	69.00	75.00	81.00
Limestone	180.00	225.00	255.00	285.00	315.00	345.00	375.00	405.00
Salt	14.40	18.00	20.40	22.80	25.20	27.60	30.00	32.40
Bone	108.00	135.00	153.00	171.00	189.00	207.00	225.00	243.00
Dried Blood	46.80	58.50	66.30	74.10	81.90	89.70	97.50	105.30
Premix	9.00	11.25	12.75	14.25	15.75	17.25	18.75	20.25
Additives	1.80	2.25	2.55	2.85	3.15	3.45	3.75	4.05
TOTAL	3,600	4,500	5,100	5,700	6,300	6,900	7,500	8,100

PTABU/FM

When looking carefully at the plant conditions of operations, the expert came up with the following comments:

At the raw material supply level:

- irregular supply of raw material which a significant constraint for the plant.

- prices are very fluctuating, as soon as crops are decreasing, prices become prohibitive.

- there is a direct competition from breeders, issues from beer mills and mollasses from MOSSO are used by cattle breeders.

- sub-products properties are fluctuating. As an example cotton oil cakes and rice brans quality is very irregular.

- hygienic conditions are very poor, especially regarding blood and fish meal supplies.

- transport costs for animal foostuff compound are prohibitive. The price is 5 FBU/kg/100 kms.

For example, molasses price double from the production location in MOSSO to the plant location (2.5 FBU/Kg to 5.5 FBU/Kg)

- animal foodstuff suffer from a lack of glucides compounds due to a lack of traditional raw material such as maïze and wheat brans (which are starcky products).

At the technical level:

- Overall, the equipment is in good working conditions and is considered to be operational for about 15 years. Only, VAPORAX boilers, the crumbler and the press are delicate to operate and should be replaced within a shorter period.

- Pelletizing and pellets bulk storage equipment are not very useful while they represent a very heavy and expensive equipment. Operating this equipment is a tough task with a high cost which is not adapted to the current and technical needs. The breakdown of the boiler, probably due to the boiler scaling has to be mentioned. The cost of this equipment when operating has been assessed to 250 to 300 BUF/kilo. At this stage, the use of this equipment is not essential. In addition, it seems that the crumbler has never been used.

- The maintenance of the plant is poor, even with the plant staff willingness. As an example, the VAPORAX boiler broke down a second one was bought without attempting of fixing the damaged one.

- The labour is surely numerous enough and not very costly. However, some staff employees are not trained well enough to properly operate the machinery: the boiler drivers as well as the person in charge of maintenance.

- The plant suffers from the energy supply which is not sufficient and regular, and sometimes is required to operate during off-peak periods.

5.1.3 - **Financial analysis**

The poor financial situation of ALCOVIT is essentialty due to an under-capacity operation. This situation improvement could be performed with an increase of the production capacity utilization rate.

External factors are made difficult to monitor by the unit manager and other measures to modernize or reorganize the plant are not relevant at the moment.

Consequently, forecasted operating costs aim essentially at identifying-primarily, the minimum profit required to break even, and therefore the corresponding level of productions-secondly, the profitability of the unit according to the production corresponding to level by the utilization rate.

Operating costs are presented in table 11. Data were collected and updated with the manager unit assistance. Hypotheses are presented in the right column of the table.

Depreciation amounts were reassessed in 1990 when the firm was privatized and therefore run up to 1999, in accordance with accounting regulations of Burundi.

Other accounts such as labour and costs and financial costs were evaluated by the plant manager.

The main two points to emphasize when looking at the table are as follows :

- A slight increase of the production level will enable to generate positive results in maintaining the same level of production costs and sales prices.

- Raw material purchase price is the major factor for the unit profitability since it accounts for 67 % of total production costs, consequently the company results are very sensitive to raw material price increase.

Consequently, it was relevant to identify the break even point position according to the raw material unit cost, taking into account that raw material purchase prices are very fluctuacting in Burundi.

This analysis is illustrated in the graph presented in the following page.

The graph calls for the following comments :

- The unit profitability requires an average unit cost for raw material of less than FBU 31,200 in constant value.

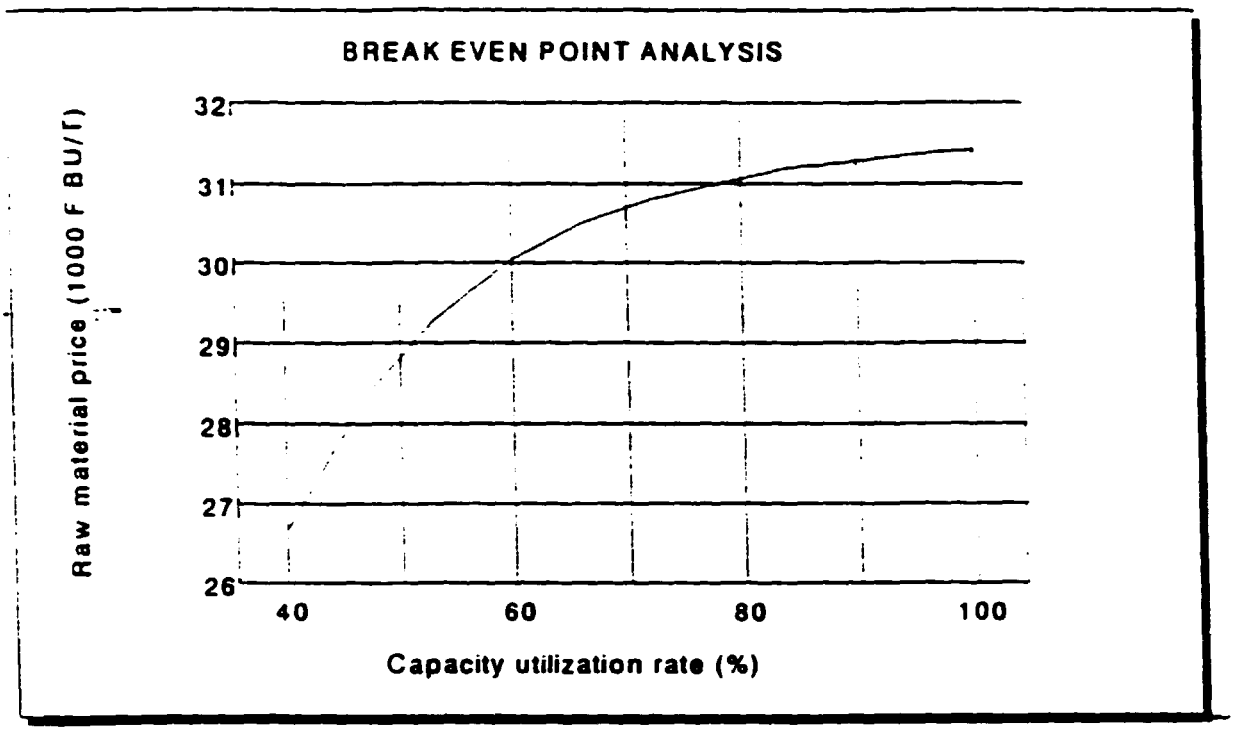
- Within the current situation which is an average unit cost of FBU 28,000, the break even point corresponds to a capacity utilization rate of 45 % with a production level of 4300 T/y.

This means a production increase of 23 % which is easily conceivable.

NET INCOME

TABLE 11

Project year	1990 1	1991 2	1992 3	1993 4	1994 5	1995 6	1996 7	1997 8	1998 9	1999 10		
INPUTS												
Production capacity utilization rate	38%	47%	53%	59%	66%	72%	78%	84%	91%	97%	(0) = (1) /	9 600
Raw material (tons)	**3 600**	**4 500**	**5 100**	**5 700**	**6 300**	**6 900**	**7 500**	**8 100**	**8 700**	**9 300**	(1)	
Packaging (unit)	72 000	90 000	102 000	114 000	126 000	138 000	150 000	162 000	174 000	186 000	(2) = (1) /	0,05
SALES VOLUME												
Animal foodstuff (tons)	3 240	4 050	4 590	5 130	5 670	6 210	6 750	7 290	7 830	8 370	(3) = (1) *	0,9
REVENUES (F BU. millions)												
Sales	129,600	162,000	183,600	205,200	226,800	248,400	270,000	291,600	313,200	334,800	(4) = (3) *	40 000
Other products	7,000	10,000	12,000	12,000	12,000	15,000	15,000	15,000	15,000	15,000	(5)	
TOTAL REVENUES	**136,600**	**172,000**	**195,600**	**217,200**	**238,800**	**263,400**	**285,000**	**306,600**	**328,200**	**349,800**	(6) = (5) + (4)	
OPERATING COSTS (F BU. millions)												
Raw material	90,720	113,400	128,520	143,640	158,760	173,880	189,000	204,120	219,240	234,360	(7) = (4) *	28 000
Packaging	10,800	13,500	15,300	17,100	18,900	20,700	22,500	24,300	26,100	27,900	(8) = (2) *	150
Labour	9,621	10,096	10,601	11,131	11,687	12,271	12,885	13,529	14,206	14,206	(9)	
Water, electricity	0,983	1,229	1,392	1,556	1,720	1,884	2,048	2,211	2,375	2,539	(10) = (1) *	273
Fuel	1,163	1,454	1,647	1,841	2,035	2,229	2,423	2,616	2,810	3,004	(11) = (1) *	323
Supplies	0,922	1,152	1,306	1,459	1,613	1,766	1,920	2,074	2,227	2,381	(12) = (1) *	256
Maintenance & Repair	4,964	4,964	4,964	4,964	4,964	4,964	4,964	4,964	4,964	4,964	(13)	
Overhead costs	4,716	5,895	6,681	7,467	8,253	9,039	9,825	10,611	11,397	12,183	(14) = (1) *	1 310
Other expenses	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210	1,210	(15)	
Financial costs	1,520	1,596	1,676	1,760	1,848	1,940	2,036	2,139	2,246	2,246	(16)	
TOTAL OPERATING COSTS	**126,618**	**154,495**	**173,297**	**192,128**	**210,990**	**229,883**	**248,810**	**267,774**	**286,775**	**304,993**	(17) = Sum (7) to (16)	
INCOME BEFORE DEPRECIATION	9,982	17,505	22,303	25,072	27,810	33,517	36,190	38,826	41,425	44,807	(18) = (6) - (17)	
Depreciation	15,843	15,843	15,843	15,843	15,843	15,843	15,843	15,843	15,843	15,843	(19)	
OPERATING INCOME BEFORE TAX	-5,861	1,662	6,460	9,229	11,967	17,674	20,347	22,983	25,582	28,964	(20) = (18) - (19)	
Tax	0,000	0,748	2,907	4,153	5,385	7,953	9,156	10,342	11,512	13,034	(21) = (20) *	45%
NET INCOME	-5,861	0,914	3,553	5,076	6,582	9,721	11,191	12,641	14,070	15,930	(22) = (20) - (21)	
CASH-FLOW	9,982	16,757	19,396	20,919	22,425	25,564	27,034	28,484	29,913	31,773	(23) = (19) + (22)	
CUMULATIVE CASH-FLOW	9,982	26,739	46,135	67,054	89,479	115,043	142,077	170,560	200,473	232,247	(24)i = (24)i-1 + (23)	


BREAK EVEN POINT ANALYSIS
Raw material price (1000 F BU/T)
32
31
30
29
28
27
26
40
60
80
100
Capacity utilization rate (%)

5.2 - RECOMMENDATIONS

The expert has attempted to come up with recommendations to improve the unit profitability whithout generating some major investments taking into account the general framework previously described :

- Shortage of Raw materials usually integrated in the animal foodstuff processing.

- Irregular cassava surpluses which can not regulary supply the ALCOVIT unit.

- The animal foodstuff market which slowly develops even though potentialities can grow.

It was not made possible to identify surpluses large enough to supply a new animal foodstuff production unit and undertake new investments linked directly to cassava processing.

Indeed, recommendations will focus on :

- raw material supply conditions with affordable costs
- cut in production costs

The proposed technical assistance mission will last at least several months to set up the required actions program. This programs is designed based on three levels :

- raw material supply
- technical measures
- staff training

5.2.1 - Raw material supply

Due to the lack or irregularity of raw material supply the main objective is to provide ALCOVIT enough supply to develop its production.

Two ways are to be investigated soundly :

- the increase of supply in traditional raw material (types of raw material which are usually processed for animal food production such as maïze, cotton oil cake, rice bran, limestone, bones, blood, fismeal, salt, premixes). For the current level of production an average of 3 500 T, insufficiency concerns more specifically glucides i.e. essentially maïze bones, blood and fishmeal are irregular in quantity and quality. Cotton oil cakes are sufficient but it has to be mentioned that cotton crop is currently decreasing.

  A survey of the existing sources of supply must be conducted integrating transport costs. The aim is eventually to identify productions which are not marketed by lack of transports networks as well as outlay identification. An information campaign could be performed on unit needs. For products as blood, bones and fishmeal this survey will also enable to study if available quantities could justify an installation (drying and crushing) which would present the following advantages :

  . best upgrading of the products

. best preservation
. good sanitary conditions for better quality product
. the environment preservation

- the consomption of unusual raw materials

Obviously, cassava is a proper product which could substitute maïze but available quantities to supply the plant are quite irregular. During the expert mission in Burundi, a high level of losses was identified even though existing cassava surplus.

The storage and transport conditions have to be precisely studied, indeed, fresh cassava is very difficult to store, the best way to store cassava dedicated to animal food processing would be in dried chips which means :

. washing
. peeling
. slicing
. drying

These operations can be processed on a traditional basis but require some significant revenues for the local population, or mechanized with large enough supplied quantities but this is not currently happening in Burundi.

The survey will have to identify villages where such a pre-treatment could be operated and under which financial conditions.

Taking into account cassava high level of humidity and for limited quantities drying at the crop cultivation locations is recommended in order to limit transport costs before the second processing operation.

In addition to this detailed survey of cassava supply, the study will have to identify sorghum locations as well as available agro-based sub-products which are not currently used.

As an example, rejected mango pulp by the fruit juice production unit as well as bagasse pulp from the sugar sector.

This survey of existing processing unit is required and has to be completed through an opportunity study to implement supply measures to limit supply and price high fluctuations.

5.2.2 - Technical measures

The main objective is to identify measures to lower production costs and eventualty new equipment purchase.

Technically, process and equipment are suitable to local conditions but a thorough study is required to analyze :

- operating conditions for pelletization due to high costs

A workers consultation will enable to identify if installed equipment is usable on a "campaign" basis and if production can be stopped periodically when raw materal supply is too limited.

- production costs to identify positions where additional cut in costs can be performed.

- the opportunity to use the crumbler as an additional crusher since the crumbler equipment is not required in the current process.

  This equipment is based on a sophisticated process which will not be used by the unit in the coming years. Three pieces of equipment are delicate to use (boiler, crumbler and press) and which require periodic reviewing. A technical study will aim at identifying how to replace these pieces of equipment later on by stronger ones or use it differently (crusher).

- packaging costs since they are significant within the operating costs total.

  It would be relevant to study the measures to be taken in order to lower packaging costs : packaging shape changes increase, bulk sales.

- a maintenance program setting up, which is a relevant measure in order to make of sure the unity proper operation.

5.2.3 - Training level

It would be useful to identify local staff required to be trained in order to lower production costs and limit previous actions such as the replacement of broken pieces of equipment by the purchase of new ones.

An audit performed by an expert in technical training seems relevant in order to estimate proper needs for a specific training : its duration, costs and setting up.

The training program has to be designed "sur mesure" integrating the man power level of skills, equipment technical conditions, local environnment. This expert will integrate the African environment within its program implementation.

5.2.4 - Proposal for a technical assistance mission

In order to set up the proposed recommendations, a technical assistance mission has to be suggested :

This mission could be performed in 3 phases :

- The first local mission will last 2 months in order to :

  . identify raw material supply
  . perform technical studies
  . collect relevant data in order to set up the training program
  . collect raw material be samples in order to perform laboratory analyses and finalize mixes according to available no traditional raw material

- The product analysis will be performed in France or in Europe in order to come up will the proper formula (adapted to local breeding conditions) and to set up the training program.

- A second mission will be performed in Burundi, for the field implementation of required formulas, for the setting up of production goals and training program implementation.

This technical assistance should be achieved by an expert from a consulting engineering firm i.e. which also performs consultation services. This will enable the European firm to follow up its assignment with other local periodic missions. The cost of such a technical assistance mission is estimated to FF 200 000. The mission should be performed, preferably, by only one expert. This mission evaluation does not integrate further local periodic missions.

ANNEX A

PERSONS MET DURING THE IN-FIELD MISSION

- Ministry of Trade and Industry
  . Mr Silvestre NDIAU RIYO - General Manager

- ISABU - T : 22.33.84
  . Mr André NIVYOBIZI - General Manager
  . Mr Hollebosh - Laboratory Manager

- French Embassy - T : 22.67.67
  . Mr BAUDIN DE LA VALETTE - Commercial attaché

- Banque Centrale ONUDI ZEP - T : 22.49.83
  . Mr LEGESSE - Chairman

- OTB - Ministry of planification
  . Mr Willi KUHN - Director

- ALCOVIT - Animal feed unit - T :23.21.06
  . Mr Aimable MANIRAKISA - General Manager

- RICE PROCESSING UNIT - SRDI
  . Mr Jérôme CAHUNGO - General Manager

- OIL PRODUCTION UNIT - TRPO - Coton
  . Mr Daniel NDIKUMASABO - General Manager

- FRUITO - Fruit juice production unit
  . Mr KIGOMA - General Manager

- MURAMVYA Flour Mill
  . Mr Calixte NZOBONIMPA - General Manager

- MOSO SUGAR UNIT - T : 22.65.76
  . Mr Gaston SINDIMWO - General Manager

- THE IMBO Development Company - T : 22.69.57
  . Mr Jérôme GAHUNGU - General Manager

- BURUNA FINANCIAL Corporation - T : 22.63.51
  . Mr Cyrille NDENZAKO - Engineer

- RANDA FARM - T : 22.60.86
  . Mr Daniel SIMBARUHIJE

- S.A.B. Livestock Farm
  . Mr BOSCO

- SODEA Livestock Farm
  . Mr Gaston SINDIMWO

- BUJUMBURA Port Facilities
  . Mr Freddy BROUMICHE - Head Administration

- ECONOMIC ADVISER
  . Mr Marcelin DAYER

ANNEX B

DOCUMENTATION

- Investors guide - Ministry of planification
- Vth Plan 1988 - 1993
- Animal feed production organzation : ALCOVIT Feasibility Study

PART B - EDIBLE OIL SECTOR

TABLE OF CONTENTS

I. - PROJECT BACKGROUND	**B3**
I.1. - PROJECT SPONSOR	B3
I.2. - PROJECT HISTORY	B3
I.3. - PRESENT SITUATION	B3
II. - MARKET SURVEY	**B4**
II.1. - LOCAL CONSUMPTION	B4
II.2. - SUBREGIONAL MARKET	B5
II.3. - RAW MATERIALS	B9
III. - INDUSTRY AND PLANT SIZE AND CAPACITY	**B13**
III.1. - INDUSTRY SIZE AND CAPACITY	B13
III.2. - DEVELOPMENT PROGRAMS	B13
III.3. - PLANT LOCATION AND CAPACITY	B14
IV. - PROJECT ENGINEERING	**B15**
IV.1. - PRELIMINARY DETERMINATION OF SCOPE OF PROJECT	B15
IV.2. - TECHNOLOGY AND APPLIED PROCESSES	B15
IV.3. - CIVIL ENGINEERING WORKS	B25
IV.4. - TOTAL INVESTMENT COSTS	B27
IV.5. - PROJECT IMPLEMENTATION SCHEDULING AND LAYOUT	B27
V. - PLANT ORGANIZATION	**B29**
V.I. - PLANT PRODUCTION	B29
V.2. - PLANT MANPOWER	B31
VI. - FINANCIAL AND ECONOMIC ANALYSIS	**B37**
VI.1. - TOTAL INVESTMENT COSTS	B37
VI.2. - PROJECT FINANCING	B38
VI.3. - FINANCIAL STATEMENTS	B40
VI.4. - SENSITIVITY ANALYSIS	B45
VI.5. - CONCLUSIONS	B46

I - PROJECT BACKGROUND

I.1 - PROJECT SPONSOR

The Cotton Marketing Board has projected the implementation of a new multipurpose oil factory in Zimbabwe showing thus some interest in developing downstream activities like cotton oil expressing.

The Ministry of Lands, Agriculture and Rural Settlements through its Agricultural Marketing Authority (A.M.A.) has in charge the allocation of oilseeds to oil expressors.

The Cotton Marketing Board (C.M.B.) one of the A.M.A. agency has the monopoly of purchasing and selling cotton from all categories of growers.

It operates about to ginneries and sells cotton seeds to the local oil expressors on an allocation basis.

I.2 - PROJECT HISTORY

The CMB's main activity is cotton ginning and it sells cotton seeds to oil expressors cotton seeds.

In order to upgrade the whole cocton subsector, oil expressing is contemplated such as a downstream activity and includes production of blended oil (cotton and soyabeans) as well as pure sunflower oil.

Grain such as soya and sunflower could be sold by the Grain Marketing Board to the CMB.

I.3 - PRESENT SITUATION

The technical mission achieved last December has enabled to update figures on raw material ressources. Zimbabwe is, currently, facing a raw material shortage due to poor climatic conditions, deseases. Nevertheless since the country's demand for edible oil is not totally met, additional production of edible oil has to be contemplated in the short-term and consequently, implementation of the project should start promptly to be fully operational by 1994.

II - MARKET SURVEY

II.1 - LOCAL CONSUMPTION

II.1.1 - Current local consumption

According to AMA latest figures. Apparent local consumption of edible oil in 1989/1990 has been estimated to 61 200 t/y which corresponds to a consumption per capita of 7.9 kg if we consider that children under age of 5 do not eat edible oil in their diets.

Since 1986-1987, exports are not possible by government regulations. Imports are heavily controlled by government and have been stopped for over 3 years. Therefore, current consumption is below actual demand.

Demand has been estimated by the Agricultural Marketing Board to 8.7 kg per capita.

Local consumption of edible oil from the past 10 years ('000 t)

	1980/81	1981/82	1982/83	1983/84	1984/85
	27.8	42.8	44.2	39.2	49.6
Per capita			7.1	6.05	7.38
	1985/86	1986/87	1987/88	1988/89	1989/90
	49.7	53.1	56.3	68.4	61.2*
Per capita	7.13	7.35	7.5	8.9	7.9

* Estimates

Soute A.M.A.

Local consumption in absolute value has decreased in 1989/90 due mainly to raw material shortage related to poor climatic conditions.

Sub-products are meals with a surplus which is exported to neigbouring countries.

Per capita consumption is rather high compared to neighbouring countries such as Malawi less than 1 kg/capita/year and Tanzania about 1 kg/capita/year and other PTA countries per capita consumption is relatively low about 2 Kg/capita/year

II.1.2 - Future local demand

Future local demand is linked to national population growth as well as the buying power of the national population :

- Population growth has been estimated to reach a 3 % level per year until 2000

- The increase of income and its share of incremental disposable income to buy edible oil products.

Two hypotheses have been selected :

- Hypothesis 1

Demand grows at a rate equal to 3 % per annum, which means no increase of the demand per capita.

- Hypothesis 2

Demand grows at a rate superior is the population growth rate and equal to 4 % per annum. This means that demand income elasticity coefficient will be of 1 % per year.

Future demand is forecasted until the year 2000 and presented in the graph next page following hypothesis I and hypothesis II. (table 2.1)

II.2 - SUBREGIONAL MARKET

II.2.1 - Exports during last decade

Zimbabwe has had exported small quantities of edible oil to neighbouring countries, especially to Bostwana and Mozambique.

Mozambique demand for palm oil is high since they import most of palm oil required quantities for consumption.

However, exports have been stopped since 1986/87 due to government regulations.

Table A and B illustrate edible oils intra PTA-trade in 1986. These data were the only ones available when the mission was achieved in Lusaka.

These statistical data do not supply all existing flows since some often them are done by smuggling. However, these figures enable to give an approximate value of intra-PTA trade exchanges of about 15 to 20.000 Tons.

II.2.2 - Future export trends

Future demand of edible oil in neighbouring countries is likely to develop with population growth. However, disposal income for edible oil is very low in countries such as Malawi, Zambia and consumption is one of the lowest in African countries.

EDIBLE OIL DEMAND PROJECTIONS

TABLE 2.1

		1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000
POPULATION		9,857	10,153	10,457	10,771	11,094	11,427	11,770	12,123	12,487	12,861
POPULATION CONSUMING OIL		8,181	8,427	8,680	8,940	9,208	9,484	9,769	10,062	10,364	10,675
TOTAL DEMAND H1	8.7	71,178	73,313	75,513	77,778	80,112	82,515	84,990	87,540	90,166	92,871
TOTAL DEMAND H2	8.79	71,914	75,561	78,606	81,774	85,069	88,497	92,064	95,774	99,634	103,649

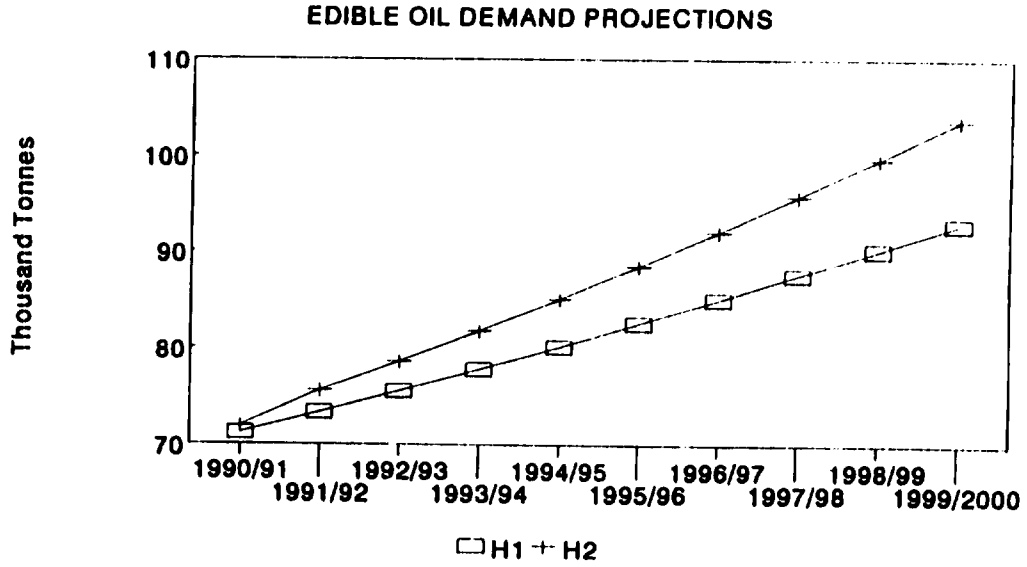


TABLE A

INTRA PTA TRADE IN EDIBLE OILS

EXPORTING COUNTRIES (IN TONS)

IMPORTING COUNTRIES	KENYA	MALAWI (1)	MAURITIUS	ZAMBIA	ZIMBABWE (2)	PTA COUNTRIES NON IDENTIFIED	TOTAL
ANGOLA		34					34
BOSTWANA					1,600		1,600
COMORO			0.8				0.8
ETHIOPIA	113					950	1,063
MOZAMBIQUE		321		0.1	370		671.1
RWANDA		38					38
TANZANIA		400					400
ZIMBABWE		419			15		424
OTHER PTA COUNTRIES NON IDENTIFIED	950						950
TOTAL	1,063	1,212	0.8	0.1	1,985	950	5,180.9

(1) Statistics precise that Malawi figures concern essentially copra oil trade : Malawi doesn't produce any coprah oil, so it must be reexports

(2) Cotton seeds oil for 50 % of total exports
Source : PTA statistical division

TABLE B

INTRA PTA TRADE IN EDIBLE OILS

IMPORTING COUNTRIES (IN TONS)

EXPORTING COUNTRIES	ETHIOPIA	MALAWI	MOZAMBIQUE	RWANDA	SOMALIA	ZAMBIA	ZIMBABWE	TOTAL
BURUNDI				1				1
KENYA	113		54	237				404
MALAWI						2.1	1.2	3.3
SWAZILAND			17					17
TANZANIA				27				27
ZAMBIA		4,250						4,250
ZIMBABWE			475					475
OTHER PTA COUNTRIES								
NON IDENTIFIED					12,500 (?)	0.1		12,500
TOTAL	113	4,250	546	265	12,500 (?)	2.2	1.2	17,677.4

SOURCE : PTA STATISTICAL DIVISION

Those potential oil importers for Zimbabwe remain Botswana which is not an edible oil producer as well as Mozambique which is currently going through high political troubles and produces very low edible oil quantities Mozambique demand for palm oil, in particular, would be partially met when palm oil is sufficiently produced to be exported by the new palm plantation project sponsored in Zimbabwe by the Abefoyles Group, let say in 1994/95.

Zambia which has faced difficulties to meet national edible oil demand is also a potential edible oil importer since oilseeds production has suffered for various reasons (climatic conditions, poor quality seeds, diseases).

II.3 - RAW MATERIALS

The edible oil industry in Zimbabwe processes various oilseeds :

- soyabeans
- cottonseeds
- sunflowerseeds
- groundnuts

Estimated crude oil extraction rates are as following :

- cottonseeds : 18 %
- soyabeans : 18 %
- groundnuts : 42 %
- sunflowerseeds : 30 %

Source : AMA and CSO
Refined oil from crude oil is about 80 %.

Cottonseeds and soyabeans oil account for respectively 50 % and 30 % of total edible oil output. Cottonseeds oil and soya beans oil are generaly blended.

The Ministry of Lands, Agriculture and Rural Settlements through its Agricultural Marketing Authority (AMA) allocates quantities of oilseeds to oil expressors.

The Cotton Marketing Board (CMB) has the monopoly of purchasing and selling cotton to the local oil compressors.

The Grain Marketing Board (GMB) sells soyabeans, sunflowerseeds, groundnuts as well as maïze to oil expressors.

II.3.1 - Raw material production

II.3.1.1 - Current situation

Oilseeds production from the last three years are distorsed from figures presented in the project identification study conducted in early 1990.

Oilseeds production figures provided by several organizations (CMB - GMB - AMA) were sometimes conflicting.

We have selected the following figures, confirmed by telex from CMB and GMB.

Oilseeds delivered to oil expressors (in tons)

	88/89	89/90	90/91
Soyabeans	115 602	113 423	97 620
Cottonseeds	165 018	156 800	94 000*
Sunflowerseeds	37 992	59 583	45 606

* estimates

Oilseeds production forecasts were as presented below :

	88/89	89/90	90/91
Soyabeans	122 000*	110 000	115 500
Cotton seeds	169 000*	200 000	208 004
Sunflowerseeds	23 266*	25 000	26 125

* actual figures

Figures from both tables demonstrate that forecasts were not achieved. In 1990/91 a shortfall of about 90 000 tons of oilseeds is present compared to forecasted figures for all oilseeds cottonseeds, soyabeans and sunflowerseeds.

This shortfall is significant regarding cottonseeds (- 114 000 tons). To a less extent soyabeans deliveries are lightly below forecasts (-17 880 tons). On the opposite sunflowerseeds deliveries exceed forecasts (+ 19 480 tons).

Production decrease is mainly due to :

- poor climatic conditions in 1989/90 and 1990/91 (erratic rains)
- diseases - poor yielding, in particular, for cottonseeds
- reduced cotton producer viability (low producer prices ; rising costs of inputs and transport bottlenecks)

II.3.1.2 - Raw material projections

The CMB has started a recovery program in order to :

- develop plantations in areas with better climatic conditions
- provide new hardy seeds
- offer better producer seeds prices.

It is useful to review oilseeds production forecasts and take into account current figures (see table 2.2.).

Oilseeds production projections were modified slightly due to sunflowerseeds production which is higher than expected.

TABLE 2.2

OILSEEDS PROJECTIONS	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/2000
Soyabeans	120,000	126,000	132,300	138,915	145,861	153,154	160,811	168,852	177,295
Cottonseeds	200,000	209,000	218,405	228,233	238,504	249,236	260,452	272,172	284,420
Sunflowerseeds	40,000	41,200	42,436	43,709	45,020	46,371	47,762	49,195	50,671
Total Oilseeds	360,000	376,200	393,141	410,857	429,385	448,761	469,026	490,219	512,386

Oilseeds production trends are as following :

- Soyabeans : This product should be promising since there is a lack of proteins on the international markets and soyabeans oil is a sub-product from soya protein.

  Soyabeans production in order to be competitive needs to be developed on large cultivated areas since crop process is very mechanically advanced.

- Cottonseeds : Given cottonseeds oil is a sub-product, it is difficult to forecast sensitive production upswing since cotton rates are very fluctuating, but the recovering program started by the CMB demonstrated the interest of cultivating cotton since this cash crop is significant in the domestic economy of Zimbabwe.

- Sunflowerseeds : Production rapidely develops but large tonnages cannot be expected. Indeed these crops come from small scale farmers forecasts and need to be reasonable.

  With oilseeds production forecasts, the new plant should start operating in 1994.

The project implementation should take about 3 years (one year for registration, quipment selection as well as new edible oil branch launching, and 2 years to build the plant).

II.3.2 - Raw material prices

II.3.2.1 - Local prices

Local prices for oilseeds are as following :

	(1990 / 1991)	
	Z $/T	US $/T
Cottonseed	338	132
Soyabean	576	225
Sunflower	534*	208

* Figures from 1989/1990

II.3.2.2 - International prices

	1988	1989	1990
Cottonseeds			120
Soyabeans*	299	280	250
Sunflower *	355 (1)	341 (2)	

* CIF Rotterdam
(1) August 1988
(2) May 1989

Taking into account transport costs which can be estimated to about US$ 110/T from CIF Durban, this demonstrates that local prices are will below international prices CIF Harvare.

Cottonseeds prices can increase within 10 or 20 % considering that cottonseeds international prices are relatively high.

III - INDUSTRY AND PLANT SIZE AND CAPACITY

III.1 - INDUSTRY SIZE AND CAPACITY

The edible oil industry is shared by four main oil expressors :

OLIVINE INDUSTRIES Ltd
LEVER BROTHERS Ltd
UNITED REFINERIES (ex Blue Ribbon)
NATIONAL FOODS Ltd

Olivine Industries is by far the main producer of edible oil. It processes cottonseeds as well as soyabeans and sunflowerseeds.

Currently, 51 % shares are owned by Heinz Company of Pittsburg (U.S.A.) 49 % of shares are government owned.

Lever Brothers is a subsidiary of the private Unilever group. It processes primarily cottonseeds and other seeds such as soyabeans and sunflowerseeds.

United refineries (ex Blue Ribbon Foods Ltd) is a subsidiary of T.A. holding group.

National Foods Ltd is a limited private company. National foods production is primarily oil extracted from maize germs.

The total oilseeds crushing capacity was estimated to 340 000 tons in 1988.

With programs extension completed by United Refineries it is now estimated to 365 000 tons/y.

The expansion program included :

- a new solvent extraction unit/commissioned in 1988
- an additional expeller line/commissioned at the end of 1989

With a utilization rate maximum of 90 % the total actual crushing capacity is estimated to 330 000 t/y.

III.2 - DEVELOPMENT PROGRAMS

Some development programs are considered; UNITED REFINERIES has obtained an import licence for a new refinery unit. This project is in obeyance because no financing plan has been drawn. This piece of information was confirmed by the Ministry of Industry.

OLIVINE Management team seems to start a program for renewing part of their equipment in regard to a factory extension to increase, inter alia, the solvent extraction capacity.

LEVER BROTHER seems also to foresee an expansion program.

These few projects are indeed forecasted but it seems difficult to estimate their implementation schedule, since they were not all confirmed by the Ministry of Industry.

