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17243 (1of3)

FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED IN ZIMBABWE

MULTIPURPOSE FACTORY

-=oOo=-

VOLUME I

3

FINAL REPORT

(208)

SOFRECO

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November 1988

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2.1. PROJECT BACKGROUND AND HISTORY

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2.1.5. THE PROJECT IDEA

- Existence of natural resources with potentiel for processing :
  - cotton
  - other oil seeds

- Strong local demand for oil
- Exports potential for meals
- Existing local industry
- Appearance of a lack of capacity by 1990

2.1.6. THE PROJECT PROMOTION

- Special position of the CMB
- Downstream complementary activities
- Downstream opportunity for the CMB
- Interest of the French Government

2.2 INTERNATIONAL CONTEXT

Oils seeds - Edible oils - Oil meals - World production and Market.

2.1. PROJECT BACKGROUND AND HISTORY

2.1.1. ZIMBABWE - BASIC DATA

2.1.1.1 Geography

Situated in South-Eastern Africa, between the 16 th and the 22nd southern latitudes and between the 25th and 33rd eastern longitudes, ZIMBABWE has a total area of 390,757 km^2.

It is a landlocked country which shares borders with ZAMBIA, MOZAMBIQUE, REPUBLIC OF SOUTH AFRICA and BOTSWANA.

The land is devided into 4 natural regions :

- the "High Veld" that runs from South-West to North-East ; this plateau is 650 km long and 80 km wide (altitude between 1,200 and 1,500 m),
- the "Middle Veld", with an altitude between 600 and 1,200 m,
- the "Low Veld" which consists of the ZAMBEZI valley and the LIMPOPO and SABI basins (altitude below 600 meters),
- the "Eastern Higlands" at the Mozambican border, which is extremely mountainous with many peaks exceeding 1,800 meters (the INYANGANI : 2,599 meters).

The climate of ZIMBABWE is tropical continental changing by altitude, specially on the central plateau.

The average annual rainfall varies from 300 m (BEIBRIDGE IN THE SOUTH) to 1,000 mm and over (INYANGA near the Mocambican border) ; at HARARE, the capital, the annual rainfall varies from 440 mm (1982/83) to 1,100 mm (1980/81).

2.1.1.2. Population

The last population census, taken in 1982, enumerated a total population of 7 517 165 persons with a growth rate of 2.93 % between 1969 and 1982.

The following table gives the figures for population and growth rates by mid 1987 and mid 2000 respectively for the medium and the high variant.

	1987	2000	1987 / 2000 growth rate % per year
Medium variant	8 639 674	11 942 622	2.52 %
High variant	8 662 506	12 375 111	2.78 %

Source : Population projections of Zimbabwe 1982 to 2032.
Central Statistical Office - Harare - January 1986.

Social indicators : (1985)

. Life expectancy at birth : - male : 55
- female : 59
. Crude birth rate : 47°/oo
. Crude death rate : 12°/oo
. Infant mortality rate : 77°/oo
. Urban/rural population % : 27/73

Source : World Development Report 1987

ZIMBABWE is divided in 8 administrative regions :

MANICALAND, MASHONALAND CENTRAL, MASHONALAND EAST, MASHONALAND WEST, MATABELELAND NORTH, MATEBELELAND SOUTH, MIDLANDS, MASVINGO.

The capital is HARARE.

The principal towns are (population figures of 1982) :

HARARE (656 000), BULAWAYO (414 000), CHITUNGWIZA (173 000), GWERU (79 000), MUTARE (70 000), KWEKWE (48 000), KADOMA (45 000).

2.1.1.3. Political background

ZIMBABWE, previously SOUTHERN RHODESIA, finally achieved official independence in 1980, the last of the british colonies in AFRICA to do so. This followed several years of guerrilla warfare. Since 1980 reconstruction has helped to overcome the consequences of the war.

The constitution involves a Parliament with a prime minister heading the executive ; ZIMBABWE is a republic within the Commonwealth, with a president as titular head.

The government stresses in particular close cooperation with ZIMBABWE's neighbours in the context of the Southern African Development Coordination Conference (SADCC) and the Preferential Trade Area (PTA) for East and Southern Africa.

ZIMBABWE is also an active member of the Organisation of African Unity and a signatory of the LOME Convention Linking African, Carribbean and Pacific (ACP) countries with the EEC.

2.1.1.4. Economy.

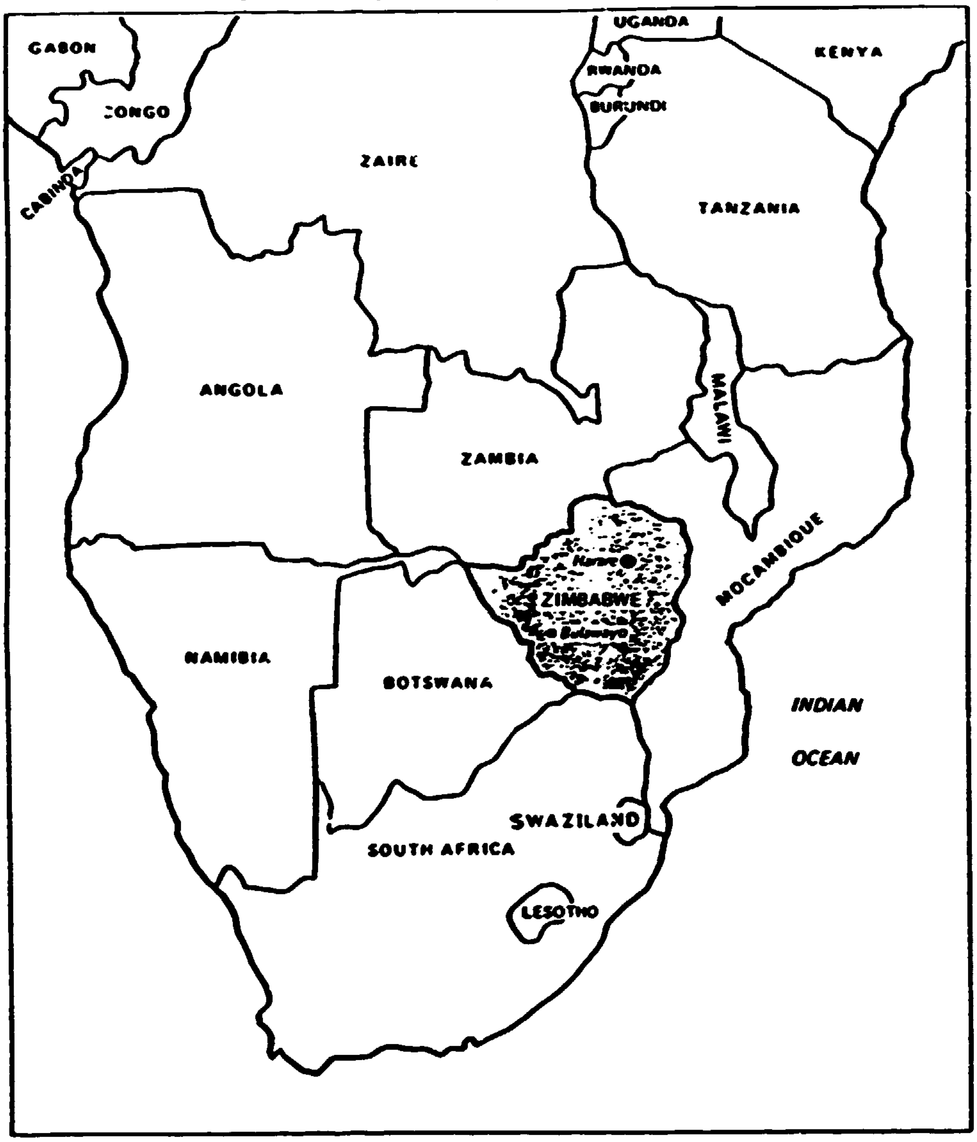
a/ Currency : Zimbabwe dollar (Z$) = 100 cents. Average exchange rate for :
1987 $1 = Z$ 1.669
May 1988 $1 = Z$ 1.7

b/ GDP at current prices and factor costs :
1986 : Z$ million 8 323

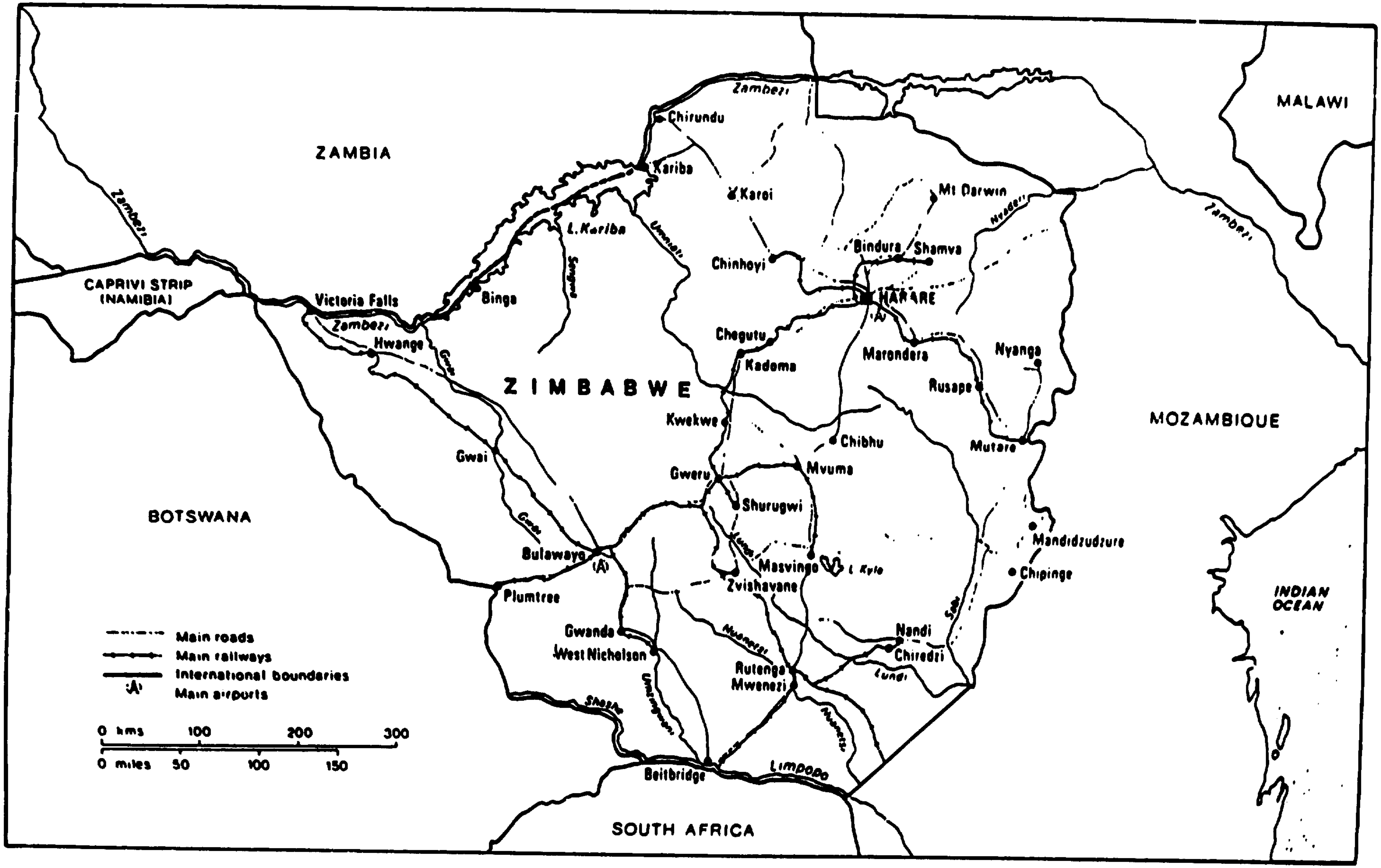
c/ GNP per capita in 1985 US$: 680
Source World Bank Development Report 1987

The World Bank classes Zimbabwe in the category of "Middle income country".

Countries of southern Africa



Zimbabwe



ZAMBIA
MALAWI
Zambezi
Chirundu
Kariba
Karoi
Mt Darwin
L. Kariba
Chinhoyi
Bindura
Shamva
CAPRIVI STRIP (NAMIBIA)
Victoria Falls
Binga
HARARE
Hwange
Chegutu
Kadoma
Marondera
Nyanga
Rusape
ZIMBABWE
Kwekwe
Chibhu
Mutare
MOZAMBIQUE
Gwai
Gweru
Mvuma
Shurugwi
BOTSWANA
Mandidzudzure
Bulawayo
Masvingo
L. Kyle
Chipinge
Zvishavane
Plumtree
INDIAN OCEAN
Main roads
Main railways
International boundaries
Main airports
Gwanda
West Nicholson
Nandi
Chiredzi
Rutenga
Mwenezi
Shashe
Limpopo
0 kms 100 200 300
0 miles 50 100 150
Beitbridge
SOUTH AFRICA

5

d/ Structure of production :

(Constant prices (1980) factor costs	1984
- primary production to total GDP	14.0 %
- secondary production to total GDP	35.3 %
- tertiary production to total GDP	50.7 %
- (Manufacturing)	(22.8 %)

The structure of ZIMBABWE's GDP differs markedly from that of most neighbouring countries, because of the relative importance of the manufacturing industry and the "Services".

e/ Foreign trade

- Export 1986 Total value	:	2 170.3 Z$ mn
Main goods	:	Tobacco, ferro-alloys, maize, cotton lint, nickel metal, asbestos.
Main destinations	:	SOUTH AFRICA, U.K., WEST GERMANY, NETHERLANDS, ITALY
- Import 1986 Total value	:	1 640.4 Z$ mn
Main goods	:	petroleum products, chemicals, transport equipment.
Main origins	:	SOUTH AFRICA, U.K., WEST GERMANY, USA.
- Import cover rate 1986	:	132 %

2.1.2. STUDY FOR INCREASING THE EDIBLE OIL PRODUCTION CAPACITY-ORIGIN OF THE REQUEST.

The project was identified at UNIDO's Regional Investment Promotion Meeting for SADCC countries held from 3-7 November 1986 in HARARE. The Government of Zimbabwe through its Government supported Cotton Marketing Board (CMB) has requested UNIDO by their letter dated November 7th, 1986 to prepare a feasibility study. This was reconfirmed officially by the Ministry of Lands, Agriculture and Rural Resettlement and, finally, the Ministry of Finance endorsed the official request in October 1987.

2.1.3. CONTRACT UNIDO/SOFRECO

The contract for the study, entitled "FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED, IN ZIMBABWE", was awarded by UNIDO to the French Consulting Company SOFRECO in PARIS, through :

UNIDO Contract n° 88/19 of April 12th, 1988
Project N° US/ZIM/87/117.

The terms of reference are attached as annex 1 to this volume.

2.1.4. MISSION TO THE PROJECT AREA

According to the Contract entered into between UNIDO and SOFRECO, a team of experts went to ZIMBABWE from April 21st to May 27th, 1988.

The composition of the team was the following :

- M. BRUN, Industrial Economist, Team Leader,
- T.J. SIEREVOGEL, Agro-Economist,
- R. LEBLANC, Oil Technologist,
- D. DELWAULLE, Mechanical Engineer,
- I.C. BRYTOW, Financial Analyst,
- in the Project Area, Peter FAHY, resident Manager of COMMERCE PROMOTION INDUSTRIE (C.P.I.) in ZIMBABWE.

During all the stay in ZIMBABWE, the team of experts maintained a close contact with the counterpart, the Cotton Marketing Board and also with the resident representation of UNDP/UNIDO.

The main organisations visited were the following :

a/ Agricultural part of the study - organisations visited

- Ministry of Lands, Agriculture and Rural Ressetlement
- Agricultural Marketing Anthority (AMA)
- Cotton Marketing Board (CMB)
- Grain Marketing Board (GMB)
- Agricultural Technical and Extension Services (AGRITEX)

- Commercial Farmers Union
- Commercial Cotton Growers Association
- Commercial Oil seeds Producers Association
- The MWENEZI Development Corporation (Palm oil Project)

b/ Market Study for oils and fats : organisations visited

The four oil expressors :

- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS

The wholesalers and Retailers :

- JAGGERS WHOLESALERS
- Supermarkets (WOOLWORTH, TM, UK) in HARARE, BULAWAYO, MUTARE KADOMA...

For various informations :

- The Ministry of Health - Nutrition Department.
  exports :

For imports and exports :

- Statistical Department - Ministry of Industry
- Customs and Exercise

for General Information :

- Gouvernment publications.

c/ Market Study for oil cakes and oil meals - Organisations visited

- AGRIFOODS (main stockfeed producer)
- National foods - Stuckfeed Division
- Commercial Cattle producers Association
- Cold Storage Commission in BULAWAYO.

d/ Industrial part of the study - Organisations Visited

Visit of the plants of the four expressors :

- OLIVINE INDUSTRIES in Harare
- LEVER BROTHERS in Harare
- BLUE RIBBON FOODS in Bulawayo
- NATIONAL FOODS in Harare and Bulawayo.

e/ Packaging - Organisations Visited

- ZIMGLASS in GWERU (glass bottles)
- Van Leer Packaging (Drums)
- Metal Box (Tins)
- Soltrama Partex (Plastic)

f/ Utilities - Organisations Visited

- ZIMBABWE ELECTRICITY SULPPLY AUTHORITY
- BP - SHELL
- WANKIE COLLIERY (Coal supply)

g/ Transports

- NATIONAL RAILWAYS of ZIMBABWE
- SWIFT) Road Transport
- CLAN Transport Cy)

h/ Sites

- TOWN CLERK of KADOMA
- RURAL COUNCIL SECRETARY of BINDURA

i/ Mechanical Engineering - Organisations Visited

- Scott Wilson Kirkpatrick and partners (consulting Engineers).
- Wade Adams (Civil and Mechanical engineering)
- Antwood Holdings (Sheet Industries)
- John Hook and Sons (Steel Construction)
- Cochrane (vessels).

j/ Manpower Costs - Income taxes - Local loans etc

- CMB Finance Division
- Deloitte Haskins and Sells (auditors).

k/ Financing

- French Trade Commission
- Deloitte Haskins and Sells.

The detailed list of persons met is attached as annex II to this volume.

2.1.5. THE PROJECT IDEA

2.1.5.1. Existence of National Resources with potential for processing.

a/ Cotton

Cotton growing is widely practised in ZIMBABWE since it is one of the few cash crops which can be produced successfully and profitably with little capital outlay.

More than 190 000 farmers from all sectors are now registered with the Cotton Marketing Board, a dramatic increase from the 30 000 registered at Independance in 1980.

The Government Policy on the production of cotton is very positive and expansionary as cotton is an important source of foreign exchange, it fits very well in the policy of rural development and it produces raw materials for the local textile and vegetable oil industry.

The crop of 250 000 t of seed cotton in 1985/1986 is expected to grow to 450 000 t by the year 2000, that is an annual growth rate of 4.3 per cent.

b/ Other oil seeds

- Soya beans

  In ZIMBABWE, soya beans have become an increasingly important oil seed crop, grown principally by large scale commercial farmers. There is a vast potential of use of the crops, in the domestic market for oil and meal and on the export market for meal.

  The crop of 84 000 t in 1985/86 is expected to grow to 180 000 t by the year 2000, that is an annual growth rate of 5.6 per cent.

- Sunflowers

  Sunflowers are grown predominantly by the small scale and communal farming sectors.

  The crop of 16 400 t in 1985/86 is expected to grow to 50 000 t by the year 2000, that is an annual growth rate of 7.4 per cent.

c/ Maize

Maize is the staple food in ZIMBABWE. The major producer of maize meal, NATIONAL FOODS, has an oil division and produces maize oil from maize germs.

2.1.5.2. Strong local demand for oils and fats.

In ZIMBABWE, edible oil is classified as "essential commodity" and consequently, the sales price to the public is strictly controlled at a relatively low level.

Imports are very low, due, to the general shortage of foreign exchange.

In the last years, the purchasing power of the lower-income group was improved with the injection of higher wages.

All these factors resulted in a strong demand for edible oil, largerly higher than the local production.

In 1986, the production was 50 000 t (of which cotton seed oil : 50 %) for an estimated demand of 60 000 t, i.e. a gap of 20 % or 10 000 t/year.

Up to the year 2000, the increase of the population and the possible improvement of the income per capita will maintain a steady demand for oil, constantly above the production, up to the arrival on the market of significative quantities of palm oil from the MWENEZI project (1995). To summarise, the demand is by no way the limiting factor for the edible oil production in ZIMBABWE.

2.1.5.3. Possible export for oil cakes and meals.

The situation is different for meals.

The present production of oil meal, approximately 140 000 t in 1986, is not completely absorbed by the local market, which is very sensitive to the price, which is also fixed by the Government.

But there is no problem to export the surplus to the neighbouring countries, of course at a price which cannot exceed the international market price.

In 1986, approximatively 45 000 t of cotton seed meal and soya bean meal were exported, chiefly to the R.S.A.

2.1.5.4. Local Industry.

The oil and fats industry in ZIMBABWE is a relatively sophisticated and well developed processing sector, with four companies, namely :

- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS

At the present moment, the oil production is not limited by insufficient processing capacity, but by a shortage of oil seeds.

Supplies to users continue to be on an allocation basis. But this situation will change with the increase of the agricultural production.

2.1.5 6. Lack of processing capacity by 1990/91.

Taking into account the general increase of the cotton and other oil seeds production up to the year 2000 on the one hand, and the present existence of a spare processing capacity in the existing on the other hand, the study shows that a lack of processing capacity will appear by 1990/91, justifying the implementation of new capacities with a domestic market orientation for the oil and export market orientation for the meal.

2.1.6. THE PROJECT PROMOTION

2.1.6.1. Project Promoter.

In ZIMBABWE, the commercialisation of oil seeds, like most of the main agricultural products, is strictly controlled by the Government, (Ministry of Agriculture), through its Agricultural Marketing Authority (AMA), which in turn, coordinates the operations of four Marketing Boards :

- Cotton Marketing Board
- Grain Marketing Board
- Cold Storage Commission
- Dairy Marketing Board.

The Cotton Marketing Board has the monopoly of purchasing seed cotton from all categories of growers. It operates 9 ginneries around the country. The Board sells cotton lint to spinners on the local and the export markets and sells cotton seed to the local oil expressors.

The Grain Marketing Board operates in the same way for the other grains, including soya beans, sunflower and groundnuts.

At present, the AMA and the CMB envisage an Agro-Industry Development programme through complementary activities downstream.

2.1.6.2. Complementary activities. Downstream.

In its First Five Year National Development Plan, the Government called for state participation in strategic enterprises and in joint ventures. The agricultural sector can therefore contribute to this policy thrust by venturing into new dimensions or downstream industries.

Downstream industries can be defined as those activities which bring about a change in-form of the product and are the result of forward and vertically integrated operations.

The advantages of downward vertically integrated operations are that the company can :

- Add value to its product through further processing
- Benefit from reduced imput costs
- Save foreign exchange through export opportunities or import substitution.

2.1.6.3. Downstream opportunity for the CMB.

Controlling the whole market for seed cotton (and therefore cotton seed) in ZIMBABWE and being close to the grain Marketing board which controls the market of other oil seeds, it is obvious that the Cotton Marketing Board could consider developing downstream into oil expressing.

The CMB could set up an oil processing plant near a ginnery. This would create employment and would also reduce transportation costs of bulky cotton seed to the urban areas for processing. Since transportation of the cotton seed will be minimal, this would reduce the costs of production and increase competitiveness of their product against the already established companies. This is because the plant will be situated in a place where both the raw material and the market are found.

2.1.7. INTEREST OF THE FRENCH GOVERNMENT

It is important to note that the Government of France is said to be ready to make investment funds available, provided the techno-economic feasibility study results in a documented and calculated recommendation on the profitability and liquidity of the project.

INTERNATIONAL CONTEXT

2.2. OIL SEEDS - EDIBLE OILS - OIL MEALS - WORLD PRODUCTION AND MARKET

2.2.1. OIL SEEDS

1/ The world production of oil seeds (8 major oil seeds) which was 83.44 million tons in 1965/66 has increased to 187.36 million tons in 1985/86 (see Table 2.2.1.), i.e. an average annual rate of growth of 4.17 % for these last 20 years.

2/ Soya bean occupies a dominating place because it ensure 51.4 % of the world production of oil seeds in 1985/86 ; this production has increased threefold during the last 20 years.

The principal producers of soya bean are the UNITED STATES which ensures slightly more than half of the world production, BRAZIL (17 %) and CHINA (12 %).

The oil content of soya bean is about 20-22 % and the soya bean meal is the leader of the protein market.

3/ Cotton seeds takes second position in the production (16 %), one cannot dissociate its quantities from the cotton lint production.

This production has increased by 37 % during the last 20 years (30,3 million tons in 1985/86) and the principal producers of cotton seeds are CHINA, USSR, USA and INDIA.

The oil content of cotton seeds is about 20 - 24 %.

4/ The groundnut production has increased by 34 % during the last 20 years from 10.2 to 13.7 million tons. The principal producing countries are INDIA, CHINA and USA. These 3 countries ensure 70 % of the world production.

The oilcontent of the shelled groundnuts is about 46 - 52 %. A significant amount of this groundnut production is used for auto-consumption.

5/ The sunflower seeds production has increased 2.4 times during the last 20 years (19.6 million tons in 1985/86) and the production of rape seeds has pratically increased fourfold during the same period from 5 million tons to 18.6 million tons ; these 2 oil seeds ensure now 20 % of the world production.

The principal producing countries are :

- For sunflower seeds : USSR, ARGENTINA, CHINA
- For rapeseeds : CHINA, CANADA, INDIA

The oil contents are 42 - 45 % for sunflower (hybrids) and 44 - 48 % for rape seed.

6/ The world production of copra (5.1 million tons in 1985/86) is dominated by 2 countries : PHILIPPINES (45 to 53 %) and INDONESIA (20 to 24 %) ; INDIA with 370 000 tons of copra per year, occupies the 3rd position.

The oil content of copra is about 65 %.

7/ Palm kernel is a by-product of palm oil industry ; its production has reached 2.4 million tons in 1985/86 versus 0.9 million tons in 1965/66.

The principal producing countries are WEST MALAYSIA (45 to 50 % of the world production), INDONESIA and NIGERIA for almost equal quantities : 280 000 and 210 000 tons in 1986/87.

The oil content of palm kernel is about 48 - 52 %.

8/ The sesame seeds production has increased by 40 % in the last 40 years (2.2 million tons in 1985/86) and the principal producing countries are CHINA, INDIA and BURMA. This production will not increase significantly.

The oil content of sesame seeds is about 50 - 54 %.

9/ At present, 4 oil seeds for edible oils : soya beans, cotton seeds, sunflower seeds and rape seeds ensure 7/8 of the world production.

2.2.2. EDIBLE OILS

The edible oil production follows about in the same way as that of the corresponding oil seeds production, (see table 2.2.2.), palm oil and olive oil are additional to the oils extracted from the 6 major oil seeds of the table.

The production of edible oil has increased 2.5 times during these last 20 years, from 20 million to 48.6 million tons, i.e. an average annual growth rate of 4.55 % ; soya bean oil, palm oil, sunflower oil and rape oil (4 major competitors) accounted for 72 % in 1985/86 versus 51 % in 1965/66 and this is mainly due, soya bean oil excluded, to the production of palm oil which has increased fourfold during the same period.

Oil palm is at present the most effective producer of edible oil per unit of area because it takes 6 ha of groundnut and 10 to 12 ha of soya beans to produce the same amount of oil as 1 ha of palm.

The most important world producer of palm oil is WEST MALAYSIA (55 % with more than 4 million tons of the production) followed by INDONESIA (17 %), NIGERIA (4 %) and IVORY COAST (2.5 %).

The foreseeable evolution of the production of the 4 major competitors edible oils is given in the following graph 1.5.2. and the biggest increase will be palm oil (and palm kernel oil, its by-product) with a relative deficite of protein meal as a consequence.

Table 2.2.1. 8 Major Oil seeds

World production (10^6 tons)

	1965/66		1975/76	1982/83	1983/84	1984/85	1985/86		1986/87
<u>OIL SEEDS</u>		%						%	
1. Soya beans	31.74	38.0	66.03	93.70	82.99	92.89	97.08	51.4	98.46
2. Cotton seeds	22.08	26.4	21.17	26.43	26.30	34.42	30.26	16.0	27.01
3. Sunflower seeds	8.11	9.7	9.95	16.80	15.48	17.91	19.56	10.4	18.82
4. Rapeseeds	4.97	6.0	7.92	14.91	14.33	17.07	18.59	9.8	19.86
5. Groundnuts (shelled)	10.25	12.3	12.48	11.67	12.59	13.21	13.74	7.3	13.65
6. Copra	3.82	4.6	5.24	4.32	3.51	4.12	5.12	2.7	4.99
7. Palmkernels	0.90	1.1	1.16	1.76	1.73	2.00	2.38	1.3	2.33
8. Sesame seeds	1.57	1.9	1.72	1.80	1.95	1.92	2.21	1.1	2.24
Total	83.44		125.67	171.39	158.88	183.54	188.94		187.36

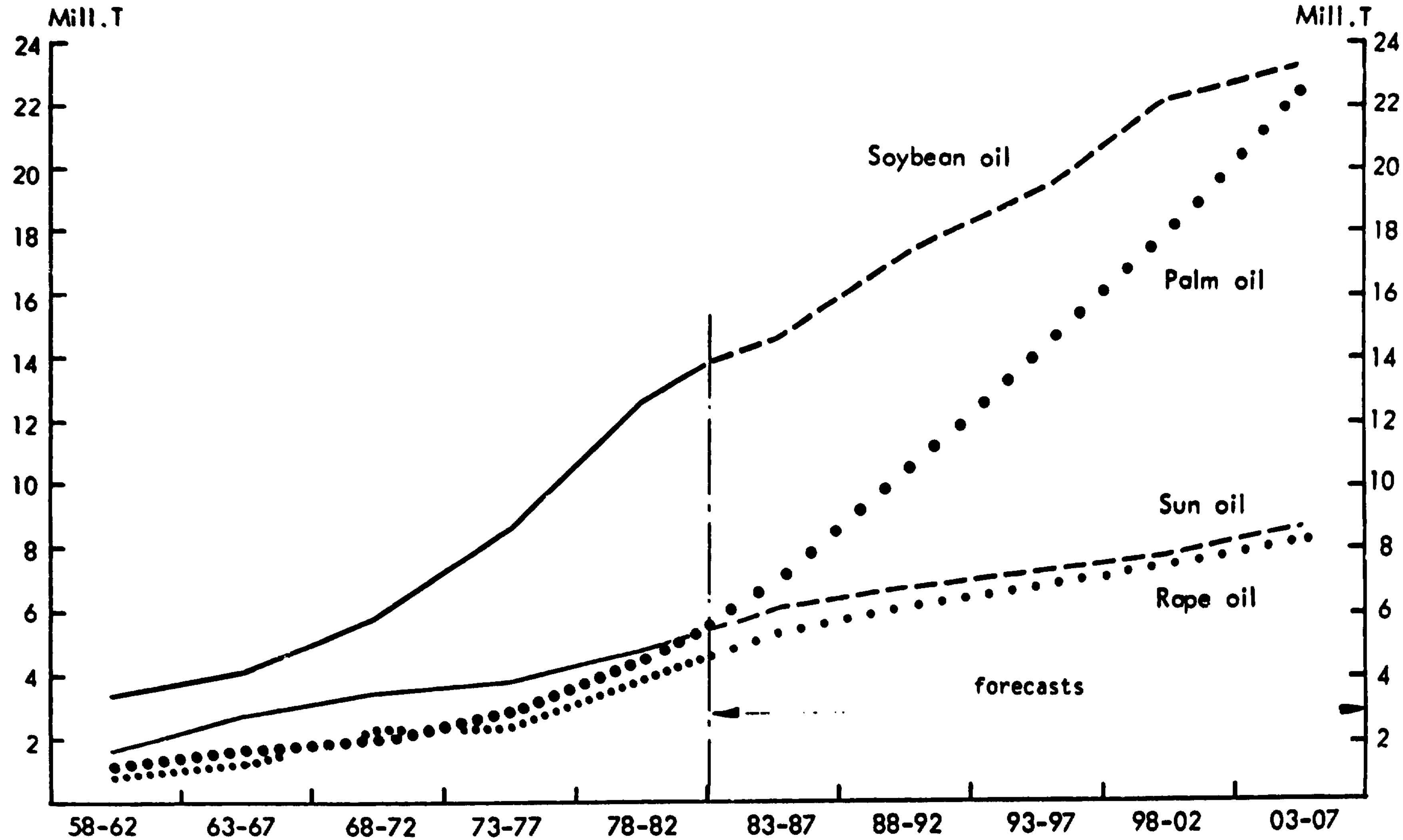
<u>Source</u> : OIL WORLD - (F)/(p) : ISTA forecast/preliminary

Table 2.2.2. 10 Major Edible Oils
World production (10^6 tons)

	1965/66	%	1975/76	1982/83	1983/84	1984/85	1985/86	%	1986/87
<u>OIL SEEDS</u>									
1. Soya beans	4.22	21.1	9.62	13.99	13.72	13.72	14.12	29.0	15.30
2. Palm oil	1.47	7.3	3.14	5.53	5.76	6.44	7.72	15.9	7.55
3. Sun oil	3.04	15.2	3.35	6.01	5.83	6.56	6.88	14.2	7.17
4. Rape oil	1.56	7.8	2.56	4.96	5.10	5.84	6.36	13.1	7.11
5. Cotton oil	2.66	13.3	2.64	3.11	3.17	3.88	3.54	7.3	3.11
6. Groundnut oil	2.68	13.4	3.07	2.58	3.14	3.56	3.49	7.2	3.44
7. Coconut oil	2.13	10.7	3.12	2.67	2.21	2.35	3.25	6.7	3.03
8. Olive oil (pressed oil)	1.37	6.8	1.75	1.82	1.47	1.56	1.62	3.3	1.65
9. Palmkernel oil	0.42	2.1	0.51	0.76	0.76	0.86	1.03	2.1	0.98
10. Sesame oil	0.45	2.3	0.47	0.54	0.54	0.57	0.60	1.2	0.60
Total	20.09		30.23	41.97	45.34	45.34	48.61		49.94

<u>Source</u> : OIL WORLD - (F)/(p) : ISTA forecast/preliminary

Graph 1.5.2. THE FOUR MAJOR COMPETITORS: World Production (million tonnes)



Source : OIL WORLD - The past 25 years and the prospects for the next 25 - 1983.

2.2.3. OIL MEALS

The production of the 8 major oil seeds meals is given in Table 2.2.3.

One has to notice that as for oil seeds, the increase in soya bean meals is enormous as it is in high demand for their richness in protein, and that rape seed meals has increased as well during the last 20 years :

- rape seed meals : average annual growth of 7.4 %
- soya bean meals : average annual growth of 6.4 %

2.2.4. MARKET

1/ The oleaginous products (oil seeds, vegetable oils and meals) have always been dominated by soya and by several developed countries for its production and its transformation.

2/ Prices : We notice that the prices of all edible oils have been decreasing over the last ten years, except for 1983/84, during which year a slight shortage did occured.

For certain oleaginous products specifically, graphs 1.5.4.a to 1.5.4.b give the price evolution :

- Graph 1.5.4.a/b : annual average prices for the four major edible oils and oil seeds meals over the last 10 years.

- Graphs 1.5.4.c/d : monthly average prices for selected oil seeds and edible oils since 1962.

Table 2.2.3. 8 Major Oil seeds meals
World production (10^6 tons)

	1965	1975	1982/83	1983/84	1984/85	1985/86	1986/87
OIL SEEDS MEALS							(F) (P)
1. Soya bean meal	17.84	35.35	61.30	57.12	59.70	61.67	67.51
2. Cotton meal	8.70	9.63	11.01	11.59	14.82	13.22	11.46
3. Rape seed meal	2.45	3.81	8.19	8.47	9.52	10.30	11.36
4. Sunflower meal	3.12	3.68	7.03	6.79	7.76	8.17	8.35
5. Groundnut meal	3.81	3.70	3.90	4.58	5.25	5.14	4.98
6. Copra meal	1.17	1.51	1.55	1.28	1.36	1.86	1.77
7. Palmkernel meal	0.46	0.55	0.95	0.94	1.07	1.28	1.23
8. Sesame meal	0.61	0.59	0.66	0.66	0.70	0.74	0.72
Total	38.16	58.82	94.59	91.43	100.18	102.38	107.30
9. Fish meal	3.60	4.39	5.01	5.60	5.81	5.93	6.12

Source : OIL WORLD - (F)/(p) : ISTA forecast/preliminary

A competition will sure develop in the future within the oils sector more precisely between soya bean oil and palm oil, which could lead to a depressed market for oils and fats.

3/ Foreign trade : Table 2.2.4. gives the evolution of the world production and exports (oil seeds, oils/fats and meals) since 1956/62 with the projections for 2003/07.

One observes that between 1958 and 1982 :

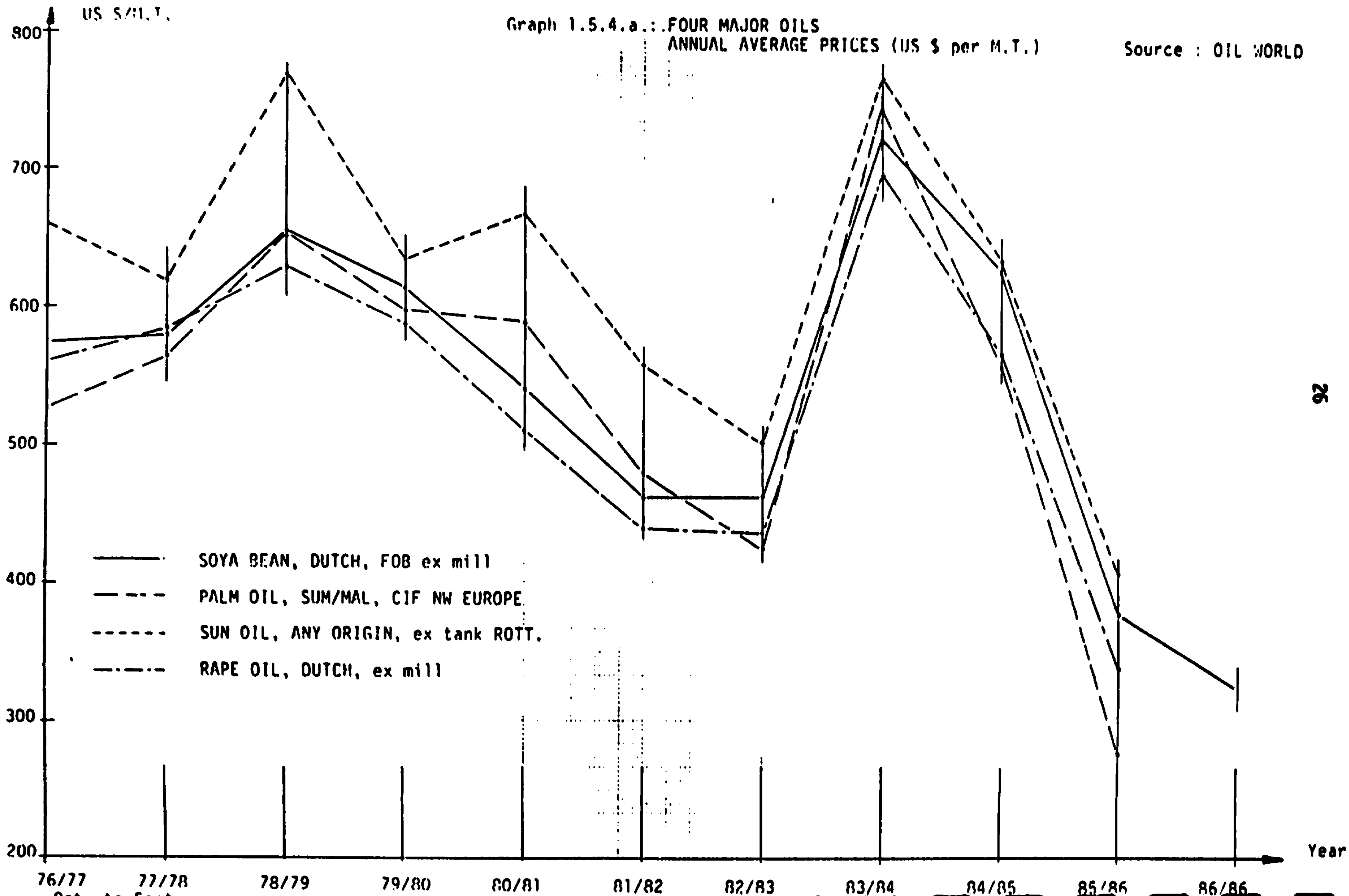
- For the oil seeds sector : the world exports have increased twofold while the world production has followed almost the same line.

- For the oils and fats sector : the world exports have increased threefold while the world production has only doubled.

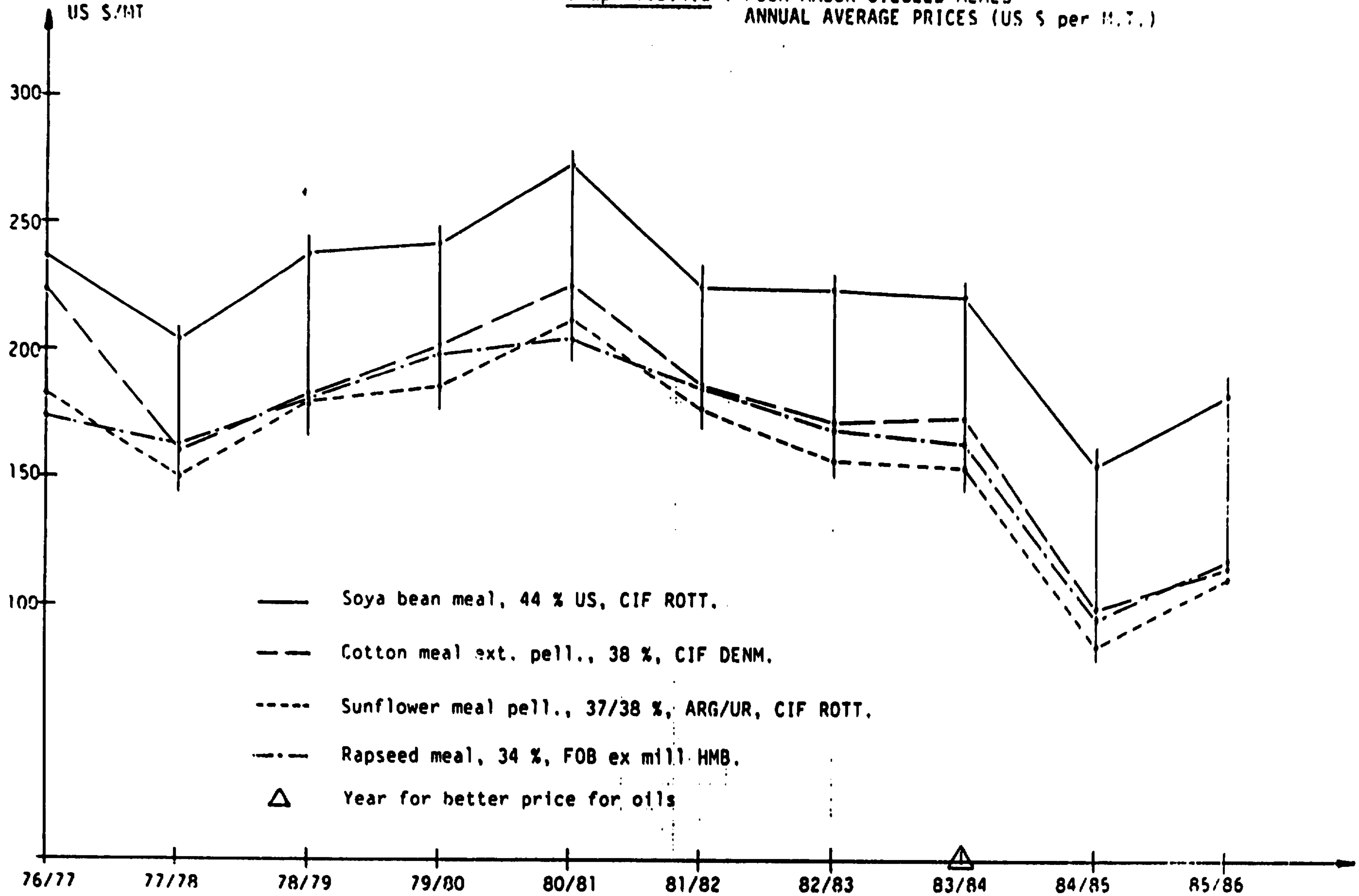
- For the oil meals sector (oil seeds meals and fish meal) : the world exports have increased fourfold while the world production has increased 2.5 times.

The world exports previsions are given on the graph.

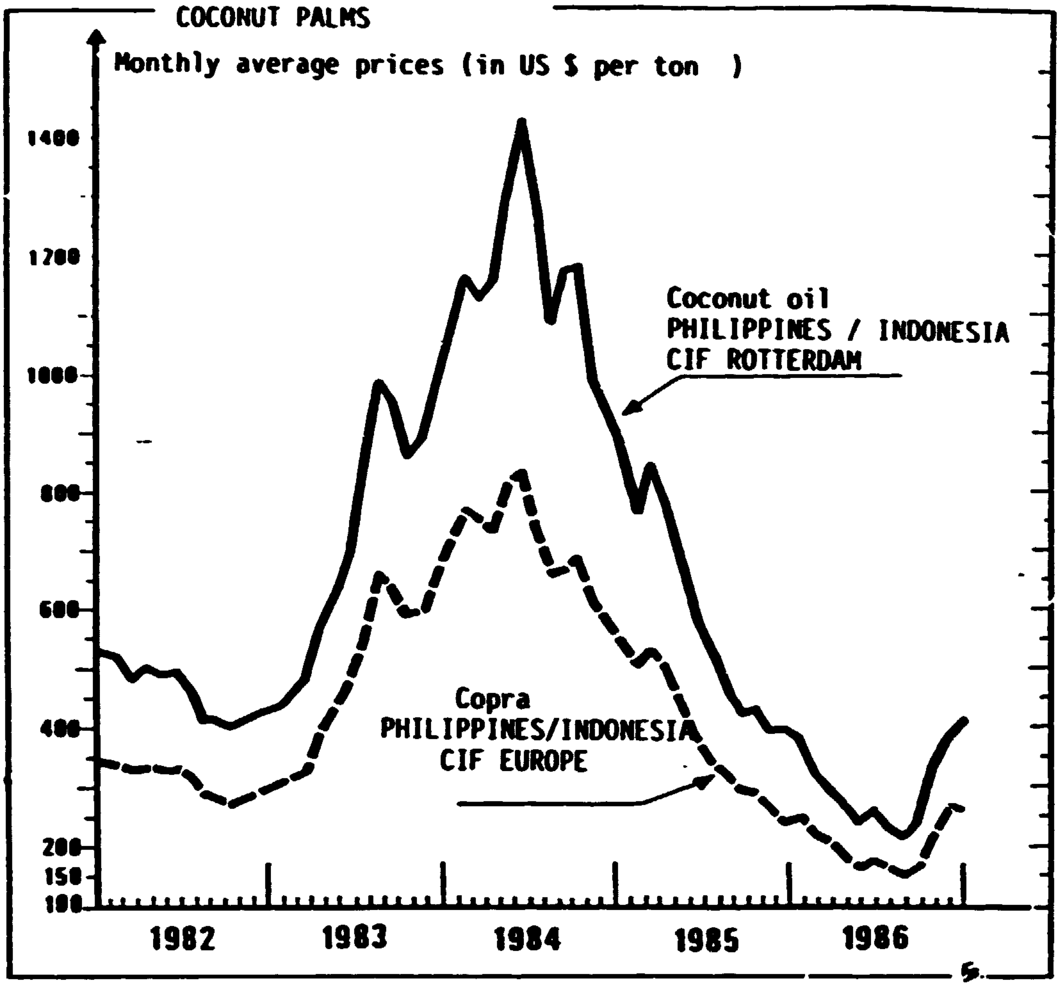
Graph 1.5.4.a.: FOUR MAJOR OILS
ANNUAL AVERAGE PRICES (US $ per M.T.)

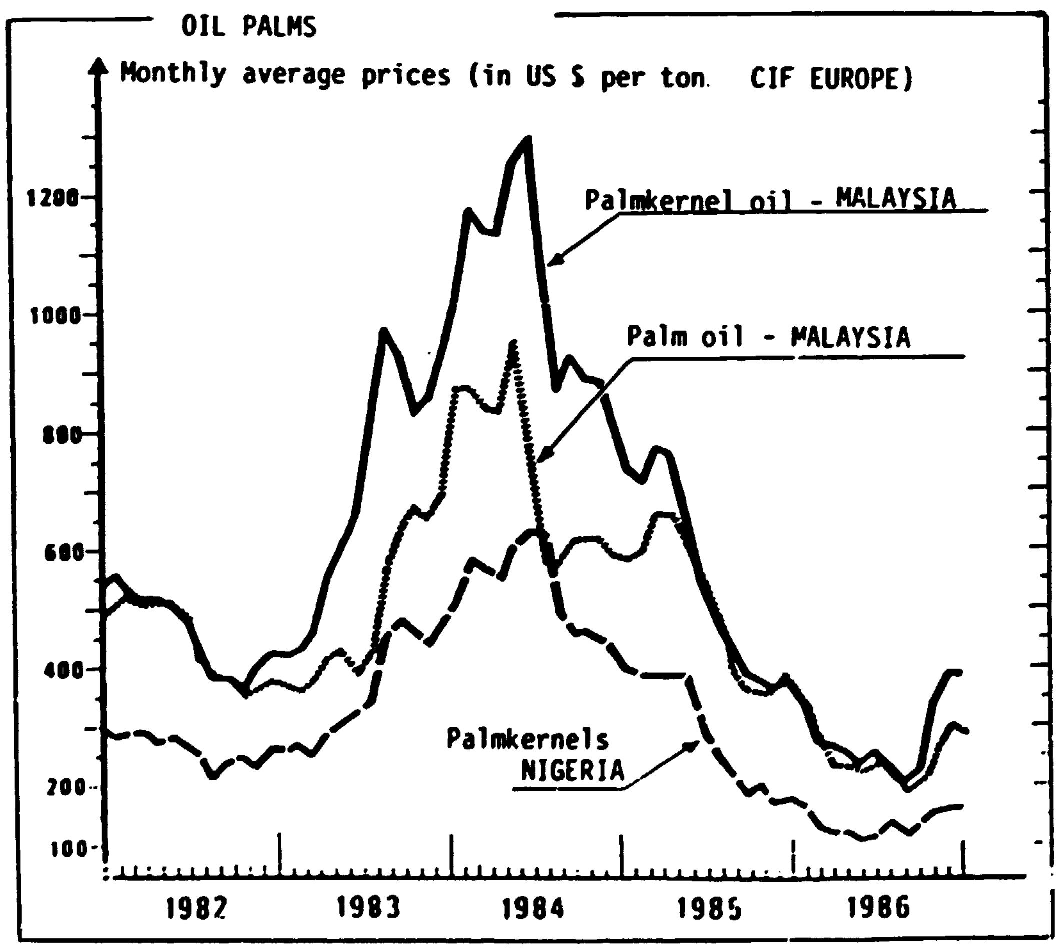


Graph 1.5.4.b : FOUR MAJOR OILSEED MEALS
ANNUAL AVERAGE PRICES (US $ per M.T.)



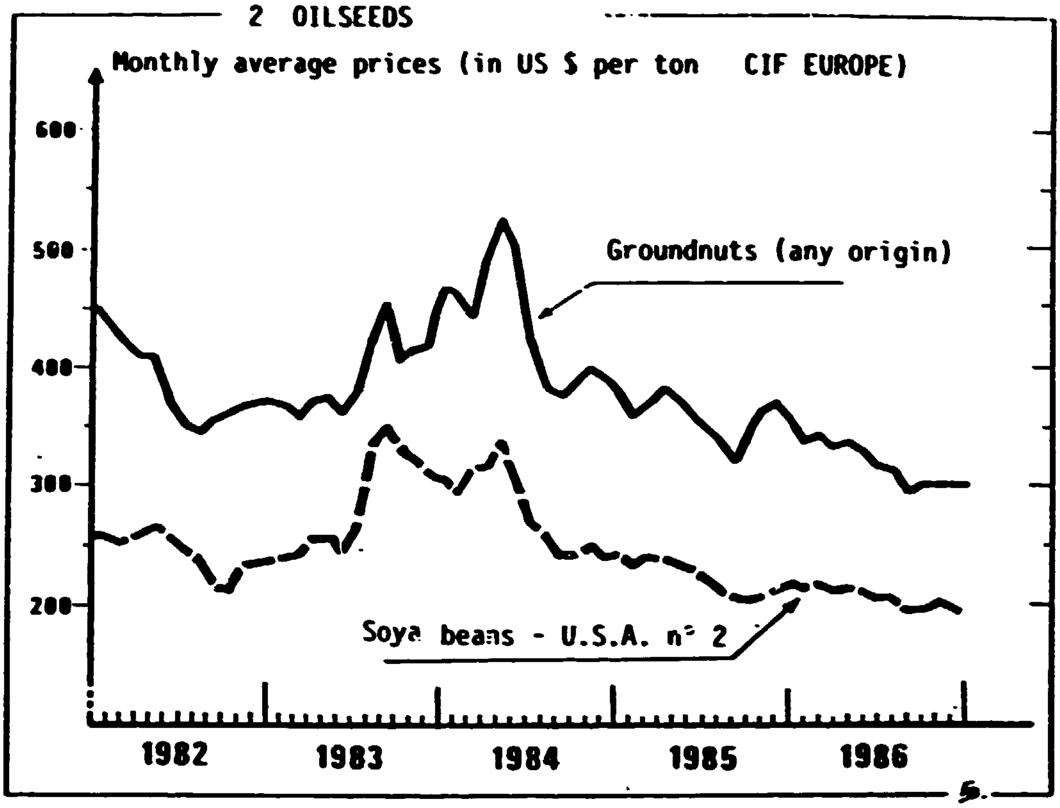
Graph 1.5.4.c : MONTHLY AVERAGE PRICES - CONONUT AND OIL PALMS PRODUCTS

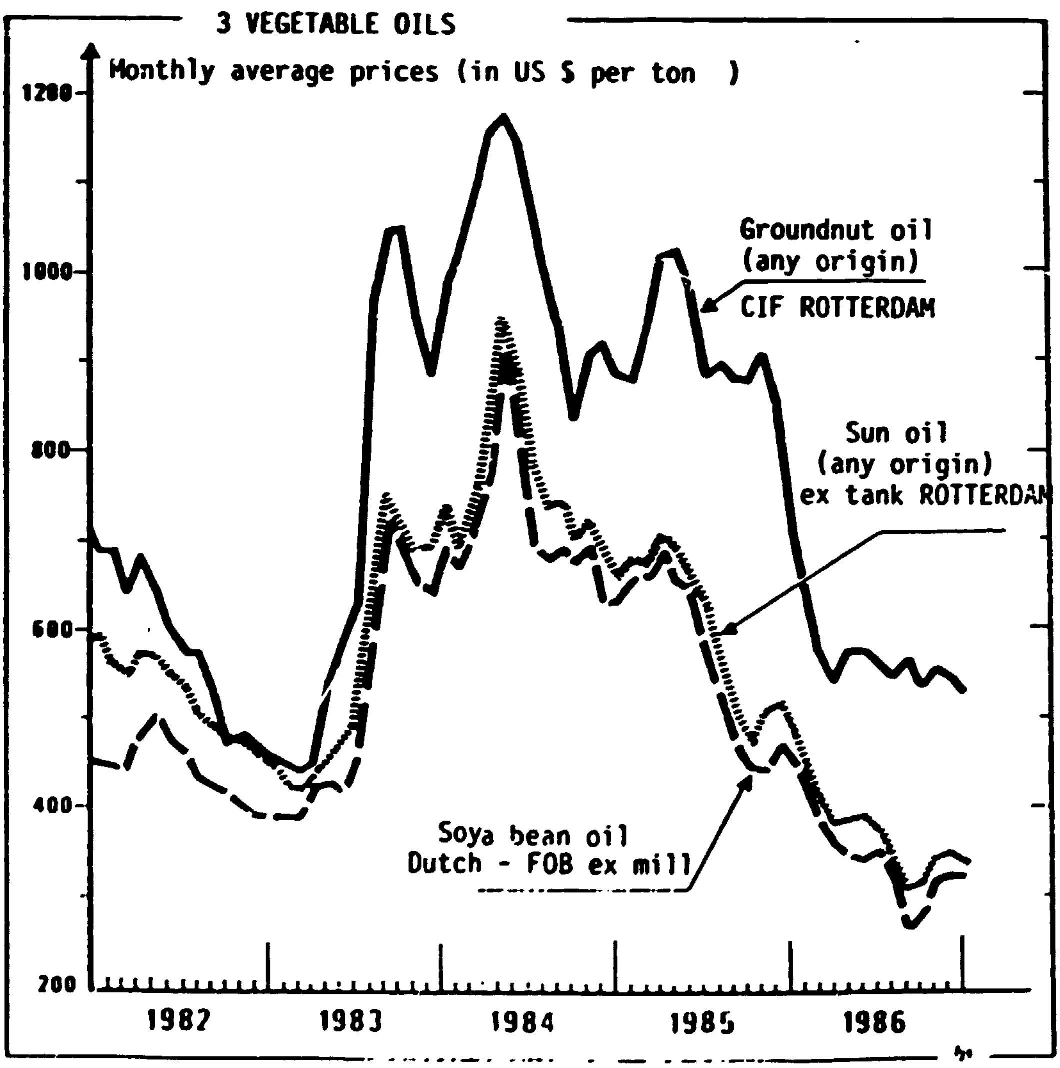




Source : Tropical markets - 01/05/1987

Graph 1.5.4. d. MONTHLY AVERAGE PRICES - OILSEEDS / EDIBLE OILS





Source : Tropical markets - 01/05/1987

TABLE 2.2.4.

OIL SEEDS, OILS/FATS AND OILMEALS
Average annual production/Exports forecasts

	OIL SEEDS (10)		OILS FATS (17)			MEALS (10)	
	Average World prod. (000 t)	Exports (000 t)	Average Annual prod. (000 t)	Disppea-rance (000 t)	Exports (000 t)	Average Annual World Prod. (000 t)	Exports (000 t)
58/62	71 584	9 798	29 088	28 893	5 321	35 028	6 138
63/67	82 271	12 586	34 012	33 758	6 919	42 899	10 267
68/72	100 403	17 345	39 613	39 619	9 024	54 451	14 187
73/77	121 153	22 958	45 425	45 139	11 583	66 458	17 366
78/82	155 153	33 105	86 170	55 721	16 616	89 784	25 867
83/87	178 135	35 349	65 287	65 069	20 252	103 502	32 120
88/89	203 926	40 770	75 512	75 248	24 937	120 461	40 074
93/97	222 952	45 028	84 377	84 065	29 534	132 575	45 913
98/02	250 154	50 335	95 158	94 846	34 666	150 424	55 148
03/07	266 277	53 179	104 525	104 035	39 192	159 567	58 402

<u>Source</u> : Oil World - the past 25 years and the prospects for the next 25 - 1963 (forecasts from 1983/87 to 2003/07)

- 10 major oil seeds
- 17 major oils and fats
- 10 major oil meals (oil seed meals and fish meal).

4/ Consumption in developing countries

Edible oil demand has been confirmed by the events of the past 10 years when material price fluctuations were noted to be particularly price inelastic and that characteristic is unlikely to change. Worldwide the apparent consumption of fats and oils has steadily increased whose share of the overall market increased from 51 % of total production in the 1960's to 60 % of world consumption by 1984. The rate of consumption in the developing nations is expected to remain buoyant through higher population growth rates, higher expected income growth rates, and higher income elasticity of demand for vegetable oils. By the year 2000, these countries are expected to have increased their share of total consumption of vegetable oils estimated at 90 million tons to a level of 68 %. Per capita, consumption in developping countries at 10 kg per annum is well below that of the industrialised nations at 22 kg per annum reflecting economic and supply factors. It is important to stress the anticipated impact on consumption caused by increasing population counts in developping regions, especially AFRICA where the birth rate exceeds 3 % and by higher levels of demand created through increasing per capita income levels. The wide disparity in relative per capita consumption levels between industrial countries where population growth is near zero and developping countries where rapid population growth continues, predicates further substantial growth into the 21st century.

The potential for growth in countries such as CHINA, INDIA and on the continent of AFRICA is well illustrated by the World Bank's assessment of consumption of edible oil (oil equivalent) by main countries and economic regions which is shown in table 2.2.5. below :

TABLE 2.2.5.

World Consumption of Edible Oils

	1970 Actual 000 t	1985 Actual 000 t	2000 Forecast 000 t	GROWTH RATES 1970-85 %	1985-2000 %
ASIA (ex PRC/INDIA)	2466	7577	14986	6.7	4.5
PRC	3387	8328	14986	6.3	3.6
AFRICA	3329	5222	10142	3.4	4.5
NORTH AMERICA	4796	7012	9946	2.3	2.4
SOUTH AMERICA	2196	5113	9942	5.9	4.5
INDIA	3067	5856	9067	4.6	3.0
EEC	4502	6488	7749	2.7	1.2
URSS/N.EUROPE	3816	5390	6644	2.5	1.4
JAPAN	917	1742	2453	4.4	2.3
OTHERS	1527	4066	5510	6.5	2.3
TOTAL	30003	56794	90505	4.2	3.2

It is notable that increases in the rate of usage in AFRICA are expected to be among the highest in the world for the period to 2000 due to forecast population growth and higher per capita consumption.

3.1 AGRICULTURAL PRODUCTION

3.1.1 INTRODUCTION

3.1.2. THE OIL SEEDS

3.1.3. COTTON

3.1.4. SOYA BEANS

3.1.5. SUNFLOWER

3.1.6. GROUNDNUT

3.1.7. MAIZE

3.1.8. OIL PALM

3.1.9. SUMMARY

3.1. AGRICULTURAL PRODUCTION

3.1.1. INTRODUCTION

Agriculture, which has been the backbone of the economy in the past will remain a dominant sector in the economy of Zimbabwe in the future.

70 per cent of the population lives in rural areas and their main source of livelihood is farming.

The growth of the economy is largely depending on the performance of the agricultural sector.

The agricultural sector not only provides more than 90 % of the food requirement of the society, it accounts also for some 40 % of the total exported produce.

It is therefore that the government of Zimbabwe has put the agricultural sector at the center of its development strategy.

Commercial Agriculture in ZIMBABWE is classified in different categories, namely :

- Large scale commercial farmers (approximately 2 000 farm units of more than 2 000 ha)

- Small scale commercial farmers (approximately 13 000 farms averaging 125 ha each)
- Communal farmers (for cotton, approximately 200 000 farmers)

- Agricultural and Rural Development Authority (ARDA), parastatal which is the largest single agricultural employer with some 24 000 workers

- Ressettlement areas

Agricultural extension is the responsibility of the Ministry of Lands, Agriculture and Rural Ressettlement, through its Department of Agricultural, Technical and Extension Services (AGRITEX).

Commercial farmers generally form part of specialized associations such as (for oil seeds) :

- Commercial Farmers Union of ZIMBABWE,
- Commercial Cotton Growers Association,
- Commercial Oil seeds Producer's Association,
- Commercial Cattle Producer's Association,
- etc...

An important report, called "Commercial Agriculture in ZIMBABWE", is published every year.

Of great importance is the transformation that has taken and is taking place in the rural areas as a result of a deliberate government policy. The smallholder farmers sector (communal and re-settlement) has increased in importance in the production of important crops such as maize and cotton, which had been dominated by the large scale commercial farmers sector.

The agricultural output is expected to rise at an annual rate nearly double that of the projected population growth of 2.76 per cent.

This growth will not be similar in each of the agricultural subsectors (communal, re-settlement, small commercial and large commercial), the growth in the communal and resettlements area is expected to increase at 7 - 8 per cent/annum ; twice that which is expected of the commercial sector at 3 - 4 per cent/annum.

3.1.2. THE OIL SEEDS

In ZIMBABWE, the commercialisation of oil seeds, like most of the main agricultural products, is strictly controlled by the Government, (Ministry of Agriculture), through its Agricultural Marketing Authority (AMA), which in turn, coordinates the operations of four Marketing Boards :

- Cotton Marketing Board
- Grain Marketing board
- Cold Storage Commission
- Dairy Marketing Board.