III.3 - PLANT LOCATION AND CAPACITY

III.3.1 - Site

Kadoma is located in the grain cotton growing area. The plant site is located along the railways and road between Harare (140 km) and Bulawayo (300 km).

The CMB is planning to build a new ginnery of 50 000 t/y of cottonseeds in Kadoma.

This site has a few advantages :

- Transport facilities
- water supply available from public network with possibility to drill boreholds to use subsurface water
- Electrical power supply
- Manpower - Kadoma is a city of 80 000 inhabitants
- Location of a technical school in Revekwe (65 km of Kadoma)

III.3.2 - Plant capacity

The proposed plant capacity will be about 88 000 tons of oilseeds. The new unit will produce over 15 000 T/year of edible oil.

The production schedule is as follows :

- 33 % of installed capacity year 1
- 66 % of installed capacity year 2
- 100 % of installed capacity year 3

The factory will triturate :

330 t/day of cottonseeds
250 t/day of other oilseeds

The year is based on 320 days.

Based on this plant capacity, the total oil expressing capacity will be as follows :

	1993/94	1994/95	1995/96
New plant	88 000 x 0.33	88 000 X 0.66	88 000
Existing plants	365 000	365 000	365 000
	395 000	425 000	453 000

These figures assume that existing plants capacity will remain the same over the 3 coming years.

The total oil expressing capacity will meet the oilseeds production requirements.

IV - PROJECT ENGINEERING

IV.1 - PRELIMINARY DETERMINATION OF SCOPE OF PROJECT

The scope of project is to increase edible oil production as well as meals production. The CMB by contemplating this project is willing to valorize the whole cotton sub-sector by developing downstream activities.

IV.2 - TECHNOLOGY AND APPLIED PROCESSES

IV.2.1 - Applied processes

The factory is a multipurpose oil expressing factory with various processes according to oilseeds decorticated.

Process flow diagrams describe the process used for cottonseeds, soyabeans, sunflowerseeds.

Two other flow diagrams describe the chemical refining process for cotton oil on one nand and soja and sunflower oil on the other hand.

Processes used are traditional and very performing with available equipment on the market.

Process include :

- decorticating
- cooking, pressing, filtration
- chemical refining
- solvant extraction
- conditionning

We have considered that there is no need for delinting cottonseeds. Indeed, this operation is very debated economically. The linter selling price does not offset manpower, maintenance and power costs generated by this operation.

Investments costs are very heavy. Delinting equipment cost is about Z$ 6,100,000 compared with decorticating equipment cost which is about Z$ 1,900,000.

It is possible to use decorticating units, with strong beaters enabling very good yields with a linter percentage of 12 %. Therefore, it seems to us that delinting process is not suitable for this particular project.

IV.2.2 - Rough lay out of proposed equipment.

IV.2.2.1 - Process Equipment

Receiving and storage for :

. Cotton
. Soya
. Sunflower complete installation including.
. Bags unloading hoppers
. Screw conveyors
. Chain conveyors
. Elevators
. Fans
. Silos (one month capacity storage) seeds cleaner
. margnet separators

Decorticating

. Conveyors
. Elevators
. Continuous Weight Metring Flow Belt
. Magnet separators
. Decorticators
. Hulls beaters

Pressing

. Elevators, conveyors, continuous weight metring flow belt
. Magnet separators
. Roller mil
. cookers
. Heavy duty presses (for cotton - sunflower)
. Roller flaker (for soja beans preparation)
. Belt conveyor going to solvant plant
. Intermediate tanks for crude oil
. Transfer pumps
. Filters

Solvant plant (complete installation including)

. Hoppers
. Solvent extractor (Belt type)
. Conveyors
. Elevators
. Desolvantizer/Toaster
. Condensors
. Miscelle distillation unit
. Heat exchangers
. Pumps
. Filters
. Transfert pumps and tanks for miscella, hexane, oil. All anti-deflagrant electrical installation.

Chemical refining unit

Deguming section } With pumps - transfert tanks - flow
} meter, etc.
Neutralising section } mixers - heat exchangers
Washing

Drying (under vacuum) } Centrifuge separators soap stock storage tank

Bleaching - { continuous bleacher (under vacuum)

Filtering - { heating system pumps and Niagara filters intermediate tanks

Deodorizing - } Vertical type deodorizer - transfer pumps and
tanks exchanges - heat exchangers
Fatty acid storage

Steam ejectors (for vacuum) - Barometric condensor - monobloc thermo fluid heater.

Conditionning
Mixing tank for blending (soya oil + cotton oil)
Transfer pumps - and tanks (8 hours production)
Filling lines (drums, cans, bottles)
Capping machines for bottles
Labelling machines
Roller conveyors

Meal bagging and storage

Elevators - Conveyors
Filling bagging machine
Sewing machine

IV.2.2.2 - Auxiliary equipment

- Water tank (600 m3)
  Water pumps - Fire fighting pumps and fitting

- Steam boilers with water treatment with all security values - fitting

- Cooling towers with pumps - and fitting

- Air compressor, air tank - and fitting

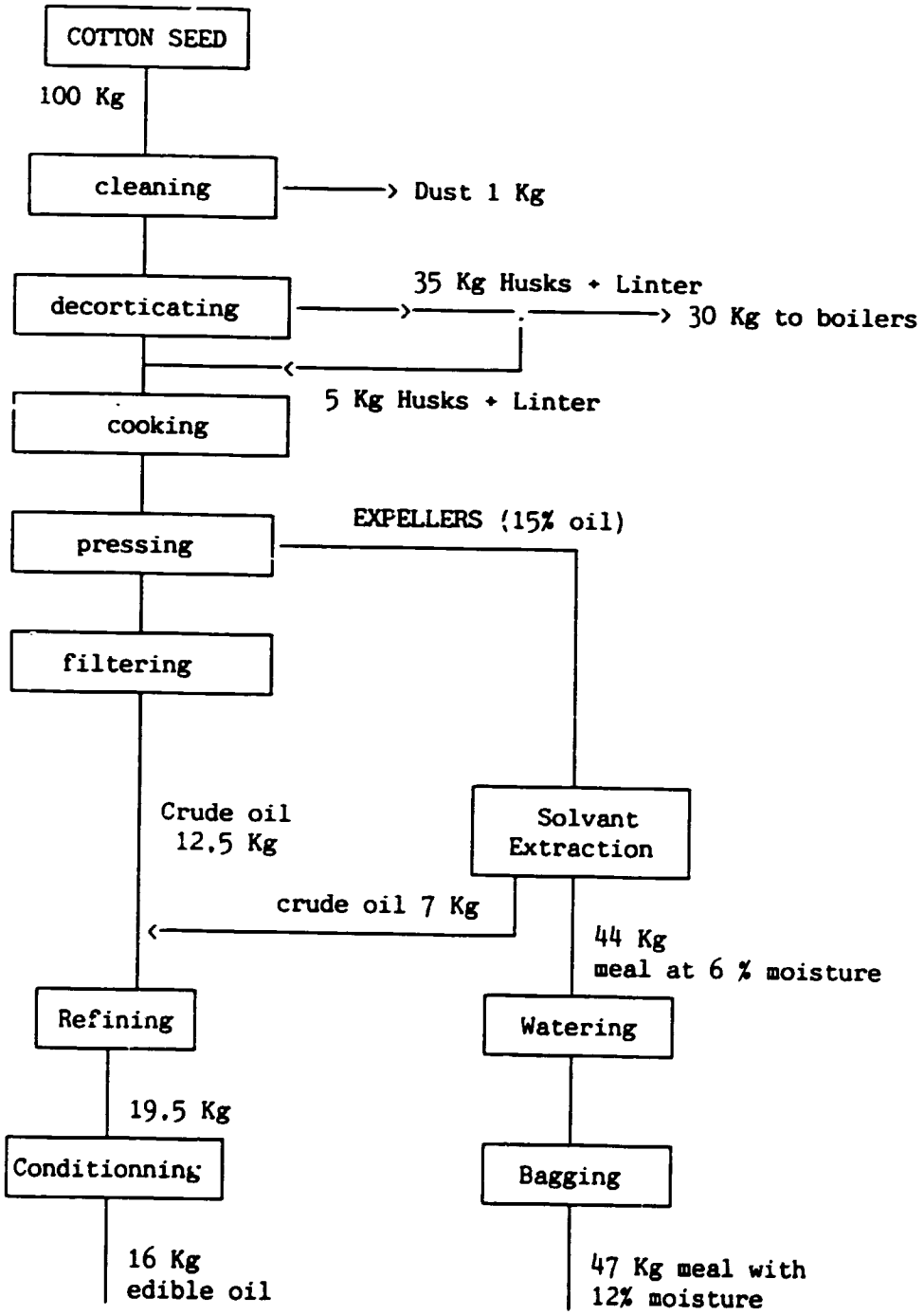
- Electrical substation - High/Low voltage, with transformers securities -
  Dispaching panel

- Emergency gen set - Diesel engine/electrical generator

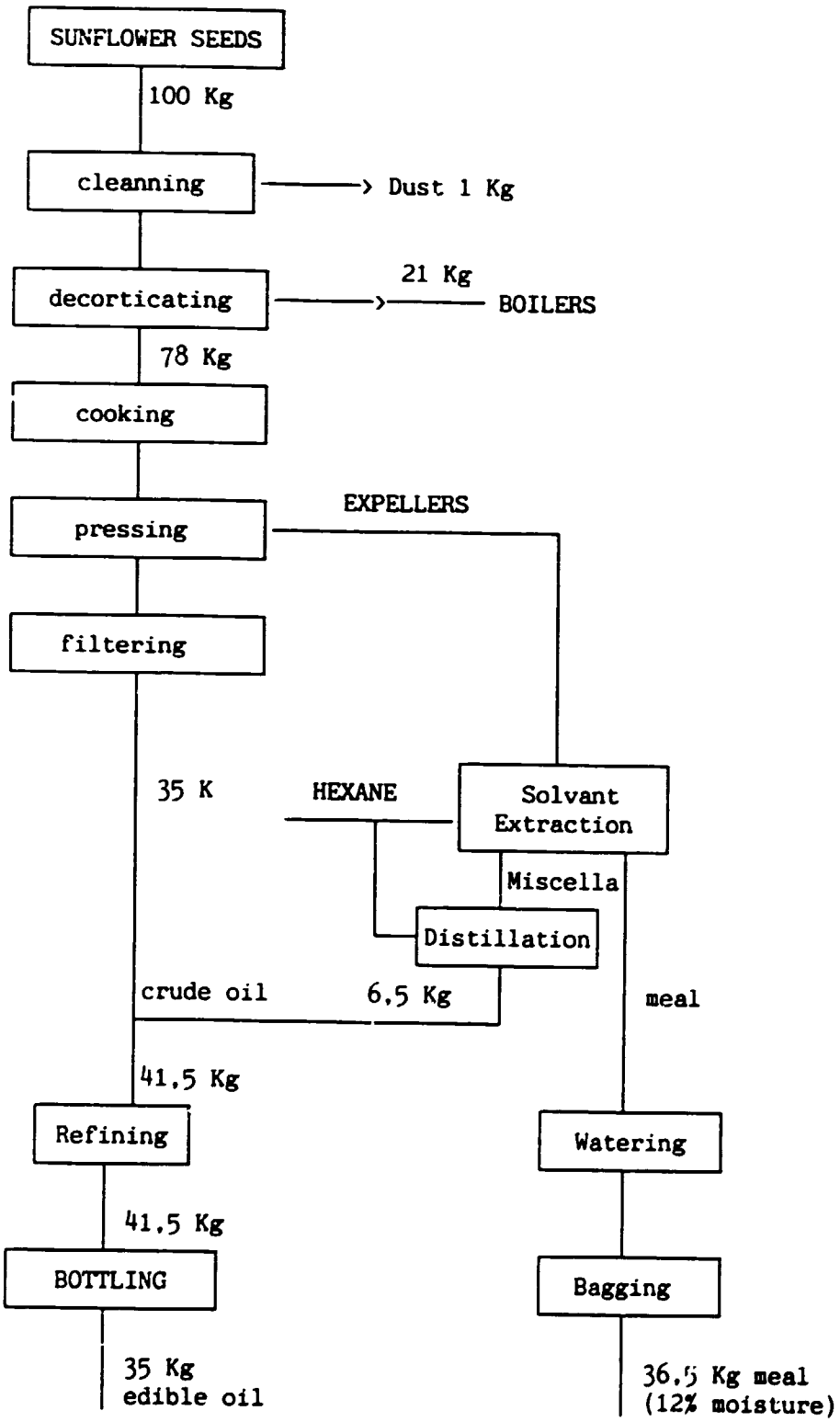
- Diesel tank

- Transport
  3 cars - 2 bick up - 2 trailers trucks
  2 forklifts - 1 Husk front and loader
  {1 locotractor
  { or
- { 2 wagon hauling engines

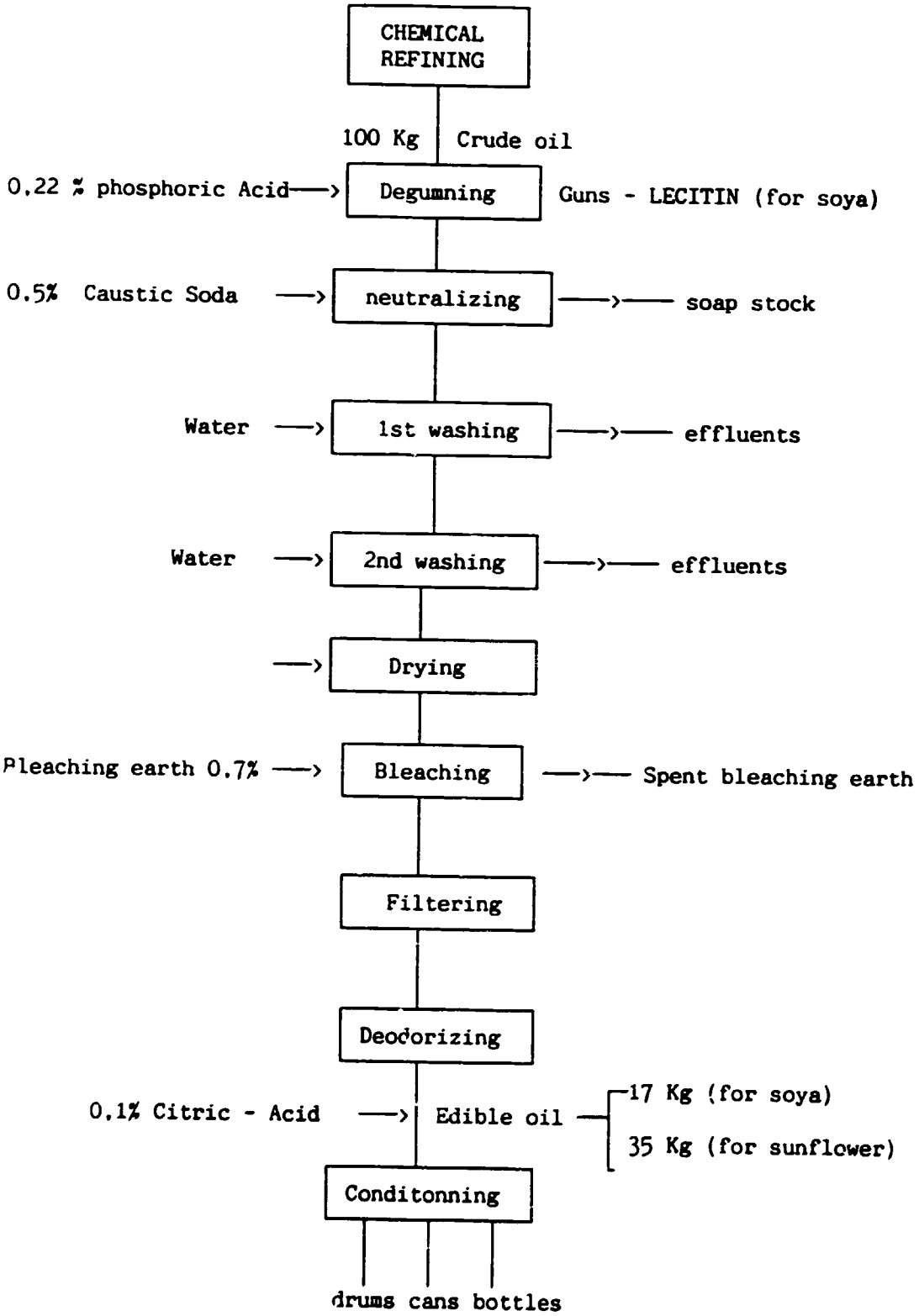
PROCESS FLOW DIAGRAM FOR COTTON SEEDS



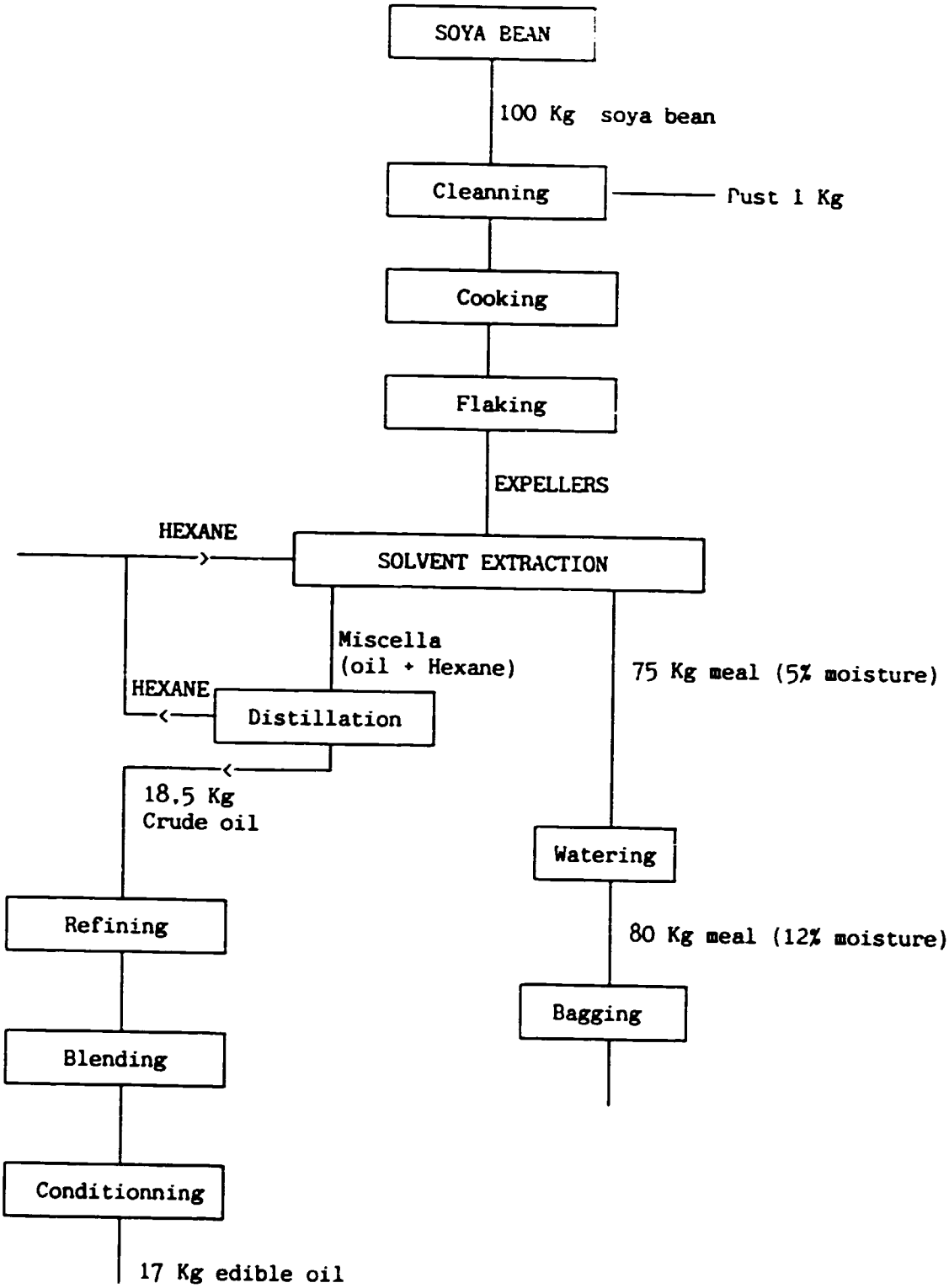
PROCESS FLOW DIAGRAM FOR SUNFLOWER SEEDS



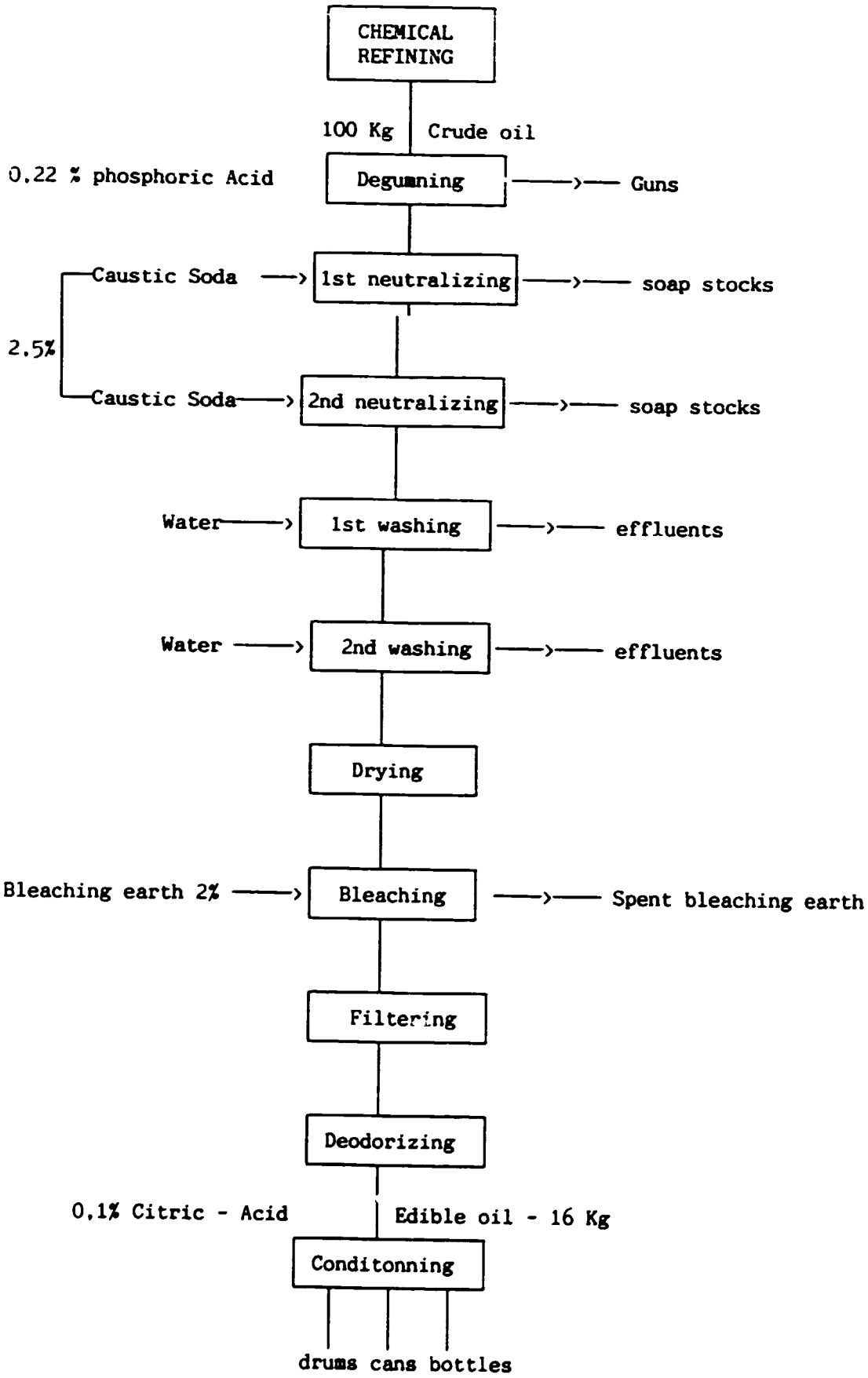
FLOW DIAGRAM FOR SOYA AND SUNFLOWER OIL REFINING



PROCESS FLOW DIAGRAM FOR SOYA BEAN



FLOW DIAGRAM FOR COTTON OIL REFINING



IV.2.3 - Equipment investments cost estimates

IV.2.3.1 - Production equipment

INVESTMENT COST 1.000 Z $				
PRODUCTION UNIT				
N°	DESCRIPTION	For.	Loc.	TOTAL
	Seads receiving and storage	1 900	320	2 220
	Decorticating	1 640	280	1 920
	Cooking - Pressing - Filtration	5 150	870	6 020
	Solvant Extraction	3 790	640	4 430
	Refining	3 070	520	3 590
	Conditionning	910	150	1 060
	Meals bagging and storage	190	32	222
	Oil storage	1 392	234	1 626
	TOTAL	18 042	3 046	21 088

IV.2.3.2 - Auxiliary equipment

INVESTMENT COST 1.000 Z $				
AUXILIARY EQUIPMENT				
N°	DESCRIPTION	For.	Loc.	TOTAL
	Elect substation	1 785	-	1 785
	Boilers and water treatment		2 015	2 015
	Emergency Gensets (Electr)	222		222
	Air compressor	132		132
	Handling and transport	1 330		1 330
	Water storage and pumps	310	40	350
	Cooling towers	196		196
	Laboratory equipment			
	Workshop equipment	510	37	547
	TOTAL	4 485	2 092	6 377

IV.2.3.3 - Service equipment

INVESTMENT COST 1.000 Z $				
SERVICE UNIT				
N°	DESCRIPTION	For.	Loc.	TOTAL
	Office equipment		52	52
	Intercommunications	84		84
	Weight bridge	58		58
	Transports	339		339
	Fire protection	210	78	288
	Sewage disposal		112	112
	TOTAL	691	242	933

IV.2.3.4 - Spare parts

INVESTMENT COST 1 000 Z $				
SPARE PARTS				
N°	DESCRIPTION	For.	Loc.	TOTAL
	Production	2 023	-	2 023
	Auxiliary	348	143	491
	Service	48	16	64
	TOTAL	2 419	159	2 578

IV.3 - CIVIL ENGINEERING WORKS

IV.3.1 - Rough layout of civil engineering works

IV.3.1.1 - Site preparation and development

Site preparation includes leveling and drainage. Land development includes roads and railways construction.

IV.3.1.2 - Buildings and special works civil

This works include civil works, buildings and metallic frames.

Areas foreseen for the plant site are detailed as follows :

BUILDINGS		
Cotton seed storage and unloading	40 x 120	4 800 m2
Soya beans storage and unloading	40 x 60	2 400 m2
Decorticating	20 x 30	600 m2
Prepressing and seeds preparation	40 x 20	800 m2
Solvant extraction (metallic structure)	30 x 20	600 m2
Oil refining	30 x 20	600 m2
Edible oil conditionning	50 x 20	1 000 m2
Husks storage	30 x 24	720 m2
Main office	20 x 40	800 m2
Laboratory	20 x 10	200 m2
General store	30 x 20	600 m2
Maintenance work Shop	20 x 10	200 m2
Meal storage and bagging	80 x 40	3 200 m2
Electrical substation and gensets	10 x 25	250 m2
Boilers House	10 x 40	400 m2
Weight bridge control office	5 x 10	50 m2
Watchman House	5 x 10	50 m2

Water and Oil storage	
Water storage	600 m3
Crude oil	3 x 300 m3
Cotton edible oil	500 m3
Soya edible oil	500 m3
Sunflower edible oil	250 m3

IV.3.2. - Civil engineering works investment costs

IV.3.2.1. - Site preparation and development

LAND

INVESTMENT COST IN Z$					
QTITY	UNIT	DESCRIPT	UNIT	LOCAL	TOTAL
15	MA	LAND ROADS RAILWAY LEVELING AND DRAINAGE	2 000	30 000	30 000 800 000 500 000 800 000
					2 130 000

IV.3.2.2. - Buildings and special civil works

INVESTMENT COST 1.000 Z $				
CIVIL WORKS - BUILDINGS				
N°	DESCRIPTION	For.	Loc.	TOTAL
	Civil work Building Metallic frames		3 040 9 100 1 054	3 040 9 100 1 054
	TOTAL		13 194	13 194

IV.4 - TOTAL INVESTMENT COSTS

Total investment costs are presented in the following table

INVESTMENT COST 1.000 Z $			
EQUIPMENTS	For.	Loc.	TOTAL
Product equipment	18 042	3 046	21 088
Auxiliary equipment	4 485	2 092	6 577
Service equipment	691	242	933
Stock spare parts - Tools	2 419	159	2 5798
Civil work		13 194	13 194
TOTAL FIXED INVESTMENT	25 637	18 733	44 370
Engineering	9 802	705	10 507
TOTAL	35 439	19 438	54 877

IV.5 - PROJECT IMPLEMENTATION SCHEDULING AND LAYOUT

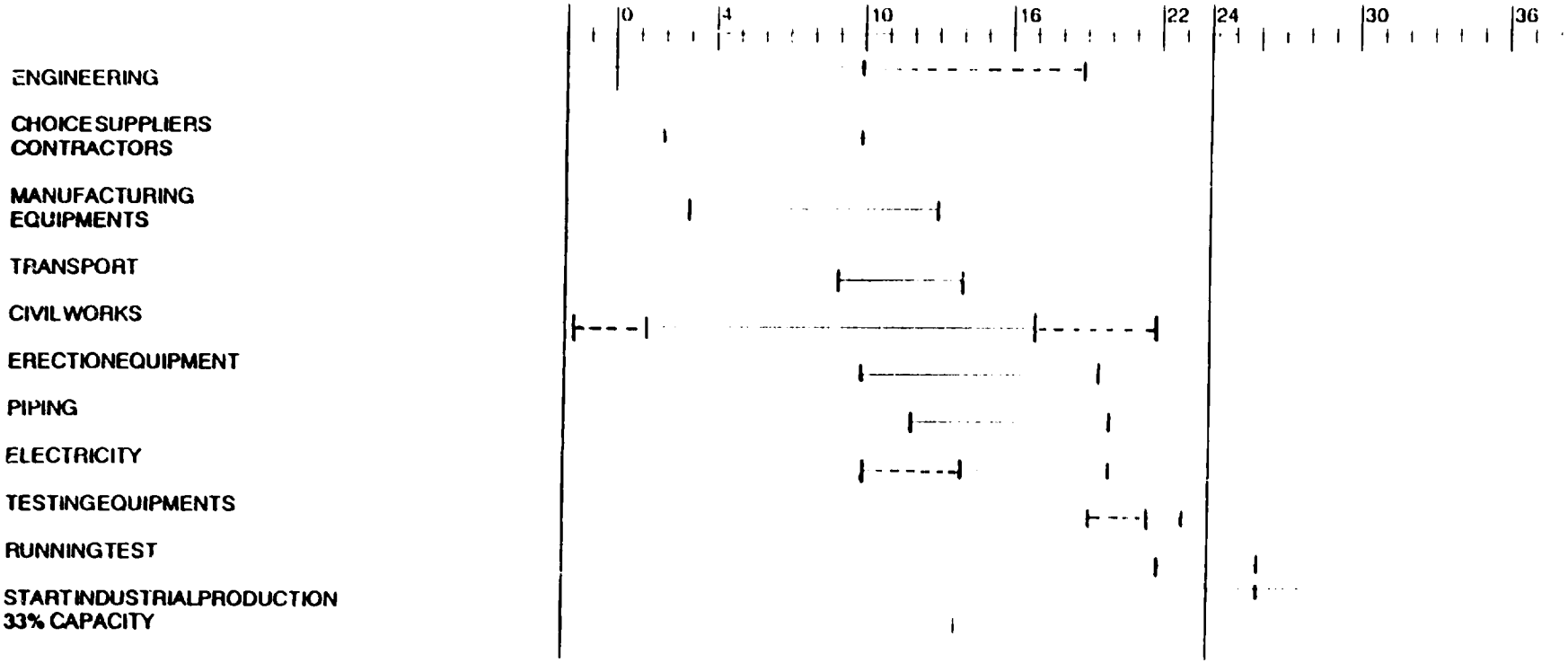
IV.5.1 - Project Scheduling Implementation

The overall length of the schedule is estimated to 24 months to start industrial production (at 33% of capacity) as illustrated in figure 1.

IV.5.2 - Project rough lay out

The lay out of the new unit is drawn with product flows and presented in the following pages. Figure 2 takes into account soyabeans and sunflowers flows. Figure 3 takes into account cottonseeds flows.

FIGURE 1



PROJECT IMPLEMENTATION SCHEDULE IN MONTHS

V. - PLANT ORGANIZATION

V.I. - PLANT PRODUCTION

Production program is set up as illustrated in table 5.1.

This production program takes into account the progressive production of the factory and includes production of edible oil as well as meals.

V.I.2. - Sales

Expected sales for refined oil as well as meals are detailed in the following tables.

The table 5.2. gives annual sales program with edible oil quantities break down for 2 kinds of products :

- Blended oil
- Sunflower oil

The table 5.3. gives the selling prices of products, currently controlled by the government. In order to compute sales amounts of edible oil, we have taken an average price by ton. Selling price of products are based on government prices to whole salers since no measure are contemplated to liberalize foods products prices.

TABLE 5.2

ANNUAL SALES PROGRAMMS(full capacity)

Blended oil (soya + cotton)	Drums 200 lts (10 %)	1.448.900 lts
	Tins 5 lts (5 %)	724.450 lts
	Tins 2.5 lts (5 %)	724.450 lts
	Bottles 0.75 lt (56 %)	8.113.840 lts
	Bottles 0.50 lt (16 %)	2.318.240 lts
	Bottles 0.375 lt (8 %)	1.159.120 lts
		14.489.000 lts = 13.040 MT
Sunflower oil	Bottles 0.750 lt 70 %	2.177.700 lts
	Bottles 0.000 lt 20 %	622.200 lts
	Bottles 0.375 lt 10 %	311.100 lts
		3.111.000 lts = 2.800 MT

TABLE 5.3

SELLING PRICE OF EDIBLE OIL (Z $)

	90 / 91
Olivine 375 ml	1.49
Olivine 500 ml	1.97
Olivine 750 ml	2.52
Tins 2,5 lts	8.24
Tins 5 lts	15.32
Drums 200 lts	474.35

PRODUCTION PROGRAM

TABLE 5.1

INPUT	COTTON SEEDS	SOYA B	SUNFLOWER SEEDS
Year I (33 %)	18.480 MT	7.920 MT	2.640 MT
Year II (66 %)	36.960 MT	15.840 MT	5.280 MT
Year III (100 %)	56.000 MT	24.000 MT	8.000 MT

OUTPUT	COTTON EDIBLE OIL	SOYA EDIBLE OIL	SUNFLOWER EDIBLE OIL
Year I	P = 16 %	P = 17 %	P = 35 %
Year II	2.957 MT or 3.285 m3	1.346 MT or 1.495 m3	924 T or 1.027 m3
Year III	5.914 MT or 6.570 m3	2.692 MT or 2.991 m3	1.848 MT 2.054 m3
	8.960 MT or 9.956 m3	4.080 MT or 4.533 m3	2.800 MT or 3.111 m3

OUTPUT	BLENDED OIL (SOYA + COTTON)
Year I	4.780 m3
Year II	9.561 m3
Year III	14.189 m3

MEALS

OUTPUT	COTTON MEAL	SOYA MEAL P = 80 %	SUNFLOWER MEAL P = 36,5 %
Year I	8.686 MT	6.336 MT	964 MT
Year II	17.372 MT	12.672 MT	1.927 MT
Year III	26.320 MT	19.200 MT	2.920 MT

The following table gives expected sales amounts for refined oil (blended oil and sunflower oil) as well as meals with progressive production until full capacity is reached. For meals, sales prices are broken down between local sales and exports.

TOTAL REVENUES ARE PRESENTED IN THE FOLLOWING TABLES

EDIBLE OIL	TOTAL PRODUCTION	AVERAGE PRICE	REVENUES (000 Z $)
Blended oil	13 320 MT	3.675	48 962
Sunflower oil	2 480 MT	5.13	12 723

	PRODUCTION	LOCAL SALES	AVERAGE PRICE	REVENUES
Meals		17 544	333	5 842
Cotton and Sunflower	29 240	11 696	550	6 433
		11 520	436	5 023
Soya	19 200	7 680	750	5 760
		TOTAL REVENUES		84 743

V.2. - PLANT MANPOWER

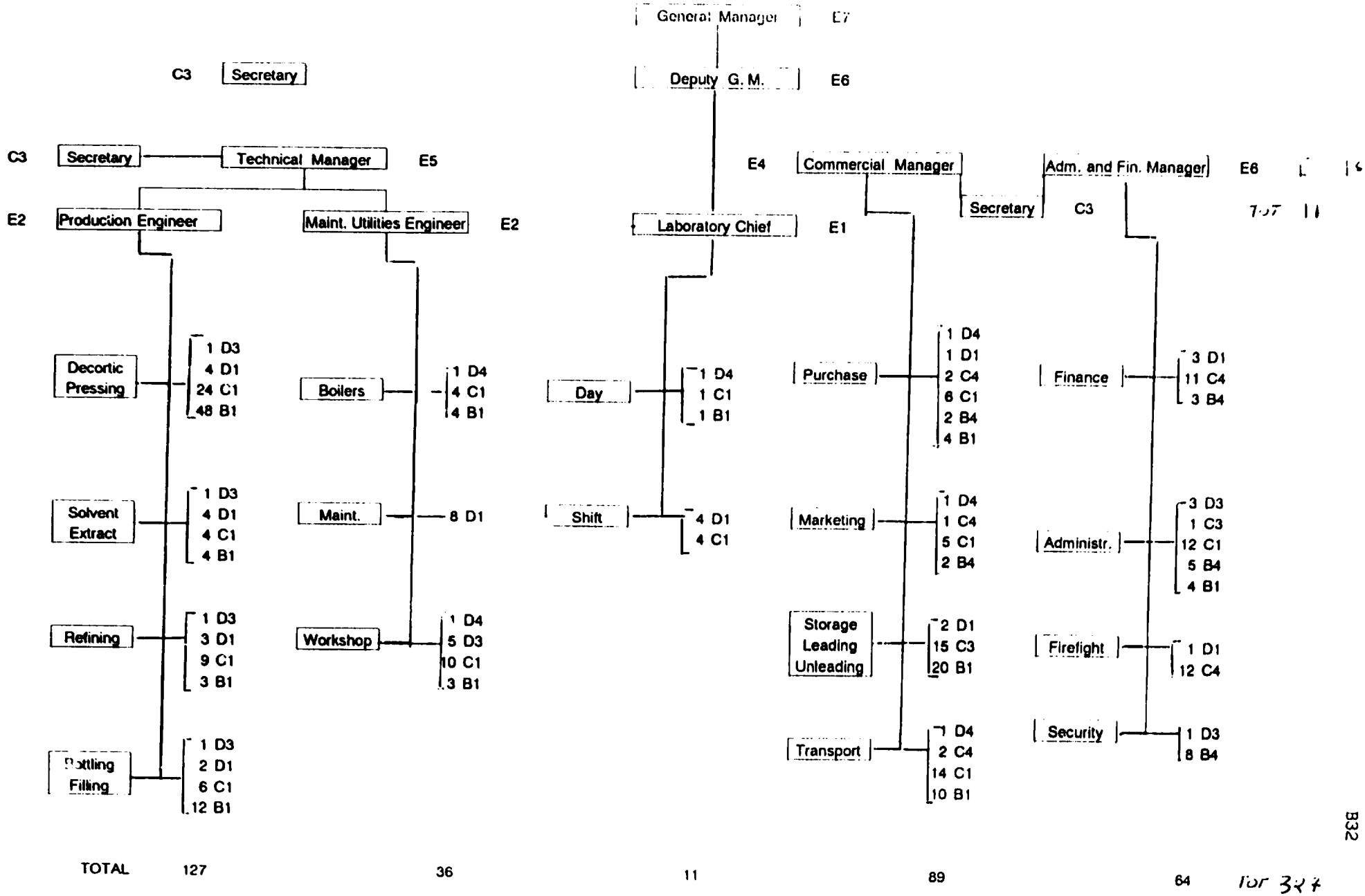
V.2.1. - **Estimated manpower requirements**

Manpower requirements are set up at 327 workers + 11 staff personnel at full capacity.

The organizational diagram presented in figure 4 gives with details, the organizational structure of the factory with workers skills and numbers.

Employees categories are given in figure 5. They include professional staff as well as skilled, semi skilled and unskilled workers.

FIGURE 4

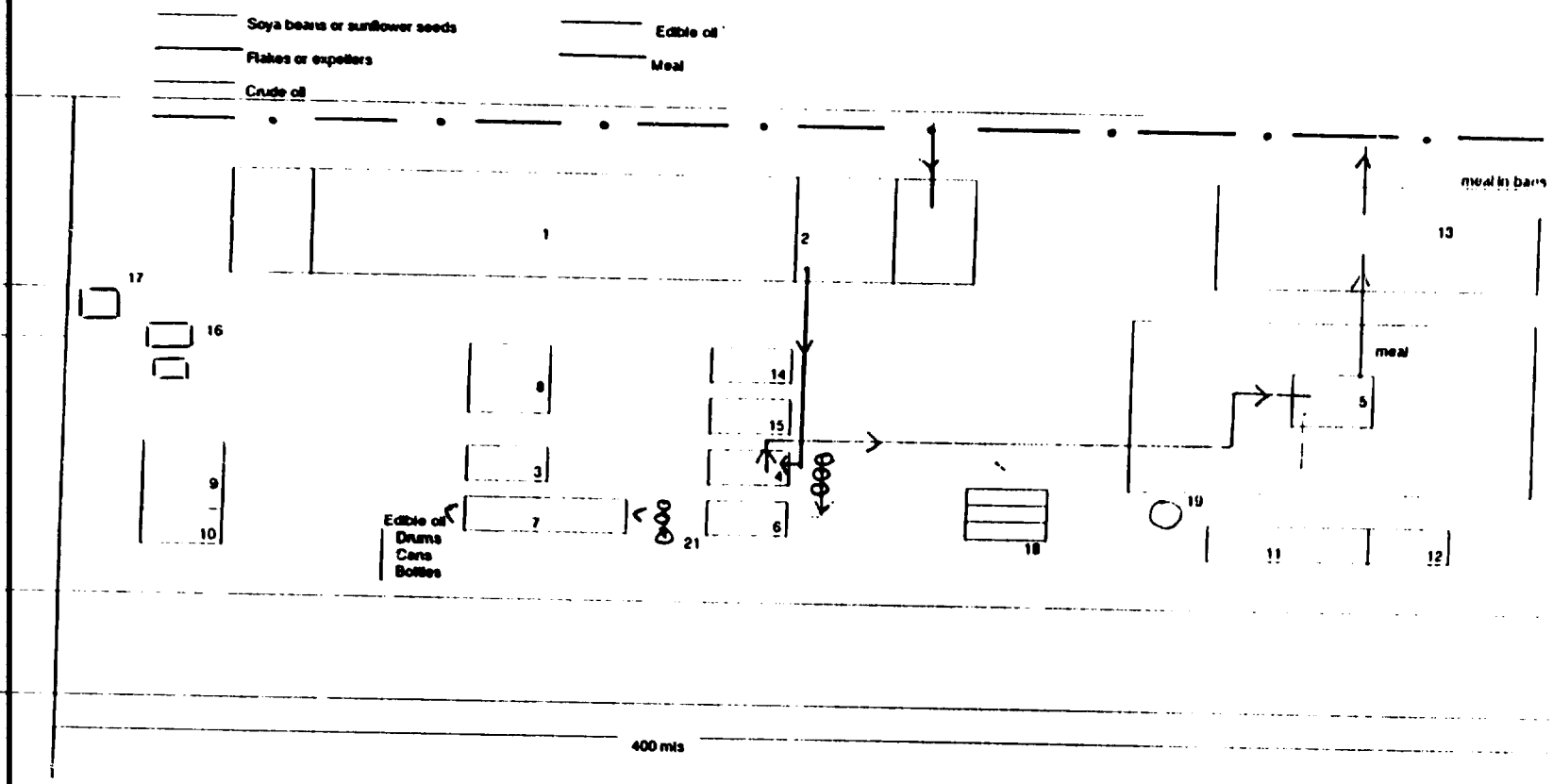

General Manager
E7
C3
Secretary
Deputy G. M.
E6
C3
Secretary
Technical Manager
E5
E4
Commercial Manager
Adm. and Fin. Manager
E6
E2
Production Engineer
Maint. Utilities Engineer
E2
Laboratory Chief
E1
Secretary
C3
Decortic Pressing
1 D3
4 D1
24 C1
48 B1
Boilers
1 D4
4 C1
4 B1
Day
1 D4
1 C1
1 B1
Purchase
1 D4
1 D1
2 C4
6 C1
2 B4
4 B1
Finance
3 D1
11 C4
3 B4
Solvent Extract
1 D3
4 D1
4 C1
4 B1
Maint.
8 D1
Shift
4 D1
4 C1
Marketing
1 D4
1 C4
5 C1
2 B4
Administr.
3 D3
1 C3
12 C1
5 B4
4 B1
Refining
1 D3
3 D1
9 C1
3 B1
Workshop
1 D4
5 D3
10 C1
3 B1
Storage Leading Unleading
2 D1
15 C3
20 B1
Firefight
1 D1
12 C4
Bottling Filling
1 D3
2 D1
6 C1
12 B1
Transport
1 D4
2 C4
14 C1
10 B1
Security
1 D3
8 B4
TOTAL
127
36
11
89
64

B32

FIGURE 5

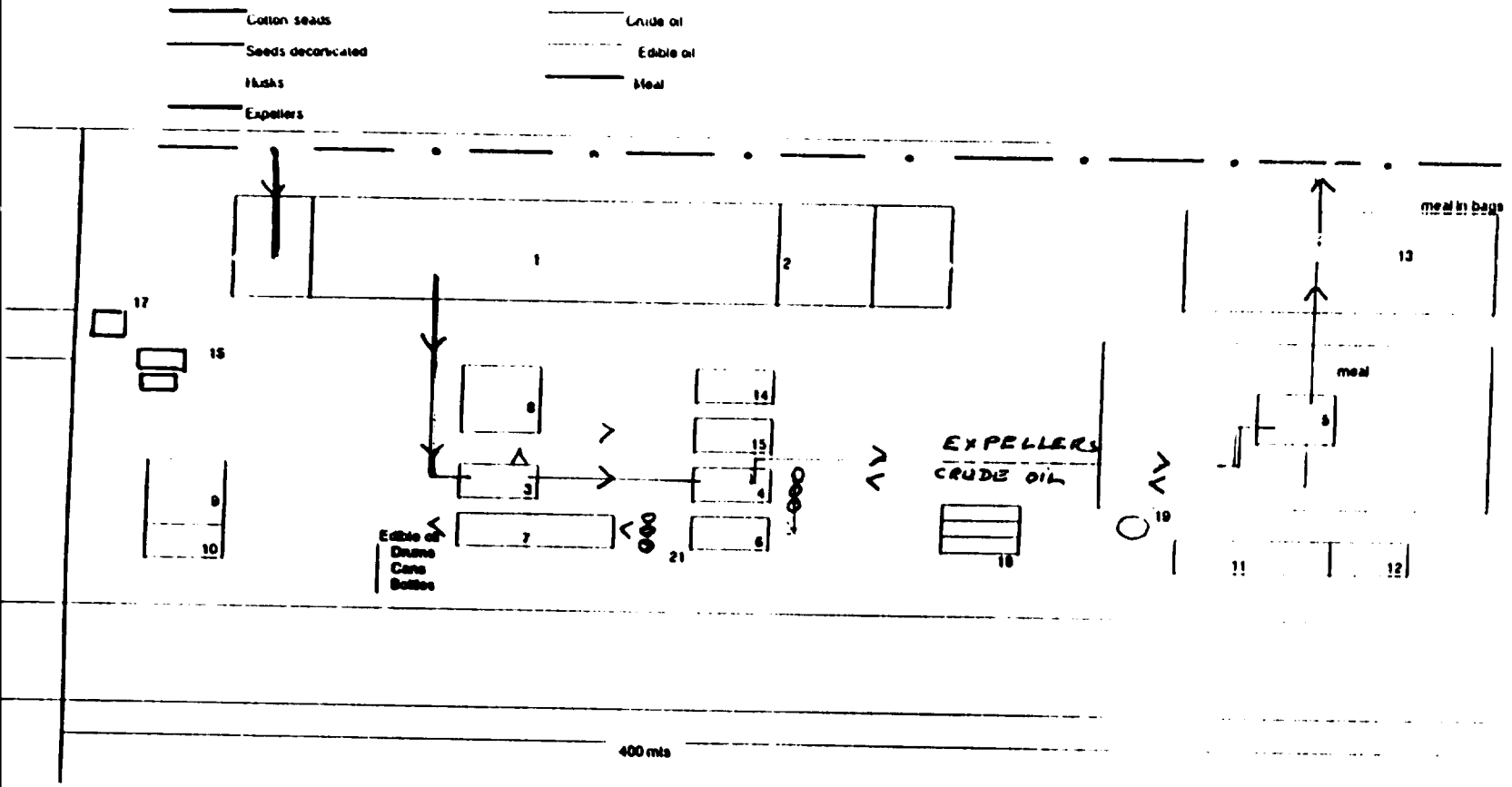
CLASSIFICATION		FUNCTIONS
	E7	G.M.
	E6	DEPUTY GM
	E5	HEAD OF DEPARTMENT
	E4	HEAD OF DEPARTMENT
	E3	PRODUCTION ENGINEER
	E2	MAINTENANCE ENGINEER
	E1	CHIEF OF LABORATORY
	D4	HEAD OF SECTION
	D3	SUPERVISORS
	D1	FOREMEN -COMPUTORS
	C4	ACCOUNTANTS -CLERCK
SEMI SKILLED	C3	SECRETARIES -FIREMEN
	C1	DRIVERS -WELDERS -ELECTR/INST. OPERATORS -CLERKS
	B4	TYPIST
	B1	ASSISTANTS

FIGURE 2



1 - Cotton seed storag
2 - Soyabean storage
3 - Decorticating
4 - Preparation - pressing
5 - Solvant extraction plant
6 - Oil refining
7 - Edible oil conditionning
8 - Husks storage
9 - Main office
10 - Laboratory
11 - General store
12 - Maintenance workshop
13 - Meal storage and bagging
14 - Electrical substation and emergency gensets
15 - Boilers house and compressors
16 - Weight bridge and receipt dispatch office
17 - Watchman house
18 - Cooling towers
19 - Water tank (600 m3)
20 - Crude oil storage
21 - Edible oil storage

FIGURE 3



1 - Cotton seed storage
2 - Soyabeen storage
3 - Decorticating
4 - Preparation - pressing
5 - Solvent extraction plant
6 - Oil refining
7 - Edible oil conditioning
8 - Husks storage
9 - Main office
10 Laboratory
11 - General store
12 - Maintenance workshop
13 - Meal storage and bagging
14 - Electrical substation and emergency gensets
15 - Boilers house and compressors
16 - Weight bridge and receipt dispatch office
17 - Watchman house
18 - Cooling towers
19 - Water tank (600 m3)
20 - Crude oil storage
21 Edible oil storage

V.2.2. - Labour cost estimates

Annual labour costs, at full capacity, are presented in the table below per categories of employees. These costs include :

- Basic scolary
- Holiday benefits
- Pension basic
- Group line cover
- Workers compensation earning
- Medical aid
- Education levy 1% earning

WAGES AND SALARIES - (Z $)

Fixed	E7	1 x	102,453	102,453
	E6	2 x	84,628	169,256
	E5	1 x	72,745	72,745
	E4	1 x	60,861	60,861
	E2	2 x	43,036	86,072
	E1	1 x	37,095	37,095
	D4	6 x	34,710	208,260
	D3	13 x	31,145	404,885
	D1	7 x	27,448	192,136
	C4	28 x	21,646	606,088
	C3	7 x	19,270	134,890
	C1	44 x	15,705	691,020
	B4	20 x	13,023	260,460
	B1	18 x	8,679	156,222
			Total	3,182,443
Variable	D1	25 x	27,448	686,200
	C3	12 x	19,270	231,240
	C1	55 x	15,705	863,775
	B1	95 x	8,679	824,505
			Total	2,605,720
Total Fixed & Variable				5,788,163

VI. - FINANCIAL AND ECONOMIC ANALYSIS

The financial analysis was conducted in Zimbabwe Dollars in constant prices. The foreign exchanges rate is US $ = 2.562 ZS as of December 90.

Financial results are presented for a plant capacity of 330T/day of cotton seeds or 250 t/day of other oilseeds as discussed in section IV with the following schedule for the construction period :

year 1 : 33 % of capacity
year 2 : 66 % of capacity
year 3 : 100 % of capacity

The financial analysis aims at demonstrating the positive results of such a project.

We have used the Unido's Computer Model for Feasibility Analysis and Reporting-COMFAR.

Financial results appear in COMFAR schedules as indicated below and are presented in ANNEX 1.

1 - Summary sheet
2 - total initial investment
3 - Investment during production
4 - Total production costs
5 - Working capital required
6 - Source of finance
7 - Cash flow tables
8 - Net income statement
9 - Balance sheets

VI.1. - TOTAL INVESTMENT COSTS

Total investment costs include fixed capital cost plus pre-production expenditures plus next working capital.

Fixed investment costs :

	in ('000 Z $)
Engineering & technical assistance	10 507
Production equipment	21 086
Auxiliary equipment	6 577
Service equipment	933
Spare parts	2 578
Land & Site preparation	2 130
Civil works & buildings	13 194
	46 500
Networking capital	2 298
Pre-production capital Expenditures (excluding financial charges)	4 886
	64 191

VI.1.1. - **Fixed Investment Costs**

Fixed investment costs are detailed in the table 6.1.

VI.1.2 - **Pre-production expenditures**

Pre-production expenditures include :
- Start-up expenses such as initial stock of raw material
- Hiring and training of management staff and workers
- Payment of interests on project loans accrued during pre-production period

VI.1.3 - **Networking capital**

The required networking capital takes into account the minimum day of coverage for various stocks as following :

* Inventories (in days)	Local	Foreign
- Raw material	30	
- Packaging	30	60
- Chemical products	30	60
- Water	30	
- Energy	15	
- Spare parts	30	60
- Finished products	30	
* Work-in-progress (in days) It accounts for intermediate stock of crude oil	10	
* Accounts receivable (in days) It accounts for one month of sales	30	
* Accounts payable (in days) It accounts for one month of raw materials, chemical products, utilities and packaging	30	
* Cash in hand (in days) It accounts for one month of operating expenditures excluding accounts payable	30	

Total initial investment is detailed in COMFAR schedule n°2

VI.2 - PROJECT FINANCING

Total financing requirements include :

	in '000 Z $	in '000 US$
Fixed investment costs	57 007	22 268
Pre-production expenditures	4 886	1 909
Working capital (pre-production period)	2 298	898
	64 191	25 075

This amount correspond to initial investment costs paid during the pre-production period. There will be additional financial charges related to foreign loans.

FIXED INVESTMENTS COSTS

TABLE 6.1

	Initial Fixed Investments						Start-up and full capacity utilization								
Year	1992			1993			1994			1995			1996		
	1			2			1			2			3		
Currency (000 Z$)	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC
FIXED INVESTMENT COSTS															
Land		30	30												
Site Preparation and Development		2100	2100												
Structures and Civil Works		6597	6597		6597	6597									
Incorporated Fixed Assets	3666	259	3926	8555	605	9160									
Plant and Machinery	3483	807	4290	19735	4573	24308									
Total	7149	9793	16942	28290	11774	40064									

We have considered that foreign loan contribution will be for the amount of US $ 17 million, equity should be slightly over US$ 8 million.

This project financing gives the following breack down : about 33 % local financing by equity, and about 67 % of foreign financing by foreign loan.

Equity will be disbursed in 1992 at almost 90 % and foreign financing will be disbursed in 1993.

Foreign financing

It was considered that one foreign loan could be contracted with one of the large tending agencies (French or European) in US Dollars for the amount of 17 million.

Only one hypothesis for one single loan was taken into account, since we do not have any information on financial negotiations which would take place during the feasibility study.

Loan conditions are as following :

Interest rate : 10 %
Repayment period : 10 years
Grace period : 2 years
1rst disbursement period : 2nd year of construction
Repayment method : constant annuities

It is considered that intermediate accrued interests will not be capitalized but will be paid during the grace period and covered by the pre-production expenditures.

Interests and principal repayment are computed by COMFAR and presented in schedule n°6.

VI.3 - FINANCIAL STATEMENTS

VI.3.1 - Total sales

Sales are computed as detailed in section V.1.2. They includes edible oil sales with an average price by ton as well as meals local sales and export sales with one local price and one export price by ton according to meal product (cottonseeds, soyabeans and sunflowerseeds).

Total expected sales are in table 6.2.

VI.3.2 - Total Production Costs

Total production costs include factory costs as administrative overheads, sales and distribution costs as well as depreciation and financial costs.

Firstly, operating costs are computed globally and are not breacking down by product.

Secondly, it is considered that products are sold both ex-factory to wholesalers (for 70 % of total sales) and consequently transportation costs were included as indirect distribution costs.

Transportation to costs are based on an average cost by km equal to about 0.2 Z $/T of goods (packaged edible oil and meals).

TABLE 6.2

EXPECTEDSALES

REFINEDOIL	Z$ 33 %	66 %	100 %
BLENDEDOIL	16.157.460	32.314.920	48.962.000
SUNFLOWEROIL	4.198.590	8.397.180	12.723.000
TOTAL	20.356.050	40.712.100	61.685.000

MEALS	Z$ 33 %	66 %	100 %
COTTON	3.646.383	7.292.346	11.049 136
SOYA	3.558.297	7.116.595	10.782.720
SUNFLOWER	404.687	808.955	1.225.816

PRICESZ/MT

LOCAL	EXPORT
333	550
436	750
333	550

VI.3.2.1 - Factory costs

Factory costs include operating costs (see table 6.3. and 6.4.) such as raw material, chemical products, packaging, and miscellaneous inputs, and factory overheads.

Factory labour costs total all labour costs including sales and distribution labour costs such as the marketing manager and other workers from the sales department. Total salaries are presented in section V.2.2.

We have not taken into account advertising costs related to the new edible oil brand launching.

VI.3.2.2 - Depreciation

Depreciation on fixed assets was computed as follows according to the local tax code available in Zimbabwe :

- 5 %/year for buildings
- 10 %/year for equipment

We did not depreciate land and site preparation as well as importated fixed assests including expenditures such as technical assistance...

Total depreciation amount for tax purpose is (in 000 Z $) : 3 453 for the first ten yeards starting 1993. From 2003 the depreciation amount is reduced to (in '000 Z $) : 594

VI.3.2.3 - Financial costs

Financial costs include payments of interests on foreign loan.

VI.3.3 - Networking capital

Networking capital was computed according to the requirements listed in section VI.1.3. The total net increase in working capital of all the project account totals in "000 Z $: 12 891, which is a significant amount of the project cost taking into account minimum days of coverage for local and foreign inputs.

Increase in working capital by year is as follows : (in "000 Z $)

1994	4 873
1995	4 784
1996	3 235
Total	12 891

Net working capital computation is presented in COMFAR schedule N°5.

VI.3.4 - Cash flow tables

The cash flow tables presented in COMFAR schedule n°7 show total inflows and out flows of cash on a yearly basis.

Net cash flows are positive as soon as the second year of production and cumulated net cash flows become positive in 1999.

The cash flow discounting table gives an IRR of almost 15 % which is quite satisfactory.

The Pay-back period is estimated to : 7 years.
A sensitivity analysis is conducted in Section VI.4. to prices changes .

PRODUCTION COSTS MATERIAL INPUTS RAW MATERIAL

Tonnes

Qtity	Unit	Description	Unit Cost	Foreign	Local	Total
56000	T	Cottonseeds	340		19040	19040
24000	T	Soyabeans	575		13800	13800
8000	T	Sunflower seeds	620		4960	4960
88000		Total				37800

PRODUCTION COSTS INPUTS CHEMICAL PRODUCTS

('000 Z$)

Qtity	Unit	Description	Unit Cost	Foreign	Local	Total
41	T	Phosphoric Acid	3161		130	130
305	T	Caustic Soda	2750		839	839
268	T	Bleaching earth	3463	928		928
17	T	Citric Acid	6730		115	115
214500	lts	Hexane	1928	414		414
		Total				2426

PRODUCTION COSTS MISCELLANEOUS INPUTS

('000 Z$)

Qtity	Unit	Description	Unit Cost	Foreign	Local	Total
		Lubricants			21	21
		Laboratory		52		52
		Spare Parts		750	130	880
		Vehicules and				
		Handling equip.		290	135	425

PRODUCTION COSTS INPUTS UTILITIES

('000 Z$)

Qtity	Unit	Description	Unit Cost	Foreign	Local	Total
279600	m3	Water	0,69		193	193
230000	lt	Diesel oil	0,889		204	204
12760000	Kwh	Electricity	0,0205		262	262
		Total				659

TABLE 6.3.

PRODUCTION COSTS INPUTS PACKAGING MATERIAL

('000 Z$)

Qtity	Unit	Description	Unit Cost	Foreign	Local	Total
7244	Lts	Drums (200 lts)	66,23		480	480
144890	Lts	Tins (5 lts)	3,19		462	462
289780	Lts	Tins (2,5lts)	2,52		730	730
13722053	Lts	Bottle (0,75 lts)	0,531		7286	7286
5880480	Lts	Bottle (0,5 lts)	0,51		2999	2999
3920586	Lts	Bottle (0,375 lts)	0,464		1819	1819
850000	Bags		2,4		2040	2040
		Total				15817

OVERHEAD COSTS

('000 Z$)

		Description		Foreign	Local	Total
		Maintenance Building			67,6	67,6
		and Civil works				
		Insurance			432	432
		Communication			60	60
		Travel			52	52
		Protective Clothing			42	42
		Housing Allowance			63	63
		Total				716,6

TABLE 6.4

VI.3.5 - Net income statements

Net income statements are presented in COMFAR schedule n°8. Net profit become positive in 1996, on the third year of production.

In 2001 net profit suffers from corporate tax burden (of a rate of 50 %) but maintains from 2003 a ROE (Return On Equity) of about 41 % which is quite positive.

VI.3.6 - Projected balance sheets

Projected balance sheets are presented in COMFAR schedule N°9. It was assumed that all profit is retained for self-financing.

VI.4. - SENSITIVITY ANALYSIS

Vl.4.1 - Local Price of edible oil and meals

We can compute basic financial results with an increase of 10 % in local selling prices for both edible oils and meals.

The results are presented in the summary sheet n° 2.

The IRR is very sensitive to selling price of products since it reaches almost 22 %.

VI.4.2. - Sales prices of seeds

Local prices of oil seeds

Total 37 800 '000 Z $ for the proposed project at full capacity. They are detailed as following :

Cottonseed	338
Soyabeans	576
Sunflower	534*

* Figures from 1989/1990

Considering local prices versus international prices for oilseeds, it seems suitable to forces increase of local oilseeds prices for the coming years within a reasonable margin, we have mixed increase of oilseeds of 10 % since they represent all most 60 % of all productions costs. With an increase edible oil price of 6 %. The sensitivity analysis conducted, gives the results presented in the summary sheet n° 3.

The IRR is very sensitive to prices increase and reaches 17 %.

VI.5 - CONCLUSIONS

The project financial and economic interests are summarized in the following conclusions.

Financially :

Interest rate of return

As mentioned in the summary sheet n° 1 the IRR for the project is about 15 % which is a positive indicator and should foster the implementation of the project.

Pay-back period

The pay back period when looking at schedule n° 7 (cash flow tables) is 7 years.

Economically :

The sensitivity analysis conducted both on edible oil price and on oil seeds prices gives the following results :

- Edible oil price increase of 10 % IRR is all most equal to 22 %,
- Oilseeds price increase of 10 % with an increase of 6 % for edible oil prices, the IRR is equal to 17 %.

Other economic aspects have to be considered :

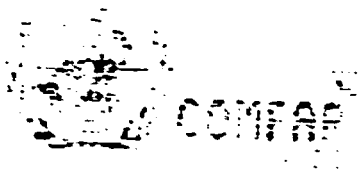
At the national level :

- The project will lead to employ 338 new people (327 workers and 11 staff employees),
- In the medium term the project will enable to meet the country's demand in edible oil with an additional production of 15,000 T of edible oil and to develop intra-PTA trade through the export of meals with over 40,000 T of meals produced.

At the local level :

- The project will enable the involvement of the CMB in the whole cotton subsector (downstream activity).

ANNEX 1



SUMMARY SHEET N°1

COMFAR 3.1 - INTER D. ABIDJAN, IVOIRE, FRANCE

Multipurpose oil expressing factory
15.5.1991
Exchange rate end 1990 1US$=2.562$

3 year s: of construction. 15 years of production
Currency conversion rates:
Foreign currency 1 unit = 1.0000 units accounting currency
Local currency 1 unit = 1.0000 units accounting currency
Accounting currency: Thousands Zimbabwe Dollars

Total initial investment during construction phase

fixed assets:	51993.00	61.597 % foreign
current assets:	2298.00	100.000 % foreign
total assets:	54191.00	62.490 % foreign

Source of funds during construction phase

equity & grants:	21367.00	3.000 % foreign
foreign loans :	43520.00	
local loans :	[illegible]	
total funds :	64587.00	67.382 % foreign

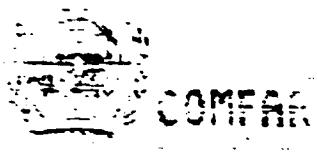
Cashflow from operations

Year:	5	6	7
operating costs:	66732.00	66732.00	66732.00
depreciation :	3453.53	3453.53	3453.53
interest :	3092.36	2585.84	2328.67
production costs	73277.89	72771.37	72214.20
thereof foreign	10.71 %	10.09 %	9.39 %
total sales :	84732.59	84732.59	84732.59
gross income :	11454.70	11961.22	12518.39
net income :	11454.70	11961.22	12518.39
cash balance :	3843.02	3843.02	3843.02
net cashflow :	18000.58	18000.58	18000.58

Net Present Value at: 15.00 % = -942.54
Internal Rate of Return: 14.74 %
Return on equity1: 20.98 %
Return on equity2: 16.61 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working capital requirements	Source of finance



---------- COMFAR 3.0 - INTER G. DIBBERVOIR, FRANCE -----

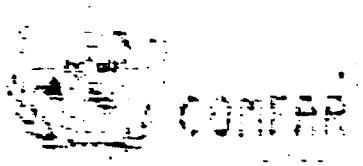
Total Initial Investment

Thousands Zimbabwe Dollars

Year	1992	1993
Fixed investment costs		
Land, site preparation, development	1193.000	0.000
Buildings and civil works	8597.000	8597.000
Auxiliary and service facilities	0.000	0.000
Incorporated fixed assets	3326.000	3159.000
Plant machinery and equipment	4290.000	34308.000
Total fixed investment costs	16343.000	43064.000
Pre-production capital expenditures	451.000	4435.000
Net working capital	326.000	1572.000
Total initial investment costs	18120.000	46071.000
Of it foreign, in %	43.466	69.872

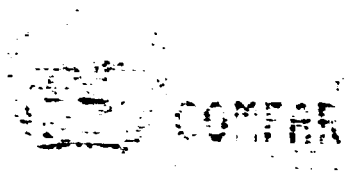
Total Current Investment in Thousands Zimbabwe Dollars

Year	1994	1995	1996
Fixed investment costs			
Land, site preparation, development	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000
Preproduction capital expenditures	0.000	0.000	0.000
Working capital	4873.134	4784.455	3234.643
Total current investment costs	4873.134	4784.455	3234.643
Of it foreign, %	4.911	4.266	6.498



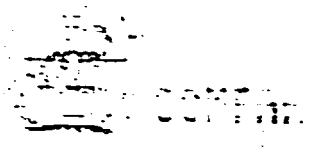
Total Production Costs in Thousands Zimbabwe Dollars

Year	1994	1995	1996	1997	1998
% of nom. capacity single product).	0.000	0.000	0.000	0.000	0.000
Raw material	12474.000	23448.000	37800.000	37800.000	37800.000
Other raw materials	6134.000	12288.000	19739.000	19739.000	19739.000
Utilities	187.000	155.000	193.000	193.000	193.000
Energy	663.000	792.000	990.000	990.000	990.000
Labour, direct	4511.000	5053.000	5738.000	5738.000	5738.000
Repair, maintenance	138.000	309.000	425.000	425.000	425.000
Spares	240.000	614.000	880.000	880.000	880.000
Factory overheads	353.000	430.000	717.000	717.000	717.000
Factory costs	24846.000	49169.000	65532.000	65532.000	65532.000
Administrative overheads	0.000	0.000	0.000	0.000	0.000
Indir. costs, sales and distribution	196.000	792.000	1200.000	1200.000	1200.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	3453.530	3453.530	3453.530	3453.530	3453.530
Financial costs	4352.000	4352.000	3971.444	3552.832	3092.359
Total production costs	33047.530	57766.530	74156.980	73738.360	73277.890
Costs per unit single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	22.897	14.413	11.769	11.268	10.710
Of it variable.%	0.000	0.000	0.000	0.000	0.000
Total labour	4511.000	5053.000	5738.000	5738.000	5738.000



Total Production Costs in Thousand Lincsowe Dollars

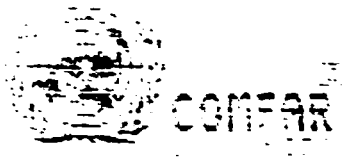
Year	1999	2000	2001	2002	2003- 6
% of cap capacity single product	1.000	1.000	1.000	1.000	1.000
Raw material 1	37800.000	37800.000	37800.000	37800.000	37800.000
Other raw materials	15739.000	15739.000	15739.000	15739.000	15739.000
Utilities	193.000	193.000	193.000	193.000	193.000
Energy	990.000	990.000	990.000	990.000	990.000
Labour, direct	5788.000	5788.000	5788.000	5788.000	5788.000
Repair, maintenance	425.000	425.000	425.000	425.000	425.000
Spares	880.000	880.000	880.000	880.000	880.000
Factory overheads	717.000	717.000	717.000	717.000	717.000
Factory costs	65532.000	65532.000	65532.000	65532.000	65532.000
Administrative overheads	0.000	0.000	0.000	0.000	0.000
Distr. costs, sales and distribution	1200.000	1200.000	1200.000	1200.000	1200.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	3453.530	3453.530	3453.530	3453.530	593.730
Financial costs	2585.833	2028.666	1415.777	741.598	0.000
Total production costs	72771.370	72214.200	71601.300	70927.130	67325.730
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	10.039	9.395	8.619	7.751	8.815
Of it variable,%	0.000	0.000	0.000	0.000	0.000
Total labour	5788.000	5788.000	5788.000	5788.000	5788.000



Net Working Capital in Thousands Diwanee Dollars

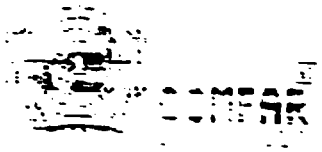
Year			1994	1995	1996	1997-2010
Coverage	adc	coto				
Current assets &						
Accounts receivable	32	10.0	2070.500	4097.417	5461.000	5461.000
Inventory and materials	21	17.0	3301.750	5672.250	7141.833	7141.833
Energy	15	24.0	27.208	38.000	41.250	41.250
Spares	56	6.5	53.167	84.583	135.833	135.833
Work in progress	10	37.0	567.842	1324.505	1759.483	1759.483
Finished products	30	12.0	2070.500	4097.417	5461.000	5461.000
Cash in hand	32	12.0	450.667	533.833	550.833	550.833
Total current assets			8241.633	16053.000	20651.233	20651.233
Current liabilities and						
Accounts payable	30	12.0	2070.500	4097.417	5461.000	5461.000
Net working capital			7171.133	11955.583	15190.233	15190.233
Increase in working capital			4870.133	4784.450	3234.648	1.000
Net working capital, local			4633.820	9214.166	12238.640	12238.640
Net working capital, foreign			2537.314	2741.422	3951.594	3951.594

Note: adc = minimum days of coverage ; coto = coefficient of turnover .