The Cotton Marketing Board has the monopoly of purchasing seed cotton from all categories of growers. It operates 9 ginneries around the country. The board sells cotton lint to spinners on the local and the export markets and sells cotton seed to the local oil expressors.

The Grain Marketing Board operates in the same way for the other grains, including soya beans, sunflower and groundnuts.

The Zimbabwean oil seed processing industry goes a long way back when the first oil mill, designed to process groundnuts into soap and oil cake, was founded in 1915.

The groundnut remained the most important oil seed until the early sixties.

Research into insect control in cotton and the adaptation of soyabean varieties to Zimbabwean condition saw an expansion in the cotton production in the late 1960's and that of soya beans in the late 1970's. The use of groundnut in the oil seeds processing industry has dwingled with only crushernuts, the remainder of the export oriented confectionary groundnuts, going into the expressing industry Table 3.1.1. shows the annual off take/allocation of oil seeds by the expressers.

Table 3.1.1. Annual Offtake of Oilseeds by Expressers

('000 t)

Oil seed year (1)	Cotton seed	Soyabean	Groundnut	Sunflower Seed	Total
1960-61 - 64/65	1,8	-	20,3	0,9	28,0
1965-66 - 69/70	29,4	-	15,1	2,3	46,8
1970-71 - 74/75	76,3	3,1	18,3	3,5	101,2
1975-76 - 79/80	82,5	40,8	10,6	14,5	148,4
1979/80	91,6	72,0	4,3	4,9	172,8
1980/81	99,6	80,1	3,8	8,7	192,2
1981/82	122,4	68,0	5,0	9,5	204,9
1982/83	91,6	84,3	3,9	8,9	188,7
1983/84	101,4	71,3	1,3	4,6	178,6
1984/85	123,2	84,0	0,2	11,7	219,1
1985/86	163,2	80,5	0,4	12,2	256,3
1986/87	141,6	77,8	6,6	18,1	244,0
1987/88	136,4	96,6	8,0	22,4	263,3

(1) Oil seed year runs from April through March. A five year average is given for the sixties and seventies decades.

This table shows clearly that in the first half of the 1960's when oil seed off take was around 28.000 tonnes, groundnuts contributed more than 70 per cent. By the end of the 1970's the total oil seed off take had risen to some 148.400 tonnes and groundnut represented only 8 per cent.

The table also shows the importance of the different oil seeds for the oil expressers industry.

The production of maize is not included in this table but maize as a source of edible oil has a certain importance in the Zimbabwean context.

3.1.3. COTTON

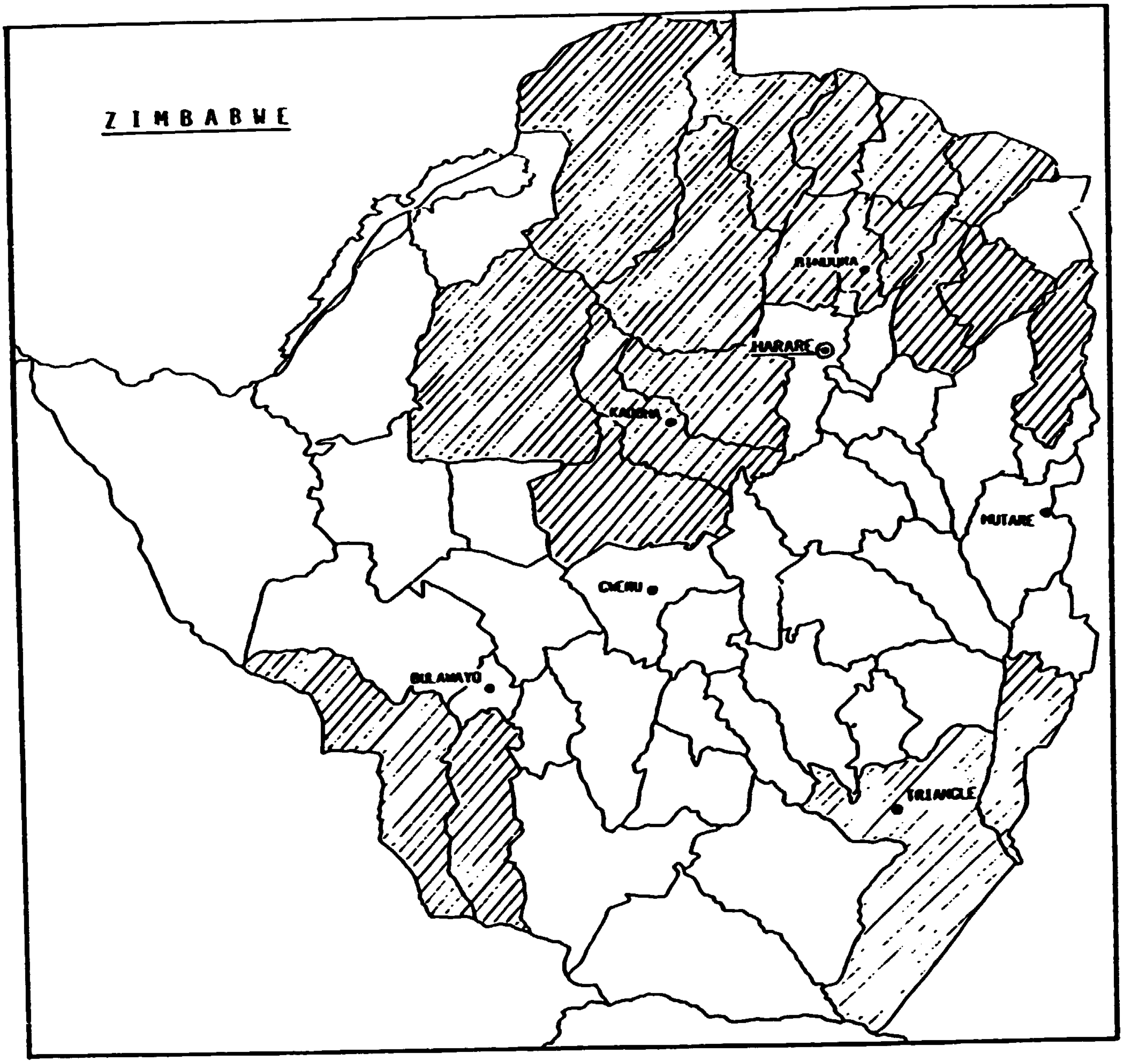
Cotton seed is by far the most important source of edible oil in ZIMBABWE.

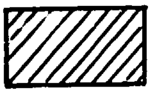
Cotton became ZIMBABWE's second most important cash crop (after tabacco) during UDI, with a tenfold increase in production between 1965 and 1975 and remained in this position ever since.

Cotton is grown througout the country, but the major production areas are : South East Lowveld (Save Valley), North East (Glendale, Bindura, Mt Darwin) and Midlands (Chegutu, Kadoma, Gokwe, Sanyati). (See map 1) Cotton was traditionnaly grown by large commercial farmers, but because of the drought resistant qualities, cotton production by smallholder farmers in the communal and resettlement area has been on the increase since 1981, from a share of 6 per cent in 1980 to about 50 % in 1986. (see table 3.1.2). Some 200 000 farmers are now registered as cotton growers and it is growing at a rate of some 2 000 per month. This registration does not mean however that all these farmers will grow cotton during the same season.

MAJOR COTTON PRODUCING AREAS

MAP 1





Cotton production over 1.000 t

It is estimated that about 60 % of the registered farmers actually grow cotton.

Production and area under cultivation by commercial farmers varies ; partly as a result of producer prices of cotton and other cash crops and partly because of the labour intensity of the crop. Peculiar to the commercial cotton growers is concern over the availability of cotton pickers to harverst the crop.
Each year with the rapidly expanding cultivation in communal and re-settlement areas, which requires a stay-home attitude among potential cotton pickers, commercial farmers' planting intentions will depend on how they see the picking situation.

Table 3.1.2 Shows the cotton production for the two production groups.

Years	Commercial	Communal + Re settlement ARDA	Total
1980	145 533	12 000	157 553
1981	125 594	45 000	170 594
1982	107 886	27 000	134 886
1983	114 021	32 500	146 521
1984	107 916	60 545	160 461
1985	148 198	102 136	250 334
1986	154 144	141 336	295 480
1987	111 512	136 644	248 156
1988	116 108	124 005	240 113
1989*	151 000	159 000	310 000

* Estimate

The Governement policy on the production of Cotton is very positive and expansionary as cotton is an important source of foreign exchange, it fits very well in the policy of rural development and it produces raw materials for the local textile and vegetable oil industry.

The major future expansion of the cotton production is expected to come from the communal areas.

The largest increase in production from the communal area is through expansion of the area planted to cotton.

Yields are expected to rise as well through the application of the techniques introduced by the extension services.

This increase in production through yield is however less important than the one through increase in area.

From the Communal Farmers some 15 % are presently producing yields comparible to commercial farmers ; an other 35 % will most probably reach higher yields through introduction of better cultivation practices ; the remaindly 50 % of the communal growers will remain low yield producers.

From the textile industry and export side there is a demand for a better, high quality, long fiber cotton. The present varieties grown in ZIMBABWE produce high yields of middle class cotton. Research in ZIMBABWE is now orientated to the long fiber cotton but this might produce varieties with lower yields/ha.

These long fiber varieties will however catch higher prices on the international market and consequently higher producer prices in ZIMBABWE.

Some of the large commercial farmers will certainly switch to these new varieties, which would produce less cotton but of higher value.

As a result less cotton seed might be available for oil expressing from this sector.

All in all total production from the large Commercial growers is expected to increase marginally.

The ARDA farms produce presently some 20 000 t of cotton. This is expected to increase when new farms are started. For the total picture however, real increase in cotton production comes only from new developments and not from existing farms taken over by ARDA.

Taking into account all the above observations the following projection could be make.

3.1.3. Cotton production up to 2000 ('000 t)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000
LSG	154	112	116	151	151	153	157	161	165	168	170	173
CFA, RA, SSG	122	117	105	139	152	164	177	188	199	205	210	242
ARDA	19	19	19	20	22	23	24	26	28	29	30	35
TOTAL Seed cotton	295	248	240	310	325	340	358	375	392	402	410	450
At about 60 % seed available for oil expressing this produces ('000 t)Cotton seed	175	150	145	190	195	205	215	225	235	242	250	270

LSG = Large Scale Growers.
CFA = Commural Farming Area
RA = Re-settement Area
SSG = Small Scale Growers.

All the seed cotton is purchased by the Cotton Marketing Board which operates also all the ginneries (one is privately owned but is on contract to CMB). 70 % of the lint is exported and the remainder used in the local textile industry.

Transport from the farm to the CMB depots, either at the ginnery or the satellite depots is for the account of the growers. Transport is normally by road haulage but also rail transport is used.

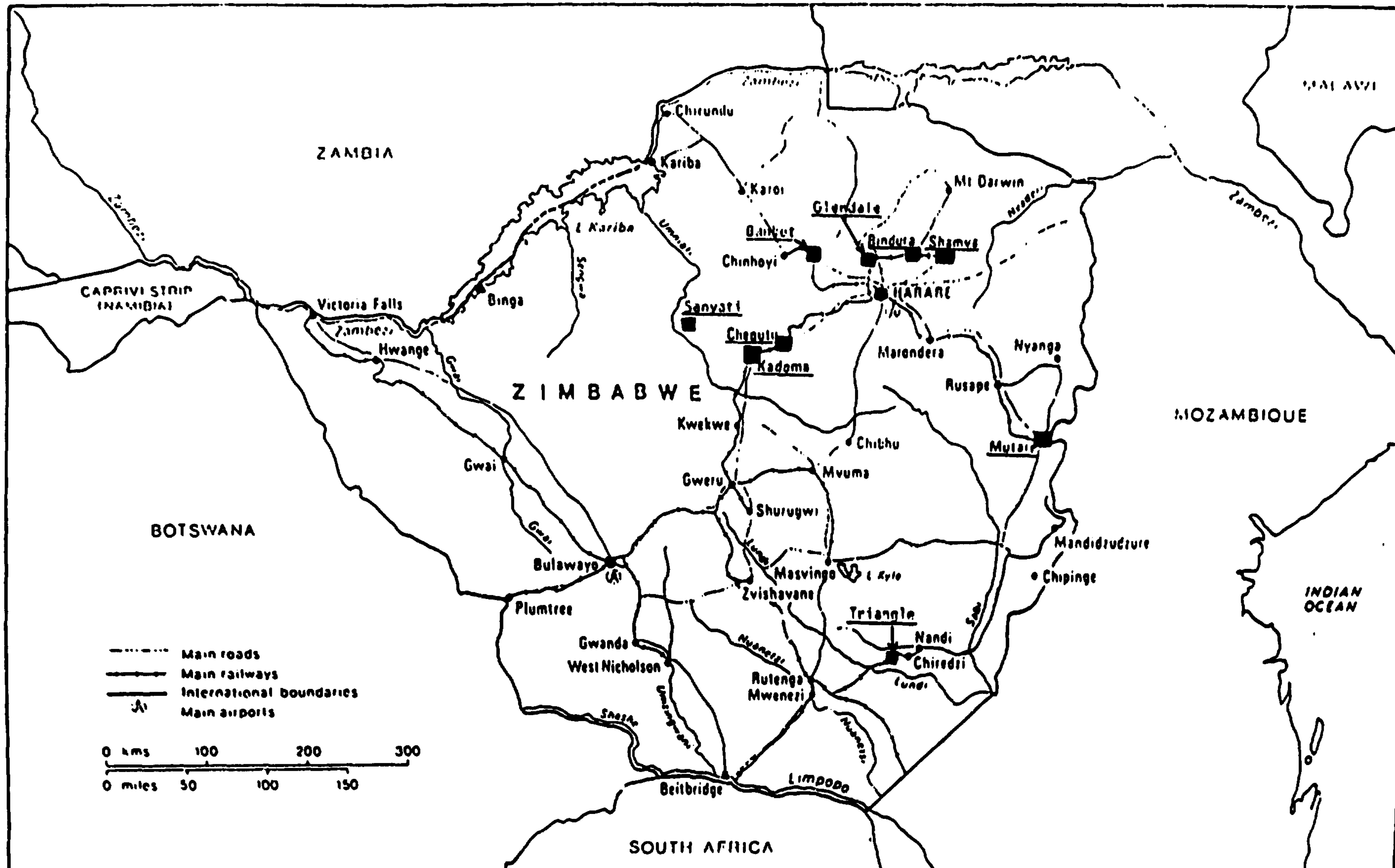
Transport between satellite and ginnery depot is for the account of the C.M.B.

The location of the ginneries and their capacities are as shown below (see map 2).

KADOMA	20 700 t/y
TAFUNA (SHAMVA)	25 300 t/y
BANKET	27 600 t/y
MUTARE	25 300 t/y
GLENDALE	25 300 t/y
CHEGUTU	57 500 t/y
SANYATI	25 300 t/y
BINDURA	50 600 t/y
TRIANGLE	29 900 t/y
Total	287 500 t/y

This capacity is based on an operation of 28 weeks per year. In years with cotton production superior to 285 000 t some of the ginneries worked more than the planned 28 weeks.

COTTON MARKETING BOARD GINNERIES



MAP 2

This period (28 weeks) is dictated by the weather.

The Seed Cotton is generally stocked in the open and rain will decrease its quality rapidely.

From the cotton production projections one could see that in about 2 to 3 years the present ginning capacity, even if the period is extended to 33 weeks, will not be sufficient to handle all the seed cotton and additional capacity should be installed.

The cotton seed is stocked at the Ginneries in the open, under tarpaulins. The oil expressers draw from the national stock according to their requirement upto their total allocation.

Transport cost from the stock to the oil expresser is for the account of the oil expressors. Transport is generally by rail, as virtually all ginneries are at the rail network, but also sometimes by road haulage.

As the quantity of cotton seed is not sufficient to satisfy the demand of all the oil expressers, the C.M.B. allocates the cotton seed to them by a system which was not disclosed to us.

3.1.4. SOYA BEANS

As soyabean cultivation is a capital intensive crop, which requires also a certain level of agro-technology (inoculation of seed) the production in ZIMBABWE has remained mainly a large commercial farmers crop. About 95 % of the product is accounted for by the large commercial farmers.

Since 1976, partly because of the labour saving nature of the crop, implying lower wage costs, and partly due to the high producers price, production has been on the increase, both in area cultiv... and total production.

The 1981 crop year has been an exception due to the 41 % increase in maize producer price in that year. After that the increase continued, also due to the drought resistance of the crop over Maize.

Soyabeans are mainly cultivated on the heavy soils in rotation with maize, cotton and winter wheat.

Table 3.1.4. Soyabeans production for the two production sectors over the last few years (production in tons, area in hectares)

	Commercial		Communal		Total	
	Production	Area	Production	Area	Production	Area
1980	89 403	40 783	8 000	12 000	97 403	52 783
1981	66 131	30 971	6 750	9 000	72 881	39 971
1982	88 596	48 417	3 000	7 000	91 596	55 517
1983	78 626	54 909	2 000	4 000	80 626	58 909
1984	88 400	53 500	400	700	88 800	54 200
1985	85 200	43 200	300	700	85 500	43 000
1986	82 660	40 000	241	600	83 422	40 600
1987	101 046	NA	612	NA	101 658	NA
1988*	116 000	60 000		NA		NA

* Estimate

The average soyabean yields from the communal level farmers is only 25 - 35 % of that of the commercial farmers mainly due to the lack of agro-technical knowhow of the smallholder farmer and the lack of varieties adaptated to the smallholder farmers conditions.

Soyabeans are a regulated crop in ZIMBABWE for which the Grain Marketing Board is the sole buyer.

From being basically an export crop in the late 1970, the soyabeans production is now wholy processed within ZIMBABWE.

Soyabeans continue to be allocated by the GMB to customers as the supply cannot satisfy the demand.

The production of soyabeans is expected to expand to about 180.000 t by 2000. As this is a typical large scale commercial farmers crop, who plant soyabean in rotation with irrigated maize, cotton and winter wheat and because the soyabean husbandry requires a certain level of agro-technology, it is expected that the majority of this production will come from this sector.

However, soyabean research in neighbouring countries, (ZAMBIA) has produced "promiscuous" varieties (varieties which do not need inoculation as they nodulate effectively with indigenous Rhizobia present in the soil), which are very suitable for smallholder, low agro-technology farmers.

If Zimbabwean research could develop similar promiscuous varieties adapted to the Zimbabwean conditions, the overall soyabean production by the year 2000 could be very much higher as soyabean cultivation fits very well in with the cropping pattern of smallholder farmers.

3.1.5. SUNFLOWER

The production of sunflower up to the mid 1970's was very small as the oil expressers did not show very interested in this oilseed.

After 1975, with a new third oil mill interested in sunflower seed, as the expected increase in cotton did not materialised, made the producer price increase and the production soared to 25 250 tons in 1977.

However, after the oil expressers withdrew the transport and seed aquisition support, the production slit back to pre 1975 levels.
In 1982 the government, faced with an increasing demand for cooking oil in the the country, decided to declare sunflower a controlled commodity.

Since then sunflower productions have increased steadily.

Most of the sunflower is grown by the small scale and communal farming sectors ; because it is suited to the lower rainfall areas and is cheap to grow.

Furthemore it is the only crop which still can be planted in early to mid-january and still produce a reasonable return.

The small scale commercial and communal farming sectors account for more than 90 % of the total production.

If the producer prices were to be increased, commercial farmers would be interested in this crop and so reduce the threat of an cooking oil shortage.

Table 3.1.5. Sunflower seed production in ZIMBABWE (tons) over the last few years.

Harvest year	Large Scale	Small Scale	C.F.A.	Total
1979	1 279	n.a.	7 000	8 270
1980	1 396	n.a.	7 100	8 498
1981	769	907	11 000	12 676
1982	1 015	437	7 500	8 952
1983	714	228	2 400	3 342
1984	917	1 100	6 400	8 417
1985	1 280	1 000	16 065	18 345
1986	960	1 000	16 400	18 360
1987	3 763	1 000	16 548	21 331
1988 (estimate)	6 700	1 000		

At present, yields have been low due to a lack of research into adapted arieties.

A recently released hybrid variety might change the attitude of large commercial farmers as yields are estimated at over 2 tons/ha.

The sunflower production is expected to increase to some 50 000 tonnes by the year 2000.

The majority of this production is to be produced by the smallholder (communal and ressettlement) sector, as sunflower has proved to have a resistance to drought and fits very well into the cropping pattern of this smallholder sector.

As a controlled commodity all sunflower seed is bought by the Grain Marketing Board (the sole buyer) who than allocates the seed to the oil expressors.

3.1.6. GROUNDNUT

Until the late sixties, groundnuts were the main raw material for the local oil expressing industry. Groundnuts are traditionally produced in the communal farming areas and the small scale commercial sector, with the first accounting for the majority of the production.

Most of the production in these communal areas is retained for auto-consumption and therefore sales to the Grain Marketing Board represent only a very small part of the national production.

Furthermore the small holders prefer to dispose of the remaining groundnuts on the unofficial, parallell market which pays substancial higher prices than the official producer prices.

However there has been a slump in the production of groundnut since 1977. This has been attributed to low yields, low prices, pests and diseases, alternative crops and lack of advice (extension) to the farmers.

In 1984 a special bulking up scheme for groundnuts was initiated which was continued in 1985 with the special target to improve the quantity and quality of the seed material. This scheme has resulted in an increase of production since than.

However adverse weather conditions in that same period (drought) reduced yields and production.

Only a very limited number of large scale commercial farmers cultivate groundnut, but under supplementary irrigation in rotation with tabacco.

Groundnut is also a very suitable legume for the communal farmer in their crop rotation, especially, on the lighter soils, because of their drought resistance.

Table 3.1.6. shows the production of groundnuts by the different production sectors for the last few years.

Table 3.1.6. Groundnuts, production in tons, area in hectares

	Commercial		Communal small Scale, ARDA		Total
	Production	Area	Production	Area	Production
1980	10 675	3 641	67 000	175 000	77 675
1981	18 797	12 909	100 000	300 000	118 797
1982	16 377	11 923	95 000	240 000	111 377
1983	9 152	10 709	22 500	180 000	31 652
1984	6 194	7 014	18 720	144 000	24 914
1985	6 938	6 938	61 000	118 000	67 938
1986	15 000	NA	54 000	NA	69 100
1987	16 250	NA	NA	NA	NA
1988*	16 750				

* Estimate

Large scale commercial farmers grow mainly long season varieties which are mainly confectionary groundnuts.

The small holder Farmers grow the more drought resistant short season varieties, also confectionary groundnuts.

The production of groundnut for the oil expressing industry in the near future, is expected to be non significant because of its high labour requirement, which makes it less attractive than other cash crops.

Research into mechanisable groundnut varieties might change this present assumption.

The Grain Marketing Board is the sole buying agent for the grounonuts. The allocation of the groundnuts crusher nuts to the experssors is also, with the GMB, and are sold on a tender base.

3.1.7. MAIZE

Maize contains 3.5 - 5 % oil which is mainly located in the maize germ.

With the highly sophisticated oil expressing industry in ZIMBABWE one has started to utilise this source of vegetable oil.

The oil is extracted from the bran and germs, a by-product of the flour milling industry. The bran + germs form about 18 % of total maize milled. The extractable oil content from the bran + germ is about 10 %. This produces a factor of 1.8 % vegetable oil available in maize.

Maize remains the main staple crop in ZIMBABWE and quantities produced are exceeding any of the other crops.

75 % of the area planted to maize was in the communal areas but 2/3 of the total commercialised maize production comes from the large commercial farming sector.

Only 8 % of the marketed maize comes from the communal areas which retain the majority of their crop for auto consumption.

The total marketed maize over the last few years is shown in Table 3.1.7.

Table 3.1.7. MAIZE, production in tons, area in hectares and quantities commercialised

	Commercial			Communal			Total	Total
	Production	Area	Yield	Production	Area	Yield	Production	Commercialisation
1970	839 627	292 010	2 875	345 700	610 000	402	1 185 327	610 686
1971	1 400 499	384 017	4 607	455 000	672 000	677	1 855 499	1 113 709
1972	1 762 067	387 015	5 213	555 100	664 661	835	2 317 167	1 420 725
1973	810 358	315 335	2 570	145 000	475 000	305	955 358	550 363
1974	1 634 356	311 058	5 254	470 000	725 000	648	2 104 356	1 336 855
1975	1 328 075	278 170	4 774	435 000	725 000	600	1 763 075	1 006 922
1976	1 287 752	257 301	5 005	550 000	760 000	724	1 837 752	958 532
1977	1 213 285	64 354	4 590	400 000	600 000	667	1 613 285	941 065
1978	1 178 234	273 144	4 374	450 000	700 000	643	1 628 234	877 026
1979	721 916	149 430[2]	4 831	420 000	600 000	700	1 141 916	511 921
1980	910 739	227 733[2]	3 999	600 000	900 000	667	1 510 739	819 168
1981	1 833 395	363 448	5 844	1 000 000	1 000 000	1 000	2 833 395	2 013 758
1982	1 213 376	316 440	3 835	595 000	1 100 000	541	1 808 376	1 391 265
1983	624 786	283 880	2 201	285 000	1 050 000	271	909 786	616 749
1984	678 403	224 586	3 021	454 400	1 136 000	400	1 132 803	941 590
1985	1 153 000	238 000	4 844	1 558 000	1 018 000	1 394	2 711 000	1 827 768
1986	910 565							1 594 322

If one take 1.5 million tonnes as the quantity available for oil extraction at 1.8 %, one has a potential of some 27.000 tons of crude vegetable oil.

However the present installed extraction capacity is about 12 000 tons of crude oil/year and produce........t/year.

The maize production is expected to increase to 3.5 Million tonnes by 1990 and then stabilise at that figure. Approximately 2.4 million tonnes is expected to be produced by the smallholder farmers in the communal and ressettlement areas and the remainder, 1.1 million tonnes, by the commercial farmers sector.

Of this quantity about 2.0 Million tonnes will be marketed, the remainder is used in auto-consumption.

3.1.8. OILPALM

There exist a project for an irrigated oil palm plantation in the Zimbabwean Low Veld.

This project is integrated with an irrigation dam in the Mwenezi river by the Mwenezi Development Corporation.

The dam is reaching completion and land clearing of the 12 000 ha area has started to allow 2 000 ha to be planted per year as from 1989.

The projected yields at full maturity of the project seem very optimistic at 25 tons of bunch/ha at 22 % of oil at the age of 8 years.

A figure of 20 tons bunch/ha at 20 % of oil at the age of 8 years seems more realistic.

Table 3.1.8. shows the crude palm oil productions at these assumptions from 1993 to full maturity at 2002.

Table 3.1.8. Crude Palm oil production at Mwenezi Project

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
4 years 25 %	1.000	1.000	1.000	1.000	1.000	1.000				
5 years 45 %		3.600	3.600	3.600	3.600	3.600	3.600			
6 years 60 %			4.600	4.800	4.800	4.800	4.800	4.800		
7 years 85 %				6.800	6.800	6.800	6.800	6.800	6.800	
8 years 100 %					8.000	16.000	24.000	32.000	40.000	48.000
Total	1.000	4.000	9.400	16.200	24.200	32.200	39.200	43.600	46.800	48.000

3.1.9. SUMMARY OF AGRICULTURAL PROJECTION TOWARDS THE YEAR 2000

A summary of the previous paragraphs is presented in table 3.1.9. ; in two different groups of vegetable oil sources ;

a) the fixed available oil sources, which are either by-products of agricultural crops (cotton, maize) or already established perannual plantation crops (oil palm and copra) ;

b) secondly the variable oil sources (annual oil seed crops ; soja, sunflower) .

Table 3.1.9. Agricultural projections towards the year 2000 ('000 tonnes).

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cotton seed ('000)	150	145	190	195	205	215	225	235	242	250	255	260	263	267	270
Soya bean	83	76	100	92	100	108	116	124	132	140	148	156	164	172	180
Sunflower	18	21	22	19	20	23	26	29	32	35	38	41	44	47	50
Groundnuts	-	7	8	8	8	8	8	8	8	8	8	8	8	8	8
Total oil seeds	251	249	320	314	333	354	375	396	414	433	449	465	479	494	508

Palm oil (crude oil)	-	-	-	-	-	-	-	1	5	9	16	24	32	39	44

3.2. MARKET STUDY

3.2.1. DEMAND AND MARKET FOR OILS AND FATS

3.2.1.1. The local consumption

a/ Products
b/ Local production
c/ Imports Exports
d/ Consumption per capita

3.2.1.2. The prices

a/ Local prices
b/ Comparison with the international prices

3.2.1.3. Estimation of the present demand

3.2.1.4. Evaluation of the future demand

a/ Income elasticity of demand - concepts and definition
b/ Variation of the GDP up to 2000
c/ Projection of demand

1.2.2. DEMAND AND MARKET FOR OIL MEALS

1.2.2.1. The local production and consumption

a/ Products
b/ Local production
c/ Exports
d/ Local consumption

3.2.2.2. The prices

a/ Local prices

b/ International prices

3.2.2.3. The demand

a/ Factors governing the demand

b/ Evaluation of future demand

3.2.3. OTHER MARKETS

3.2.4. PLANT CAPACITY

3.2.4.1. Evaluation of the existing Industry

a/ Actual operating period

b/ Oil mills

3.2.4.2. Evaluation of the agricultural production

3.2.4.3. New Plant Capacity

3.2.5. PRODUCTION PROGRAMME

3.2. MARKET STUDY

3.2.1. DEMAND AND MARKET FOR OILS AND FATS

3.2.1.1. The local consumption

a/ Products

Edible oils and fats commercialized in ZIMBABWE are essentially :

- Pure sunflower oil

- Blended oil. The blend is based on cotton seed oil plus variable quantities of soya bean oil and/or groundnut oil and or/maize oil.

- Small quantities of pure maize oil are also sold.

Over the last years, cotton seed oil represented approximately 50 % of the total output, soyabean oil approximately 30 %, and the remainder being sunflower oil and maize oil. Groundnut oil, the share of which was very important in the sixties, is no longer important as a vegetable oil.

It is very important for this study to note that cotton seed oil, in spite of representing the largest proportion of edible oil produced in ZIMBABWE, is never marketed in its pure form, but always blended. This is for reasons of taste and colour. Cotton seed oil is indeed much darker than the other oils.

Consequently, any new plant must be designed to produce not only cotton seed oil, but also other oils.

Be[illegible] edible oil, margarines and cooking fats are also produced and sol[illegible] [illegible]MBABW[illegible].

Edible oils are sold in :

- Bottles of 375 ml, 500 ml and 750 or 738 ml
- Tins of 2.5 l, 5 l and 20 l
- Drums of 200 l.

Margarine and cooking fats are sold in :

- Packets of 125 g, 250 g, 500 g, 1 kg, 2 kg
- Tubs of 42 g, 250 g, 500 g (magarine only).

Conditionning is a real problem in ZIMBABWE because of the shortage of foreign exchange to import raw materials.

In fact, plastic bottles and tins have to be imported, so most of the oil conditionning is made with glass bottles, locally produced by the Company ZIMGLASS in GWERU.

b/ Local production

Production and distribution of oils and fats

All edible oils and fats in ZIMBABWE are produced by four companies, namely :

- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS

OLIVINE INDUSTRIES are by far the largest oil expressor with 43 % of the total production.

They also produce the largest quantity (75 %) of soya bean oil.

LEVER BROTHERS contributes a quarter to the total production.

BLUE RIBBON FOODS and NATIONAL FOODS are smaller, but production of oil is only a relatively small part of their total activity.

NATIONAL FOODS are the sole producers of maize oil.

Margarine and cooking fats are produced only by OLIVINE INDUSTRIES and LEVER BROTHERS.

Based on allocations of oil seeds to the expressors, the productions of refined oil between 1983/84 and 1987/88 were the following :

1983/84	35 000 t
1984/85	46 000 t
1985/86	49 800 t
1986/87	50 300 t
1987/88	54 700 t

c/ Imports - Exports

Compared to the local production, imports of oil are very low : 2 000 t in 1986 - 2 400 t in 1987.

They essentially consist of :

- Import of crude oil, which is then refined in ZIMBABWE and reexported, chiefly to BOTSWANA and ZAMBIA (1 200 t in 1986 - 1 600 t in 1987) through a revolving fund.

- Import of coconut oil, for the soap industry.

Therefore, import of edible oil for local consumption are neglectable.

Some margarine and fats are exported : 400 t in 1986 and 400 t in 1987.

Imports are very low because of the shortage of foreign exchange. Also the rates of duty are high : on vegetable oils 20 % import duty plus 20 % surtax.

d/ Consumption per capita

For the last five years, the main figures are :

	83/84	84/85	85/86	86/87	87/88
Local production t	35 000	46 000	49 806	50 328	54 700
Net imports t	9 150	NA	1 200	800	800
Global consumption t	44 150	46 000	51 000	51 128	53 500
Population 1 000	7 949.0	8 174.8	8 405.5	8 639.6	8 876.1
Consumption per capita - Kg/year	5.55	5.62	6.06	5.92	6.25

For the last three years, the average consumption per capita was 6.07 kg/year.

Say 6 kg per capita per year.

This level is relatively low compared to the developped countries, but relatively high compared to the region (average consumption for SADCC countries, 2 kg per capita per year).

3.2.1.2. The prices

a/ Local prices

In ZIMBABWE, vegetable oils and fats are classified as "Essential Commoditites". Consequently, the prices from distributors or wholesalers are "stabilised" and officially published in so calleo "Statutory Instruments", which are regularly updated.

The Basic Control of Goods (price control) Order is published in the Statutory Instrument 116 of 1987 (see annex in the main study) still applicable in May 1988.

Generally, two categories are considered :

- Blended oil and associated products
- Sunflower oil and associated products, which are more expensive.

EXAMPLES OF PRICES Z $

	BLENDED OIL				SUNFLOWER OIL			
	Unit price	Price of conditionning	Oil price	Oil price per liter	Unit price	Price of conditionning	Oil price	Oil price per liter
Bottle of 750 ml	1.89	.40	1.49	1.986	2.19	.40	1.79	2.386
Drum of 200 l	356.39	48.42	307.97	1.54	412.37	48.42	363.95	1.82
Variation bottle/drum price of oil				29 %				31 %

This table shows that, when conditioned in bottles, the same oil is sold 30 % more expensive than in drums. The return for the company is therefore much better when the oil is sold in retail packs.

If we consider that the oil price in drums is the real price ex works of this oil, we can calculate this price in US $/t.

	Z $/l	US $/l ($1 = Z$ 1.7)	US $/t (1 l= 0.9 kg)
Blended oil	1.54	0.9059	1 006
Sunflower oil	1.82	1.0705	1 189

We make the assumption that local blended oil is comparable to international soya bean oil.

b/ Comparison with the international prices

Prices of oil, ex tank Rotterdam, in US $/t

October/September	Soya bean Oil	Sunflower Oil
1982/83	463	
1983/84	722	
1984/85	625	632
1985/86	377	406
1986/87	324	356
Sept 88	485	515

Import Parity price US $/t

Example for soya bean oil

	Base	84/85	86/87
Oil ex tank Rotterdam		625	324
Sea freight Rotterdam Durban		45	45
Port charges		25	25
Rail Road transport to Harare		90	90
TOTAL		785	484
Import duty 20 %)) 44 % Surtax 20 %)		345	213
Other costs		40	40
Import parity price		1 170	737

Local price 1 006 $/t

This example shows that, at present, the local price in ZIMBABWE is higher than the international price. This was the contrary in 1984/85.

3.2.1.3. Estimation of the present demand

Several factors have to be considered :

- The prices
  The prices of vegetable oils and fats, classified as "essential commodities", are strongly controlled at relatively low levels.

  Edible oil is not a luxury commodity in ZIMBABWE.

- The shortage of foreign exchange.

  As seen above, imports of edible oils for local consumption are maintained at very low levels through the limitation of import licences and dissuasive rates of duties (20 % plus 20 % surtax).

- The improvement of the income of lower income families.

  For families with an income of up to 3 600 $/year, the increase of income has been 15 % on the 1.7.85, 10 % on the 1.7.86, 15 % on 1.3.88.

  These figures are higher than the increases of the price indexes in the same period.

  Even if the real rate of inflation is higher than the increase of price indexes, there is probably an improvement in buying power for the lower classes.

- The distribution network
  As said in the study, there is a good distribution network in ZIMBABWE.

As a result of these main factors, all the marketing people we met :

- The Marketing Managers of OLIVINE INDUTRIES, LEVER BROTHERS, BLUE RIBBON FOODS, NATIONAL FOODS.

- The wholesalers, for instance the Managing Director of JAGGER.

- The Agricultural organizations etc...

- The retailers (surpermarkets)

All agree that one should consider that the present demand is largely above the present production and that the demand is increasing sharply every year.

The consumption is limited now by a shortage of oilseeds and a strong control of imports. It is therefore clear that the present consumption of 6 kg per capita per year is below the actual demand.

- Publications by the Agricultural Marketing Authority estimate the global demand in 1966 at 60 000 T, with a population of 8,405,577 (medium variant), this would give a figure of 7.14 kg per capita per year.

- The Ministry of Industry considers that production could meet the demand with one litre of cooking oil per person over the age of five, per month, that would give 9 kg per person per year.

  Finally, we propose to consider two variants - medium variant : 7,2 kg per capita per year, which is 20 % more thant the present consumption. High variant : 9 kg per capita per year, which is 50 % more than the present consumption. These figures are based on 1966.

3.2.1.4. Evaluation of the future demand

There is considerable evidence that the price elasticity of the demand for edible oil is very low.

Therefore, for the evolution of the demand, two main factors have to be considered :

- The increase in demand due to the increase of the population
- The increase in demand due to the increase of income (through the income elasticity).

a/ Income elasticity of demand - concepts and definitions

It is well known that income plays a significant role in determining the composition of diets in general.

With regard to fats and oils, the apparent consumption tends to increase very sharply at low levels of income and very slowly at high levels, approaching saturation at around 30 Kg per capita per annum.

The following figure shows the relation between GNP in US $ and apparent consumption of fats and oils in kg per capita per year, in selected countries in 1980.

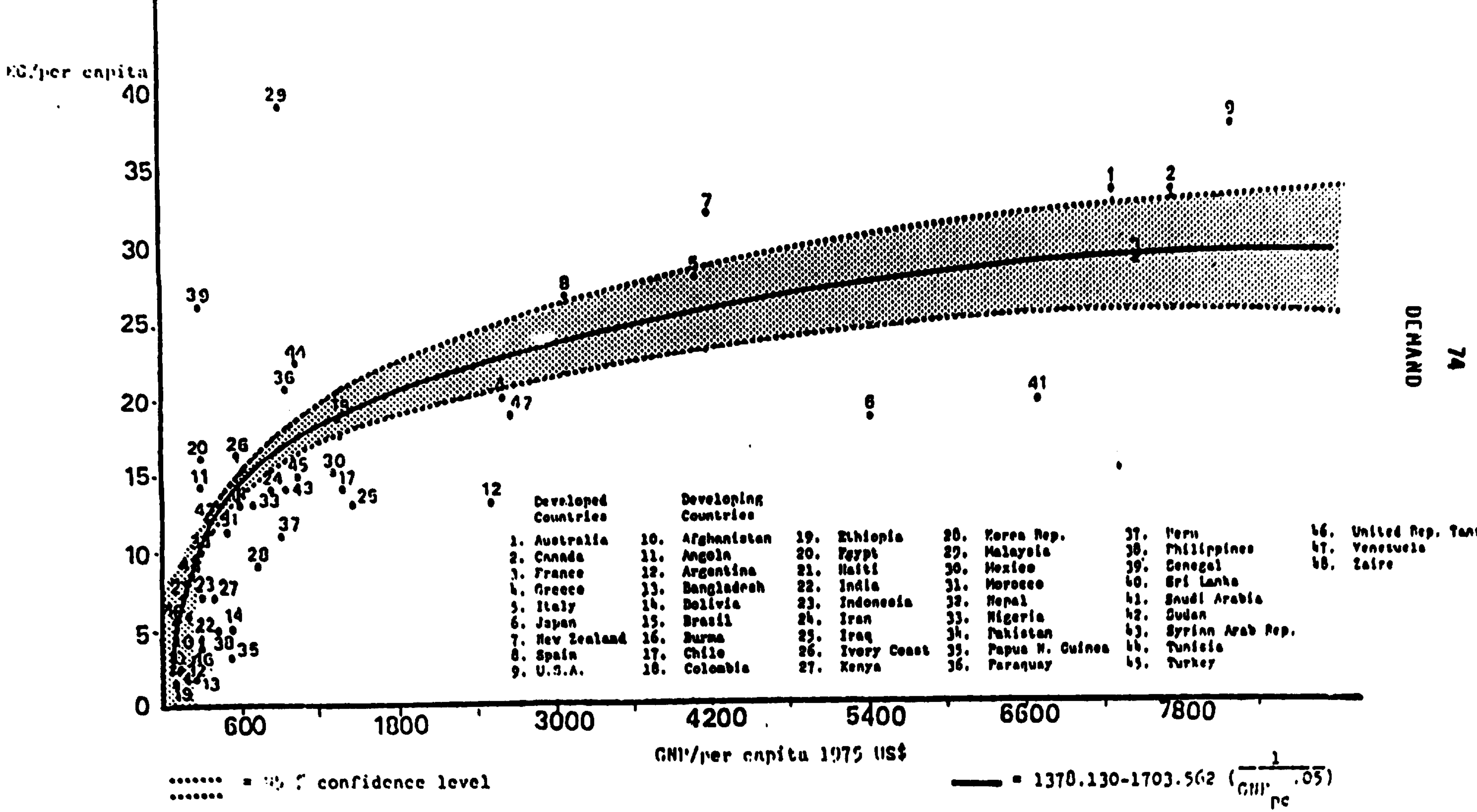
Source : United Nations - Industrial Development Organization.
Sectoral study
The vegetable Oils and Fats Industry in developing Countries
- Outlook and perspectives.

The income elasticity of demand is defined by the ratio between the variation of consumption of edible oil in percentage to the variation of income (measured for instance with GDP per capita) also in percentage.

The World Bank estimates GNP per capita is ZIMBABWE in 1985 at US $ 680 (World Development report 1987).

At this level and taking into account the income distribution in ZIMBABWE (Lorentz Curve - Income tax Statistics), we consider that the income elasticity of the demand of edible oil is 0,5.

Figure 4.1. Per capita apparent consumption of fats and oils in selected countries in 1980



b/ Variation of the GDP up to 2000

The first five-year National Development Plan 1986 - 1990 is baseo on an annual growth in GDP of 5.1 per cent.

A recent mini boom in 1985, with a real growth rate of 9.3 % slowed down to close to zero in 1986. Preliminary figures for 1987 suggest nearly 2 per cent. Prospects for 1988 are much better and figures of 5 % and possibly more are expected.

We made the assumption that the GDP growth rate would exceed the population growth rate by 2 % per year.

Considering an elasticity coefficient of 0.5, that would give an increase of the edible oil demand of 2 % x 0.5 = 1 % per year. (increase of consumption per capita).

c/ Projection of oemand

Taking into account the factors developped above :

- We consider two figures for the edible oil demand per capita in 1986.

  Medium variant : 7.2 kg/year
  High variant : 9 kg/year

- If consider that these figures will grow with of 1 % per year, we are able to calculate the demand per capita, up to the year 2000, for the two variants.

- With the population growth, we arrive, for the projection of the global demano at the following table.

EDIBLE OIL IN ZIMBABWE - EVOLUTION OF DEMAND

	1986	1990	1995	2000
Population 1 000 Medium variant	8 405.6	9 369.4	10 633.7	11 942.6
Coefficient 1 % per year	1	1.0406	1.0937	1.1496
Demand per capita Medium variant Kg/year	7.2	7.49	7.86	8.28
Demand per capita High variant Kg/year	9	9.37	9.84	10.35
Global demand t/year Medium variant round figures	60 520 60 000	70 177 70 000	83 687 84 000	98 884 100 000
Global demand t/year high variant round figures	75 650 76 000	87 791 88 000	104 636 105 000	123 606 124 000

3.2.2. DEMAND AND MARKET FOR OIL MEALS

3.2.2.1. The local production and consumption

a/ Products

Nota : "Cake" is defined as the product coming out of the expellers. "Meal" is defined as the products coming out of the solvent plant.

Oil cake/oil meal is utilised in the stockfeed industry as a very important source of protein (cotton seed cake : 40/45 % - soya cake (44 - 50 %). Production in ZIMBABWE is essentially cotton seed meal and soya bean meal.

Of course, cotton seed meal is principally used for the beef and the dairy industry because of the problem of gossypol for monogastrics (poultry and pigs).

On the contrary, soya bean meal is used in all stockfeeds. Soya bean meal is well known as an important product on the international market.

b/ Local production

Derived from oil seeds allocation, the oil meal productions were the following :

	TOTAL	COTTON MEAL	SOYA MEAL
1983/84	125 000	-	-
1984/85	137 000	-	-
1985/86	137 000	-	-
1986/87	140 000	68 000	63 000
1987/88	154 000	66 000	76 000

c/ Exports

ZIMBABWE exports significative quantities of oil meals, principally to the RSA. The figures were

		to RSA
1986	42 000 t	98.7 %
1987	57 000 t (first 9 months)	97.9 %

Exports - detail for 1986

PRODUCT	TO	QUANTITY t	UNIT VALUE Z $/kg
Cotton Meal	RSA	28 710	.172
	Others	196	
	TOTAL	28 906	
Soya meal	RSA	11 496	.338
	Others	303	
	TOTAL	11 799	
Others		941	
TOTAL		41 646	

Exports - detail for 1987 (first 9 months)

PRODUCT	TO	QUANTITY t	UNIT VALUE Z $/kg
Cotton Meal	RSA	29 937	.258
	Others	77	
	TOTAL	30 014	
Soya meal	RSA	25 062	.346
	Others	974	
	TOTAL	26 036	
Others		720	
TOTAL		56 770	

d/ Local consumption

In ZIMBABWE, the stockfeed industry is very concentrated in 3 companies :

AGRIFOODS
NATIONAL FOODS (stockfeed Division)
RUMEVITE (smaller)

A relatively small quantity of meals is also sold directly to farmers.

The final consumer is of course the Commercial Agriculture, large scale and small scale commercial farmers, generally organized in associations such as :

Cattle Producers Association
National Association of Dairy Farmers
Commercial Poultry Producers Association

The demand for stockfeed is very sensitive to the price, consequently, the production varies widely from one year to the other.

3.2.2.2. The prices

a/ Local prices

Similarly to the prices of oils, the prices of oil meals are fixed by the Government. The evolution of the prices in the recent years has been the following :

Oil meal prices Z \$/t and US \$/t (\$1 = Z\$ 1.7).

YEAR	COTTON MEAL		SOYA MEAL	
	Z$	US$	Z$	US$
1983/84	152	90	165	109
1984/85	291	171	328	194
1985/66	291	171	328	194
1986/87	291	171	326	194
1987/86	251	148	330	194

Nota :

- Sunflower seed meal prices are similar to cotton seed meal prices.
- Groundnut meal prices are similar to soyabean meal prices.

The meal prices were tremendously increased in October 1983. As this resulted in a drop of domestic offtake, the Government recently reduced the price of cotton seed meal from 291 to 251 Z$ per ton.

b/ International prices

(Source oil world) US $/t

	82/83	83/84	84/85	85/86	86/87	15/4/88	15/9/88
Cotton seed meal CIF Rotterdam	172	174	99	115	134	157	165
Soya bean meal CIF Rotterdam	224	221	155	183	189	240	309

Because of the draught in the United States, the price of soya meal increased sharply in the recent period (April, May, June 1988).

The comparison between the figures of paragraphs a/ and b/ shows that the local prices of cotton meal, up to the recent reduction, were higher than those of the international market.

The local prices of soya meal were comparable.

3.2.2.3. <u>The demand</u>

a/ Factors Governing the demand

As mentioned above, the final consumer for oil meals is the Commercial Agriculture and for cotton seed in particular, the cattle and dairy industries. It seems that there is a good correlation between the cotton meal demand and the ratio : price of beef (Cold Dressed Mass CDM) to the price of cotton meal.

The cattle Industry in ZIMBABWE comprises two systems :

- the communal herd comprising about 3.3. million head.
- the commercial herd comprising about 1.8 million head (in 1986).
  For the stockfeed Industry, only the commercial herd has to be taken into account.

In 1982, the commercial beef herd was 2.1 million head. There has been a decline between 1982 and 1986 (droughts - long awaited entry into the European Market). Its seems now that the herd will increase again.

In the winter of 1982, the price of cotton seed meal was approximately $ 152 per ton. The price of beef (Cold Dressed Mass : CDM) was 1 360 $/t. The ratio was therefore 9 to 1.

In September 1983, cotton seed meal almost doubled in price (291 $ per ton). The situation in 1985, with a price of beef (CDM) of 1 560 $/t was therefore a ratio of 5 to 1.

There was consequently a dramatic fall off in sales of stockfeed in 1985. The drought of the previous two years prevented this fall happening sooner.

In such a situation, beef producers tend to reduce their winter feeding levels and are looking at lighter stocking rates to improve individual animal performance. Stockfeed manufacturers tend to use more urea, molasses and milling residues to cut down the costs of the rations.

We think that, in order to maintain relatively low prices for oil (essential commodity), the Government increased the price of meal to allow a reasonable return to the oil expressors.

In fact, the local meal market dropped and the expressors were obliged to export the surplus of meal, at the international prices, which are much lower than the local prices.

This situation has now been corrected. The price of cotton seed meal has been reduced to 251 \$/t.

The price of beef (CDM) was in May 1988 at 2 320 \$/t.

The resulting ratio is now therefore 9 to 1 again.

For soya bean meal, the problem is different since the local price has always been kept close to the international price and because soya bean meal is easier to use, particularly for poultry and pigs. Additionally, poultry production is one of the fastest growing industries in ZIMBABWE. Day old chick production increased from about 15 million in 1985 to over 20 million in 1986. The pig industry is still relatively small, with a commercial sector estimated at 100 000 pigs, but the country is suited for pig production because of its climate and this industry is therefore growing.

The following Table show the stockfeed production in ZIMBABWE from 1980 to 1987, and the prices of cotton seed meal.

	STOCKFEED PRODUCTION t/y	PRICE OF COTTON MEAL \$/t
1980	510 000	117
1981	525 000	152
1982	510 000	152
1983	660 000	152
1984	580 000	291
1985	450 000	291
1986	512 000	291
1987	575 000	291

Between 1983 and 1985, the price of cotton seed meal has been increased by 91 % and the stockfeed production dropped 32 %.

b/ Evaluation of the future demand

The Cattle Producers Associations assumes that, once the right price ratio is found between beef and cotton seed meal, the industry could possibly use in excess of 100 000 tons of meal per annum. That right ratio is thought to be in the order 8 to 1.

It is clear that, since the local stock feed industry does not absorb the total quantity of cotton seed meal produced, the local prices of cotton seed meal (and soya bean meal) should not be too different of those of the international market.

This factor being taken into account, it seems that there is no problem to export additional quantities of oil meal to RSA, a natural Market to ZIMBABWE because of the importance of the transport costs for meals.

We do not think it appropriate to produce a chart showing the demand for oil meal up to the year 2 000, because the sensitivity of this market to various factors is very high.

However, considering :

- the improvement of the situation of the cattle industry.
- the good situation of the dairy industry,
- the increase in production of the poultry and pig industries,
- the fact that the prices of cotton seed meal are now fixed at reasonable levels, taking into account the local price of beef and the international prices of meals,
- the fact that Export of meals to neighbouring countries, specially RSA creates a natural market for the surplus of the oil meal production.

We estimate that, provided the prices, fixed by the Government are not too far from the international prices, there will be no problem for the oil expressors to sell their oil meals, either on the local market or the export market in the region.

3.2.3. OTHER MARKETS

a/ Soap industry

The soap industry in ZIMBABWE is controlled by the same producers as those for Edible oils, plus a small company, which is a subisioary of the COLGATE-PALMOLIVE Group.

The four producers confirmed that no vegetable oil was used for soap production. The main raw material for soap is tallow, either sold by the Cold Storage Commission or imported. Also a small quantity of coconut oil is imported from MALAYSIA for soap production.

Consequently, we have not taken into account the soap industry in our market study for vegetable oils.

b/ Industrial uses

The informations from the marketing managers of the four expressors indicate that industrial uses, such as paints, only represent a very small proportion of the vegetable oil production. This proportion is estimated at 5 %.

3.3. PLANT CAPACITY

3.3.1. OILSEEDS PRODUCTION AND ALLOCATION

3.3.2. EXISTING OIL SEEDS MILLS CAPACITY.

3.3.2.1 National Foods Northern Region

3.3.2.2. National Foods Southern Region

3.3.2.3. Olivine line n°1

3.3.2.4. Olivine line n°2

3.3.2.5. Lever brothers

3.3.2.6. Blue Ribbon Foods

3.3.3. PLANT CAPACITY ESTIMATE

Scenario I
Scenario II
Scenario III

3.3.4. PRODUCTION PROGRAMME

3.3.4.1. Products and qualities

3.3.4.2. Products and quantities

3.3. PLANT CAPACITY

The capacity of a new oil mill will depend upon 2 factors :

- the oilseeds production and their allocation
- the capacity of existing oilseeds mills and their ability to increase these capacities.

3.3.1. OILSEEDS PRODUCTION AND ALLOCATION

It has been explained in previous chapters that the oil seeds production is not sufficient to cope demand. Consequently all the production is or will be transformed into edible oil.

Currently oil seeds are crushed and transformed in crude oil and meals by 5 oil mills which are :

- OLIVINE INDUSTRIES LTD - 51 % HEINZ group, 49 % public, Birmingham Rd, Willowale, HARARE.

- LEVER BROTHERS ZIMBABWE Ltd, private subsidiary of UNILEVER, Stirling Rd HARARE.

- NATIONAL FOODS Ltd, Northern Region, private, Stirling Rd, HARARE.

- NATIONAL FOODS, Ltd, Southern Region, private, BULAWAYO.

- BLUE RIBBON FOODS Ltd, T.A. Holding group subsidiary, Khami Rd, BULAWAYO.

The crude oil obtained is transformed in edible oil in refining plants located on the premises of the oil mills, except at NATIONAL FOODS NORTH, which sends its crude oil to NATIONAL FOODS BULAWAYO for refining.

Because of insufficient production, oil seeds are allocated to the expressors by :

- the Cotton Marketing Board for cotton seeds
- the Grain Marketing Board for sunflower seeds, groundnuts and soya beans.

Table III.3.1.1. shows the drawings made to the expressors for the seasons 1985/1986, 1986/1987, 1987/1988. This table calls for the following observations :

- Each of the existing oil mills can process more than one type of seeds. OLIVINE, LEVER BROTHER and BLUE RIBBON FOODS are able to crush cotton seeds, soya beans, groundnuts and sunflower.

- NATIONAL FOODS NORTH is mainly processing maize germs but can also crush cotton seeds and therefore might be interested in an allocation of cotton seeds, although it has not received cotton seeds for the last two seasons.

- NATIONAL FOODS SOUTH is also mainly processing maize germs but can also crush sunflower seeds and groundnuts for which it has an allocation.

- The present oil seeds allocations and drawings are divided according to a certain ratio which we have utilized for the calculation of oil seeds distribution towards the year 2000.

3.3.2. CAPACITY OF EXISTING OIL SEEDS MILLS AND THEIR ABILITY TO INCREASE THESE CAPACITIES

In tables III.3.2.1./2/3/4/5/6/7 we have summarised the possible activity of each mill towards the year 2000, starting from allocations during the last three seasons. This activity is given in metric tons (MT) per year and in number of days.

It is assumed that an oil mill must run continuously 7 days a week (4 shifts), the maximum possible days during the year. Generally an oil mill stops 30 days for maintenance, about 10 days for public holidays and an other 5 days for modifying and cleaning the plant from one oil seed to another. Consequently, we have calculated that the oil mills must run 320 days per year.

We shall review each oil mill into more detail.

Table III.3.2.1. National Foods Northern Region

a/ It is difficult to know exactly the general strategy of NATIONAL FOODS. This Company is mainly specialized in maize but also is interested in crushing other oil seeds. Consequently, although NATIONAL FOOD NORTH received only 9 156 MT of cotton seed in 1985/1986 and nothing in 1986/1987 and 1987/1988, we think it reasonable that 10 000 MT/year of cotton seeds will be allocated to them.

b/ The number of days of activity on cotton seeds is based on an average daily input of 90 MT. In fact the installed cotton seeds capacity at NATIONAL FOODS NORTH is 100 MT/D, but we have assumed a 90 % efficiency (eventual shutdowns, maintenance, quality problems, etc..).

c/ The number of days reserved for maize germs is calculated by subtracting the days reserved for cotton seeds from the total 320 days per year.

d/ Installed capacity on maize germs : 200 MT/D

Average daily input : 180 MT/D.

Therefore if the quantity of cotton seeds is 10 000 MT/year, the quantity of maize germs which could possibly be treated is 37 620 MT.

Table III.3.2.2. National Foods Southern Region

a/ For the same reason as above we think it reasonable to continue with the same allocation obtained during the last two seasons, i.e. .... 4 000 MT sunflower seeds, 2 000 MT groundnuts (total : 6.000 MT).

b/ The equipment at NATIONAL FOODS SOUTH is generally in poor condition, especially the expellers and the solvent plant need to be rehabilitated. Therefore, an average daily input of sunflower seeds and groundnuts of 50 MT is a reasonable assumption.

c/ Days of activity for maize germs : 320 - days of activity sunflower/groundnuts.

d/ Reasonable daily input 140 MT/D on maize germs.

Therefore if the quantity of sunflower seeds/groundnuts is 6000 MT/year, the quantity of maize germs which possibly could be treated is 26,000 MT.

Table III.3.2.3. Olivine - Line N° 1

a/ OLIVINE has two production lines running in parallel. Line N° 1 is processing cotton seeds, sunflower seeds, and groundnuts. Line N° 2 is specifically used for soya beans.

b/ Currently 40 % of cotton seed production is allocated to OLIVINE. In the future, we assume therefore, starting from the cotton seeds production programme, that the quantity of cotton seeds allocated to OLIVINE will remain 40 % of the production, after the deduction of 10,000 MT for NATIONAL FOODS.

c/ The future sunflower allocation will be 20 % of the production, of which we have deducted 4,000 MT for NATIONAL FOODS.

d/ The future groundnuts allocation will be 20 % of the production, of which we have deducted 2,000 MT for NATIONAL FOODS.

e/ After discussion with OLIVINE, the number of days of activity is calculated on the basis of an average daily input of 240 MT from an installed capacity of 270 MT/D. It can be seen that line n° 1 was used 257 to 260 days a year during the last 3 seasons (utilization rate : 80.3 % to 67.5 %), but that from 1990 onwards the line will be saturated.

f/ and g/ In brackets are marked the excess of days of activities and quantities of cotton seeds/sunflower seeds/groundnuts, which cannot be crushed at OLIVINE and which consequently will be supplied to the new oil mill.

h/ The surplus capacity is shared 90 % for cotton seeds and 10 % for sunflower seeds/groundnuts.

Table III.3.2.4. OLIVINE - Line N°2

a/ As explained before, the line is utilized only for soya beans.

b/ The soya beans production is shared between OLIVINE, LEVER BROTHERS and BLUE RIBBON FOODS. OLIVINE receives 75 % of the soya beans production. This percentage has been used for the allocation of soya beans in each year up to 2000.

c/ After discussion with OLIVINE, the number of days of activity is calculated on the basis of a 300 MT average daily input from an installed capacity of 330 MT/D. It can be seen that line N°2 was used 194 to 240 days/year during the last 3 seasons (utilization rate : 60.6 % to 75.0 %) and that this line will be saturated only from 1994 onwards.

d/ and e/ In brackets are marked the excess of days of activity and quantity of soya beans which cannot be crushed at OLIVINE and will be allocated to the new oil mill.

Table III.3.2.5. LEVER BROTHERS

a/ LEVER BROTHERS has only one line capable to crush either cotton seeds, sunflower seeds, groundnuts, or soya beans.

b/ 40 % of the cotton seeds production is allocated to LEVER BROTHERS, same as for OLIVINE. We therefore assumed that the same percentage will be allocated in the future.

c/ 25 % of the sunflower seeds production, of which we have deducted 4,000 MT for NATIONAL FOODS, will be allocated.

d/ 50 % of the groundnuts production, of which we have deducted 2.000 MT for NATIONAL FOODS, will be allocated.

e/ After discussion with LEVER BROTHERS the number of days of activity is calculated on the basis of an average daily input of 300 MT/Day from an installed capacity of 330 MT/D. The number of days used for cotton seeds/sunflower seeds/groundnuts has varied from 169 to 210 days during the last 3 seasons.

f/ 100 % of the soya beans production is allocated to LEVER BROTHERS.

g/ Also after discussion with LEVER BROTHERS the number of days of activity on soya beans is calculated on the basis of an average daily input of 300 MT/Day from an installed capacity of 330 MT/D.

In fact, it must be underlined that soya beans are crushed at LEVER BROTHERS through pre-pressing, followed immediatly by solvent extraction. The advantage is an increase in capacity, but an important disadvantage is a decrease in quality of both oil and meal, in which the proteins are partially destroyed. The normal process would be extracted the oil directly by the solvent process.

h/ It can be seen that the LEVER BROTHERS oil mill operated 199 to 244 days a year during the last 3 seasons (utilization rate : 62.2 % to 76.2) on soya beans, but that it will be satured from the year 1990.

i/and j/ In bracket are marked the excess of days of activity and quantities of oil seeds which cannot be crushed at LEVER BROTHERS and will be supplied to the new oil mill. This quantity is assumed to contain : cotton seeds 75 %, sunflower and groundnuts 10 %, soya bean 15 %.

BLUE RIBBON FOODS

This is a special case. For the last 3 seasons, the plant has been running with a solvent plant in very poor condition, and the capacity could be maintained for soya beans by working through the pre-pressing plus solvent extraction process, which is recommended as explained above for LEVER BROTHERS.

A new solvent plant is now being built which will be commissioned by the end of 1988. Therefore the capacity for soya beans will be appreciably increased. It will not increase much for the other seeds. For this reason BLUE RIBBON FOODS applied to the Ministry of Industry and Technology for an import licence for a new expeller. The additional decorticator should be manufactured in ZIMBABWE.

In order to adjust the existing capacity at the right level we prepared 2 tables :

- III.3.2.6. After New Solvent Plant start-up and commissioning
- III.3.2.7. After New Solvent Plant start-up plus additional new expeller : 150 MT/D.

Table III.3.2.6. BLUE RIBBON FOODS. After New Solvent Plant start-up and commissioning

a/ BLUE RIBBON oil mill is capable crushing either cotton seeds, sunflower seeds, groundnuts or soya beans.

b/ The ratio of cotton seeds allocated to BLUE RIBBON is 20 %, i.e. half that of OLIVINE or LEVER BROTHERS.

c/ Sunflower seeds ratio is 35 % of the production programme of which we deducted 4,000 MT for NATIONAL FOODS.

d/ After start-up of the new solvent plant, the number of days of activity for cotton seeds and sunflower seeds is calculated on an average daily input of 150 MT for an installed capacity which remains only at 170 MT/day. However the number of days utilized during the last 3 seasons is very important because of the old solvent plant, but even with the new solvent plant, the oil mill will be already saturated from 1991, only with cotton seeds plus sunflower seeds.

e/ The soya beans production ratio allocated to BLUE RIBBON FOODS is 15 %.

f/ After start-up of the new solvent plant the number of days of activity on soya beans is calculated on the basis of an average daily input of 250 MT for an installed capacity of 280 MT/D.

g/ It can be seen that the BLUE RIBBON oilmill has been working on a average of 323 days a year $\frac{(368 + 288 + 313)}{3}$ during the last three seasons.

However, although there is a new solvent plant, the oil mill will be is satured from 1990 (cotton seeds + sunflower seeds + soya beans).

h/ and i/ In brackets are the excess of days of activity and quantity of oil seeds which cannot be crushed at BLUE RIBBON FOODS oil Mill and will have to be supplied to the new oil mill.

This quantity is shared between cotton seeds (67 %) and soya beans 33 %).

Table III.3.2.7. BLUE RIBBON FOODS. After New Solvent Plant start-up plus additional new expeller : 150 MT/D

It is assumed that BLUE RIBBON will obtain the licence for the new expeller and the latter will be on stream in 1990, that is already very tight.

a/, b/ and c/ Same remarks as above.

d/ The average daily input for cotton seeds and sunflowers becomes 270 MT for and installed capacity : 300 MT/Day.

e/f/ Same remark as above.

g/ Same remarks as above for the past 3 seasons, but from 1990 the oil mill will be saturated only in 1997.

h/ and j/ Consequently it will be necessary to feed the BLUE RIBBON oil mill between 1990 and 1996 and the quantities calculated will have to be deducted from the surplus calculated for OLIVINE and LEVER BROTHERS. From 1997, in brackets are the days of activity and quantities in excess which cannot be crushed by the BLUE RIBBON oil mill and will have to be supplied to the new oil mill.

This quantity is shared between cotton seeds (67 %), and soya beans (33 %).

3.3.3. PLANT CAPACITY ESTIMATE

Proposed solution (scenario I) and alternatives (scenario II and III)

The plant capacity is determined by the excess quantity of oilseeds which cannot be absorbed by the existing companies. The oil seeds surplus is calculated from the oil seeds production programme on one hand and the calculations in paragraph 3.3.2 above on the other hand.

For this purpose we computed the normal capacity for each expressor taking account of necessary rehabilitation. However, BLUE RIBBON FOODS constitutes a particular case as they installed a new solvent plant that increase which increases the capacity in soya beans, but not very much on cotton seeds and sunflower seeds.

It is not confirmed whether this company will obtain the licence for importing additional equipment, nevertheless we supposed they will get it. Consequently 2 cases are contemplated :

* Case 1. After start-up of and commissioning of the new solvent plant only at BLUE RIBBON FOODS.

** Case 2. After start-up of the new solvent plant plus new expeller.

he tables III.3.3.1. and III.3.3.2. are showing the quantities of oil seeds which could be supplied as raw materials to the new oil mill.

It can be seen that an excess of oil seeds is already available from 1990 in case 1 and only from 1992 in case 2.

It can also be seen in case 1 that an excess of oil seeds of 156 531 MT in the year 2 000 needs an average actual capacity calculated as follows.

$$\frac{158\ 531\ \text{MT}}{320\ \text{working days}} = 495\ \text{MT/day}$$

Starting from a solvent plant of installed capacity 500 MT/ or actual capacity 450 MT/day, the number of days of activity on soya beans plus palm kernel should be :

$$\frac{59\ 130\ \text{MT} + 4\ 000\ \text{MT}}{450} = 141\ \text{days}$$

The remaining oil seeds (cotton seeds, sunflower seeds, groundnuts) should be crushed at an installed capacity of 660 MT/D or actual capacity of 600 MT/D as only the cakes obtained from seeds after decorticating and prepressing are extracted into the solvent plant.

Consequently, the number of days of activities for the oil seeds should be :

$$\frac{156\ 531\ \text{MT} - 63\ 300\ \text{MT}}{600} = 159\ \text{days}$$

$$\text{TOTAL} \ldots\ldots\ldots\ldots\ldots\ldots = 300\ \text{days}$$

In case 2, the same plant should be running at full capacity in the year 2002.

Therefore, one solution should be to start in 1990/1992 a new oil mill of installed capacity :

- 660 MT/D on cotton seeds/sunflower seeds/groundnut
- 500 MT/D on soya beans and eventually on palm kernel.

Nevertheless, this oil mill whould only be working at full capacity in the year 2000/2002 that is to say 10 years after start-up.

It is well known that in oil mills the break-even point is usually to 80 % or more of the utilization rate.

This utilization rate of 80 % should be achieved only after more than 7 years.

Consequently, we have considered this solution in our study and we name it : SCENARIO III, but we already believe that it will not be feasible.

Another solution is to erect 2 oil mills of half capacity, the first running at full capacity in 1995, the second in the year 2000/2002.

For this solution we considered the following capacities.

- 330 MT/day installed capacity based on cotton seeds, sunflower seeds and groundnuts or

- 250 MT/day installed capacity based on soya beans or palm kernels.

  This capacity is considered in our study as the most interesting and we name it : SCENARIO I.

If the first oil mill of such capacity is feasible, it will be necessary from 1993/1994 to consider the interest of a second oil mill.

The Tables III.3.3.3. and III.3.3.4. show the utilization rate of such a plant according to its oil seeds supply. For the purpose, we have taken the following basic figures :

- Average daily input of cotton seeds, sunflower seeds, groundnuts :
  330 MT x 90 % = 300 MT

- Average daily input of soya beans or palm kernels.
  250 MT x 90 % = 225 MT

- Number of working days per year : 320.

The utilization rate will be 99,1 % in 1995 in case 1 and 100 % between 1996/1997 in case 2.

Other alternative : SCENARIO II

Two plants installed in 2 steps at separate location, each of them will be half the capacity of scenario I, i.e 165 MT/D installed capacity based on cotton seeds, sunflower seeds or groundnuts or 125 MT/D installed capacity based on soya beans or palm kernels.

It is well known that capital investment will be much higher for two separate plants but this solution has to be considered and will be examined in our study.

It must be pointed out that this solution is the minimum size available for the solvent plant process.

- Medium scale oil mills

The process in the above paragraphs foresees a pre-pressing of cotton seeds, sunflower seeds, groundnuts which produces a certain amount of crude oil and cakes with an oil content of 15 - 16 %.

These cakes are afterwards submitted to extraction in a solvent plant where the remaining crude oil is extracted and meal is obtained with an oil content of less than 1 %.
In the case of soya beans, the seeds are directly extracted in solvent plant without passing through the presses.

Another process consists of pressing the seeds at a maximum without utilizing a solvent plant. Therefore, the meal obtained is having a 5 - 6 % oil content.

The advantages of this process are to allow the installation of smaller size plants and to spread them in the whole country. The disadvantages are for the same daily input to increase the capital investment, to leave an important quantity of oil in the meals and increase the manufacturing costs.

On the other hand, it is not possible to crush the soya beans which represents a non-neglectable part of oil seeds supply, and this soya beans oil is absolutely necessary for blending with cotton seeds oil to produce the vegetable oil sold on the market.

Therefore, this solution of medium scale oil mills does not seem to be interesting and will not be considered in our study.

CONCLUSION

This feasibility will include the following scenarios of plant installed capacity.

- SCENARIO I : 330 MT/day installed capacity based on cotton seeds, sunflower, groundnuts or 250 MT/day installed capacity based on soya beans, palm kernel.

  This unit could be on stream in 1992 and working at full capacity in 1995.

  Another plant of the same size could be contemplated to be on stream in 1995/1997 and reach full capacity in the year 2000.

  This plant could be installed at KADOMA (see Chapter V) :

- SCENARIO II

  First step : 165 MT/day installed capacity based on cotton seeds, sunflower, groundnuts or 125 MT/day soya beans, palm kernels.

  This plant could be installed at KADOMA.

Second step :

The same oil mill should be installed 2 or 3 yers after in the site of BINDURA .

- SCENARIO III :

660 MT/day installed capacity based on cotton seeds, sunflower seeds, groundnuts or 500 MT/day installed capacity based on soya bean/palm kernel.

This very important unit should be started in 1990/1992 and at full capacity only 10 years after in 2000/2002.

As the break-even point would be reached only after 7/8 years of activity, this scenario will not be examined in detail.

3.3.4. PRODUCTION PROGRAMME

3.3.4.1. Products and quality specifications

The products which will be manufactured and sold are of 2 types :

- Edible oil for human consumption
- Meals for stockfeeds.

A provision can be contemplated for an extension of activity as margarine/shortenings, soaps, stockfeeds manufacturing

a/ Edible oil

2 types of edible oil will be manufactured :

- sunflower oil well known for its dietetic properties
- vegetable oil which is a blend of cotton seed oil and soya bean oil.

Each type of edible oil shall have the following specifications :

. Moisture : Max 0.20 %
. Soaps : Max 0.05 %
. Insoluble in Hexane : Max 0.05 %
. Free fatty acids (calculated as oleic acid) Max 0.10 %
. Peroxyde value : less than 1.0 milli equivalent
. Ultra violet spectrophotometric examination :
E 232 : max 60
E 270 : between 0 and 12.

. Colour lovibond : 5 1/4 inches cell :

vegetable oil : Max 4 Red

sunflower oil : Max 2.5 Red.

b/ Meals

Each meal is designated by its origin and can be sold separately. Nevertheless the soyabean meal is of higher protein value and therefore more expensive.

The specifications will be as follows :

	Cotton seed meal	Sunflower meal	Soyabean meal
	-	-	-
Profat value (Protein + fats)	38.0 % min.	38.0 % min.	44.0 % min.
Moisture	12.0 % max.	12.0 % max.	12.0 % max.
Oil content	0.5 - 1,0 %	0.5 - 1,0 %	0.5 - 1.0 %
Hexane content	0.1 % max.	0.1 % max.	0.1 % max.
Urease			0.50 % max.
Residual antitrypsin			
Chicken and herd			10.0 % max.
Monogastric animals and human beings			5.0 % max.

3.3.4.2. Products and quantities obtained

The production programme is based on the follwing data.

a/ Oil seeds supply to the new oil mill is obtained from the Table III.3.3.2. in Chapter 3.3 (case 2 : BLUE RIBBON has installed a new expeller).

However, we have also considered that the C.M.B. will prefer to crush sunflower seeds instead of palm kernel which oil will be used for soap making. In order to simplify the programme we also consider that the C.M.B. will prefer to crush sunflower seeds instead of groundnuts. Therefore, at full capacity the annual breakdown will be :

Cotton seeds : 56 000 MT/year
Soya beans : 24 000 MT/year
Sunflower seeds : 8 000 MT/year.

b/ It is also considered for reasons of edible oil quality to keep the same composition of the oils blend form the very beginning of the poject.

Therefore, taking acocunt of the qauntity of oil seeds available, we make the assomption that the activity of the new oil mill will be :

- In year 1 : 30 % of capacity
- In year 2 : 60 % of capacity
- In year 3 : 90 % of capacity
- From year 4 : 100 % of capacity.

The quantity of oil seeds inputs are given in schedule 3.3.B from the scenario I.

c/ The yields of edible oils and meals can be obtained with each type fo oil seeds according to the foreseen process in one hand and to the oil content in the seeds in the other hand. These yields are provided in the schedule 3.3.A.

The production programme for Scenario I and is shwon in Shedule 3.3.B.

The outputs of edible oils are separated according to their originating oil seeds. However, sunflower oil will be sold separately, and cotton seed plus soya bean oils will be blended and sold as vegetable oil with a ratio of 70/30.

These outputs of edible oils are detailed in their separate types of packaging in chapter IV : Materials and Inputs.

TABLE N°III.3.1.1. OILSEEDS DRAWINGS BY EXPRESSORS (M.T.)

COMPANY	Cottonseed Edible oil yield : 16,5 %			Soye Edible oil yield : 17,0 %			Groundnut Edible oil yield : 41,0 %			Sunflower Edible oil yield : 31,0 %			TOTAL		
	Drawings	Share %	Edible oil content	Drawings	Share %	Edible oil content	Drawings	Share %	Edible oil content	Drawings	Share %	Edible oil content	Drawings	Share %	Edible oil content
1985/86															
OLIVINE	64 413	39,5	10 628	59 794	74,2	10 165	-	-	-	2 640	21,7	818	126 847	49,5	21 611
LEVERS BROS.	47 448	29,1	7 829	8 900	11,1	1 513	432	100 %	177	2 640	21,7	818	59 420	21,7	10 337
BLUES RIBBON	42 157	25,8	6 956	11 810	14,7	2 008	-	-	-	4 268	35,1	1 323	58 235	35,1	10 287
NAT. FOODS	9 156	5,6	1 511	-	-	-	-	-	-	2 610	21,5	809	11 766	21,5	2 320
	163 174	100,0	26 924	80 504	100,0	13.686	432	100 %	177	12.158	100,0	3 769	256 268	100,0	44 556
1986/1987															
OLIVINE	60 981	43,1	10 062	57 939	74,4	9 850	1 235	18,7	506	4 623	25,5	1 433	124 778	51,1	21 851
LEVER BROS.	50 361	35,6	8 310	8 364	10,7	1 422	4 113	62,1	1 686	4 565	25,2	1 415	67 403	27,6	12 833
BLUE RIBBON	30 227	21,3	4 987	11 514	14,8	1 957	-	-	-	4 390	24,2	1 360	46 071	24,2	8 304
NAT. FOODS	-	-	-	-	-	-	1 270	19,2	521	4 541	25,1	1 408	5 811	25,1	1 929
	141 569	100,0	23 359	77.817	99,9	13 229	6 618	100,0	2 713	18 119	100,0	5 617	244 063	100,0	44 918
1987/1988															
OLIVINE	54 845	40,2	9 049	71 780	74,3	12 203	2 172	27,3	890	4 542	20,3	1 408	133 339	50,6	23 550
LEVER BROS	54 261	39,8	8 953	10 225	10,6	1 738	4 295	54,0	1 761	4 365	19,5	1.353	73 146	27,8	13 805
BLUE RIBBON	27 325	20,0	4 509	4 509	15,1	2 472	-	-	-	8 904	39,8	2 760	50 773	19,3	9 741
NAT. FOODS	-	-	-	-	-	-	1 491	18,7	611	4 554	20,4	1 412	6 045	2,3	2 023
	136.431	100,0	22 511	96 550	100,0	16 413	7 958	100,0	3 263	22 365	100,0	6 933	263 304	100,0	49 120

TABLE N° III.3.2.1. Company : NATIONAL FOODS NORTHERN REGION Days of activity calculation

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Cotton seeds (a) MT	9 156	-	-	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000
2. Days of activity allowed to cotton seeds (b) average daily input : 90 MT	102	-	-	111	111	111	111	111	111	111	111	111	111	111
3. Days of activity (c) available for maize-germs	218	320	320	209	209	209	209	209	209	209	209	209	209	209
4. Corresponding quantity of maize germs MT (d) average daily input : 180 MT	39 240	57 600	57 600	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620
5. Summary														
cotton seeds : MT	9 156	-	-	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000
maize germs : MT	39 420	57 600	57 600	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620	37 620

TABLE N° III.3.2.2. Company : NATIONAL FOODS SOUTHERN REGION Days of activity calculation

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Sunflower/groundnut MT (a)	2 610	5 811	6 045	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000
2. Days of activity allowed to sunflower and groundnut (b) average daily input : 50 MT	53	117	121	120	120	120	120	120	120	120	120	120	120	120
3. Days of activity (c) available for maize germs	267	203	199	200	200	200	200	200	200	200	200	200	200	200
4. Corresponding quantity of maize germs - MT (d) average daily input 140 MT	37 380	28 420	27 860	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000
5. Summary														
Sunflower/groundnut (MT)	2 610	5 899	6 045	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000	6 000
Maize germs (MT)	37 380	28 420	27 860	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000	28 000

TABLE N° III.3.2.3. Company : OLIVINE Line N°1 Days of activity calculation

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Line n° 1 (a)														
1.1. Cotton seeds/Sunflower/Groundnuts														
- Cotton seeds (40 %) (b) MT	64 413	60 981	54 845	78 000	82 000	86 000	90 000	92 800	96 000	98 000	100000	101200	102800	104000
- Sunflower (20 %) (c) MT	2 640	4 623	4 542	3 200	3 800	4 400	5 000	5 600	6 200	6 800	7 400	8 000	8 600	9 200
- Groundnut (30 %) (d) MT	-	1 235	2 172	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000	2 000
available for maize germs	67 053	66 839	61 559	83 200	87 200	92 400	97 000	99 800	104200	106800	109400	111200	113400	115200
1.2. Days of activity allowed to above seeds (e) average daily input : 240 MT	280	279	257	347	364	385	405	416	435	445	456	464	473	480
1.3. Additional days of activity (f) available for above seeds	40	41	63	(27)	(44)	(65)	(85)	(96)	(115)	(125)	(136)	(144)	(153)	(160)
1.4. Corresponding quantity of (g) above seeds (MT)	9 600	9 840	15 120	(6480)	(10560)	(15600)	(20400)	(23040)	(27600)	(30000)	(32640)	(34650)	(36720)	(38400)
1.5. Summary														
- quantity of cotton seeds/sunflower/groundnut which can be crushed at Olivine (MT)	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800	76 800
(h) surplus of above seeds	-	-	-	6 480	10 560	1 560	20 400	23 040	27 600	30 000	32 640	34 560	36 720	38 400
of which cotton seeds (90 %)	-	-	-	5 850	9 500	14 050	18 350	20 740	24 850	27 000	29 400	31 200	33 050	34 550
sunflower/groundnuts (10 %)	-	-	-	630	1 060	1 550	2 050	2 300	2 750	3 000	3 240	3 360	3 670	3 850

TABLE N° III.3.2.4. Company : OLIVINE Line N°2 Days of activity calculation

Year / Seeds	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
2. Line n° 2 (a)														
(b) 2.1. Soyabeans (75 %) MT	59 794	57 939	71 780	75 000	81 000	87 000	93 000	99 000	105000	111000	117000	123000	129000	135000
2.2. Days of activity allowed to above seeds (c) Average daily input : 300 MT	200	194	240	250	270	290	310	330	350	370	390	410	430	450
(d) 2.3. Additional days of activity available for soyabeans	120	126	80	70	50	30	10	(10)	(30)	(50)	(70)	(90)	(110)	(130)
(e) 2.4. Corresponding quantity of soyabeans (MT)	36 000	37 800	24 000	21 000	15 000	9 000	3 000	(3000)	(9000)	(15000)	(21000)	(27000)	(33000)	(39000)
2.5. Summary														
Quantity of soyabeans which can be crushed at Olivine (MT)	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000
surplus of soyabeans (MT)	-	-	-	-	-	-	-	3 000	9 000	15 000	21 000	27 000	33 000	39 000

TABLE N° III.3.2.5. Company : LEVER BROTHERS Days of activity calculation

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. <u>Cotton seeds/Sunflower/Groundnuts</u> (a) (MT)														
(b) Cottonseeds (40 %) MT	47 448	50 361	54 261	78 000	82 000	86 600	90 000	92 800	96 000	98 000	100000	101200	102800	104000
(c) Sunflower (25 %)	2 640	4 565	4 365	4 000	4 750	5 500	6 250	7 000	7 750	8 500	9 250	10 000	10 750	11 500
(d) Groundnut (50 %)	432	4 113	4 295	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000
	50 520	59 039	62 921	86 000	90 750	96 000	100250	103800	107750	110500	113250	115200	116750	123500
2. Days of activity allowed to above seeds	169	197	210	287	303	319	334	346	360	369	378	384	390	412
(c) Average daily input : 300 MT														
3. Soyabeans (10 %) MT (f)	8 900	8 364	10 225	10 000	10 800	11 600	12 400	13 200	14 000	14 800	15 600	16 400	17 200	18 000
4. Days of activity allowed (g) to soyabeans	30	28	34	34	36	39	42	44	47	50	52	55	58	60
Average daily input : 300 MT														
(h) 5. Total days	199	225	244	321	339	358	376	390	407	419	430	439	448	472
(i) 6. Additional days of activity available	121	95	76	(1)	19)	(38)	(56)	(70)	(87)	(99)	(110)	(119)	(128)	(152)
7. Summary														
Total quantity of seeds which can be crushed at LEVER BROTHERS	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000	96 000
(j) Surplus of seeds	-	-		(300)	(5 700	(11400	(16800	(21000	(26700	(33000	(35700	(35400	(38400	(45600
of which cottonseeds - 75 %				225	4 275	8 550	12 600	15 750	19 575	22 275	24 775	26 775	28 800	34 200
sunflower/groundnuts - 10 %				30	570	1 140	1 680	2 100	2 610	2 970	3 300	3 570	3 840	4 560
soyabeans - 15 %				45	965	1 710	2 520	3 150	3 915	4 455	4 900	5 355	5 760	6 840

TABLE N° III.3.2.6. Company : BLUE RIBBON FOODS Days of activity calculation

* After New Solvent Plant start-up and commissioning

Seeds / Year	85/86	86/87	87/88	1990 *	1991 *	1992 *	1993 *	1994 *	1995 *	1996 *	1997 *	1998 *	1999 *	2000 *
1. Cotton seeds/sunflower (a)														
(b) Cotton seeds (20 %) MT	42 157	30 227	27 235	39 000	41 000	43 000	45 000	46 400	48 000	49 000	50 000	50 600	51 400	52 000
(c) Sunflower (35 %) MT	4 268	4 390	8 904	5 600	6 650	7 700	8 750	9 800	10 850	11 900	12 950	14 000	15 050	16 100
	46 425	34 617	36 139	44 600	47 650	50 700	53 750	56 200	58 850	60 900	62 950	64 600	66 450	68 100
2. Days of activity allowed to above seeds	309	231	241	298	318	338	359	375	393	406	4[illegible]0	431	443	454
(d) Average daily input : 150 MT														
(c) 3. Soyabeans (45 %) MT	11 810	11 514	14 544	15 000	16 200	17 400	18 600	19 800	21 000	22 200	23 400	24 600	25 800	27 000
4. Days of activity allowed to soyabeans	59	57	72	60	65	70	75	80	84	89	94	99	104	108
(f) * Average daily input : 250 MT														
(g) 5. Total days	368	288	313	358	383	408	434	455	477	495	514	530	547	562
(h) 6. Additional days of activity available	-	-	-	(38)	(63)	(88)	(114)	(135)	(157)	(175)	(194)	(210)	(227)	(242)
7. Summary														
Total quantity of seeds which can be crushed at Blue Ribbon Average input : 175 MT/D	51 700	51 700	51 700	56 000	56 000	56 000	56 000	56 000	56 000	56 000	56 000	56 000	56 000	56 000
(i) Surplus of seeds	-	-	-	(3600)	(7850)	(12100)	(16350)	(20000)	(23850)	(27100)	(30350)	(33200)	(36250)	(29100)
of which cotton seeds (67 %)				2 400	5 250	8 050	10900	13 350	15 900	18 070	20 250	22 150	24 170	25 810
soyabeans (33 %)				1 200	2 600	4 050	5 450	6 650	7 950	9 030	10 100	11 050	12 080	13 290

TABLE N° III.3.2.7. Company : BLUE RIBBON FOODS Days of activity calculation

** After New Solvent Plant start-up plus additional nex expeller : 150 MT/D

Seeds / Year	85/86	86/87	87/88	1990 **	1991 **	1992 **	1993 **	1994 **	1995 **	1996 **	1997 **	1998 **	1999 **	2000 **
(a) 1. Cotton seeds/sunflower														
(b) Cotton seeds (20 %) MT	42 157	30 227	27 235	39 000	41 000	43 000	45 000	46 400	48 000	49 000	50 000	50 600	51 400	52 000
(c) Sunflower (35 %) MT	4 268	4 390	8 904	5 600	6 650	7 700	8 750	9 800	10 850	11 900	12 950	14 000	15 050	16 100
	46 425	34 617	36 139	44 600	47 650	50 700	53 750	56 200	58 850	60 900	62 950	64 600	66 450	68 100
2. Days of activity allowed to ** above seeds	309	231	241	166	177	188	200	209	218	226	234	240	247	253
(d) Average daily input 270 MT														
(e) 3. Soyabeans (15 %) MT	11 810	11 514	14 544	15 000	16 200	17 400	18 600	19 800	21 000	22 200	23 400	24 600	25 800	27 000
4. Days of activity allowed ** to soyabeans	59	57	72	60	65	70	75	80	84	89	94	99	104	108
(f) Average daily input : 250 MT														
(g) 5. Total days	368	288	313	226	242	258	275	289	302	315	328	339	351	361
(h) 6. Additional days of activity available	-	-	-	94	76	62	45	31	18	5	(8)	(19)	(31)	(41)
7. Summary Total quantity of seeds which can be crushed at Blue Ribbon Average input : 265 MT/D	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400	84 400
(j) Surplus of seeds	-	-	-	24 800	20 550	16 300	12 050	8 400	4 550	1 300	(1950)	(4800)	(7850)	(10700)
of which cotton seeds (67 %)				16 500	13 700	10 900	8 050	6 000	3 050	850	(1300)	(3200)	(5250)	(7150)
soyabeans (33 %)				8 300	6 850	5 400	4 000	2 400	1 500	450	(1600)	(1600)	(2600)	(3550)

SURPLUS OF OILSEEDS NOT CONSUMED BY THE EXISTING EXPRESSOR COMPANIES

Table N° : III.3.3.1.

* Case 1 : After start-up New Solvent Plant only at BLUE RIBBON FOODS

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Surplus of cotton seeds not consumed by the following expressers														
- National Foods North	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Olivine	-	-	-	5 850	9 500	14 050	18 350	20 740	24 850	2 700	29 400	31 200	33 050	34 550
- Lever Brothers	-	-	-	225	4 275	8 550	12 600	15 750	19 575	22 275	24 750	26 775	28 800	34 200
- Blue Ribbon Foods	-	-	-	2 400	5 250	8 050	10 900	13 350	15 900	18 070	20 250	22 150	24 170	25 810
	-	-	-	8 475	19 025	30 650	41 850	49 840	60 325	67 345	74 400	80 125	86 020	94 560
2. Surplus sunflower/groundnut not consumed by the following expressers														
- National Foods South	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Olivine	-	-	-	630	1 060	1 550	2 050	2 300	2 750	3 000	3 240	3 360	3 670	3 850
- Lever Brothers	-	-	-	30	570	1 140	1 680	2 100	2 610	2 970	3 300	3 570	3 840	4 560
- Blue Ribbon Foods	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	660	1 630	2 690	3 730	4 400	5 360	5 970	6 540	6 930	7 510	8 410
3. Surplus soyabeans not consumed by the following expressers														
- Olivine	-	-	-	-	-	-	-	3 000	9 000	1 500	21 000	27 000	33 000	39 000
- Lever Brothers	-	-	-	45	965	1 710	2 520	3 150	3 915	4 455	4 900	5 355	5 760	6 480
- Blue Ribbon Foods	-	-	-	1 200	2 600	4 050	5 450	6 650	7 950	9 030	10 100	11 050	12 080	13 290
	-	-	-	1 245	3 565	5 760	5 760	12 800	20 865	28 485	36 000	43 405	50 840	59 130
4. Others : Palm Kernel									1 000	1 500	2 000	2 500	3 000	4 000
5. Total	-	-	-	10 380	24 220	39 100	53 550	67 040	87 550	103300	118940	132960	147370	158531

SURPLUS OF OILSEEDS NOT CONSUMED BY THE EXISTING EXPRESSOR COMPANIES

Table N° : III.3.3.2.

* Case 2 : After start-up New Solvent Plant plus additional new expeller at BLUE RIBBON FOODS

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Surplus of cotton seeds not consumed by the following expressers														
- National Foods North	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Olivine	-	-	-	5 850	9 500	14 050	18 350	20 740	24 850	27 000	29 400	31 200	33 050	34.550
- Lever Brothers	-	-	-	225	4 275	8 550	12 600	15 750	19 275	22 275	24 750	26 775	28 800	34.200
- Blue Ribbon Foods	-	-	-	(16500)	(13700)	(10900)	(8 050)	(6 000)	(3 050)	850	1 300	3 200	5 250	7 150
	-	-	-	(10425)	75	11 700	22 900	30 440	41 375	50 125	55 460	61 175	67 100	75 900
2. Surplus sunflower/groundnut not consumed by the following expressers														
- National Foods South	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- Olivine	-	-	-	630	1 060	1 550	2 050	2 300	2 750	3 000	3 240	3 360	3 670	3 850
- Lever Brothers	-	-	-	30	570	1 140	1 680	2 100	2 610	2 970	3 300	3 570	3 840	4 560
- Blue Ribbon Foods	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	660	1 630	2 690	3 730	4 400	5 360	5 970	6 540	6 930	7 510	8 410
3. Surplus soyabeans not consumed by the following expressers														
- Olivine	-	-	-	-	-	-	-	3 000	9 000	15 000	21 000	27 000	33 000	39 000
- Lever Brothers	-	-	-	45	965	1 710	2 520	3 150	3 915	4 455	4 900	5 355	5 760	6 840
- Blue Ribbon Foods	-	-	-	(8300)	(6 850)	(5 400)	(4 000)	(2 400)	(1 500)	450	650	1 600	2 600	3 550
	-	-	-	(8255)	(5 885)	(3 690)	(1 480)	(3 750)	11 415	19 905	26 550	33 955	41 360	49 390
4. Others : Palm Kernel									1 000	1 500	2 000	2 500	3 000	4 000
5. Total	-	-	-	(17990)	(4 180)	10 700	25 150	38 590	59 150	77 500	90 550	104560	118970	137700

SCENARIO I - UTILIZATION RATE CALCULATION FOR A NEW OIL MILL INSTALLED CAPACITY - 330 MT/D COTTON SEEDS/SUNFLOWER/GROUNDNUTS/ PALM KERNEL

Table N° III.3.3.3.

Case 1 : After Start-up of New Solvent Plant at BLUE RIBBON FOODS

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Days of activity allowed on cotton seeds, sunflower, groundnuts	-	-	-	31	69	112	152	181	219	245	270	291	312	344
a) Average daily input : 300 MT														
2. Days of activity : allowed on soyabeans/Palm kernel	-	-	-	6	16	26	36	57	98	134	169	205	240	281
b) Average daily input : 225 MT														
3. Total days of activity	-	-	-	37	85	138	188	238	317	375	439	496	552	625
c) 4. Utilization rate %	-	-	-	11.6	26.6	43.1	58.7	74.4	99.1	118.4	137.2	155.0	172.5	195.3

SCENARIO I - UTILIZATION RATE CALCULATION FOR A NEW OIL MILL INSTALLED CAPACITY : 330 MT/D COTTON SEEDS/SUNFLOWER/GROUNDNUT
PALM KERNEL

Table N°III.3.3.4.

** Case 2 : After Start-up of New Solvent Plant plus additional new expeller at BLUE RIBBON FOODS

Seeds / Year	85/86	86/87	87/88	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Days of activity allowed on cotton seeds, sunflower, groundnuts	-	-	-	-	7	48	88	117	156	187	207	227	249	281
a) Average daily input : 300 MT														
2. Days of activity : allowed on soyabeans/Palm kernel	-	-	-	-	-	-	-	17	56	96	127	162	198	238
b) Average daily input : 225 MT														
3. Total days of activity	-	-	-	-	7	48	88	134	212	283	334	389	447	519
c) 4. Utilization rate %	-	-	-	-	2.2	15.0	27.5	41.9	66.2	88.4	104.4	121.5	139.7	162.2

SCHEDULE 3.3.A - PRODUCTION PROGRAMME

YIELDS OBTAINED IN OILSEEDS CRUSHING AN REFINING

OIL SEED TYPE	OIL CONTENT %	CRUDE OIL OBTAINED FROM OIL SEEDS CRUSHING AVERAGE %	CRUDE OIL OBTAINED FROM OCRUDE OIL REFINING AVERAGE %	EDIBLE OIL OBTAINED FROM OIL SEEDS CRUSHING PLUS REFINING AVERAGE %	MEAL OBTAINED FROM OIL SEEDS CRUSHING - BASE 12 HUMIDITY AVERAGE %
- cotton seeds	20-24	19.5	85.0	16.5	48.0
- soya beans	20-22	18.5	92.0	17.0	81.0
- Sunflower seeds	32-38	33.7	92.0	31.0	33.0
- Skilled groundnuts	48-52	44.6	92.0	41.0	48.0

SCHEDULE 3.3.B. PRODUCTION PROGRAMME - SCENARIO I

PRODUCTS	MT at 100 % actual capacity	Year 1		Year 2		Year 3		Year 4 to 10	
		MT	Utilization rate %	MT	Utilization rate %	MT	Utilization rate %	MT	Utilization rate %
1. INPUTS									
Cotton seeds	56 000	16 800		33 600		50 400		56 000	
Soya beans	24 000	7 200		14 400		21 600		24 000	
Sunflower seeds	8 000	2 400		4 800		7 200		8 000	
	88 000	26 400	30,0	52 800	60,0	79 200	90,0	88 000	
2. OUTPUTS									
2.1. Cotton seed oil	9 240	2 772		5 544		8 316		9 240	
Sunflower oil	4 080	1 224		2 448		3 672		4 080	
Groundnut oil	2 640	792		1 584		2 376		2 640	
Soya oil	15 960	4 788		9 576		14 364		15 960	
2.2. Cotton meal	26 860	8 064		16 128		24 192		26 880	
Sunflower meal	19 440	5 832		11 664		17 496		19 440	
Groundnut meal	2 640	792		1 584		2 376		2 640	
Soya meal	48 960	14 688		29 376		44 064		48 960	

3.4 SUMMARY FOR AGRICULTURAL PRODUCTION, MARKET AND PLANT CAPACITY

To compare the various figures of demand, agricultural production, processing capacity, and their trends, it is interesting to use a graphical presentation.

With the graphical presentation, it is possible to see at a glance the respective values of the different parameters, and the corresponding gaps. However, all these parameters must be expressed in the same unit. We choose as the common unit the **tonnages of refined edible oil (E.O)** in metric tons per year.

3.4.1. AGRICULTURAL PRODUCTION

The contents of edible oil in the various seeds are the following :

CS	:	16.5 %
SB	:	17 %
Sunflower	:	31 %
Groundnut	:	41 %

- For maize germs, the content is 8.5 % (10 % crude oil - 85 % refining yield).

- For palm oil, the refining yield is also 85 %.

The agricultural production, expressed in edible oil with the above coefficient, is showed in the following table.

AGRICULTURAL PRODUCTION AND CORRESPONDING EDIBLE OIL

	1986	1990	1995	2000
Production t				
Cotton seeds	150 000	205 000	250 000	270 000
Soya bean	83 000	100 000	140 000	180 000
Sunflower	18 000	20 000	35 000	50 000
Groundnuts	-	8 000	8 000	8 000
Total oil seeds	251 000	333 000	433 000	508 000
Maize germs *	66 000	66 000	66 000	66 000
Crude palm oil **			9 000	44 000
Corresponding refined oil t				
CS oil 16.5 %	24 750	33 825	41 250	44 500
SB oil 17 %	14 110	17 000	23 800	30 600
SF oil 31 %	5 580	6 200	10 850	15 500
GN OIL 41 %	-	3 260	3 280	3 280
TOTAL 1	44 440	60 305	79 180	93 880
Maize oil 8.5 %	5 610	5 610	5 610	5 610
TOTAL 2	50 050	65 915	84 790	99 490
Palm oil	-	-	7 650	37 400
TOTAL 3	50 050	65 915	92 440	136 890

* Difference for NATIONAL FOODS between the total processing capacity and the assumed allocation in cotton seeds and sunflower.

** The production begins in 1993.

3.4.2. EXISTING PROCESSING CAPACITY

In 1990, the agricultural production is estimated at 333 000 tons of oil seeds corresponding to 65 915 tons of edible oils.

The existing processing capacity has been estimated at 340 000 tons per year.

Consequently, expressed in edible oil, this capacity is :

$$65\ 915\ \frac{340}{333} = 67\ 300\ t/y$$

3.4.3. DEMAND

The demand is directly expressed in edible oil. The values are :

Demand t	1986	1986	1986	1986
Medium variant	60 000	70 000	84 000	100 000
High variant	75 000	88 000	105 000	124 000

DIAGRAM

The diagram presents :

- On the X axis, the years from 1986 to 2000
- On the Y axis.

1 Demand medium variant
1 Bis demand high variant
2 Processing capacity
3 Agricultural production (without palm oil)
3 Bis palm oil
3 + 3 bis total agricultural production.

All values are expressed in refined edible oil (metric tons per year).

Nota : The tonnages of edible oil are not presented in round figures. This does not mean that the precision is accurate at the ton, but this allows, if one wishes, to return to the original figures, either in crude oil or in oil seeds.

	1986	1990	1995	2000
1 Demand - medium variant	60 000	70 000	84 000	100 000
1 Bis demand - high variant	75 000	88 000	105 000	124 000
2 Processing capacity	67 300	67 300	67 300 + 15 800 83 100	83 100 + 15 800 98 900
3 Agricultural production without palm oil	50 050	65 915	84 790	99 490
3 Bis Palm oil	0	0	7 650	37 400
3 + 3 bis total	50 505	65 915	92 440	136 890

COMMENTS

A/ DEMAND VERSUS AGRICULTURAL PRODUCTION, WITHOUT PALM OIL

If we compare the curves of the demand (1 and 1 bis) with the curve of the Agricultural Production (3), we can see that :

- The high variant of the demand is constantly and largely above the agricultural production.
- The medium variant of the demand joins the Agricultural Production by the year 1994 and then follows it.

If we assume that the actual demand is between the curves 1 and 1 bis, we can say that the demand is by no way a limiting factor for the production of edible oil.

B/ AGRICULTURAL PRODUCTION WITH PALM OIL

The curve (3 + 3 bis) will cut the curves 1 and 1 bis respectively in 1992 and 1998.

Consequently, according to the actual demand, palm oil (or other oil by substitution) could be exported at a date situated between 1992 and 1998.

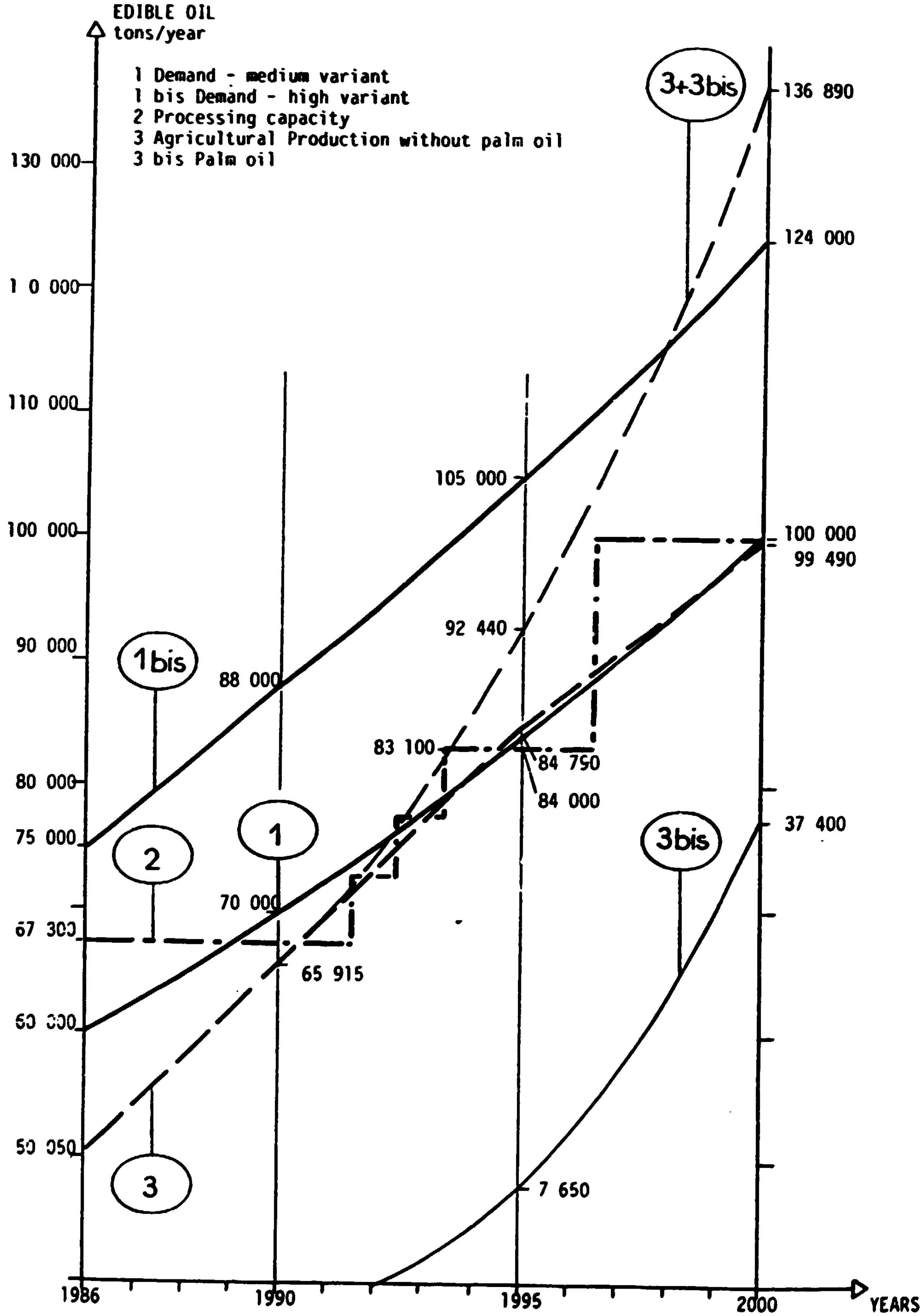
C/ PROCESSING CAPACITY VERSUS AGRICULTURAL PRODUCTION

If we compare the curve of the processing capacity (2) and the curve of the agricultural production (3),

We can see that :

- Up to 1990, the processing capacity (taking into account rehabilitation) is higher than the agricultural production.

ZIMBABWE


EDIBLE OIL
tons/year
1 Demand - medium variant
1 bis Demand - high variant
2 Processing capacity
3 Agricultural Production without palm oil
3 bis Palm oil
130 000
1 0 000
110 000
100 000
90 000
80 000
75 000
67 300
60 000
50 050
3+3bis
136 890
124 000
105 000
100 000
99 490
92 440
88 000
83 100
84 790
84 000
1bis
1
2
3
3bis
70 000
65 915
37 400
7 650
1986
1990
1995
2000
YEARS

- A lack of processing capacity appears in 1990/91.

- An investment in a 330 t/day processing plant (or 15 800 t/Y of edible oil), will allow to follow the increase in agricultural production up to 1995.

- At this date a new processing capacity of approximatively the same volume will be necessary to follow the increase in seeds production up to 2000.

CHAPTER 4

MATERIAL AND INPUTS

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CHAPTER 4

MATERIAL INPUTS

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1. CHARACTERISTICS OF MATERIALS AND INPUTS

1.1 INTRODUCTION

The feasibility study of the edible oil factory is assessed on the increase of oil seeds production. This increase and the availability of the cotton seeds and the other oil seeds has been clearly indicated in the Chapter 3 (Market and Plant Capacity). So, in this Chapter, we shall take in consideration the other inputs and only give a summary for the raw material.

1.2. RAW MATERIAL : OIL SEEDS

a/ Quantity

The plant capacity has been fixed by the excess quantity of oilseeds which cannot be absorbed by the existing companies. This calculation is resulting from the comparison between Agricultural oilseeds production programme and the capacities of the existing expressors. Taking account of necessary rehabilitation, the figures for the different oil seeds (cotton seeds, soyabeans and sunflower are detailed in Table III 3.3.2).

In a steady year, the annual oil seeds supply will be :

- Cotton seeds : 56 000 MT
- Soya beans : 24 000 MT
- Sunflower seeds : 8 000 MT

b/ Quality

The oil seeds to be processed should be :

- mature
- of international commercial quality
- free of damages caused during storage.

In ZIMBABWE, there is no specification for oil seeds. After discussion with the oil expressors, the quality of oils seeds delivered to the existing factories is generally good. Nevertheless, it sometimes occurs some damages during storage in the CMB or GMB depots mainly in the rainy season (the seeds are stored outside under Tarpaulin).

c/ Prices

The prices of the oilseeds are established by the Ministry of Lands, Agriculture and Rural Resettlement with the approbation of the Government.

The exclusive right of purchasing to the producers and sale to consumers is belonging to :

- Cotton Marketing Board for the cotton seeds. The price of the cotton seeds is "on trucks" or "on wagon" ex ginnery.

- Grain Marketing Board for the others oil seeds. The oil seeds are sold to the expellers "at gate of the oil factory".

The hypotheses taken for the study are :

a/ For cotton seeds

The price of the cotton seeds "ex ginnery" is Z$ 195 per MT.

The average price of transport indicated by the existing oil expressors is Z$ 18 per MT (Z$ 8 to Z$ 38 depending of the distance).

But the new factory is supposed to receive the cotton seeds from :

- The ginnery of KADOMA which is neighbouring the oil factory.

- The ginnery of CHEGUTU which is implanted at a distance of 34 km, with a railway connection.

The average price of transport by railway is 5 cents per 1 000 kg and per kilometer for cotton seeds.

So we shall take into account a transport charge of Z$ 2.00 per MT including actual transport cost and miscellaneous costs charged by the National Railways (delivery of wagons, settling up convoy..).

The bags are paid by the expressors but are re-used for the meal. So the charge of the bags will be taken in account in the packaging material paragraph.

The hypothese taken for the study is a price of Z$ 197 per MT at gate of oil factory.

b/ Others oil seeds

The oil seeds depending of the Grain Marketing Board are sold "at gate of the oil factory". So no transport charge is to be taken in account.

The charge of the bags will be taken in account in the packaging material paragraph.

The hypotheses taken for the study are the following prices :

- Z$ 448 for soya beans
- Z$ 456 for sunflower seeds.

1.3. UTILITIES

Inputs for utilities are :

- fuels for steam boiler and thermofluid heater
- electricity for electrical energy and lighting,
- water for process units and drinking water.

1.3.1. FUEL

a/ Fuel for steam boiler

The boiler is a multi purpose and can burn coal or oil seeds husks. The quantity of husks, by product of the preparation of cotton seeds and sunflower seeds, will be in excess to produce the necessary steam for the process. In a steady state year, the total need of steam for the process is 50 000 MT taking in account :

- The efficiency of the boiler and the losses
- A P.C.I. of 4.200 kcal/kg for the husks
- A saturated steam at an effective pressure of 10 bars (663 Kcal/kg)
- A production of husks of 13 600 T per year.

We can calculate that the quantity of husks necessary to produce the steam is 10 880 MT and it appears a theorical excess of 2 720 MT per year. This calculation takes in account the quantity of husks which is introduced for technical reason before pressing the prepared oil seeds.

So, at full capacity of the factory, it will not be necessary to buy external fuel. But for the first year, it will be necessary to foreseen a small quantity of coal for technical tests and start up. Based on our experience, we forecast 350 MT of coal at Z$ 44.87, price indicated by WANKIE COLLIERY for delivery in KADOMA (Transport charge included).

b/ Fuel for thermo fluid heater

The deodorizing plant needs a thermal oil heater to heat the oil up to the distillation temperature. This thermal oil heater is using diesel oil in its burner. The consumption is 30 kg per hour. For a steady state year, the total consumption will be 208.500 liters. The diesel oil will also be used to run the safety diesel electrical generator in case of emergency. This diesel oil is available on the ZIMBABWE Market at the price of Z$ 0.68, taxes included.

1.3.2. ELECTRICITY

Electrical power is supplied by the ZIMBABWE ELECTRICITY SUPPLY AUTHORITY (ZESA) at 15 000 volts or 33 000 volts.

a/ Ratio

The electrical consumption is variable according to the oil seeds processed.

The Kwh charged to each ton of oil seeds is estimated from the total power installed in each unit of production and from estimated ratios(power consumed/power installed). Here, not only the Kwh are charged through the quantity of each oil seeds processed, but also the Kwh of utilities and lighting are distributed.

Results are the following :

Cotton seeds	: 150.48 Kwh per ton of seeds
Other seeds	: 147.30 Kwh per ton of seeds

b/ Quantity

The factory will consume 13 140 460 Kwh per steady state year.

c/ Price

ZESA will charge for industrial consumers (high voltage use) as follows :

Service charge per month	: Z$ 22.00
Monthly maximum power demand	: Z$ 20.26 per Kw
Energy consumption	: Z$ 0.0191 per Kwh peak load
	: Z$ 0,0169 per Kwh other time.

<u>Nota</u> : This tarif was not yet official, during our visit in ZIMBABWE, but shoul be very soon in application and has been recommanded for the study by the ZESA Commercial Manager.

They are basic prices and will be negociable, depending of the voltage of the line and of the consumption.

The peak load is corresponding to the period from 6 AM to 9 PM. The factory is working 24 hours each day, so we use, in our calculation, an average price of Z$ 0.0183 per KWh.

1.3.3. WATER

a/ <u>Quality</u>

The factory needs two kinds of water :

- raw water from a bored well or from a public network. This water is sent without treatment to the factory (cooling devices, fire network, cleaning...).

- treated water taken from the same bored well or public network but physically and chemically treated in order to feed special utilisations in the factory. (boiler feed water, drinking water...).

b/ <u>Ratio</u>

Variable according to the oilseeds processed. The quantity of water charged to each ton of oilseeds processed has been estimated as follows :

- Cotton seeds : 2.7 m^3 per MT of seeds
- Other seeds : 3.7 m^3 per MT of seeds.

including the needs of the process, the cooling devices and utilities.

We will take into consideration a fixed consumption about 10 000 m^3/year for various needs (sanitary, drinking water...).

c/ Quantity

The factory will consume 280.000 m^3 of water per steady state year.

d/ Price

- Raw water
  The price of water from public network is about Z$ 0.25 per m^3.

- Treated water
  It is assumed a fixed cost of Z$ 0.50/m^3 for treatment of water. The cost will correspond essentiallly to the cost of chemicals needed for water treatment.

  When taking into consideration that treated water represents about 20 % of the total consumption of water. The average price of water used for this study will be Z$ 0.35 per m^3.

1.4. CHEMICAL PRODUCTS

1.4.1. CHEMICALS FOR PROCESS UNITS

a/ Quality

For process units the quality of the chemical products is shown in the following Table :

CHEMICALS	QUALITY
- Caustic Soda	Technical grade, in flakes
- Citric acid	Monohydrated Food quality
- Phosphoric acid	85 % concentration Food grade
- Bleaching earth	TONSIL FF or equivalent
- Hexane	Technical grade

b/ Ratio

Chemicals are used in quantities proportional to the production and depending of the type of oil seeds processed.

The consumption ratios are the following :

- Caustic soda
  - . 2,5 % of crude oil quantity for cotton seeds
  - . 0.5 % of crude oil quantity for the other seeds.

- citric acid
  0.1 % of edible oil quantity

- phosphoric acid
  0.2 % of crude oil quantity

- bleaching earth
  . 2.0 % of crude oil quantity for cotton seeds
  . 0.5 % of crude oil quantity for the other seeds.

- hexane
  5 litres per MT of meal.

c/ Quantities

In a steady state year, the consumption will be about :

Caustic soda	:	310 MT
Citric acid	:	16 MT
Phosphoric acid	:	37 MT
Bleaching earth	:	256 MT
Hexane	:	245 m^3.

d/ Prices

All the chemicals are imported. As this was recommended by the Cotton Marketings Board, we have made an estimation of the price according to quotation from producers. We have incorporated transport charges and taxes. The different prices used in the study are the following :

	CIF PRICE Z$/MT	CUSTOM TAXES Z$/MT	TOTAL PRICE Z$/MT
Caustic soda	1 260	441	1 701
Citric acid	3 280	1 148	4 428
Phosphorique acid	1 765	618	2 383
Bleaching earth	1 584	554	2 138

<u>Nota</u> :

The Hexane is imported on requirement by local petroleum companies as BP-SHELL and this product is sold on the local market at Z$ 6.95 per liter, taxes included. The importation needs the use of the customers's quota of forex.

1.4.2. <u>CHEMICALS FOR UTILITIES</u>

a/ <u>Quality</u>

Boiler :

- Phosphate will be used for boiler
- Brine will be used for the treatment of softened water for the make up of the boiler.

Raw water treatment

The use of chemicals depends on the quality of the raw water. It shall be assumed that chemicals needed for raw water treatment are :

- chlore for potabilisation
- brine for softened water system
- anticorrosion and antialgue for cooling tower.

b/ Quantities, prices and ratios

The use of chemicals for utilities have been taken into account in the price of treated water (see § 1.3.3. above).

1.5. PACKAGING MATERIALS

Packaging materials needed by the factory are :

- Drums, tins, glass bottles for the edible oil
- Bags for meal.

1.5.1. PACKAGING MATERIAL FOR EDIBLE OIL

The main packaging materials for edible oil used in ZIMBABWE are :

- 200 litres drums
- 2.5 and 5 litres metal tins
- 375 ml, 500 ml and 750 ml glass bottles.

a/ Quantities

Following our discussions with the commercial managers of the existing edible oil manufacturers and some wholesalers, according to the demand of the consumers, we can split the packaging material as follows :

- Blended oil
  10 % of edible oil in 200 litres drums
  10 % of edible oil in 2.5 and 5 litres tins
  80 % of edible oil in glass bottle.

- Sunflower oil

This oil is not blended and sold only in bottles.

The glass bottles are split as follows :
10 % of oil in 375 ml bottles
20 % of oil in 500 ml bottles
70 % of oil in 750 ml bottles.

In a steady state year the consumption of packing material will be :

Drums (2 00 1)	7 400
Tins (5 1)	148 000
Tins (2.5 1)	296 000
Glass bottles (375 ml)	3 892 149
Glass bottles (500 ml)	5 838 222
Glass bottles (750 ml)	13 622 519

b/ Prices

Based on the informations collected with the existing oil expressors and packaging material manufacturers, and using an average cost of transport, the prices of the packaging materials are as follows, in Z$:

CONTAINERS	GLASS BOTTLES			TINS		DRUMS
Capacity	375 ml	500 ml	750 ml	2.5 l	5 l	200 l
Empty package	0,175	0,21	0,24	1,5	1,85	44,02
Cap	0,04	0,04	0,04			
Label	0,01	0,01	0,01			
Card board box	0,05	0,05	0,05			
Shrink wrap	0,03	0,03	0,03			
Transport	0,03	0,03	0,03	0,15	0,185	4,40
TOTAL	0,335	0,370	0,400	1,65	2,035	48,42

Nota : all the packaging material is of "non returnable" type.

1.5.2. BAGS FOR OIL SEEDS AND MEAL

The oil seeds are charged of Z$ 1.85 per bag when delivered at the oil factory. A part of them will be re-used for the meal, but the sale price of the meal include the price of the bags. Some bags are damaged and cannot be re-used. The surplus may be re-used for the oilseeds by the Cotton Marketing Board or sold by the factory.

In a steady state year, the factory will receive about 1 645 000 bags with oil seeds (1 245 000 with cotton seeds and 400 000 with other seeds), and needs about 612 000 bags for the meal. Taking in account the damaged bags, the factory will be able to sale about 800 000 bags to the oils seeds producers. So the real financial charge represent about 50 % of the cost of initial bags.

It has been taken a charge of Z$ 1 573 000 per steady state year of operation, which is corresponding to the cost of about 850 000 bags.

1.6. LUBRICANTS

Quality and quantity of lubricants will depend on the mechanical equipments installed in the factory, and which will be defined in detail during the final engineering study.

It has been taken a fixed cost of Z$ 15 000 per year of operations.

1.7. LABORATORY

All along the year, the laboratory will need reagents, glassware, instruments,...

It has been taken a fixed cost of Z$ 40 000 per working year.

1.8. SPARE PARTS

Quality and quantity of spare part used for the maintenance of the factory depend on the mechanical equipments installed in the factory and shall be defined in detail during the detailed engineering study with the different equipment furnishers.

For this feasibility study it will be used of an average ratio corresponding to the average cost in edible oil industries. This ratio is about 4 % of installed equipment, and include the major cost center of the expeller unit.

It has been taken an estimated cost of Z$ 600 000 per year of operations.

Nota :

The maintenance of building and civil works are included in the overhead costs (see Chapter 7).

1.9. VEHICLES AND HANDLING EQUIPMENT

For vehicles and handling equipment operated by the factory, annual operating costs per unit have been allowed as follows :

ITEM	ANNUAL UNIT OPERATING COST Z$
Staff and Company cars	5 000
Pick up	5 000
Truck	70 000
Forklift and Frontend loader	25 000
Shunting loco	70 000

In the project engineering Chapter, it is foreseen :

- 3 staff and Company cars
- 2 pick up
- 2 trucks
- 2 forklifts
- 1 shunting loco
- 1 frontend loader.

For a steady state year, the total cost will be Z $ 310 000.

These estimates include all annual operating costs, i.e; fuel and oil, repair and maintenance, tyres, etc...

2. AVAILABILITY AND STORAGE CAPACITIES

2.1. AVAILABILITY AND STORAGE CAPACITIES FOR OILSEEDS

The oil seeds are stored

- by the Cotton Marketing Board for the cotton seeds.
- by the Grain Marketing Board for the other oil seeds (soya, and sunflower).

The seeds are stored in bags, outside and under tarpualins.
So the availability of the oil seeds will be possible all along the year not withstanding the fact that the oil seeds crop is seasonal.

Nevertheless a storage capacity is to be foreseen for two reasons :

- When it is raining, it is not possible to take of Tarpaulins to load trucks or wagons so the factory must have a safety storage to avoid a shortage of seeds.

- An important part of the oil seeds will be transported by railway. The factory must be able to unload the wagons in a short time to avoid surcharges by immobilizing the wagons.

We will foresee one month storage for the soyabeans in one hand and for cotton seeds (and other seeds) on the other hand.

2.2. INTERMEDIATE PRODUCTS STORAGE

For safety reason, each section of the factory will have a daily storage to avoid a stop of all the factory in case of a breakdown on some equipment.

Some intermediate storage are also foreseen to assure the connection between the extraction unit working in a continuous way and units working with a batch process, five days by week or 16 hours per day.

2.3. BY PRODUCTS STORAGE (oil seeds meals and husks)

- The main by product of an oil factory is the oil seeds meal which will be sold to local stock feed manufacturers and exported. The dispatching will be done mainly by railway.

  A storage capacity of one month is foreseen.

  The husks are to be used as fuel for the boiler and the excess, if any, will be sold to local stock feed manufacturer. A storage area is located near the boiler room.

- The linter, the other by product of the factory, is supposed to be sold on the local market. A storage capacity of one month is foreseen.

2.4. AVAILABILITY AND STORAGE CAPACITY FOR DIESEL OIL

Diesel oil is available on the local market. The storage is foreseen to receive a full tank delivery.

2.5. SOURCES AND STORAGE CAPACITY FOR CHEMICAL PRODUCTS

All chemical products will be imported. It is assumed that a storage capacity of three months consumption at full capacity is sufficient.

Only the storage of hexane present a specificity : two tanks are necessary : one for the actual storage and one to collect the working hexane in case of breakdown of the hexane unit.

2.6. SOURCES AND STORAGE CAPACITY FOR PACKAGING MATERIALS

Drums and tins are locally made by companies as VAN LEER and METAL BOX. But there is sometimes forex availability problems to import the raw material. For the study, we assume that exportation of meal will procure enough forex to allow importation of the raw material needed.

Glass bottles are locally made by ZIM GLASS, an IDC Company in GWERU. The capacity of the factory is actually limited, but there is a project of a second melter which should increase the production and insure more versatility. So we assume that ZIM GLASS will be able to furnish all the needed bottles.

We have not foreseen plastic bottles, too much depending of the importation of raw material and equipments and are of very little use in ZIMBABWE.

The bags are furnished by the oil seeds producers and represent only a financial cost. A storage capacity of one month is sufficient and will be taken at the factory for packaging material.

3. SUPPLY PROGRAMME AND COST ESTIMATES

3.1. SUPPLY PROGRAMME

As shown in Table 4.2, materials and inputs will be delivered at factory either all along the year or each 1 month, 3 months or 6 months depending for each supply, on :

- the sources (foreign or local)
- the availability
- the storage capacity.

The supply programme will be adapted to the production programme of the factory and is detailed in Table 4.1. No major problem is foreseen, except forex availability for the foreign materials.

3.2. COST ESTIMATES

Cost estimates for materials and inputs has been split into :

- Raw material
- Utilities
- Chemical products
- Packaging material
- Other material inputs.

They have been detailed in schedules 4.1 for a steady state year.

Schedule 4.2 summarizes for steady state year and for each year from start up to full capacity of the factory.

ESTIMATE OF PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.1.1.
(Carry over total of project component to summary sheet (schedule 4.2)).

Steady state year

ESTIMATE OF PRODUCTION COST								
MATERIALS AND INPUTS								
PROJECT COMPONENT N° 1		DESCRIPTION : RAW MATERIAL						
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST Z $	COST Z$ '000		
						FOREIGN	LOCAL	TOTAL
56 000	T	Cotton seeds	X		197		11 032	11 032
24 000	T	Soyabeans	X		448		10 752	10 752
8 000	T	Sunflower	X		456		3 648	3 648
							25 432	25 432

ESTIMATE OF PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.1.2
(Carry over total of project component to summary sheet (schedule 4.2)).

Steady State Year

ESTIMATE OF PRODUCTION COST								
MATERIALS AND INPUTS								
PROJECT COMPONENT		N° 2	DESCRIPTION : UTILITIES					
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST Z $	COST Z$ '000		
						FOREIGN	LOCAL	TOTAL
208 500	l	Diesel oil	X		0.680		142	142
	T	Coal	X		44.87			-
280 000	m^3	Water	X		0.35		98	98
13 140 480	KWH	Electricity variable fixe	X		0.0183		241 487	241 487
							968	968

ESTIMATE OF PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.1.3.
(Carry over total of project component to summary sheet (schedule 4.2)).

Steady State Year

ESTIMATE OF PRODUCTION COST								
MATERIALS AND INPUTS								
PROJECT COMPONENT N° 3		DESCRIPTION : CHEMICAL PRODUCTS						
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST Z $	COST Z$ '000		
						FOREIGN	LOCAL	TOTAL
310	T	Caustic Soda		X	1 701	391	137	528
16	T	Citric Acid		X	4 428	53	18	71
37	T	Phosphoric acid		X	2 383	65	23	88
256	T	Bleaching earth		X	2 138	406	141	547
245 m^3	M^3	Hexane		X	950	233		233
						1 148	319	1 467

ESTIMATE OF PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.1.4.
(Carry over total of project component to summary sheet (schedule 4.2)).

Steady State Year

ESTIMATE OF PRODUCTION COST								
MATERIALS AND INPUTS								
PROJECT COMPONENT N° 4		DESCRIPTION : PACKAGING MATERIALS						
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST Z $	COST Z$ '000		
						FOREIGN	LOCAL	TOTAL
7 400		Drums	X		48.42		358	358
148 000		Tins (5 l)	X		4.035		301	301
296 000		Tins (2.5 l)	X		1.65		489	489
3 892 149		Bottles 375 ml	X		0.335		1 304	1 304
5 838 222		Bottles 500 ml	X		0.370		2 160	2 160
13 622 519		Bottles 750 ml	X		0.400		5 449	5 449
850 000		Bags	X		1.85		1 573	1 573
							11 634	11 634

ESTIMATE OF PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.1.5.
(Carry over total of project component to summary sheet (schedule 4.2)).

Steady State Year

ESTIMATE OF PRODUCTION COST								
MATERIALS AND INPUTS								
PROJECT COMPONENT N° 5		DESCRIPTION : OTHER MATERIAL INPUTS						
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST	COST Z$ '000		
						FOREIGN	LOCAL	TOTAL
		Lubricants	X			15		15
		Laboratory		X		40		40
		Spare parts		X		600		600
		Vehicules and handling equipment		X		200	110	310
						855	110	9650

SUMMARY SHEET - PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.2.1.
(Insert total in schedule 10-11)

First Year

SUMMARY SHEET - PRODUCTION COST				
MATERIALS AND INPUTS				
PROJECT COMPONENT		PRODUCTION COST CARRIED OVER Z$ 000		
NUMBER	DESCRIPTION	FOREIGN	LOCAL	TOTAL
1	Raw Material		7 630	7 630
2	Utilities		646	646
3	Chemical Products	344	96	440
4	Packaging Material		3 490	3 490
5	Other material inputs	427	55	483
	TOTAL	771	11 918	12 689

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SUMMARY SHEET - PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.2.2.
(Insert total in schedule 10-11)

Second Year

SUMMARY SHEET - PRODUCTION COST				
MATERIALS AND INPUTS				
PROJECT COMPONENT		PRODUCTION COST CARRIED OVER Z$ 000		
NUMBER	DESCRIPTION	FOREIGN	LOCAL	TOTAL
1	Raw Material		15 260	15 260
2	Utilities		774	774
3	Chemical Products	689	191	880
4	Packaging Material		6 980	6 980
5	Other material inputs	513	66	579
	TOTAL	1 202	23 271	24 473

SUMMARY SHEET - PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.2.3.
(Insert total in schedule 10-11)

Third Year

SUMMARY SHEET - PRODUCTION COST				
MATERIALS AND INPUTS				
PROJECT COMPONENT		PRODUCTION COST CARRIED OVER Z$'000		
NUMBER	DESCRIPTION	FOREIGN	LOCAL	TOTAL
1	Raw Material		22 889	22 889
2	Utilities		917	917
3	Chemical Products	1 033	287	1 320
4	Packaging Material		10 471	10 471
5	Other material inputs	855	110	965
	TOTAL	1 888	34 674	36 562

SUMMARY SHEET - PRODUCTION COST : MATERIALS AND INPUTS

SCHEDULE 4.2.4
(Insert total in schedule 10-11)

Steady State Year

SUMMARY SHEET - PRODUCTION COST				
MATERIALS AND INPUTS				
PROJECT COMPONENT		PRODUCTION COST CARRIED OVER Z$'000		
NUMBER	DESCRIPTION	FOREIGN	LOCAL	TOTAL
1	Raw Material		25 432	25 432
2	Utilities		968	968
3	Chemical Products	1 148	319	1 467
4	Packaging Material		11 634	11 634
5	Other material inputs	855	110	965
	TOTAL	2 003	38 463	40 466

TABLE 4.1.1.