Source of Finance, construction in Thousands Zimbabwe Dollars

Year	1992	1993
Equity, ordinary ..	18500.000	2567.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	0.000	43520.000
Loan B, foreign..	0.000	0.000
Loan C, foreign .	0.000	0.000
Loan A, local....	0.000	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
Total loan	0.000	43520.000
Current liabilities	0.000	0.000
Bank overdraft	0.000	0.000
Total funds	18500.000	46087.000



Source of Finance, production ... Thousands Lumakwe Dollars

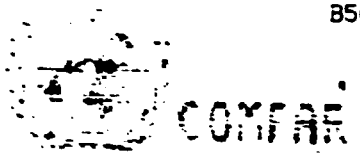
Year ...	1994	1995	1996	1997	1998	1999
Equity, ordinary	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign	0.000	-3805.563	-4186.119	-4604.731	-5065.204	-5571.725
Loan B, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, foreign	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, local	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local	0.000	0.000	0.000	0.000	0.000	0.000
Total loan ...	0.000	-3805.563	-4186.119	-4604.731	-5065.204	-5571.725
Current liabilities	2273.501	3226.917	3562.583	0.000	0.000	0.000
Lease overdraft	2730.621	5167.397	-7508.375	-4093.242	0.000	0.000
Total funds ...	5004.121	4409.350	-8130.910	-8697.973	-5065.204	-5571.725

Multipurpose oil expressing factory --- 0.0133.

Source of Finance, production ... Thousands Lumakwe Dollars

Year ...	2000	2001	2002
Equity, ordinary	0.000	0.000	0.000
Equity, preference	0.000	0.000	0.000
Subsidies, grants	0.000	0.000	0.000
Loan A, foreign	-6128.856	-6741.786	-7415.977
Loan B, foreign	0.000	0.000	0.000
Loan C, foreign	0.000	0.000	0.000
Loan A, local	0.000	0.000	0.000
Loan B, local	0.000	0.000	0.000
Loan C, local	0.000	0.000	0.000
Total loan	-6128.856	-6741.786	-7415.977
Current liabilities	0.000	0.000	0.000
Lease overdraft	0.000	0.000	0.000
Total funds	-6128.856	-6741.786	-7415.977

Multipurpose oil expressing factory --- 0.0133



Cashflow Tables, construction in Thousand Zimbabwe Dollars

Year	1992	1993
Total cash inflow	18530.000	46038.000
Financial resources	18530.000	46038.000
Sales, net of tax	0.000	0.000
Total cash outflow	18120.000	46071.000
Total assets	18120.000	43835.000
Operating costs	0.000	0.000
Cost of finance	0.000	2176.000
Repayment	0.000	0.000
Corporate tax	0.000	60.000
Dividends paid	0.000	0.000
Surplus / deficit	410.000	-33.000
Cumulated cash balance	410.000	377.000
Inflow, local	18530.000	2567.000
Outflow, local	10244.000	13374.000
Surplus / deficit	8286.000	-10807.000
Inflow, foreign	0.000	43520.000
Outflow, foreign	7876.000	32697.000
Surplus / deficit	-7876.000	10823.000
Net cashflow	-18120.000	-43835.000
Cumulated net cashflow	-18120.000	-62015.000

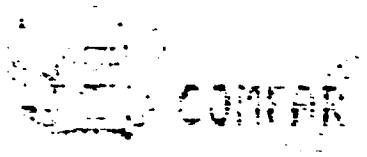
[redacted] COMPAS

COMPAS 3.1 - INTER G. [illegible] FRANCE

Cashflow tables, production in Thousands Lebanese Dollars

Year	1994	1995	1996	1997	1998	1999
Total cash inflow	20032.810	57343.940	88096.170	84732.530	84732.530	84732.530
Financial resources	2370.501	2325.917	1363.583	0.000	0.000	0.000
Sales, net of tax	17661.510	55323.330	84732.530	84732.530	84732.530	84732.530
Total cash outflow	26570.540	54962.340	73521.410	74889.590	74889.570	74889.570
Total assets	5976.624	5844.372	4632.238	0.000	0.000	0.000
Operating costs	35242.300	49961.300	66732.010	66732.010	66732.010	66732.010
Cost of finance	4352.000	4352.000	3971.444	3552.832	3092.359	2585.839
Repayment	0.000	3835.563	4196.119	4604.731	5065.204	5571.725
Corporate tax	0.000	0.000	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus / deficit	-6538.625	-7012.996	5574.375	9843.008	9843.016	9843.016
Cumulated cash balance	-6142.625	-13155.620	-6581.246	3261.762	13104.780	22947.790
Inflow, local	65335.770	49843.340	73843.500	72545.090	72545.030	72545.090
Outflow, local	31011.910	54886.020	63654.900	64298.010	64298.010	64298.000
Surplus / deficit	-5076.137	-5042.677	5188.602	8247.074	8247.078	8247.082
Inflow, foreign	4096.242	8106.301	12252.670	12187.500	12187.500	12187.500
Outflow, foreign	5558.730	10076.320	10866.900	10591.560	10591.560	10591.560
Surplus / deficit	-1462.488	-1970.021	1385.768	1595.940	1595.939	1595.939
Net cashflow	-2186.623	1144.565	14731.940	18000.580	18000.580	18000.580
Cumulated net cashflow	-64201.630	-63057.060	-48325.130	-30324.550	-12323.970	5676.609

Multipurpose oil expressing factory --- 15.3.1991



---------- COMFAR 3.1 - INTER G. GUINGUETTE, FRANCE -----

Cashflow tables, production in Thousands Zimbacwe Dollars

Year	2000	2001	2002	2003	2004	2005
Total cash inflow	84732.590	84732.590	84732.590	84732.590	84732.590	84732.590
Financial resources	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	84732.590	84732.590	84732.590	84732.590	84732.590	84732.590
Total cash outflow	74889.570	81455.210	81792.310	75435.440	75435.440	75435.440
Total assets	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	66732.010	66732.010	66732.010	66732.010	66732.010	66732.010
Cost of finance	2028.666	1415.777	741.593	0.000	0.000	0.000
Repayment	6125.895	6741.786	7415.977	0.000	0.000	0.000
Corporate tax	0.000	6565.641	6902.730	8703.426	8703.426	8703.426
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000
Surplus / deficit	9843.019	3277.375	2940.273	9297.148	9297.148	9297.148
Cumulated cash balance	32790.810	36068.180	39008.460	48305.610	57602.750	66899.910
Inflow, local	72545.090	72545.090	72545.090	72545.090	72545.090	72545.090
Outflow, local	64238.000	70963.640	71200.730	73001.440	73001.440	73001.440
Surplus / deficit	8247.082	1581.445	1344.352	-456.352	-456.352	-456.352
Inflow, foreign	12187.500	12187.500	12187.500	12187.500	12187.500	12187.500
Outflow, foreign	10591.560	10591.560	10591.570	2434.000	2434.000	2434.000
Surplus / deficit	1595.940	1595.940	1595.923	9753.503	9753.503	9753.503
Net cashflow	13000.580	11434.940	11097.850	9297.152	9297.152	9297.152
Cumulated net cashflow	23677.190	35112.130	46209.970	55507.130	64804.280	74101.430

Cashflow tables, production in Thousands Zimbabwe Dollars

Year	2006	2007	2008
Total cash inflow	84732.590	84732.590	84732.590
Financial resources	0.000	0.000	0.000
Sales, net of tax	84732.590	84732.590	84732.590
Total cash outflow	75435.440	75435.440	75435.440
Total assets	0.000	0.000	0.000
Operating costs	66732.010	66732.010	66732.010
Cost of finance	0.000	0.000	0.000
Repayment	0.000	0.000	0.000
Corporate tax	8703.426	8703.426	8703.430
Dividends paid	0.000	0.000	0.000
Surplus (deficit)	9297.148	9297.148	9297.148
Cumulated cash balance	76137.050	85434.200	94731.350
Inflow, local	72545.090	72545.090	72545.090
Outflow, local	73001.440	73001.440	73001.440
Surplus (deficit)	-456.352	-456.352	-456.352
Inflow, foreign	12187.500	12187.500	12187.500
Outflow, foreign	2434.000	2434.000	2434.000
Surplus (deficit)	9753.503	9753.503	9753.503
Net cashflow	9297.152	9297.152	9297.146
Cumulated net cashflow	83398.580	92695.730	101992.900

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value	10378.15	at	15.00 %
Internal Rate of Return (IRR1) ..	20.98 %		

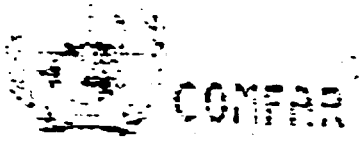
b) Net Worth versus Net cash return:

Net present value	3645.01	at	15.00 %
Internal Rate of Return (IRR2) ..	16.61 %		

c) Internal Rate of Return on total investment:

Net present value	-342.54	at	15.00 %
Internal Rate of Return (IRR) ..	14.74 %		

Net Worth = Equity paid plus reserves



COMFAS 2.1 - INTER G. COUREVOIE, FRANCE

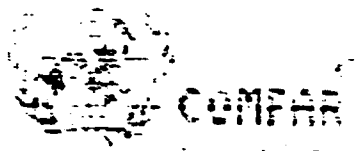
Net Income Statement in Thousands Zimbabwe Dollars

Year	1994	1995	1996	1997	1998
Total sales, incl. sales tax	27961.510	55923.020	84732.590	84732.590	84732.590
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	27961.510	55923.020	84732.590	84732.590	84732.590
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	25695.511	52414.533	70185.530	70185.530	70185.530
Operational margin	2265.980	2508.492	14547.060	14547.060	14547.060
As % of total sales	8.105	4.486	17.168	17.168	17.168
Cost of finance	4352.000	4352.000	3971.444	3552.832	3032.359
Gross profit	-5086.020	-1843.508	10575.610	10994.230	11454.700
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	-5086.020	-1843.508	10575.610	10994.230	11454.700
Tax	0.000	0.000	0.000	0.000	0.000
Net profit	-5086.020	-1843.508	10575.610	10994.230	11454.700
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-5086.020	-1843.508	10575.610	10994.230	11454.700
Accumulated undistributed profit	-5086.020	-6929.527	3646.082	14640.310	26095.000
Gross profit, % of total sales	-18.189	-3.297	12.481	12.975	13.519
Net profit, % of total sales	-18.189	-3.297	12.481	12.975	13.519
ROE, Net profit, % of equity	-24.142	-8.751	50.200	52.187	54.373
ROI, Net profit+interest, % of invest.	-1.097	3.497	19.394	19.394	19.394

Multipurpose oil expressing factory --- 15.3.1991

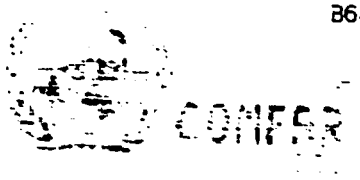
Net Income Statement in Thousands Zimbabwe Dollars

Year	1999	2000	2001	2002	2003
Total sales, incl. sales tax	94732.593	94732.593	94732.593	94732.593	94732.593
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	94732.593	94732.593	94732.593	94732.593	94732.593
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	70185.530	70185.530	70185.530	70185.530	67325.730
Operational margin	24547.063	24547.063	24547.063	24547.063	27406.863
As % of total sales	27.168	27.168	27.168	27.168	28.943
Cost of finance	2585.839	2028.666	1415.777	741.538	0.000
Gross profit	21961.223	22518.398	23131.286	23805.460	27406.863
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	21961.223	22518.398	23131.286	23805.460	27406.863
Tax	0.000	0.000	6565.641	6902.730	8703.426
Net profit	21961.223	22518.398	6565.641	6902.730	8703.426
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	21961.220	22518.398	6565.641	6902.730	8703.426
Accumulated undistributed profit	39056.220	50574.610	57140.250	64042.980	72746.410
Gross profit, % of total sales	24.116	24.774	25.497	26.293	28.943
Net profit, % of total sales	24.116	24.774	7.749	8.146	10.272
ROE. Net profit, % of equity	56.777	59.422	31.166	32.766	41.313
ROI. Net profit+interest, % of invest.	19.396	19.394	10.641	10.791	11.603



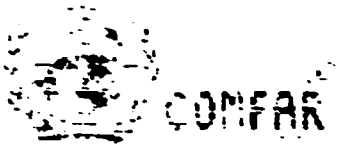
Net Income Statement in Thousands Zimbabwe Dollars

Year	2004	2005	2006	2007	2008
Total sales, incl. sales tax	84732.590	84732.590	84732.590	84732.590	84732.590
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	84732.590	84732.590	84732.590	84732.590	84732.590
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	67325.730	67325.730	67325.730	67325.730	67325.730
Operational margin	17406.850	17406.850	17406.850	17406.850	17406.860
As % of total sales	20.543	20.543	20.543	20.543	20.543
Cost of finance	0.000	0.000	0.000	0.000	0.000
Gross profit	17406.850	17406.850	17406.850	17406.850	17406.860
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	17406.850	17406.850	17406.850	17406.850	17406.860
Tax	8703.426	8703.426	8703.426	8703.426	8703.430
Net profit	8703.426	8703.426	8703.426	8703.426	8703.430
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	8703.426	8703.426	8703.426	8703.426	8703.430
Accumulated undistributed profit	81449.830	90153.250	98856.670	107560.100	116263.500
Gross profit, % of total sales	20.543	20.543	20.543	20.543	20.543
Net profit, % of total sales	10.272	10.272	10.272	10.272	10.272
ROE. Net profit, % of equity	41.313	41.313	41.313	41.313	41.313
ROI. Net profit+interest, % of invest.	11.603	11.603	11.603	11.603	11.603



Projected Balance Sheets, construction in Thousand Zimbabwe Dollars

Year	1992	1993
Total assets	18500.000	94587.000
Fixed assets, net of depreciation	1.000	17394.000
Construction in progress	17294.000	44439.000
Current assets	706.000	2334.000
Cash, bank	0.000	1.000
Cash surplus, finance available	200.000	196.000
Loss carried forward	0.000	1.000
Loss	0.000	1.000
Total liabilities	18500.000	94587.000
Equity capital	18500.000	21067.000
Reserves, retained profit	0.000	1.000
Profit	0.000	1.000
Long and medium term debt	0.000	43520.000
Current liabilities	0.000	0.000
Bank overdraft, finance required	0.000	1.000
Total debt	0.000	43520.000
Equity, % of liabilities	100.000	22.618



Projected Balance Sheets, Production in Thousands Zimbabwe Dollars

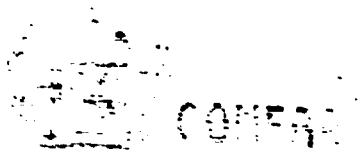
Year	1994	1995	1996	1997	1998
Total assets	73930.000	78224.440	78213.000	72091.000	78481.000
Fixed assets, net of depreciation	59438.672	54385.840	51532.410	48178.480	44625.340
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	8420.367	15585.172	20130.430	20130.430	20130.430
Cash, bank	450.667	550.833	550.833	550.833	550.833
Cash surplus, finance available	0.000	0.000	0.000	2261.785	10124.820
Loss carried forward	0.000	5186.000	6929.527	0.000	0.000
Loss	5186.000	1843.508	0.000	0.000	0.000
Total liabilities	73930.000	78224.440	78213.000	72091.000	78481.000
Equity capital	21067.000	21067.000	21067.000	21067.000	21067.000
Reserves, retained profit	0.000	0.000	0.000	3646.082	14640.313
Profit	0.000	0.000	12575.613	12394.230	12454.700
Long and medium term debt	43520.000	39714.440	35528.320	31323.590	25359.390
Current liabilities	2970.500	4087.417	5461.000	5461.000	5461.000
Bank overdraft, finance required	6142.625	13155.620	6531.242	0.000	0.000
Total debt	51733.130	56957.480	47570.560	36784.590	31319.390
Equity, % of liabilities	28.938	26.937	26.935	29.222	26.843

Multipurpose oil expressing factory --- 15.3.1991

Projected Balance Sheets, Production in Thousands Zimbabwe Dollars

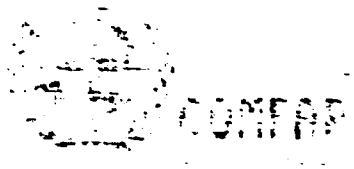
Year	1999	2000	2001	2002	2003
Total assets	84870.830	91260.380	91084.230	90570.980	89274.410
Fixed assets, net of depreciation	41171.810	37718.280	34264.750	30811.220	30217.430
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	20100.400	20100.400	20100.400	20100.400	20100.400
Cash, bank	650.833	650.833	650.833	650.833	650.833
Cash surplus, finance available	22947.840	32790.860	36068.250	39008.540	40305.680
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	84870.820	91260.380	91084.230	90570.980	89274.410
Equity capital	21067.000	21067.000	21067.000	21067.000	21067.000
Reserves, retained profit	29093.000	29093.220	30574.810	31740.220	31902.980
Profit	11361.220	12518.330	6565.641	5302.710	5703.426
Long and medium term debt	20286.660	14157.770	7415.979	0.003	0.003
Current liabilities	5461.000	5461.000	5461.000	5461.000	5461.000
Bank overdraft, finance required	3.000	0.000	0.000	0.000	0.000
Total debt	25747.660	19618.770	12876.980	5461.002	5461.002
Equity, % of liabilities	24.822	23.084	23.129	23.250	21.221

Multipurpose oil expressing factory --- 15.3.1991



Projected Balance Sheets, Production in Thousand Zimbabwe Dollars

Year	2004	2005	2006	2007	2008
Total assets	107977.800	116581.300	125384.700	134088.100	142791.500
Fixed assets, net of depreciation	29633.760	29030.300	28436.300	27942.570	27248.840
Construction in progress	0.000	0.000	0.000	0.000	0.000
Current assets	88100.400	88100.400	88100.400	88100.400	88100.400
Cash, bank	650.833	650.833	650.833	650.833	650.833
Cash surplus, finance available	87502.840	86899.360	86187.140	85494.300	84791.453
Loss carried forward	0.000	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000	0.000
Total liabilities	107977.800	116581.300	125384.700	134088.100	142791.500
Equity capital	21067.000	21067.000	21067.000	21067.000	21067.000
Reserves, retained profit	72746.410	81449.830	90153.250	98856.670	107560.100
Profit	8703.426	8703.426	8703.426	8703.426	8703.430
Long and medium term debt	0.003	0.003	0.003	0.003	0.003
Current liabilities	5461.000	5461.000	5461.000	5461.000	5461.000
Bank overdraft, finance required	0.000	0.000	0.000	0.000	0.000
Total debt	5461.002	5461.002	5461.002	5461.002	5461.002
Equity, % of liabilities	19.510	19.055	16.802	15.711	14.754



SUMMARY SHEET N°2

Multipurpose oil expressing factory
15.3.1991
Exchange rate Dec 1990 1US$=2.5621$

2 year s. of construction. 15 years of production
currency conversion rates:
Foreign currency 1 unit = 1.0000 units accounting currency
Local currency 1 unit = 1.0000 units accounting currency
accounting currency: In Thousands Zimbabwe Dollars

Total initial investment during construction phase

fixed assets:	51393.00	61.397 % foreign
current assets:	2738.00	100.000 % foreign
total assets:	54131.00	62.430 % foreign

Source of funds during construction phase

equity & grants:	21067.00	0.000 % foreign
foreign loans :	43520.00	
local loans :	0.00	
total funds :	54537.00	67.382 % foreign

Cashflow from operations

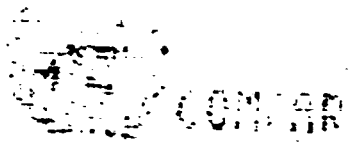
Year:	4	5	6
operating costs:	66732.00	66732.00	66732.00
depreciation :	3453.53	3453.53	3453.53
interest :	3552.83	3032.36	2585.84
production costs	73738.36	73277.89	72771.37
thereof foreign	11.27 %	10.71 %	10.09 %
total sales :	92000.55	92000.55	92000.55
gross income :	18262.20	18722.66	19229.19
net income :	18262.20	18722.66	19229.19
cash balance :	17110.98	17110.98	17110.98
net cashflow :	25268.55	25268.55	25268.55

Net Present Value at: 15.00 % = 25375.03
Internal Rate of Return: 21.71 %
Return on equity1 33.58 %
Return on equity2: 28.23 %

Index of Schedules produced by COMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

SUMMARY SHEET N°3



CONFAR 2.1 - INTER G. CONSEILS, FRANCE

Multipurpose oil expressing factory
10.3.1991
Exchange rate End 1990 US$=2.562$

3 year's of construction. 15 years of production
Currency conversion rates:
Foreign currency 1 unit = 1.0000 units accounting currency
Local currency 1 unit = 1.0000 units accounting currency
accounting currency: in Thousands Zimbabwe Dollars

Total initial investment during construction phase

fixed assets:	61993.00	61.037 % foreign
current assets:	2238.00	100.000 % foreign
total assets:	64191.00	62.490 % foreign

Source of funds during construction phase

equity & grants:	21057.00	1.000 % foreign
foreign loans :	43529.00	
local loans :	1.00	
total funds :	64587.00	67.382 % foreign

Cashflow from operations

Year:	4	5	6
operating costs:	70512.00	70512.00	70512.00
depreciation :	3453.53	3453.53	3453.53
interest :	3552.83	3092.36	2585.84
production costs	77518.37	77057.89	76551.38
thereof foreign	10.72 %	10.18 %	9.59 %
total sales :	89084.40	89084.40	89084.40
gross income :	11566.03	12026.51	12533.02
net income :	11566.03	12026.51	12533.02
cash balance :	10414.82	10414.83	10414.83
net cashflow :	18572.39	18572.39	18572.39

Net Present Value at: 15.00 % = 7937.28
Internal Rate of Return: 17.08 %
Return on equity1: 25.22 %
Return on equity2: 20.30 %

Index of Schedules produced by CONFAR

Total initial investment
Total investment during production
Total production costs
Working Capital requirements
Cashflow Tables
Projected Balance
Net income statement
Source of finance

PART C - GRAIN MILLING SECTOR

TABLE OF CONTENTS

	Page
1. - PROJECT BACKGROUND	C4
1.1 - PROJECT HISTORY	C4
1.2 - CURRENT STATUS	C4
2. - MARKET SURVEY	C8
2.1 - LOCAL CONSUMPTION	C8
2.2 - SUBREGIONAL MARKET	C9
2.3 - RAW MATERIALS	C11
3. - INDUSTRY AND PLANT SIZE AND CAPACITY	C16
3.1 - INDUSTRY SIZE AND CAPACITY	C16
3.2 - PILOT PROJECT LOCATION	C20
4. - PROJECT ENGINEERING	C22
4.1 - PRELIMINARY DETERMINATION OF SCOPE OF PROJECT	C22
4.2 - TECHNOLOGY AND APPLIED PROCESSES	C22
4.3 - CIVIL ENGINEERING WORKS	C26
4.4 - TOTAL INVESTMENT COSTS	C26
4.5 - PROJECT IMPLEMENTATION SCHEDULING AND LAYOUT	C27
5. - PLANT ORGANIZATION	C30
5.1 - PLANT PRODUCTION	C30
5.2 - PLANT MANPOWER	C31
6. - FINANCIAL ANALYSIS	C36
6.1 - INTRODUCTION	C36
6.2 - PROJECT FINANCING	C36
6.3 - FINANCIAL STATEMENTS	C39
6.4 - CONCLUSIONS	C45

1 - PROJECT BACKGROUND

1 - PROJECT BACKGROUND

1.1 - PROJECT HISTORY

The expert during his technical mission has identified the need for a small scale project taking into account the following local conditions :

- potential capacities of industrial maize milling are much higher than requirements ;
- milling in rural area is carried out by small scale industry and would be financed under pilot program by international organizations ;
- due to poor condition of the road network maize milling is located close to consumption regional sectors ;
- poor marketing facilities.

Consequently the identified project has a low milling capacity and is decidated to local consumption in villages.

1.2 - CURRENT STATUS

Domestic milling capacities were updated during the expert mission and the expert set up the project capacity at 2 to 3 000 T/year which corresponds to the minimum size of such a small scale project.

The expert also studied the opportunity to double the capacity for maize milling and to integrate sorghum milling. Therefore, a second option was selected with a production capacity of 5 000 to 6 000 T/y.

The reasons of implementing such a project are as follows :

- Potential capacities of industrial wheat and maize milling and paddy dehulling are much higher than requirements, if the industrial equipment used for this type of activity is refurbished and modernized. This concerns the implementation of the Economic Recovery Programme Policy and obtaining the financial and technical means, provided for in the World Bank and UNDP aid programs.

- Milling in rural areas is carried out by Small Scale Industries (SSI) and households. It applies to maize, in competition with NMC and to millet and sorghum, for almost the whole productions used for self consumption and women's small trade. This sector receives confirmed and efficient aids of SIDO which noticeable example should be reminded and developed. This was acknowledged by UNDP, who is envisaging to give financial support to SSIs and to village women organizations.

- In the present bad condition of the road network, which improvement will take time, in spite of the measures taken by W.B. and taking into account the erratic price fluctuations in the present experimentation phase, apparently maize milling close to supply, to consumption regional centres and to local transportation is possible.

Consequently it is worthwhile identifying a project which could be reproduced in various areas of the country to meet local populations needs through semi-industrial production of mix flour.

The consultant will identify required equipment to process sorghum as well as maize, and will study profitability of a medium scale project.

Hypotheses of the prefeasibility study :

The identified pilot project could operate at potential two levels of production with maize flour only as well as with mix flour.
The production capacity is estimated at 2 to 3000 T/year for the basic option, at 5000 T/year for the double option.

With additional purchase of dehulling equipment due to sorghum high level of tannin contents, the unit will be able to process maize and sorghum flour.

Since major sorghum production is marketed in the rural areas, it was very difficult to assess raw material prices. Therefore, selected prices for both grains were assumed based on available information.

Conclusions of the pre-feasibility study :

Due to the reasons mentioned above, the project study was essentially concentrated on identifying production costs as well as their breakdown. Secondly, it was attempted to demonstrate the project profitability according to selected hypotheses.

Profitability of the project is sustainable with the higher level of production (5000 T/year). With maize flour production, the IRR totals 22% which is quite satisfactory based on a 11 years period.

With mix flour production the IRR remains insufficient (6%) unless sorghum flour price tends to be similar to maize flour price, in this case the IRR totals 14%.

2 - MARKET SURVEY

2 - MARKET SURVEY

2.1 - LOCAL CONSUMPTION

2.1.1 - Current local consumption

The vast majority of Tanzania's grain is consumed in the rural areas by the growers families. Only a very small percentage finds its way into the commercial or parastatal mills.

Grain thereby processed is sold as finished products in the urban areas. It was not possible to ascertain the sales levels of the private mills but table below gives an indication of the market pertaining to the National Milling Corporation (NMC), the parastatal that is concerned nationwide with milling. Given the underlying trends beginning to run through Tanzania's economy, it is reasonable to surmise that the private sector sales are larger than these.

NMC Sales of Maize and other cereals products (1000 Tonnes)

YEAR	MAIZE	RICE WHEAT & SEMBE
1982/83	19	300
1983/84	58	289
1984/85	95	239
1985/86	87	142
1986/87	46	123
1987/88	88	169
Mean 1982/88	**65**	**210**

Source : Marketing Development Bureau

The greatest demand is for maize based products while wheat tends to be associated with the luxury end of the market.

Due to reason of palatability of flours which include sorghum and millet, there is little or no market.

2.2 - SUBREGIONAL MARKET

Due to the small scale of the project, it is not relevant to consider flour trade between PTA countries linked with this implementation. Statistics data available from PTA sources, identify SOMALIA as a potential importer of flour and meal but major imports within PTA countries are raw material imports (see table next page).

TABLE 3 GRAIN INTRA-PTA TRADE

EXPORTING COUNTRIES TRADE IN TONS

IMPORTING COUNTRIES	ETHIOPIA	MOZAMBIQUE	SOMALIA	TANZANIA
ORIGINS				
Maize unmilled				
KENYA	3,700	40,820		
MALAWI		3,047		1
SWAZILAND		2,800		36
TANZANIA		1,200		
ZIMBABWE	29,000	43,200		7
OTHER PTA COUNTRIES			15,480	
NON IDENTIFIED				
Wheat unmilled				
OTHER COUNTRIES	59,300			
Semolina, flour, and other preparation				
OTHER PTA COUNTRIES	10,500		55,700	
SWAZILAND		687		
ZIMBABWE		530		

Source: PTA Statistics (1985-1986-1987)

2.3 - RAW MATERIALS

2.3.1 - Raw material production

In Tanzania the most important raw materials for flour production are maize and wheat. Of secondary importance are sorghum and millet.

Maize is generally grown by smallholders and its production centres on the four Southern highland regions namely : Iringa, Mbeya, Rukwa, and Ruvuma and in the North in Arusha, Mwanza, Tabora and Shinyanga. Together these 8 areas produce 80% of the countries supply.

The regional breakdown of maize production is illustrated in the table next page for the 1980/81 and 1985/86 periods.

Sorghum can be grown in all areas of Tanzania but is more common in areas with marginal rainfall such as Dodoma, Singida, Tabora Millet is similarly distributed.

Historic production and import figures are given in the following pages.

Agricultural production is subject to the damage of the climate, so in periods of low rainfall, imports are necessary to match domestic consumer demand for finished products.

Throughout the period from 1980 until 1986, official purchases of maize and rice and wheat too were not sufficient to meet the demand from official consumer channels so imports were a necessity.

In the last three years larger harvest have depressed prices to level below official prices. Farmers would rather accept lower prices for immediate settlement by private traders than wait indefinitely for the higher official prices. This price-driven disincentive could result in smaller harvests in the coming years. This likelihood was also mentioned by a senior World Bank Official in Dar Es Salaam.

The efforts made by the Government to distribute red sorghum varieties, and specially the Serena variety, aim at intensifying this grain production in zones where rain level is between 500 and 800 mm. The Government wants, among other things, to encourage a 15% substitution of maize flour by sorghum flour, hoping that surplus will be used by cattle feed industries. At present, these industries are using large quantities of Sudan imported sorghum (white varieties with no acceptability problem). In order to explain the Government attitude, we should underline that, due to high transportation costs, these imports cannot be used for inner areas of the country. Therefore, within the present Tanzania framework, milling schemes should provide for sorghum production development in parallel with dehulling introduction.

Regional Breakdown of Maize Production in selected years

	1980/81		1985/86	
	Production '000 t	% of total	Production '000 t	% of total
	166	9%	212	10%
	300	16%	281	13%
	56	3%	54	3%
	236	13%	219	10%
	123	7%	108	5%
	29	2%	248	12%
	72	4%	213	10%
	201	11%	214	10%
	191	10%	185	9%
	656	36%	579	27%
TOTAL	1 839		2 128	

PRODUCTION OF MAIZE AND MILLET/SORGHUM (1000 Tonnes)

YEAR	MAIZE					SORGHUM/MILLET
	PRODUCTION	IMPORTS			EXPORTS	PRODUCTION
		COM	AID	TOTAL		
1976/77	1 664	34.6	7.0	41.6	-	244
1977/78	1 465	-	34.3	34.3	-	no data
1978/79	1 720	-	-	-	49.0	"
1979/80	1 726	32.5	-	32.5	28.0	"
1980/81	1 839	188.1	86.5	274.6	-	"
1981/82	1 654	27.5	207.1	234.6	-	"
1982/83	1 651	17.0	106.4	123.4	-	"
1983/84	1 939	125.1	69.2	194.3	-	no data
1984/85	2 093	110.9	17.6	128.5	-	760
1985/86	2 211	3.1	3.0	6.1	-	1 081
1986/87	2 359	85.0	8.8	93.8	-	922
1987/88	2 339	-	-	-	90.8	953
1988/89	*	*	*	*	*	700
mean 1984/89	2 250	50.0	7.4	57.4	22.7	883

* no data

Source : Marketing Development Bureau

3 - INDUSTRY AND PLANT SIZE AND CAPACITY

2.3.2 - Raw material prices

Producer prices

The producer pricing system did not seem to be satisfactory and from information gathered, prices were not high enough to incitate farmers to sell their crop surpluses.

From data collected, prices below are presented in the table below. It was attempted to forecast a regular price increase in order to assist grain production development.

Retail prices

Retail prices are fixed by the government.

Available maize retail prices are presented in the table below.

PRICES OF RAW MATERIAL AND PRODUCTS

		1984	1985	1986	1987	1988	1989	1990	1991	1992
RAW MATERIAL (current prices, Tsh/tonne)										
PRODUCER PRICES										
Maize grain	(1)	3 100	4 625	5 775	7 250	8 600	10 000	12 000	14 200	17 040
Wheat grain	(2)	3 750	5 250	6 600	8 100	9 675	11 675	22 500	35 200	
Sorghum, millet	(3)	2 500	3 500	4 400	5 400	6 300	6 925	7 625	8 738	10 224
RETAIL PRICES										
Maize grain	(4)	5 400	7 600	12 200	n.d.	n.d.	n.d.	n.d.	n.d.	
PRODUCTS .RETAIL PRICES (current prices, Tsh/tonne)										
Maize flour	(5)	8 000	13 750	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Wheat flour	(6)	14 500	17 200	25 150	n.d.	n.d.	n.d.	n.d.	n.d.	

3 - INDUSTRY AND PLANT SIZE AND CAPACITY

3.1 - INDUSTRY SIZE AND CAPACITY

* Grain Millers

The schema of the sector with indication of the grain processors, is given next page.

* National Milling corporation

The National Milling Corporation (NMC) is the most important purchaser and processor of grains in Tanzania. It is a large ponderous bureaucracy and has been the focus of considerable attention in the last few years. As a result of negotiations between the Government of Tanzania and the World Bank, precursive to the initiation of TANAA the NMC is intended to perform a much reduced role in Tanzania's flour sector. It is now intended to move towards a more commercial style of operation.

Notwithstanding this the NMC is expected to continue to have political dimensions, which in fact is not inappropriate as one of its functions is to assist in operating the strategic grain reserve, which itself is run as a trust administered by several ministries.

The NMC buys in grain at three price levels, the first is currently set at 26/- per kilogramme (cf private sector prices of around 18/-). This makes it rather uncompetitive, furthermore, the NMC uses credit for its purchases. Grain purchases made at this price go into the NMC raw material stockpiles. Storage facilities operated by the NMC are, strangely, generally adequate. Regular funigation takes place and the losses are within acceptible limits.