CONSUMPTION OF INPUTS

ITEM	1ST YEAR	2ND YEAR	3RD YEAR	4th YEAR AND FOLLOWING
1/ RAW MATERIALS				
Cotton seeds T	16 800	33 600	50 400	56 000
Soya beans T	7 200	14 400	21 600	24 000
Sunflower T	2 400	4 800	7 200	8 000
TOTAL	26 400	52 800	79 200	88 000
2/ UTILITIES				
Diesel oil l	62 550	125 100	187 650	208 500
Coal T	350			
Water m^3	84 000	168 000	252 000	280 000
Electricity variable KWh	3 942 144	7 884 288	11 826 432	13 140 480
Electricity fixe Z$	487 000	487 000	487 000	487 000

CONSUMPTION OF INPUTS

TABLE 4.1.2.

ITEM		1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR AND FOLLOWING
3/ CHEMICAL PRODUCTS					
Caustic Soda	T	93	186	279	310
Citric Acid	T	4.8	9.6	14.4	16
Phosphoric Acid	T	11.1	22.2	33.3	37
Bleaching Earth	T	76.8	153.6	230.4	256
Hexane	m^3	73.5	147.0	220.5	245
4/ PACKAGING MATERIALS					
Drums	200 l	2 220	4 440	6 660	7 400
Tins Tins	5 l 2,5 l	44 400 88 800	88 800 177 600	133 200 266 400	148 000 296 000
Bottles	375 ml	1 167 645	2 335 289	3 502 934	3 892 149
Bottles	500 ml	1 751 467	3 502 933	5 254 400	5 838 222
Bottles	750 ml	4 086 756	8 173 511	12 260 267	13 622 519
Bags		255 000	510 000	765 000	850 000

CONSUMPTION OF INPUTS

TABLE 4.1.3

ITEM		1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR AND FOLLOWING
5/ OTHER MATERIALS INPUTS					
Lubricants	Z$	7 500	9 000	15 000	15 000
Laboratory	Z$	20 000	24 000	40 000	40 000
Spare parts	Z$	300 000	360 000	600 000	600 000
Vehicles and handling equipment	Z$	155 000	186 000	310 000	310 000

Nota : For the consumption of item 5 (other material inputs), a special ratio has been taken, because the consumption is not proportional to the rate of utilisation of the factory :

YEAR	1ST YEAR	2ND YEAR	3RD YEAR	4TH YEAR AND FOLLOWING
Utilization rate in % of seeds quantity	30 %	60 %	90 %	100 %
Consumption ratio of other material inputs	50 %	60 %	100 %	100 %

TABLE 4.2 SUPPLY PROGRAMME - SUPPLY

DELIVERIES AT FACTORY

	SOURCES		STORAGE CAPACITY AT FACTORY	DELIVERY AT FACTORY
	Local	Foreign		
OIL SEEDS	X		1 month	All along the year depending of production programme
UTILITIES				
. Diesel oil	X		1 month	All along the year
. Electricity	X		available	All along the year
. Water	X		available	All along the year
CHEMICALS		X	3 months	Each 3 months
PACKAGING MATERIALS				
. Drums	X		1 month	All along the year
. Tins	X		1 month	All along the year
. Glass bottles	X		1 month	All along the year
SPARE PARTS		X	6 months	Each 6 months
LUBRICANT	X		available	All along the year
LABORATORY		X	6 months	Every 6 months
VEHICLES HANDLING	X		available	All along the year

CHAPTER 5

LOCATION AND SITE

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2.2.1. BINDURA

2.2.2. KADOMA

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2.4. COST ESTIMATES

CHAPTER V

LOCATION AND SITE

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included in the text

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5. LOCATION AND SITE

1. LOCATION

1.1. DATA AND REQUIREMENT

This feasibility study has determined a plant capacity of 330 MT/D of Cotton seeds and 250 MT/D of Soya beans.

1.1.1. DATA

The main technical figures are :

- Inputs of raw material :

  Cotton seeds : 56.000 MT per year
  Soya beans : 24.000 MT per year
  Sunflower : 8.000 MT per year

- Production of edible oil :
  15 800 MT per year

  packaged as follows :

  23 352 890 glass bottles of 375 ml, 500 ml and 750 ml
  444 000 Tins of 2.5 and 5 litres
  7 400 Drums of 200 litres

- Production of oil seed meal :

  26 880 T of cotton seeds meal
  19.440 T of soya beans meal
  2 640 T of sunflower meal.

- Utilities consumption :

Electrical power	:	2 000 kw/h
Water	:	34 m^3/h
Steam	:	7 MT/h

Electricity and water are to be available by public network. The steam will be produced by burning the husks of the cotton seeds. Some coal will be necessary at the start up of the factory and in exceptionnal case of gap of husks.

- Manpower requirement :

  363 persons including workers (supervisory, skilled, semi-skilled and unskilled) and staff : (managerial, technical, administrative and financial).

- Waste disposal.

  An edible oil factory is not producing significant waste material or emissions.

  The only emission is the smoke of the boiler which should be safe if the combustion is well supervised.

  The refining plant may involve some water lightly polluted with oil. But this water is collected and recycled, and the oil is recovered.

1.1.2. REQUIREMENTS

The location of this vegetable oil factory must take in consideration a certain number of requirements which are the following :

- The raw material (mainly Cottonseeds and Soyabeans) must be available at a short distance of the factory. This factory will have an imput of 56 000 MT of Cotton seeds and 24.000 T of Soya beans.

- The main seeds are coming from the ginneries, so it will be necessary to select sites in areas close to the Cotton Marketing Board ginneries.

- The new factory will have to be fed with raw material and inputs and will have to dispatch his production. So the sites need to be well connected with railway and road network.

- The new factory will need manpower, energy (electrical power) and water. The site needs to be in an area where all these basic requirements are available in quantity and in quality.

- The factory should be also in the proximity of centres of consumption to reduce costs of transportation for the edible oil but also for the meal.

- In ZIMBABWE there is a considerable pressure for the decentralization of industries to limit industrial concentration around the two main towns (HARARE and BULAWAYO) and to create growth points in Province.

1.2 CHOICE OF LOCATION

Excepting the areas of TRIANGLE and PLUMTREE in the South, the main area for cotton production is the half North of the country, in MANICALAND, MIDLANDS AND MASHONALAND (See Table 5.1.). The area of soya production is in the North of HARARE.

To take in consideration the decentralization politic, HARARE and its suburbs are excluded. When looking the map showing the repartition of the ginneries, one can see two regions where ginneries are relatively closed : the area of GLENDALE - BINDURA - SHAMVA with BANKET on the West, and the area of CHEGUTU-KADOMA-SANYATI (see Table 5.2).

After a discussion with the Cotton Marketing Board Management, the two Regions were agreed and specially the areas of KADOMA and BINDURA. These two towns are located in intensive cotton production areas. They are not very far from centres of consumption for edible oil and oil seeds meal. They are well connected with railway and road networks. (see Table 5.3, 5.4 and 5.5).

2. SITE

2.1. FUNDAMENTAL DATA AND REQUIREMENTS

An edible oil factory of 330 MT/D of cotton seeds and 250MT/D of soya beans needs a land of about 10 hectares. This surface is necessary for the plant itself, for the storage or raw material, intermediate materials (crude oil) and refined oil before blending and packaging, packaging material.

If the actual study is considering only the oil factory, it is necessary to provide the future extensions such as soap and margarine production, or feedstock production with the oil seed meal. If possible, the possibility of dublings the capacity of the factory will be foreseen. This will increase the land up to about 30 hectares.

The land must be as near as possible of road and railway networks for the inflow of the inputs and the marketing of products. It must be easy to connect to a high voltage electrical line (33 000 volts) and water must be available in quantity and quality (34 m^3/h) from public network and/or from surface or sub-surface sources. The availability of skilled and semi-skilled workers is necessary.

General living conditions are important specially in social welfare and recreational facilities.

2.2. ALTERNATIVES

During our visit in ZIMBABWE, in May 1986, we have visited BINDURA and KADOMA.

2.2.1. BINDURA

BINDURA is a Rural Council of less than 30.000 inhabitants at 87 kilometers in the North of HARARE and has a **Growth Point** status. Three possibilities of implantation have been seen : the areas of LONG ACRES, STATE LAND and a piece of land near the CMB ginery in the TOWNSHIP RESERVE (see Table 5.6). Only the third could be convenient, but there is some options on it. The two others are too small, hilly or uneven ; the site preparation would be very expensive.

Data concerning BINDURA :

a/ Climate

temperature : minimum 11°C
maximum 36 °C

Precipitations : average rainfall of 860 mm/year from October to February/March.

b/ Site description (Township reserve - Table 5.7)

Flat terrain on vegetable soil
The soil characteristics are assumed to be good and similar to the one of the adjoining ginnery recently implanted. The foundations will be of swallow type :

c/ Transport facilities

- There is a railway spur into the ginery which should have only to be prolongated on about 400 meters.
- The road along the site is formed but not surfaced. The major roads are tarred.

d/ Water supply

The water is available from the public network in quantity and quality, and boreholes are possible to use sub-surface water if necessary. A recent analytical bulletin shows the following characteristics.

	Raw Water	Treated water
PH	7.5	8.1
Total hardness mg/l $CaCO_3$	76	68
Total alcalinity mg/l $CaCO_3$	76	72
Color Hazen units	55	5
Iron mg/l Fe	0.70	Nil
Manganese mg/l Mn	trace	Nil
Aluminium mg/l Al	trace	Nil

No figure was available on the temperature. It looks to be between 15 and 20 °C at the purification works, when we visit it.

e/ Power supply

- Electricity

Normal power supply from ZESA (Zimbabwe Electricity Supply Authority).

Voltage 33 000 volts and 15 000 Volts.

Frequency 50 Hz.

The power supply of 2 000 KW necessary for the factory is available. The network is near to the land.

- Coal

Coal is locally available from a merchant's storage or may come directly by rail from HWANGE (WANKIE COLLIERY).

f/ Communication systems

Available from the national grid.

g/ Waste disposal

Waste water network near the CMB ginnery.

h/ Manpower

Unskilled workers are available
Semiskilled and skilled workers could be found from the two technical schools of the Province.

i/ Living conditions

There is a lack of housing in BINDURA. Housing for the board of the factory will have to be foreseen.

The general living conditions (recreation, schools, medical welfare, shopping facilities) are existing but are limited.

2.2.2. KADOMA

KADOMA is a municipality of about 80 000 inhabitants situated along the main rail and road routes between HARARE (141 km) and BULAWAYO (298 km). It stands at an altitude of 1163 meters above sea level. In addition to mining, KADOMA is a center of the Cotton Industry (ginnery, spinning mills, weaving mills, textile manufacturing works) and an industrial area is etablished with the Dairy Marketing Board, the Cold Storage Commission's abattoir, a brewery, a glass factory...

In the industrial area, many lands are available for new industries, specially near the future new ginnery of CMB (see Table 5.8).

Data concerning KADOMA :

a/ Climate

Three main seasons :

- Cool and dry from April to July
- Hot and dry from August to September
- Warm and wet from October to March.

Temperature minimum : 8.4° C in July to
17.8° C in December

maximum : 23.8° C in June to
32.3° C in October

Precipitations : average rainfall of 775 mm/year from October to March.

b/ Site description

Flat terrain on vegetable soil.
The soil characteristics are assumed to be good and similar to the one of the adjoining new ginnery. The foundations will be of swallow type.

c/ Transport facilities

There is a railway spur along the new ginnery.
The road along the site is tarred.

d/ Water supply

The water is available from the public network in quantity and quality and boreholes are possible (7. - 9.000 m) to use sub-surface water if necessary. The public network is supplied from the CLAW DAM via the Pasi Purification Works.

Characteristics of the water :

pH : 7.2

Hardness : under 178 mg/l $CaCO_3$

Temperature : 15 to 25 degrees (depending on season).

e/ Power supply

Electricity

Normal power supply from ZESA (Zimbabwe Electricity Supply Authority)

Voltage : 33 000 Volts and 15 000 Volts

Frequency : 50 Hz

The necessary power of 2 000 KW is available.

Coal :

Coal is locally available from a merchant's storage or may come directly by rail from HWANGE (WANKIE COLLIERY).

f/ Communication systems

Available from the national grid.

g/ Waste disposal

Two sewage disposal works situated at VISSER ROAD and RIMUKA. Both are activated sludge plants. A waste water network is efficient in the industrial area.

h/ Manpower

Unskilled workers are available.

Semi-skilled and skilled workers are available on the site and from the technical school of KWEKWE.

i/ Living conditions

Housing for the staff will have to be foreseen. The general living conditions (recreation, schools, medical welfare, shopping facilities...) are good.

2.3. SITE SELECTION

Following our visit of the two sites, the information we have got in the two Towns and the appreciation of the Cotton Marketing Board, we can consider that the two sites are possible but KADOMA should be more convenient.

KADOMA is a well located town regarding to :

- The main cotton growing areas which are MANICALAND, MIDLANDS and MASHONALAND.

- the proximity of the CMB ginneries. A new ginnery of 50 000 MT of cotton will be built in KADOMA to replace an old one and will start up in 1990.

  This new ginnery will produce 32 500 MT of cottonseeds. The CHEGUTU ginnery can produce 35 000 of cottonseeds and will be able to complete the supply of cotton seeds. The transport will be done by railway at the cost of Z$ 1.70 by MT in this case.

  The other seeds are supplied by the Grain Marketing Board "at gate" of the vegetable oil factory.

- A traditional cattle ranching area (beef cattle and dairy cattle) in the district of KADOMA, and a feed lot of the Cold Storage Commission carrying the final finishing for a number of the ranches.
  KADOMA is a major centre of the dairy industry and a cheese factory has been developped by the Dairy Marketing Board.

- The Zinglass factory of GWERU (135 Km of KADOMA) for the inflow of the main packaging material by a direct railway line.

- The railway and road network, on the main axle from HARARE to BULAWAYO, for the inflow of inputs and marketing of production.

- The living conditions which are better than in BINDURA.

- The presence of an industrial area well developped which can offer many facilities.

  The site of KADOMA has been agreed by the Cotton Marketing Board Management and a piece of flat land of 32,3 hectares is available just aside the new ginnery (See Table 5.9).

For the feasibility study of a 330 MT/D vegetable oil factory, we can consider that KADOMA is the optimum site. The site of BINDURA could be envisaged for the second factory (a new 330 MT/D factory will be necessary in years 1997/1998 to be on stream in year 2000), or if the alternative of two small factories of 165 MT/day was considered.

2.4. COST ESTIMATE

The estimate of investment cost is a schedule 5.1

The estimate of production cost is in schedule 5.2.

These costs are concerning the site of KADOMA but should not be very different for BINDURA.

ESTIMATE OF INVESTMENT COST : LAND

SCHEDULE 5.1.
(Insert total in schedule 10-1/1)

ESTIMATE OF INVESTMENT COST								
LAND								
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST	FOREIGN	LOCAL	TOTAL
32,3	ha	Land	X		1 500		50 000	50 000
		Land formation and drainage	X				700 000	700 000
		Roads	X				900 000	900 000
		Railways	X				450 000	450 000
		Others	X				100 000	100 000
					TOTAL		2 200 000	2 200 000

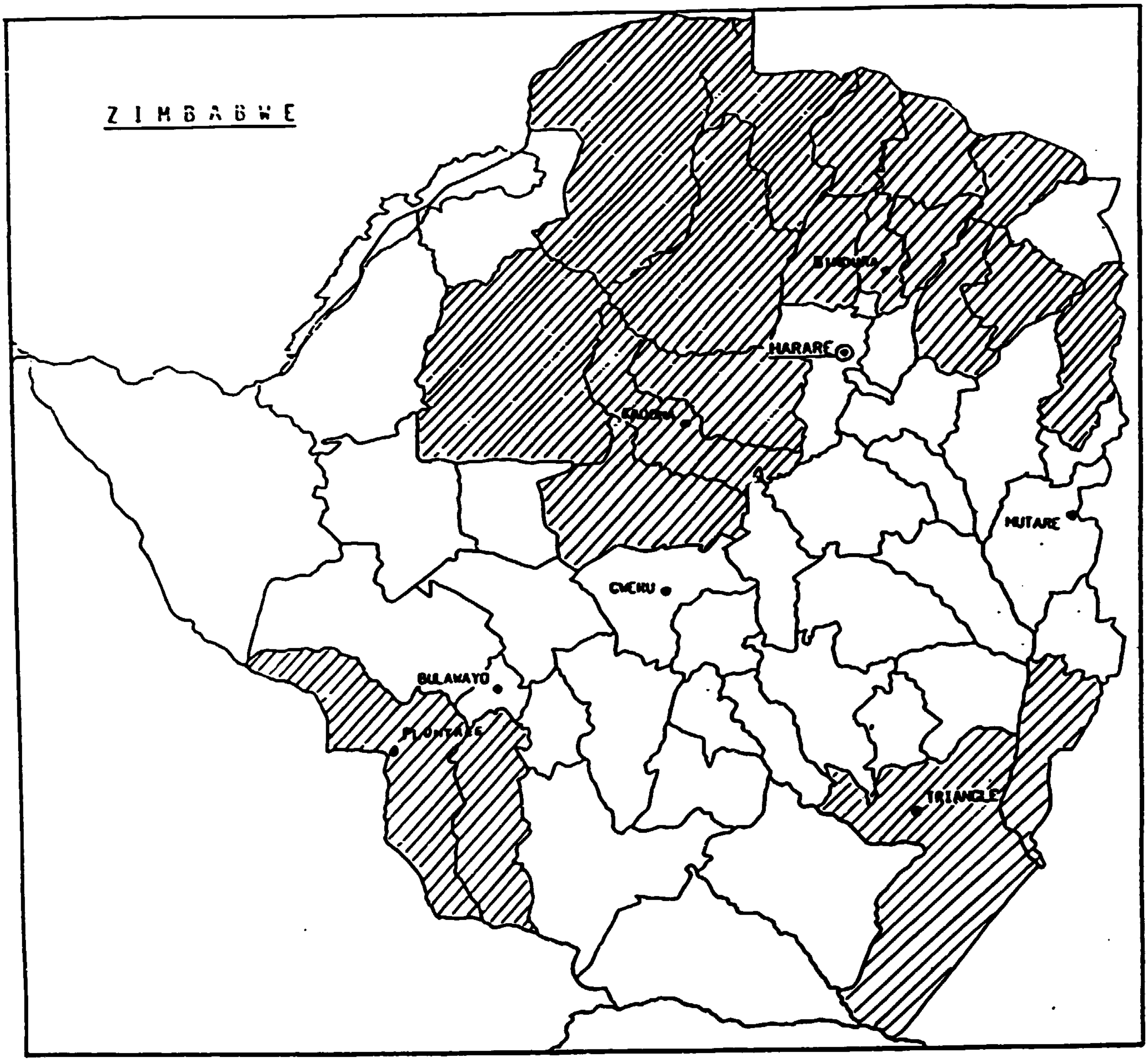
ESTIMATE OF PRODUC''ON COST : LAND

SCHEDULE 5.2
(Insert total in schedule 7)

ESTIMATE OF PRODUCTION COST								
LAND								
QUANTITY	UNIT	ITEM DESCRIPTION	LOCAL	FOREIGN	UNIT COST	COST Z$		
						FOREIGN	LOCAL	TOTAL
		Annual payments for :						
		Rights of way						
		Easements						
		Rents						
		Assessment for land	X				6 541	6 541
		TOTAL					6 541	6 541

TABLE 5.1

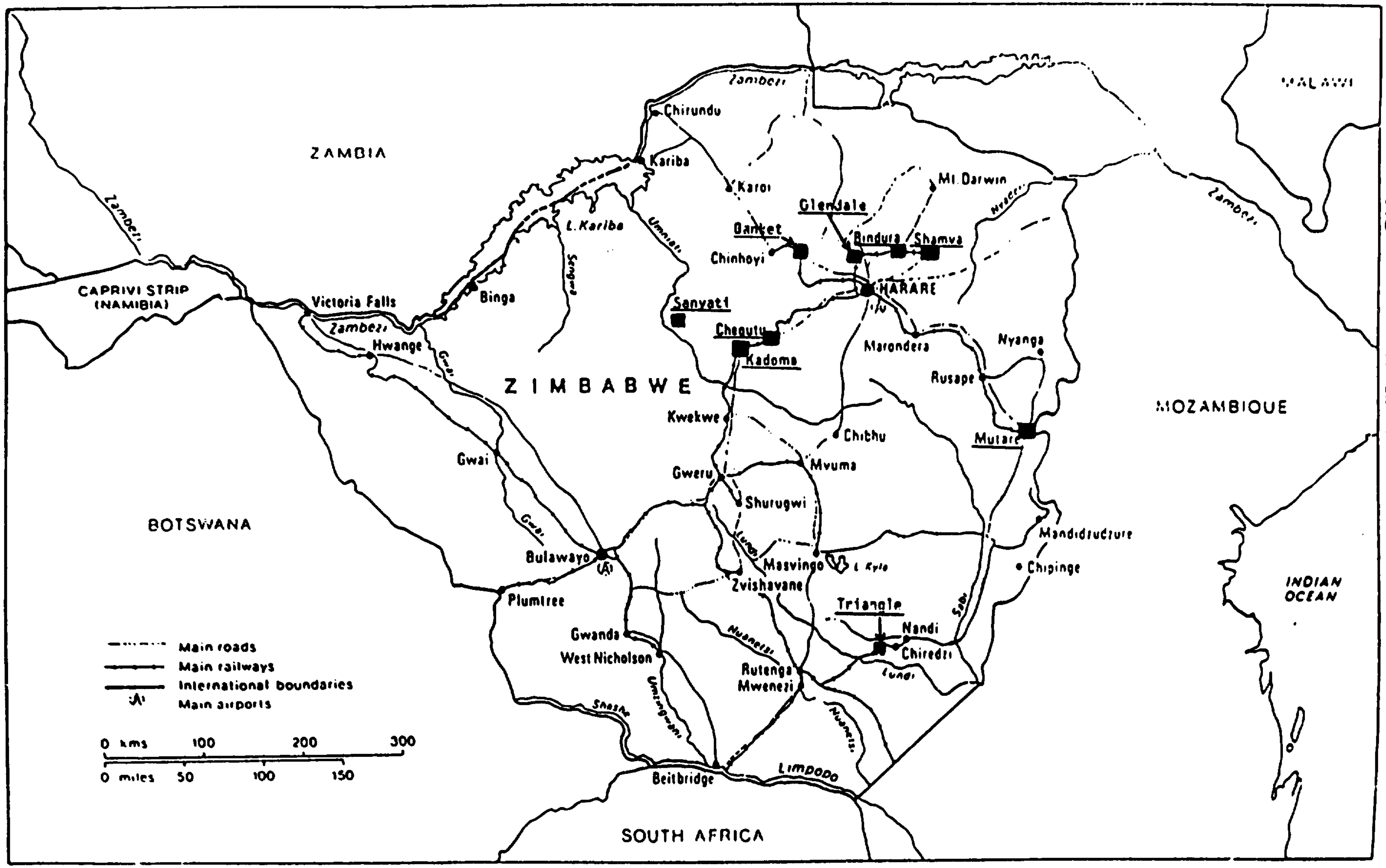
MAJOR COTTON PRODUCING AREAS



Cotton production over 1.000 t

Table 5.2

COTTON MARKETING BOARD GINNERIES



MAIN ROADS

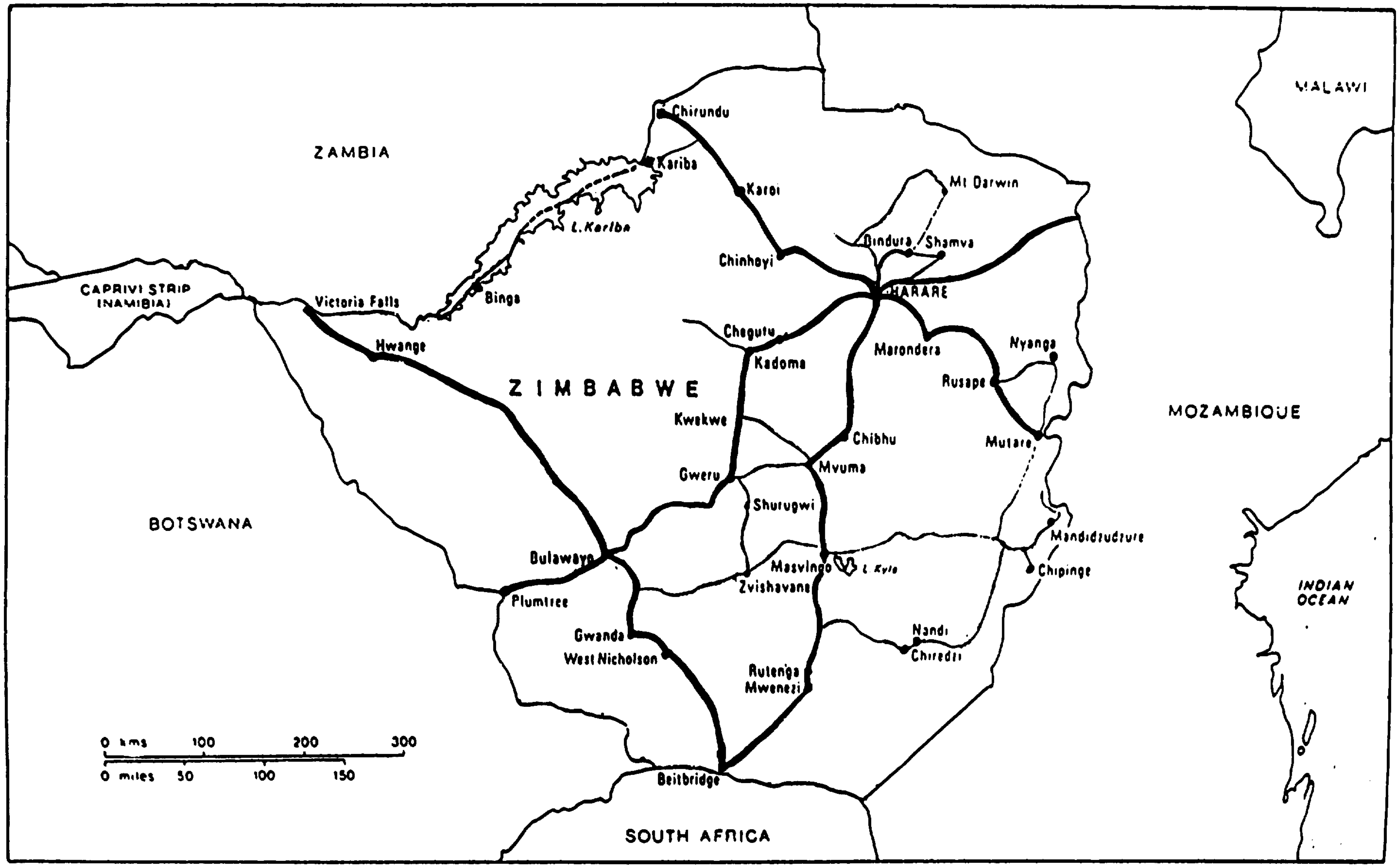


TABLE 5.3

MAIN RAILWAYS

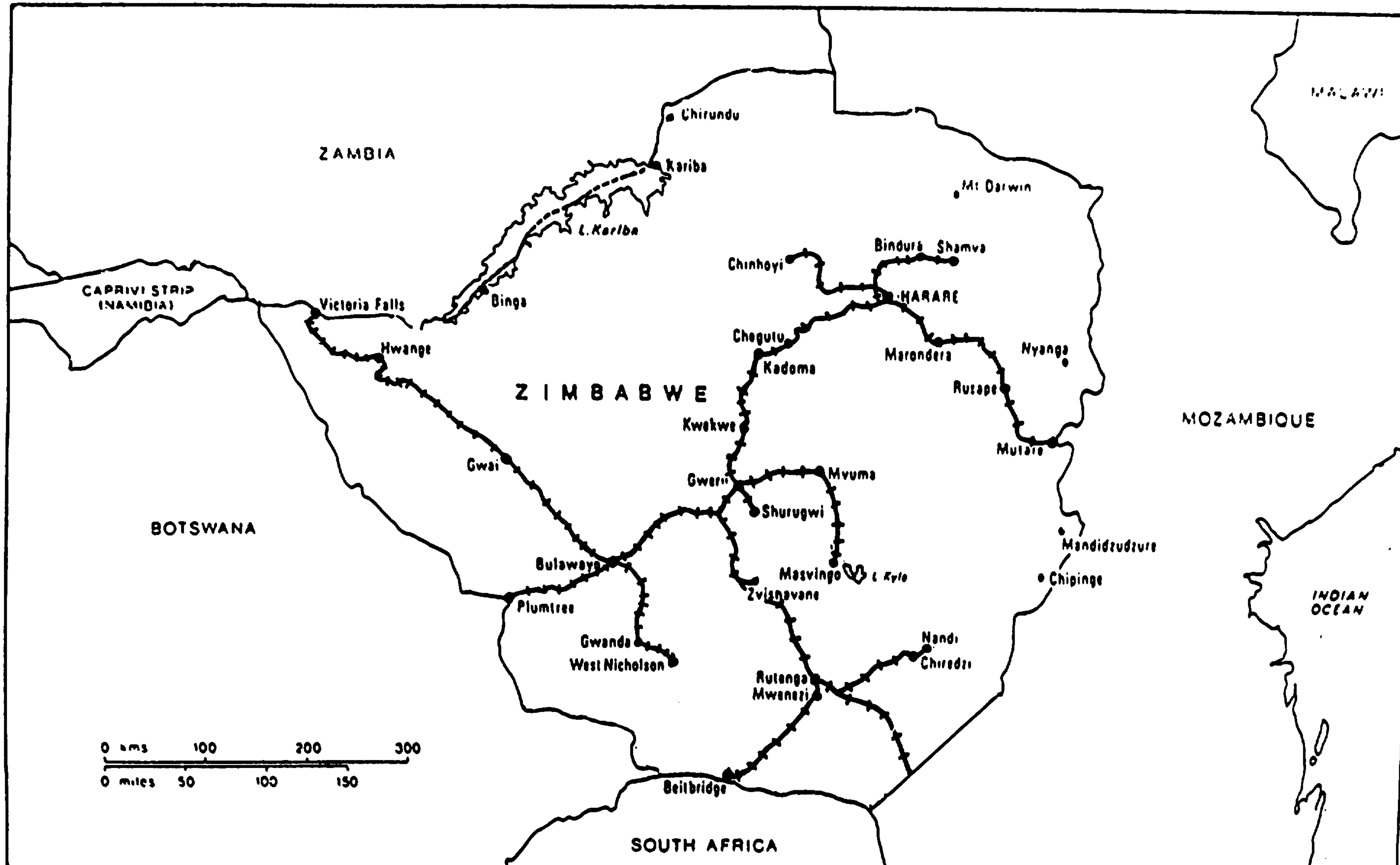
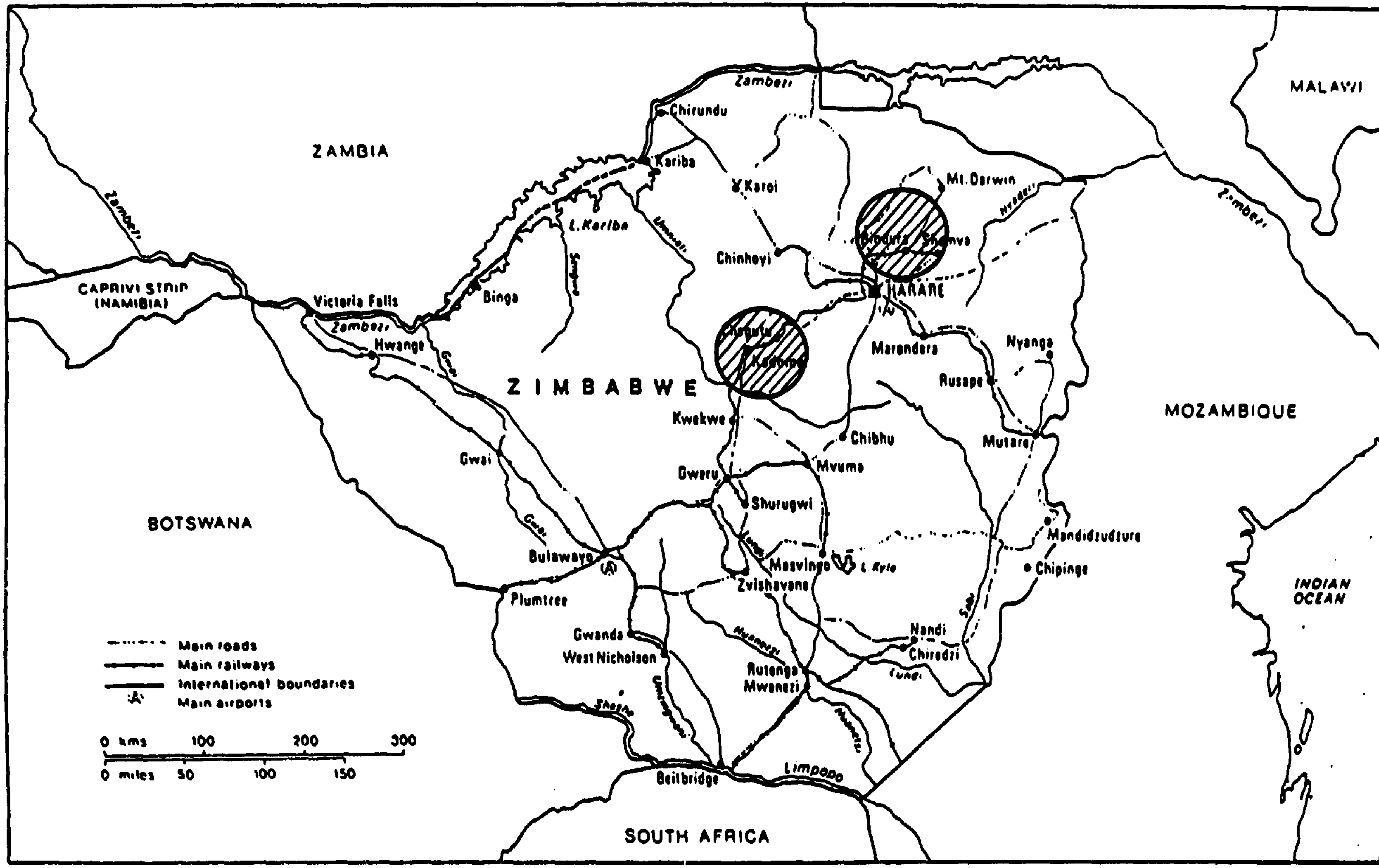


TABLE 5.4

TABLE 5.5.

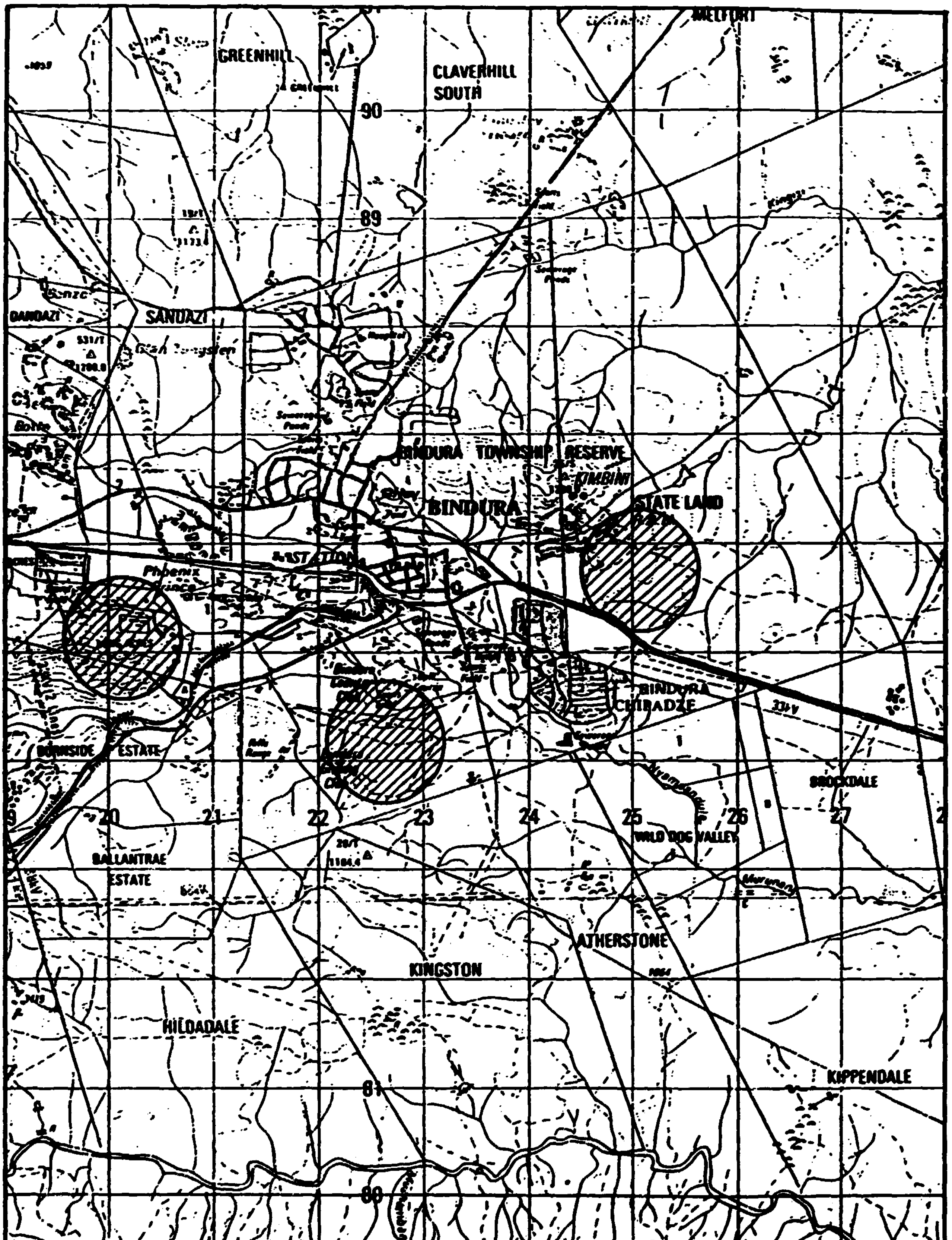
LOCATION

Zimbabwe



BINDURA

AVAILABLE LANDS



Scale 1 : 50 000

TABLE 5.7

SITE OF BINDURA

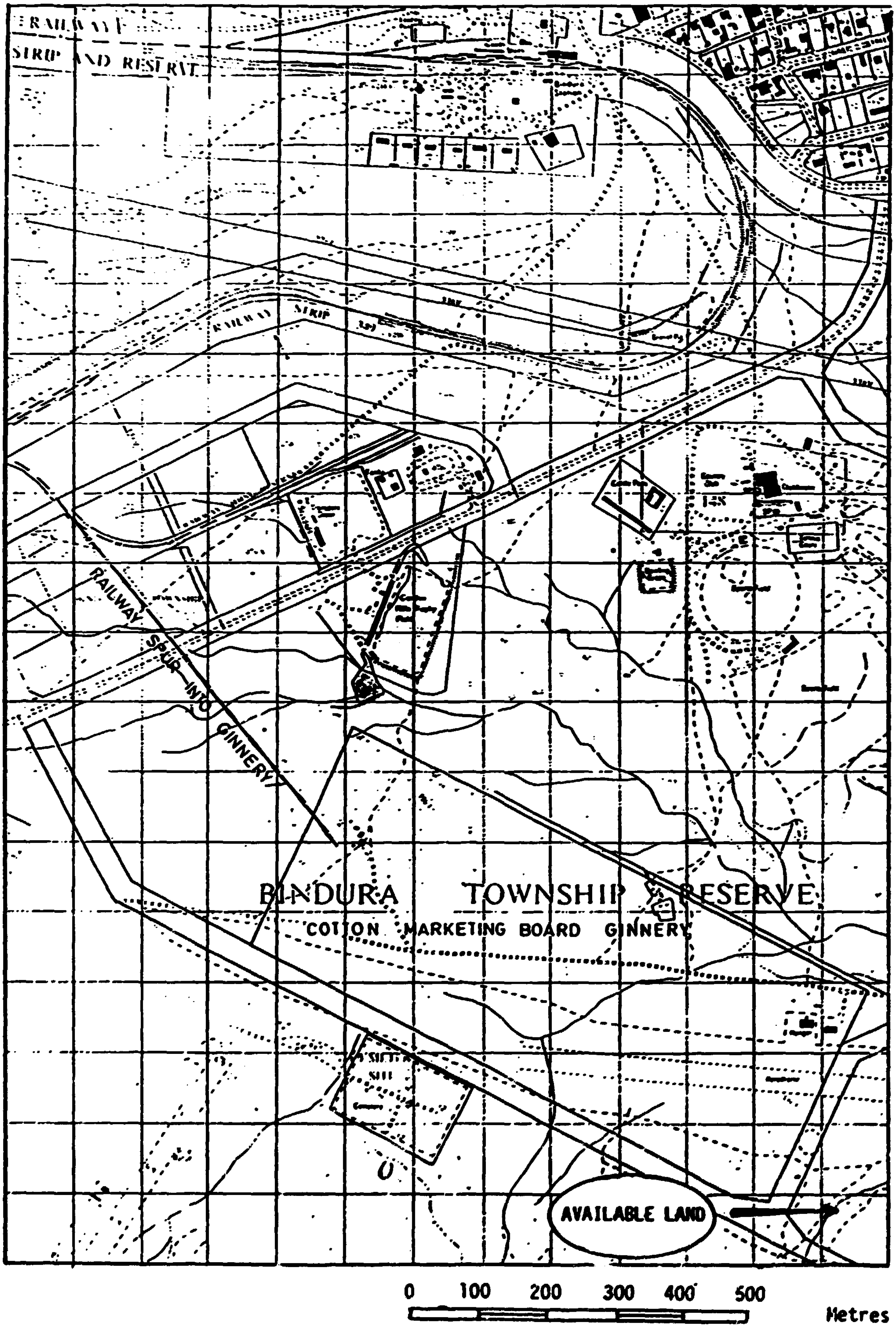
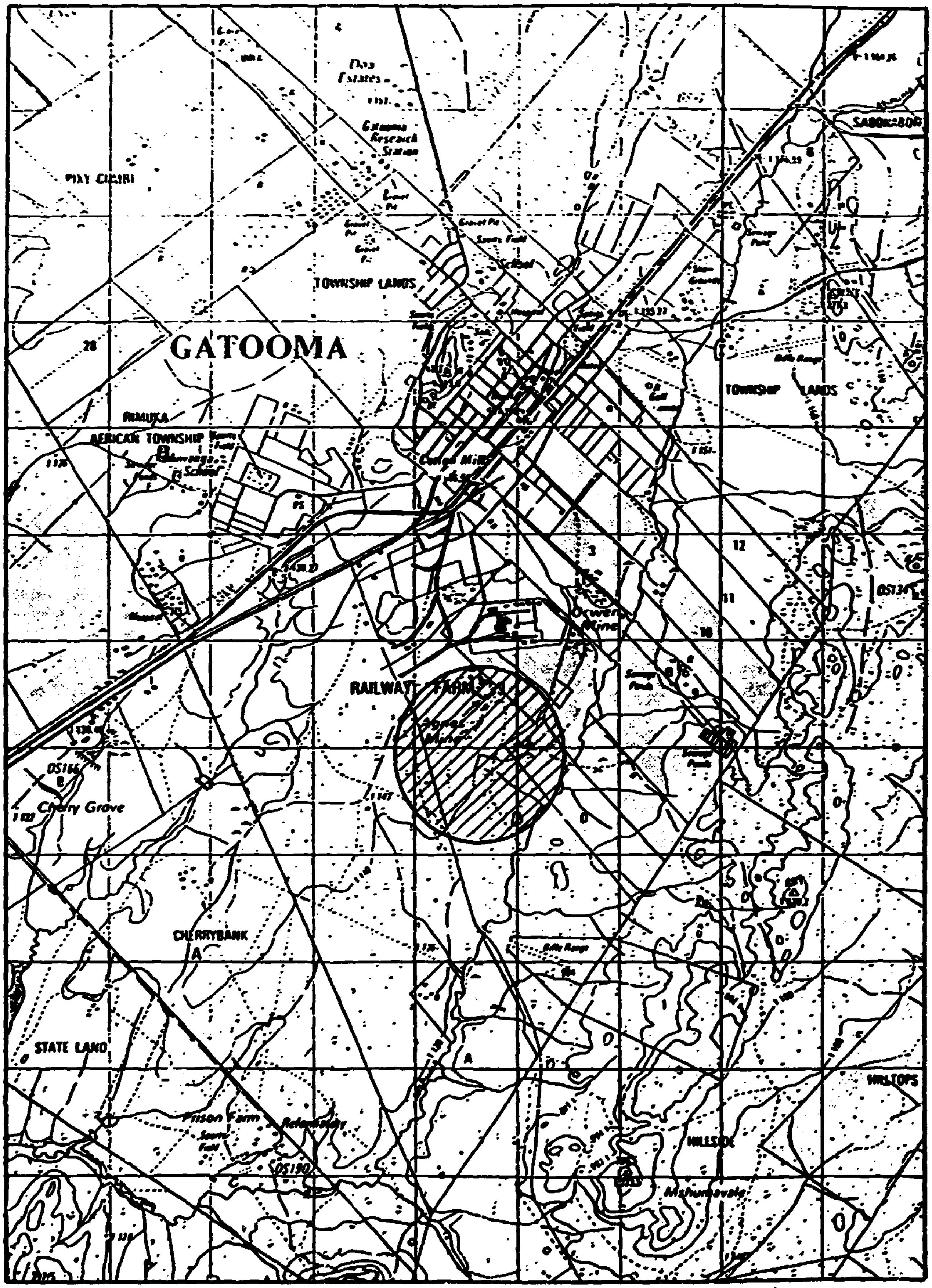


TABLE 5.8

KADOMA

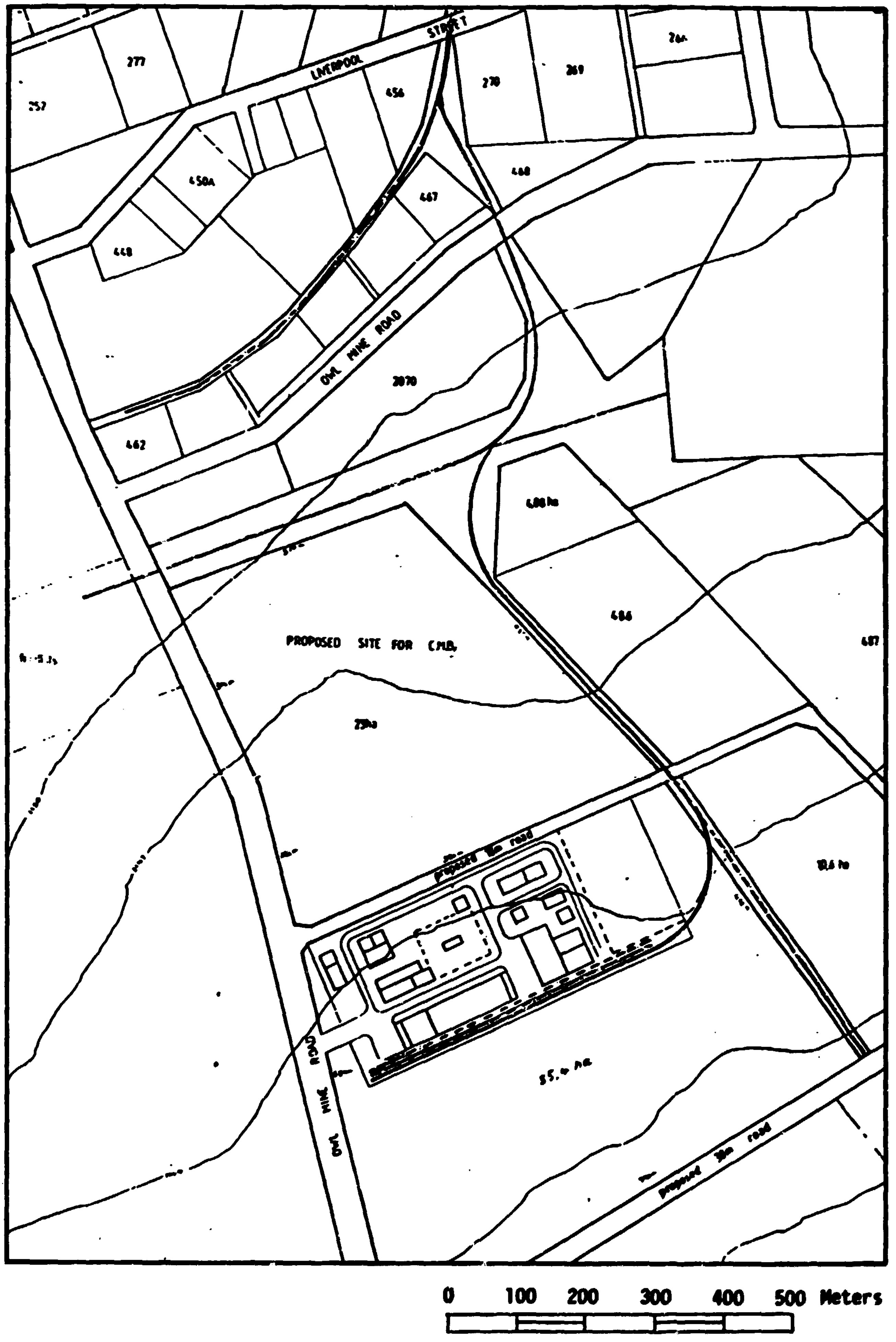
AVAILABLE LANDS



Scale 1 : 50 000

TABLE 5.9

SITE OF KADOMA



A N N E X 1

TERMS OF REFERENCE

U.Loeser/ah

15 January 1988

Annex E - Contract No. 88/19

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT US/ZIM/87/117

"FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED"

TERMS OF REFERENCE

Prepared by the Feasibility Studies Branch

Department of Industrial Operations

A. General Background Information

1) Origin of the request for the preparation of a detailed feasibility study

The project was identified at UNIDO's Regional Investment Promotion Meeting for SADCC countries held from 3-7 November 1986 in Harare, Zimbabwe. The Government of Zimbabwe through its Government supported Cotton Marketing Board (CMB) has requested UNIDO by their letter dated 7 November 1986 to prepare a feasibility study. This was reconfirmed officially by the Ministry of Lands, Agriculture and Rural Resettlement and, finally, the Ministry of Finance endorsed the official request in October 1987. The Cotton Marketing Board also confirmed on 24 April 1987 its readiness to provide for cost-sharing. CMB will provide local transport, accommodation and food in local currency or in kind for two experts during the feasibility study for a period of up to two months.

It is important to note that the Government of France is said to be ready to make investment funds available of up to US$ 14 million provided the techno-economic feasibility study results in a documented and calculated recommendation on the profitability and liquidity of the project.

2) Agricultural preconditions for the investment proposal

It is the Zimbabwe Government policy to promote industrial activities throughout the country. Agro-based industries are of particular importance, because they process locally available raw materials and provide job opportunities to the unemployed in rural areas.

Zimbabwe's agricultural sector continues to be the backbone of Zimbabwe's economy. The major food crops are maize, wheat, soybeans, ground-nuts, sorghum and, to a lesser degree, indigenous Zimbabwean mhunga and rapoko. The main cash crops include flue-cured and burley tobacco, cotton, coffee, tea, and a wide variety of other products such as vegetables and fruit.

Cotton growing is widely practised in Zimbabwe since it is one of the very few cash crops which can be produced successfully and profitably with very little capital outlay. There are large-scale commercial cotton growers as well as small-scale cotton farmers who now contribute about 30 per cent of the nation's cotton production. The contribution of cotton to Zimbabwe's economy is quite subtantial not only in terms of providing raw materials (cotton lint) and finished products for export but also in satisfying the clothing needs of the country.

Zimbabwe accounts for 35 per cent of cotton seed production and 37.2 per cent of cotton lint production in the SADCC subregion. Approximately 44.9 per cent of total production of cotton lint is exported. The recent upturn of cotton production has created an unprecedented surplus of the crop which could not all be processed or exported given the limited existing processing facilities available and access to markets.

The cotton growing areas in Zimbabwe are:

High veld: Mazowe, Mutoko, Murewa, Zambezi valley;
Middle veld: Harare, Kadoma, Gokwe, Sanyati, Lake Kariba;
Low veld: Triangle, Burchenough Bridge, Nyamaropa, Mutare.

Ginning centres are located in:

Bindura (Sanyati), Glendale (Mutare), Banket (Triangle) and Tafuna (Kadoma).

Cotton seed is presently used for

Planting:	7,000 m/t (plus a reserve of 2,000 m/t)
Expressing:	144,000 m/t
Stockfeed:	2,260 m/t

All the above figures are based on the 1986 season. The Cotton Marketing Board informed us that recent planting of cotton has almost been doubled.

3) Existing oil expressing industry

Currently five companies operate in the oil pressing industry: four in Harare and one in Bulawayo. Their total capacity is 1,890,600 litres/annum. At present no edible oil is being imported. Locally produced oil seeds are mainly used for the production of stockfeed which satisfies this market.

New plants for cotton seed oil pressing should be located outside major urban areas, preferably close to the cotton ginneries in the Kadoma/Chedutu area.

4) Zimbabwe Cotton Marketing Board (CMB)

The strong upturn in the economy in 1985 largely reflects the positive contribution to growth of the agricultural and the industrial sector and the Government of Zimbabwe through the CMB is giving priority to the development of the agro-based industry. The CMB is an important organization in the agricultural sector in Zimbabwe, employing more than 4.000 people and co-ordinating the activities of more than 130.000 registered cotton 4rowers in the large and small-scale commercial as well as communal farming areas. The Board has many key functions in the Zimbabwean cotton industry, which provides the country with all its cotton lint requirements, much of its cake (or meal) for stockfeed and about half of its edible oil. Exports of cotton lint by the Board also earn the country milli ns of dollars' worth of foreign currency each year. In the Cotton Commodity Committee are representatives of the Commercial Cotton Growers' Association, the National Farmers' Association of Zimbabwe and the Zimbabwe National Farmers' Union, who are all cotton growers themselves.

B. The scope of contracting services

A feasibility study for increasing the oil production capacity from cotton seed which will follow the approach and methodology of the UNIDO "Manual for the Preparation of Industrial Feasibility Studies" (ID/206).

The feasibility study will consist of 10 chapters, each providing detailed analyses and information in the way outlined as follows:

Chapter I	Executive summary
Chapter II	Project background and history
Chapter III	Market and plant capacity
Chapter IV	Materials and inputs
Chapter V	Location and site
Chapter VI	Project engineering
Chapter VII	Plant organization and overhead costs
Chapter VIII	Manpower
Chapter IX	Implementation scheduling
Chapter X	Financial evaluation

The feasibility study is determined by rather detailed terms of reference as are contained in the UNIDO document 10.401 "Guidelines for the Preparation of Industrial Feasibility Studies for Consulting Firms". These Guidelines provide the full scope of required work and define the details of the consultants' inputs. They are an integral part of the contractual services and are attached to these terms of reference as annex.

The feasibility study of the consulting firm should contain a complete financial evaluation, based on Chapter X of the above-mentioned "Manual for the preparation of Industrial Feasibility Studies" (ID/206) and should apply, whenever possible, computer-supported analytical methods such as the UNIDO Computer Model for Feasibility Analysis and Reporting (COMFAR).

The implementation of this project requires a team of experts in various disciplines in order to cover all aspects of the feasibility study. This task requires a high degree of professional expertise in similar projects and a proper timing of experts' inputs and project outputs. It is, therefore, recommended to subcontract the feasibility study to a consulting firm.

The team of experts provided by the consulting firm should include an industrial economist, two industrial engineers, a market analyst and a financial analyst. The team leader should be selected by the consulting firm.

For the performance of his obligation under the contract, the Contractor shall make available a total of 15 man-months of services as follows:

1 Industrial Economist	4 m/m
1 Technologist	2 m/m
1 Mechanical Engineer	3 m/m
1 Market Analyst	3 m/m
1 Financial Analyst	3 m/m
	15 m/m

C. General time schedule

The Contractor will keep the following time schedule:

- The team leader of the consulting firm will be briefed for two days in Vienna prior to the departure of the team to the project area.

- The team leader will be debriefed for two days in Vienna following the work in the project area.

- A progress report will be submitted at mid-term during the work in the project area; to UNIDO in 5 copies.

- A draft final report will be submitted to UNIDO within six months from the date of commencement of the field work.

- The final report will be submitted one month after the Contractor has received UNIDO's comments on the draft final report.

D. Personnel in the field

The Contractor's team shold consist of at least 5 specialists, viz.:

(a) One industrial economist with experience in the preparation of feasibility studies in the field of edible oil production;

(b) One vegetable oil technologist with special knowledge and practical experience in both mechanical pressing and solvent extraction of cotton seed as well as crude cotton seed oil refining and edible oil packaging;

c) One mechanical engineer with special knowledge in the oil seed processing and vegetable oil refining engineering sector and experience in the preparation of vegetable oil factory layout plans and equipment specifications;

d) One market analyst with experience in the assessment of market potential, distribution, sales and marketing of cotton seed oil; experience in African markets highly desirable;

(c) One financial analyst, with experience in project preparation and evaluation, preferably acquainted with computerized methods.

The Team should have access to specialists in other fields, as needed. All of them should have practical knowledge of developing countries. The Contractor may suggest another composition of the team and the allocation of man-months proposed above for UNIDO's consideration.

E. Participation of counterparts in the Contractor's work

UNIDO requests that the Zimbabwean counterparts be associated at all phases of the Contractor's work in order to assure their training and to familiarize them with the project from the very beginning. Potential investors, including development financing or industrial investment institutions, should also be involved as of an early stage of the Contractor's work.

F. Language requirements

The working language of the Contractor's field personnel will be English.

G. Reports

(a) The Contractor will submit to UNIDO, in line with the time schedule indicated under C), 10 copies of the draft final report in English.

(b) The Contractor will submit to UNIDO 35 copies of the final version of the feasibility study, after a discussion in Malawi has taken place and the parties concerned have had an opportunity to comment.

A N N E X E   II

PERSONS MET

a/ Resident representation of UNDP/UNIDO - Persons met

- Mr A. CHIMA.
- Mr A. KLAP, Agricultural Adviser
- Mrs Doris MUGWARA.

b/ Cotton Marketing Board - Persons met

Mr Peter DOVE	General Manager
Mr R. M. GASELA	Deputy General Manager (Administration and Finance)
Mr M. C. H. GANDIWA	Deputy General Manager (Operations and Marketing)
Mr R. CHAMISA	Operations and Marketing
Mr MANDENGU	Assistant General Manager (Finance)
Mr BEHESHTY	Assistant General Manager (Engineering)
Mr G. P. GOTORA	Crop Production Manager
Mr NYANHI	Accountant Manager
Mr CHITENJE	Assistant General Manager (Operations)

The ginneries managers

c/ Agricultural part of the study - Persons Met

Ministry of Lands, Agriculture and Rural Resettlement

Mr T.H. GENTLEMAN

Cotton Marketing Board

Mr GANDIWA and Mr CHAMISA

Grain Marketing Board

Mr SANSOM	Grain Marketing Manager
Mr M. R. REEVES	Depot Organization Manager
Mr KAZIBONI	Oil Seeds Marketing Manager

Commercial Farmers Union

Mr D. P. FULKS Chief Economist

Commercial Cotton Growers Association

Mr R. R. MC NEIL Chief Executive

Commercial Oilseeds Producer's Association

Mr R. H. AMYOT Production Executive

AGRITEX

Mr SILK Assistant Chief to Crop Production

The MWENEZI Development Corporation

B.G. LEWIS Chief Executive

d/ Industrial and market Study - Oils and fats - Persons met

OIL EXPRESSORS

OLIVINE INDUSTRIES

J. G. OSTERBERG, Purchasing Director.

LEVER BROTHERS

F. A. MILNE, Buying Manager.

BLUE RIBBON FOODS

G. BOWLER, Executive Director.

Ken J. JERRARD, General Manager.

SHEPHERD, MANCAMA, Production Managers.

NATIONAL FOODS

R. SHUTTLEWORTH, Operations Manager.

PRIOR, Plant Manager.

JAGGERS WHOLESALERS

Y. A. HUSSEIN, Managing Director.

SUPERMARKETS in HARARE, BULAWAYO, MUTARE, KADOMA, etc..
WOOLWORTH, TM, OK.

STATISTICAL DEPARTMENT, Ministry of Industry,
Mr SIMAKAWI, Statistician.
Mr DALIWAYO, Statistician.

CUSTOMS AND EXCISE,
Mr MARANGE, Officer.

MINISTRY OF HEALTH - NUTRITION DEPARTMENT
Mrs TAGWIREYI, Director of Nutrition Department.
Mrs MUSHONGA, Assistant.

PACKAGING

- ZIMGLASS
  Glass packaging.

  . Mr GOUGH, Managing Director.
  . Mr CHOMUTARE, Sales Manager.

- VAN LEER PACKAGING
  Drums.

  . Mr Ian NEWELL, Sales Manager.

- METAL BOX
  Metal Packaging Division (Tins).

  . Mr PEARSON, Production Manager.
  . Mr BVUNZAWABAYA, Marketing Manager.

- SOLTRAMA PLASTEX
  Plastic Packaging.

  . Mr GRAHAM, Sales Representative.

e/ Industrial and Market study for cakes and meals - Persons met

The four oil expressors already mentioned or oils and fats :

AGRIFOODS

C.D. AMIRA, Managing Director

NATIONAL FOODS - STOCKFEED DIVISION

R. SHUTTLEWORHT, Operation Manager

COMMERCIAL CATTLE PRODUCERS ASSOCIATION

P. D'HOTMAN, Production Executive

COLD STORAGE COMMISSION (C.S.C.)

P.F. CHAKAUYA, A.G.M. (Marketing)

f/ Manpower costs

The team collected informations on wages during the visits to the various ginneries of the C.M.B. : MUTARE, CHEGUTU, BINDURA.

They received informations on wages and information on salaries plus information on overheads from the Assistant Manager of Finance of the Cotton Marketing Board.

They also obtained such type of informations from the Company DELOITTE HASKINS and SELLS, auditors of the C.M.B.

Persons met :

C.M.B :

C. MANDENGU, Assistant General Manager (Finance).

The depots Managers.

DELOITTE HASKINGS and SELLS

A. J. ASCHMANN, Partner.

g/ Sites and Local Conditions - Persons met

UTILITIES.

- ZIMBABWE ELECTRICITY SUPPLY AUTHORITY

. Mr NEISHER, Commercial Manager, HARARE

. Mr GAMBI, Local Manager, KADOMA

. Mr BISHOP, Assistant to Local Manager, BINDURA

- B.P. - SHELL

. Mr JAFA, Technical Advisor, HARARE

- WANKIE COLLIERY (Supply of coal)

. Mr MUTITI, Marketing Manager

TRANSPORT.

- NATIONAL RAILWAYS OF ZIMBABWE

. Mr LUGUBE, Area Traffic Manager

. Miss RAMUSHU)

. Mr SIMPSON) Good Department

- SWIFT (Road Transport)

ZIMBABWE UNITED FREIGHT

. Mr NALAN-NEYLAN, Marketing Manager

- CLAN TRANSPORT Co (Road Transport)

. Les VARKEVISSER, Marketing Manager

. Helen ST LEGER WILLIAMS, Sales and Marketing

h/ Mechanical Engineering - Persons met

1. CIVIL WORK

- **SCOTT WILSON KIRKPATRICK and PARTNERS**
  Consulting Civil and Structural Engineers

  . Mr SIMPSON, Associate,
  . Mr RAWSON, Partner.