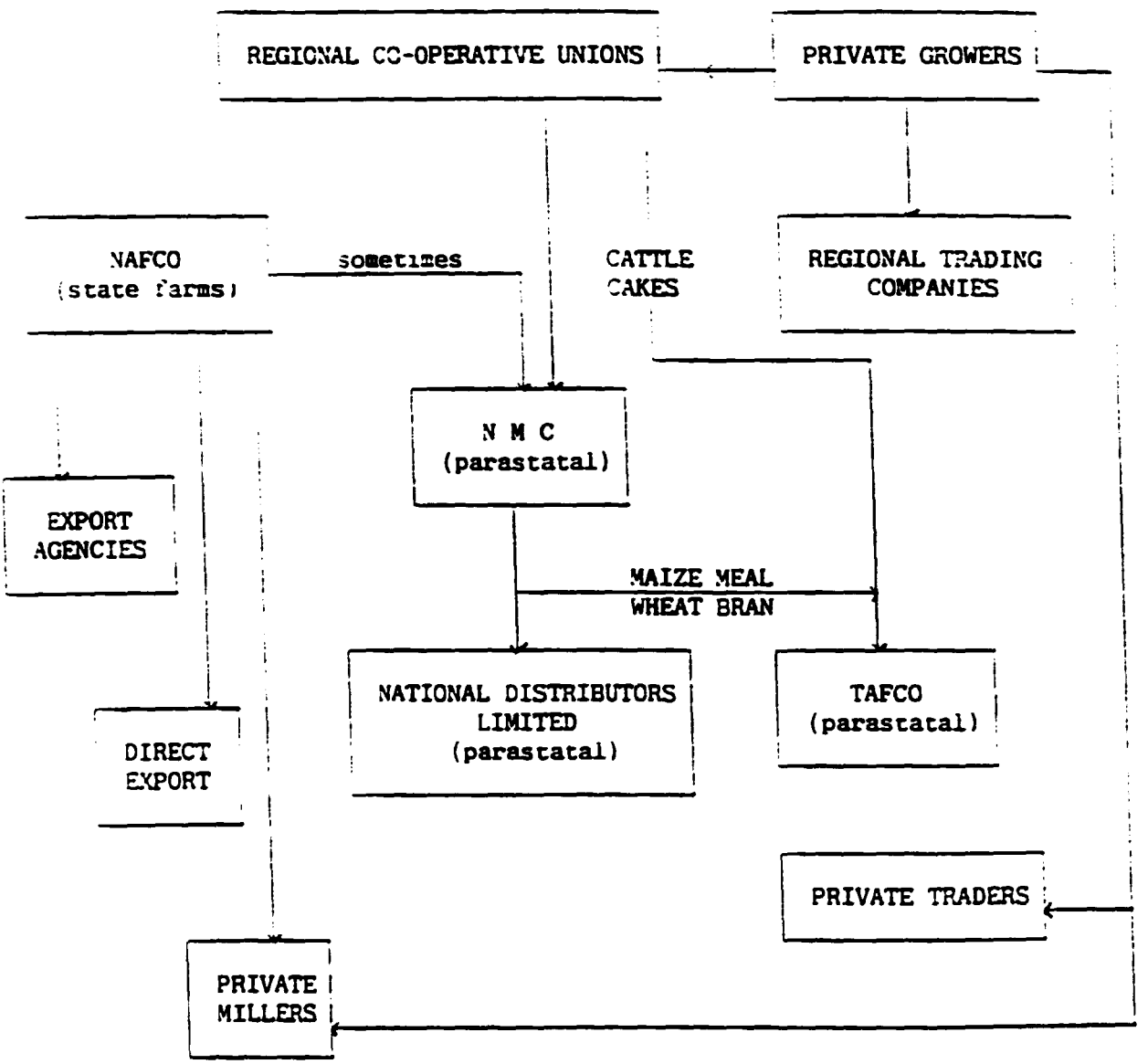
The second NMC price is that paid for grain which goes into the strategic grain reserve while the third price is set by the Ministry of Agriculture and is a sort of mysterious combination of grain reserve prices and theoretical export prices.

Like many other parastatals the NMC is very short of operating capital and is reported to sell of parts of the strategic grain reserve to finance its debts. Increasingly therefore, and despite governmental reservations, the private sector is beginning to assume ever increasing importance.

It must be stressed at this stage however, that the total tonnages of grains sold for parastatal or commercial milling are tiny in comparison with the amounts processed in the rural areas.

The announced reforms concerning industrial activities the company privatisation was not yet implemented, for lack of buyers offering required management and due to the need to modernize equipments.

SCHEMA OF THE SECTOR



In order to overcome the constraints of the development of the private sector it is stressed that the recently Investment Promotion Center (IPC) should be strengthened so that it can effectively create enabling environnment for private sector. Assistance would be needed for :

- Investment promotion with regards to attracting foreign investors.
- Training of entrepreneurs.
- Training in the preparation and evaluation of projects.

Meanwhile, NMC increased its milling power with the recent implementation of three maize milling units with a capacity of 120t/24h each, and five rice milling units with a processing capacity of 2t/h on paddy. Equipment was supplied by Buhler-Miag. The maize units have a unit cost of DM 3 million and are at the following development level:

IRINGA: Opening on July 24th

ARUSHA: Currently receiving equipment

DAR ES SALAM: Currently setting up equipment

Five rice mills are operational: two in the MWANZA region, two in the SHINYANGA zone and one in TABORA.

So the existing capacity of NMC has increased as such :

LOCATION	CAPACITIES (tm / year)		
	MAIZE	WHEAT	PADDY
ARUSHA	120	180	
DAR ES SALAAM	300	240	120
IRINGA	120		
ISHIANGA			240
TABRA			70
MWANZA			120
MOROBORO			30
MBEYA			24
TOTAL	540	420	604

These figures, given by NMC Technical Management, must be taken with some reserve. They should be compared with those given by the same source for the 1985/86 campaign, that show the low rate of use of installed equipment and somehow justify the development of the units of the DAR ES SALAM and ARUSHA.

* Other expressors

The current state of the industry was very difficult to establish. Very little data concerning the status of grain milling in Tanzania could be found in the public domain.

* Tanzania Food Co. LTD., ARUSHA

A wheat mill, with a capacity of 30t/24h, of Buhler-Miag construction, was opened last year and allows autonomy of flour requirements for pasta and cookies production.

* Rural and village mills of the SIDO program.

SIDO is in charge of promoting a large number of rural maize mills, usually of small capacity: about 300 Kg/h, financed under the Rural Hire (RHP) scheme. Their present distribution is the following:

LOCATION	NUMBER
ARUSHA	16
KILIMANDJARO	44
LINDI	40
MARA	16
MBEYA	4
MTWARA	32
MWANZA	9
RUKWA	71

SIDO has the merit of developing, in KILOSA, a prototype milling unit for millet and sorghum that was badly needed, due to the introduction of the dehuller developed by CRDI Agency, which is necessary to improve the palatability of flours extracted from the "Serena" variety, and to allow its use in poultry feed. Due to the high tannin content (0.65%) of this variety (which was adopted because of its high yield) that decreases distribution and to the 25% dehulling loss, compared with the 10% loss of the so-called native varieties, (such as "lulu"), the Serena future may be questioned.

The production of millets (Bulrush and Finger species) and Sorghom doesn't release surpluses available hors the rural areas and that the processing is mainly performed by the women to meet the household needs and for their access to money through trading on the rural markets.

Notwithstanding the lack of hard data, speculation that is not unreasonable would be that, like all other industries in Tanzania, the grain milling industry is suffering from liquidity problems, from run down machinery, from capitalisation problems and transport bottlenecks.

3.2 - PILOT PROJECT LOCATION

The project location has to be set up close to maize and sorghum production locations and where surpluses are available.

The identified area presented in the maps next page is the millet and sorghum area. The project should be located at the border of this area since maize production location is spread out all over the country.

4 - PROJECT ENGINEERING

4 - PROJECT ENGINEERING

4.1 - PRELIMINARY DETERMINATION OF SCOPE OF PROJECT

Four units lay out can be considered : according to the hourly production capacity with potentiality of an additional sorghum flour capacity.

It is estimated that the unit will operate 250 days/year, on a permanent basis from 16 to 24 hours/day. It will operate 5 000 hours on a yearly basis. Installed capacity are as following :

	Hourly capacity (t/hour)	Yearly capacity (t/year)
Option "Basic"		
. Maize milling	0.5	2 500
. Sorghum milling	0.25	1 250
Option "Double"		
. Maize milling	1.00	5 000
. Sorghum miulling	0.5	2 500

4.2 - TECHNOLOGY AND APPLIED PROCESSES

4.2.1 - Applied process

Since flour acceptability (Sembé) should only satisfy food requirement, it is not necessary to desprout grain before milling. Partial sprout separation will be done during sieving, when sprouts will go with bran, detached by abrasion, through the scourer, before milling.

A grade 1 maize ("GDI"); with 4.30% fat content of dry maize yield a 75% flour output on raw grain, with 20% impurity rate.

The processing stages are as follows :

* Grain milling

Grain cleaning	Separator-Aspirator with three screens.
Destoning	Gravity separator
Scouring-brushing	Vertical scourer

Iron elimination	Magnet
Milling	Diagonal roller mill ; performing 3 crossings.
Sieving of products	Plansifter 7 screens 4 outlets
Products han60a- 3 Buckets elevators	
	- 3 Pneumatic Handling equipment from roller mill to plansifter
Flour storage and Bagging	4 receiving 10 t bins. 100 kg precision scale.
Maintenance	Stock of spares parts for one year. Small maintenance tools.
Electrical supply	Wiring and synoptic. control Panel.

* Sorghum dehulling :

Alimentation	1 Bucket elevator and 700 kg feed Hopper
Dehulling	Vertical dehuller with flotting abrasive stones and glass cylinder
Bran extraction and Conveying	Pneumatic equipment with Dust collector.

4.2.2 - Rough lay out of proposed equipment

EQUIPEMENTS LIST

- Bucket elevator (HP 0,75) x 3
- Separator - Aspirator (TARARA n°3)
- Destoner (BS/S.10)
- Ventilator with fan, air lock
- Feed hopper
- Dehuller (BSC)
- Fan, ventilator, dust collectors, air lock
- Scourer with fan, air lock, ventilator
- Magnet
- Roller hill T.45 - 800 x 250

- Sucking nose with fan, air lock
- Plansichter cube (7 screens) with dust collector, air lock
- Control panel
- Bagging

A copy of relevant equipement supply proposed by an italian firm is presented in annex A.

A picture of the pilot project facility is presented next page.

4.2.3 - Equipment investments cost estimates

DETAILLED COSTS OF EQUIPEMENTS	TSH
- Bucket elevator (HP 0.75) x 3	2 054 199
- Separator - Aspirator (Tarara n'3)	3 077 863
- Destoner (BS/S.10)	1 854 961
- Ventilator with Fan, air lock	1 351 145
- Feed hopper	270 229
- Dehuller (BSC)	4 328 244
- Fan, ventilator, dust collectors, air lock	1 877 863
- Scourer with Fan, air lock, Ventilator	1 923 664
- Magnet	130 534
- Roller Hill T.45 - 800 x 250	8 716 489
- Sucking nose with Fan, Air lock	1 832 061
- Plansichter cube (7 screens) with dust collector, air lock	3 077 863
- Control panel	2 312 977
- Bagging	286 259
Total FOB (option "Basic")	**33.094.350**
Transport	**7.185.900**
Setting up of equipments	**1.500.000**
TOTAL	**41.780.250**
	or 140.000 US$ (# 139.500)

For the production capacity increase which corresponds to a production doubling, additional equipment will be required, with the following incremental costs.

- Milling machineries	Tsh 15,000,000
- Transport	Tsh 3,000,000
TOTAL CIF Dar Es Salam	Tsh 18,000,000 or US$ 60,000

4.3 - CIVIL ENGINEERING WORKS

4.3.1 - Rough layout of civil engineering works

This works include civil works, buildings and metallic frames.

The facility based on setting framework supplied with the equipment, can be set up on the ground level of a building with a required area of 160 m² (20m x 8m).

Such unit should be designed in such a way that civil engineering and assembly costs would be reduced, and included pre-assembled equipment on scaffolding, easy to set up on the ground level of an existing building.

4.3.2 - Civil engineering works investment costs

- Building : Tsh/m2 52 500 x 160 m2 = Tsh 8,400,000

- Metallic framework for machineries = Tsh 1,800,000

Tsh 10,200,000
or
US$ 34,000

Foreign investment : 18%

4.4 - TOTAL INVESTMENT COSTS

Total investment costs include fixed capital cost plus pre-production expenditures :

			FI
* CIVIL WORKS			
- Building 160 m2, socle, framework and pits		US$ 34,000	18%
* MACHINERY and EQUIPMENT			

These costs are Dar Es Salam CIF costs for containerized equipment. The setting up of equipment totals 5,000 US$

			FI
- Basic milling equipment :	Option "Basic"	US$ 104,000	100%
	Option "Double"	US$ 164,000	100%
- Sorghum dehulling equipment		US$ 36,000	100%

* PRE-OPERATIONAL COSTS

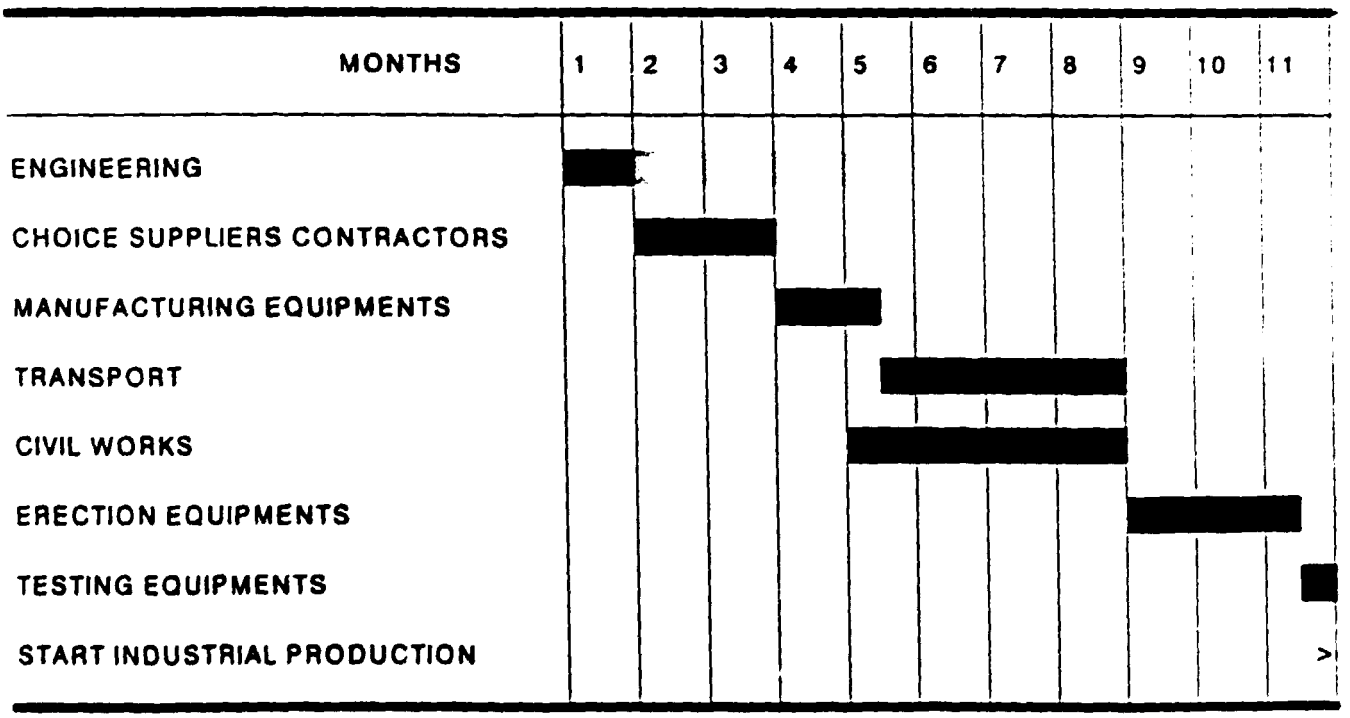
- Haulages, Travelling, Local engineering			FI
	. Option "Basic"	US$ 2.000	3%
	. Option "Double"	US$ 4.000	3%
* TOTAL	. Option "Basic" .. with maize only	US$ 140.000	78%
	.. with sorghum dehulling	US$ 176.000	83%
	. Option"Double" .. with maize only	US$ 202.000	84%
	.. with sorghum dehulling	US$ 238.000	87%

4.5 - PROJECT IMPLEMENTATION SCHEDULING AND LAYOUT

4.5.1 - Project Scheduling Implementation

The overall of schedule timing is estimated to 11 months to start industrial production (at 60% of capacity) as illustrated below.

PROJECT IMPLEMENTATION SCHEDULE



4.5.2 - **Project rough lay out**

The lay out of the new unit is drawn with product flows and presented in next page. The diagram takes into account two kind of flows : sorghum (with dehulling) and maize (direct from point 8 to 16).

5 - PLANT ORGANIZATION

5 - PLANT ORGANIZATION

5.1 - PLANT PRODUCTION

5.1.1 - Production

Production program is set up as illustrated in table next page.

This production program takes into account progressive production of the factory and includes sorghum as well as maize.

Taking into account sorghum flour production, it was assumed that :

- Option "Basic": sorghum will be the only processed raw material (excluding maize), in order to test this new production interest.
- Option "Double" sorghum will be mixed with maize according to the following proportioning (sorghum 40% and maize 60%).

5.1.2 - Sales

Expected sales for flours are detailed in the next page. The table gives the selling prices of products estimated from official producer prices data of raw material adding a margin for processing of 60%.

Raw material costs estimates are presented next page as well as flour prices. This evaluation is based available statistics projections, which were previously assessed in order to confirm figures reliability.

Flour cost price

Due to the present price disorder, no appropriate reference allows to understand the real differential existing between raw material and finished product. It would therefore be risky to use the traditional feasibility computation method.

However, the known milling and output margin allows to make operating simulations in order to compute profit potentialitie, since price statistics of the last 10 years give a maize average ratio related to a 1.6 flour / grain price rate.

Sorghum flour price was set up at a 20% lower price level in order to study the project profitability on a long term basis. Industrial margin between raw material price and finished product price is of 2.26.

The computation applies to milling of 5,000 tm of all grains, from which 3,850 tm of flour and 1,100 tm of bran are extracted. The retained bran price subject to less variation is US $ 30/t.

This applies only to maize, since the very large tannin content of red sorghum (Serena) brans, which are main goal of dehulling, limitate food uses. Their price is estimated at US $ 20/t.

5.2 - PLANT MANPOWER

5.2.1 - Estimated manpower requirements

For basic option, manpower requirements are set up at 9 workers + 2 staff personnel and for option "Double" with 13 workers.

Since the status of private company was adopted, managers who will also be in charge of marketing, will be paid by withdrawals on results. They will be assisted by an administrative executive who will be in charge of accounts, and a storekeeper. Production staff will be distributed as follows:

	Option B	Option D
- Manager	1	1
- Assistant accountant.	1	1
- Head miller-mechanic.	1	1
- Operators.	3	4
- Material Handling	4	7
- Plant cleaner	1	1
TOTAL	11	15

PROGRAM OF PRODUCTION AND SALES

Project year		1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9	
Production capacity utilization rate		60%	100%	100%	100%	100%	100%	100%	100%	100%	(0)
PRODUCTION LEVEL (tonnes)											
OPTION "BASIC"	.with maize	1 500	2 500	2 500	2 500	2 500	2 500	2 500	2 500	2 500	(1) = (0) * 2 500
	.with sorghum	750	1 250	1 250	1 250	1 250	1 250	1 250	1 250	1 250	(2) = (0) * 1 250
OPTION "DOUBLE"	.with maize	3 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	5 000	(3) = (0) * 5 000
	.maize/sorghum	1 500	2 500	2 500	2 500	2 500	2 500	2 500	2 500	2 500	(4) = (0) * 2 500
FLOUR SALES (US $)											
OPTION "BASIC"	.with maize	183 150	305 250	305 250	305 250	305 250	305 250	305 250	305 250	305 250	(5) = (1) * 122
	.with sorghum	75 000	125 000	125 000	125 000	125 000	125 000	125 000	125 000	125 000	(6) = (2) * 100
OPTION "DOUBLE"	.with maize	366 300	610 500	610 500	610 500	610 500	610 500	610 500	610 500	610 500	(7) = (3) * 122
	.maize/sorghum	169 890	283 150	283 150	283 150	283 150	283 150	283 150	283 150	283 150	(8) = (4) * 113
BRAN SALES (US $)											
OPTION "BASIC"	.with maize	13 200	22 000	22 000	22 000	22 000	22 000	22 000	22 000	22 000	(9) = (1) * 30 * 29%
	.with sorghum	4 400	7 333	7 333	7 333	7 333	7 333	7 333	7 333	7 333	(10) = (2) * 20 * 29%
OPTION "DOUBLE"	.with maize	26 400	44 000	44 000	44 000	44 000	44 000	44 000	44 000	44 000	(11) = (3) * 30 * 29%
	.maize/sorghum	11 440	19 067	19 067	19 067	19 067	19 067	19 067	19 067	19 067	(12) = (4) * 26 * 29%
TOTAL SALES (US $)											
OPTION "BASIC"	.with maize	196 350	327 250	327 250	327 250	327 250	327 250	327 250	327 250	327 250	(13) = (5) + (9)
	.with sorghum	79 400	132 333	132 333	132 333	132 333	132 333	132 333	132 333	132 333	(14) = (6) + (10)
OPTION "DOUBLE"	.with maize	392 700	654 500	654 500	654 500	654 500	654 500	654 500	654 500	654 500	(15) = (7) + (11)
	.maize/sorghum	181 330	302 217	302 217	302 217	302 217	302 217	302 217	302 217	302 217	(16) = (8) + (12)

PRICES OF RAW MATERIAL AND PRODUCTS

		1984	1985	1986	1987	1988	1989	1990	1991	1992
RAW MATERIAL (current prices, Tsh/ton)										
PRODUCER PRICES										
Maïze grain	(1)	3,100	4,625	5,775	7,250	8,600	10,000	12,000	14,200	17,040
Wheat grain	(2)	3,750	5,250	6,600	8,100	9,675	11,675	22,500	35,200	
Sorghum, millet	(3)	2,500	3,500	4,400	5,400	6,300	6,925	7,625	8,738	10,224
RETAIL PRICES										
Maïze grain	(4)	5,400	7,600	12,200	n.d.	n.d.	n.d.	n.d.	n.d.	
PRODUCTS ,RETAIL PRICES (current prices, Tsh/ton)										
Maïze flour	(5)	8,000	13,750	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	
Wheat flour	(6)	14,500	17,200	25,150	n.d.	n.d.	n.d.	n.d.	n.d.	
TRADE MARGIN										
Maïze grain	(4)/(1)-1	74%	64%	111%						83%
INDUSTRIAL+TRADE MARGIN										
Maïze flour	(5)/(1)-1	158%	197%							178%
Wheat flour	(6)/(2)-1	287%	228%	281%						
PRODUCER PRICE RATIO										
Sorghum/maïze	(3)/(1)	81%	76%	76%	74%	73%	69%	64%	62%	60%
EVOLUTION										
Inflation rate		44%	28%	33%	29%	28%	24%	14%	22%	20%
Increasing of maïze price			49%	25%	26%	19%	16%	20%	18%	20%

HYPOTHESIS (Tsh/ton in 1992)					
PRODUCER PRICES WITH TRANSPORT :	transport cost estimated to 30% of producer price				
Maïze grain	17,040	*	1.30	=	22,200
Sorghum, millet	10,224	*	1.30	=	13,300
FLOUR PRICES EX-MILL :					
Maïze flour (industrial margin estimated to 65% (178%-83%-30%) prod price)	22,200	*	1.65	=	36,630
Sorghum flour (to improve profitability of project)	13,300	*	2.26	=	30,000

5.2.2 - Labour cost estimates

Annual labour costs, are presented in the table below per categories of employees. These costs include : basic salary, holiday benefits, pension basic, group life cover, workers compensation earning and medical aid.

Staff	Monthly wages	Number	Option B Total	Number	Option D Total
Manager	20,000	1	20,000	1	Tsh 20,000
Assistant accountant.	10,000	1	10,000	1	Tsh 10,000
Head miller-mechanic.	15,000	1	15,000	1	Tsh 15,000
Operators.	10,000	3	30,000	4	Tsh 40,000
Material handling.	6,000	4	24,000	7	Tsh 42,000
Plant cleaner.	6,000	1	6,000	1	Tsh 6,000
TOTAL per month			**105,000**		**Tsh 133,000**
TOTAL per year			**1,260,000**		**Tsh 1,596,000**
			or US$ 4,200		**US$ 5,320**

6 - FINANCIAL ANALYSIS

6. - FINANCIAL ANALYSIS

6.1 - INTRODUCTION

Data were changed to US$ using the following exchange rates :

US$ 1 = Tsh 300
US$ 1 = FF 6
US$ 1 = IL 1310

Financial results are presented for a plant capacity of 2500 t/year (Option "Basic") and of 5000 t/year (Option "Double"), for maize or sorghum milling, with the following schedule for the construction period :

year 1 : 60% of capacity
year 2 : 100% of capacity

6.2 - PROJECT FINANCING

6.2.1 - Fixed Investment Costs

Fixed investment costs are detailed in chapter 4.4.

6.2.2 - Working capital

The required working capital takes into account the minimum day of coverage for stocks.

Raw material stocks will be financed through a seasonal credit with a concessional rate in order to limit expenses. Therefore, interests generated by this type of financing will be integrated in production costs computation.

Working capital will only include the following expenses : wages (1 month) & sales (1 month).

6.2.3 - Project financing

Total financing requirements include fixed investment costs and working capital.

This amount corresponds to initial investment costs paid during the pre-production period. There will be additional financial charges related to foreign loans.

This project financing gives the following break down : about 40% financed by equity, and about 60% financed by foreign loan.

Equity and foreign financing will be disbursed in 1992.

It was considered that one foreign loan could be contracted with one of the large lending agencies (French or European) in US Dollars.

Assuming, this project could be integrated in a OGL program and supported by the World Bank through the CRBD, an interest rate of 12% could be selected, the unit being a cooperative under NADCO control.

This is to be compared to the usual pertaining bank rate, of some 30%, which would hamper such a project.

Loan conditions are as following :

Interest rate	: 12%
Repayment period	: 8 years
Grace period	: 1 year
Repayment method	: constant annuities

It is considered that intermediate accrued interests will not be capitalized but will be paid during the grace period and covered by the pre-production expenditures.

Interests and principal repayments are presented in schedule in the next page.

PROJECT FINANCING (US $)

			1991	1992	1993	1994	1995	1996	1997	1998	1999
Project year			0	1	2	3	4	5	6	7	8
OPTION "BASIC" .with maize											
FINANCING REQUIREMENTS											
Fixed investment costs			140 000								
Working capital			27 621								
Total requirements			167 621								
FINANCING											
Equity		40%	67 048								
Foreign financing		60%	100 573								
REPAYMENT											
Principal	8 years			12 572	12 572	12 572	12 572	12 572	12 572	12 572	12 572
Interests		12%		12 069	10 560	9 052	7 543	6 034	4 526	3 017	1 509
OPTION "BASIC" .with sorghum											
FINANCING REQUIREMENTS											
Fixed investment costs			176 000								
Working capital			11 378								
Total requirements			187 378								
FINANCING											
Equity		40%	74 951								
Foreign financing		60%	112 427								
REPAYMENT											
Principal	8 years			14 053	14 053	14 053	14 053	14 053	14 053	14 053	14 053
interests		12%		13 491	11 805	10 118	8 432	6 746	5 059	3 373	1 686
OPTION "DOUBLE" .with maize											
FINANCING REQUIREMENTS											
Fixed investment costs			202 000								
Working capital			54 985								
Total requirements			256 985								
FINANCING											
Equity		40%	102 794								
Foreign financing		60%	154 191								
REPAYMENT											
Principal	8 years			19 274	19 274	19 274	19 274	19 274	19 274	19 274	19 274
Interests		12%		18 503	16 190	13 877	11 564	9 251	6 939	4 626	2 313
OPTION "DOUBLE" .maize/sorghum											
FINANCING REQUIREMENTS											
Fixed investment costs			238 000								
Working capital			25 628								
Total requirements			263 628								
FINANCING											
Equity		40%	105 451								
Foreign financing		60%	158 177								
REPAYMENT											
Principal	8 years			19 772	19 772	19 772	19 772	19 772	19 772	19 772	19 772
Interests		12%		18 961	16 609	14 236	11 863	9 491	7 118	4 745	2 373

6.3 - FINANCIAL STATEMENTS

6.3.1 - Total production costs

Total production costs include variable costs and fixed costs such as administrative overheads, as well as depreciation and financial costs.

Secondly, it is considered that products are sold ex-flour mill to wholesalers and consequently transportation costs are not included.

6.3.1.1 - Variable costs

Variable costs were computed for the 2 selected options.

They include raw material, packaging, energy, maintenance and repair as well as financial charges on raw material purchases. Raw material costs account for about 2/3 of variable costs, maize being more expensive than sorghum. Other variable costs are reasonable and are detailed in the following page.

6.3.1.2 - Fixed costs

Fixed costs include labour wages and salaries, administration expenses, insurance costs, financial costs and depreciation.

Wages and salaries

Wages and salaries are presented in section 5.2.2. Labour is made up of about 15 people due to the size of the project.

Administrative expenses

Administrative expenses are lowered proportionnally within the option double since they only increase of 40% for production doubling.

Insurance costs

Insurance costs were computed as 2.5% of total Civil Works and Equipment expenses.

Financial costs

Financial costs include payments of interests on foreign loans.
Long term interests are presented in the project Financcing and detailed in Section 6.2.3.

VARIABLE COSTS (US $/ton)

			Maize	Sorghum	Mix
RAW MATERIAL					
Share in mixed production			60%	40%	
Consumption rate			133%	133%	133%
Costs in Tsh/ton			29,600	17,733	24,853
Costs in US $/ton			98.67	59.11	82.84
ENERGY					
Rate n°3 :	38 Tsh/HP				
Low capacity					
Consumption (HP/h.)		Milling	18	18	18
		Dehulling	0	25	10
Capacity (tons/hour)			0.50	0.25	0.40
Costs in Tsh/tonne			1,368	6,536	2,660
Costs in US $/tonne			4.56	21.79	8.87
High capacity					
Consumption (HP/h.)		Milling	32	32	32
		Dehulling	0	26	10
Capacity (tons/hour)			1.00	0.50	0.80
Costs in Tsh/ton			1,216	4,408	2,014
Costs in US $/ton			4.05	14.69	6.71
INTEREST ON WORKING CAPITAL (US $/tonne)					
Stock (2 months) of raw material			16.44	9.85	13.81
Interest with a rate of	12%		1.97	1.18	1.66
MAINTENANCE AND REPAIR					
% of val. equipments		2.5%			
Low capacity	2,500	.val equip.	104,000	140,000	140,000
Capacity max. (tons/year)			2,500	1,250	2,000
Costs in US $/ton			1.04	2.80	1.75
High capacity	5,000	.val equip.	164,000	200,000	200,000
Capacity max. (tons/year)			5,000	2,500	4,000
Costs in US $/ton			0.82	2.00	1.25
PACKAGING					
Flour	Lined polystene bags	50	kg ,price	100	/unit
	Costs in US $/ton	6.67			
Bran	Gunny bags	70	kg ,price	190	/unit
	Costs in US $/ton	9.05			
	Rate Bran/flour production	29%			
Total (flour + bran)		9.29			

SALE PRICES (US $/ton)

	Maize	Sorghum	Mix
FLOUR	122.10	100.00	113.26
BRAN	30.00	20.00	26.00

PRODUCTION COSTS (US $)

Project year		1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9
OPTION "BASIC"	**.with maize**									
VARIABLE COSTS	(US $/T.)									
Raw material	98.67	148,000	246,667	246,667	246,667	246,667	246,667	246,667	246,667	246,667
Packaging	9.29	13,936	23,226	23,226	23,226	23,226	23,226	23,226	23,226	23,226
Energy	4.56	6,840	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400
Maintenance & Repair	1.04	1,560	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Interest working capital	1.97	2,960	4,933	4,933	4,933	4,933	4,933	4,933	4,933	4,933
Total variable costs		173,296	288,826	288,826	288,826	288,826	288,826	288,826	288,826	288,826
FIXED COSTS										
Salaries and wages		4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Administration expenses		500	500	500	500	500	500	500	500	500
Insurance : CW +Equip	2.5%	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450
L.T. interests		12,069	10,560	9,052	7,543	6,034	4,526	3,017	1,509	
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total fixed costs		35,319	33,810	32,302	30,793	29,284	27,376	25,867	24,359	22,850
Total operating costs		**208,614**	**322,636**	**321,128**	**319,619**	**318,111**	**316,202**	**314,693**	**313,185**	**311,676**
OPTION "BASIC"	**.with sorghum**									
VARIABLE COSTS	(US $/T.)									
Raw material	59.11	44,333	73,889	73,889	73,889	73,889	73,889	73,889	73,889	73,889
Packaging	9.29	6,968	11,613	11,613	11,613	11,613	11,613	11,613	11,613	11,613
Energy	21.79	16,340	27,233	27,233	27,233	27,233	27,233	27,233	27,233	27,233
Maintenance & Repair	2.80	2,100	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Interest working capital	1.18	887	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Total variable costs		70,628	117,713	117,713	117,713	117,713	117,713	117,713	117,713	117,713
FIXED COSTS										
Salaries and wages		4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Administration expenses		500	500	500	500	500	500	500	500	500
Insurance : CW + Equip	2.5%	4,350	4,350	4,350	4,350	4,350	4,350	4,350	4,350	4,350
L.T. interests		13,491	11,805	10,118	8,432	6,746	5,059	3,373	1,686	
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total fixed costs		42,141	40,455	38,768	37,082	35,396	33,309	31,623	29,936	28,250
Total operating costs		**112,769**	**158,168**	**156,481**	**154,795**	**153,109**	**151,022**	**149,336**	**147,649**	**145,963**
OPTION "DOUBLE"	**.with maize**									
VARIABLE COSTS	(US $/T.)									
Raw material	98.67	296,000	493,333	493,333	493,333	493,333	493,333	493,333	493,333	493,333
Packaging	9.29	27,871	46,452	46,452	46,452	46,452	46,452	46,452	46,452	46,452
Energy	4.05	12,160	20,267	20,267	20,267	20,267	20,267	20,267	20,267	20,267
Maintenance & Repair	0.82	2,460	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100
Interest working capital	1.97	5,920	9,867	9,867	9,867	9,867	9,867	9,867	9,867	9,867
Total variable costs		344,411	574,019	574,019	574,019	574,019	574,019	574,019	574,019	574,019
FIXED COSTS										
Salaries and wages		5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320
Administration expenses		700	700	700	700	700	700	700	700	700
Insurance : CW +Equip	2.5%	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950
L.T. interests		18,503	16,190	13,877	11,564	9,251	6,939	4,626	2,313	
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total fixed costs		52,473	50,160	47,847	45,534	43,221	40,109	37,796	35,483	33,170
Total operating costs		**396,884**	**624,179**	**621,866**	**619,553**	**617,241**	**614,128**	**611,815**	**609,502**	**607,189**
OPTION "DOUBLE"	**.maize/sorghum**									
VARIABLE COSTS	(US $/T.)									
Raw material	82.84	124,267	207,111	207,111	207,111	207,111	207,111	207,111	207,111	207,111
Packaging	9.29	13,936	23,226	23,226	23,226	23,226	23,226	23,226	23,226	23,226
Energy	6.71	10,070	16,783	16,783	16,783	16,783	16,783	16,783	16,783	16,783
Maintenance & Repair	1.25	1,875	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
Interest working capital	1.66	2,485	4,142	4,142	4,142	4,142	4,142	4,142	4,142	4,142
Total variable costs		152,633	254,388	254,388	254,388	254,388	254,388	254,388	254,388	254,388
FIXED COSTS										
Salaries and wages		5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320
Administration expenses		700	700	700	700	700	700	700	700	700
Insurance : CW+ Equip	2.5%	5,850	5,850	5,850	5,850	5,850	5,850	5,850	5,850	5,850
L.T. interests		18,981	16,609	14,236	11,863	9,491	7,118	4,745	2,373	
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total fixed costs		58,351	55,979	53,606	51,233	48,861	45,688	43,315	40,943	38,570
Total operating costs		**210,984**	**310,366**	**307,994**	**305,621**	**303,248**	**300,076**	**297,703**	**295,331**	**292,958**

6.3.2.2 - Depreciation

Depreciation on fixed assets was computed as follows according to the local tax code available in Tanzania :

- 5% year for buildings
- 12.5% year for equipment
- 20% year for pre-operational costs

The depreciation table is presented in the table below.