2. CONSTRUCTORS

- **WADE ADAMS**
  Building, Civil and Mechanical Engineers.

  . Mr CHADWICK, General Manager.
  . Mr GOLDSMITH, Contracts Manager.

- **ANTWOOD HOLDINGS**
  Sheet Metal Industries
  Mechanical Contracting and Design.

  . Mr HOLLAND, Manager Director.
  . Mr BLOODWORTH, Managing Director.

- **JOHN HOOK and SONS**
  Steel Construction.

  . Mr RHEITT HOOK.

- **COCHRANE NEI ENGINEERING**
  Boilers and Pressure Vessel Manufacturing.

  . Mr COCHRANE, Sales Director.

- HIGH VOLTAGE CONSTRUCTION

HV and LV installations and maintenance.

. Mr FIELD-COLLMAN, Managing Director.

i/ Financing

Persons met.

French Trade Commission :

Christian SAILLARD, Economic and Commercial Counsellor

Bruno VINAY, Assistant Commercial Attached

Eric NOITAKIS, Commercial attached.

D.H.S.

A.J. ASCHMANN, Partner.

SITES

- <u>KADOMA</u>

  . Mr PRIDDY, Town Clark

  . Mr GUNISSE, Deputy Town Clark

  . Mr KAMBA, Acting Town Engineer

- <u>BINDURA</u>

  . Mr MAKONI, Rural Council Secretary

  . Mr BARRINGTON, Water Network and Waste Treatment Superintendant

ANNEX 3.2.I

IMPORTS- EXPORTS

Imports - Exports

The two following tables 10.3.3.a. and 10.3.3.b. show main imports and exports from 1981 to 1986. 1984 was not available.

We also give in detail Imports and Exports in 1986. Tables 10.3.3.c. and 10.3.3.d.

Comments

Imports :

ZIMBABWE imports of vegetable oils and associated products are very low, compared to the domestic output.

Exports consist mainly of significative quantities of Butter (about 300 t) and Margarine (about 400 t), but principally oil cake (about 50 000 t/annum).

Table 10.3.3.a.

MAIN IMPORTS - ZIMBABWE
(tons)

	1981	1982	1983	1984	1985	1986
Butter	0.85	2.8	2.54		4.6	6
Margarine	-	-				-
Groundnuts	9		449		134	33
Other oil seeds	-	11 900	890		316	567
Oil cake or meal	1 763	3 674	-		35	105
Vegetable oil	3 252	2 941	10 344 (*)		2 400	2 000

NOTA : * In 1983, a large quantity of soyabean oil was imported, we assume that it was crude oil, to be refined in ZIMBABWE to compensate for the low avaibility cf oil seeds in that year (drought) (equivalent to 9 150 t refined oil).

Table 10.3.3.b.

MAIN EXPORTS - ZIMBABWE
(tons)

	1981	1982	1983	1984	1985	1986
Butter	-	-	-	NA	560	370
Margarine	383	175	82		370	400
Groundnuts	-	-	1 493		25	1 640
Other oil seeds			17		215	430
Oil cake or meal	17 700	10 000	4		58 000	42 000
Vegetable oil	1 165	1 775	0		1 200	1 200

Net imports (imports minus exports) of vegetable oil :

- 1981 : 3 252 - 1 165 = 2 087 t
- 1982 : 2 941 - 1 775 = 1 166 t
- 1983 : 9 150 t
- 1984 : N.A.
- 1985 : 2 400 - 1 200 = 1 200 t
- 1986 : 2 000 - 1 200 = 800 t (provisional).

Country Code	Country Number	Country Name
AR	163	ARGENTINA
BE	081	BELGIUM
BR	165	BRASIL
BW	012	BOTSWANA
DE	100	GERMANY FDR
ES	126	SPAIN
FR	091	FRANCE
GB	001	UNITED KINGDOM
IT	109	ITALY
JP	139	JAPAN
MU	057	MAURITIUS
MY	030	MALAYSIA
MW	046	MALAWI
MZ		MOZAMBIQUE
PT	118	PORTUGAL
SG	031	SINGAPORE
TZ	052	TANZANIA
US	150	U.S. OF AMERICA
ZA	011	REPUBLIC OF SOUTH AFRICA
ZM	045	ZAMBIA
ZR	082	ZAIRE
ZW	044	ZIMBABWE

Table 10.3.3.c.
IMPORTS 1986 - ZIMBABWE

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB	CUM Duty
023 000 Butter	GB	kg	2 771	18 158	335
	ZW	kg	3 500	7 000	0
			6 271	25 158	335
081 310 Oil cake of soyabeans	BW	kg	105 008	37 927	0

Total oil cakes : ± 105 tons

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB	CUM Duty
222 100 Groundnuts	MW	kg	2 340	4 721	0
	ZM		30 600	19 950	0
			32 940	24 671	0
222 200 Soyabeans	ZM	kg	399 175	137 798	0
222 300 Cottonseeds	ZA	kg	22 625	45 584	0
222 400 Sunflower seeds	BW	kg	58 188	18 958	0
	ZA	kg	68 630	170 381	0
			126 818	189 339	0
222 500 Sesame seeds	MW		1 155	940	0
	ZA		326	614	0
			1 481	1 554	0
223 800 n.e.s.	MW NL		346	11 472	0

Total oils seeds : ± 600 tons

Continued

Table 10.3.3.c.
IMPORTS 1986 - ZIMBABWE

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB 1 000 Z$	CUM Duty
423 200 Soyabean oil	AR	kg	1,073,507	564,903	0
423 500 Olive oil	ES	kg	960	4 645	697
	IT		1 232	5 694	177
	+ FR GB PT ZA		286	2 257	451
			2 478	12 596	1 325
423 600 Sunflower oil	ZA	kg	100	167	33.4
424 200 Palm oil	BW	kg	57 680	63 444	0
	DE		2 820	5 051	0
			60 500	68 495	
424 300 Coconut oil	MY	kg	1 190	2 792	558.4
	ZA	kg	76 573	69 664	0
	Others		560	1 044	208.8
			78 323	73 500	767.2
424 400 Palm Kernel Oil	MY	kg	111 242	46 405	0
	NL		4 000	5 519	1 148.0
	ZA		660	1 707	341.4
			115 902	53 631	1 489.4
424 909	BE	kg	28 560	21 640	0
Other n.e.s.	BW		111 710	89 188	0
	DE		5 462	7 563	1 512.6
	FI		83 352	156 017	0
	MW		1 182	2 563	567.8
	MY		249 346	93 527	18 705.4
	ZA		6 658	15 888	32
	Others		428	433	272.8
			486 698	387 819	21 090.6

Total edible oils : ± 2 000 tons

Table 10.3.3.d.
EXPORTS 1986 - ZIMBABWE

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB	Unit Value
091 410 Margarine	BW	kg	332 287	571 351	1.719
	MZ		296	652	2.202
	ZM		1 078	1 217	1.128
	ZR		21 000	50 028	2.382
			354 661	623 248	
091 490 Lard and other edible fats n.e.s.	BW	kg	31 782	51 570	1.622
	ZM		11 008	15 846	1.439
			42 790	57 416	

Total margarine and fats ± 400 tons

Div. 22 oils seeds and oleagineous fruit

222 100 Groundnuts	BW	kg	72 320	34 710	.479
	GB		343 460	363 211	.836
	JP		52 500	53 735	1.214
	MD		100 000	119 517	1.195
	MZ		726 695	737 138	1.083
	BW		177 208	250 352	1.469
	ZA		80 000	101 400	1.267
			1 643 183	1 730 065	

Continued

Table 10.3.3.d.
EXPORTS 1986 - ZIMBABWE

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB	Unit Value
222 200					
Soyabeans	MZ		50 000	24 430	.488
222 400	MZ		78 700	62 970	.800
Sunflower seeds	ZM		243 955	36 593	.149
	Others		5 090	6 542	
			327 745	106 105	
222 500	MZ	kg	20 158	26 462	1.312
Sesame seeds					
223 800	MZ		73 500	47 513	.646
oil seeds n.e.s.					
	Others		5 052	17 831	
			78 552	65 344	
Total oil seeds ± 2 070 tons					
423 200	MZ	kg	100 038	205 403	2.063
Soyabean oil					
423 300	BW		6 363	9 564	1.501
Cottonseed oil					
423 400	BW		1 185	2 213	1.87
Groundnut oil					
423 500	BW		1 251	2 112	1.823
Olive oil					
423 600					
Sunflower oil	BW	kg	790 326	1 182 948	1.496
	ZM		260 000	24 700	.095
	Others		184	376	
			1 050 510	1 208 024	
423 909	BW	kg	16 046	32 861	2.047
Others	ZA		1 010	2 341	2.812
			17 056	35 702	

Total export Edible Oil ± 1 200 tons

Table 10.3.3.d.
EXPORTS 1986 - ZIMBABWE

SITC	CTRY Code	Unit	CUM Quantity	CUM Value FOB	Unit Value
023 000 Butter	BW	kg	72 844	157 095	2.156
	MU		150 000	228 790	1.525
	MW		30 000	69 000	2.300
	TZ		22 775	66 193	2.906
	ZM		91 408	213 265	2.333
	Others		1 315	3 896	-
Total butter ± 370 tons			368 342	738 239	
081 310 Oil cake of soya beans	BW	kg	69 990	25 668	.366
	MW		82 500	7 938	.871
	MZ		30 000	9 830	.327
	ZA		11 496 031	3 890 504	.338
	ZM		60 060	19 974	.332
	ZR		59 990	19 951	.332
			11 798 571	4 037 865	
081 330 Oil cake of cotton seed	BW	kg	152 360	25 965	.170
	ZA		28 710 081	4 966 536	.172
	ZM		44 050	21 974	.498
			28 906 491	5 014 475	
0813 50 oil cake of sunflower seed	BW	kg	29 400	4 773	.162
	ZA		911 400	167 064	.183
			940 800	171 837	

Total oil cake ± 42 000 tons

IMPORTS - JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT		CUM QUANTITY	CUM VALUE FOB	CUM DUTY
0 23 000	BE	Kg	0	30 000	81 012	0.0
Butter	GB	Kg		4 755	15 907	220.6
CCN 04 03						
0 813 10	ZA	Kg		1	17	0
Oil cake soya bean						
0 914 10	NL	Kg	Netherlands	9	8	0.8
Margarine	ZW			537	1 248	0.0
0 914 90	NL	Kg		4 800	184 428	528
Imitation lard and other edible fats n.e.s						

IMPORTS - JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT		CUM QUANTITY	CUM VALUE FOB	CUM DUTY
222 100	MW	Kg		93 991	96 542	0.0
Groundnut	ZM	Kg		498 450	33 742	0
				592 441	130 284	0
222 200	ZA	Kg		40	82	0
Soyabeans						
222 300	MZ	Kg		800 010	98 861	0.0
Cotton seeds	ZA	Kg		12 906	14 940	0.0
				812 916	113 801	0.0
222 400	MW	Kg		500	178	0.0
Sunflower seeds	ZA	Kg		1 440	1 757	0.0
				1 940	1 935	0.0
222 500	MW	Kg		3 650	5 766	0.0
Sesame seeds	ZA	Kg		23	200	0.0
				3 673	5 966	0.0
222 500	MW	Kg		47 845	24 530	0.0
Castor	US			4 649	18 985	0.0
	ZA			14 800	20 141	0.0
	ZW			112	17	0.0
				67 406	63 673	0

IMPORTS - JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY	CALCULATED RATE
223 800	BE	Kg	8	103	0	
n.e.s	FR		1 500	12 347	0	
	GB		1 250	2 095		
PG = PAPUA NEW	MW		405	2 430		
GUINEA	NL		261	20 586		
	PG		30	2 250		
	US		121	148		
			3 575	39 959	0	
223 900	JP	Kg	30	47	9.4	
TOTAL OIL SEEDS : 1 500 t						
423 200	AR	Kg	825 000	435 131	0	
Soyabean oil	DE	Kg	2 200	4 964	992.8	
			827 200	440 095	992.8	
423 500	ES	Kg	220	1 206	241.2	
Olive oil	GB		480	3 223	433.2	
	IT		2 360	13 059	526.9	
	TN		1 481	1 814	362.8	
	ZA		45	93	18.6	
			4 536	19 395	1 582.2	
423 600	AR	Kg	580 000	291 689	0.0	
Sunflower oil	ZW	Kg	3 324	1 690	0.0	
			583 324	293 379	0.0	
423 920	JP		8	10	2.0	

Continued

IMPORTS - JANV-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY	CALCULATED RATE
424 100	CA	Canada	9 668	14 048	2 809.6	
Linseed oil	ZA		15 518	23 709	3 939.2	
					6 748.8	
424 200	FR	Kg	1	54		
Palm oil	IT	Kg	940	1 929		
	MY	Kg	907 126	441 358		
			908 057	443 341	10.8	
424 300	ZA	Kg	185	1 248	134.4	
Coconut oil						
424 400						
Palm kernel oil	NL	Kg	2 400	8 941	1 788.2	
424 500	BR	Kg	1 080	2 096	419.2	
Castor oil	BW		190	374	74.8	
	DE		30	15	3.0	
	GB		40	94	18.8	
	MW		8 309	25 895	3 625.3	
	NL		2 500	5 250	1 050.0	
	PT		65	126	25.2	
	ZA		6 532	14 134	2 819.6	
			18 746	47 989	8 035.9	

Continued

IMPORTS - JANV-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY	CALCULATED RATE
424 901	ZW	Kg	85	127	0	
424 909	FI	Kg	115 358	184 317	0	
Other n.e.s.	FR		53	2 451	490.2	
	IT		64	357	71.8	
	KE		0	0	0.0	
FI Finland	MW		197	430	103.2	
KE Kenya	ZA		886	3 325	231.0	
	ZW		1 110	1 276	0.0	
			117 668	192 156	896.2	
TOTAL OILS : 2 440 TONS				2 439 800		

1987 October Domestic Exports by Item/country

SITC	CTRY CODE	UNIT	CUM QUANTIT-	CUM VALUE FOB	CUM DUTY
0 23 000	CA	Kg	10 340	26 296	2.543
Butter ETHIOPA	ET	Kg	100	226	8.26
	MV	Kg	15 000	27 394	1.826
	MW	Kg	50 023	80 423	1.607
	MZ	Kg	6 495	15 635	2.407
SWITZERLAND	SZ	Kg	3 000	5 800	1.933
	TZ		16 325	33 628	2.059
	ZA		270 103	508 970	1.884
	ZM	Kg	82 028	146 256	1.7834
	ZR		100 000	239 579	2.395
			557 414	1 094 086	
TOTAL BUTTER :.................. 557 T					

EXPORTS JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY
0 813 10	BW	Kg	50 050	16 402	.327
Oil cake of	KE	Kg	213 630	118 811	.556
Soyabean	MW	Kg	30 000	22 500	.750
	ZA	Kg	25 062 287	8 678 749	.346
	ZR	Kg	680 040	226 683	.333
			26 036 007	9 063 145	
0 813 20	ZA	Kg	38 260	10 114	.264
Oil cake of					
groundnuts					
0 81 330	BW	Kg	77 650	20 099	.258
Oil cake of	ZA	1	29 936 709	7 151 749	.238
cotton seed					
0 81 350	BW	Kg	106 500	32 767	.307
Oil cake of	ZA	1	574 960	149 993	.260
sunflower seeds			681 460	182 760	
TOTAL OIL CAKE : 56 770 T					

EXPORTS JANV-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY
0 914 410	BW	Kg	307 330	541 115	1 760
Margarine	MZ	Kg	874	2 035	2 328
	ZA	Kg	20	55	2 750
	ZM	Kg	41 368	71 184	1 72
			349 592	614 389	
0 91 490	BW	Kg	43 123	10 114	1.400
	MZ		5 225	5.225	1.871
			48 398	70 279	
TOTAL MARGARINE : 398 T				9 cents/kg	
222 100 ANGOLA	AO	Kg	5 000	6 500	1.300
Groundnuts	BW		7 239	4 144	.572
	DE		18 000	17 927	.995
CCCN 12.01.10	GB		238 003	291 215	.977
NEW ZEALAND	JP		105 000	133 565	1.272
	MZ		1 232 690	1 614 316	1.300
	NZ		51 000	54 609	1.070
	ZA		1 780 080	1 561 013	.876
	ZR		200 000	209 139	1.045
			3 697 012	3 892 428	
TOTAL GROUNDNUTS : 3 700 T					

EXPORTS JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY
22 200	AO	Kg	32 000	67 902	2 121
Soyabean	ZA	Kg	50	25	.500
CCN 12.01.25			32 050	67 927	
222.300 Cotton seed O CCN 12.0.35					
222 400					
Sunflower	MZ	Kg	135 594	108 770	.802
CCN 12.01.45					
222.500 Sesame CCN 12.01.50					
222.600					
Mape of colza seeds	MZ		62	854	
12.01.55					
223 100 Copra CCN 12.01.15					
223 200 Palm nut and					
223 400 Linseed 12.01.30					
223 500	BW		15	8	.533
Castor oil seeds	ZA		171	17	

EXPORTS JANV-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	CUM DUTY
223.800	BW	Kg	55 124	36 619	
	MZ		879	8 238	
Oil seeds n.e.s	RW		150	4 455	
			56 153	45 312	
TOTAL OIL SEEDS : 200 T					
223.900 12.02 Flours or meals or oil seeds or oleaginous fruit, non defatted (excluding mustard flour	ZA	Kg	668 910	171 011	
423.200					
Soyabean oil	BW	Kg	676 593	1 091 465	1 613
15.07.10	MW		87 839	196 502	2 237
	MZ		4 105	9 250	2 253
423.300	BW	Kg	44 377	62 217	1 402
Cotton seed oil	MW		775	2 211	2 852
15.07.20	MZ		38	60	1 578
			45 190	64 488	
423.400					
Groundnut oil	BW		3 095	4 273	1.38
15.087.30					
423.500	BW	Kg	4 921	7 174	1.457
Castor oil	MZ		2 482	7 277	2.931
15.07.80			7 403	14 451	
423.600	BW	Kg	594 540	861 713	1.715
Sunflower seed oil	MZ		153 553	739 600	
15.07.50	ZM		10	16	
			748 103	1 101 329	

continued

EXPORTS JAN-SEPT 1987 - ZIMBABWE

SITC	CTRY CODE	UNIT	CUM QUANTITY	CUM VALUE FOB	UNIT VALUE
423 910	BW	Kg		31 008	54 264
Other soft fixed v.o					
Mape colza and mustard oils					
424 100					
Linseed oil	MZ	Kg	26	144	5 538
NCC 15 07 60					
200 palm oil					
NCC 15 07 70		Kg			
400 Palm kermel oil					
NCC 15 07 75					
424 500					
Castor oil	ZA	Kg	17 800	17 800	1 000
NCC 15 07 80					
424 901	BW	Kg	17 108	29 347	1 715
Fixed v.o n.e.s.	MZ		4 570	12 629	2 763
Maize germ oil			21 678	41 976	
424 909					
Others	BW	Kg	66 280	101 172	1 526
NCC 15 07 90 90	MZ		645	1 500	2 325
	ZM	Kg	1 353	3 757	2 776
			68 278	106 429	
TOTAL EDIBLE OILS : 1 600 T					

ANNEX 3.2.II

Gives the detail of the Statutory instrument 116 of 1987

STATUTORY INSTRUMENT 116 OF 1987

Control of goods (vegetable oils and fats prices) order, 1987

It is hereby notified that the Miniser of Trade and Commerce has, in terms of section 7 of the Control of Goods (Price Control) Regulations, 1954, made the following order :

1/ This order may be cited as the Control of Goods (Vegetable Oils and Fats Prices) Order, 1987.

2/ In this order :

"Distributors" means Blue Ribbon Foods Limited, Lever Brothers (Private) limited, National Foods Limited and Olivine Industries (Private) limited ;

"Wholesaler" has the meaning given to it in the Control of Goods (Price Control) Order, 1982, published in Statutory Instrument 263 of 1982.

3/ No distributor or wholesaler shall sell any vegetable oil or fat specified in the first column of the Schedule to any retailer of trade outlet at a price in excess of the specifed opposite thereto in the second column of the Schedule.

4/ The Control of Goods (Vegetable Oils and Fats Prices) orders, 1986, published in Statutory Instrument 145 of 1986 and corrected by Statutory Instrument 168 of 1986, is repeated.

MAXIMUM PRICES OF VEGETABLE OILS AND FATS

VEGETABLE OILS AND FATS	UNIT PRICE $
Olivine, bottles, 375 ml	1,12
Olivine, bottles, 500 ml	1,48
Olivine, bottles, 750 ml	1,89
Panol, bottles, 375 ml	0,99
Panol, bottles, 750 ml	1,69
Helio, bottles, 750 ml	2,19
Covo, bottles, 375 ml	1,12
Covo, bottles, 750 ml	1,89
Solo, bottles, 738 ml	2,19
Roil, bottles, 375 ml	0,99
Roil, bottles, 750 ml	1,69
Sunshine, bottles, 375 ml	1,12
Sunshine, bottles, 750 ml	2,19
Red Seal Pure Maize, bottles, 375 ml	1,06
Red Seal Pure Maize, bottles, 750 ml	1,78
Red Seal Salad and Cooking Oil, bottles, 375 ml	1,12
Red Seal Salad and Cooking Oil, bottles, 750 ml	1,89
Red Seal Pure Sunflower, bottles, 375 ml	1,30
Olivine, tins, 2,5 litres	6,19
Olivine, tins, 5,0 litres	11,51
Olivine, round tins, 20,0 litres	37,72
Panol, tins, 2,5 litres	5,09
Panol, tins, 5,0 litres	9,64
Panol, round tins, 20,0 litres	36,26
Helio, tins, 2,5 litres	6,85
Helio, tins, 5,0 litres	12,81
Helio, round tins, 20,0 litres	43,84
Mazola, round tins, 20,0 litres	36,26
Soyala, round tins, 20,0 litres	40,87
Covo, tins, 2,5 litres	6,19
Covo, tins, 5,0 litres	11,51
Solo, tins, 2,5 litres	6,87

VEGETABLE OILS AND FATS	UNIT PRICE $
Buttercup, packets, 1 kg	2,09
Buttercup, blocks, 2 kg	4,05
Harvest, packets, 250 g	0,60
Harvest, packets, 500 g	1,15
Harvest, tins, 250 g	0,74
Maypole, tubs, 500 g	1,35
Helio, tubs, 250 g	0,81
Helio, tubs, 500 g	1,47
Melva, packets, 500 g	1,14
Melva, tubs, 500 g	1,35
Stork, tubs, 41,67 g	0,29
Stork, tubs, 500 g	0,33
Stork, packets, 125 g	0,60
Stork, packets, 500 g	1,15
Stork, packets, 2 kg	4,05
Stork, tins, 250 g	0,74
Holsum, cooking fat, 125 g	0,33
Holsum, cooking fat, 250 g	0,60
Holsum, cookng fat, 500 g	1,14
Solo, 250 g	0,81
Solo, 500 g	1,47
Marvello, 2 kg	3,94
Marvello, 25 kg	48,86
Marvello (unsalted) 25 kg	48,86
Marvello, 190 kg	354,52
Margeon, 2 kg	3,94
Margeon, 25 kg	48,86
Margeen, 190 kg	354,52

VEGETABLE OILS AND FATS	UNIT PRICE $
Solo, tins, 5,0 litres	12,81
Roil, tins, 2,5 litres	5,09
Roil, tins, 5,0 litres	9,64
Superoil, tins, 20,0 litres	36,26
Sunshine, tins, 2,5 litres	6,87
Sunshine, tins, 20,0 litres	43,84
Sunol, tins, 20,0 litres	43,84
Lotus, tins, 20,0 litres	36,26
Red Seal Salad and Cooking Oil, 2,5 litres	6,19
Red Seal Salad and Cooking Oil, 5,0 litres	11,51
Red Seal Salad and Cooking Oil, 20,0 litres	37,72
Red Seal Pure Maize, jerry cans, 2,5 litres	5,69
Red Seal Pure Maize, jerry cans, 5,0 litres	10,60
Red Seal Pure Maize, jerry cans, 10,0 litres	19,87
Cornol Pure Maize, jerry cans, 2,5 litres	5,69
Cornol Pure Maize, jerry cans, 5,0 litres	10,60
Covo, PVC bottle, 2,0 litres	5,01
Olivine, drums, 200,0 litres	356,39
Panol, drums, 200,0 litres	325,59
Panol, drums, 200,0 litres	412,37
Helio, drums, 200,0 litres	325,59
Soyala, drums, 200,0 litres	387,84
Colons, drums, 200,0 litres	357,26
Sunshine, drums, 200,0 litres	412,37
Sunol, drums, 200,0 litres	412,37
Lotus, drums, 200,0 litres	325,59
Lotus, drums, X200,0 litres	327,01
Express, drums, 200,0 litres	303,68
Red Seal Salad and Cooking Oil, 200,0 litres	356,39
Red Seal Pure Maize, drums, 20,0 litres	36,64
Red Seal Putre Maize, drums, 200,0 litres	324,17
Superoil, tins, 200,0 litres	325,59
Buttercup, packets, 250 g	0,60
Buttercup, packets, 500 g	1,15

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FEASIBILITY STUDY FOR INCREASING
THE OIL PRODUCTION CAPACITY
FROM COTTON SEED IN ZIMBABWE

MULTIPURPOSE FACTORY

-=oOo=-

VOLUME II
3 FINAL REPORT

(20?)

SOFRECO

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ACTIVITY CODE : J 12516

FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED IN ZIMBABWE

MULTIPURPOSE FACTORY

-=oOo=-

VOLUME II
3 FINAL REPORT

(20?)

November 1988

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CHAPTER VI

PROJECT ENGINEERING

6.1. PRODUCTION PROGRAMME

The data required for the preparation of the lay out are the following :

The production programme has been detailed in Chapter III, schedule 3.3.B. see Scenario I. This production programme is based mainly on oil seeds supply programme, taking in account, in one hand of the oil seeds production programme ; and in the other hand of the supply at full capacity of existing oil mills.

At full capacity, the oilseeds supply and finished proudcts output will be as follows :

- Oilseeds supply inputs :

. Cotton seeds	:	56.000 MT
. Sunflowerseeds	:	8.000 MT
. Soya beans	:	24.000 MT
		88.000 MT

- Edible oil outputs :

. Cotton seed oil	:	9 240 MT
. Sunflower oil	:	2 480 MT
. Soya oil	:	4 080 MT
		15.800 MT

The sunflower oil will be sold in bottles., tins, containers or drums as such, the other oils will be blended and sold in bottles, tins, containers or drums as vegetable oil.

- Meals outputs :

. Cotton meal	:	26 880 MT
. Sunflower meal	:	2 640 MT
. Soya meal	:	19 440 MT
		48 960 MT

This programme is corresponding to a capacity of :

	Installed	Actual
Cotton seeds	330 MT/D	300 MT/D
Soya beans	250 MT/D	225 MT/D

6.2. TECHNOLOGY

The technology is based on a multi seeds oil mill. The heart of this oil mill will be the solvent plant which will produce :

- Crude oil which is transformed in edible oil after refining.
- Meals which are raw materials for the manufacturing of stockfeeds.

However, the technology is different for each type of seeds for the steps which are preceding the solvent plant and therefore the equipment will have to be adapted to this difficulty.

- Cotton seeds are treated in following steps : cleaning, delinting, decorticating, preparation, cooking, pre-pressing before entering the solvent plant.
- Soya beans are treated in cleaning, cooking, flaking.
- Sunflower seeds are treated in preparation, cooking, pre-pressing.

There are also differences in the refining process for crude cotton seed oil and for soya bean/sunflower oil.

- Cottonseed oil is treated by the following steps : miscella neutralization, bleaching, deodorization.
- Soya bean oil and sunflower oil are treated by physical refining : degumming, bleaching and desacidification, deodorization.

However, as miscella neutralization, notwithstanding its advantages, is a relatively new process technology, **a conventional chemical refining is proposed as an alternative** (Annex VI. 1.3) (pages 209.1 - 209.6).

6.2.1. DESCRIPTION

The alternatives which have been selected and the reasons for the choice are the following :

a/ Receiving and storage

Oil seeds are obtained from annual plants and the crop is done once a year generally at the same period March - April in ZIMBABWE. Therefore,the total crop must be stored and dispatched during the year to the oil expressors.

The cotton seeds are in fact the by-products of seed cotton after treatment in the ginneries. Therefore, the cottonseeds are regularly produced and stored by the Cotton Marketing Board that supply the oil expressors in about monthly deliveries.

The other oil seeds : soya beans, sunflower seeds and groundnuts are stored and regularly supplied to oil expressors by another organization : the Grain Marketing Board.

Consequently, the storage of oil seeds will have to be organized at the oil mill in order to have a certain amount of each type of oil seeds, specially for the two main seeds : cotton seeds and soya beans (about one month storage).

In existing oil mills in ZIMBABWE, all oil seeds are deilivered and stored in bags.

In this project, we choose to empty the bags. Cotton seeds and sunflower seeds will be stored in a well ventilated warehouse. Soya beans after cleaning will be stored in well ventilated silos. Under these conditions, the seeds will be protected against contamination and mold attack. They will also be protected against fire by self fermentation.

b/ Delinting

Cotton seeds will be delinted as some deliveries have a linter content which can reach until 15 % and therefore will make easier the cotton seeds decorticating.

c/ Decorticating

Cotton seeds will be decorticated. The advantage is to allow the production of meal with a high protein content.

80 % of husks will be used as fuel for steam production in boiler, the remaining 20 % will be recycled to the pre-pressing section in order to make it easier.

d/ Preparation - Pre-pressing

The oil extraction from cotton seeds, sunflower seeds and will be done through the following procedure :

- preparation through roller mills
- cooking
- pre- pressing
- foots separation and recycling
- solvent extraction.

This process is the most modern one already practised in existing oil mills in ZIMBABWE. It allows to obtained the lower oil content in meals. The minimum economical size for such process is 100 MT/day consequently, the project is interested with it.

The soya beans are not pre-pressed as it is in some existing oil mills in ZIMBABWE. The prepressing of soyabeans is decreasing the quality of oil and destroy some proteins in the meals. In the project soya beans are only cooked and then flaked through a roller-mill and direct extracted in solvent plant.

The cooking of cottonseeds destroys at its maximum, the gossypol which could remain in the meal and that is not acceptable on the meal market.

e/ Neutralizing

An important improvement is the cotton oil neutralizing in the miscella obtained from the solvent extraction plant. In that case, the crude oil dissolved in miscella is mixed with the crude oil from pre-pressing, neutralised and freed of soap in one centrifuge separator. The neutralized miscella is sent to the distillation plant where the hexane is removed from the neutralized oil.

The advantages are :

- Better quality and better oil colour as it is neutralized immediatly without intermediate oil storage and heating.

- Better yields as production of soapstocks is reduced and as cotton seeds soapstocks are raw mateirals for very poor quality soaps.

f/ Bleaching and deodorization

After solvent neutralisation, the cottonseeds oil will be bleached and deodorised in continuous in the most modern existing equipment. The refining of this project will be very much in advance as compared to the existing plants, in ZIMBABWE.

The soya oil, sunflower oil will not be neutralized in miscella but physically refined through the bleaching and deodorizing plant.

g/ Oil mill activity organization

The oil mill activity will have to ve organized in campaigns...It is not possible to mix the oil seeds before crushing. Each type must be treated separately. It is the same for oil refining. The edible oils are blended only after refining. The same, also for the meals which are tagged, stored and sold separately.

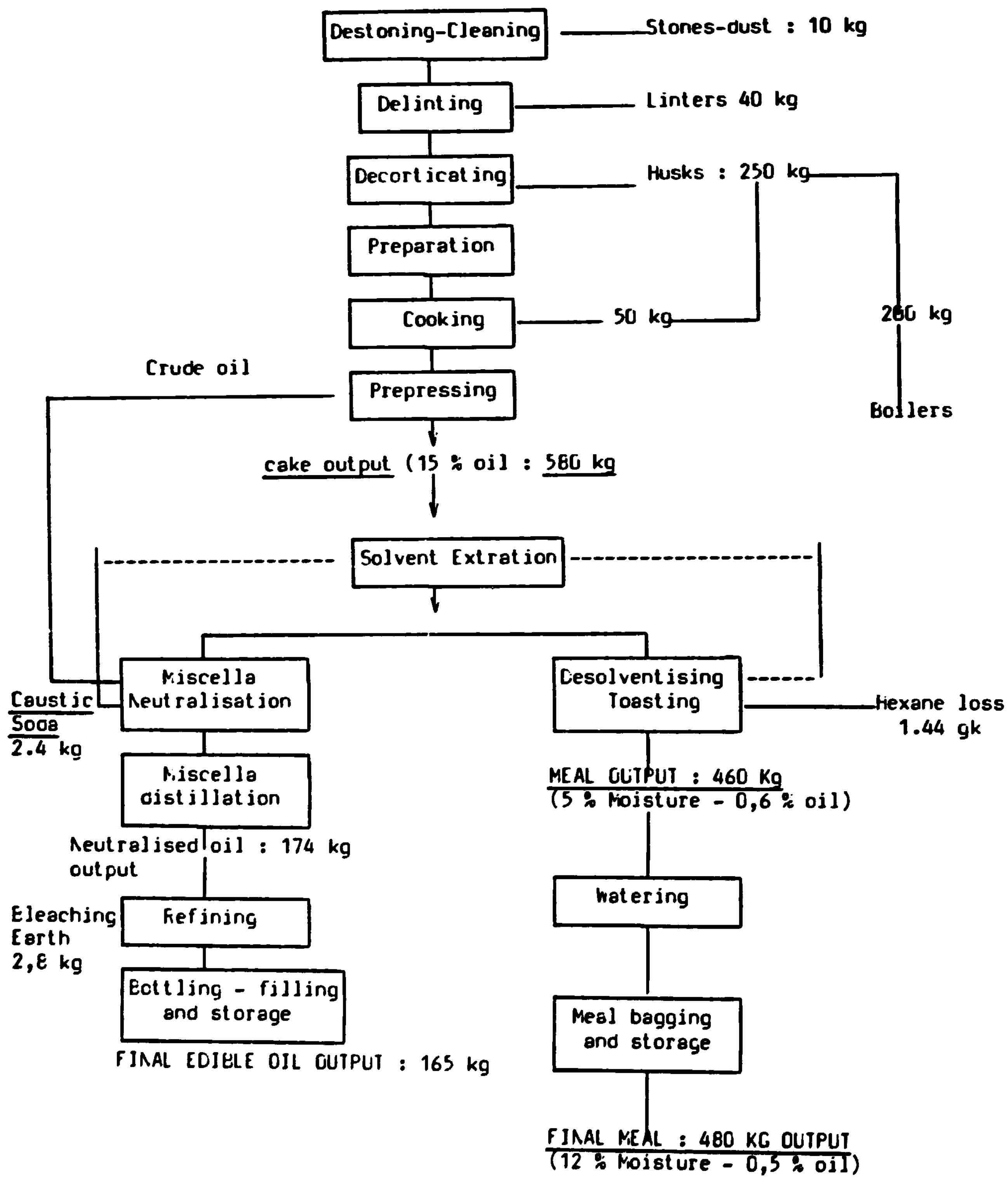
Therefore, the equipment will have to be cleaned at each change of quality. The time necessary will be one or two days. Each campaign will last 3 or 4 weeks.

The two following charts : Tables VI.1.1. and VI.1.2. show the processing flow diagram respectively of cotton seeds and soya beans.

ABLE VI - 1.1.

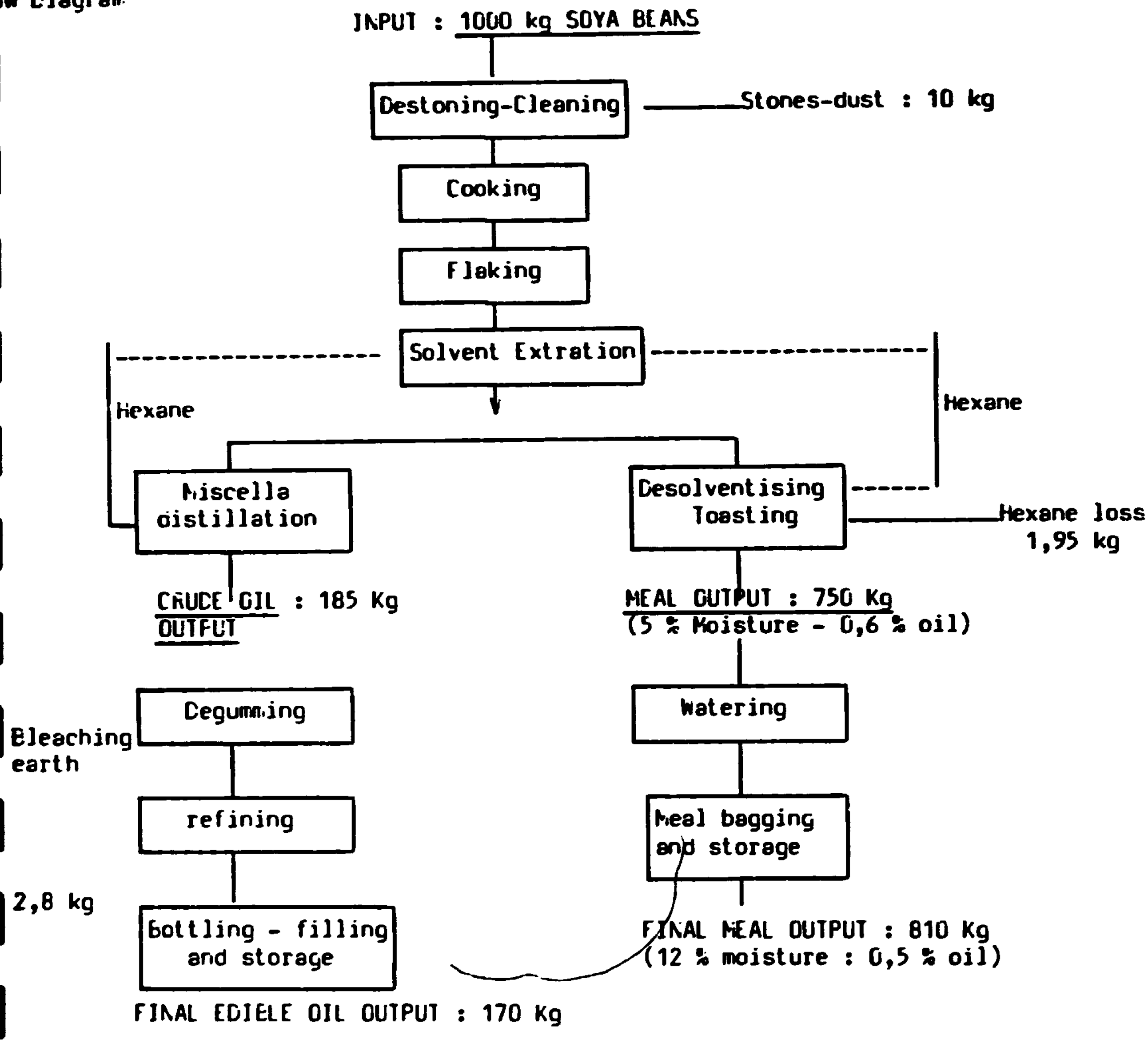
otton seeds Process Materials and Quantity Flow Diagram

INPUT : 1000 kg COTTON SEEDS



ABLE VI - 1.2

a beans Process Materials and Quantity
w Diagram



6.2.2. COMMENTS ON OTHER ALTERNATIVES

a/ Direct extraction of cotton seeds without delinting and decorticating

The advantage of this process is to reduce the capital investment and manufacturing costs. But, it produces a meal with less than 31 % profat (proteins + fats) which cannot be sold on export market and probably not interesting for the local market. This alternative is rejected.

b/ Direct extraction of cotton meat obtained after delinting and decorticating

The meat is directly sent to the solvent plant without pre-pressing. The advantages is to reduce the capital investment for the screw presses and manufacturing costs to a less extent than the preceding alternative. But the meal obtained will be less thant 38 % profat (protein + fats) and gossypol content will remain between 0,03 % and 0,10 %. This quality will be difficult to sell on export market and therefore this alternative is rejected.

6.3. PLANT DESCRIPTION

The production equipment is listed in 5 section N° 100 to N° 500. The auxiliary equipment is listed in section N° 900.

The item N°, quantity and general specifications for each item are provided in Chapter 6.4.1. hereafter. In addition a process flow sheet is provided in this study for each section of the oil mill. The main sections are the following :

a/ Section 100-1 - Cotton seeds receiving and storage

In this section, the cotton seeds are received in bags by railway trucks or road trucks. The bags are emptied in a hopper. Cotton seeds are transported through screw conveyors, bucket elevator, chain conveyors and stored in a warehouse of about capacity 9 000 MT or 40 000 m^2 covered area.

-.

A ventilation system is provided under the building floor and supply a continuous flow of cold air through the mass of cotton seeds by means of regular holes spread on the floor.

Cotton seeds are evacuated from the building by means of belt conveyors located under the floor level and transferred to delinting by means of belt elevators and bucket elevator.

b/ Section 100-2 - Soya beans receiving and storage

In this section, the soya beans are received in bags by railway trucks or road trucks. The bags are emptied in a hopper. Soya beans are cleaned then transported through screw conveyors, buckets elevator and stored in 3 silos representing a total capacity of 7 350 MT or 10 500 m^3.

A ventilation system is provided in the bottom of each silo in order to supply a continuous flow of cold air through the mass of soya beans.

Soya beans are evacuated from the silos and transfered to the preparation section (200-3) by means of screw conveyors and belt conveyors.

c/ Section 200-1 - Cotton seeds delinting

The cotton seeds transferred form the storage warehouse are stored in a day binrepresenting 6 hours of activity (DB 201), then sent to the seeds cleaners through screw conveyors, continuous scale (CSC 204). Permanent Magnet separator (MAG 205), Hopper with Level Control for the flow regulation (H 206 A/B).

Cotton seeds are freed from trask, stones, dust, mote etc.. through 4 Pneumatic-Mechanical 4 trays Cotton Seeds Cleaners (SCL 206 A/B/C/D/).

Cleaned cotton seeds are transferred to the first cut delinting section by means of screw conveyors and screw elevators.

The first cut section includes 7 delinters type : 176 saw brush system with Auto load-trol feed control DEL 213A/B/C/D/E/F/G. Lint is sucked by means of fans and tranferred to the Lint Bale Press : black cotton seeds are transported to the decorticating section.

The cotton seeds which are not delinted in first cut section are transferred to the second cut section. The latter includes 2 x 7 delinters (DEL 214 A/B/C/D/E/F/G and DEL 215 A/B/C/D/E/F/G lint is sucked and transferred to the Lint Bale Press and Black cotton seeds are transported to the decorticating section.

The Lint Bale Press (BLP 220) is of type 100 MT, single box down packing linter press, double acting ram and cylinder, automatic charging system, hydraulic side door.

d/ <u>Section 200-2 - Cotton seeds decorticating</u>

The delinted cotton seeds tranferred from the delinting section are stored in a day bin representing 6 hours of activity (DB 230), then sent to the decorticators through belt conveyor and bucket elevator, continuous scale (CSC 233). Permanent Magnet (MAG 234), hopper with Level Control for the flow regulation (H 235/LCT 235). Cotton seeds are decorticated in 5 groups of 2 equipments : the decorticator followed by the hull beater.

The decorticators (DEC 238 A/B/C/D/E are of the type : Bladed hulling Machine where after breaking husks are separated from meat by means of a fan and cyclone. Meats are cleaned and freed from sand and dust through a vibrating screen. After decorticating and cleaning, the meat is transferred to the preparation, pre-pressing section 200-3.

The husks from the above cyclone are then freed of meat which has been carried away with the husks, through the Hull Beaters (HBT 239 A/B/C/D/E). Hull Beaters are of type : Perforated Sheet Metal Rotating Horizontal Cylinder filled with an inside high speed rods beater. The husks are then separated from meat through a vibrating screen.

The meat is transferred to section 200-3. Husks are transferred to the Steam Boiler Section through a Belt conveyor.

c/ <u>Section 200-3 - Cotton meat, sunflower seeds : preparation cooking, pre-pressing.</u>
<u>Soya beans : preparation</u>

In this section, cotton meat, soya beans and sunflower seeds follow a different way which we shall describe separately.

- <u>Cotton seed meat</u>

The cotton seed meat transferred from the decorticating section is stored in a day bin representing 6 hours of activity (DB 250), then sent to the preparation through belt conveyor, bucket elevator, continuous scale (CSC 253), Permanent Magnet (MAG 234).

Then, cotton meat is crushed in 3 millimeters thick pieces through a corrugated Roller Mill : (CRM 255).
The Roller Mill is of the type :

After preparation, the cotton seed meat is transferred to the cooking through a hopper with level control for the flow regulation (H 257 A/B) screw conveyor, bucket elevator.

The cooking is made in 2 cookers (COK 261 A/B of type :

These machines are used to condition the seed in order to obtain the optimum temperature and moisture conditions for proper extraction both mechanical and solvent. During cooking, the fatty cells aree broken, gossypol is partially destroyed and transofrmed, proteins are coagulated. This result is obtained by a common action of steam jacketing an live steam.

The vertical stacked conditioner provides a moist cooling action which confers a higher nutritional property to the finished meal. The stack cooker consits of a number of superimposed steam-heated pans. The content of each pan is stirred by sweeper arms attached to a central vertical shaft. The stirring action moves the seeds over the heated pan surface according to a preset path until they reach an appropriate gate and fall through a chute down to the pan below and so forth. The first pan is fitted with spray jets whereby it is possible to add moisture to the seeds.

Each cooker is fed through a chain conveyor (CH260) in order to fill them at a maximum, the excess is recycled to the hopper H 257 A/b.

The cooked seeds are extracted from cooker by means of variable speed screw conveyors SC 262 A/b and transferred to the screw presses.

The pre-pressing is made in 2 screws presses (SCP 263 A/B). They are of type :

Pre-pressing is meaning that the cotton seeds meat is not pressed at its maximum.

Two types of products are obtained at the screw-presses :
- Crude oil
- Cakes.

Contrary to the expeller process or full press process, in the pre-pessing a certain amount of oil (15 - 18 %) is left in the cake.

The remaining oil in cake will be further extracted through the solvent process.

The advantage is to increase the screw press capacity at a reasonable pressure and therefore to decrease the maintenance problem. It also allows to have better yields as oil content left after solvent extraction is inferior to 10 % compared to the expeller process where it is from 6 to 8 %.

The cakes obtained at the screw presses are transferred to the solvent plant through a belt conveyor.

The crude oil when leaving the press is a mix of about 80 % liquid oil and 20 % solid fines called foots.

The foots separation is obtained in 3 steps :

- First step :
  the oil mix is tranferred to a vibrating screen through a screw conveyor, intermediate tank (MXT 268 A/AGT 268 B), transfer pump (P 269 A/B). About 90 % of solid foots are separated.

- Second step :
  The oil mix with the 10 % remaining foots are transferred to 2 NIAGARA filters of the vertical type where the oil is clarified.

- Third step :
  A final clarification is obtained through a pocket filter (FLR 275).

  The solid foots separated from the liquid are regularly recycled to the hopper H257 A/B by means of a screw conveyor (SC 274).

- Soya beans

  Soya beans follow a simpler way.
  After passing through the day bin, belt conveyor, belt elevator, continuous scale, Permanent Magnet, Corrugated Roller Mill largely open, Hopper, etc... Soya beans are transferred to the cookers and from there to a Roller Flaker.

  The Roller Flaker (SCP 264) is of the type :

- The Roller Flaker is aiming at obtaining seed particles reduced to 0.25 - 0.35 millimeters thick flakes in order to make the oil extraction easier through the solvent process.

  From the Roller Flaker, soya flakes are transferred to the solvent Plant through the belt conveyor (BC 266).

- Sunflower seeds

  Sunflower seeds are treated in the following way :
  - Day bin, continuous scale, Magnet
  - Corrugated roller Mill
  - Hopper
  - Cookers
  - Pre-pressing
  - Cakes to solvent plant
  - Crude oil to foots separation.

SECTION 300 - Solvent Plant and Miscella neutralization

The solvent Plant is fed with pre-pressing cotton seeds and sunflower cakes with an oil content of 15 - 16 % or with soya beans flakes with an oil content of 18 - 20 %.

The solvent Plant is aiming at extracting the above oil by percolation with a solvent.The solvent generally utilized is an hydrocarbure called hexane, in order to obtain as final product :

- Meals with an oil content inferior to 1,0 %
- The remaining crude oil which was not extracted during the pre-pressing operation.

In addition, an important improvement is proposed in the project, which consists of neutralizing the cotton seeds oil when it is dissolved in hexane (the name of oil solution in hexane is caled miscella).

a/ The sections of a solvent plant are the following :

- 300-1 - Percolation where the oil seeds cakes or soya beans flakes are crossed by a flow of liquid hexane. During this operation, the oil is passing from the cakes or flakes to the hexane until reaching a solution (miscella) with a content of about 20 % oil and 80 % hexane.

- 300-2 - Desolventizing - toasting where the meals after percolation are freed from the hexane which is carried out the percolator. Hexane is evaporated by means of a steam heating system (coils, double-jacket) and live steam which is injected in the mass of meals. The hexane vapors are recovered in the section 300-3 : Miscella distillation system hereafter.

  Live steam is not only helping to hexane evaporating, but also makes a toasting of meal. This toasting is also improving the quality of meals especially soya beans meals in which urease and antitrypsin must be distroyed in order to make the soya beans meal digestible in stockfeeds for monogastric animals.

- 300-3 - Miscella distillation system where the oil/hexane solution is submitted to a distillation process. Hexane only is evaporated, condensed and recycled to the percolation process.

- 300-4 Miscella neutralization : especially designed for cotton seeds oils. Before refining, cotton seeds oils from pre-pessing and solvent plant are generally of very poor quality as compared with soya beans oils or sunflower oils. Cotton seeds oil contains a certain amount of free fatty acids which are prodcued inside the seeds ater the crop by an enzyme (lipase) during transport and storage. These free fatty acids are carried away by reaction with caustic soda producing a soap. This soap is separated from oil through a centrifuge separator. The soap obtained is called soap stocks.

In addition, cotton seeds oil contains a contaminant called gossypol. This gossypol is destroyed with an excess of caustic solda and will be recovered with the soapstocks.

The cotton seed oil must be neutralized as fresh as possible. Consequently, it is better to neutralize it when it is dissolved in the miscella. Furthermore, due to an important difference of specific gravity between the soapstocks and miscella the centrifuge separator is very efficient. The soapstocks are thereafter mixed to the meals before entering the desolventizer-toaster.

Soya beans oil and sunflower oil do not pass through the miscella neutralization plant.

b/ The process in solvent plant is therefore as follows :

The Solvent Extractor (SE 303) or Percolator is fed in continuous with pre-pressing cakes or soya flakes through a chain conveyor, variable speed screw conveyor, and rotary valve. The solvent extractor proposed is of the type : Moving Belt extractor. The cake are spread on the belt and make a bed of about : 8 to 10 meters long, 2 meters wide, 1.70 to 2.00 meters high. Extraction is obtained by a flow of Hexane in countercurrent, the fresh hexane encounters the meals before they leave the percolator.

- The meals leaving the Extractor are transferred to the Desolventizer-toaster (DT 305) through a chain conveyor . The D.T is constructed and works as a cooker previously described in section 200-3. It is composed of 5-6 stacks. The meals are discharged in continous from the D.T by a variable speed screw conveyor and transferred to the meals bagging and storage through a belt conveyor. During transport, meals are watered in order to cool them and to increase the water content until a normal 12 %. The hexane vapors are conveyed to the miscella distillation system.

- The miscella leaving the extractor is transferred to the miscella distillation system through a miscella tank. The distillation system is a set of evaporators and condensers so that hexane is recovered as liquid and oil is recovered free of hexane.

- In case of miscella neutralization, the miscella is transferred to 3 mixing tanks where it is mixed in batch process with pre-pressing crude oil. After measuring the necessary caustic soda according to the free fatty acids content, the miscella and caustic soda are transferred in continuous to a mixer and thereafter, soapstocks are separated from neutralized miscella through a centrifuge separator. The neutralised miscella is transferred to the miscella distillation system. The soap stocks are transferred to the D.T.

- Section 400 - Refining and oil storage

The crude oil obtained at the pre-pressing section -section 200-3) and at the solvent plant (section 300) are transormed in edible oil through the refining porcess.

Two cases are possible :

- Neutralized cotton seeds oil
- Crude soya beans oil and sunflower oil.

a/ Neutralized cotton seeds oil

Cotton seed oil has been previously neutralized in hexane solution (miscella) in the solvent plant. After hexane evaporation, the neutralized cotton seeds oi is stored in a tank.

From this tank, neutralized cotton seeds oil is transferred to the Bleaching Plant through an intermediate tank representing 6 hours of activity (TK401) and feeding pump (P 402).

The bleaching process consits of submitting the oil previously heaten to the action of bleaching earth. In contact with oil, the bleaching earth adsorbs the pigments and colouring materials. Thereafter, the bleaching earth is separated from oil by filtration. The oil obtained is therefore discoloured from brown to yellowish.

The bleaching is done in continuous through a bleaching earth metering device (MET 404), mixer for slurry preparation (MIX 405) and continuous bleacher (BL 408). This operation is done under vacuum in order to avoid overheating and contact with air oxygen. The filtration is discontinuous through 2 filters (FLR 412 A/B) of vertical NIAGARA type working in parallel. The bleached oil is stored in intermediate tank (T 415). After filtration the bleaching earth is discarded.

From this tank, the bleached oil is tranferred to the deodozizing plant through the feeding pump (P 420).

The deodorization process consists to blow live steam through the mass of oil heaten at 200-230°C under a very high vacuum (3 -5 torrs). Under these conditions the remaining fatty materials and odoriferous matter are carried away with the steam flow, and condensed in the vapors washer VCL 429). The deodorized oil must be cooled from 200-230°C to 60°C in order to avoid the oil oxydation and eventually burning. Heating-cooling is obtained in counter current oil/oil plate heat exchangers (HE 423 A/B).

The deodorization is done in continuous through a deaerator (DAR 421) and deodorizor (DEOD 4 4). The deodorizor is the master piece of this plant. It consits of a vertical column in which 3 vessels are piled. Each vessel is separated with partition plates including live steam injectors. There is continuous vertical flow from upper vessel to lower vessel, and horizontal flow in each vessel by means of overlow system. In addition a thermo oil steam coil is heating the oil in upper vessel. This termo oil is heaten in thermo-oil boiler (TFB 442). High vacuum is obtained by means of 4 stages set : steam ejector (STE A/B/C/) vacuum pump (VP438). The fatty acids and odoriferous materials are stored in tank T 435. They can be sold to Soap Makers. Deodorized oil is stored in intermediate tank (TK 432) for quality control before transferred to edible oil storage tanks.

b) Soya beans oil - sunflower oil

Soya beans oil and sunflower oil are not neutralized in solvent plant because of gums which are disturbing the process. Consequently, these oils are degummed and bleached together in the bleaching process by means of addition of phosphoric acid to the bleaching earth in in view of neutralizing the phosphoric acid in excess.

After filtration, the bleached oil is submitted to deodorization in which the fatty acids are distilled.

ALTERNATIVE CONVENTIONAL CHEMICAL REFINING

This process is proposed as an alternative to the main proposal, which consists of :

- for crude cotton seed oil : miscella neutralization followed by bleaching and deodorization

and

- for soya bean and sunflcwer oils physical refining i.e. : degumming, bleaching plus desacidification and deodorization.

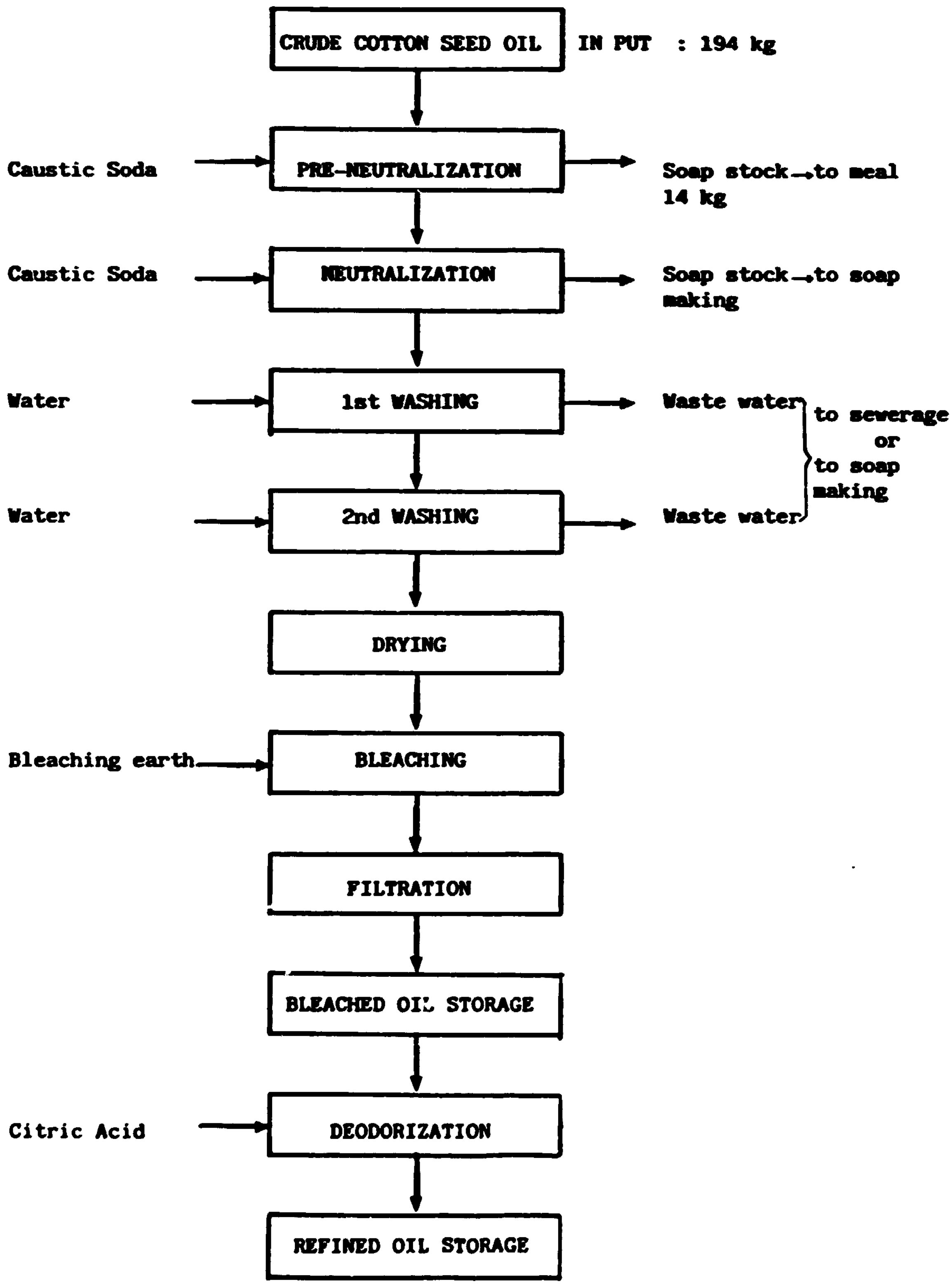
Because of the gossypol content in crude cotton seed oil, refining is very difficult. The gossypol in the crude cotton seed oil must be removed by a reaction with caustic soda as quickly as possible after oil extraction from the seed. The result obtained is not very opportune, the refined oil is very darkly coloured. It is therefore blended with soya bean oil and is than sold as vegetable oil.

To remove the gums and the lecithin (soya bean oil only) crude soya bean and sunflower oil have to be treated with phosphoric acid.

Tables VI 1.3 and VI 1.4 show the flow-diagrams for the chemical refining.

TABLE VI 1.3

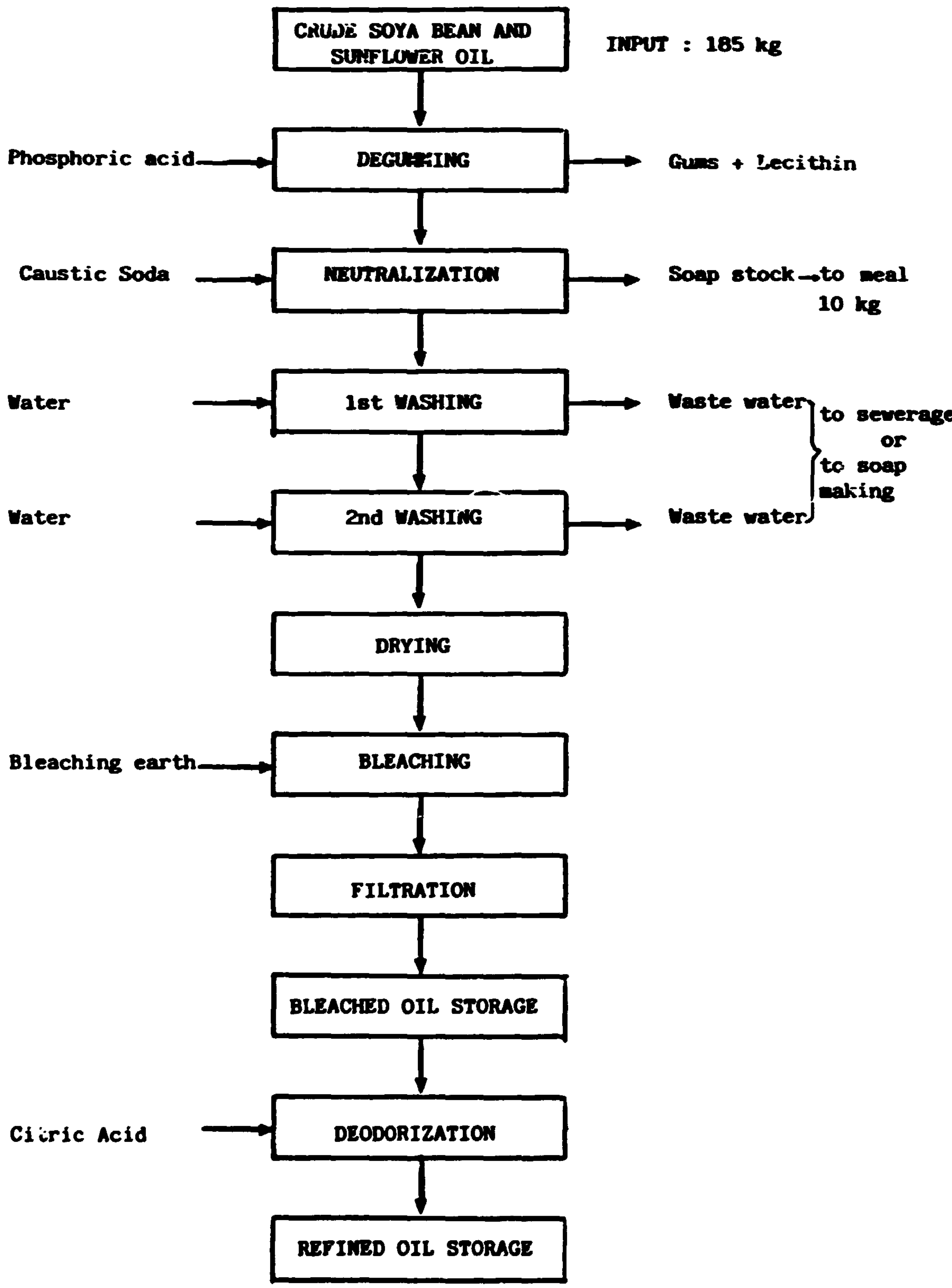
CRUDE COTTONSEED OIL CHEMICAL REFINING



FINAL EDIBLE OIL OUTPUT 165 kg

TABLE VI 1.4

CRUDE SOYA BEAN AND SUNFLOWER OIL CHEMICAL REFINING



FINAL EDIBLE OIL OUTPUT : 170 kg

PLANT DESCRIPTION

Section 400 - Refining and oil storage.

The crude oil obtained at the pre-pressing section (200-3) and at the solvent plant (section 300) is transformed in edible oil through the refining section.

Using the similar type of equipment as described in the main proposal (page 207) the refining is carried out in the following sections.

- neutralization plant
- bleaching plant
- deodorization plant

Neutralization Plant.

Two different processes have to be followed.

- Neutralization of crude cotton seed oil.
- Neutralization of crude soya bean/sunflower oil.

Neutralization of crude cotton seed oil

The neutralization of cotton seed oil is a continuous process which comprises the following steps.

a. Pre-neutralisation

Crude cotton seed oil is pumped and measured (volumetric) continuously, heated and mixed with a measured quantity of a caustic soda solution in order to neutralize the free fatty acid content. The chemical reaction produces a matter called soap stock. The soap stock, which has a higher specific gravity than the oil is removed through the first centrifugal separator.

The oil is transferred to the next process step ; the soap stock is transferred to a storage tank from where it is either mixed with the meal from the solvent plant or is used for the manufacturing of soap.

b. Neutralization

This second step is carried out with identical equipment as described above. However, an excess of caustic soda is mixed with the oil to destroy the gossypol. The soap stock is removed by the second centrifugal separator.

The oil is transferred to the next process step while the soap stock is transfered and used as above.

c. First washing

The neutralized oil has to be freed of the soap which was not removed through the centrifugal separators.

For this the oil is mixed continuously with hot water which is than removed by a third centrifugal separator.

The oil is transferred to the next process step while the waste water is either spilled in the sewerage or is mixed with the soap stock for the soap manufacturing.

d. Second washing

The pre-washed oil is washed a second time similarely as above. The waste water is separated by a fourth centrifugal separator. The oil is transferred to the next process step while the waste water is dealt with as above.

c. Drying.

The neutralized and washed oil is freed of remaining water by continuous drying under vacuum, after which the oil is transferred to the bleaching plant.

Remark : The centrifugal separators are of the type with bottomflush and auto-mud separator.

Neutralization of crude soya bean/sunflower oil

The neutralization consists of the following steps.

a. Degumming

Crude soya bean and sunflower oil is mixed on a continuous basis with a solution of phosphoric acid. Gums and lecithin (soya bean only) are precipitated and than removed through the first centrifugal separator.

Lecithin may be recovered and sold as an emulsifiant on the local market or treated as gums and mixed with the soapstock.

b. Neutralization

Neutralization is carried out on a continuous basis to neutralize the free fatty acids present in the crude oil with a slight excess of caustic soda. Soap stocks are removed through the second centrifugal separator.

The soap stock is mixed with the meal from the solvent plant.

First and Second Washing and Drying.
These process steps are carried out similarely to the description for the cotton seed oil.

Bleaching - Deodorization

These two processes are described in Chapter 6.3., pages 207-209, PLANT DESCRIPTION - SECTION 400 Refining and oil storage.

- Section 500-1 - Edible oil bottling, filling, storage

Edible oils will be sold in several types of packagings :
. Glass bottles : capacity : 37,5 cl, 50 cl, 75 cl
. Metal or plastic containers : 2,5 and 5 liters
. Drums : 200 liters.

Two types of edible oils will be sold :
. Vegetable oil : blend of cotton seeds oil and soya oil
. Sunflower oil.

The mixing of cotton seeds oil and soya oil will be operated in the mixing tank MKT 501. For the purpose, each type of oil will be pumped from refined oil storage tanks TK 446 and TK 447 in the foreseen ratio. The quantity of blended oil which will be prepared is representing from 6 to 8 hours of filling equipment.

The sunflower oil will be transfered directly to the filling lines.

The bottling, filling is done in 4 separate lines.

Line A : Glass bottles 37,5 cl and 50 cl

The line is fed by an intermediate tank TK 503. The bottles are filled at the production speed of 1 500 bottles, 37.5 cl per hour or 2 000 bottles 50 cl per hour in a filling machine including 6 filling pistons. Thereafter, each bottle is capped in a multi capping machine and labelled in a labelling machine. The bottles are put by hand in cartons over a roller conveyor and then put on pallets.

Line B : Glass bottles 75 cl

THe line is fed by an intermediate tank TK 508. Filling, capping and labelling are operated on the same type of equipment as above. Production speed is 5 000 bottles per hour. Bottles are further put in cartons as above.

Line C : Plastic or metal containers : 2,5 and 5 liters

The line is fed by an intermediate tank TK 513. The containers are filled at the production speed of 250 containers 2,5 liters per hour or 120 containers 5 liters per hour in a measuring filling machine. Capping and labelling are hand processed.

Line D : Drums

Drums are filled separately on a filling dial scale.

Section 500-2 - Meals bagging and storage

Meals from solvent plant are transfered to meals bagging and storage by means of belt conveyor BC 310 where they are watered in order to cool them and increase the water content to 12 %.

Thereafter, meals are transfered to 3 filling bagging scale by means of bucket elevator (BE 521) and screw conveyor (SC 522).

After filling, the backs are closed by means of a serwing machine and stacked in storage warehouse before shipping.

6.3.2. UTILITIES (see C 228-A-901 and 902 Schemes)

6.3.2.1. Water/steam

- Well water is tranfered in the vessel V 901. From it, water is dispatched to :

  . Utilities (cleaning, process, cooling tower make up and steam boiler) by P 902 pump.

  . Fire protection network by P 903 A,B pumps (diesel and electrical motor coupling).

  Before feeding the steamboilers (F 907 A,B) by 907 A,B pumps, this water is partially demineralized on ion exchangers V 905 and V 906 (regeneration with salt by 912 pump and V 911 tank).

- Two steam boilers are designed : the first F 907 A in normal function from husks as fuel feeding and F 907 B, in emergency function, in case of shut down or stop of the first boiler. This second boiler is fed by coal as fuel.

  . The steam network includes two pressure levels : 12 and 4 bars effective. The 12 bar steam is used for steam ejector in refining section. The 4 bar steam is used principally in the solvent plant (hexane recovery), refining section and seed cooking section. The major part of condensates is recycled in the boiler feed water tank V906 through the E 908 blowdown cooler.

6.3.2.2. Cooling water

Two atmospheric cooling water towers are installed.

The first A 951 works in network loop (P 952 pump) principally for the solvent section and the pre-pressing section.

The second A 953 works in network loop principally for the refining section (P 954 pump).

For both equipment, a permanent blow down permits the deconcentration in mineral salts.

6.3.2.3. Compressed air

The compressed air network is feeded by C-961 air compressor with air cooler and tank separator V 962. This air is dispatched to the process (control and utility) and utilities.

6.3.2.4. Power

- The plant is feeded by 33 KVolt network. The total installed power is about 2 000 Kw.

- Three low voltage substations are installed :
  . two (1000 KVA)with the height voltage station
  . one (800 KVA)with the direct generator (400 KVA)
  They include: power transformer, bus bar, switchboard protection.

- Diesel emergency generator feeds the essential services equipment or sections : (solvent plant, refining plant, steam boilers, compressed air and cooling towers, fire pump).

- Electrical motors are designed as asynchrom watertight except for solvent plant when they are explosion proof.

- Lighting is designed with minimum features as following :

. in door :	production	200 lux
	offices	300 lux
. out door :	storage	100 lux
	road	50 lux.

6.4. EQUIPMENT LIST

6.4.1. PRODUCTION EQUIPMENT

Section 100-1- Cotton seeds receiving and storage

ITEM	QUANTITY	DESIGNATION
H 101	1	BAGS UNLOADING HOPPER
SC 102	1	SCREW CONVEYOR
BE 103	1	BUCKET ELEVATOR
SC 104	1	SCREW CONVEYOR
XHC 105 A/E	1	CHAIN CONVEYORS
F 106	1	FAN
BC 107/A/B	1	BELT CONVEYOR
BC 109	1	BELT CONVEYOR
BE 110	1	BELT ELEVATOR
BC 111	1	BELT CONVEYOR

Section 100-2 - Soya beans - Reception - Cleaning storage

ITEM	QUANTITY	DESIGNATION
H 112	1	SCREW CONVEYORS
SC 113	1	BUCKET ELEVATOR
SC 114	1	BUCKET ELEVATOR
SCL 115	1	SEEDS CLEANER
SC 116	1	SCREW CONVEYOR
SC 117	1	SCREW CONVEYOR
BE 118	1	BUCKET ELEVATOR
CHT 119 A,B,C	1	CHUTE 3 DIRECTIONS
SBS 120 A,B,C	1	STORAGE SILOS Each capacity 3500 m^3
SC 121 A,B	2	EXTRACTION SCREW CONVEYORS
SC 122	1	EXTRACTION SCREW CONVEYOR
BC 123	1	BELT CONVEYOR

Section 200-1 - Cotton seed delinting

ITEM	QUANTITY	DESIGNATION
DB 201	1	DAY BIN
SC 202	1	SCREW CONVEYOR
SC 203	1	SCREW ELEVATOR
SCS 204	1	CONTINUOUS SCALE Type : Avery continuous metering flow belt
MAG 205	1	PERMANENT MAGNET SEPARATOR Type : Permanent Magnet Drum
H 206 A,B	1	HOPPER WITH LEVEL CONTROL
SC 207 A	1	SCREW CONVEYOR FOR SEED CLEANERS FEEDING
SC 207 B	1	SCREW CONVEYOR FOR SEEDS AND LINTERS OVERFLOW
SCL 208	1	SEEDS CLEANERS type : Pneumatic mechanical (four-tray cotton seeds cleaners
SC 209	1	SCREW CONVEYOR
SCE 210	1	SCREW ELEVATOR

ITEM	QUANTITY	DESIGNATION
SC 211 A,B,C	3	SCREW CONVEYORS TO FEED DELINTERS
SC 212 A,B	2	CONNECTON SCREW CONVEYORS
SC 212 C	1	SCREW CONVEYOR
DEL 213 A,B,C,D,F,G	7	FIRST CUT DELINTERS Type : 176 saw brush delinter feeder with magnetic seed slide auto load trol feed control.
DEL 214 A,B,C,D,E,F,G	7	SECOND CUT DELINTERS 1ST GROUP Type : 176 saw brush delinter feeder with magnetic seed slide auto load trol feed control.
DEL 215 A,B,C,D,E,F,G	7	SECOND CUT DELINTERS 2ND GROUP delinter feeder with magnetic seed slide auto load trol feed control.
SC 216 A,B,C	3	SCREW CONVEYORS TO COLLECT DELINTED SEEDS
SC 217 A,B,C	3	SCREW ELEVATORS
SC 218	1	SCREW CONVEYOR FOR TRANSFER DELINTED SEED TO DECORTICA-TING

ITEM	QUANTITY	DESIGNATION
SC 219	3	SCREW CONVEYOR FOR MOTES TRANSFER
BC 220	1	BELT CONVEYOR FOR LINT TRANSFER
SC 221	1	SCREW CONVEYOR FOR FRESH UNDER SEED CLEANERS
F222 A,B,C	3	SET OF FANS, CYCLONES, PIPES FOR LINT FROM DELINTERS
F 223	1	FAN FOR LINT TRANSFER TO LINT PRESS
F 220	1	SET OF FAN, CYCLONE, PIPES FOR DELINTER MOTE PICK-UP SYSTEM
BLP 226	1	LINTER BALER PRESS Type : 100 MT, single box down packing linter press, double acting ram and cylinder. Automatic charging system hydraulic side door Pumping and pressure unit set Bale bagging system

ITEM	QUANTITY	DESIGNATION
Section 200-2 - Cotton seeds decorticating		
DB 230	1	DAY BIN 8 hours activity or 102 MT
BC 231	1	BLET CONVEYOR
B 232	1	BUCKET ELEVATOR
CSC 233	1	CONTINUOUS SCALE Type : Avery Continuous metring flow belt.
MAG 234	1	PERMANENT MAGNET SEPARATOR Type : permanent Magnet drum.
H 235 LCT 235	1	HOPPER WITH LEVEL CONTROL
SC 236 A	1	SCREW CONVEYOR FOR CHAIN CONVEYOR FEEDING
SC 236 B	1	SCREW CONVEYOR FOR SEEDS OVERFLOW
BE 236C	1	BUCKET ELEVATOR FOR SEEDS OVER FLOW RECYCLING TO HOPPER
CHC 237	1	CHAIN CONVEYOR FOR DECORTICAITNG FEEDING
DFC 238 A,B,C,D,E	5	COTTON SEEDS DECORTICATORS Type : bladed hulling machine kernel sifting fan, cyclone, and pipings set for husks.

ITEM	QUANTITY	DESIGNATION
HBT 239 A,B,C,D,,E	5	HULL BEATERS Type : perforated sheet metal rotating horizontal cylinder fitted with an inside high speed rods beater, Complementary sifting system.
BC 240 A	1	BELT CONVEYOR FOR MEAT
BC 240 B	1	BELT CONVEYOR FOR MEAT
BC 240 C	1	BELT CONVEYOR FOR MEAT TRANSFER TO PREPARATION, COOKING, PRE-PRESSING SECTION.
BC 241 B	1	BELT CONVEYOR FOR HUSKS TRANSFER TO BOILER SECTION

Section 200-3 - Cotton meat - sunflower seeds : preparation cooking pre-pressing - soya bean preparation

ITEM	QUANTITY	DESIGNATION
BE 249	1	BUCKET ELEVATOR
DE 250	1	DAY BIN 8 hours activity or 75 MT
BC 251	1	BELT CONVEYOR
BE 252	1	BUCKET ELEVATOR
CSC 253	1	CONTINUOUS SCLAE Type : Avery Continuous metering flow belt.
MAG 254	1	PERMANENT MAGNET SEPARATOR Type : permanent Magnet drum. Capacity : 10 MT/hr.
CRM 255	1	CORRUGATED ROLLER MILL
BE 256	1	BUCKET ELEVATOR
H257 A,B	1	HOPPER WITH LEVEL CONTROL
SRC 258	1	SCREW CONVEYOR
BE 259	1	BUCKET ELEVATOR
CHC 260	1	CHAIN CONVEYOR FOR COOKERS FEEDING
CDK 261 A,B	2	COOKERS
SC 262 A,B	2	SCREW CONVEYORS FOR PRESSES FEEDING

ITEM	QUANTITY	DESIGNATION
COK 261 A,B	2	COOKERS
SC 262 A,B	2	SCREW CONVEYORS FOR PRESSES FEEDING
SCP 263 A,B	2	HEAVY DUTY PRESSES
SCP 264	1	SCREW CONVEYOR FOR ROLLER FLAKER FEEDING
RFL 265	1	ROLLER FLAKER FOR SOYA BEANS PREPARATION
BC 266	1	BELT CONVEYOR FOR SOLVENT PLANT FEEDING
SC 267	1	SCEW CONVEYOR FOR FOOTS SEPARATION FEEDING
MXT 268 A AGT 268 B	1	MIXING TANK FOR CRUDE OIL + FOOTS (20 % MAX SOLID FOOTS SUSPENDED IN CRUDE OIL
P 269 A,B	2	TRANSFER PUMP TO SCREENER Type : vertical immersed Automatic starting
SRC 270	1	FOOTS SCREENER Type : vibrating foots screener, 1 deck.
TK271	1	INTERMEDIATE TANK
P 272	1	TRANSFER PUMP Type : centrifuge

ITEM	QUANTITY	DESIGNATION
FLR 273 A,B	1	FOOTS SEPARATION FILTER Type : Niagara vertical filter
SC 274	1	SCREW CONVEYOR FOR FOOTS RECYCLING TO SC 259
FLR 275	1	CRUDE OIL FILTER

Section 300-1 - Solvent Plant-Percolation

ITEM	QUANTITY	DESIGNATION
CH 301	1	CHAIN CONVEYOR
SC 302	1	SCREW CONVEYOR FOR EXTRACTOR FEEDING
SE 303	1	SOLVENT EXTRACTOR Belt type 5-6 washing pumps/stages.

Section 300-2 - Desolventizing - toasting

ITEM	QUANTITY	DESIGNATION
SC 304	1	SCREW CONVEYOR FOR DESOLVENTIZER- TOASTER FEEDING
DT 305	1	DESOLVENTIZER - TOASTER Type : Cylindric vertical 5-6 stacks
BC 310	1	BELT CONVEYOR FOR DESOLVENTIZED MEAL

Section 300-3 - Miscella distillation system

ITEM	QUANTITY	DESIGNATION
CY 306	1	DESOLVENTIZER - TOASTER SCRUBBING CYCLONE
ME 307	1	MISCELLA EVAPORATOR
ME 315	1	SECOND STAGE MISCELLA EVAPORATOR
DSC 319 A,B	2	DOUBLE EFFECT OIL STRIPPPING COLUMN
HE 316/318	2	HEAT EXCHANGERS
D 314/317/320	3	MISCELLA/OIL TRANSFER PUMPS
HE 308	1	HEAT EXCHANGER COOLER
HE 311	1	HEAT EXCHANGER COOLER
D 341	1	DECANTOR OF HEXANE/ WATER SEPARATION
P 342	1	TRANSFER PUMP HEXANE TO STORAGE
P 343	1	TRANSFER PUMP WATER TO SEWAGE SYSTEM
S 344	1	WATER STRIPPER FOR STRIPPING THE PROCESS WATER OF THE RESIDUAL SOLVENT BY MEANS OF STRIPPING STEAM

ITEM	QUANTITY	DESIGNATION
TK 345	1	HEAT EXCHANGER COOLER FOR HEXANE VAPORS FROM DECANTOR
AC 348/352	2	ABSORPTION COLUMS FOR UNCON-DENSABLE VAPORS WASHING
F 349	1	EXHAUST AIR FAN
P 350/353	2	TRANSFER PUMP FOR ABSORPTION OIL
HE 351/354	2	HEAT EXCHANGERS
TK 381/382	2	HEXANE STORAGE TANKS
P 383	1	HEXANE TRANSFER PUMP.

Section 300-4 - Miscella neutralization

ITEM	QUANTITY	DESIGNATION
MTK 371 A,B,C	3	Mixing tanks for the mixing of miscella, crude oil and hexane
P 372	1	Metering pump
MIX 373	2	HEAT EXCHANGERS/STOK MIXERS PER ADDITION OF PHOSPHORIC ACID AND CAUSTIC SODA
MIX 374	1	VERTICAL AGITATED MIXER FOR SOAP PARTICLES AGGLO-MERATION
HE 375	1	HEAT EXCHANGER
CS 376	1	CENTRIFUGE SEPARATOR FOR THE SEPARATION OF NEUTRALIZED MISCELLA AND SOAPSTOCKS
TK 377	1	SOAPSTOCK STORAGE TANK
TK 378	1	NEUTRALIZED MISCELLA STORAGE TANK
P 379	1	TRANSFER PUMP OF NEUTRALIZED MISCELLA TO THE SECTON 300-3 MISCELLA DISTILLATION SYSTEM
P 380	1	TRANSFER PUMP OF SOAPSTOCKS TO THE SECTION 300-2 DESOLVENTIZER TOASTER.

Section 400-1 - Refining : bleaching deodorisation

ITEM	QUANTITY	DESIGNATION
TK 401	1	INTERMEDIATE CRUDE OIL STORAGE TANK
P 402	1	FEEDING PUMP
H 403	1	HOPPER FOR BLEACHING EARTH
MET 404	1	BLEACHING EARTH METERING DEVICE Type : continous screw
MIX 405	1	MIXER FOR SLURRY PREPARATION
HE 406	1	HEAT EXCHANGER Type : Plate exchanger
DRY 407	1	DEAERATOR DRYER Type : cylindric conical bottom.
BL 408	1	CONTINUOUS BLEACHER Type : Vacuum bleacher with two partitions. heating system 4 bars in outside jacket.
BC 409	1	BAROMETIC CONDENSER
VP 410	1	VACUUM PUMP
P 411	1	FILTERING PUMP

ITEM	QUANTITY	DESIGNATION
FLR 412 A,B	2	BLEACHING FILTERS Type : Vertical Niagara filter
P 413	1	TRANSFER PUMP
FLR 414	1	POCKET FILTER
TK 415	1	INTERMEDIATE BLEACHED OIL TANK
MIX 416	1	PRE-COAT MIXER
P 417	1	PRE-COAT PUMP
TK 418	1	SET FOR OIL RECOVERY FROM FILTERS BLOWING
P 420	1	FEEDING PUMP OF BLEACHED OIL TO DEODORIZATION
DAR 421	1	DEAERATOR
P 422	1	TRANSFER PUMP TO DEODORIZOR
HE 423 A,B	2	HEAT ECHANGERS Type : Oil - oil plate exchanger.

ITEM	QUANTITY	DESIGNATION
DEO 424	1	DEODORIZOR Type : vertical column, double jacketed 3 deodorization vessels in serial each fitted with partition plates, live steam injectors, overflow system. The upper vessel is fitted with an heating coil by means of thermo-fluid liquid.
P 425	1	EXTRACTION PUMP OF OIL FROM THE DEODORIZOR
P 426	1	TRANSFER PUMP TO THE POCKET FILTER OF DEODORIZED OIL
HE 427	1	HEAT EXCHANGER DEODORIZED OIL COOLER
FL 428	1	POCKET FILTER
VCL 429	1	VAPORS WASHER
P 430	1	CIRCULATION PUMP FOR THE VAPORTS WASHER
P 431	1	EXTRACTION PUMP FOR FATTY ACIDS
TK 432	1	DEODORIZED OIL INTERMEDIATE STORAGE
TK 435	1	FATTY ACIDS STORAGE

ITEM	QUANTITY	DESIGNATION
TK 434	1	FATTY ACIDS INTERMEDIATE TANK, WORKING UNDER VACUUM
HE 433	1	HEAT ECHANGER FATTY ACIDS COOLER
STE 436 A,B,C	1	GROUP OF 2 STEAM EJECTORS AND AIR EJECTOR FOR HIGH VACUUM IN DEODORIZOR
BC 437	1	BAROMETRIC CONDENSER
VP 438	1	VACUMM PUMP
P 439	1	SOFT WATER CIRCULATION PUMP
HE 440	1	HEAT EXCHANGER
HE 441	1	SOFT WATER STORAGE
TFB 442	1	THERMO OIL BOILER SET Type : monobloc, forced circulation, burner with gas-oil mechanical spray. Automatic system and panel board thermo-oil transfer pump.
TK 443	1	GAS OIL STORAGE TANK

Section 400-2 - Oil storage

ITEM	QUANTITY	DESIGNATION
TK 444 A,B,C,D	4	CRUDE OIL STORAGE TANKS Capacity : 540 m^3 or 460 MT each.
P 445	1	TRANSFER PUMP TO REFINING OR MISCELLA NEUTRALIZATION Capacity : 20 m^3/hr
TK 446	1	REFINED OIL STORAGE TANK FOR COTTON SEEDS OIL Capacity : 450 m^3 or 400 MT.
TK 447	1	REFINED OIL STORGE TANK FOR SOYA BEAN OIL Capacity : 450 m^3 or 160 MT
TK 448	1	REFINED OIL STORAGE TANK FOR SUNFLOWER OIL Capacity : 110 m^3 or 100 MT
P 449	1	TRANSFER PUMP TO BOTTLING, FILLING SECTION

Section 500-1 - Edible oil bottling - filling storage

ITEM	QUANTITY	DESIGNATION
MTK 501	1	MIXING TANK FOR VEGETABLE OIL - BLENDING (COTTON SEEDS OIL - SOYA BEANS OIL Capacity : 6-8 hours of activity
P 502	1	TRANSFER PUMP TO BOTTLING FILLING LINES

Line A : Glass bottles - small size (37.5 cl - 50 cl)

TK 503	1	Intermdeiate tank Capacity : 6-8 hours of activity
MFM 504	1	Measuring filling machine Production : 1 500 bottles 37,5 cl per hour or 2 000 bottles 50 cl per hour hour speed variator - 6 filling pistons
CPM 505	1	Multi-capping machine Production : 1 500 bottles 37,5 cl per hour or 2 000 bottles 50 cl per hour
LM 506	1	LABELLING MACHINE Production : 1 500 bottles 37,5 cl per hour or 2 000 bottles 50 cl per hour
RC 507	1	ROLLER CONVEYOR FOR CARTONS FILLING

Line B : Glass bottles - large size (75 cl)

TK 508	1	INTERMEDIATE TANK Capacity : 4 hours of activity
MFM 509		MEASURING FILLING MACHINE Production : 5 000 bottles 75 cl per hour Speed variator - 6 filling pistons
CPM 510	1	MULTI COPPING MACHING Production : 5 000 bottles 75 cl per hour
RC 512	1	ROLLER CONVEYOR FOR CARTONS FILLING

Line C : Plastic or metal container

TK 513	1	INTERMEDIATE TANK Capacity : 6-8 hours of activity
MFM 514	1	MEASURING FILLING MACHINE Production : 250 containers 2,5 l/Hr or 120 containers 5 cl/Hr
RC 515		ROLLER CONVEYOR FOR HAND CAPPING AND LABELLING

Line D : Drums filling

FSC 516	1	FILLING SCALE Type : dial scale Capacity : 0-500 Kg Accurcy : 10 g
RC 517	1	ROLLER CONVEYOR

Section 500-2 - Meals bagging and storage

ITEM	QUANTITY	DESIGNATION
BE 521	1	BUCKET ELEVATOR
SC 522	1	SCREW CONVEYOR FOR MEALS BAGGING FEEDING
FSC 523/A,B,C	3	FILLING BAGGING SCALE Type : Dial scale Capacity : 200 Kg Accuracy : 10 gr
SEM 524 A,B,C	3	SEWING MACHINE Type : Sturdy sewing machine suspended or a top level balancer
RC 525	1	ROLLER CONVEYOR

6.4.2 EQUIPMENT LIST AND SPECIFICATIONS

6.4.2.1 UTILITIES

ITEM	QUANTITY	DESIGNATION
V 901	1	SERVICE : WATER TANK
P 902 A,B	2	SERVICE : WATER PUMP
P903 A,B	2	SERVICE : FIRE PUMPS
V 904/905	2	SERVICE : DEMINERALISATION VESSELS
V 906	1	SERVICE : BOILER WATER TANK
P 907 A,B	2	SERVICE : BOILER FEED WATER PUMP
E 908	1	SERVICE : BOILER BLOW DOWN COOLER
F 909 A,B	2	SERVICE : STEAM BOILERS
PCV 910	1	SERVICE : STEAM PRESSURE CONTROL VALVE
V 911	1	SERVICE : SALT TANK
P 912	1	SERVICE : SALT PUMP
SC 914	1	SERVICE : HUSK SCREW CONVEYOR
V 913	1	SERVICE : HUSK PIT
A 951	1	SERVICE : COOLING TOWER 1

ITEM	QUANTITY	DESIGNATION
P 952	1	SERVICE : COOLING WATER PUMP
A 953	1	SERVICE : COOLING TOWER 2
P 954	1	SERVICE : COOLING WATER PUMP.
C 961	1	SERVICE : AIR COMPRESSOR
V 962	1	SERVICE : AIR TANK

6.4.2.2. Utilities equipment

HANDLING AND TRANSPORT EQUIPMENT

QUANTITY	DESIGNATION
2	TRAILER TRUCKS
1	COTTON SEED FRONT END LOADER
2	FORKLIFTS
1	HUSK FRONT END LOADER
2	WAGON HAULING ENGINE.

GENERAL SERVICES

QUANTITY	DESIGNATION
3	LIMOUSINES
2	DELIVERY TRUCKS

6.5 GENERAL LAY-OUT

The attached drawing shows the general lay-out for the oil mill.

The attached list gives the breakdown of the various buildings and installations with their surface and area.

The buildings distribution has been contemplated in order to obtain through the process a regular flow of material from the oils seeds receiving to the finished products shipping which are located on the same side of the railway line and main trucks road.

An emergeny area is provided all around of solvent plant according to the safety regulations.

Auxilliary services are installed close to the main Consumers.

With provision for an eventual extension of activity such margarine plant, soap manufacturing, stock feeds ect...it is foreseen a rectangular area of 520 M x 220 M. # 120 000 m^2 or 12 hectares.

The land of 32 hectares which has been described in paragraph 4 : location and site, is therefore very confortable and could allow to double the initial capacity of the plant.

6.6. SCOPE OF THE PROJECT

Unless otherwise specified, the project includes all civil works, buildings, machinery, equipments inside the factory boundaries (battery limits) and excludes everything being outside these boundaries except staff accomodation.

Some more precisions are necessary for particular fields :

The battery limits are considering that the future oil mill will be installed in the site of KADOMA, located near the industrial area close to a piece of land which has been recently acquired by the Cotton Market Board for its new ginnery.

The limitation factors which we will examine hereafter are the following :

- Boundaries
- Roads
- Railway
- Transport
- water supply : local or boreholes
- Electricity supply
- Combustible
- Waster disposal
- Communications system
- Manpower living conditions.

a/ Boundaries

The fence enclosing the rectangular area of 520 m x 220 m.

b/ Roads

The oil mill is bordered on its west side by the existing owl mine road. All works of improvement or widening this road is not included in the project. Only, the connection with the oil mill entrance is included.

c/ Railway

The railway line feeding the neighbouring ginnery will be extended to the oil mill, however, only the tracks installed inside the property boundaries are included in project engineering.

d/ Transport

The supply of raw materials, chemicals, packaging materials, etc.. and shippping of finished products will be done through local organization, private road transporters as : SWIFT, CLAN etc... or ZIMBABWE National railways.

Only two trucks, capacity 30 MT are foreseen for emergency transports.

e/ Water supply

The water pipe will be connected to the city water main located 1 km from the oil mill. Therefore, a pipe of 3 inches will be foreseen. A water storage of 600 m^3 including a water surpressor is also foreseen. Only the water storage, the surpressor and connection pipe inside the property boundaries arc include in the scope of project.

f/ Electricity supply

The electricity line will be connected to the 30 KV ZESA (Zimbabwe Electricity Supply Authority) main line which will be extenoed to the ginnery and then to the oil mill. This line will be connected to the oil mill substation. Only the substation and connection line inside the property boundaries are included in the scope of project.

A diesel generator is foreseen in emergency for security reasons in case of ZESA supply shutdown.

g/ Combustible

The oil mill will be normally self sufficient with its husks production from cotton seed decorticating. They will be used to produce the necessary steam. An additional supply of coal could be contemplated in emergency.

Gas-oil will be necessary for the thermo-oil boiler and trucks and diesel generators.

h/ Waste disposal

Wastes are consisting of water which will be thrown to the sewage system. The city sewage system will be extended to the oil mill but only the connection line located inside the property boundaries is included in the scope of project.

i/ Communications systems

The oil mill will need to be equipped with telephone and telex for local and international communications. The scope of project include the connections and telephone/telex equipment installed inside the property boundaries. All connections with the city main lines out of the property are not included.

j/ Manpower and staff

The whole manpower will be self accomodated and transported. Staff housing is included in the scope of the project.

6.7 CIVIL WORK AND BUILDING DESCRIPTION

See general lay out - drawing N° C 228 -A-001.

The installation includes :

6.7.1. PRODUCTION INDUSTRIAL BUILDINGS (total area 8 200 m^2)

- Cotton seeds unloading : 400 m^2
- Soya bean unloading : 200 m^2
- Cotton seed delinting : 1 000 m^2
- Cotton seed decorticating: 600 m^2
- Oil seeds preparation and pre-pressing : 800 m^2
- Solvent plant : 600 m^2
- Oil refining : 600 m^2
- Conditionning : 1 000 m^2
- Meal bagging and storage : 1 800 m^2
- Edible oil and linter storage : 1 200 m^2.

The main features of these buildings are : steel structure,floor in reinforced concrete, load 3 T/m^2, roofing in asbestos cement or profiled steel sheet, siding profiled steel sheet wiht lower part brick work or equivalent.

6.7.2. GENERAL SERVICES BUILDING (total area 1 750 m^2)

- Boiler and water treatment compressed air : 400 m^2
- General stores : 600 m^2
- Maintenance shop : 200 m^2
- H.V power and Low Voltage substation : 450 m^2
- Diesel and L.V substation : 100 m^2

The main features of these building are similar to the Industrial Building but the building ridge is lower (4 to 10 m).

6.7.3. OFFICES (total area 1 150 m^2)

- Offices : 800 m^2
- Laboratory : 300 m^2
- Watchman house : 50 m^2

Standard features : walls in brick work or masonry, roofing in asbestos cement - height : 2.8 m.

6.7.4. SPECIFIC BUILDING (area : 4 000 m^2)

Cotton seed storage (100 x 40 x 20)

Divided in two bays, steel structure, floor in reinforced concrete with air ventilation (load : 3 T/m^2) siding in profiled steel sheeet wiht lower part brick work, and roofing in asbestos cement or profiled steel sheet.

6.7.5. STORAGE AREAS (total areas : 3 250 m^2)

- Soya beans storage : 900 m^2
- Husks storage : 1 000 m^2 (side walls 1 m - pit depth : 2 m)
- Cooling towers : 200 m^2
- Crude oil storage : 400 m^2
- Refined oil storage : 300 m^2
- Coal storage : 300 m^2 (side walls 2 m)
- Water storage : 100 m^2 (side walls 1.5 m)
- Weighbridge : 50 (depth 1 m).

construction in reinforced concrete (load from 0,5 to 3 T/m^2.

6.8 TECHNICAL INVESTMENT COSTS

All technical costs have been calculated within the economical conditions prevailing in May 1988, with the following exchange rates :

1 US$ = 1.7 Z$

1 Z$ = 3.7 FF

For these technical investment costs, all the figures are expressed in ZIMBABWE dollars in order to facilitate the calculations, but the reference currency remains the French Franc.

The values of the technical investment costs are indicated in the following tables.

6.8.1. TOTAL INVESTMENT COST (1 000 ZW $)

	FOREIGN	LOCAL	TOTAL
TECHNOLOGY	7 540	564	8 104
EQUIPMENT	23 417	17 647	41 064
TOTAL	30 957	18 211	49 168

The conventional chemical refining alternative requires a higher investment cost which is estimated as follows.

- chemical refining : add. : 6.0 million FF
- miscella neutralization : deduct. : 1.3 million FF

Total additional required : 4.7 million FF

or 783 000 US$

or 1.270 000 Z$

6.8.2. SCHEDULE - ESTIMATE OF TECHNOLOGY COSTS

We consider here the costs for design, engineering, technical assistance :

Foreign	7 540
Local	564
TOTAL	8 104

6.8.3. ESTIMATE OF INVESTMENT COST : EQUIPMENT AND CIVIL WORKS

ITEM DESCRIPTION	COST		
	FOREIGN	LOCAL	TOTAL
PRODUCTION EQUIPMENT	15 513	3 039	18 552
AUXILIARY EQUIPMENT	3 307	1 573	4 880
SERVICE EQUIPMENT	462	188	650
PRIMARY STOCK OF SPARE PARTS, WEAR AND TEAR PARTS, TOOLS	1 613	123	1 736
CIVIL WORKS AND BUILDINGS	-	11 108	11 108
CONTENGENCIES	2 522	1 616	4 138
TOTAL	23 417	17 647	41 064

SUMMARY SHEET - INVESTMENT COST : EQUIPMENT

Schedule 6.8.3.1

SUMMARY SHEET – INVESTMENT COST				
Equipment PRODUCTION - UNIT : 1 000 ZW $				
Project component		Investment cost carried over		
No.	Description	Foreign	Local	Total
1	OIL SEED RECEIVING - STORAGE	1 269	248	1 517
2.1	COTTON SEED DELINTING	3 477	684	4 161
2.2	COTTON SEED DECORTICATING	1 089	214	1 303
2.3	SEED COOKING PRE-PRESSING)	3 430	668	4 098
2.4	OIL FILTRATION)			
3	SOLVENT EXTRACTION PALNT	2 525	495	3 020
4.1	REFINING	2 051	402	2 453
4.2	OIL STORAGE	928	182	1 110
5.1	EDIBLE OL BOTTLING/FILLING	610	120	730
5.2	MEALS BAGGING/STORAGE	134	26	160
	Total	15 513	3 039	18 552

SUMMARY SHEET - INVESTMENT COST : EQUIPMENT

Schedule 6.8.3.2.

SUMMARY SHEET – INVESTMENT COST

Equipment AUXILIARY - UNIT COST : 1 000 ZW $

Project component		Investment cost carried over		
No.	Description	Foreign	Local	Total
2	STEAM BOILERS/WATER TREATMENT	-	1 573	1 573
2	ELECTRICAL	1 190	-	1 190
2	WATER STORAGE	243	-	243
2	COOLING WATER	131	-	131
2	COMPRESSED AIR	88	-	88
2	HANDLING AND TRANSPORT	887	-	887
2	EMERGENCY POWER	148	-	148
2	WORKSHOP EQUIPMENT	365	-	365
2	LABORATORY	255	-	255
	Total	3 307	1 573	4 880

SUMMARY SHEET - INVESTMENT COST : EQUIPMENT

Schedule 6.8.3.3.

SUMMARY SHEET – INVESTMENT COST				
Equipment SERVICE - UNIT : 1 000 ZW $				
Project component		Investment cost carried over		
No.	Description	Foreign	Local	Total
3	INTERCOMMUNICATION	56	-	56
3	SEWAGE DISPOSAL	-	88	88
3	FIRE PROTECTION	140	60	200
3	OFFICE MATERIAL	-	40	40
3	GENERAL SERVICES TRANSPORT	226	-	226
3	WEIGHT BRIDGE	40	-	40
	Total	462	188	650

SUMMARY SHEET - INVESTMENT COST : EQUIPMENT

Schedule 6.8.3.4.

SUMMARY SHEET – INVESTMENT COST

Equipment SPARE PARTS - UNIT : 1 000 ZW $

Project component		Investment cost carried over		
No.	Description	Foreign	Local	Total
4	PRODUCTION	1 349	-	1 349
4	AUXILIARY	232	110	342
4	SERVICE	32	13	45
	Total	1 613	123	1 736

SUMMARY SHEET - INVESTMENT COST : EQUIPMENT

Schedule 6.8.3.5.

SUMMARY SHEET – INVESTMENT COST				
Equipment CIVIL WORK AND BUILDING : 1 000 ZW $				
Project component		Investment cost carried over		
No.	Description	Foreign	Local	Total
5	CIVIL WORK	-	2 432	2 432
5	BUILDING	-	7 865	7 865
5	METALLIC FRAME	-	811	811
	Total		11 108	11 108

CHAPTER 7

FACTORY ORGANIZATION ADN OVERHEAD COSTS

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1. FACTORY ORGANIZATION

The Type of operations and services required to achieve the production objectives of the Factory are the following :

- Management services

- Production process :

  . Seeds storage
  . Seeds preparation and pressing
  . Solvant plant
  . Refining plant
  . Bottling and conditioning plant
  . Laboratory process control
  . Utilities

- Maintenance services

  . Repair and maintenance of machinery and equipment, buildings, vehicules.

- Commercial services

  . Handling and internal transport
  . Handling and external transport
  . Stores for purchased spare parts, packing material, supplies and equipment.
  . Purchasing of raw material, spare parts and other supplies.

- Financial services

  . Budgeting
  . Planning control and performance evaluation
  . Accountancy
  . Finance

- Administrative services

  . General administration
  . Social and welfare services
  . Security
  . Wages and salaries
  . Personnel training

These operations and services correspond to the main lines of the factory organization as indicated in the organization chart.

These operations and services correspond also to cos. centers. However, for the purposes of this study detailed costs center accountancy has not been undertaken. They will take place after the start-up of the Factory and the final distribution of cost centers will be adapted to the local requirements and to the preferences of the future management.

2. OVERHEAD COST ESTIMATES

Schedules 7 shows all overhead costs of the factory, on an annual basis. Total overheads, on a financial cost basis, for a typical steady state year are Z$ 587 000 devided as follows :

2.1. MAINTENANCE OF BUILDINGS AND CIVIL WORKS

Maintenance of buildings and civil works has been calculated for at an annual rate of 0.70 % of the "at site" value of the fixed assets (from SCHEDULE 6.7 : Project Engineering). An allowance of Z$ 52 000 has been made.

2.2. INSURANCE

An annual insurance charge of Z$ 360 000 has been assessed. This is equivalent to a rate of 1.25 % of the "at site" value of the initial fixed assets (buildings, civil works, plant and equipment).

2.3. COMMUNICATION

An annual overhead allowance of Z$ 50 000 has been made for telex and telephon charges.

2.4. TRAVEL

Annual allowance of Z$ 40 000 has been made ; this covers all travel not provided for by the factory car pool.

2.5. EFFLUENT DISPOSAL

No annual allowance has been made, the factory does not generate exceptional pollution.

2.6. PROTECTIVE CLOTHING

An annual allowance of Z$ 35.000 has been made, at an average allowance of Z$ 100 per employee.

2.7. OFFICE SUPPLIES

Offices supplies have been estimated at Z$ 50.000 per year;

2.8. HOUSING

No annual allowance is foreseen for housing. The housing will only be supplied to the managerial staff and its cost is included in Chapter VI, project engineering.

SCHEDULE 7 : OVERHEAD COST ESTIMATES

ZIM $'000, June 1988 Prices

Insert total in Schedule 10.2

ESTIMATE OF PRODUCTION COST		
No.	ITEM DESCRIPTION	COST '000 Z$
		TOTAL
1.	Maintenance, buildings and civil works	52
2.	Insurance	360
3.	Communication	50
4.	Travel	40
5.	Effluent disposal	-
6.	Protective clothing	35
7.	Office supplies	50
8.	Housing allowances	-
TOTAL		587

CHAPTER 8

MANPOWER

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5. MANPOWER SUMMARY

A/ DEFINITIONS

1/ FACTORY ORGANISATION

As detailed in the schedule 8.1, the plant organisation includes several departments, the responsible of each being directly under the authority of the General Manager.

These departments are :

- The Technical Department
- The Laboratory Department
- The Security Department
- The Commercial Department
- The Financial Department
- The Administrative Department.

The Departments are usually divided in different sections with a specialized function. For example : Seed Storage Section, Production Section and Maintenance and Utilities Sections.

2/ SALARIES STRUCTURE

For this study, we used the Salary Structure Schedule of the Cotton Marketing Board referenced : 3rd December 1967 which is summarized in the following table :

GRADES	EXAMPLES OF FUNCTIONS
E	- General Manager - Deputy General Manager - Head of Department
D	- Head of Sections - Shift leaders - Supervisors - Foremen
C	- Process operators - Maintenance Operators - Accountants - Secretaries
B	- Typists - Assistants - Labour

The details are showed in following schedules 8.4.1 to 6.4.4.

1. FACTORY ORGANIZATION

1.1. ORGANIZATION CHART

The schedule 8.1 details the plant organization. Under the authority of the General Manager with the assistance of a Deputy General manager (Secretary General Responsible of the strategy), the organization chart includes the following departments :

- Technical (seeds storage, production, maintenance and utilities)
- Laboratory and quality control
- Security (fire brigade, general safety, watchmen)
- Commercial (purchasing, general store, marketing, depots and transports)
- Financial (accountants, computers, cashier)
- Administration (general, personnel, social welfare, training)

1.2. MANPOWER REQUIREMENTS

1.2.1. LABOUR

The needs of labourers are detailed in Manning tables schedules 8.2.1./2/3/4/5/6/7/8/9).

The labour requirements are based on the following :

a/ Factory running at full capacity the oil mill crush

- Cotton seeds	:	56 000 MT
- Sunflower seeds	:	8 000 MT
- Soya beans	:	24 000 MT
		88 000 MT

and will produce 15 800 MT edible oil and 48 960 MT meals.

b/ Working in continuous, 24 hours per day, 7 days a week, 320 days per year (45 days are stopped for maintenance, holidays, cleanings, shutdowns, etc..).

c/ Shifts organization

- Seeds receiving and bags unloading : 2 shifts - 5 days/week
- Storage operators : 4 shifts
- Production : seeds preparation and pressing : 4 shifts
- Production : solvent plant : 4 shifts
- Production : refining plant : 3 shifts - 5 days/week
- Production : bottling, filling, packaging - 2 shifts, 5 days/week
- Factory Maintenance : 4 shifts
- Maintenance - workshop : 1 shift - 5 days/week
- Laboratory - 4 shifts except 3 persons in 1 shift
- Commercial - purchasing 1 shift - 5 days/week
- Commercial - general store - 4 shifts
- Commercial - marketing - 1 shift - 5 days/week
- Commercial - transports - 1 shift - 5 days/week
- Finance and administration - 1 snift - 5 days/weeks
- Security : 4 shifts.

- The total number of workers should be : 351

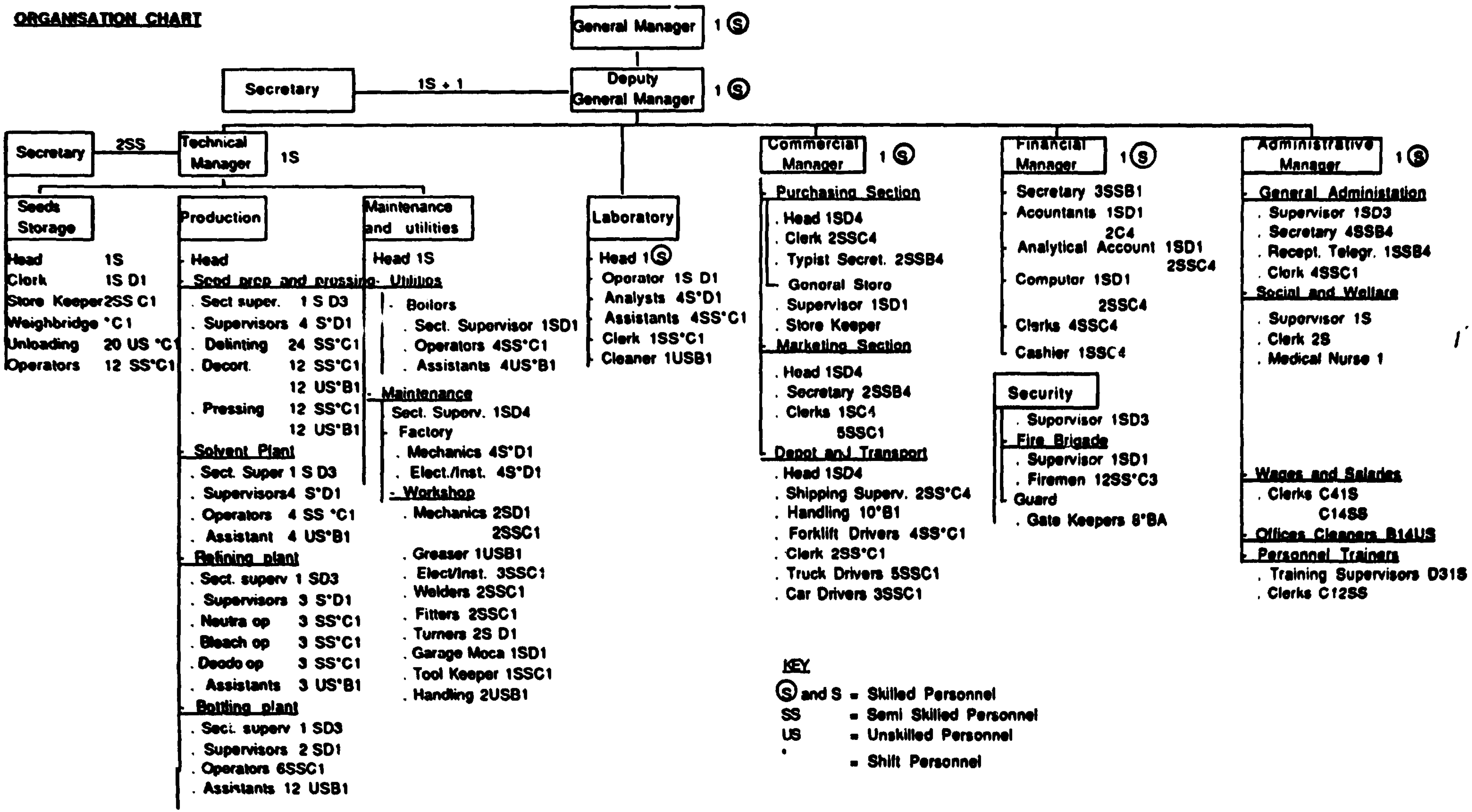
Number and assignment of the personnel are defined in the organization chart (schedule 8.1).

Note : the personnel should be permanent and no seasonal personnel are foreseen.

The reason for the shift organization are the following :

- Regular supply of oil seeds by the Cotton Marketing Board and the Grain Marketing Board. Unloading the bags during the daylight as much as possible. However the storage operations must follow the seeds crushing organization.

ORGANISATION CHART



- Seeds preparation, pressing and solvent extraction are equipment which is long to start and must run in continuous.

- Refining will be in over capacity and 3 shifts - 5 days/week are sufficient.

- Bottling, filling, packaging must run during the daylight for quality control.

- Boilers, maintenance of factory, laboratory, security and fire brigade, general store (spare parts) must follow the seeds crushing organization, except some activities in laboratory, maintenance workshop, which can work in one shift.

- The finished products : meals, edible oil will be shipped in 2 shifts.

- Other departments : financial, administration, commercial, management will work in one shift.

d/ The whole labour workers will be originated from ZIMBABWE

1.2.2. LABOUR QUALIFICATION

According to their assignment, we have determined three categories of personnel in relation with their qualification requirements.

a/ Skilled personnel

They include, the chief of section, shift leaders, supervisors or foremen. They should have, a high school education and some experience in oilseeds milling and edible oil manufacturing.

According to the salary structure received from the Cotton Marketing Board, we divided this category in 3 salary ranges D1, D3, D4.

b/ Semi-skilled personnel (SS)

The process operators need a preliminary professional skill and must be chosen during the erection and training phase for their demontrated capability.

The laboratory personnel must be chemist and graduated form technical school.

The professionnal people like welders, electricians, mechanists, fitters, accountants, secretaries, etc.. shall have the correspon-ding skill and diploma plus some experience in industry.

We have divided this category in 3 salary ranges : C1, C3, C4.

c/ Unskilled personnel (US)

Unskilled Personnel correspond to the personnel who do not have any particular qualification. We have divided this category in 2 salary ranges : B1 and B4.

The schedule 8.2.9 shows the repartition for each category in each department, with the following distribution :

- Skilled	D4	:	6
	D3	:	13
	D1	:	32
- Semi-skilled	C4	:	28
	C3	:	16
	C1	:	123
- Unskilled	B4	:	20
	B1	:	113
TOTAL......................			351

1.2.3. STAFF

The needs of staff are detailed in the Manning Table (schedule 6.3).

It includes the top ten men (Managers, Engineers, etc..) in the organization chart. They shall have a University degree and a great experience in industry in general, and oil seeds milling and edible oils in particular.

According to the salary structure of C.M.B. we have divided this category in 7 salaries ranges : E1, E2, E3, E4, E5, E6, E7.

We have also included the 2 main secretaries in the staff. Therefore this staff represents 12 persons.

The total personnel will be : Labour : 351 + Staff : 12 = 363 persons.

2. COSTS ESTIMATES

2.1. COSTS ESTIMATES AT FULL ACTIVITY (FROM YEAR 4)

2.1.1. FINANCIAL COST OF WAGES AND SALARIES

According to the salary structure of C.M.B., we have calculated the yearly wages and salaries for each category.

REMARK : according to informations received in ZIMBABWE and difficulties to appoint the necessary staff at a very high level we have increased considerably the figures which had been received. The salaries that we suggest are also the ones utilized in the private sector. Nevertheless the whole staff will be originated from ZIMBABWE.

For the wages, we have taken the maximum value in the C.M.B.

We have also calculated the surcharge which represents about : 25 - 30 % of the wages and 20 - 25 % of the salaries.

2.1.2. PRODUCTION COSTS WAGES

The schedules 8.5.1. and 8.5.2. are giving the wages in each department and each category. We have separated the wages in variable costs and fixed costs.

- Schedules 8.5.1. - variables for the personnel working in 3 and 4 shifts.

- Schedule 8.5.2. fixed for the personnel in one and two shifts which cannot be changed in case of production decreasing.

The production costs - wages are estimated as follows :

. Variable	:	Z$	: 2 818 400
. Fixes	:	Z$	: 2 455 434

TOTAL......Z$ = 5 273 834 # 5,3 millions Z$

2.1.3. PRODUCTION COSTS - SALARIES

the schedule 8.6 is giving the salaries in each department and each category.

The production costs salaries are estimated at : Z$ 561 192,64.

2.1.4. TOTAL WAGES AND SALARIES

Wages :	Z$ 5 273 834
Salaries :	Z$ 561 193

TOTAL..... Z$ 5 835 027 # 5,85 millions Z$

2.2. COSTS ESTIMATES IN BUILD UP YEARS (1.2. and 3)

During the build up period the utilization rate increase will be as follows :

Year 1 : 30 %
Year 2 : 60 %
Year 3 : 90 %

The only possibility to reduce the costs if the activity is decreasing is to run the oil mill in 3 shifts - 5 days a week instead of 4 shifts - 7 days a week - By running 5 days in continuous the losses during starting the plan will be minimized.

Therefore, the number of working days per year will be :
(5 days x 46 weeks) - 10 days holidays = 230
The maximum utilization rate in 3 shifts will be :

$$\frac{230}{320} \# 72 \%$$

Consequently, it will be possible to run in 3 shifts only in the years 1 and 2.

During years 1 and 2, it will be also possible to run in one shift, 5 days a week at the oil seeds receiving, bottling and filling and finished products shipping.

The schedule 8.7 is an estimate of the variable costs cutting down in the year 1 and 2.

Consequently, the total wages and salaries in year 1 and 2 will be :

Z$ = 5 019 832

2.1.2. PROCUCTION COSTS WAGES

The schedules 8.5.1. ano 8.5.2. are giving the wages in each department and each category. We have separated the wages in variable costs ano fixed costs.

- Schedules 8.5.1. - variables for the personnel working in 3 and 4 shifts.
- Schedule 8.5.2. fixed for the personnel in one and two shifts which cannot be changed in case of production decreasing.

The production costs - wages are estimated as follows :

. Variable	:	Z$	: 2 818 400
. Fixes	:	Z$	: 2 455 434

TOTAL......Z$ = 5 273 834 # 5,3 millions Z$

2.1.3. PRODUCTION COSTS - SALARIES

the schedule 8.6 is giving the salaries in each department and each category.

The production costs salaries are estimated at : Z$ 561 192,64.

2.1.4. TOTAL WAGES AND SALARIES

Wages :	Z$	5 273 834
Salaries :	Z$	561 193

TOTAL..... Z$ 5 835 027 # 5,85 millions Z$

2.3. COSTS ESTIMATES - SUMMARY Z$

Year 1	Year 2	Year 3	From Year 4
5 019 832	5 019 832	5 835 027	5 835 027
# 5,02 millions	5.02 millions	5.85 millions	5.85 millions

3. PRE-PRODUCTION PHASE

3.1. FROM THE BEGINNING OF PROJECT

During the pre-production phase some technical personnel and staff will be foreseen in order :

a/ To participate and follow the erection works and planning

b/ To be informed on the new plant

c/ To be trained on the technology which will be utilized.

In schedule 8.6, we have listed the suggested manpower necessary during the pre-production phase in each department and each category.

The total workers during the pre-production phase will be : 37.

In schedule 8.9, we have listed the staff which will be of 6 persons from the General Manager and his Secretary to the top Engineers and Technicians who will have to manage the plant.

The costs estimates per year during the pre-production phase are :

Wages Z$ = 755 689.72
Salaries Z$ = 291 456.68

TOTAL...... 1 047 146.40
 # 1,05 millions Z$

According to the planning developped in Chapter IX : implementation scheduling, the pre-production phase will last 2 years.

3.2. BEFORE START UP

Before starting up the plant the following works have to be done :

- supply the necessary oil seeds
- supply the chemicals
- supply the combustible
- supply the packaging materials
- participate to the equipment pre-commissioning.

Therefore, we consider that 3 months before start-up the manpower foreseen in year 1 will be necessary.

3.3. COSTS ESTIMATES DURING THE PRE-PRODUCTION PHASE (Z$)

	Year-1	Year 0
From the beginning of project	1 047 146	1 047 146
Before start-up	-	993 171
TOTAL..................	1 047 146	2 040 317

4. TRAINING OF THE PERSONNEL

4.1. TRAINING SERVICES

Refering to the qualification needed for the personnel, this paragraph describes the selection and training activities foreseen for the personnel of the factory. Training will be theoritical and practical on the job.

The training services to be carried out are summarised hereafter and include.

- Management, coordination, technical and didactic assistance in relation with specific theoritical and practical on the job training.

- Preparation and supply of complete sets of training manuals necessary to hold the basic theoritical and practical course.

- Basic theoritical and pratical on the job course.

- Logistic assistance in all training phases which will be conducted abroad.

- General assistance during the selection and recrutment of the personnel.

4.2. PERSONNEL IN TRAINING

The personnel in training will be the one appointed since the beginning of the project listed in schedules 8.7 and 8.8. Some of them with key position in addition of training on site will also be trained abroad.

TRAINING ABROAD

The training will be carried out abroad in similar oil mills, crushing oil seeds and producing edible oils and meals.

Training will be theoritical and practical :

- Basic theoritical courses :

  The objective is to enable personnel in training to acquire practical knowledge of the type of operations necessary to perform the corresponding job.

- Basic theoritical courses :

  The purpose of these courses is to provide a detailed explanation of the factory, plant description, process in theory, review of spcifications documents, analysis and laboratory general procedures, maintenance organization, analytical accounting (yields, specifications, etc..).

- Pratical training

  The objective is to enable personnel in training to acquire practical knowledge of the type of operations necessary to perform the corresponding job.

The training will be performed for the following personnel :

DESIGNATION	NUMBER	DURATION OF TRAINING ABROAD	IN ADVANCE BEFORE START-UP
Technical Manager	1	3 months	1,5 year
Production Head	1	3 months	1,5 year
Maintenance Head	1	3 months	1,5 year
Laboratory Supervisor	1	2 months	1 year
Seeds storage sup.	1	2 months	1 year
Seeds Prep. and Pressing supervisor	1	3 months	1 year
Solvent Plant sup.	1	3 months	1 year
Refining sup.	1	3 months	1 year
Bottling filling sup.	1	2 months	1 year
Workshop sup.	1	3 months	1 year
TOTAL	10	27 men/month	

The men once trained must take part into the factory erection and train their own personnel.

4.2.2. TRAINING ON SITE

Training on site will be carried out during the final erection, pre-commissionning, start-up and commissionning of the plant until the take over by the Investor.

The objective is to let the personnel in training acquire direct experience of their plant and equipments and acquire or complete their theoritical knowledge in :

- Theoritical course in classroom
- Practical course on site.

The personnel in training will be assigned to their future position and will be present during final assembly, mechanical testing operation and start up of the factory.

The training will be performed for :

- Process operators
- Maintenance personnel (mechanical, electrical, instrumentation)
- Laboratory personnel.

The training period will last 3 months.

4.2.3. EXPATRIATE PERSONNEL FOR TRAINING, PLANT START UP AND TECHNICAL ASSISTANCE

a/ Start up of the plant

We consider that during a period of 3 months, the following personnel will be necessary :

Participation of the site manager previously in charge of the erection coordination :

2 Process Engineers
1 Mechanical Engineer
1 Electrical Engineer
1 Instrument Engineer
TOTAL : 18 man.months.

b/ Training and Technical Assistance

We consider that the following personnel will be necessary :

1 Process Engineer, coordinator of formation	:	6 months
1 Production Manager	:	12 months
1 Mechanical Engineer	:	12 months
1 Electrical Engineer	:	6 months
1 Instrument Engineer	:	6 months

TOTAL : 42 man.months.
GENERAL TOTAL : 60 man.months.

The corresponding costs are included under the heading "TECHNOLOGY" of the chapter "PROJECT ENGINEERING".

5. MANPOWER : SUMMARY

The cost estimates for the manpower section during the life of the project are as follows :

5.1. PRE-PRODUCTION PERIOD

Year-1 Personnel : Z$ 1 047 146
Year 2 Personnel : Z$ 2 040 317

5.2. FIRST YEARS OF PRODUCTION

Year 3 Personnel : Z$ 5 019 832
Year 4 Personnel : Z$ 5 019 832
Year 5 Personnel : Z$ 5 835 027

5.3. FULL ACTIVITY

From Year 6 : Z$ 5 835 027.