DEPRECIATION (US $)

		CAPITAL				DEPRECIATION			
	Rate	OPTION "BASIC"		OPTION "DOUBLE"		OPTION "BASIC"		OPTION "DOUBLE"	
		maize	sorghum	maize	maize/sor.	maize	sorghum	maize	maize/sor.
Civil works	5,0%	34 000	34 000	34 000	34 000	1 700	1 700	1 700	1 700
Equipments	12,5%	104 000	140 000	164 000	200 000	13 000	17 500	20 500	25 000
Pre-operational costs	20,0%	2 000	2 000	4 000	4 000	400	400	800	800
Total years 1 to 5						15 100	19 600	23 000	27 500
Total years 6 to 9						14 700	19 200	22 200	26 700

6.3.3 - Cash Flow tables

Cash inflow includes financial resources (equity and loans) as well as sales and depreciation. Cash outflow includes investment expenditures, production costs and as well as debt service and tax payment (30% on profits).

When looking at the Cash Flow table the comments are as follows :

- option "basic" with maize, Cash Flows are positive as soon as 1993.
- option "basic" with sorghum Cash Flows remain negative along the period.
- option "double" with maize Cash Flows are positive all over the period.
- option "double" with maize/sorghum, Cash Flow become positive in 1994 but cumulative cash balance remain negative until 1997

The cash flow tables presented next page show total cash inflows and out flows on a yearly basis.

CASHFLOW TABLE (US $)

Project year	1991 0	1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9
OPTION "BASIC"	.with maize								IRR =	11.20%
CASH INFLOW										
Equity	67,048									
Foreign financing	100,573									
Sales		196,350	327,250	327,250	327,250	327,250	327,250	327,250	327,250	327,250
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total cash inflow	167,621	211,450	342,350	342,350	342,350	342,350	341,950	341,950	341,950	341,950
CASH OUTFLOW										
Total Assets	167,621									
Production costs		208,614	322,636	321,128	319,619	318,111	316,202	314,693	313,185	311,676
Repayments (principal)		12,572	12,572	12,572	12,572	12,572	12,572	12,572	12,572	
Tax		0	1,384	1,837	2,289	2,742	3,314	3,767	4,220	4,672
Total cash outflow	167,621	221,186	336,592	335,536	334,480	333,424	332,008	331,032	329,976	316,348
BALANCE	0	-9,736	5,758	6,814	7,870	8,926	9,862	10,918	11,974	25,602
CUMUL.CASH FLOW ...	0	-9,736	-3,978	2,836	10,706	19,632	29,494	40,412	52,386	77,988
NET CASHFLOW	-167,621	14,904	30,274	30,274	30,274	30,274	30,274	30,274	30,274	30,274
OPTION "BASIC"	.with sorghum								IRR =	-12.00%
CASH INFLOW										
Equity	74,951									
Foreign financing	112,427									
Sales		79,400	132,333	132,333	132,333	132,333	132,333	132,333	132,333	132,333
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total cash inflow	187,378	99,000	151,933	151,933	151,933	151,933	151,533	151,533	151,533	151,533
CASH OUTFLOW										
Total Assets	187,378									
Production costs		112,769	158,168	156,481	154,795	153,109	151,022	149,336	147,649	145,963
Repayments (principal)		14,053	14,053	14,053	14,053	14,053	14,053	14,053	14,053	
Tax		0	0	0	0	0	0	0	0	0
Total cash outflow	187,378	126,822	172,221	170,535	168,848	167,162	165,076	163,389	161,703	145,963
BALANCE	0	-27,822	-20,288	-18,601	-16,915	-15,229	-13,542	-11,856	-10,169	5,570
CUMUL.CASH FLOW ...	0	-27,822	-48,110	-66,712	-83,627	-98,856	-112,398	-124,254	-134,423	-128,853
NET CASHFLOW	-187,378	-278	5,570	5,570	5,570	5,570	5,570	5,570	5,570	5,570
OPTION "DOUBLE"	.with maize								IRR =	22.13%
CASH INFLOW										
Equity	102,794									
Foreign financing	154,191									
Sales		392,700	654,500	654,500	654,500	654,500	654,500	654,500	654,500	654,500
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total cash inflow	256,985	415,700	677,500	677,500	677,500	677,500	676,700	676,700	676,700	676,700
CASH OUTFLOW										
Total Assets	256,985									
Production costs		396,884	624,179	621,866	619,553	617,241	614,128	611,815	609,502	607,189
Repayments (principal)		14,053	14,053	14,053	14,053	14,053	14,053	14,053	14,053	
Tax		0	9,096	9,790	10,484	11,178	12,112	12,806	13,499	14,193
Total cash outflow	256,985	410,938	647,329	645,710	644,091	642,472	640,293	638,674	637,055	621,382
BALANCE	0	4,762	30,171	31,790	33,409	35,028	36,407	38,026	39,645	55,318
CUMUL.CASH FLOW ...	0	4,762	34,934	66,724	100,133	135,162	171,569	209,595	249,240	304,558
NET CASHFLOW	-256,985	37,319	69,511	69,511	69,511	69,511	69,511	69,511	69,511	69,511
OPTION "DOUBLE"	.maize/sorghum								IRR=	5.80%
CASH INFLOW										
Equity	105,451									
Foreign financing	158,177									
Sales		181,330	302,217	302,217	302,217	302,217	302,217	302,217	302,217	302,217
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total cash inflow	263,628	208,830	329,717	329,717	329,717	329,717	328,917	328,917	328,917	328,917
CASH OUTFLOW										
Total Assets	263,628									
Production costs		210,984	310,366	307,994	305,621	303,248	300,076	297,703	295,331	292,958
Repayments (principal)		19,772	19,772	19,772	19,772	19,772	19,772	19,772	19,772	
Tax		0	0	0	0	0	642	1,354	2,066	2,778
Total cash outflow	263,628	230,756	330,139	327,766	325,393	323,021	320,490	318,829	317,168	295,736
BALANCE	0	-21,926	-422	1,951	4,323	6,696	8,426	10,087	11,748	33,181
CUMUL.CASH FLOW ...	0	-21,926	-22,348	-20,397	-16,074	-9,378	-951	9,136	20,884	54,066
NET CASHFLOW	-263,628	16,827	35,959	35,959	35,959	35,959	35,959	35,959	35,959	35,959

CASHFLOW TABLE (US $)

Project year	1991 0	1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9
OPTION "BASIC"	with maize								IRR =	11.20%
CASH INFLOW										
Equity	67,048									
Foreign financing	100,573									
Sales		196,350	327,250	327,250	327,250	327,250	327,250	327,250	327,250	327,250
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total cash inflow	167,621	211,450	342,350	342,350	342,350	342,350	341,950	341,950	341,950	341,950
CASH OUTFLOW										
Total Assets	167,621									
Production costs		208,614	322,636	321,128	319,619	318,111	316,202	314,693	313,185	311,676
Repayments (principal)		12,572	12,572	12,572	12,572	12,572	12,572	12,572	12,572	
Tax		0	1,384	1,837	2,289	2,742	3,314	3,767	4,220	4,672
Total cash outflow	167,621	221,186	336,592	335,536	334,480	333,424	332,088	331,032	329,976	316,348
BALANCE	0	-9,736	5,758	6,814	7,870	8,926	9,862	10,918	11,974	25,602
CUMUL CASH FLOW ...	0	-9,736	-3,978	2,836	10,706	19,632	29,494	40,412	52,386	77,988
NET CASHFLOW	-167,621	14,904	30,274	30,274	30,274	30,274	30,274	30,274	30,274	30,274
OPTION "BASIC"	with sorghum								IRR =	7.70%
CASH INFLOW										
Equity	75,784									
Foreign financing	113,677									
Sales		94,400	157,333	157,333	157,333	157,333	157,333	157,333	157,333	157,333
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total cash inflow	189,461	114,000	176,933	176,933	176,933	176,933	176,533	176,533	176,533	176,533
CASH OUTFLOW										
Total Assets	189,461									
Production costs		112,919	158,299	156,594	154,889	153,184	151,079	149,373	147,668	145,963
Repayments (principal)		14,210	14,210	14,210	14,210	14,210	14,210	14,210	14,210	
Tax		0	0	222	733	1,245	1,876	2,388	2,900	3,411
Total cash outflow	189,461	127,129	172,509	171,025	169,832	168,638	167,165	165,971	164,777	149,374
BALANCE	0	-13,129	4,425	5,908	7,102	8,295	9,369	10,562	11,756	27,159
CUMUL CASH FLOW ...	0	-13,129	-8,704	-2,796	4,305	12,601	21,969	32,532	44,288	71,447
NET CASHFLOW	-189,461	14,722	30,570	30,570	30,570	30,570	30,570	30,570	30,570	30,570
OPTION "DOUBLE"	with maize								IRR =	22.13%
CASH INFLOW										
Equity	102,794									
Foreign financing	154,191									
Sales		392,700	654,500	654,500	654,500	654,500	654,500	654,500	654,500	654,500
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total cash inflow	256,985	415,700	677,500	677,500	677,500	677,500	676,700	676,700	676,700	676,700
CASH OUTFLOW										
Total Assets	256,985									
Production costs		396,884	624,179	621,866	619,553	617,241	614,128	611,815	609,502	607,189
Repayments (principal)		14,210	14,210	14,210	14,210	14,210	14,210	14,210	14,210	
Tax		0	9,096	9,790	10,484	11,178	12,112	12,806	13,499	14,193
Total cash outflow	256,985	411,094	647,485	645,866	644,247	642,628	640,449	638,830	637,211	621,382
BALANCE	0	4,606	30,015	31,634	33,253	34,872	36,251	37,870	39,489	55,318
CUMUL CASH FLOW ...	0	4,606	34,621	66,255	99,508	134,380	170,631	208,501	247,990	303,308
NET CASHFLOW	-256,985	37,319	69,511	69,511	69,511	69,511	69,511	69,511	69,511	69,511
OPTION "DOUBLE"	maize/sorghum								IRR=	14.30%
CASH INFLOW										
Equity	106,118									
Foreign financing	159,177									
Sales		193,330	322,217	322,217	322,217	322,217	322,217	322,217	322,217	322,217
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total cash inflow	265,295	220,830	349,717	349,717	349,717	349,717	348,917	348,917	348,917	348,917
CASH OUTFLOW										
Total Assets	265,295									
Production costs		211,104	310,471	308,084	305,696	303,308	300,121	297,733	295,346	292,958
Repayments (principal)		19,897	19,897	19,897	19,897	19,897	19,897	19,897	19,897	
Tax		0	3,524	4,240	4,956	5,672	6,629	7,345	8,061	8,778
Total cash outflow	265,295	231,001	333,892	332,221	330,549	328,878	326,647	324,975	323,304	301,736
BALANCE	0	-10,171	15,825	17,496	19,167	20,839	22,270	23,941	25,613	47,181
CUMUL CASH FLOW ...	0	-10,171	5,654	23,149	42,317	63,155	85,425	109,367	134,979	182,161
NET CASHFLOW	-265,295	28,827	55,959	55,959	55,959	55,959	55,959	55,959	55,959	55,959

6.4 - CONCLUSIONS

6.4.1 - Internal rate of return

In order to measure the financial interest of the project, we have computed the IRR. It is computed on an eleven year basis and integrate the salvage value of the equipment.

According to figures presented in the table, the best option is option "double" with maize which gives an IRR of about 22% which is quite satisfactory based on the selected period.

The other options :

- option "basic" illustrates the low level of production for maize as well as mix flour and does not make the project profitable (The IRR totals 11% with maize which is not quite sufficient).

- options "double" with mix flour is less profitable than with maize only but this project enables to sell sorghum flour on the market at a lower price than maize flour (sorghum flour price is at Tsh 36 000, maize flour price is at Tsh 30 000). An increase of the sorghum flour price (+ 20%) to the same level of maize flour price will give an IRR of 14%.

6.4.2 - Pay-back period

Sumultaneously, the pay-back period was computed based on operating profit before debt repayment for the option "double" with maize.

The pay back period for option "double" with maize is less than 5 years.

6.4.3 - Economic Aspects

To complete this project evaluation some economic considerations deserve to be mentioned.

At the national level:

- the project will supply the villages with sorghum and maize flour which is valuable with wheat or other cereals shortage.

- the project which can be reproduced can benefit to other areas of the region in integrating market evolution.

- the project enables to keep the local population in villages instead of moving to urban area.

- the project as a medium scale project is more adapted to local conditions and does not require high investments.

ANNEX A

OFF. MECC. BALDESCHI & SANDREANI s.r.l.
CANTIANO

			LIT.
1	UNE	TREMIE de reception, à batir en maçonnerie sur place à la charge de l'acheteur.	
2	UN	ELEVATEUR avec godets 100, cannes 120x120 hauteur mts. 6,5 motorisé par moyen d'un moteur électrique HP 0,75.....	2.990.000.
3	UN	SEPARATEUR ASPIRATEUR modèle "TARARA" n°3, construction métallique, système à 3 passages à tamis à commande à éxcentrique, tamis garnis selon le diagramme, moteur électrique de commande HP 1.	13.440.000.
4	UN	EPIERREUR A SEC Mod. BS/S.10, construction en acier, hotte d'aspiration avec vanne de regolation; vannes laterales de ventilation; couverture en plexiglas; moteur électrique HP 0,5.....	8.100.000.
5	UNE	LIGNE D'ASPIRATION pour le separateur et pout l'epierreur à sec, complète de ventilateur aspirateur, tuyauterie metallique, supercyclone de decantation et écluse d'air motorisée.....	5.900.000.
6	UN	ELEVATEUR métallique avec cannes 120x120 pour une hauteur de mts. 6,5 moteur électrique de commande HP 0,75.....	2.990.000.
7	UN	CONTENITEUR de pre- decortiquage ayante une capacité de 7 Qx. avec vanne. Charpente metallique de soutien pour le conteniteur ci-dessus indiqué.	1.180.000.
8	UNE	DECORTIQUEUSE Mod. BSC. entrée de l'appareil avec une glissière de barrage et un cylindre en verre; meules flottants décortiqueuses; machine motorisée par moyen d'un moteur electrique HP 30.	18.900.000.
9	UNE	INSTALLATION D'ASPIRATION pour la dite composée de: électroventilateur, supercyclone avec écluse d'air; vis d'ensachage pour sons Ø 150x1500 motorisée avec moteur électrique HP 1 et intercommande écluse d'air; tuyauterie pour l'aspiration filtre 19 manches Ø 120x2,5 mt. avec ensachage et accessoires.....	8.200.000.
10	UN	ELEVATEUR métallique comme ci-dessus indiqué...	2.990.000.

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CANTIANO

11	UN	EPOLITEUR a mais avec tarara d'aspiration a la sortis de la machine, moteur électrique, manteau cylindriques a systeme de bateur reglables.....	8.400.000.
12	UN	APPAREIL magnétique plurilamellaire pour la separation des corps métalliques avec pétite caisse de montage.....	570.000.
13	UN	APPAREIL A CYLINDRES notre mod. TRIONFO 45 à 4 cylindres superposés de mm. Ø 250x800 trois passages consecutifs; à double rouleau d'alimentation avec deux tamis éxtracteurs, réglage micrometrique et signal d'alert, garniture selon le diagramme.....	38.062.000.
14	UNE	MOTORISATION pour appareil à cylindres avec moteur électrique HP 15.	
15	UNE	LIGNE DE TRANSPORT pneumatique composé de: cyclon ecluse d'air, tube en acier, filtre électroventilateur-aspirateur.....	8.000.000.
16	UN	PLANSICHTER CUBE - 7 tamis motorisé par moyen d'un moteur électrique HP 1 - quatre sorties, ensachage des produits avec ensachoirs.....	13.440.000.
17	UN	TABLEAU électrique de commande avec appareils de contrôle.....	10.100.000.
18	==	GROUPE de tuyauterie metallique pour produits et accessoires variées de montage.....	1.250.000.
		PRIX TOTAL FRANCO DEPART.....LIT.	144.512.000.=
		EN ALTERNATIVE, UNE CHARPENTE METALLIQUE DE SOUTIEN DES MACHINES.....LIT.	8.000.000.=

Poids Net sans Charpente: Kg. 6380 env.

Cubage: mtc. 30

Poids Net avec Charpente: Kg. 9380 env.

Cubage: mtc. 37

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CANTIANO

CONDITIONS DE VENTE:

Livraison : 90/100 ouvrables à partir de la réception de L/C.

Payment : Lettre de Credit irrevocable et confirmée.

Montage : Non compris. La Maison Vendeuse s'engage mettre à disposition un monteur spécialisé pour le montage de l'usine en question, contre remboursement des honoraires de catégorie + logement & nourriture + billets aériens aller-retour + argent de pôche.

Validité : 15 Octobre 1991.

Exclusiones : bâtiment et toutes les oeuvres de maçonnerie. Montage et main d'oeuvre d'aide, comme maçons, manoeuvrers, mecanicien et électricien. Appareils de soulevement machines. Tout ce qui n'est pas indiqué dans l'offre.

ANNEX B

PERSONS MET DURING THE IN FIELD MISSION

- UNIDO
  . Mr E. MANGESHO - Senior Economist

- FRENCH EMBASSY
  . Mrs COUFFON DE TREVOS

- NOTCO - SCAC SUBSIDIARY
  . Mr COUFFON DE TREVOS - General Manager

- FAO
  . Ms A. HILMI - Program Officer

- INVESTMENT PROMOTION CENTER
  . Mr B. KADWAGE - Consultant
  . Mr K. BARUANI - Consultant

- SADCC SOUTHERN AFRICAN DEVELOPMENT COORDINATION CONFERENCE
  . Mr J. MERO

- NAFCO - NATIONAL AGRICULTURE FOOD CORPORATION
  . Mr F. SHEMPEMDU - Director of Planning and Operations

- NMC - NATIONAL MILLING CORPORATION
  . Mr MBADILA - Director

- SIDO - SMALL INDUSTRIES DEVELOPMENT ORGANIZATION
  . Mr NTABAJANA - Manager of Planning and Strategy

- TISCO - AGRICULTURES AN FOOD CONSULTING DEPT.

- WB - WORD BANK
  . Mr SOUTHWORTH
  . Mr SUNGUSIA

PRODUCTION COSTS (US $)

Project year		1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9
OPTION "BASIC"	**.with maize**									
VARIABLE COSTS	(US $/T.)									
Raw material	98.67	148,000	246,667	246,667	246,667	246,667	246,667	246,667	246,667	246,667
Packaging	9.29	13,936	23,226	23,226	23,226	23,226	23,226	23,226	23,226	23,226
Energy	4.56	6,840	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400
Maintenance & Repair	1.04	1,560	2,600	2,600	2,600	2,600	2,600	2,600	2,600	2,600
Interest working capital	1.97	2,960	4,933	4,933	4,933	4,933	4,933	4,933	4,933	4,933
Total variable costs		173,296	288,826	288,826	288,826	288,826	288,826	288,826	288,826	288,826
FIXED COSTS										
Salaries and wages		4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Administration expenses		500	500	500	500	500	500	500	500	500
Insurance : CW +Equip	2.5%	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450	3,450
L.T. interests		12,069	10,560	9,052	7,543	6,034	4,526	3,017	1,509	
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total fixed costs		35,319	33,810	32,302	30,793	29,284	27,376	25,867	24,359	22,850
Total operating costs		**208,614**	**322,636**	**321,128**	**319,619**	**318,111**	**316,202**	**314,693**	**313,185**	**311,676**
OPTION "BASIC"	**.with sorghum**									
VARIABLE COSTS	(US $/T.)									
Raw material	59.11	44,333	73,889	73,889	73,889	73,889	73,889	73,889	73,889	73,889
Packaging	9.29	6,968	11,613	11,613	11,613	11,613	11,613	11,613	11,613	11,613
Energy	21.79	16,340	27,233	27,233	27,233	27,233	27,233	27,233	27,233	27,233
Maintenance & Repair	2.80	2,100	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Interest working capital	1.18	887	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Total variable costs		70,628	117,713	117,713	117,713	117,713	117,713	117,713	117,713	117,713
FIXED COSTS										
Salaries and wages		4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Administration expenses		500	500	500	500	500	500	500	500	500
Insurance : CW + Equip	2.5%	4,350	4,350	4,350	4,350	4,350	4,350	4,350	4,350	4,350
L.T. interests		13,491	11,805	10,118	8,432	6,746	5,059	3,373	1,686	
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total fixed costs		42,141	40,455	38,768	37,082	35,396	33,309	31,623	29,936	28,250
Total operating costs		**112,769**	**158,168**	**156,481**	**154,795**	**153,109**	**151,022**	**149,336**	**147,649**	**145,963**
OPTION "DOUBLE"	**.with maize**									
VARIABLE COSTS	(US $/T.)									
Raw material	98.67	296,000	493,333	493,333	493,333	493,333	493,333	493,333	493,333	493,333
Packaging	9.29	27,871	46,452	46,452	46,452	46,452	46,452	46,452	46,452	46,452
Energy	4.05	12,160	20,267	20,267	20,267	20,267	20,267	20,267	20,267	20,267
Maintenance & Repair	0.82	2,460	4,100	4,100	4,100	4,100	4,100	4,100	4,100	4,100
Interest working capital	1.97	5,920	9,867	9,867	9,867	9,867	9,867	9,867	9,867	9,867
Total variable costs		344,411	574,019	574,019	574,019	574,019	574,019	574,019	574,019	574,019
FIXED COSTS										
Salaries and wages		5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320
Administration expenses		700	700	700	700	700	700	700	700	700
Insurance : CW +Equip	2.5%	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950
L.T. interests		18,503	16,190	13,877	11,564	9,251	6,939	4,626	2,313	
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total fixed costs		52,473	50,160	47,847	45,534	43,221	40,109	37,796	35,483	33,170
Total operating costs		**396,884**	**624,179**	**621,866**	**619,553**	**617,241**	**614,128**	**611,815**	**609,502**	**607,189**
OPTION "DOUBLE"	**.maize/sorghum**									
VARIABLE COSTS	(US $/T.)									
Raw material	82.84	124,267	207,111	207,111	207,111	207,111	207,111	207,111	207,111	207,111
Packaging	9.29	13,936	23,226	23,226	23,226	23,226	23,226	23,226	23,226	23,226
Energy	6.71	10,070	16,783	16,783	16,783	16,783	16,783	16,783	16,783	16,783
Maintenance & Repair	1.25	1,875	3,125	3,125	3,125	3,125	3,125	3,125	3,125	3,125
Interest working capital	1.66	2,485	4,142	4,142	4,142	4,142	4,142	4,142	4,142	4,142
Total variable costs		152,633	254,388	254,388	254,388	254,388	254,388	254,388	254,388	254,388
FIXED COSTS										
Salaries and wages		5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320	5,320
Administration expenses		700	700	700	700	700	700	700	700	700
Insurance : CW+ Equip	2.5%	5,850	5,850	5,850	5,850	5,850	5,850	5,850	5,850	5,850
L.T. interests		18,981	16,609	14,236	11,863	9,491	7,118	4,745	2,373	
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total fixed costs		58,351	55,979	53,606	51,233	48,861	45,688	43,315	40,943	38,570
Total operating costs		**210,984**	**310,366**	**307,994**	**305,621**	**303,248**	**300,076**	**297,703**	**295,331**	**292,958**

6.3.2.2 - Depreciation

Depreciation on fixed assets was computed as follows according to the local tax code available in Tanzania :

- 5% year for buildings
- 12.5% year for equipment
- 20% year for pre-operational costs

The depreciation table is presented in the table below.

DEPRECIATION (US $)

		CAPITAL				DEPRECIATION			
	Rate	OPTION "BASIC"		OPTION "DOUBLE"		OPTION "BASIC"		OPTION "DOUBLE"	
		maize	sorghum	maize	maize/sor.	maize	sorghum	maize	maize/sor.
Civil works	5,0%	34 000	34 000	34 000	34 000	1 700	1 700	1 700	1 700
Equipments	12,5%	104 000	140 000	164 000	200 000	13 000	17 500	20 500	25 000
Pre-operational costs	20,0%	2 000	2 000	4 000	4 000	400	400	800	800
Total years 1 to 5						**15 100**	**19 600**	**23 000**	**27 500**
Total years 6 to 9						**14 700**	**19 200**	**22 200**	**26 700**

6.3.3 - Cash Flow tables

Cash inflow includes financial resources (equity and loans) as well as sales and depreciation. Cash outflow includes investment expenditures, production costs and as well as debt service and tax payment (30% on profits).

When looking at the Cash Flow table the comments are as follows :

- option "basic" with maize, Cash Flows are positive as soon as 1993.
- option "basic" with sorghum Cash Flows remain negative along the period.
- option "double" with maize Cash Flows are positive all over the period.
- option "double" with maize/sorghum, Cash Flow become positive in 1994 but cumulative cash balance remain negative until 1997

The cash flow tables presented next page show total cash inflows and out flows on a yearly basis.

CASHFLOW TABLE (US $)

Project year	1991 0	1992 1	1993 2	1994 3	1995 4	1996 5	1997 6	1998 7	1999 8	2000 9
OPTION "BASIC"	.with maize								IRR =	11.20%
CASH INFLOW										
Equity	67,048									
Foreign financing	100,573									
Sales		196,350	327,250	327,250	327,250	327,250	327,250	327,250	327,250	327,250
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total cash inflow	167,621	211,450	342,350	342,350	342,350	342,350	341,950	341,950	341,950	341,950
CASH OUTFLOW										
Total Assets	167,621									
Production costs		208,614	322,636	321,128	319,619	318,111	316,202	314,693	313,185	311,676
Repayments (principal)		12,572	12,572	12,572	12,572	12,572	12,572	12,572	12,572	
Tax		0	1,384	1,837	2,289	2,742	3,314	3,767	4,220	4,672
Total cash outflow	167,621	221,186	336,592	335,536	334,480	333,424	332,088	331,032	329,976	316,348
BALANCE	0	-9,736	5,758	6,814	7,870	8,926	9,862	10,918	11,974	25,602
CUMUL.CASH FLOW ...	0	-9,736	-3,978	2,836	10,706	19,632	29,494	40,412	52,386	77,988
NET CASHFLOW	-167,621	14,904	30,274	30,274	30,274	30,274	30,274	30,274	30,274	30,274
OPTION "BASIC"	.with sorghum								IRR =	-12.00%
CASH INFLOW										
Equity	74,951									
Foreign financing	112,427									
Sales		79,400	132,333	132,333	132,333	132,333	132,333	132,333	132,333	132,333
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total cash inflow	187,378	99,000	151,933	151,933	151,933	151,933	151,533	151,533	151,533	151,533
CASH OUTFLOW										
Total Assets	187,378									
Production costs		112,769	158,168	156,481	154,795	153,109	151,022	149,336	147,649	145,963
Repayments (principal)		14,053	14,053	14,053	14,053	14,053	14,053	14,053	14,053	
Tax		0	0	0	0	0	0	0	0	0
Total cash outflow	187,378	126,822	172,221	170,535	168,848	167,162	165,076	163,389	161,703	145,963
BALANCE	0	-27,822	-20,288	-18,601	-16,915	-15,229	-13,542	-11,856	-10,169	5,570
CUMUL.CASH FLOW ...	0	-27,822	-48,110	-66,712	-83,627	-98,856	-112,398	-124,254	-134,423	-128,853
NET CASHFLOW	-187,378	-278	5,570	5,570	5,570	5,570	5,570	5,570	5,570	5,570
OPTION "DOUBLE"	.with maize								IRR =	22.13%
CASH INFLOW										
Equity	102,794									
Foreign financing	154,191									
Sales		392,700	654,500	654,500	654,500	654,500	654,500	654,500	654,500	654,500
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total cash inflow	256,985	415,700	677,500	677,500	677,500	677,500	676,700	676,700	676,700	676,700
CASH OUTFLOW										
Total Assets	256,985									
Production costs		396,884	624,179	621,866	619,553	617,241	614,128	611,815	609,502	607,189
Repayments (principal)		14,053	14,053	14,053	14,053	14,053	14,053	14,053	14,053	
Tax		0	9,096	9,790	10,484	11,178	12,112	12,806	13,499	14,193
Total cash outflow	256,985	410,938	647,329	645,710	644,091	642,472	640,293	638,674	637,055	621,382
BALANCE	0	4,762	30,171	31,790	33,409	35,028	36,407	38,026	39,645	55,318
CUMUL.CASH FLOW ...	0	4,762	34,934	66,724	100,133	135,162	171,569	209,595	249,240	304,558
NET CASHFLOW	-256,985	37,319	69,511	69,511	69,511	69,511	69,511	69,511	69,511	69,511
OPTION "DOUBLE"	.maize/sorghum								IRR=	5.80%
CASH INFLOW										
Equity	105,451									
Foreign financing	158,177									
Sales		181,330	302,217	302,217	302,217	302,217	302,217	302,217	302,217	302,217
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total cash inflow	263,628	208,830	329,717	329,717	329,717	329,717	328,917	328,917	328,917	328,917
CASH OUTFLOW										
Total Assets	263,628									
Production costs		210,984	310,366	307,994	305,621	303,248	300,076	297,703	295,331	292,958
Repayments (principal)		19,772	19,772	19,772	19,772	19,772	19,772	19,772	19,772	
Tax		0	0	0	0	0	642	1,354	2,066	2,778
Total cash outflow	263,628	230,756	330,139	327,766	325,393	323,021	320,490	318,829	317,168	295,736
BALANCE	0	-21,926	-422	1,951	4,323	6,696	8,426	10,087	11,748	33,181
CUMUL.CASH FLOW ...	0	-21,926	-22,348	-20,397	-16,074	-9,378	-951	9,136	20,884	54,066
NET CASHFLOW	-263,628	16,827	35,959	35,959	35,959	35,959	35,959	35,959	35,959	35,959

CASHFLOW TABLE (US $)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Project year	0	1	2	3	4	5	6	7	8	9
OPTION "BASIC"	.with maize								IRR =	11.20%
CASH INFLOW										
Equity	67,048									
Foreign financing	100,573									
Sales		196,350	327,250	327,250	327,250	327,250	327,250	327,250	327,250	327,250
Depreciation		15,100	15,100	15,100	15,100	15,100	14,700	14,700	14,700	14,700
Total cash inflow	167,621	211,450	342,350	342,350	342,350	342,350	341,950	341,950	341,950	341,950
CASH OUTFLOW										
Total Assets	167,621									
Production costs		208,614	322,636	321,128	319,619	318,111	316,202	314,693	313,185	311,676
Repayments (principal)		12,572	12,572	12,572	12,572	12,572	12,572	12,572	12,572	
Tax		0	1,384	1,837	2,289	2,742	3,314	3,767	4,220	4,672
Total cash outflow	167,621	221,186	336,592	335,536	334,480	333,424	332,088	331,032	329,976	316,348
BALANCE	0	-9,736	5,758	6,814	7,870	8,926	9,862	10,918	11,974	25,602
CUMUL CASH FLOW ...	0	-9,736	-3,978	2,836	10,706	19,632	29,494	40,412	52,386	77,988
NET CASHFLOW	-167,621	14,904	30,274	30,274	30,274	30,274	30,274	30,274	30,274	30,274
OPTION "BASIC"	.with sorghum								IRR =	7.70%
CASH INFLOW										
Equity	75,784									
Foreign financing	113,677									
Sales		94,400	157,333	157,333	157,333	157,333	157,333	157,333	157,333	157,333
Depreciation		19,600	19,600	19,600	19,600	19,600	19,200	19,200	19,200	19,200
Total cash inflow	189,461	114,000	176,933	176,933	176,933	176,933	176,533	176,533	176,533	176,533
CASH OUTFLOW										
Total Assets	189,461									
Production costs		112,919	158,299	156,594	154,889	153,184	151,079	149,373	147,668	145,963
Repayments (principal)		14,210	14,210	14,210	14,210	14,210	14,210	14,210	14,210	
Tax		0	0	222	733	1,245	1,876	2,388	2,900	3,411
Total cash outflow	189,461	127,129	172,509	171,025	169,832	168,638	167,165	165,971	164,777	149,374
BALANCE	0	-13,129	4,425	5,908	7,102	8,295	9,369	10,562	11,756	27,159
CUMUL CASH FLOW ...	0	-13,129	-8,704	-2,796	4,305	12,601	21,969	32,532	44,288	71,447
NET CASHFLOW	-189,461	14,722	30,570	30,570	30,570	30,570	30,570	30,570	30,570	30,570
OPTION "DOUBLE"	.with maize								IRR =	22.13%
CASH INFLOW										
Equity	102,794									
Foreign financing	154,191									
Sales		392,700	654,500	654,500	654,500	654,500	654,500	654,500	654,500	654,500
Depreciation		23,000	23,000	23,000	23,000	23,000	22,200	22,200	22,200	22,200
Total cash inflow	256,985	415,700	677,500	677,500	677,500	677,500	676,700	676,700	676,700	676,700
CASH OUTFLOW										
Total Assets	256,985									
Production costs		396,884	624,179	621,866	619,553	617,241	614,128	611,815	609,502	607,189
Repayments (principal)		14,210	14,210	14,210	14,210	14,210	14,210	14,210	14,210	
Tax		0	9,096	9,790	10,484	11,178	12,112	12,806	13,499	14,193
Total cash outflow	256,985	411,094	647,485	645,866	644,247	642,628	640,449	638,830	637,211	621,382
BALANCE	0	4,606	30,015	31,634	33,253	34,872	36,251	37,870	39,489	55,318
CUMUL CASH FLOW ...	0	4,606	34,621	66,255	99,508	134,380	170,631	208,501	247,990	303,308
NET CASHFLOW	-256,985	37,319	69,511	69,511	69,511	69,511	69,511	69,511	69,511	69,511
OPTION "DOUBLE"	.maize/sorghum								IRR=	14.30%
CASH INFLOW										
Equity	106,118									
Foreign financing	159,177									
Sales		193,330	322,217	322,217	322,217	322,217	322,217	322,217	322,217	322,217
Depreciation		27,500	27,500	27,500	27,500	27,500	26,700	26,700	26,700	26,700
Total cash inflow	265,295	220,830	349,717	349,717	349,717	349,717	348,917	348,917	348,917	348,917
CASH OUTFLOW										
Total Assets	265,295									
Production costs		211,104	310,471	308,084	305,696	303,308	300,121	297,733	295,346	292,958
Repayments (principal)		19,897	19,897	19,897	19,897	19,897	19,897	19,897	19,897	
Tax		0	3,524	4,240	4,956	5,672	6,629	7,345	8,061	8,778
Total cash outflow	265,295	231,001	333,892	332,221	330,549	328,878	326,647	324,975	323,304	301,736
BALANCE	0	-10,171	15,825	17,496	19,167	20,839	22,270	23,941	25,613	47,181
CUMUL CASH FLOW ...	0	-10,171	5,654	23,149	42,317	63,155	85,425	109,367	134,979	182,161
NET CASHFLOW	-265,295	28,827	55,959	55,959	55,959	55,959	55,959	55,959	55,959	55,959

6.4 - CONCLUSIONS

6.4.1 - Internal rate of return

In order to measure the financial interest of the project, we have computed the IRR. It is computed on an eleven year basis and integrate the salvage value of the equipment.

According to figures presented in the table, the best option is option "double" with maize which gives an IRR of about 22% which is quite satisfactory based on the selected period.

The other options :

- option "basic" illustrates the low level of production for maize as well as mix flour and does not make the project profitable (The IRR totals 11% with maize which is not quite sufficient).

- options "double" with mix flour is less profitable than with maize only but this project enables to sell sorghum flour on the market at a lower price than maize flour (sorghum flour price is at Tsh 36 000, maize flour price is at Tsh 30 000). An increase of the sorghum flour price (+ 20%) to the same level of maize flour price will give an IRR of 14%.

6.4.2 - Pay-back period

Sumultaneously, the pay-back period was computed based on operating profit before debt repayment for the option "double" with maize.

The pay back period for option "double" with maize is less than 5 years.

6.4.3 - Economic Aspects

To complete this project evaluation some economic considerations deserve to be mentioned.

At the national level:

- the project will supply the villages with sorghum and maize flour which is valuable with wheat or other cereals shortage.

- the project which can be reproduced can benefit to other areas of the region in integrating market evolution.

- the project enables to keep the local population in villages instead of moving to urban area.

- the project as a medium scale project is more adapted to local conditions and does not require high investments.

ANNEX A

OFF. MECC. BALDESCHI & SANDREANI s.r.l.
CANTIANO

			LIT.
1	UNE	TREMIE de reception, à batir en maçonnerie sur place à la charge de l'acheteur.	
2	UN	ELEVATEUR avec godets 100, cannes 120x120 hauteur mts. 6,5 motorisé par moyen d'un moteur électrique HP 0,75.....	2.990.000.
3	UN	SEPARATEUR ASPIRATEUR modèle "TARARA" n°3, construction métallique, système à 3 passages à tamis à commande à éxcentrique, tamis garnis selon le diagramme, moteur électrique de commande HP 1.	13.440.000.
4	UN	EPIERREUR A SEC Mod. BS/S.10, construction en acier, hotte d'aspiration avec vanne de regolation; vannes laterales de ventilation; couverture en plexiglas; moteur électrique HP 0,5.....	8.100.000.
5	UNE	LIGNE D'ASPIRATION pour le separateur et pout l'epierreur à sec, complète de ventilateur aspirateur, tuyauterie metallique, supercyclone de decantation et écluse d'air motorisée.....	5.900.000.
6	UN	ELEVATEUR métallique avec cannes 120x120 pour une hauteur de mts. 6,5 moteur électrique de commande HP 0,75.....	2.990.000.
7	UN	CONTENITEUR de pre- decortiquage ayante une capacité de 7 Qx. avec vanne. Charpente metallique de soutien pour le conteniteur ci-dessus indiqué.	1.180.000.
8	UNE	DECORTIQUEUSE Mod. BSC. entrée de l'appareil avec une glissière de barrage et un cylindre en verre; meules flottants décortiqueuses; machine motorisée par moyen d'un moteur electrique HP 30.	18.900.000.
9	UNE	INSTALLATION D'ASPIRATION pour la dite composée de: électroventilateur, supercyclone avec écluse d'air; vis d'ensachage pour sons Ø 150x1500 motorisée avec moteur électrique HP 1 et intercommande écluse d'air; tuyauterie pour l'aspiration filtre 19 manches Ø 120x2,5 mt. avec ensachage et accessoires.....	8.200.000.
10	UN	ELEVATEUR métallique comme ci-dessus indiqué...	2.990.000.

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CANTIANO

11	UN	EPOINTEUR a mais avec tarara d'aspiration a la sortie de la machine, moteur électrique, manteau cylindriques a systeme de bateur reglables.....	8.400.000.
12	UN	APPAREIL magnétique plurilamellaire pour la separation des corps métalliques avec pétite caisse de montage.....	570.000.
13	UN	APPAREIL A CYLINDRES notre mod. TRIONFO 45 à 4 cylindres superposés de mm. Ø 250x800 trois passages consécutifs; à double rouleau d'alimentation avec deux tamis éxtracteurs, réglage micrometrique et signal d'alert, garniture selon le diagramme.....	38.062.000.
14	UNE	MOTORISATION pour appareil à cylindres avec moteur électrique HP 15.	
15	UNE	LIGNE DE TRANSPORT pneumatique composé de: cyclon ecluse d'air, tube en acier, filtre électroventilateur-aspirateur.....	8.000.000.
16	UN	PLANSICHTER CUBE - 7 tamis motorisé par moyen d'un moteur électrique HP 1 - quatre sorties, ensachage des produits avec ensachoirs.....	13.440.000.
17	UN	TABLEAU électrique de commande avec appareils de contrôle.....	10.100.000.
18	--	GROUPE de tuyauterie metallique pour produits et accessoires variées de montage.....	1.250.000.
		PRIX TOTAL FRANCO DEPART.....LIT.	144.512.000.-
		EN ALTERNATIVE, UNE CHARPENTE METALLIQUE DE SOUTIEN DES MACHINES.....LIT.	8.000.000.-
		Poids Net sans Charpente: Kg. 6380 env.	
		Cubage: mtc. 30	
		Poids Net avec Charpente: Kg. 9380 env.	
		Cubage: mtc. 37	

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CANTIANO

CONDITIONS DE VENTE:

Livraison : 90/100 ouvrables à partir de la réception de L/C.

Payment : Lettre de Credit irrevocable et confirmée.

Montage : Non compris. La Maison Vendeuse s'engage mettre à disposition un monteur spécialisé pour le montage de l'usine en question, contre remboursement des honoraires de catégorie + logement & nourriture + billets aériens aller-retour + argent de pôche.

Validité : 15 Octobre 1991.

Exclusiones : bâtiment et toutes les oeuvres de maçonnerie. Montage et main d'oeuvre d'aide, comme maçons, manoeuvrers, mecanicien et électricien. Appareils de soulevement machines. Tout ce qui n'est pas indiqué dans l'offre.

ANNEX B

PERSONS MET DURING THE IN FIELD MISSION

- UNIDO
  . Mr E. MANGESHO - Senior Economist

- FRENCH EMBASSY
  . Mrs COUFFON DE TREVOS

- NOTCO - SCAC SUBSIDIARY
  . Mr COUFFON DE TREVOS - General Manager

- FAO
  . Ms A. HILMI - Program Officer

- INVESTMENT PROMOTION CENTER
  . Mr B. KADWAGE - Consultant
  . Mr K. BARUANI - Consultant

- SADCC SOUTHERN AFRICAN DEVELOPMENT COORDINATION CONFERENCE
  . Mr J. MERO

- NAFCO - NATIONAL AGRICULTURE FOOD CORPORATION
  . Mr F. SHEMPEMDU - Director of Planning and Operations

- NMC - NATIONAL MILLING CORPORATION
  . Mr MBADILA - Director

- SIDO - SMALL INDUSTRIES DEVELOPMENT ORGANIZATION
  . Mr NTABAJANA - Manager of Planning and Strategy

- TISCO - AGRICULTURES AN FOOD CONSULTING DEPT.

- WB - WORD BANK
  . Mr SOUTHWORTH
  . Mr SUNGUSIA

PART D – SUGAR SECTOR

TABLE OF CONTENTS

I	- PROJECT BACKGROUND HISTORY AND PRESENT SITUATION	D3
I.1	- PROJECT SPONSOR	D3
I.2	- PROJECT HISTORY	D3
I.3	- PRESENT SITUATION	D5
II	- MARKET SURVEY	D7
II.1	- LOCAL CONSUMPTION	D7
II.1.1	- Current local consumption	D7
II.1.2	- Future local consumption	D9
II.2	- SUBREGIONAL MARKET	D11
II.2.1	- Exports during last decade	D11
II.2.2	- Future export trends	D14
II.3	- PLANT CAPACITY	D15
II.4	- PRICES	D15
II.4.1	- Sugar selling price	D15
II.4.2	- Molasse selling price	D16
III	- LOCATION OF THE PROJECT	D17
IV	- PROJECT ENGINEERING	D18
IV.1	- PRELIMINARY DETERMINATION OF SCOPE OF PROJECT	D18
IV.2	- TECHNOLOGY AND EQUIPMENT	D18
IV.2.1	- Technology	D18
IV.2.2	- Present equipment	D18
IV.2.3	- Expansion program	D19
IV.3	- ROUGH LAY OUT OF INVESTMENT COSTS	D20
V	- FINANCIAL AND ECONOMIC ANALYSIS	D22
V.1	- TOTAL INVESTMENT COSTS	D22
V.2	- PROJECT FINANCING	D22
V.3	- FINANCIAL STATEMENTS	D24
V.3.1	- Projected statements	D24

I - PROJECT BACKGROUND HISTORY AND PRESENT SITUATION

I.1 - PROJECT SPONSOR

The rehabilitation/expansion project of NAKAMBALA is sponsored by the Zambia Sugar Company Limited.

This company existing since 1964, is the only producer of centrifugal Sugar in Zambia.

ZSC was originally a company held in private hands. In 1985, the controlling interest was acquired by Indeco Limited which is a holding company for 42 subsidiaries engaged in all aspects of the Zambian industrial sector. Indeco is itself a wholly owned subsidiary of Zimco (Zambia Industrial and Mining Corporation Limited), the Government's arm responsible for state participation in industry.

Indeco holds 78% of the share capital of ZSC, Tate and Lyle PLC 11%, other overseas shareholders 2% and local investors 9%.

As long as Tate and Lyle will hold at least 10% of the shares, they will be entitled to the management contract for running the estate and the refinery. In fact, they have been managing the Company form the start of operations same 20 years ago. They now operate under the name of Booker Tate.

I.2 - PROJECT HISTORY

The Zambia Sugar Company has a need to expand its sugar production to meet the growing demand of the local consumption and to explore the opportunities of facilitating sugar sales to PTA and neighbouring countries.

Two possibilities were considered :

- The expansion in sugar production at Nakambala Estate;
- The development of a second sugar estate.

But it appeared that - due to the present equipment in Nakambala - it was economically quite clear that the investment per tonne of sugar would be much lower in Nakambala = one fifth to one fourth per tonne of sugar compared with a new estate.

First by Tate and Lyle Technical services expansion studies were achieved in 1988 considering two development axes.

Axe 1 = developping sugar-cane production by :

- improving sugar-cane yields
- new cane area planting up to the maximum within the existing water right
- requiring additional water rights on about 15,500 ha of new lands.

Axe 2 = rehabiliting part of existing equipment and housing and implementing later on additionnal equipment.

Sugar production is installed at the two plants of Nakambala (raw and domestic white sugar) and Ndola (refined sugar).

The capacity of production before any rehabilitation and expansion is of :

- 1.4 million tons of cane in a 220 day operating period for Nakambala sugar factory. The white sugar equipment includes a refining plant.

There is a facility to produce up to 160,000 T of refined sugar per annum but due to the age of part of the equipment, the efficiency of operations has been knocked down and present production reaches about 130,000 T per annum.

- 60,000 Tonnes per annum of white sugar at Ndola sugar refinery. However in view of the age of the equipment the actual capacity is now considered to be 35,000 tonnes per annum.

With the introduction in 1988 at Nakambala of a plant (Talodura) to produce white sugar it is forecasted to phase out refining at Ndola.

Here below we recall the main facts of Nakambala factory history.

Nakambala factory was built during the period 1966-68, and commissioning took place in 1968. Initially it was a small factory with an hourly crushing capacity of 80 tch. Much of the original equipment was brought to Nakambala from the dismantled Chirundu factory in Zimbabwe.

The standards and type of technology were up-to-date at the time of the initial construction.

A series of expansions was undertaken, the first major one being in 1976/77 when ZSC added a new "84" milling tandem and a new 68 t/h boiler, which gave Nakambala a nominal crushing capacity of 300 tc/h.

Simultaneously, the factory was also equiped with sugar refining plant capable of producing up to 13.6 t/h of fully refined sugar.

In 1983, a new 91 t/h boiler was installed in preparation for future expansion up to 400 tc/h. This crushing rate was achieved intermittently during 1983-85, although mean rates were less than this target.

The restricted availability of foreign exchange for the purchase of essential factory and cane transport equipment spares has been restricted for several years.

This had resulted in a serious deterioration of factory and agricultural equipment, and has also resulted in unreliability of factory equipment and intermittent deliveries of cane.

For ZAMBIA the reduced ZSC equipment efficiency is a major contribution factor in the decline of the overall sugar recovery performance.

I.3 - PRESENT SITUATION

Currently the cane area covers 12.384 ha - all of which irrigated - distributed as follows :

	Ha	average yield
Nakambala Estate	9,904	105 TC/ha
KASCOL Estate plus attendant Settler Farmers	1,782	117 TC/ha
Private Farmers		
Marshall	385	120 TC/ha
Garner	313	120 TC/ha
TOTAL	12,384	

The lack of necessary equipment which led to an inappropriate maintenance (roads, drains, irrigation system...) over recent years, and more over, the poor conditions of Nakambala agricultural equipment (lack of spare parts and oldness) contributed to the decline in cane yields as shows Table 1.1.

Regarding the factory, the poor state of the equipment led to a subsequent reduction in factory efficiency. The current potential production of Nakambala in now in the range of 125,000 - 135,000 T per annum of commercial sugar, i.e. 87% of the design capacity (150,000 T or 160,600 T/y of raw sugar).

Since 1978, investment in housing facilities has been quite limited and there is currently a large short fall in the number of available housing units.

Due to lack of appropriate housing and incompetitive conditions, these last years, a large number of skilled manpower left Nakambala estate and could not be replaced.

TABLE 1.1

THE ZAMBIA SUGAR COMPANY LIMITED

SUGAR CANE OUTPUT AND YIELDS

1979 - 1990

CROP YEAR	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979
Hecares Harvested												
- Estate	9522	9823	9237	8489	7569	8081	8065	8631	9101	9403	8791	8791
- Farmers	2452	2323	2463	2372	2097	2146	1607	837	620	632	632	632
- TOTAL	11974	12146	11700	10861	9666	10227	9672	9468	9721	10035	9423	9423
Cane Harvested '000												
- Estate	848.7	866.4	1022.8	924.1	889.5	897.8	943.6	874.0	933.6	825.8	845.5	820.7
- Farmers	277.9	270.6	299.0	317.2	284.2	309.7	235.0	112.2	76.8	67.3	74.2	868.0
- TOTAL	1126.5	1137.0	1321.8	1241.3	1173.7	1207.3	1178.6	1086.2	1010.4	893.1	919.7	887.5
Tonnes Cane/Ha.												
- Estate	89.12	85.20	110.74	108.87	117.52	111.17	116.99	112.84	102.60	87.83	96.17	94.72
- Farmers	113.34	116.46	121.39	133.71	135.48	144.31	146.22	134.07	123.92	106.53	117.47	105.77
Tonnes Sugar/Estate Ha.	9.86	10.27	11.38	11.33	11.94	13.18	14.82	13.71	11.88	10.88	11.56	10.90

Source ZSC Ltd

II - MARKET SURVEY

II.1 - LOCAL CONSUMPTION

II.1.1 - Current local consumption

According to wether we consider statistical information published by the International Sugar Year Book of the Zambia Sugar Company Limited local consumption varies, yet it stands in the range of 100 to 120,000 tonnes of sugar as presented in Table below.

Consumption of Sugar - '000 Tonnes

Source	1982	1983	1984	1985	1986	1987	1988	1989
International Sugar Year Book	100.70	110.70	117.90	112.90	99.0	107.20	114.60	105.00
Zambia Sugar Company Limited	101.80	99.80	106.40	102.10	113.80	104.80	108.70	117.2

Theoretically, sugar should be available within the whole country, since the ZSC has small depots all over the country, on top of the larger ones at Lusaka, Ndola and Mazabuka. It is understood, however, that sugar can be in short supply in places located at 200 kms or more off the railway lines. Or else, in such places, retail prices are at black market rates.

Part of the molasses is exported, the principal market being Zimbabwe for the supply of its ethanol plant and for livestock feed purposes. There are also exports to Europe. Molasses are equally sold on the domestic market where they are used inter alia, for animal feed purposes. ZSC has just got a contract with a new distillery DUNCAN, GILBEY and MATHESON - for 3250 T of molasses per annum.

Detailed Zambian sugar sales are presented in table 2.1. Most of the local demand is for white sugar, the great majority of which is for house-hold consumption. Small quantities of white sugar are sold to soft drinks manufacturers, and food processing industries.

We notice that small quantities of brown sugar are still sold, they are for domestic consumption.

Raw sugar is supplied to the brewing industry. Item "specials" concerns sugar used in food processing at Ndola (jam, syrup). The average annual growth rate during last decade 1980-1989 is equivalent to 2.5% if we consider ZSC data and to 2.2% if we consider International Sugar Year Book data.

Meanwhile, it is necessary to record that significant volumes of sugar sold on the local market are in fact exported to border countries. Favorite destinations are the southern part of Zaïre, Tanzania and Burundi. The quantities involved are unknown but estimates around 10,000 T are often mentioned.

So, local consumption would be a little lower than official data let it appear.

TABLE 2.1

SOURCE

STUDY FOR THE REHABILITATION AND EXPANSION OF THE NAKAMBALA SUGAR ESTATE

BOOKER TATE - 1990 -

ZAMBIA SUGAR SALES AND CONSUMPTION

('000 tonnes commercial sugar)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Local Sales										
White Sugar	84.9	93.1	92.4	90.2	95.0	94.2	110.3	102.3	106.7	104.0
Brown Sugar	2.4	6.4	5.3	5.1	5.3	7.3	1.6	-	-	9.3
Raw Sugar	3.9	3.6	3.3	3.8	5.4	-	1.5	2.0	1.3	3.3
Specials	1.0	0.8	0.8	0.7	0.7	0.6	0.4	0.5	0.7	0.6
Total	92.2	103.9	101.8	99.8	106.4	102.1	113.8	104.8	108.7	117.2
Annual Consumption per capita (Kg)	16.1	17.4	16.7	15.8	16.5	15.5	15.6	14.8	14.9	15.6

Annual average consumption per capita fluctuates around 16 Kg/capita, then consumption is slightly above average for Africa (14.1 Kg in 1988) but lower than net exporter Zimbabwe, a neighbouring state with 29.7 Kg and than Kenya with 19.3 Kg and much higher than other neighbouring states as Burundi 3 Kgs, Tanzania 5.9 Kgs, Zaïre 3.7 Kgs.

It appears that the per capita consumption has been falling since 1981 due to the decline of real incomes.

In the eighties, self-sufficiency has, at least apparently, been attained since production has, by and large, exceeded consumption and imports have been neglectable.

II.1.2 - Future local consumption

In the future, the question as to whether the present production level of about 130,000 tons (before any rehabilitation with or without expansion) will match consumption requirements hinges on the growth of population and evolution of the Gross National Product (GDP) per capita.

During last decade population average annual growth rate is 3.5%/annum. When evolution of GDP (Grow National Product per capita) is negative (1980-1986) or stationnary (1987-1988).

While the growth of population indicates that consumption should rise at a corresponding rate, on the assumption that consumption per capita does not vary, the fall in per capita (GNP might result in increasing difficulties to purchase sugar (and what is more, at higher liberalized prices). Let it be noted, however, that GDP per capita rose by about 1% in 1988. The estimated growth of GNP for 1989 is 0.1 per-cent, resulting again in a fall in per capita GNP.

Forecasts of future growth in consumption must consider this situation, and two hypothesis have been selected :

- The extension of the growth rate recorded over the period 1980-1989 i.e. 2.5%/annum (Hypothesis I)
- A growth in consumption assumed at 3.5% per annum, growth slightly below the forecasted growth in population of 3.7% (Hypothesis 2), which means no increase in consumption per capita. It has been observed that Zambian consumption per capita tends to vary with production, i.e. with availability. This is why it is more accurate to refer to consumption rather than to demand which may have been suppressed and can only be quantified through a detailed market study.

According to these hypotheses, consumption would rise over the next years as following (see table 2.2 next page) :

	Hypothesis 1	Hypothesis 2
1995	131,000 T	139,000 T
2000	148,000 T	165,000 T
2005	168,000 T	196,000 T
2010	190,000 T	233,000 T

TABLE 2.2

LOCAL CONSUMPTION PROJECTION

DIC

II.2 - SUBREGIONAL MARKET

II.2.1 - Exports during last decade

During last decade exports of sugar from Zambia have widely fluctuated. All exports have been to neighbouring countries namely to Burundi, Rwanda, Tanzania, Zaïre.

Any assessment on these markets is made difficult by the lack of reliable data since two different statistical sources are available :

- export and import statistics published by World Sugar Statistics Table 2.3 International Sugar Year Book - ISO table 2.4
- data on exports quantities published by the Zambia Sugar Company Table 2.5

An analysis of these tables makes notice :

- exports of sugar from Zambia have in general been low except for the period 1986-1988 when Zambia sold an important pact of its accumulated stock.
- data concerning Zambian Sugar exports recorded by the ISO are quite different from figures transmitted by ZSC;

This difference can be explained by date reporting errors when stocks are disposed of. Tables for Zambia sugar experts are presented next page.

Table 2.3

ZAMBIA'S NEIGHBOURS : HISTORIC AND PROJECTED SUGAR IMPORTS
(1000 TONNES RAW VALUE)

	1983	1984	1985	1986	1987	1988	1989
Burundi	-	-	-	12.0	13.4	-	-
Rwanda	-	-	-	6.0	6.3	6.0	6.5*
Zaire	12.7	36.4	44.7	41.5	43.0	29.0	3.0
Tanzania	5.3	12.5	21.6	26.7	13.0	10.0*	10.0*
TOTAL	18.0	48.9	66.3	86.2	75.7	45.0	19.5

Source : F.O. Lichts World Sugar Statistics

* estimated

Table 2.4

Zambia Sugar Exports - Tonnes - Raw Value

Calendar years	Burundi	Rwanda	Tanzania	Zaire	Total
1981	1,043	-	-	845	1,888
1982	-	-	-	-	-
1983	-	-	-	107	107
1984	2,094	-	-	4,193	6,287
1985	3,660	-	-	5,429	9,089
1986	9,050	5,800	13,740	8,290	36,880
1987	13,442	1,141	1,070	7,686	23,339
1988	3,428	-	-	1,902	5,330
1989	40	-	-	3,200	3,200
Total	32,757	6,941	14,810	31,652	86,120
Pourcentage	38.0	8.4	17.2	36.7	100.0

Sources : OFIDA International Sugar Year Book - ISO

EXPORTS BY ZAMBIA

SUGAR SALES AND CONSUMPTION

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
White Sugar	-	1.4	1.3	0.1	0.2	5.5	10.6	24.9	13.3	6.4
Brown Sugar	-	0.1	0.3	-	-	2.0	4.9	31.5	10.0	2.7
Total	-	1.5	1.6	0.1	0.2	7.5	15.5	56.4	23.3	9.1

Source : ZSC

Table 2.5

In 1986 and 1987 the most significant imports took place, but these statistics do not include volumes exported through the widespread practice of smuggling.

Adjustment politicies applied by many african countries have contributed to development of these uncontrolled exchanges (estimated to 10,000 T of sugar from Zambia at least).

We want to underline that :

- in 1987 and 1988 Zaïre imported 9,000 T from EEC
- in 1988 and 1989 Tanzania imported respectively 14,000 and 10,000 T from EEC.

If there was a sufficient production, these imports could come from a PTA country.

II.2.2 - Future export trends

From what has been observed over the past decade, the sub-regional market for Zambian sugar is made up of Zaire, especially the Shaba province where there is no sugar industry, and Burundi, Rwanda and Tanzania. There is reason to believe that Zaire and those three PTA countries can continue, for the time being, to remain a market for any surplus Zambian sugar.

In the long term, Zaire and Tanzania might replace imports by local production, if they managed to invest the large sums required for new lands, plant and machinery, and rolling stock. Rwanda has no large scale sugar industry, while Burundi has set up a factory of less than 20,000 tonnes capacity near the border with Tanzania but is experiencing difficulties with running it. The bead-in times for such developments are likely to be long.

In these countries, population growth at a high rate so the demand for sugar supplies increases quite quickly. Moreover, the high potentiality for further growth in sugar consumption is strengthened by the very low levels of sugar consumption per capita in neighbouring countries.

In 1987 there were in Kg/capita :

Burundi	3.0
Rwanda	1.9
Tanzania	5.2
Zaïre	3.7

Source : ISO

Due to its geographical position, and to the competitive freight rates, if Zambia is to secure a steady and permanent foothold in such markets, in the context of the promotion of intra-PTA trade, it appears that it could aim at supplying at leat one-half of the requirements and thus provide, during the 1990's, for some 30,000 to 35,000 tonnes over and above its own estimated local consumption requirements.

As for molasses, which are used for animal feed purposes locally and are also exported to Zimbabwe and to Europe, they will increase if sugar production goes up. The present volume of about 45,000 tonnes might reach some 60,000 tonnes if sugar production were to go up to 170,000 tonnes.

This additional volume of 15,000 tonnes could find its way into a more developed livestock sub-sector and into a local distillery in substitution of imported alcohol for blending, but the major part of it would be available for exports, thus earning foreign exchange for the country.

II.3 - PLANT CAPACITY

In the current situation plant capacity is estimated around 130,000 T/y of commercial sugar and will continue to decline without urgent rehabilitation.

Forecasts of future sugar demand presented in chapitre II.1.2 and II.2.2 would rise over the next 10 years to :

	local demand		export
	low	High	
1995	131,000 T	139,000 T	30,000 T
2000	148,000 T	165,000 T	30,000 T
2010	190,000 T	233,000 T	30,000 T

Obviously in any case Nakambala will satisfy these requirements.

Booker Tate current managing staff studied three options :
- rehabilitation without expansion
- rehabilitation associated with a cost effective increase in factory capacity to reach a secure production level of 170,000 T of commercial sugar per annum,
- a major factory development to get a production capacity of 232,000 T of commercial sugar annually.

It concluded that option 2 was the most viable for medium term development. The following prefeasibility study is achieved on this base.

II.4 - PRICES

II.4.1 - Sugar selling price

Until 1989 the price of sugar sold on domestic market was controlled by GRZ. The price was liberalized during 1989. The ex-factory price should move from current K 14,300 (i.e. US$ 286) per ton to, ultimately, K 37,500 (i.e. US$ 750) per ton. This will not be achieved at one time but nevertheless in a short term, indeed the administrative contraints slow down the price evolution.

The aim of this increase is :
- to reflect the import rise which affected costs of production in recent past years,
- to take into account the current level of inflation.

Let us record that Zambian economy in undergoing rapid and considerable changes and that figures, particularly in Kwacha, are soon out of date. The exchange rate which is to day K 50 = US$ 1 is now "market-related" and depreciates at approximatively 2.5% per month.

Prices for export sales have tended to follow free world market levels. By the end of 1990 ZSC communicate a price of US$ 400 per ton of white sugar, FOB Mazabuka for exports. Free world market raw sugar prices stand approximately between US$ 300 and 450 - prices reflecting the supply/demand balance.

In the first days of January 91 raw sugar price on world market was around US $ 300.

II.4.2 - Molasse selling price

On Domestic market current price is K.450 per ton (US$ 9) likely to increase to K.750 (US$ 15) shortly - for the same reasons than sugar selling price.

Export prices vary but are around US$ 20 per ton FOB Mazabuka.

III - LOCATION OF THE PROJECT

Nakambala Sugar Estate

The Nakambala Estate and Sugar Factory are located between the Kafue river and the main Railway/Road at Mazabuka, in the Southern Province of the Republic of Zambia.

It is located at a road distance of 128Km to the South West of Lusaka and is 352Km North-East of Livingstone.

The Estate is the production center for both raw and white sugar and for Molasses during the harvest period (April-November). It is forecasted that all white sugar production will be done by Nakambala Estate. Ndola Factory will send for refining its raw sugar to Nakambala.

The Estate maintains liaison with local Government bodies and the farming community.

The Estate employs people of which the largest single group are cane cutters who number about 2,000.

Head Office

The Company's Head Office is located at Stand No. 1646, Malambo Road, in the City of Lusaka. Head Office staff are the policy making authority and maintain liaison, on behalf ot the Company, with outside bodies such as, Indeco Limited, Central Government, Banks, Business Institutions and other organisations of relevant relationship to the Company's operation.

IV - PROJECT ENGINEERING

IV.1 - PRELIMINARY DETERMINATION OF SCOPE OF PROJECT

Technical Diagnosis and market study lead to promptly consider a rehabilitation and extention of the Nakambala estate.

Indeed, if no improvements come along in the future years, the effective production capacity will drop from 130,000 T to 120,000 T ultimately of sugar/year. This production will not to meet the local demand as soon as 1995 even with the low hypothesis.

Considering, estimated local market as well as forecasted estimated exports within the PTA area, it was anticipated that rehabilitation and extension works will progressevely enable to reach the production of 170 000 T of sugar/year. This will lead to the irrigation system improvement and to the plant of additionnal 2,340 ha (currently, 12,400 ha of irrigated and cultivated land).

IV.2 - TECHNOLOGY AND EQUIPMENT

IV.2.1 - Technology

The estate operated with a classical technology for the production of cane sugar, with however the following process "SUCRO BLANCO DIRECTO" and Talodura which enable to increase yields and direct production of quality white sugar.

As in all sugar plants of this type, processing phases are the following :

- CANE HANDLING AND CANE PREPARATION
- JUICE EXTRACTION PLAN
- JUICE TREATMENT, CLARIFICATION AND MOD FILTRATION
- EVAPORATION
- BOILING HOUSE (VACUM PAN, CRYSTALLISERS, CENTRIFUGAL MACHINES)
- SUGAR HANDLING AND PACKAGING
- UTILITIES (BOILERS, ELECTRICAL EQUIPMENT..)

IV.2.2 - Present equipement

The factory equipment includes 2 milling tandems with a combined capacity to crush 9,000 tonnes of cane per 24 hours, Boiling House Equipment for processing cane juice into crystalline sugar and a packing station with 6 automatic packing machines capable of packing 360 tons of sugar per day. The white sugar equipment includes a refining plant which simultaneously clarifies and decolourises raw sugar liquor from which high quality refined sugar is produced. In 1988, a Talodura plant was commissioned which economically enables the factory to produce white sugar for domestic use.

IV.2.3 - Expansion program

IV.2.3.1 - Factory expansion program

Due to the contemplated production factory will require to be expanded in different stages.

The appraisal mission and data collected from ZSC enabled to identify the following main items in the development program are :

a) Cane yard

- Install three hydro-unloaders - reposition one feed table supplying n° 1 TANDEM CARRIER

b) Milling

- Install unigrator type shredder for n° 1 tandem and replace all worn mill gearing
- Install heavy duty shredder for n° 2 mill tandem together with Donnely type feed-chutes and underfeed rollers on all mills. Replace apron type intercarriers with inclined rake type carriers.
- Install 6th mill on n° 2 tandem, together with new 400 T ph mixed juice scale.
- Increase imbibition water to n° 2 tandem to improve sucrose extraction.

c) Clarification

- Install additional juice heaters.
- Install clarified juice heaters.
- Install additional mud filter and additional bagacillo screening.
- Upgrade juice sulphitation system.

d) Evaporation

- Replace existing third and fourth effect vessels (3C and 4C with larger units)
- Install two new 1st effect evaporator vessels.
- Install one each 2nd, 3rd and 4th effect vessels.
- Install additional entrainment separators and condenser.
- Upgrade talodura syrup clarification equipment

e) Boiling House

- Install a new continuous vacuum pan and four new vertical crystallisers for "C' massecuite, all external to the boiling house building.
- Install three continuous centrifugal machines for "3" massecuite. Use all twelves existing machines for "C" massecuite.
- Convert the existing "A" centrifugal machines to 48" x 36" units, and renew control systems. Add one new 48" x 36" machines.
- Replace all massecuite and magma pumps, and syrup and molasses pumps as necessary.

f) Sugar Handling and Packaging

- Install new 100 tonne and two new 60 Tonne silos for Household White sugar in "C" shed, with necessary conveyors and elevators.

- Install 2 new Pack-o-matic packing machines for 1 Kg packs in "A" packing station
- Install 6 new Pack-o-matic machines in "B" packing station, complete with conveyor system and feed-hoppers.

g) Services

- Rehabilitate and modify bagasse handling systeme installation of new 60 tph boiler and ancillaries convert to mechanical ASH handling system for all boilers.
- Install additional electrical distribution equipment and cabling as necessary.
- Install additional injection and ejection pumps and enlarge spray system.
- Extend/upgrade HP steam piping.

For this expansion programme it is necessary to examine in detail the HP/LP steam balance.

IV.2.3.2 - Other essential investment costs

- Expansion of land under cane by 2,340 ha : which would be developed and managed by 14 local farmers,
- Replacement and rehabilitation of the estate's agricultural machinery fleet, the establishment of an estate land preparation unit and the establishment of a central machinery pool for the farmers,
- extension of the irrigation system involving construction of a new pipeline with an associated pump station,
- improvements to present pump stations and to in-field drainage,
- a housing construction programme, because housing on the estate has not kept pace with the numbers of shilled workers and labour : 420 houses (various housing sizes) and seasonal workers barrachs (1 600 persons) and ablution blocks.

IV.2.3.3 - Flow sheet

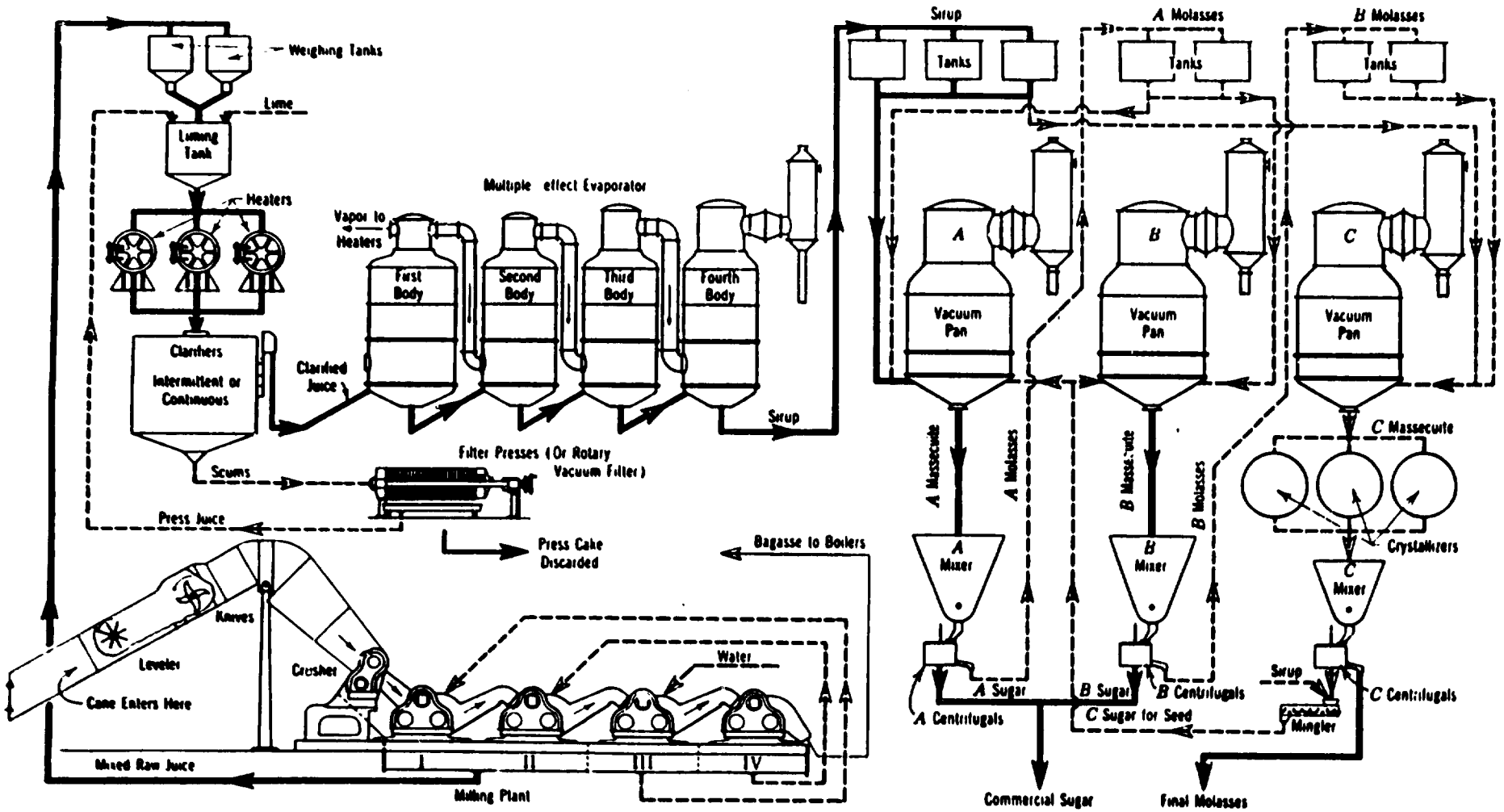
Next page is presented a flow diagram of raw sugar manufacturing (table 4.1).