SCHEDULE 8.2.1. - MANNING TABLE - LABOUR

SECTION	seeds receiving and storage	WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
Seeds receiving and storage	I			1 superv.		2				3
	II			1 superv.		1				2
	III									
	IV									
	TOTAL									5
Bags unloading	I								10	10
	II								10	10
	III									
	IV									
	V									
	TOTAL								20	20
Storage operators	I					3				3
	II					3				3
	III					3				
	IV					3				
	TOTAL					12				12
	TOTAL			2		15			20	37

SCHEDULE 8.2.2. - MANNING TABLE - LABOUR

SECTION : PRODUCTION		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4	Skilled D3 Supervisor	Skilled D1 Supervisor	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1 Operators	Unskilled B4	Unskilled B1 Assistants	TOTAL
Seeds preparation and pressing	I		1	1			12		12	26
	II			1			12		12	25
	III			1			12		12	25
	IV			1			12		12	25
	TOTAL		1	4			48		48	101
Solvent plant	I		1	1			1		1	4
	II			1			1		1	3
	III			1			1		1	3
	IV			1			1		1	3
	TOTAL		1	4			4		4	13
Refining plant	I		1	1			3		1	6
	II			1			3		1	5
	III			1			3		1	5
	IV									
	TOTAL		1	3			9		3	16
	TOTAL		3	11			61		55	130

SCHEDULE 8.2.3. - MANNING TABLE - LABOUR

SECTION : PRODUCTION (continued)		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4	Skilled D3 Supervisor	Skilled D1 Supervisor	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1 Operators	Unskilled B4	Unskilled B1 Assistants	TOTAL
Bottling filling	I		1	1			3		6	11
	II			1			3		6	10
	III									
	IV									
	TOTAL		1	2			6		12	21
	I									
	II									
	III									
	IV									
	TOTAL									
	I									
	II									
	III									
	IV									
	TOTAL									
	TOTAL		4	13			67		67	151

SCHEDULE 8.2.4. - MANNING TABLE - LABOUR

SECTION : MAINTENANCE and UTILITIES		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4 Supervisor	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1 Operators	Unskilled B4	Unskilled B1 Assistants	TOTAL
Boilers	I	1					1		1	3
	II						1		1	2
	III						1		1	2
	IV						1		1	2
	TOTAL	1					4		4	9
Factory maintenance	I			2						2
	II			2						2
	III			2						2
	IV			2						2
	TOTAL			8						8
Workshop	I	1	5				10		3	19
	II									
	III									
	IV									
	TOTAL	1	5				10		3	19
	TOTAL	2	5				14		7	36

SCHEDULE 8.2.5. - MANNING TABLE - LABOUR

DEPARTMENT : LABORATORY		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4 Supervisor	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1 Operators	Unskilled B4	Unskilled B1 Assistants	TOTAL
Personnel working by the day	I	1					1		1	3
	II									
	III									
	IV									
	TOTAL	1					1		1	3
Personnel in shifts	I			1			1			2
	II			1			1			2
	III			1			1			2
	IV			1			1			2
	TOTAL			4			4			8
	I									
	II									
	III									
	IV									
	TOTAL									
	TOTAL	1		4			5		1	11

SCHEDULE 8.2.6. - MANNING TABLE - LABOUR

DEPARTMENT : COMMERCIAL		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4 Supervisor	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1 Operators	Unskilled B4	Unskilled B1 Assistants	TOTAL
Purchasing and General store	I	1		1	2		3	2	1	10
	II						1		1	2
	III						1		1	2
	IV						1		1	2
	TOTAL	1		1	2		6	2	4	16
Marketing	I	1		1	1		5	2		9
	II									
	III									
	IV									
	TOTAL	1			1		5	2		9
Depot and Transport	I	1			1		11		5	18
	II				1		3		5	9
	III									
	IV									
	TOTAL	1			2		14		10	27
	TOTAL	3		1	5		25	4	14	52

SCHEDULE 8.2.7. - MANNING TABLE - LABOUR

DEPARTMENT : FINANCE and ADMINISTRATION		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
Finance	I			3	11			3		17
	II									
	III									
	IV									
	TOTAL			3	11			3		17
Administration	I		3			1	12	5	4	25
	II									
	III									
	IV									
	TOTAL		3			1	12	5	4	25
	I									
	II									
	III									
	IV									
	TOTAL									
	TOTAL		3	3	11	1	12	8	4	42

SCHEDULE 8.2.8. - MANNING TABLE - LABOUR

DEPARTMENT : SECURITY		WAGES CATEGORIES (no of workers)								
FUNCTION	Shift	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
Fire Brigade	I			1	3					4
	II				3					3
	III				3					3
	IV				3					3
	TOTAL			1	12					13
General safety	I							2		3
	II							2		2
	III							2		2
	IV							2		2
	TOTAL							8		9
	I									
	II									
	III									
	IV									
	TOTAL									
	TOTAL		1	1	12			8		22

SCHEDULE 8.2.9. - MANNING TABLE - LABOUR SUMMARY

DEPARTMENT	WAGES CATEGORIES (no of workers)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds receiving and storage			2		15			20	37
- Production		4	13			67		67	151
- Maintenance and utilities	2	5	8			14		7	36
- Laboratory	1		4			5		1	11
- Commercial	3		1	5		25	4	14	52
- Finance and Administration		3	3	11	1	12	8	4	42
- Security		1	1	12			8		22
TOTAL	6	13	32	28	16	123	20	113	351

SCHEDULE 8.3. - MANNING TABLE - STAFF

FUNCTION	SALARIES CATEGORIES (N° of staff)								
	E7	E6	E5	E4	E3	E2	E1	Secretaries C3	TOTAL
- General Manager	1								1
- Deputy General Manager		1							1
- Technical Manager			1						1
- Commercial Manager				1					1
- Financial Manager		1							1
- Administration Manager					1				1
- Head Production						1			1
-Head Maintenance/utilities						1			1
- Head Laboratory							1		1
- Head seeds receiving/ storage							1		1
- Secretaries								2	2
TOTAL	1	2	1	1	1	1	2	2	12

SCHEDULE 8.4.1. - FINANCIAL COST OF WAGES AND SALARIES

GRADE	E 1	E2	E3	E4	E5	E6	E7
Annual basic salary	25 000	30 000	35 000	45 000	50 000	60 000	70 000
Holiday benefit 120 % monthly salary	-	-	-	-	-	-	-
or $ 1100	1 100	1 100	1 100	1 100	1 100	1 100	1 100
Pension 17 % of basic	4 250	5 100	5 950	7 650	8 500	10 200	11 900
Group live cover 0,213 % /basic	53.25	63.9	74.55	95.85	106.5	127.8	149.1
Workmen compensation 0,62 % of earnings	161.82	192.82	223.82	285.82	316.82	378.82	440.82
Medical aid	95.60	95.60	95.60	95.60	95.60	95.60	95.60
Education levy 1 % of earning	261	311	361	461	511	611	711
TOTAL	**30 921,67**	**36 863,32**	**42 804,97**	**54 688,27**	**60 629,92**	**72 513,22**	**84 396,52**

SCHEDULE 8.4.2. FINANCIAL COST OF WAGES AND SALARIES

GRADE	D 1	D2	D3
Annual basic salary	20 000	23 000	25 000
Holiday benefit 120 % monthly salary	-	-	-
or $ 1100	1 100	1 100	1 100
Pension 17 % of basic	3 400	3 910	4 250
Group live cover 0,213 % /basic	42.6	48.99	53.25
Workmen compensation 0,62 % of earnings	130.82	149.42	161.82
Medical aid	95.60	95.60	95.60
Education levy 1 % of earning	211	241	261
TOTAL	24 980,02	28 545,01	30 921,67

SCHEDULE 8.4.3. FINANCIAL COST OF WAGES AND SALARIES

GRADE	C 1	C3	C4
Annual basic salary	12 000	15 000	16 000
Holiday benefit 120 % monthly salary	-	-	-
or $ 1100	1 100	1 100	1 100
Pension 17 % of basic	2 040	2 550	2 720
Group live cover 0,213 % /basic	25.56	31.95	34.08
Workmen compensation 0,62 % of earnings	81.22	99.82	106.02
Medical aid	95.60	95.60	95.60
Education levy 1 % of earning	131	161	171
TOTAL	**15 473,38**	**19 038,37**	**20 226,70**

SCHEDULE 8.4.4. FINANCIAL COST OF WAGES AND SALARIES

GRADE	B 1	B4
Annual basic salary	6 000	10 000
Holiday benefit 120 % monthly salary	600	999.6
or $ 1100	-	-
Pension 17 % of basic	1 020	1 700
Group live cover 0,213 % /basic	12.78	21.30
Workmen compensation 0,62 % of earnings	40.92	68.20
Medical aid	81.80	95.60
Education levy 1 % of earning	66	110
TOTAL	7 821.58	12 994.70

SCHEDULE 8.5.1 - ESTIMATE OF PRODUCTION COSTS - WAGES
VARIABLE COSTS - ZIMBABWE DOLLARS

DEPARTMENT OR SECTION	VARIABLE COSTS - WAGE CATEGORIES (N° OF WORKERS)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds receiving and storage					12			20	32
- Production			13			67		67	147
- Maintenance and utilities			8			4		4	16
- Laboratory			4			4			8
- Commercial						4		4	8
- TOTAL N° OF WORKERS			25		12	79		95	211
- Individual wage per year			20 000		15 000	12 000		6 000	
- Surcharge			4 980,02		4 038,37	3 473,38		1 821,50	
- Sub-total individual wage			24 980,02		19 038,37	15 473,38		7 821,50	
- TOTAL WAGES PER YEAR			624 500,50		228 460,44	1 222 397,02		743 042,50	2 818 400,46

SCHEDULE 8.5.2 - ESTIMATE OF PRODUCTION COSTS - WAGES
FIXED COSTS - ZIMBABWE DOLLARS

DEPARTMENT OR SECTION	VARIABLE COSTS - WAGE CATEGORIES (N° OF WORKERS)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds receiving and storage			2		3				5
- Production		4							4
- Maintenance and utilities	2	5				10		3	20
- Laboratory	1					1		1	3
- Commercial	3		1	5		21	4	10	44
- Finance - Administration		3	3	11	1	12	8	4	42
- Security		1	1	12			8		22
- TOTAL N° OF WORKERS	6	13	7	28	4	44	20	18	140
- Individual wage per year	25000	23000	20000	16000	15000	12000	10000	6000	
- Surcharge	5921,67	5541,012	4980,02	4226,70	4038,37	3473,38	2994,70	1821,50	
- Sub-total individual wage	30921,67	28541,012	24980,02	20226,70	19038,37	15473,38	12994,70	7821,50	
- TOTAL WAGES PER YEAR	185530,02	371033,13	174860,14	566347,60	76153,48	680828,72,02	259894,00	140787,000	2455434,09

SCHEDULE 8.6 - ESTIMATE OF PRODUCTION COSTS : SALARIES - ZIMBABWE DOLLARS

DEPARTMENT OR SECTION	SALARY CATEGORIES (N° OF STAFF)								
	E7	E6	E5	E4	E3	E2	E1	E3 Secretaries	TOTAL
- General Manager	1								1
- Deputy General Manager		1							1
- Technical Manager			1						1
- Commercial Manager				1					1
- Financial Manager		1							1
- Administration Manager					1				1
- Head Production						1			1
- Head Maintenance/utilities						1			1
- Head Laboratory							1		1
- Head seeds receiving/storage							1		1
- Secretaries								2	2
TOTAL	1	2	1	1	1	2	2	2	12
- Individual salary per year	70 000	60 000	50 000	45 000	35 000	30 000	25 000	15 000	
- Surcharge	14396,52	12513,22	10624,92	9688,27	7804,97	6863,32	5921,67	4038,37	
- Sub-total Individual salary	84396,52	72513,22	60629,92	54688,27	42804,97	36863,32	30921,67	19038,37	
- Total salaries per year	84396,52	145026,44	60629,92	54688,27	42804,97	73726,64	61843,34	38076,74	561192,80

SCHEDULE 8.7 - ESTIMATE OF PRODUCTION COSTS - WAGES ZIMBABWE DOLLARS
VARIABLE COSTS - CUTTING DOWN IN YEAR 1 AND YEAR 2

DEPARTMENT OR SECTION	VARIABLE COSTS IN YEAR 1 AND 2 (N° OF WORKERS REDUCED)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds storage bags - unloading			1					10	11
Storage operator					3			3	6
- Production			2			13		13	28
- Bottling filling			1			3		6	10
- Boilers and factory maintenance			2			1		1	4
- Laboratory			1						2
- Commercial						2		2	4
- TOTAL N° OF WORKERS			7		3	20		35	65
- Individual wage per year			20 000		15 000	12 000		6 000	
- Surcharge			4 980,02		4 038,37	3 473,38		1 821,50	
- Sub-total individual wage			24 980,02		19 038,37	15 473,38		7 821,50	
- TOTAL WAGES PER YEAR			174 860,14		5 7115,11	309 467,60		273 752,50	815 195,35

SCHEDULE 8.9 - STAFF TABLE DURING THE PRODUCTION TABLE - ZIMBABWE DOLLARS

DEPARTMENT OR SECTION	SALARY CATEGORIES (N° OF STAFF)								
	E7	E6	E5	E4	E3	E2	E1	C3	TOTAL
- General Manager	1								1
- Technical Manager			1						1
- Financial Manager		1							1
- Head Production						1			1
- Head Maintenance									1
- Secretary						1		1	1
TOTAL NUMBER OF STAFF	1	1	1			2		1	6
- Individual salary per year	84 396,52	72 512,22	60 629,92			36 863,32		19 038,37	
- TOTAL SALARIES PER YEAR	84 396,52	72 513,22	60 629,92			73 726,64		19 038,37	291 456,68

SCHEDULE 8.8 - MANPOWER MANNING TABLE - ZIMBABWE DOLLARS
DURING THE PRE-PRODUCTION PHASE

DEPARTMENT OR SECTION	VARIABLE COSTS IN YEAR 1 AND 2 (N° OF WORKERS REDUCED)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skille C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds storage			1 superv.		2 operators				3
- Seeds preparation and			1 superv.		6 operators				7
pressing			1 superv.		2 operators				3
- Solvent plant			1 superv.		2 operators				3
- Bottling filling			1 superv.		2 operators				3
- Boilers	1 superv.					2 operators			3
Factory maintenance									2
- Workshop	1 superv.	2	1						3
- Laboratory	1 superv.								1
- Security		1					8		9
- TOTAL Nr OF WORKERS	3	3	7		14	2	8		37
- Individual wage per year	30921.67	28541.01	24980.02		19038.37	15473.38	12994.38		
- TOTAL WAGES PER YEAR	92765.01	86623.03	174860.14		266537.18	30946.76	103957.60		755689.72

IX IMPLEMENTATION SCHEDULING

The implementation activities will proceed in stages, in line with the progress of the project.

9.1. PREPARATORY STAGE

Activities during this stage mainly include :

- A decision on the ownership and control of the new investment :
  - AMA/CMB solo or
  - Joint venture with Industrial Development Corporation (I.D.C) or
  - Joint partnership with a functioning company or
  - Any other option to be chosen by the Government.
- A decision on project financing, both foreign and local currency.
- A decision on the capacity of the new plant.
- A decision on site selection and purchase of land.
- A decision on the type of contracts required on a basis of work division between owner and contractor with two extremes :
  - Turnkey contract
  - Reimbursable contract

9.2. PROJECT EXECUTION

Project execution consists of the main following functions and stages : Direction coordination and control of the Project.

- Engineering
  - Process engineering
  - Basic engineering
  - Detailed engineering.

- Procurement

  . Material and equipment specifications
  . Appointment of suppliers and subcontractors
  . Inspection of equipments and materials
  . Follow up of the contracts
  . Reception - Transportation of materials and equipments.

- Construction

  . Land preparation
  . Civil works
  . Equipment
  . Electrical and utilities works.

- Commissionning

  . Mechanical acceptance
  . Garantee test runs
  . Commissionning up to full operating conditions.

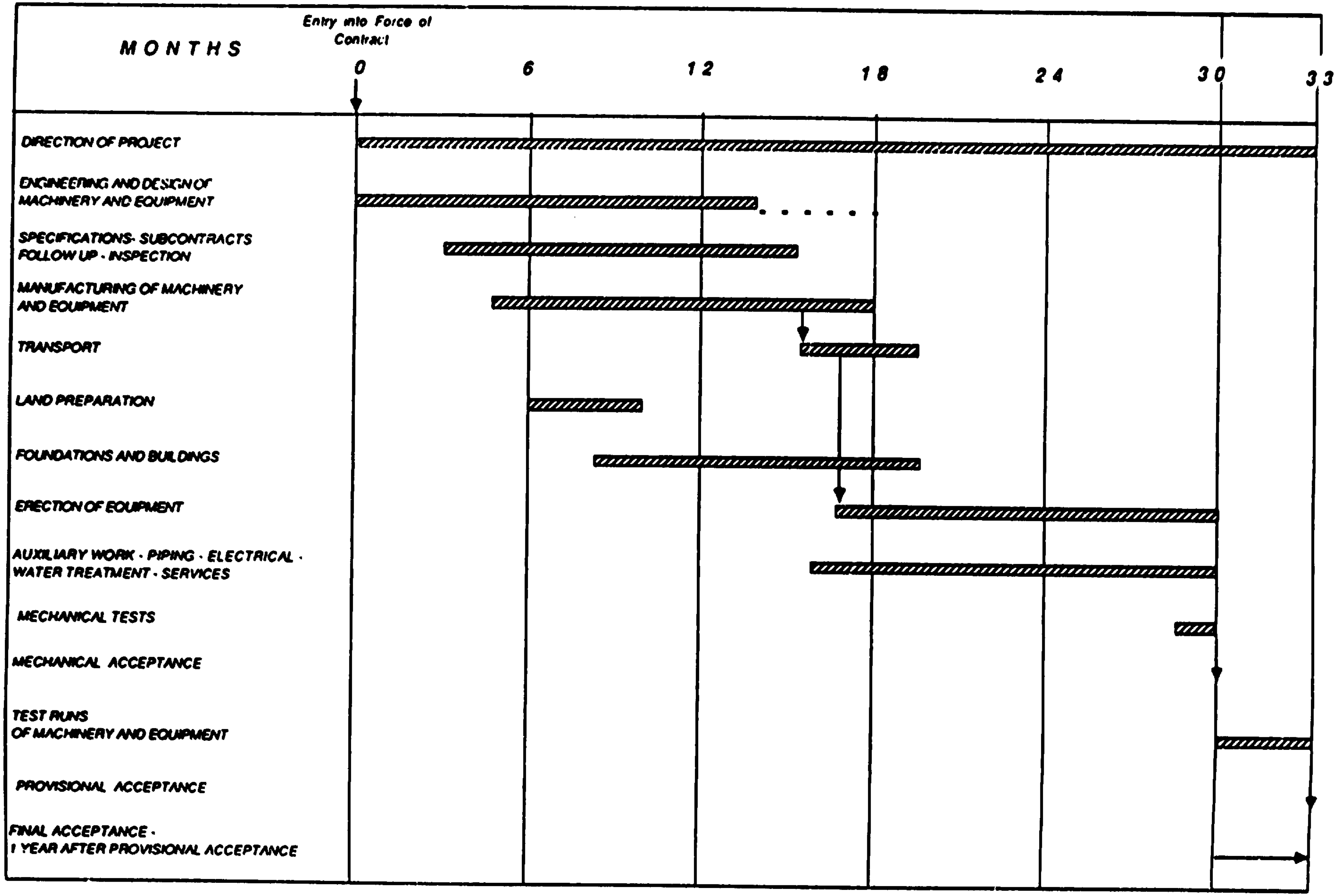
- Assistance in operation and training

After the entry into force of the contract with the contractor, we consider that the project could be complemented within a period of 33 months.

Period between the entry into force date of the contract and the beginning of Industrial operation.

The main stages of the project execution are indicated in the attached schedule.

EDIBLE OIL PLANT - PROJECT EXECUTION -



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X. FINANCIAL AND ECONOMIC EVALUATION

This Chapter puts together the data contained in the preceding chapters in order to arrive at a financial and economic evaluation of the project. Other data are also introduced for the calculation of working capital requirements and corporate income tax. The chapter is divided in three parts, viz Basic Data, Financial Analysis, and Economic Cost-Benefit Analysis. The first part presents the basic data assembled in a systematic way under the headings : investment costs, production costs, and sales ; it then provides input data for working capital requirements, financing requirements and corporate income tax. The second part provides production costs and working capital estimates and the main project schedules which are the cash flow table, net income statement and balance sheet. Third part assesses the impact of the project on the foreign exchange balance, employment and income, rural development and public finances.

USE OF COMFAR

In the present study, we used the UNIDO's computer Model for feasibility analysis and reporting - COMFAR.

The financial results appear on 9 Comfar schedules as indicated below.

1 Summary Sheet
2 Total Initial Investment
3 Investment during production
4 Total production costs
5 Working capital required
6 Source of finance
7 Cashflow tables
8 Net income statement
9 Balance sheet.

The following documents are attached to this Chapter :

1/ For the 330 t/day plant, which was described in detail in this study as the BASE CASE, we give the complete set of Comfar schedules.

2/ For the sensivity analysis on sales prices, costs prices, inflation, etc..

We give the summary sheets, which show the IRR.

3/ For the scenario II (plant of 165 t/d) we give also the summary sheet.

Nota : The related case is indicated in each schedule. Ex : "BASE CASE" or "plus 10 % on sales prices".

10.1. BASIC DATA (FOR EVALUATION)

The basic data which follow, relate to be base case. Other alternatives such a two smaller plants have been eliminated at an early stage as being obviously less economic than the option retained.

10.1.1. INVESTMENT

10.1.1.1. Initial investment

Initial technical investment includes civil engineering and buildings, equipment with spare parts, installation, and engineering design with technical assistance ant training, totalling Z$ 49 168 000, distributed as follows (from Chapter VI) :

	000 Z$
Design, technical assistance, training...............	8 104
Equipment, including spare parts, transportation and Installation	28 845
Civil engineering and buildings......................	12 219
TOTAL technical investment...........................	**49 168**

of which imported equipment.....	30 957
of which local expenses.........	18 211

For imported equipment, estimates were obtained in French Francs (FF) and converted into Z$ at the rate of 1 Z$ = 3.7 FF.

In addition to this technical investment, there is also land (Z$ 50 000) and site preparation (Z$ 2 150 000) and housing for management staff (Z$ 400,000), which are entirely local expenses.

Total initial investment will thus amount to Z$ 51 768 000 divided between :

Technical investment	49 168
Land and site preparation.........................	2 200
Housing...	400
TOTAL................................: 000's Z$	**51 768**

TABLE 10.1

TECHNICAL INVESTMENT

000's Z$	TOTAL	YEAR 1	YEAR 2	YEAR 3
Design, technical assistance, training	8,104	3,080	3,224	1,800
of which :				
- Foreign	7,540	3,040	3,000	1,500
- Local	564	40	224	300
Equipment incl. spare parts and transportation of which :	24,512	2,452	22,066	
- Foreign	22,634	2,264	20,370	
- Local	1,878	188	1,690	
Installation of which :	4,333	-	4,333	
- Foreign	773	-	773	
- Local	3,560	-	3,560	
Civil engineering and buildings	12,219	6,110	6,109	
of which :	-			
- Foreign		-	-	
- Local	12,219	6,110	6,109	
Total : Technical investment	49,168	11,142	35,726	1,800
of which :				
- Foreign	30,957	11,642	24,143	1,500
- Local	18,211	5,304	11,583	300

10.1.1.2. Renewals and residual values

The equipment of this plant, excluding plant and road vehicles, normally has a technical life over 15 years. Since for study purposes the project production period is limited to 15 years, no renewal of major investment will have to be considered, except for :

	000's Z$
- Several plant vehicles	339
- Two trailer trucks..............................	331
- Two light truks.................................	46
- Three passenger cars............................	122
TOTAL...	838

These vehicles will be serviceable for about 5 years and will have therefore to be replaced in the 6th year of production and again in the 11th year.

Residual values are difficult to assess and are not of much significance in this context. To simplify the case, no residual value was considered.

10.1.1.3. Depreciation of assets

Allowable depreciation is defined by the local tax code which in ZIMBABWE allows :

- 5 % /year for buildings
- 10 %/year for equipment
- 10 %/year for incorporate assets
- 20 %/year for road vehicles.

The depreciation to be considered for tax purposes is therefore as follows during the first ten years : Z$ 4 891 000.

After the first ten years, the depreciation schedule is reduced to Z$ 906,000. The depreciation of road vehicles is continuing over the whole life of the project because they are being renewed very five years.

10.1.1.4. Pre-production expenditures

They are incurred for activities preparatory to production : hiring and training of management staff and workers, test runs and start-up expenses. They have been estimated to amount to Z$ 1,047,000 in year 1 and 2,040,000 in year 2 (Chapter VIII).

10.1.2. OPERATING EXPENDITURES

Production Costs are made of Raw Materials (from CHAPTER IV), Utilities, Chemicals and Various Materials Inputs (from Chapter VI), Packaging Materials (from Chapter III), Overheads (from Chapter VII) and Manpower (from Chapter VIII).

Other operating expenditures associated to production activities are transportation of packaged oil to wholesalers, warehouses and main depot stations (from Chapter III) and some local taxes (from Chapter V).

All operating expenditures are shown on the following table (10.2). The Table also separates expenditures in local currency from imports. It can be seen that imported supplies account for only about 4 % of total operating expenditures.

TABLE 10.2
OPERATING EXPENDITURES

In 000's Z$

PRODUCTION PROGRAMME	30 %	60 %	90 %	100 %
RAW MATERIALS (local) (Chap IV)	7,630	15,259	22,889	25,432
- Cotton seed				(11,032)
- Soya bean				(10,752)
- Sunflower seed				(3,648)
UTILITIES (local) (Chap VI)	646	774	917	968
CHEMICALS (Chap VI)	440	880	1,320	1,467
- Foreign	(344)	(689)	(1,033)	(1,148)
- Local	(96)	(191)	(287)	(319)
PACKAGING MATERIALS (local) (Chap III)	3,490	6,980	10,471	11,634
OTHER MATERIAL INPUTS (Chap VI)	483	579	965	965
- Foreign	(427)	(513)	(855)	(855)
- Local	(56)	(66)	(110)	(110)
OVERHEADS (local) (Chap VII)	294	352	587	587
MANPOWER (local) (Chap VIII)	5,020	5,020	5,835	5,835
TRANSPORTATION (Chap III) (local)	213	427	640	711
TAXES (Chap V)	7	7	7	7
TOTAL	18,223	30,278	43,631	47,606
- Foreign	771	1,202	1,888	2,003
- Local	17,752	29,076	41,743	45,603
- Variable				41,507
- Fixed (a)				6,099

a/ Utilities 487 + Overheads 587 + taxes 7 + 86 % Manpower 5,018 = 6,099.

TABLE 10.3
EXPECTED SALES (a)
(from Chapter 3)

In 000's Z$

PRODUCTION PROGRAMME	30 %	60 %	90 %	100 %
Blended oil (packaged)	11,281	22,563	33,844	3,604
Sunflower oil (packaged)	2,542	5,083	7,625	8,473
Sub-total refined oils	13,823	27,646	41,469	46,077
Cotton seed meal	2,024	4,048	6,072	6,747
Sunflower seed meal	199	398	596	663
- Cotton + sunflower meals	2,223	4,446	6,668	7,410
Soya beans meal	1,924	3,849	5,774	6,415
Sub-total : meals	4,147	8,295	12,442)	13,825)
Linters	134	269	403	448
TOTAL	**18,105**	**36,210**	**54,314**	**60,349**
of which : export (30 %M of meals)	(1,244)	(2,488)	(3,733)	(4,147)

Notes :

a/ Sale value of production (net of transporttion costs) to correct an over valuation of expected sales.
b/ Sale value of production
c/ Raw materials, packaging materials, chemicals and utilities.

10.1.3. SALES

The finished products for sale are packaged oils (blended or sunflower, for details see Chapter III), meals (from cotton seeds, sunflower seeds and soya beans), and cotton linters. Practically all the products are for local consumption except for about 40 % of the meals which are expected to find an outlet in export to the region.

Table 10.3 shows the values of expected sales from the first year of production when the plant will be operating at 30 % capacity to the fourth year of production when the plant will operate at full capacity (as defined in Chapter VI). Full capacity operation will thereafter be maintained for the next eleven years to complete the 15-year production span contemplated.

The figures in the table actually indicate the value of production at selling prices, which value differs form actual sales in the first years of operation by the increases in inventories of finished products, and in turn actual sales differ from actual receipts by the increases in accounts receivable (see next section on working capital).

10.1.4. WORKING CAPITAL REQUIREMENTS

For the proposed operation the components of working capital and the corresponding days of coverage are the following :

1/ Inventories of :

Raw materials (local)	1 month
Chemicals (imported)	3 months
Packaging materials (local)	1 month
Finished products	1 month.

2/ Work in progress (10 days or 1/3 month mainly)

Work-in-progress is mainly accounted for by the intermediate stock of crude oil.

3/ Cash in and : 1 month

(one month of operating expenditures minus raw materials, chemicals and packaging materials).

4/ Accounts payable : 1 month

(one month of raw materials, chemicals, utilities and packaging materials).

5/ Accounts receivable

(one month of sales).

10.1.5. PROJECT FINANCING

Financing requirement are usually estimated by adding fixed investment expenditures with pre-production expenditures and working capital :

	000's Z$
Fixed investment expenditures	51,768
Pre-production expenditures	3,087
Working capital (first year)	3,884
TOTAL....................................	58,739

In addition, there will be financial costs due to interest payments on the loans.

For this project, a foreign-exchange loan is contemplated for an amount of US $ 20 million (i.e Z$ 34 million), which will be sufficient to cover the initial foreign exchange costs of the project. In these conditions, the amount of equity necessary for the project would be slightly over Z$ 24 million. This equity could be smaller if some loan financing is available locally in Z$.

Foreign financing

The Foreign_exchange loan actually comprises :

- A treasury loan of US $ 10 million, bearing a 2.5 % rate of interest, with a 20 year duration, and a repayment grace period of 10 years, and

- A supplier credit also of US $ 10 million, bearing a 8 % rate of interest, with a 10 year duration andh repayments beginning after commissioning.

This loan, which is in foreign exchange, will be applied to the foreign exchange share of fixed investment expenditures and to the initial financial costs in foreign exchange.

Comfar Schedule 6 shows the inflows and outflows related to this foreign loan. The amount of the treasury loan still outstanding at the end of the project is assumed to be repaid in the liquidation year 18.

10.1.6. CORPORATE INCOME TAX

According to the information received, the corporate income tax is levied at the rate of 50 % of taxable income which in turn is obtained after deduction of allowable depreciation and interest payments from operating income. It is assumed that this project which interests a parastatal organization, will be granted a 5-year tax holiday in order to make it attractive for private capital equity investment.

10.2. FINANCIAL ANALYSIS

10.2.1. TOTAL PRODUCTION COSTS

Total production costs are obtained by adding together operating expenditures, depreciation and financial costs. The total production costs per unit have a tendency to decrease over time because of diminishing financial costs and lower depreciation after the first ten years of operation. This is shown on Comfar Schedule 4 which follows.

The division of production costs between fixed and variable is the basis for the calculation of the break-even point...

Break-even point

The break-even point indicates the risk associated with a possible reduction in the production and sales of the project. It is calculated by relating fixed costs to the difference between sales receipts and variable costs.

Here, the figures are the following :

Fixed costs	000's Z$
Depreciation (section 10.1.1.3)	4,891
Fixed operating expenditures (Table 10.2)	6,099
TOTAL	10,990

Variable costs

Variable operating expenditures (Table 10.2)	41,507
Sales receipts (Table 10.3)	60,349

The break-even point (BEPT) is therefore :
10,990 : (60,349 - 41,507) = 0,58, i.e : 58 %.

This means that the project would be able to turn out a profit as long as the rate of operation (at unchanged prices) does not fall below 58 % of the normal production programme. This rate is also called the profitability threshold.

It is interesting to consider also the liquidity threshold or cash break-even point which takes into account only curent expenditures :

6,099 : (60,349 - 41,507) = 0.32, I.e : 33 %.

The project would remain liquid as long as the rate of operation does not dip beyond 33 % of the expected level.

If financial obligations are included, the situation changes over the years. Considering year 6 (4th production year) in which operation is expected to reach its normal level, financial expenditures for debt servicing would be 3,077 thousand Z$, so that the profitability threshold would be :

$$\frac{13{,}057}{(60{,}349 - 41{,}507)} = 0.69 \text{ i.e } 69\ \%$$

and the liquidity threshold :

$$\frac{9{,}113}{(60{,}349 - 41{,}507} = 0.48 \text{ i.e } 48\ \%$$

Altogether, the project shows a rather favourable break-even point indicating that risk is rather low from that angle.

10.2.2. NET WORKING CAPITAL

Net working capital was estimated on the basis of the requirements outlined above. The total net working capital needed amounts to nearly Z$ 10.4 million and it therefore a significant element in the financial aspects of this project. The increases in working capital are :

	000's Z$
Year 1991	3 884
Year 1992	2 684
Year 1993	2 938
Year 1994	886

There is no need to increase working capital beyond year 1994 because the plant continues to operate at the same level.

10.2.3. CASFLOW TABLES (COMFAR SCHEDULES 7)

The cashflow tables show the total inflows and outflows yearly and the subdivisions thereof. The resulting next annual cashflow is negative for the first three years of the project i.e inclusive of the fist year of production. The cumulative cashflow dips to a low at the end of 1991 when it turns positive. The internal rate of return on total investment (IRR) is about 10 %, indicating a moderate profitability. This figure relates to the base case.

Sensitivity analysis was carried out for various changes as described in the following paragraph 1.9.5.

10.2.4. NET INCOME STATEMENT (COMFAR SCHEDULE 8)

The net income statement shows that the project can generate a substantial operational margin and/or gross profit. Gross profit stands at about 11 % of sales, increasing to 19 % in the later years because both depreciation and financial costs are then appreciably lower.

After the first five years of operation, net profit suffers from the 50 % tax. However, annual net profit represents about 25 % of equity (ROE), which is quite good.

10.2.5. PROJECTED BALANCE SHEETS (COMFAR SCHEDULE 9)

The projected balance sheets have been computed on the assumption that all profits will be retained in the project. That assumption could be modified without changing the overall picture. The tables show that equity represents a diminishing share of liabitilies, from 70 % in 1989 to a healthy 25 % at the end of the project in 2005.

10.3. ECONOMIC COST-BENEFIT ANALYSIS

10.3.1. IMPACT OF THE PROJECT

The impact of the project on the national economy will be felt on (i) foreign exchange, and (ii) employment and income.

10.3.1.1. Foreign exchange

The project will use foreign exchange for part of the investment and operating expenditures, and for making interest payments on foreign debt. On the other hand, the project will earn some foreign exchange through the export of meals.

(All values in 000's Z$ equivalent)

Foreign exchange in investment :

Year 1	5,304
Year 2	24,153
Year 3	1,500
TOTAL	30,957

Plus renewals :

Year 8	838
Year 13	838
GRAND TOTAL	32.633

Foreign exchange during operation :

	Chemicals	Other inputs	Total
Year 3	344	427	771
Year 4	689	513	1,202
Year 5	1.033	855	1,888
Year 6 (until 17)	1.148	855	2,003

Foreign exchange earned through meal exports (40 % of meal production) is in a current year of production : Z$ 5 586 000.

Adding up all costs of finance, repayments and operating expenditures in foreign exchange, on comes to a total of 73 595,000 Z$, compared to foreign exchange receipts of 77,253,000 Z$. The surplus in foreign exchange is threfore approximatively Z$ 4 000 000.

However, in order to obtain a more complete picture of the effects of the project on the foreign exchange balance of the country, one should add :

- On the debit side : the foreign exchange (or import) content of all purchases in local currency.

- On the credit side : the import substitution achieved by making available to the national consumers edible oils which otherwise would have to be imported. On the debit side again : the interest payments on the foreign loan.

Though precise figures cannot be given because of lack of information on import contents, it can be safely advanced that the credit side would become much more important than the debit side. For example, the import content in the value of seeds (which are the main inputs) is small in percentage. The project, therefore, will be a net saver of foreign exchange.

10.3.1.2. Employment and income

The project will emply 363 people (Staff : 12 - Workers : 351) and will distribute about 5.5 million Z$ annually in wages and salaries, including deferred pension benefits.

Direct value added, created by the project, will vary slightly from year to year ; in year 6, the 1st year of full production, it will be :

	000's Z$
Benefits distributed to manpower	5,835
Dividend and taxes	3,327
TOTAL : value added..................	9,162

Direct value added, therefore, will be quite large, but this is only part of the picture because the project will also create indirect value added upstream through its inputs.

The indirect effect will be felt most strongly in the agricultural sector where the increased production of seeds will be made possible because of the new outlet created by the project. The increase in agricultural production will improve the welfare of the rural community of ZIMBABWE, and thus contribute to fulfilling one of the main objectives of the government.

The effect on public finances will be quite substantial. Even if a tax holiday is granted for the first five years of production (corresponding to the pay-back period of equity after loan financing), the cumulative receipts of the government over the next 10 years will reach 46 million Z$, i.e in the average about 4.6 million Z$ annually. The government will greatly benefit from the project.

10.3.2. FINANCIAL PROFITABILITY

In the absence of information on the tax content of inputs and the real value of foreign exchange, it is not possible to make a realistic calculation of the economic rate of return cf the project. However, it is possbile to arrive at some conclusion.

The tax content on the main raw materials (seeds) will be small, but somewhat more important on packaging materials. Whatever the exact size of the tax content, its elimination for cost benefit analysis will tend to make the project better from the national economic standpoint.

Concerning the exchange value of the Z$, it is periodically calculated by the Reserve Bank of ZIMBABWE by reference to a basket of currencies of the country's mai trading partners. In spite of quantitative restrictions on imports, the mission team in May 1988 found no evidnece of a parallel market for foreign exchange. This in an indication that the official rate of exchange at that time was not far away form the true value of foreign exchange.

All this means that the economimc rate of retunr is probably not much different form the financial rate. The net result is that the project appears quite good from the national point of view and that it should be therefore recommended for implementation.

10.4. ALTERNATIVES

10.4.1. SCENARIO 2

In this scenario, we consider a plant with half capacity i.e :

165 t/d in cotton seeds
125 t/d in soya bean.

Detailed calculation are made with the COMFAR.

Following Comfar schedule 7 (cashflow tables) shows the main values for Financial Ressources, total assets, sales, operating costs etc.. and IRR.

It appears that this scenario has to major drawbacks :

1/ The IRR on total Investment is low (3.2 %).

2/ The capacity is not sufficient to follow the increase of the Agricultural production (see the graph in paragraph 1.2 above).

Therefore, we will not recommend it.

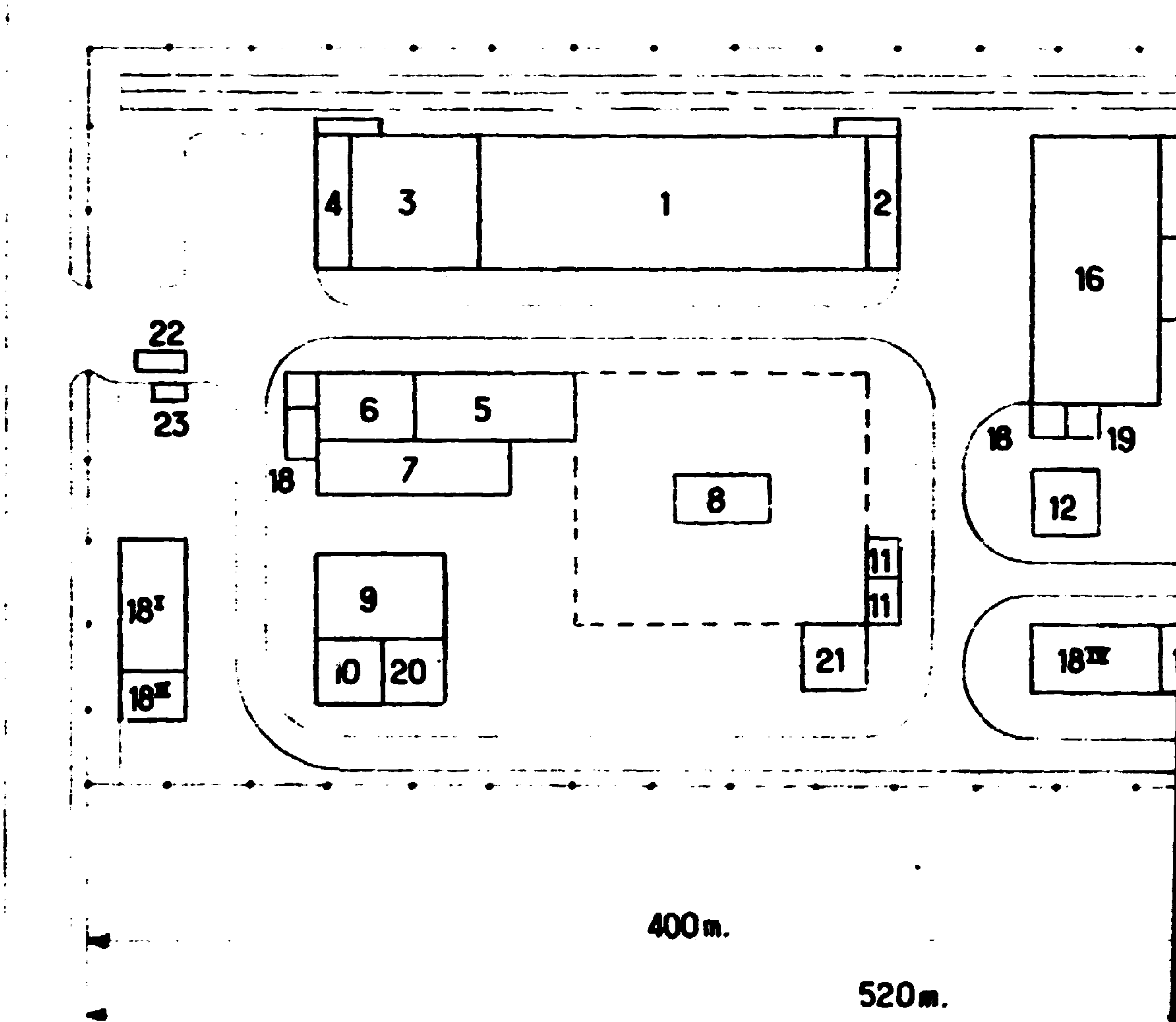
10.4.2. SCENARIO 3

In this scenario we consider a plant with double capacity, i.e :

660 t/d in cotton seed
500 t/d in soya bean.

It is obvious that such a scenario is not viable since the full production could not be obtained before the year 2000.

Therefore, we consider that this scenario must be eliminated.



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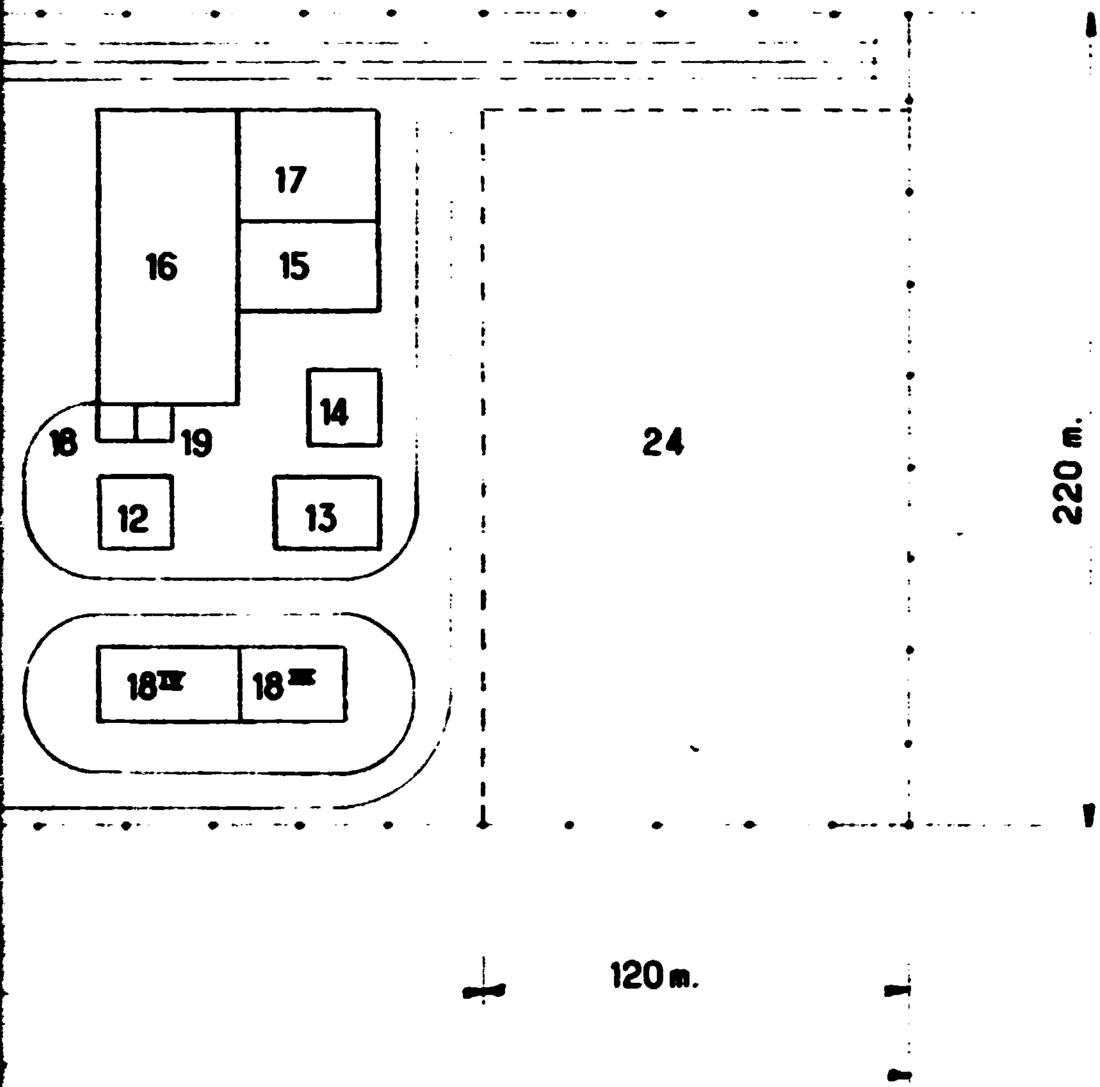
20
21
18I
18II
18III
400m.
520m.

SECTION 1



SECTION .2

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6	Co
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8	Sc
9	Hu
10	Bo me
11	Co
12	Cr 4

SECTION 3

EDIBLE OILS PLANT – BUILDINGS

NBR	FUNCTIONS	DIMENSIONS m	NBR	FUNCTIONS	DIMENSIONS
1	Cotton seed storage	100 x 40 x 20 2 bays	13	Oil refining	30 x 20 x 12
2	Cotton seed unloading	40 x 10	14 2	Refined oil storage for 3 tanks Ø 7, 5.5, 4.5 m H 10, 8.5, 6.3 m .	30 x 10
3	Soyabeans storage	3 silos each H = 27 m Ø 13 m	15	Conditionning	40 x 25 x 8
			18	Power substations	10x25/10x20
	Floors	30 x 30	16	Meal bagging and storage	45 x 40 x 8 2 bays
4	Soyabeans unloading	20 x 10 x 10	17	Edible oil and linter storage building	40 x 30 x 8
5	Cotton seed delinting	50 x 20 x 8			
			18 I	Offices	40 x 20 x 5
6	Cotton seed decorticating	30 x 20 x 8	II	Laboratory	15 x 20 x 5
7	Oil seeds preparation and pre-pressing	50 x 16 x 12	III	General stores	30 x 20 x 8
8	Solvent plant	30 x 20 x 15	IV	Maintenance shop	20 x 10 x 8
9	Husks storage	40 x 25	19	Diesel building	10 x 10
10	Boiler and water treat- ment	20 x 20 x 8	20	Coal storage ment	20 x 15
11	Cooling towers 2	10 x 10	21	Water storage for tank 600 m^3 Ø 8 H =12	10 x 10
12	Crude oil storage for [illegible]	20 x 20	22	Wheight bridge	18 x 3 (60 t)

DIMENSIONS
30 x 20 x 12
30 x 10
40 x 25 x 8
10x25/10x20 45 x 40 x 8 2 bays
40 x 30 x 8
40 x 20 x 5
15 x 20 x 5
30 x 20 x 8
20 x 10 x 8
10 x 10
20 x 15
10 x 10
18 x 3 (60 t)

SECTION 4

ZIMBABWE
VEGETABLE OIL FACTORY

330MT/DCOTTON SEEDS,SUNFLOWER SEEDS

250MT/D SOYA BEANS

SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

TEL [illegible]
TELEX [illegible]

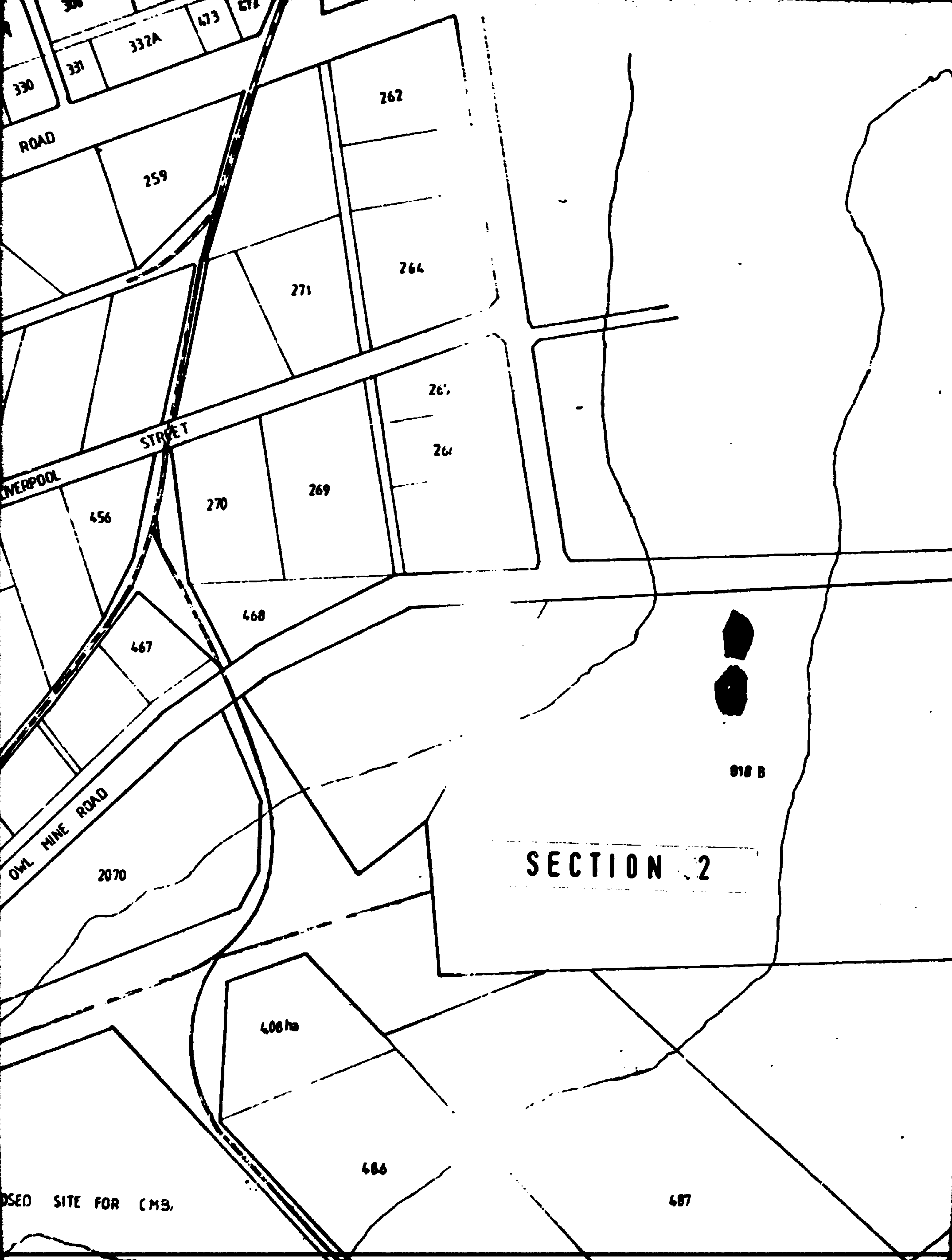
GENERAL LAY-OUT

1	22.9.80	Mise à Jour
0	15.8.80	Première Emission

ECH. 1/2000 — DATE: 15.8.1980

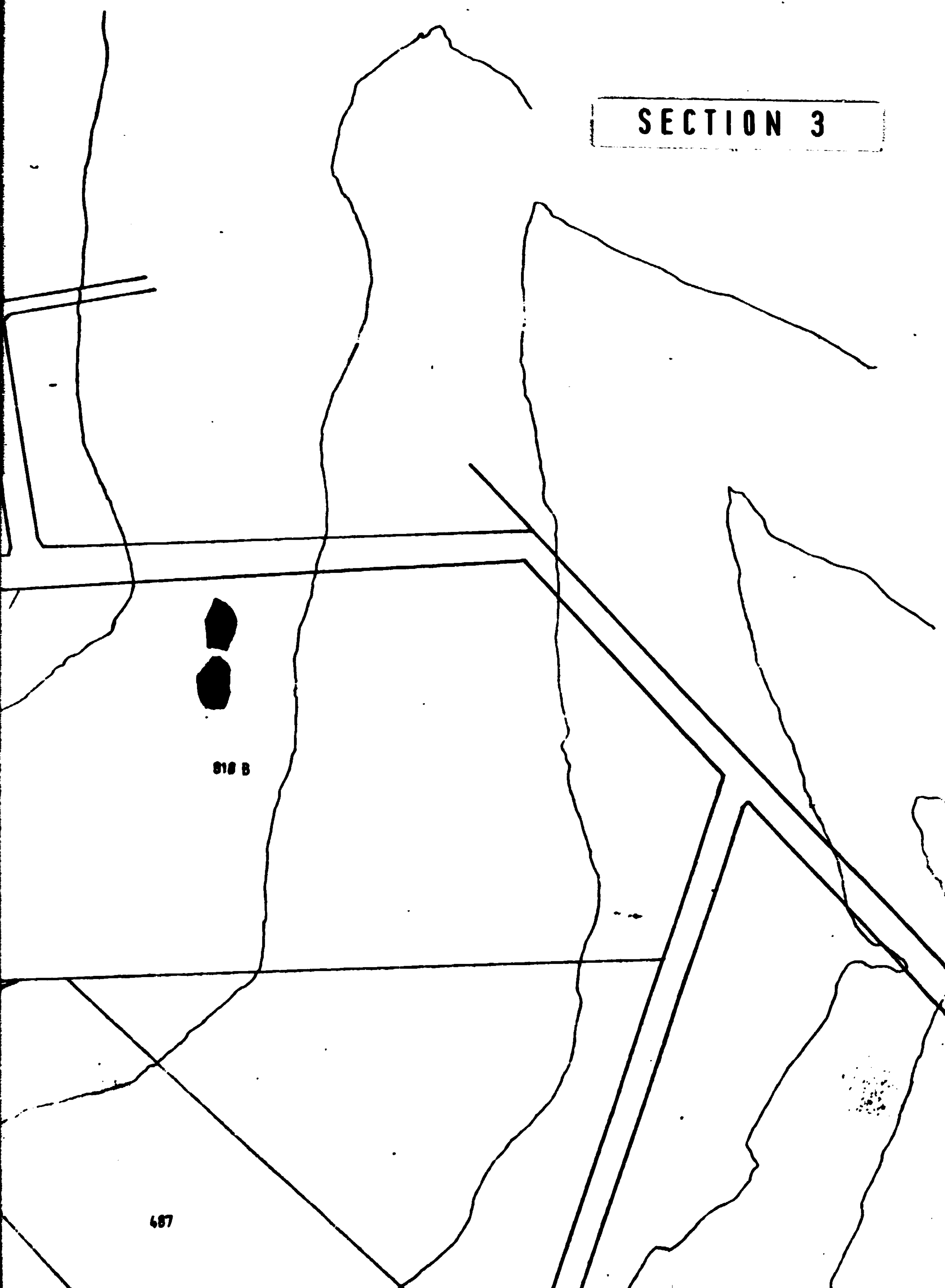
SECTION 1

309
330
331
332A
GODWIN ROAD
253
277
252
LIVERPOOL
456
450A
448
OWL MINE ROAD
2070
462
PROPOSED SITE FOR

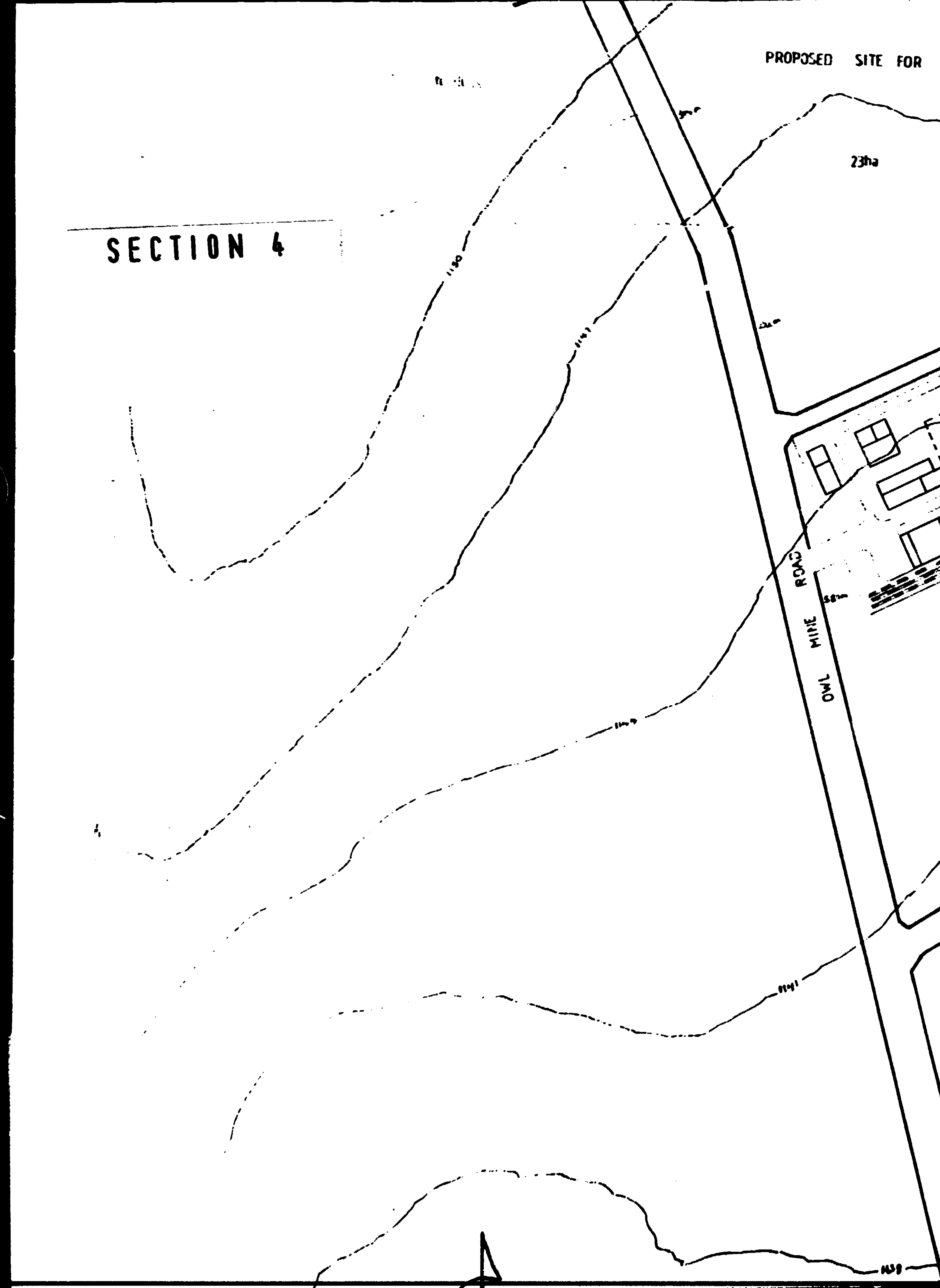


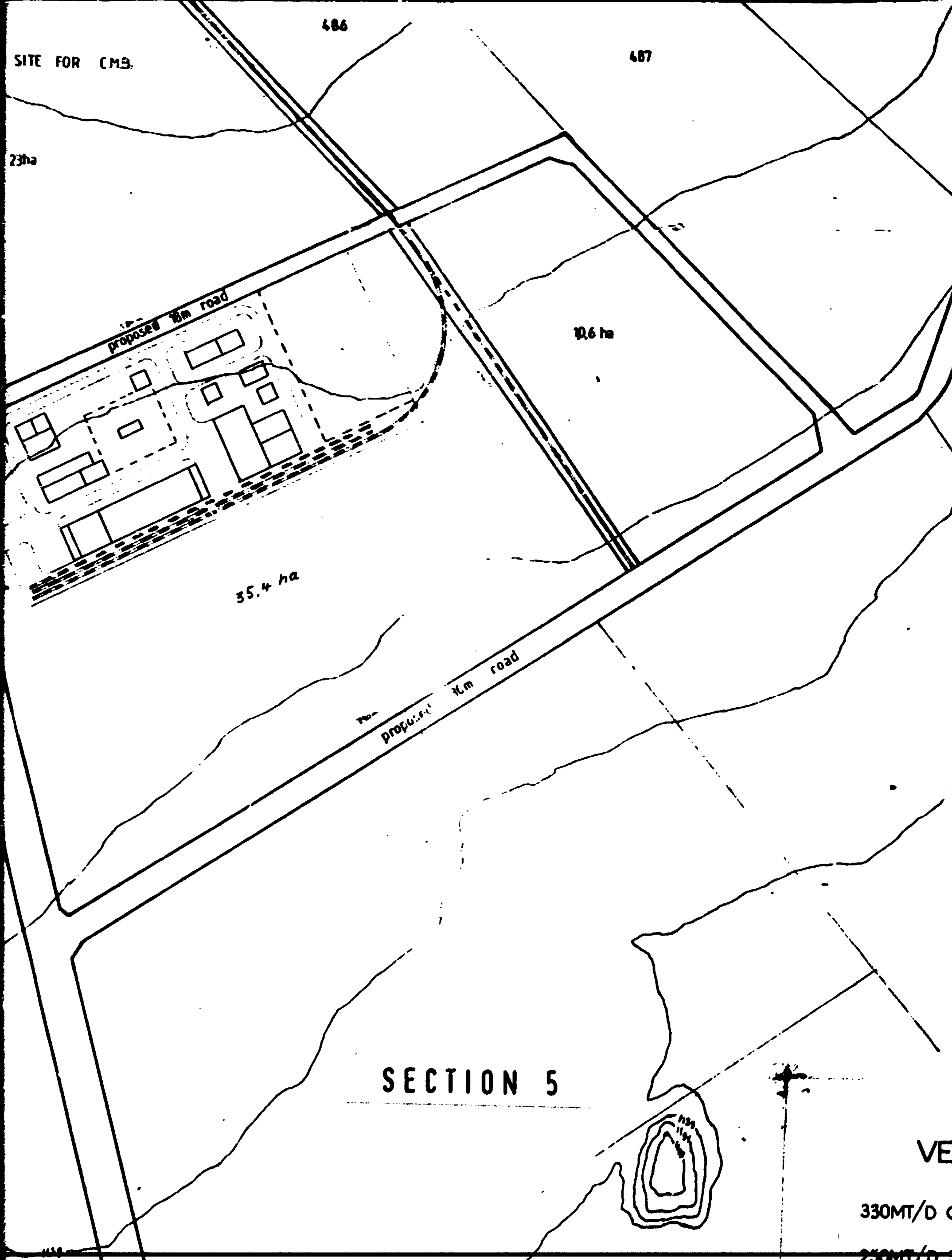
332A
473
330
331
262
ROAD
259
264
271
26
26
STREET
LIVERPOOL
456
270
269
468
467
818 B
OWL MINE ROAD
SECTION 2
2070
4.08 ha
486
487
OSED SITE FOR CMB.