IV.3 - ROUGH LAY OUT OF INVESTMENT COSTS

Investments costs will be broken down on a five years period as follow (included estate and farmers costs)

year	1	2	3	4	5
	27,904	13,980	6,396	4,425	1,115

TABLE 4.1



Flow Diagram of Raw Sugar Factory.

V - FINANCIAL AND ECONOMIC ANALYSIS

V.1 - TOTAL INVESTMENT COSTS

The financial analysis aims at demonstrating the positive financial impact of the project of rehabilitation and extension of the NAKAMBALA Estate.

Firstly, we will describe investments costs for the project.

Investments costs include fixed capital costs plus net working capital.

Fixed investment costs include for the Estate (US $ '000) :

- Factory and equipment	20,964
- Housing and infrastructure	9,243
- Irrigation	8,332
- Land development	
- Power supply	1,000
- Agric Plant/Equip Estate	6,396
- Agric Plant/Equip Farmers	2,575
- Incremental working capital	2,854

Fixed invesment costs for the farmers include :

- Housing and infrastructure	949
- In-field irrigation	2,455
- Land development	1,339
- Agric Plant/Equipment	547

Investment costs are presented in table 5.1, they are the ones estimated by Booker Tate when a thorough technical appraisal was achieved.

Capital costs will be partly foreign costs. Direct foreign component of total capital costs are essentially for the Factory, and Agricultural Plant and Equipment, they account for 63% of total capital costs.

The total amount of investments in ('000 US$) cost :

Factory	Fixed investments	48,510
Farmers	Fixed investments	5,310
		53,820

These amounts do not include the increase in working capital.

The increase in working capital is estimated to reach for the total period of investments about US $ 3,000,000.
Therefore capital costs total about US $: 57,000,000.

V.2 - PROJECT FINANCING

According to ZSC estimates, it was assumed that the project should be financed by equity for 20% and by foreign loans for 80%.

TABLE 5.1

INVESTMENTS COSTS

	1992			1993			1994			1995			1996			
	1			2			3			4			5			
	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	FC	LC	TC	TC
Fixed investments costs																
Estate																
Factory	10,906	2,077	12,983	5,392	1,027	6,419	845	161	1,006	467	89	556				20,964
Housing and Infrastructure	330	2,209	2,539	330	2,209	2,539	301	2,012	2,313	241	1,611	1,852				9,243
Irrigation	5,216	3,064	8,280	33	19	52										8,332
Land development																
Power Supply	700	300	1,000													1,000
Agric Plant/Equip Estate	1,659	293	1,952	894	158	1,052	940	166	1,106	995	176	1,171	948	167	1,115	6,396
Agric Plant/Equip Farmers Dvt	530	93	623	702	124	826	585	103	688	372	66	438				2,575
Total Estate	19,341	8,036	27,377	7,351	3,537	10,888	2,671	2,442	5,113	2,075	1,942	4,017	948	167	1,115	48,510
Farmers																
Housing and Infrastructure					491	491		458	458		20	0				949
Infield Irrigation				186	1,672	1,858	35	312	347	25	225	250				2,455
Land Development	187	80	267	319	137	456	335	143	478	97	41	138				1,339
Agric Plant/Equipment	221	39	260	244	43	287										547
Total Farmers	408	119	527	749	2,343	3,092	369	914	1,283	122	286	408				5,310
TOTAL INVESTMENTS COSTS	19,749	8,155	27,904	8,100	5,880	13,980	3,040	3,356	6,396	2,197	2,228	4,425	948	167	1,115	53,820

From self-financing from previous years before the implementation of the project, equity was generated at least up to US $ 9,680,000 to finance capital costs in 1992.

Cash flows generated from the project enable to self-finance in 1995 and 1996 respectively, US $ 4,405,000 and US $ 1,115,000.

Foreign Loans

Foreign loans could be contracted with large European financing agencies such as CDC the British lending Agency or KFW the German one which have shown some interest in financing this project.

Since we do not have any information on specific loan conditions for this particular project we need to make some assumptions on loan financing. The total amount of the loan will be (in 000 US$) : 38,600.

Interest rate : 10%
Repayment Period : 10
Grace Period : 2

We have computed loan interests as well as principal repayments and presented them in table 5.2.

It is to be noted that this financial schedule is indicative since project has still to be discussed with potential lending agencies.

V.3 - FINANCIAL STATEMENTS

V.3.1 - Projected statements

The financial analysis will include Income Statements Projections as well as a Cash Flow Table in order to illustrate how the project will be profitable for the Estate.

Statements are computed in constants US dollars until the year 2000 (exchange rate : 50 K : 1 US $ as of January 1991).

In order to illustrate the project impact on current situation we have presented Net Income Statements in table 5.3 without the project and in table 5.4 with the project.

V.3.1.1 - Net Income Statements

The computation of the various accounts from the statements will be detailed below.

a - Sales volume

without the project

Sales volume without the project decrease a little and reach a steady level of about 120,000 t/y of sugar if we consider that yields will be lower since the equipment is not rehabilitated.

DETAIL OF FINANCIAL COSTS

TABLE 6.3

CURRENCY : 000 US $, Constant money

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
02/03 - CREDITS												
FIN.CREDIT # 1	18,224	13,980	6,396	0	0	0	0	0	0	0	0	0
. SUB-TOTAL.....	18,224	13,980	6,396	0	0	0	0	0	0	0	0	0
11 - FINANCIAL EXPENSES												
FIN.CREDIT # 1	0	0	0	0	0	0	0	0	0	0	0	0
. SUB-TOTAL.....	0	0	0	0	0	0	0	0	0	0	0	0
13 - INTERESTS												
FIN.CREDIT # 1	911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603	121	0	0
. SUB-TOTAL.....	911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603	121	0	0
14 - REPAYMENTS												
FIN.CREDIT # 1	0	0	4,825	4,825	4,825	4,825	4,825	4,825	4,825	4,825	0	0
. SUB-TOTAL.....	0	0	4,825	4,825	4,825	4,825	4,825	4,825	4,825	4,825	0	0

INTER G -

NET INCOME

TABLE 5.2

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Project year	0	1	2	3	4	5	6	7	8	9
Tonnes of cane		1,178,694	1,178,694	1,178,694	1,178,694	1,178,694	1,178,694	1,178,694	1,178,694	1,178,694
SALES VOLUME										
Tonnes sugar		129,656	123,763	120,227	120,227	120,227	120,227	120,227	120,227	120,227
Tonnes molasses		41,254	41,254	41,254	41,254	41,254	41,254	41,254	41,254	41,254
Tonnes raw sugar equivalent		170,911	165,017	161,481	161,481	161,481	161,481	161,481	161,481	161,481
REVENUES										
Sugar										
Exports		3,630	1,733	1,663	1,663	1,663	1,663	1,663	1,663	1,663
Local Sales		90,435	89,573	87,014	87,014	87,014	87,014	87,014	87,014	87,014
Total sugar		94,066	91,306	88,697	88,697	88,697	88,697	88,697	88,697	88,697
Molasses										
Exports		464	464	464	464	464	464	464	464	464
Local Sales		340	340	340	340	340	340	340	340	340
Total molasses		804	804	804	804	804	804	804	804	804
TOTAL SALES		94,870	92,111	89,502	89,502	89,502	89,502	89,502	89,502	89,502
Sales Taxes		9,487	9,211	8,950	8,950	8,950	8,950	8,950	8,950	8,950
TOTAL REVENUES		85,383	82,899	80,552	80,552	80,552	80,552	80,552	80,552	80,552
OPERATING COSTS										
Agriculture		9,521	9,521	9,521	9,521	9,521	9,521	9,521	9,521	9,521
Factory Operating Costs										
Labour		1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Factory chemicals		812	812	812	812	812	812	812	812	812
Import duty		385	385	385	385	385	385	385	385	385
Factory Miscellaneous		4,878	4,878	4,878	4,878	4,878	4,878	4,878	4,878	4,878
Administration		213	213	213	213	213	213	213	213	213
Electricity		76	76	76	76	76	76	76	76	76
Packaging		3,339	3,186	3,133	3,133	3,133	3,133	3,133	3,133	3,133
Cleanage/Bagasse		100	100	100	100	100	100	100	100	100
Total Factory Operating Costs		11,484	11,312	11,257	11,257	11,257	11,257	11,257	11,257	11,257
Irrigation Development Charges		1832	1832	1832	1832	1832	1832	1832	1832	1832
Cane from Outgrowers		5,398	5,398	5,398	5,398	5,398	5,398	5,398	5,398	5,398
Overheads/Administration		1,869	1,854	1,849	1,849	1,849	1,849	1,849	1,849	1,849
TOTAL OPERATING COSTS		30,082	29,915	29,855	29,855	29,855	29,855	29,855	29,855	29,855
OPERATING INCOME BEFORE DEPRECIATION		55,301	52,984	50,697	50,697	50,697	50,697	50,697	50,697	50,697
Depreciation										
OPERATING INCOME		55,301	52,984	50,697	50,697	50,697	50,697	50,697	50,697	50,697
On-going repayments		4,022	4,022	1,543	1,543	1,543	1,543	1,543	1,543	1,543
INCOME BEFORE TAXATION		51,279	48,962	49,154	49,154	49,154	49,154	49,154	49,154	49,154
Tax		9,615	9,180	9,216	9,216	9,216	9,216	9,216	9,216	9,216
NET INCOME		41,664	39,782	39,937	39,937	39,937	39,937	39,937	39,937	39,937

TABLE 5.4

NET INCOME WITH THE PROJECT

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Project year	0	1	2	3	4	5	6	7	8	9
Tonnes of cane		1,178,694	1,217,595	1,367,080	1,472,026	1,481,944	1,482,539	1,483,000	1,483,000	1,483,000
SALES VOLUME										
Tonnes sugar		128,658	135,153	156,736	169,136	170,275	170,373	170,374	170,374	170,374
Tonnes molasses		41,254	42,616	48,547	51,521	51,868	51,889	51,905	51,905	51,905
Tonnes raw sugar equivalent		170,911	177,769	205,285	220,657	222,143	222,262	222,279	222,279	222,279
REVENUES										
Sugar										
Exports		3,630	6,147	13,304	16,778	15,720	14,175	12,580	11,994	11,994
Local Sales		90,435	89,840	92,609	95,380	98,232	101,202	104,231	105,291	105,291
Molasses										
Exports		464	479	546	580	584	584	584	584	584
Local Sales		340	352	401	425	428	428	428	428	428
TOTAL SALES		94,870	96,817	106,859	113,176	114,963	116,389	117,803	118,296	118,296
Sales Tax		9,487	9,682	10,686	11,318	11,496	11,639	11,780	11,830	11,830
TOTAL REVENUES		85,383	87,136	96,173	101,858	103,467	104,750	106,023	106,466	106,466
OPERATING COSTS										
Agriculture		9,941	9,985	10,112	10,112	10,130	10,094	10,118	10,118	10,118
Factory Operating Costs										
Labour		1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Factory chemicals		812	839	956	1,014	1,021	1,021	1,022	1,022	1,022
Import duty		365	378	430	456	459	460	460	460	460
Factory Miscellaneous		7,295	7,535	8,584	9,110	9,171	9,175	9,178	9,178	9,178
Administration		213	213	213	213	213	213	213	213	213
Electricity		76	76	76	76	76	76	76	76	76
Packaging		3,339	3,653	4,161	4,416	4,446	4,448	4,449	4,449	4,449
Carriage/Bagasse		100	100	100	100	100	100	100	100	100
Total Factory Operating Costs		13,880	14,474	16,200	17,066	17,167	17,173	17,177	17,177	17,177
Irrigation Development Charges		1,832	2,052	2,208	2,220	2,220	2,220	2,220	2,220	2,220
Cane from Outgrowers		5,382	6,819	9,155	10,304	10,374	10,378	10,381	10,381	10,381
Overheads/Administration		2,109	2,334	2,756	2,959	2,976	2,977	2,978	2,978	2,978
Recoveries		-267	-2414	-1634	-1870	-1421	-1377	-1377	-1377	-1377
TOTAL OPERATING COSTS		32,878	33,250	38,797	40,791	41,445	41,465	41,497	41,497	41,497
OPERATING INCOME BEFORE DEPRECIATION		52,505	53,886	57,376	61,067	62,021	63,285	64,525	64,971	64,971
Depreciation		15,095	22,759	25,585	27,789	28,733	28,733	28,733	28,733	28,733
OPERATING INCOME		37,410	31,127	31,791	33,288	33,288	34,552	35,792	36,238	36,238
Interest on new project		911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603
On-going repayments		4,022	4,022	1,543	1,543	1,543	1,543	1,543	1,543	1,543
INCOME BEFORE TAXATION		36,391	28,498	28,505	30,174	30,647	32,393	34,116	35,044	35,527
Income Tax		6,823	5,343	5,345	5,658	5,746	6,074	6,397	6,571	6,661
NET INCOME		29,568	23,155	23,160	24,517	24,901	26,319	27,719	28,473	28,865

It is considered that yields of production vary from one year to another and that crops period vary also but in order to simplify, the total production of sugr will be steady over the years.

With the project

Production of sugar will reach 170,000 tons with the rehabilitation and the extension of the factory equipment in 1996.

b - Revenues

Sugar prices

Sales of sugar are mainly for local consumption since production succeeds in meeting the local demand to a great extent. With current level of sugar productions of about 130,000 t/y, exports will only account for 7% of total sales in 1992 and will drop to 3.5 % in 1993 after sugar production will decrease to 120,000 tons.

With the project, sugar exports will grow significantly since local consumption will be met with about 130,000 t/y. Exports will reach about 17 % of total sugar production.

Sugar export price has been set up at US $ 400/T in constant prices. Export price has been set up according to general international market trends (cf World Bank Projections). Moreover, since Zambia neighbouring countries are land-locked and import sugar from Zambia export prices is likely to be sold at a higher price.

Sugar local price was estimated at K 37,500 i.e. US $ 750/t. Lending agencies consider price liberalization as a pre-condition for the success of the project (based on information given by ZSC).

Molasses prices

Sales of molasses are equally divided up between local sales and exports.

Molasses export price has been set up at US $ 25/t which is higher than current prices but we can anticipate that average prices will reach this level in the coming years.

Molasses local price has been set up at K 750/t i.e. US $ 15/t which is the price estimated by ZSC for the near future (according to prices used in the previous years).

Without the project

Total revenues will probably stay constant but are not expected to increase over the years since cane yields should be lower and cane production will decrease to 120,000 t/y ultimately.

With the project

Total production increasing to 170,000 t/y, revenues will increase proportionnally with export revenues reaching 30,000 t/y.

Molasses production will increase proportionnally to cane production, we do not anticipate any changes in molasses exports and local sales break down.

c - Sales tax

Sales tax are set up at 10 % on total sales (including exports).

d - Operating costs

Agriculture

Agriculture costs are based on Nakambala Estate budget costs for 1991-1992 and remain constant.

Agriculture costs include essentially growing cane, harvesting, cane haulage, land preparation.

With the project, agriculture costs increase and are incremented according to ZSC and Booker Tate analysis.

Factory operating costs

Labour

Labour of Nakambala Estate is of subsequent size. There are more than 7000 workers including 300 staff personnel and 70% of them work in agriculture. Production employees (part of the factory) represent about 1300 people including packing (see organization chart next page).

Factory workers are broken down as follow :

- Mills and caneyard	39
- Boilers and turbine	39
- Boiling house	53
- Factory workshop	80
- Production operations	163
- Production engineering	213
- Laboratory	90
- Packing station	617
- Electrical/Instrumentation	76
- Administration	5

Factory Labour costs have been computed based on ZSC actual figures.

We consider that there will be no major additional costs with the project since workers will be reorganized more efficiently and non significative "recruitement" is forecasted.

Factory chemicals

Factory Chemicals are computed with current prices given by ZSC. Chemicals are essentielly imported products (80%), they account for a significant part of the factory operating costs about 6 % of total factory costs without tax. With the project, chemicals use will increase proportionnally to cane production. The average cost per ton of cane is US $ 689.

Nakambala Rehabilitation/Expansion

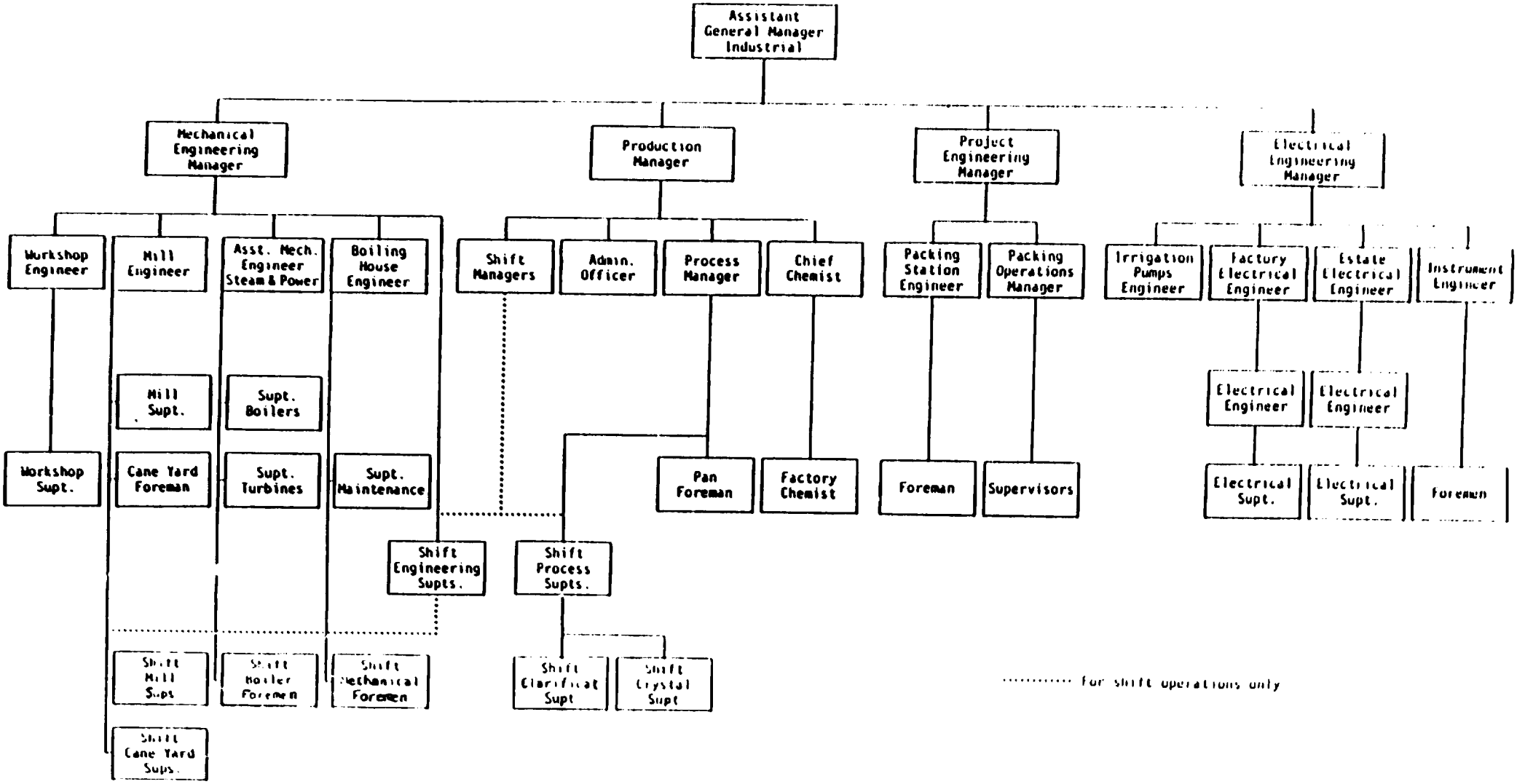
Factory Chemical Costs

PRODUCTION TONNES
Cane
Commercial sugar

CHEMICAL	Basic rate kg/1000 tc	Ex stores cost US$/t
Factory		
Aluminium sulphate	30.0	550
Sulphamic acid	20.0	1500
Caustic soda	90.0	1000
IR resin	1.5	3200
Iso-propyl alcohol	.3	3500
Sodium Carbonate	45.0	550
Hydros	15.0	2700
TSP	150.0	220
Lime	1000.0	100
Talosep	5.0	4600
Talodura	3.0	4800
Phosphoric acid	45.0	1500
Sodium polyacrylate	15.0	3500
Dextranase	.4	15000
Chlorine	2.0	2500
Salt	25.0	300
Sulphur	300.0	550
Tri-sodium phosphate	5.0	1500

SOURCE : ISC and booker tate

Factory Department Existing Organisation



Source : S.S.C.

Import Duty

Import Duty is due on chemical imports and is set at 45% of import prices.

Factory Miscellaneous

Factory Miscellaneous are broken down into the following items :

- Laboratory consummables
- Factory lubricants
- Factory welding rods
- Maintenance Spares
- Materials
- Consummables

We have computed these costs based on the figures given by ZSC according to the factory current operation and to Booker Tate estimates.

Administration

Administration costs remain constant over the years and stay at a reasonable level.

They are based on Nakambala existing budget data from 1988/89

Electricity

Power is generated within the factory by steam produced by bagasse burning, current facilities should enable to generate enough power.

With the project, the annual charge should remain at about US $ 76,000.

Packaging

Packaging is a significant part of factory operating costs, and it is very labour intensive. It accounts for about 1/3 of total operating costs.

Packaging cost has been computed for total production taking into account breaking down of production into various types of packages used.

Types of packaging are the following :

- 50 kg paper bagging
- 50 kg polypropylene bagging
- 10 kg paper bagging
- 2 kg household white paper
- 2 and 1 kg household white polyfilm.

Polypropylene bags are more expensive and the 2 and 1 kg polyfilm bags are the most common used.

Cranage/Bagasse

This account should remain constant over the years we have estimated its value according to current costs in Nakambala State.

e - **Irrigation development charges**

Irrigation development charges include in-field irrigation, as well as electricity.

Charges are based on Nakambala Estate budget for 1991/1992 and remain constant without the project.

With the project, charges are incremented according to Booker Tate's appraisal and projections for the coming years.

f - **Cane from outgrowers**

Without the project

Cane is bought by the Estate at a price equal to K 1 000 i.e. US $ 20/t. As far as cane production, we have kept the previous break down between cane harvested by the Estate and cane harvested by the farmers in order to forecast cane production by the farmers for the coming years.

With the project

Cane produced by the farmers will grow significantly since additional land will reach 2 340 ha, and total area cultivated by the farmers will double.

In 1992, cane harvested by the farmers account for about 25 %. With land development by the farmers to produce additional cane, the percentage increase to 35 % by 1995.

Yields in the first years will be lower about 111 tc/ha but still remain higher than yields at the Estate 98 tc/ha.

g - **Overheads/Administration**

Overheads costs have been estimated to about 10% of total operating costs. Therefore these costs increase proportionnally with the operating costs level.

h - **Recoveries**

We have discounted some operating charges which will not burden operating costs because of the project implementation. Those charges were estimated by Booker Tate in their appraisal and include water charges, irrigation development charges, land development charges.

i - **Operating Income**

Operating Income is computed before depreciation, to compare both Operating Incomes without and with the project.

j - **Depreciation**

According to various investments programs achieved since the beginning of operations of the Estate, it was not possible to evaluate depreciation on present equipment. We have computed depreciation based on new equipment

purchases as well as new extension program according to the economic life of the equipment (see table 5.5).

The following rates of linear depreciation are given below :

- Factory Equipment	: 10%
- Housing and infrastructure	: 4%
- Irrigation : Main supply - Pipeline	: 4%
- Pumps	: 10%
- In-field Development	: 4%
- Agric Plant/Equipment	: 10%
- Power supply	: 10%

k - Interests

Interests are computed only for loans financing of the project as detailed in section V.2.

l - On-going repayments

From past financial statements, we have projected on going repayments from foreign loans but we were not able to differentiate interests from principal repayments.

Consequently, on-going repayments discounted to compute the Net Income before taxation burden the final result.

m - Tax

ZSC is relevant from two different income tax :

- income tax on agricultural profits : 15 %
- income tax on manufacturing profits : 40 %

In 1990 balance sheet, the average tax income was 18,75 %. We have used the same taxation level in our prefeasibility analysis.

V.3.1.2 - Cash flow table

Projections of cash flow table aims at demonstrating the project can be financially supported by the estate over the coming years.

Cash inflow includes financial resources (equity and loans) as well as operating profit from net income statement. Cash outflow includes investment expenditures, production costs and other expenditures as well as debt service. Cash flow table is numbered table 5.6.

a - Cash inflow

Financial resources as mentioned in section V.2 (loan financing) include equity and financial credits. The schedule of loan financing has been spread over 3 years with total capital disbursement on year 1.

Operating profit is computed in the Net Income Statement (see table 5.4) and added to annual depreciation give the International Cash Generation of the Estate.

b - Cash outflow

Capital and replacement costs

Capital and replacement costs include the expenditures for the factory, housing and infrastructure, the irrigation system, the agriculture, the power supply.

Factory, housing and irrigation cost have been spread over 4 years while agriculture costs on 5 years power supply costs are totally paid on the first year.

It is to be noted that about half of all costs occur during the first year.

Debt service

It includes interest and repayments for the extension project as well as debt service from previous loans.

Increase in working capital

Increase in working capital is due to project additional expenses, we have introduced figures according to current working capital and to progressive increase of operating costs during the implementation of the project. Increase in working capital is estimated to 25 % of operating costs.

Balance

The computed Balance gives the difference between cash inflow and cash outflow.

V.3.1.3 - Conclusions

Internal rate of return

In order to measure the financial interest of the project, we have computed the financial Internal Rate of Return (see table 5.7).

As this project is an expansion project, the incremental internal rate of return takes account of incremental profits resulting from incremental production of the expansion project based on new investments.

When computing the Internal Rate of Return on Incremental Net Cash Flow for an eleven year period, we have taken into account the salvage value of factory equipment, housing and infrastructure, irrigation equipment. This period corresponds to the total period of implementing and financing the project.

The estimated rate of 15.3 % is a positive result and should foster the implementation of the project.

Payback period

Simultaneously, we have computed the pay back period of the project based on operating profit before financial charges and depreciation. Pay back period computation is presented in table 5.7. It includes total investment costs of the project. The payback period is estimated to 7 years.

Moreover, in order to support the implementation of the project, we have conducted a sensibility analysis based on sugar prices -local and export- to the internal rate of return. Indeed, we thought it was relevant to take into consideration of possible future international sugar rates.

Sensibility analysis

Considering results above, this sensibility analysis has only been conducted on sugar price reduction.

1 - Local price : US $ 700 i.e. 35 000 K
    Export price : US $ 370 i.e. 18 500 K

2 - Local price : US $ 700 i.e. 35 000 K
    Export price : US $ 400 i.e. 20 000 K

The analysis is presented in table 5.8 and table 5.9 and illustrates through the Internal Rate of Return that the project is very sensitive to sugar price changes.

Economic aspects

To complete the project evaluation, some economic considerations deserve to be noted.

At the national level :

- the project will enable to sustain employment level : more than 7 000 employees

- the project will enable to meet the country's demand in sugar consumption

- the project will facilitate Zambia involvement in the intra-PTA trade through sugar trade for 25 000 to 35 000 tons exported.

At the local level (for ZSC) :

- the rehabilitation of the factory equipment will lead to a better use of existing equipments therefore a better profitability,

- export sales to neighbouring countries will enable to repay foreign loans annuities (see table 5.10)

- increase in cane production will lead to a surplus of bagasse which will not be burnt. Consequently, this volume could be eventually sold to farmers for animal feed production (bagasse-molasses mix) or used for craft paper production. One project was identified to produce 6 000 t/y of craft paper from bagasse pulp (about 30 000 t/y).

Currently, the technical studies on the extension-rehabilitation project are, effectively, not detailed enough to foresee available bagasse production. These potential additional revenues could be taken into account when the final feasibility study is achieved.

TABLE 5.5.

DEPRECIATION TABLE

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Factory		11,113	5,485	861	476	0				
Housing and Infrastructure		418	418	381	306	0				
Irrigation - Main Supply		560	4	0	0	0				
Infield Development										
Power Supply		730	0	0	0	0				
Agric Plant/Equip Estate		1,688	910	957	1,013	964				
Agric Plant/Equip Farmers		838	714	595	378	0				
Total Depreciation		15,068	7,841	2,784	2,173	964				
Cumulated Depreciation		15,068	22,910	25,404	27,577	28,542	28,542	28,542	28,542	28,542
Farmers										
Housing and Infrastructure		0	20	16	1	0				
Infield Irrigation		0	74	14	10	0				
Agric Plant/Equipment		26	28	0	0	0				
Total Depreciation		26	123	32	11	0				
Cumulated Depreciation		26	149	181	192	192	192	192	192	192
Total Depreciation		15,095	22,788	25,585	27,769	28,733	28,733	28,733	28,733	28,733

TABLE 5.6

CASH FLOW TABLE

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	0	1	2	3	4	5	6	7	8	9
CASH INFLOW										
Capital		9,680								
Financial Credits		18,224	13,980	6,396						
Operating Income		37,410	31,127	31,791	33,298	33,268	34,552	35,792	36,238	36,238
Depreciation		15,095	22,759	25,585	27,769	28,733	28,733	28,733	28,733	28,733
TOTAL CASH INFLOW		80,409	67,866	63,772	61,067	62,021	63,285	64,525	64,971	64,971
CASH OUTFLOW										
Capital and Replacement Costs										
Factory		12,963	6,419	1,006	556					
Housing and Infrastructure		2,539	3,030	2,771	1,852					
Irrigation		8,260	1,910	347	250					
Agriculture		3,102	2,621	2,272	1,747	1,115	1,052	1,052	1,366	1,366
Power Supply		1,000								
Total Assets schedule		27,904	13,980	6,396	4,405	1,115	1,052	1,052	1,366	1,366
Debt Service										
Interests		911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603
Repayments				4,825	4,825	4,825	4,825	4,825	4,825	4,825
On-going repayments		4,022	4,022	1,543	1,543	1,543	1,543	1,543	1,543	1,543
Total Debt Service		4,933	6,543	9,546	9,384	8,901	8,419	7,936	7,454	6,971
Income Tax		6,823	5,343	5,345	5,658	5,746	6,074	6,397	6,571	6,661
Increase in working capital		699	93	1,387	498	164	5	8	0	0
TOTAL CASH OUTFLOW		40,359	25,959	22,674	19,945	15,926	15,549	15,393	15,391	14,998
BALANCE		40,050	41,907	41,099	41,122	46,095	47,736	49,132	49,580	49,973

TABLE 5.1

INTERNAL RATE OF RETURN AND PAY BACK PERIOD

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	0	1	2	3	4	5	6	7	8	9	10	11
INCREMENTAL CAPITAL COSTS		-27,904	-13,980	-6,396	-4,405	-1,115	-1,052	-1,052	-1,366	-1,366	-1,366	-1,366
INCREMENTAL OPERATING INCOME		-2,795	902	6,680	10,371	11,325	12,589	13,829	14,274	14,274	14,274	14,274
NET CASH FLOW		-30,699	-13,078	284	5,966	10,210	11,537	12,777	12,908	12,908	12,908	35,708
INTERNAL RATE OF RETURN BEFORE TAXATION		15.31%										
INCREMENTAL OPERATING INCOME		-2,795	902	6,680	10,371	11,325	12,589	13,829	14,274	14 274	14,274	14,274
INTERESTS		911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603	121	0
OPERATING INCOME AFTER FINANCIAL CHARGES		-3,706	-1,619	3,502	7,355	8,792	10,538	12,261	13,188	13,671	14,153	14,274
AVERAGE PROFIT		8,401										
PAY BACK PERIOD		6.94										

TABLE 5.3

INTERNAL RATE OF RETURN AND PAY BACK PERIOD

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	0	1	2	3	4	5	6	7	8	9	10	11
INCREMENTAL CAPITAL COSTS		-27,904	-13,980	-6,398	-4,405	-1,115	-1,052	-1,052	-1,366	-1,366	-1,366	-1,366
INCREMENTAL OPERATING INCOME		2,795	588	5,560	8,849	9,704	10,894	12,062	12,482	12,482	12,482	12,482
NET CASH FLOW		-30,699	-13,392	-836	4,444	8,589	9,842	11,010	11,116	11,116	11,116	33,916
INTERNAL RATE OF RETURN BEFORE TAXATION		12.35%										
INCREMENTAL OPERATING INCOME		2,795	588	5,560	8,849	9,704	10,894	12,062	12,482	12,482	12,482	12,482
INTERESTS		911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603	121	0
OPERATING INCOME AFTER FINANCIAL CHARGES		-3,706	-1,933	2,382	5,833	7,171	8,843	10,494	11,396	11,879	12,361	12,482
AVERAGE PROFIT		7,018										
PAY BACK PERIOD		8.31										

TABLE 5.9

INTERNAL RATE OF RETURN AND PAY BACK PERIOD

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	0	1	2	3	4	5	6	7	8	9	10	11
INCREMENTAL CAPITAL COSTS		-27,904	-13,980	-6,396	-4,405	-1,115	-1,052	-1,052	-1,366	-1,366	-1,366	-1,366
INCREMENTAL OPERATING INCOME		-2,795	886	6,344	9,868	10,652	11,737	12,796	13,178	13,178	13,178	13,178
NET CASH FLOW		-30,699	-13,094	-52	3,463	9,537	10,685	11,744	11,812	11,812	11,812	34,612
INTERNAL RATE OF RETURN BEFORE TAXATION		13.93%										
INCREMENTAL OPERATING INCOME		-2,795	886	6,344	9,868	10,652	11,737	12,796	13,178	13,178	13,178	13,178
INTERESTS		911	2,521	3,178	3,016	2,533	2,051	1,568	1,086	603	121	0
OPERATING INCOME AFTER FINANCIAL CHARGES		-3,706	-1,635	3,166	6,852	8,119	9,686	11,228	12,092	12,575	13,057	13,178
AVERAGE PROFIT		7,692										
PAY BACK PERIOD		7.58										

TABLE 5.10

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	0	1	2	3	4	5	6	7	8	9
FOREIGN CURRENCY FLOW										
EXPORTS		3,630	6,147	13,304	16,778	15,720	14,175	12,560	11,994	11,994
DEBT SERVICE		911	2,521	8,003	7,841	7,358	6,876	6,393	5,911	5,428
BALANCE		2,719	3,626	5,301	8,937	8,362	7,299	6,167	6,083	6,566

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