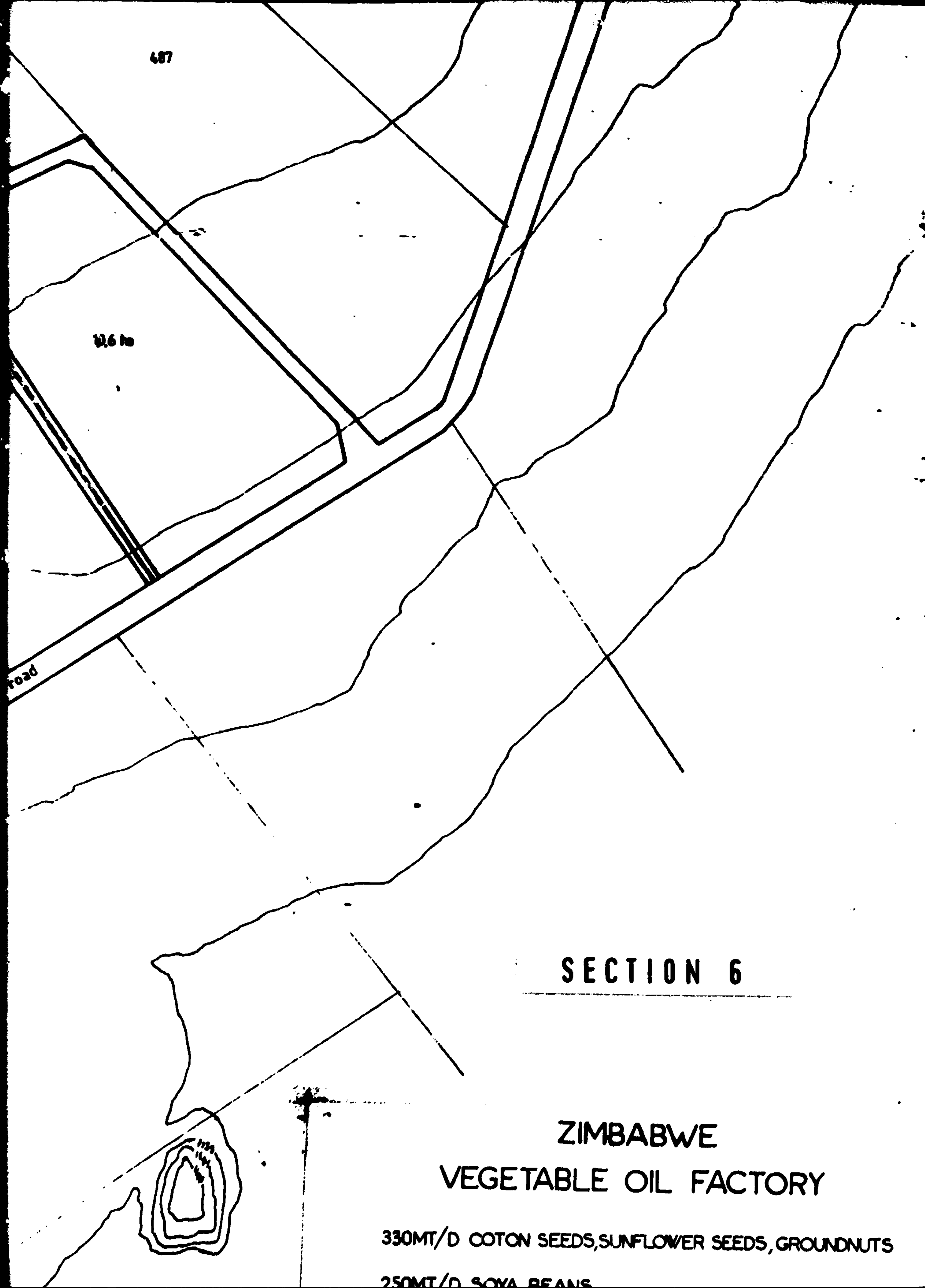
SECTION 3



SECTION 4




486
487
SITE FOR CMB.
23ha
proposed 18m road
10,6 ha
35.4 ha
road
SECTION 5
VE
330MT/D C



SECTION 6

ZIMBABWE

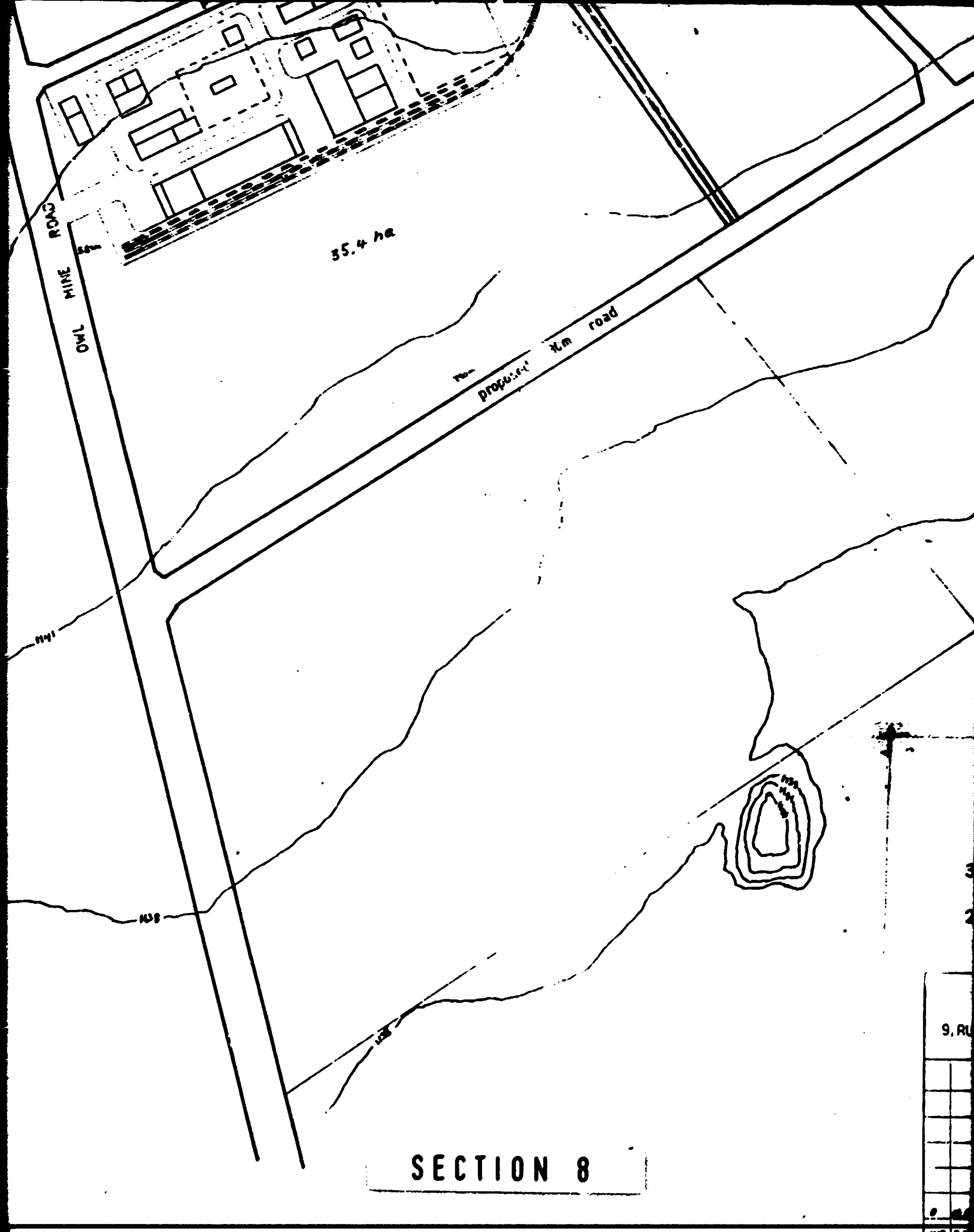
VEGETABLE OIL FACTORY

330MT/D COTON SEEDS, SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SCALE 1:5000

SECTION 7



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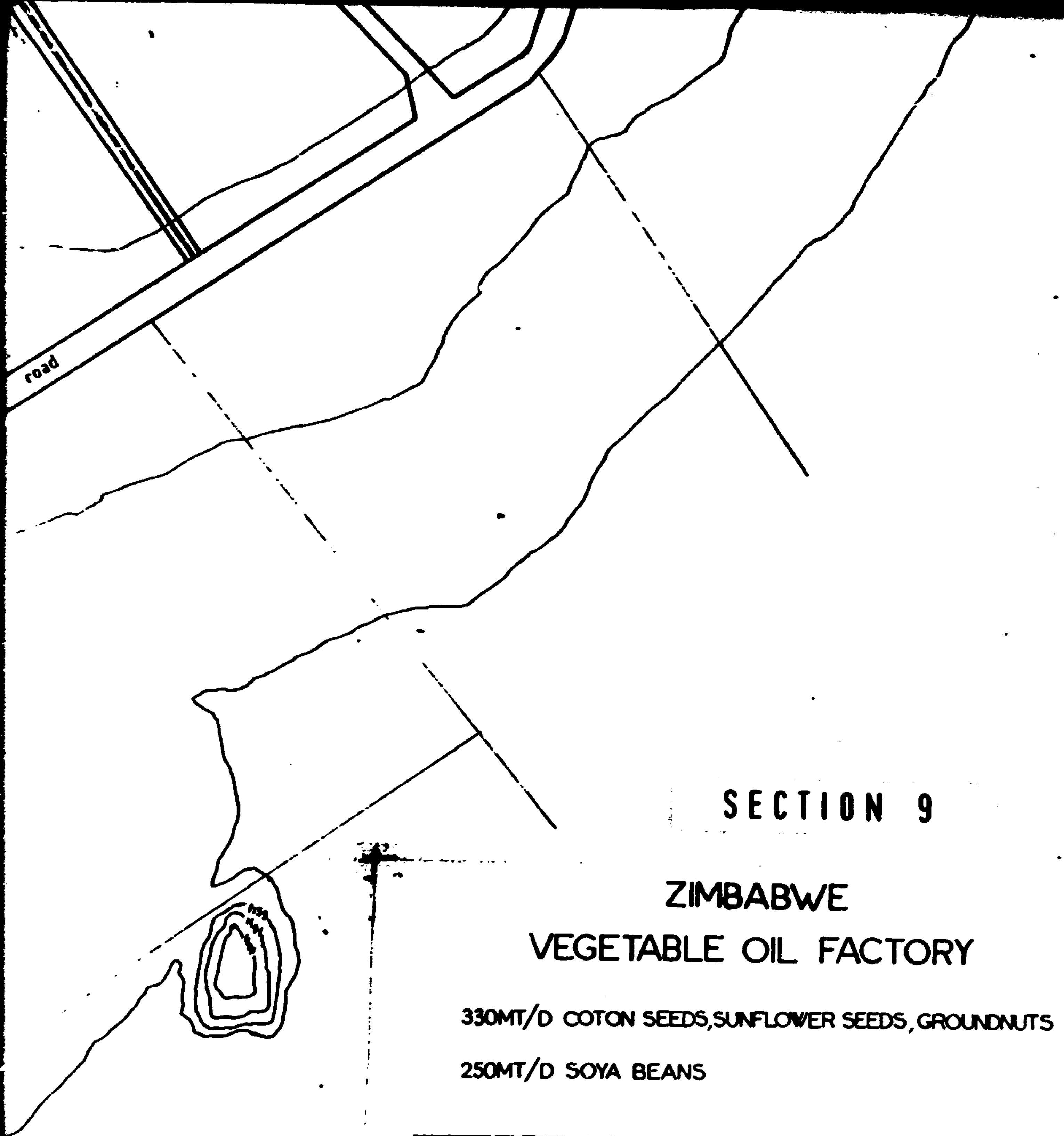


SECTION 9

ZIMBABWE
VEGETABLE OIL FACTORY

330MT/D COTON SEEDS,SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SOFRECO

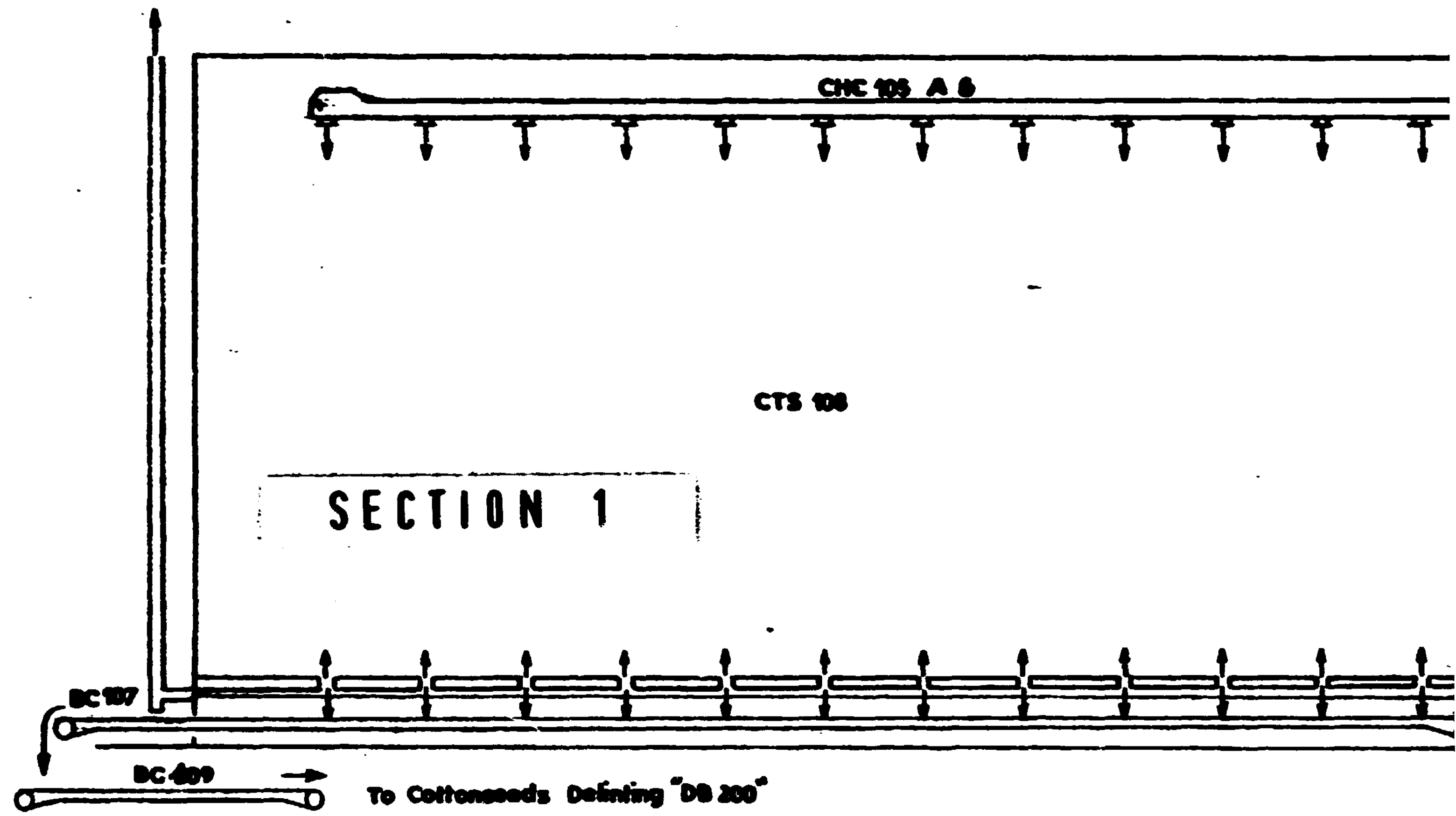
9, RUE ALFRED DE VIGNY
75008 PARIS

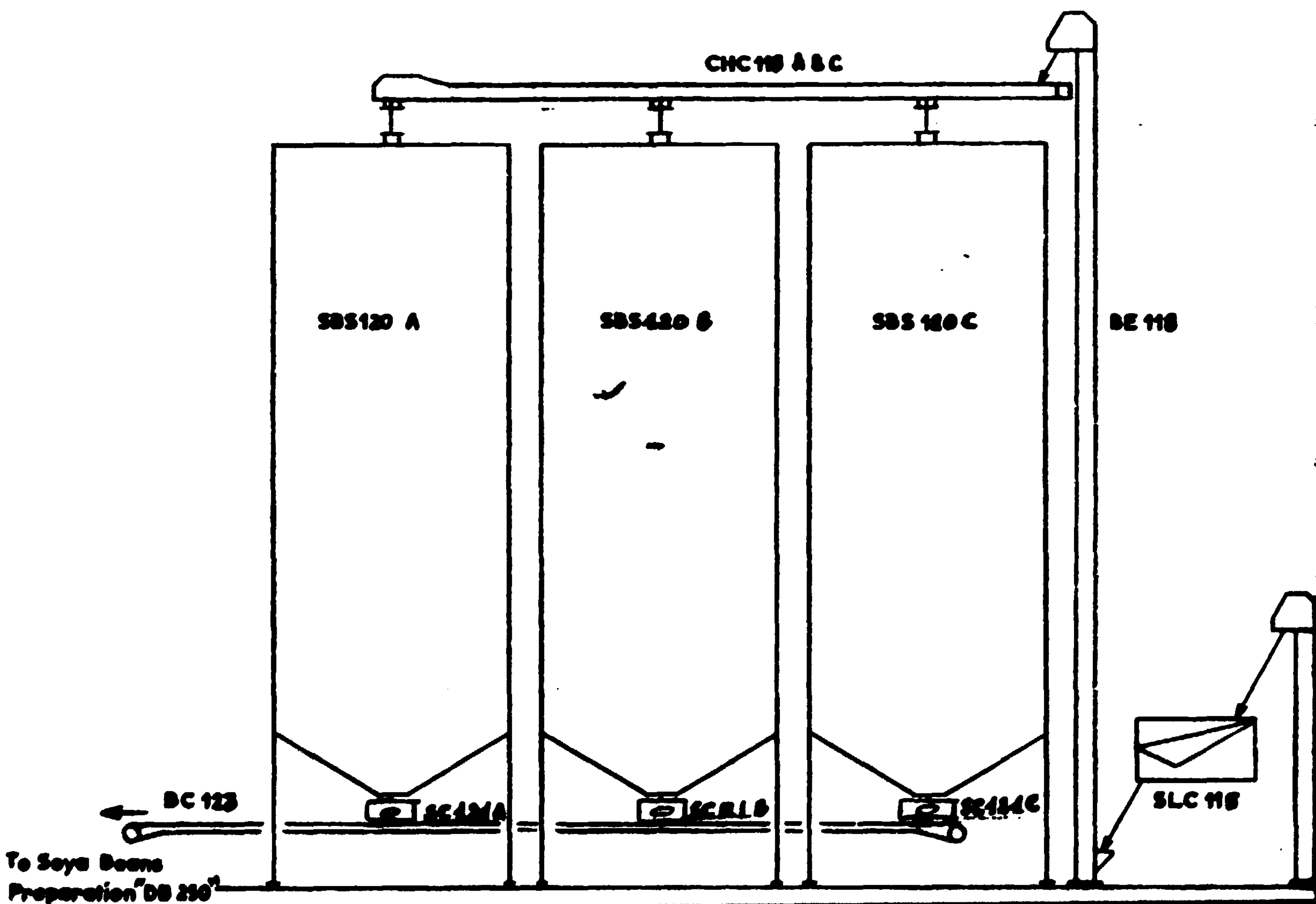
TEL (1) 45 22 19 [illegible]
TELEX 641 [illegible]

SITE

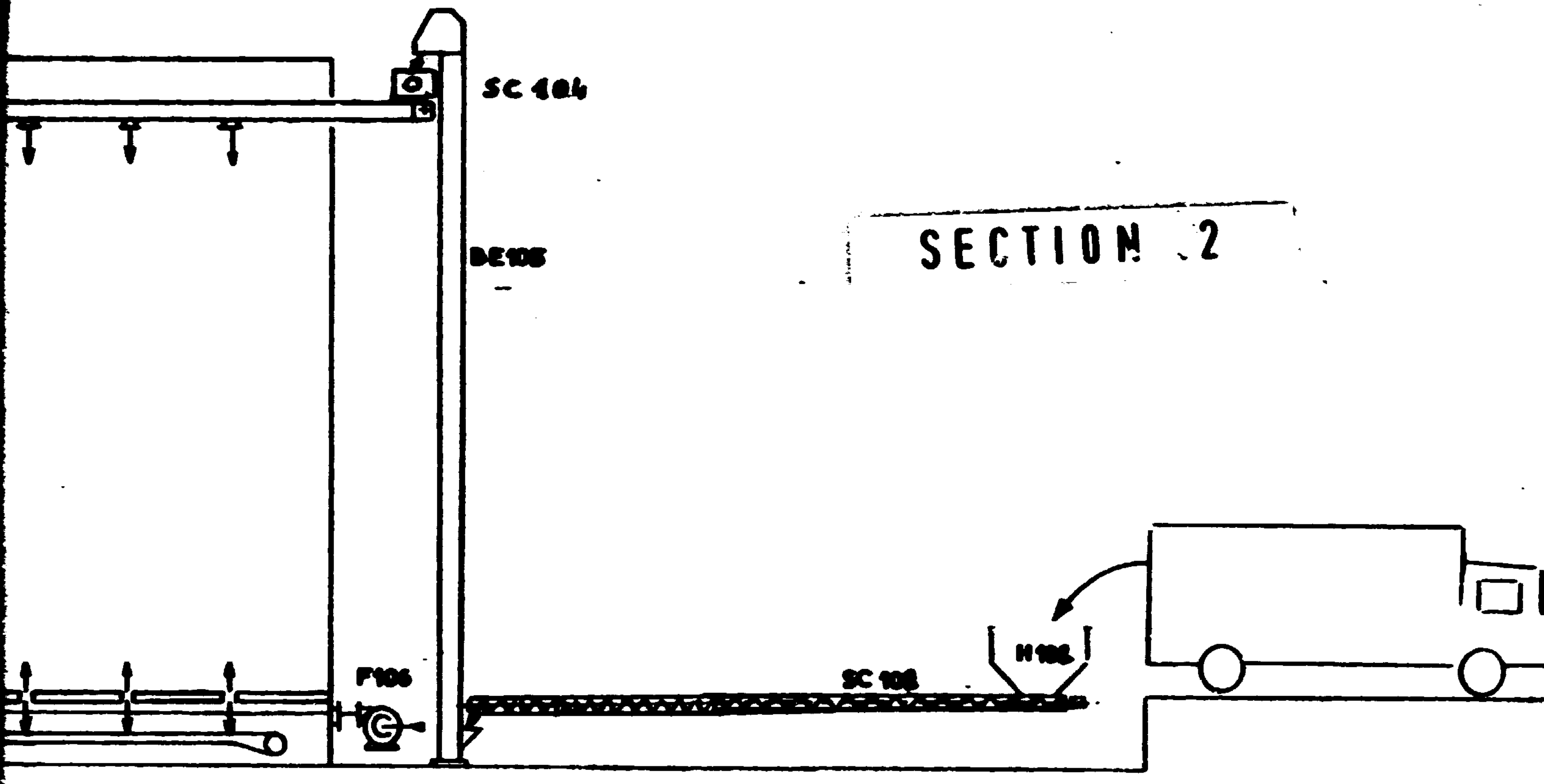
0	[illegible]	Première émission	ECH.	DATE : 09.03.1988

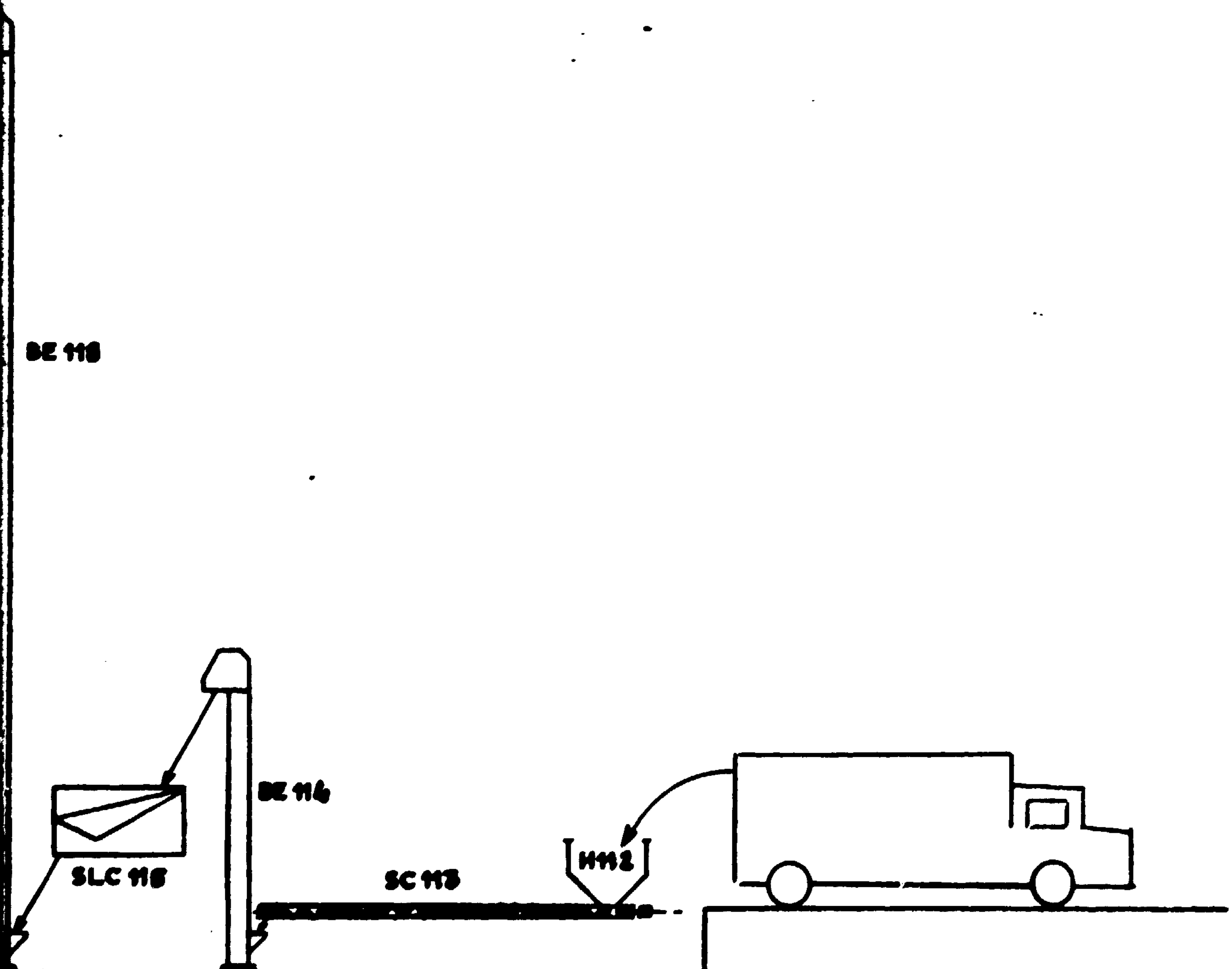
C228 A002


CTS 108
SECTION 1
BC 107
To Cottonseeds Delinting "DB 200"


SBS120 A
SBS 120 C
BC 123
SLC 118
To Soya Beans
Preparation "DB 250"

SECTION 2





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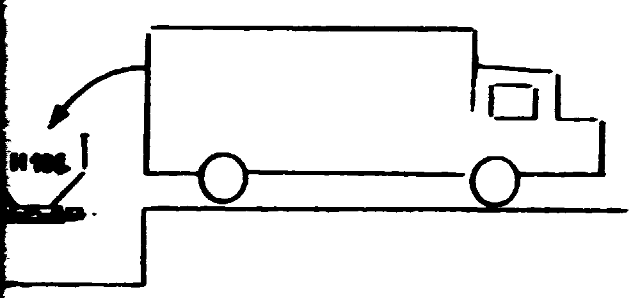
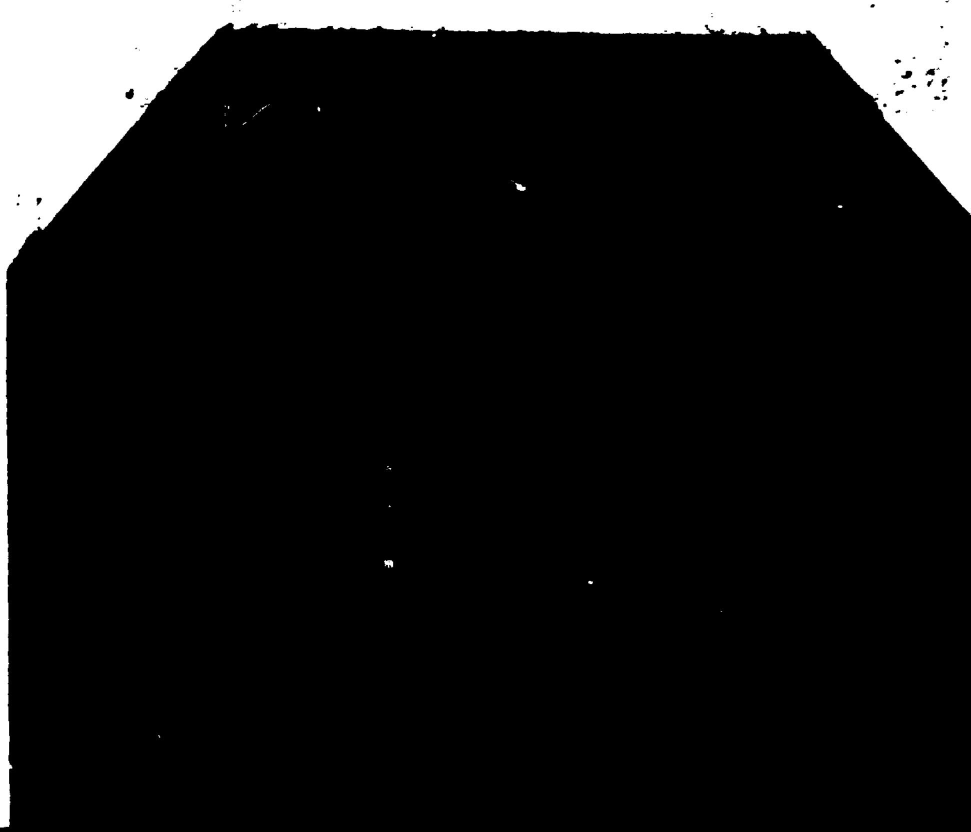
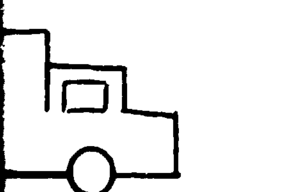
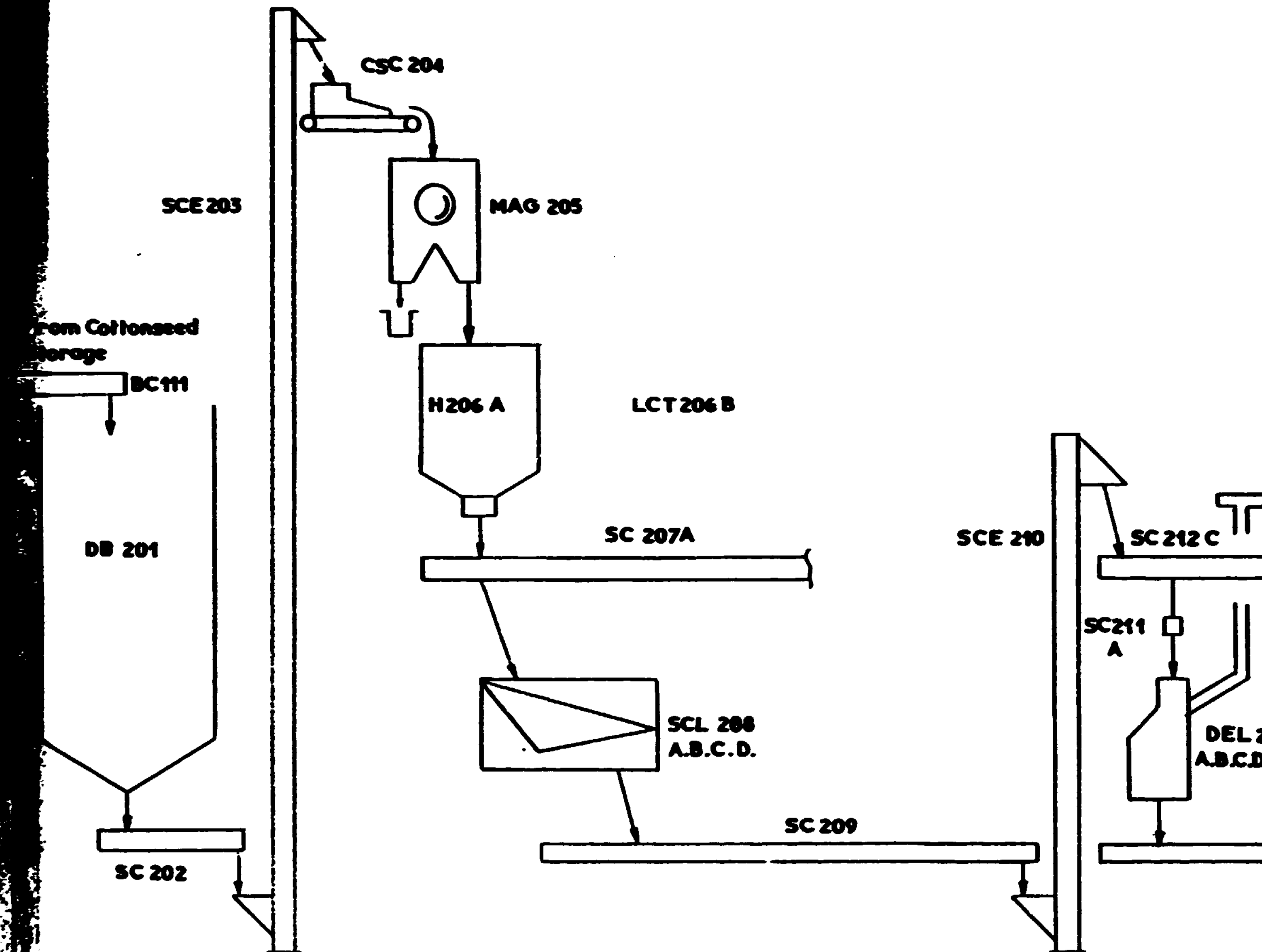
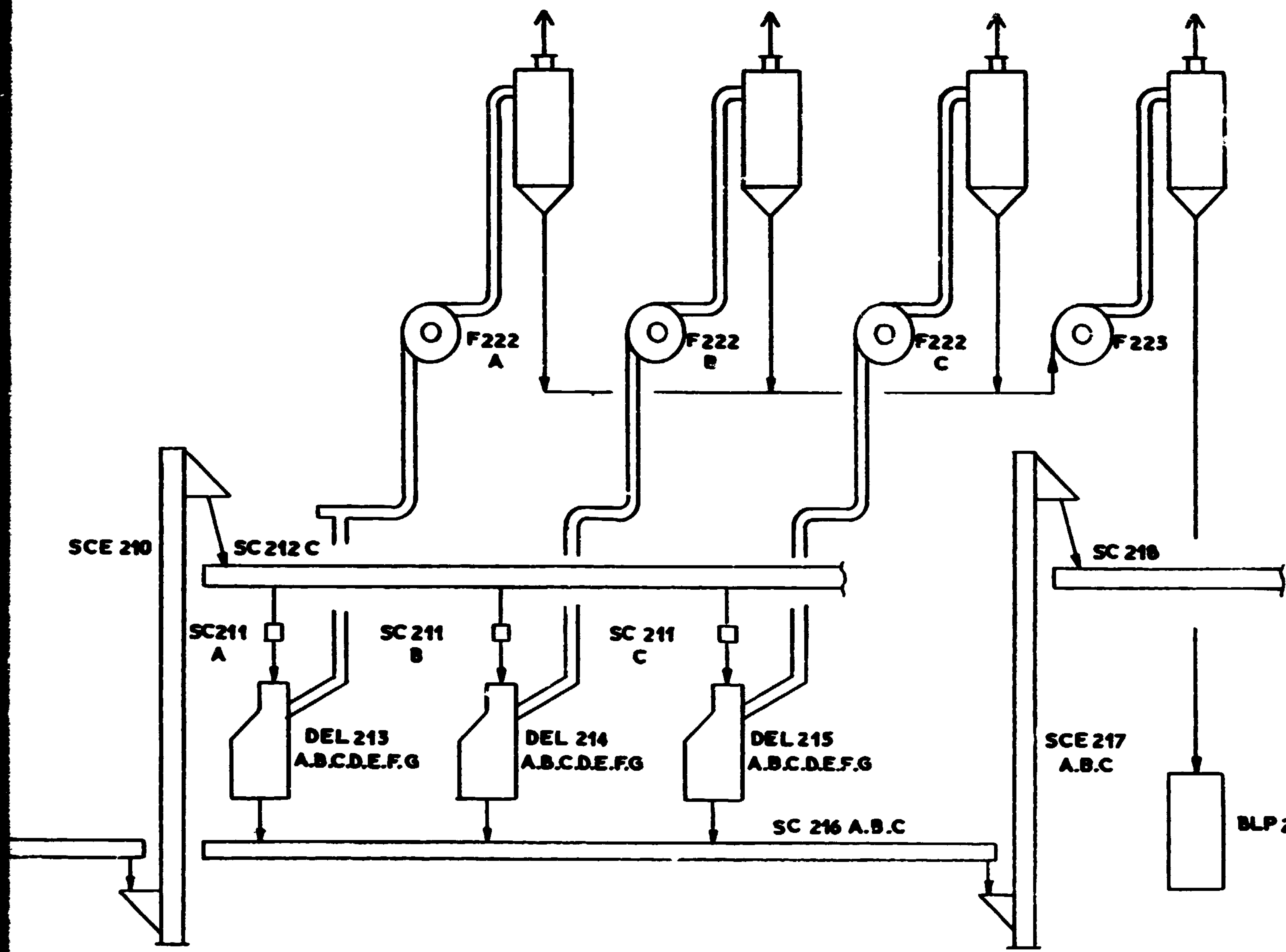








CSC 204
SCE 203
MAG 205
rom Cottonseed
torage
BC111
H206 A
LCT 206 B
DB 201
SC 207A
SCE 210
SC 212 C
SC211
A
SCL 208
A.B.C.D.
DEL
A.B.C.D
SC 209
SC 202



SECTION 2

ZIMBABWE

VEGETABLE OIL FACT

330MT/D COTON SEEDS,SUNFLOWER SEED

250MT/D SOYA BEANS

SOFRECO

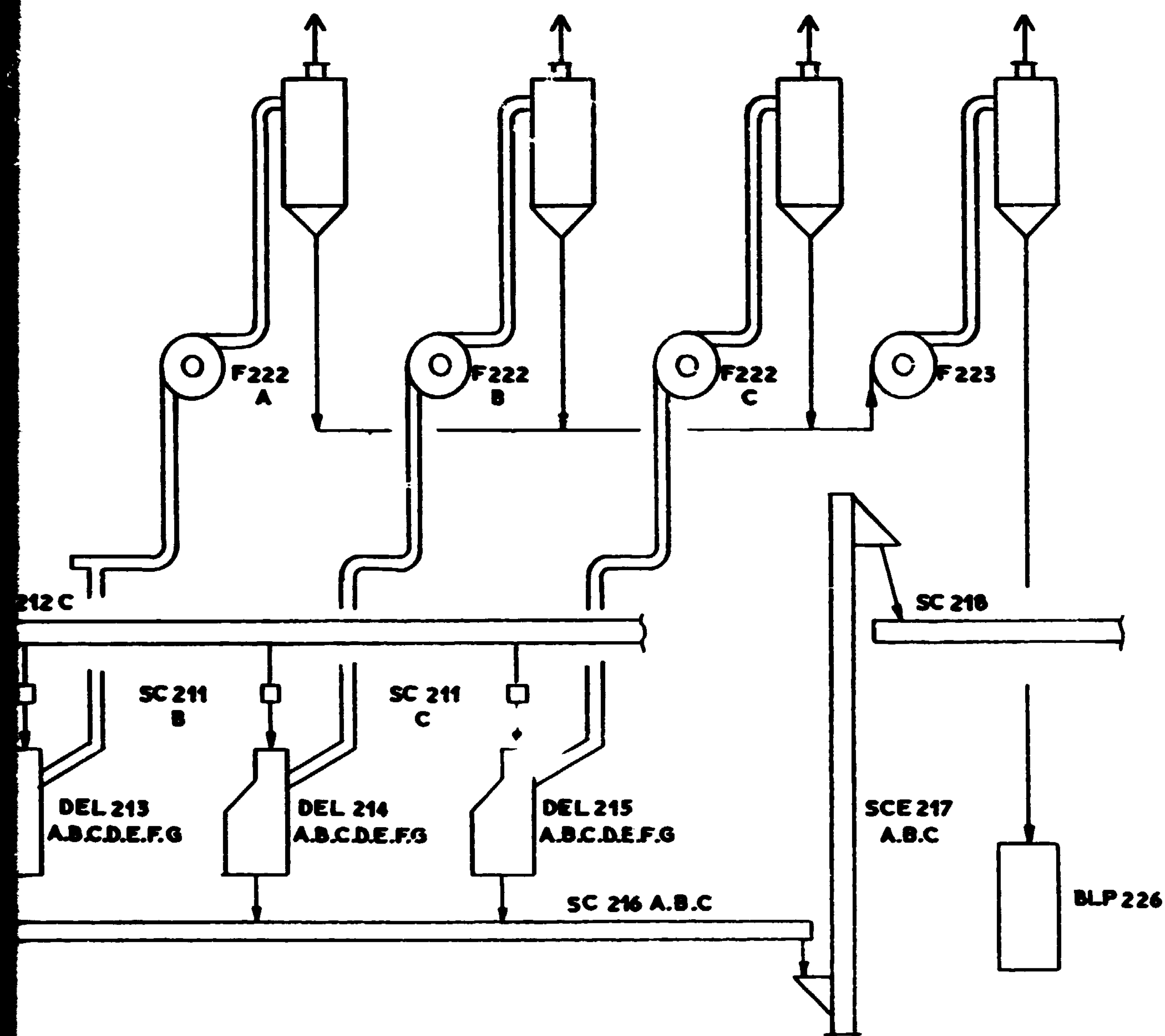
9, RUE ALFRED DE VIGNY
75008 PARIS

COTTON SEED DEL

FLOW DIAGRAM

SECTION 200

ECH. | DATE:



SECTION 3

ZIMBABWE
VEGETABLE OIL FACTORY

330MT/D COTON SEEDS, SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

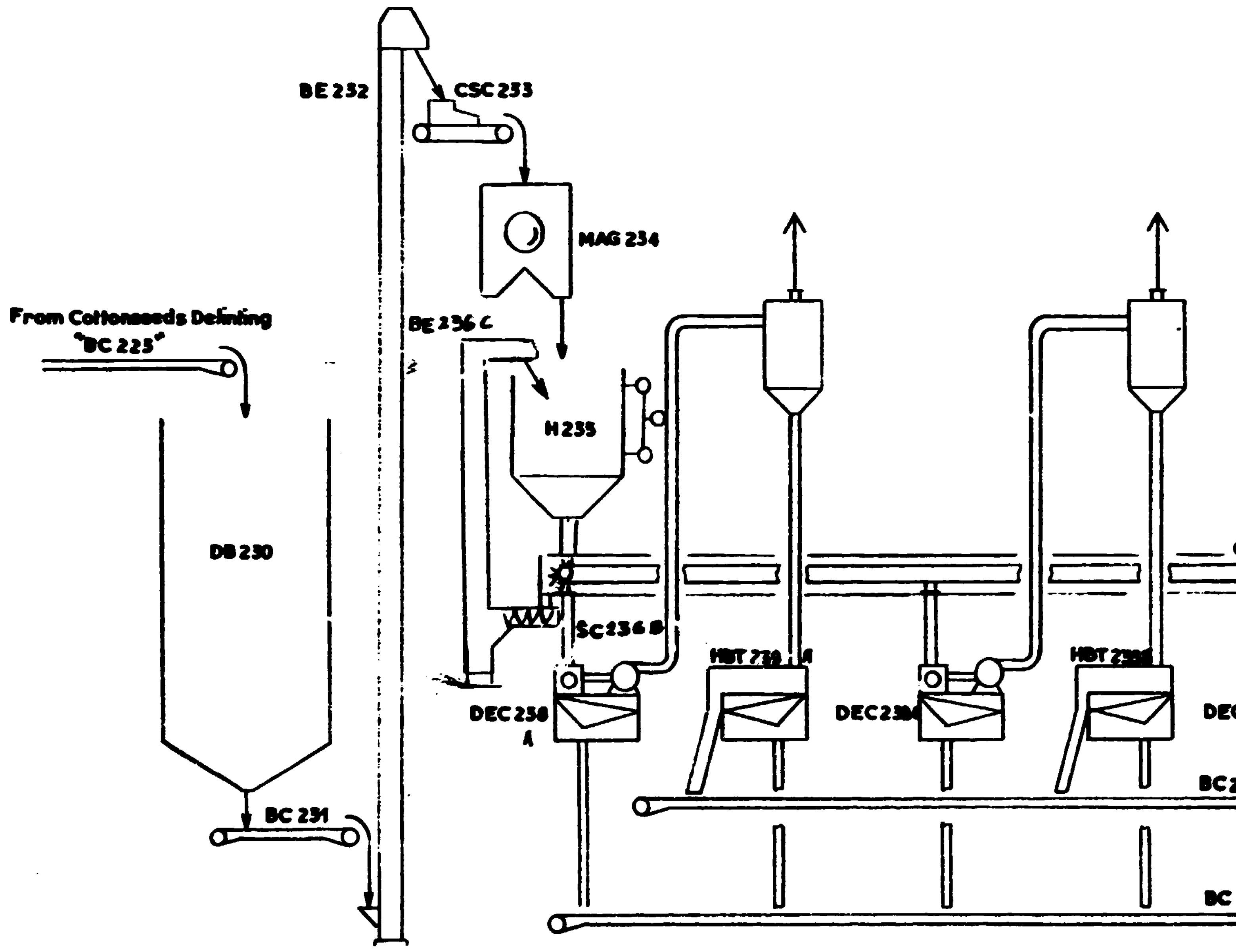
TEL (1) 45 22 [illegible]
TELEX 641 610 F

COTTON SEED DELINTING

FLOW DIAGRAM

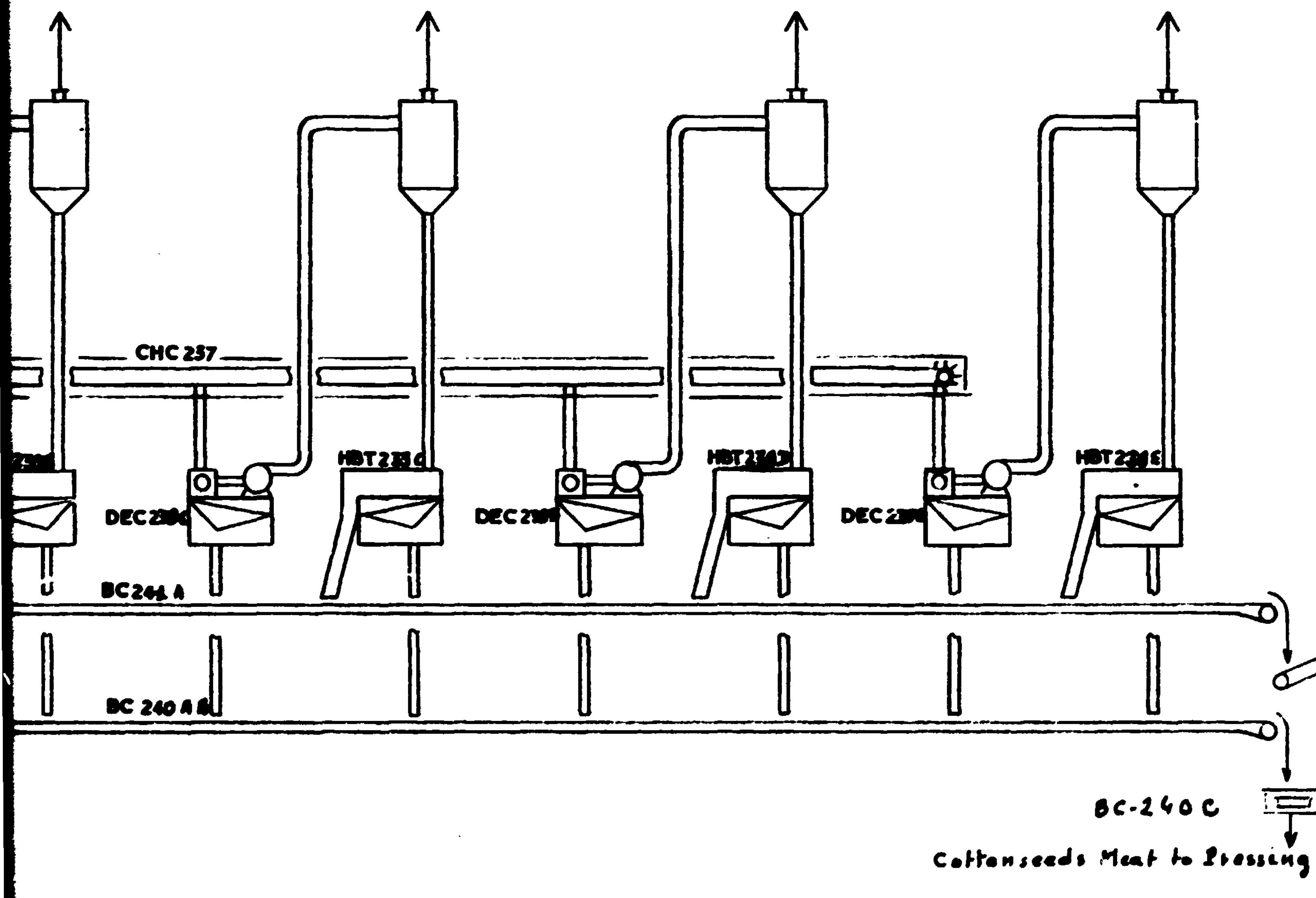
SECTION 200

ECH. | DATE. | C328-A301

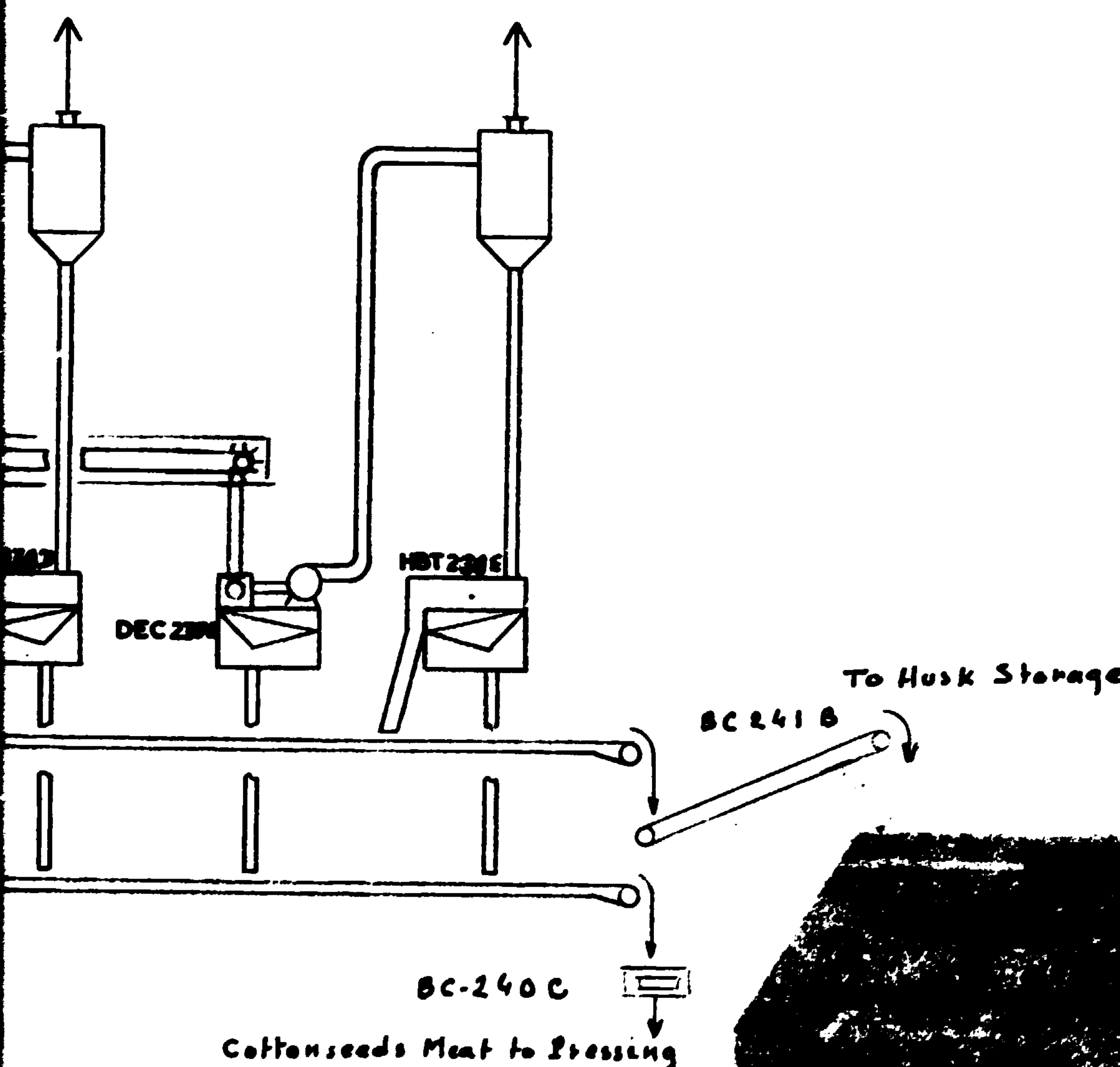


BE 232
CSC 233
MAG 234
From Cottonseeds Delinting
"BC 225"
BE 236 C
H 235
DB 230
SC 236 B
DEC 238 A
BC 231

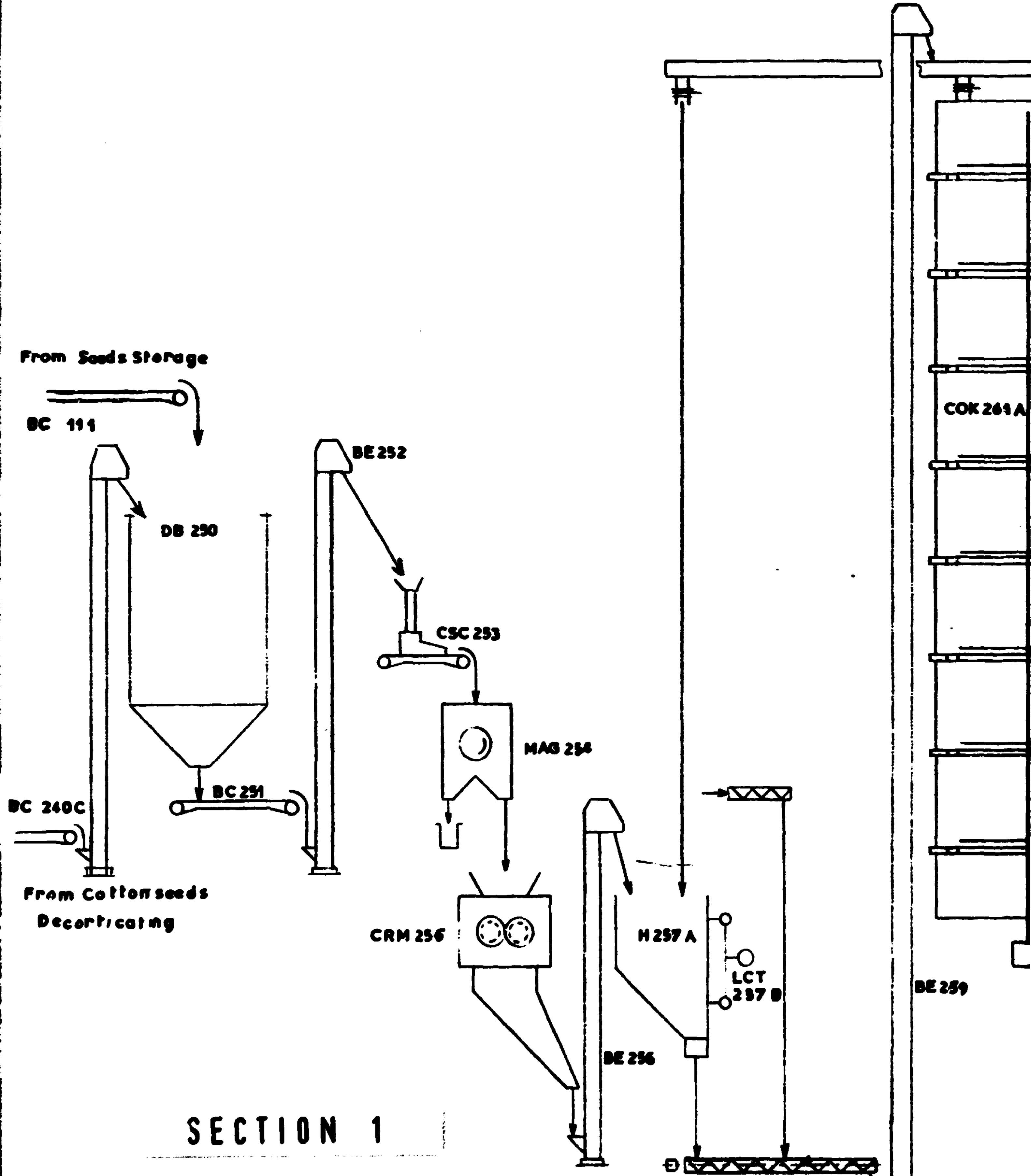
SECTION 1



SECTION .2

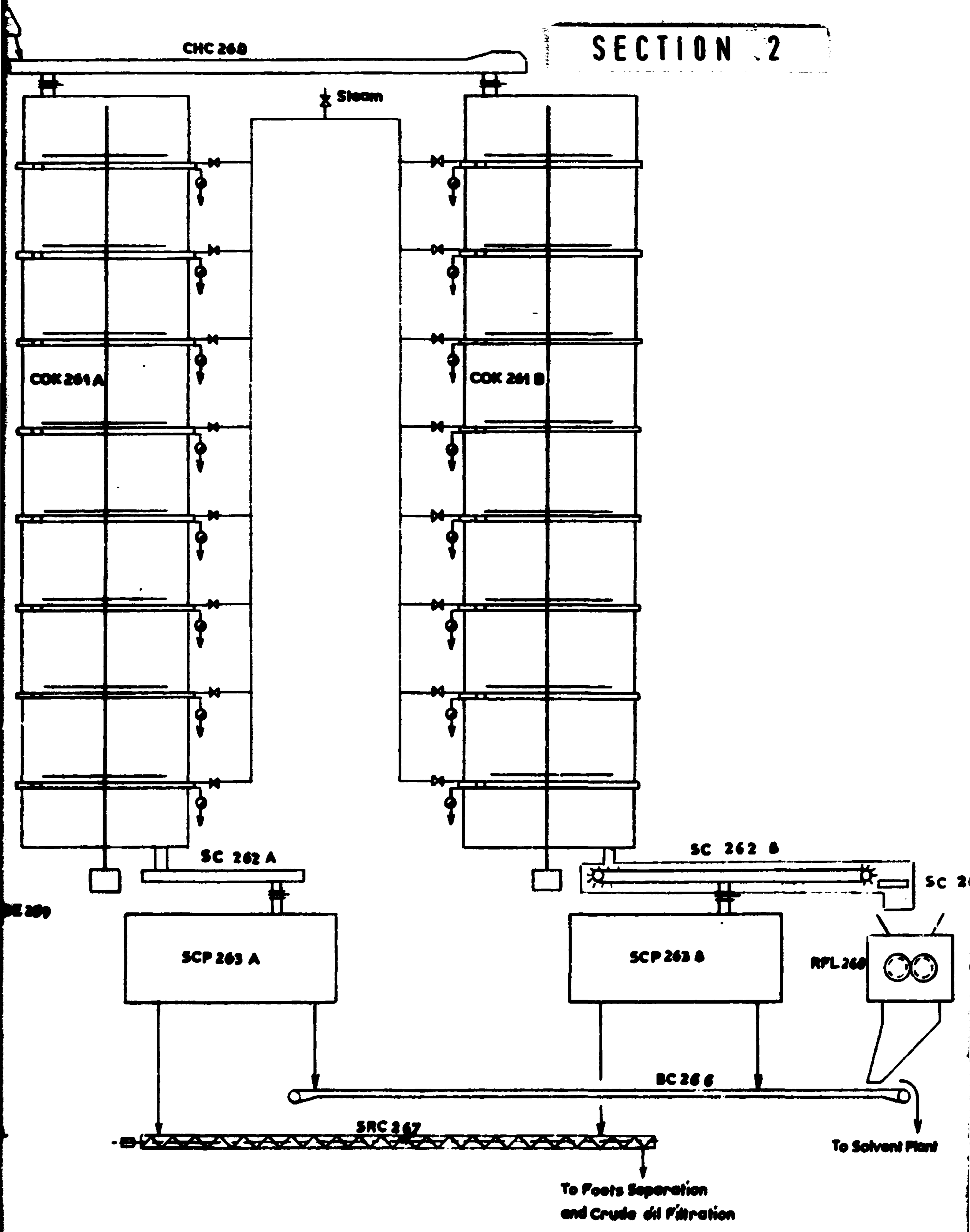

To Husk Storage
BC 241 B
BC-240 C
Cottonseeds Meat to Pressing

SECTION 3

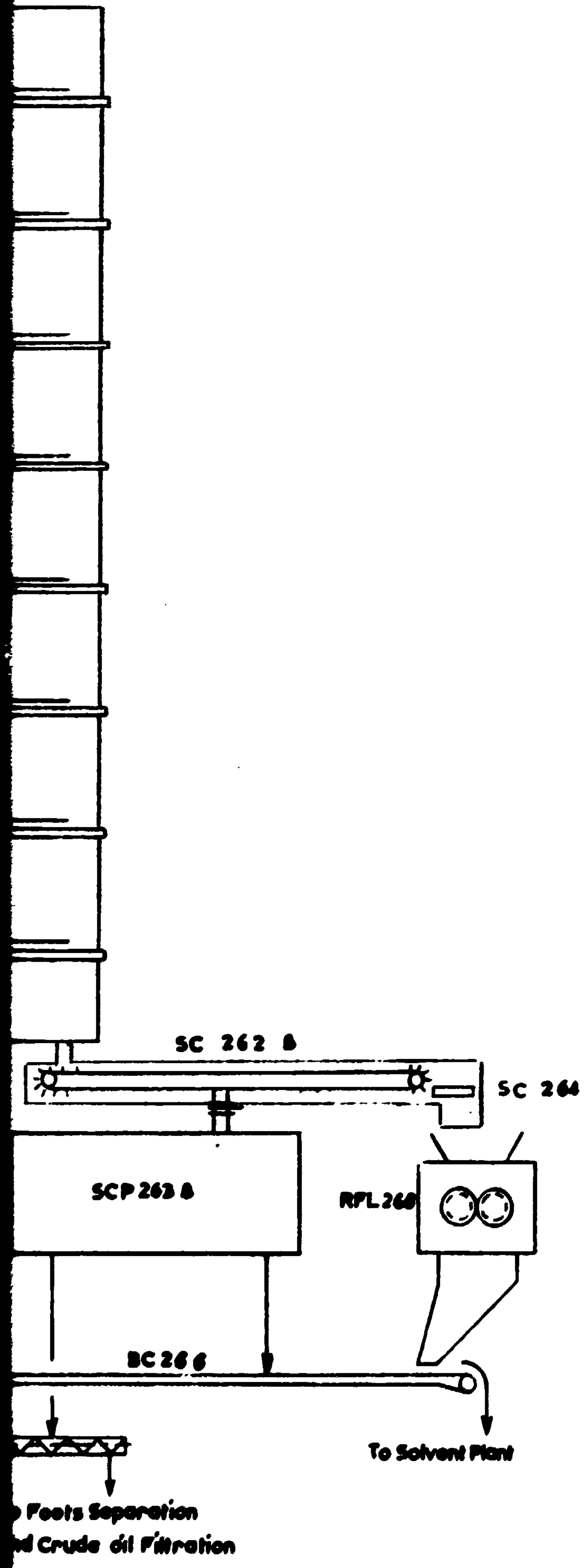

From Seeds Storage
BC 111
DB 250
BE 252
CSC 253
MAG 254
BC 251
BC 240C
From Cottonseeds Decorticating
CRM 256
BE 256
H 257 A
LCT 257 B
SRC 258
BE 259
COK 261 A

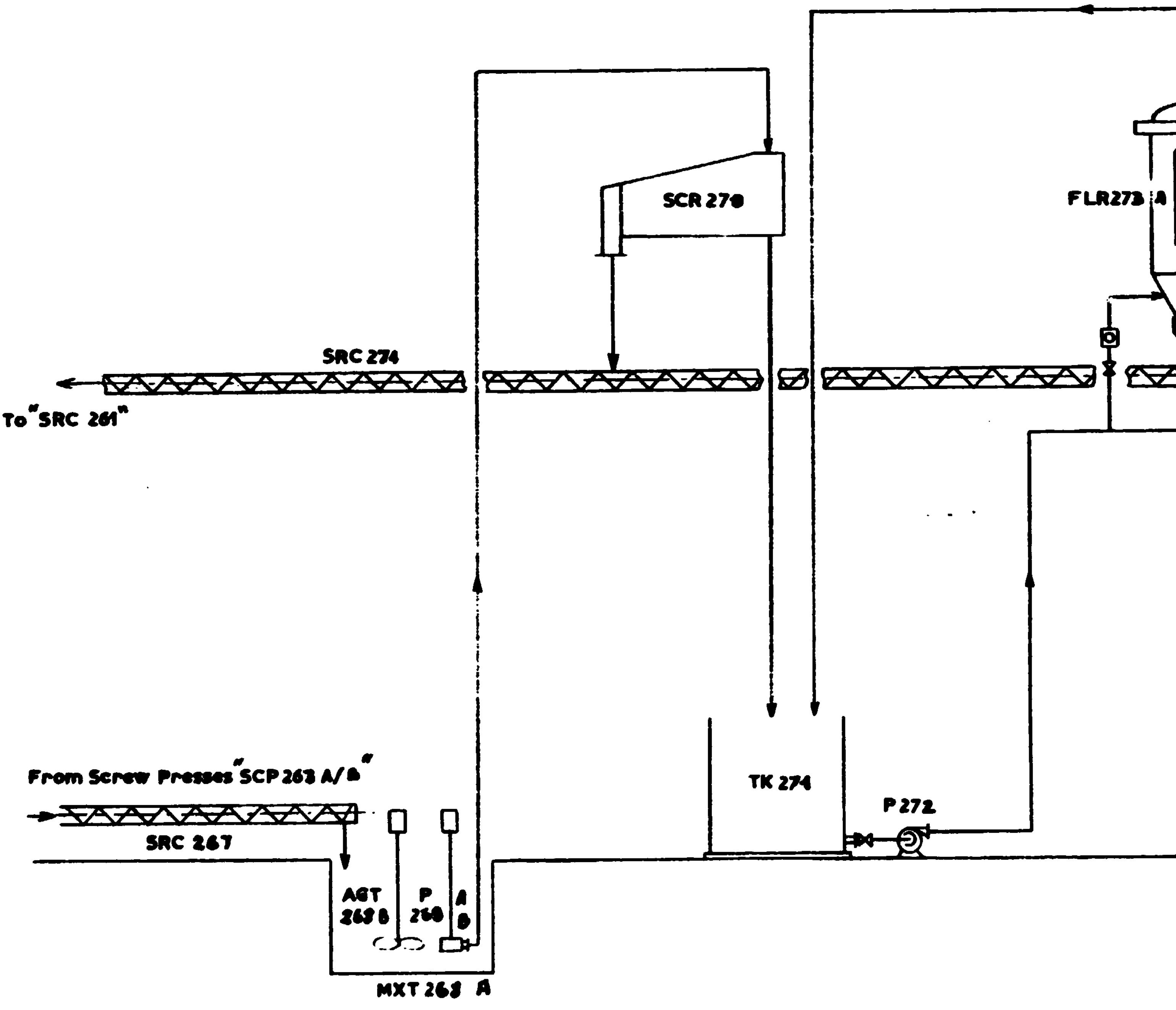
SECTION 1

SECTION 2


CHC 268
Steam
COK 261 A
COK 261 B
SC 262 A
SC 262 B
SCP 263 A
SCP 263 B
BC 266
SRC 267
To Solvent Plant
To Foots Separation
and Crude oil Filtration

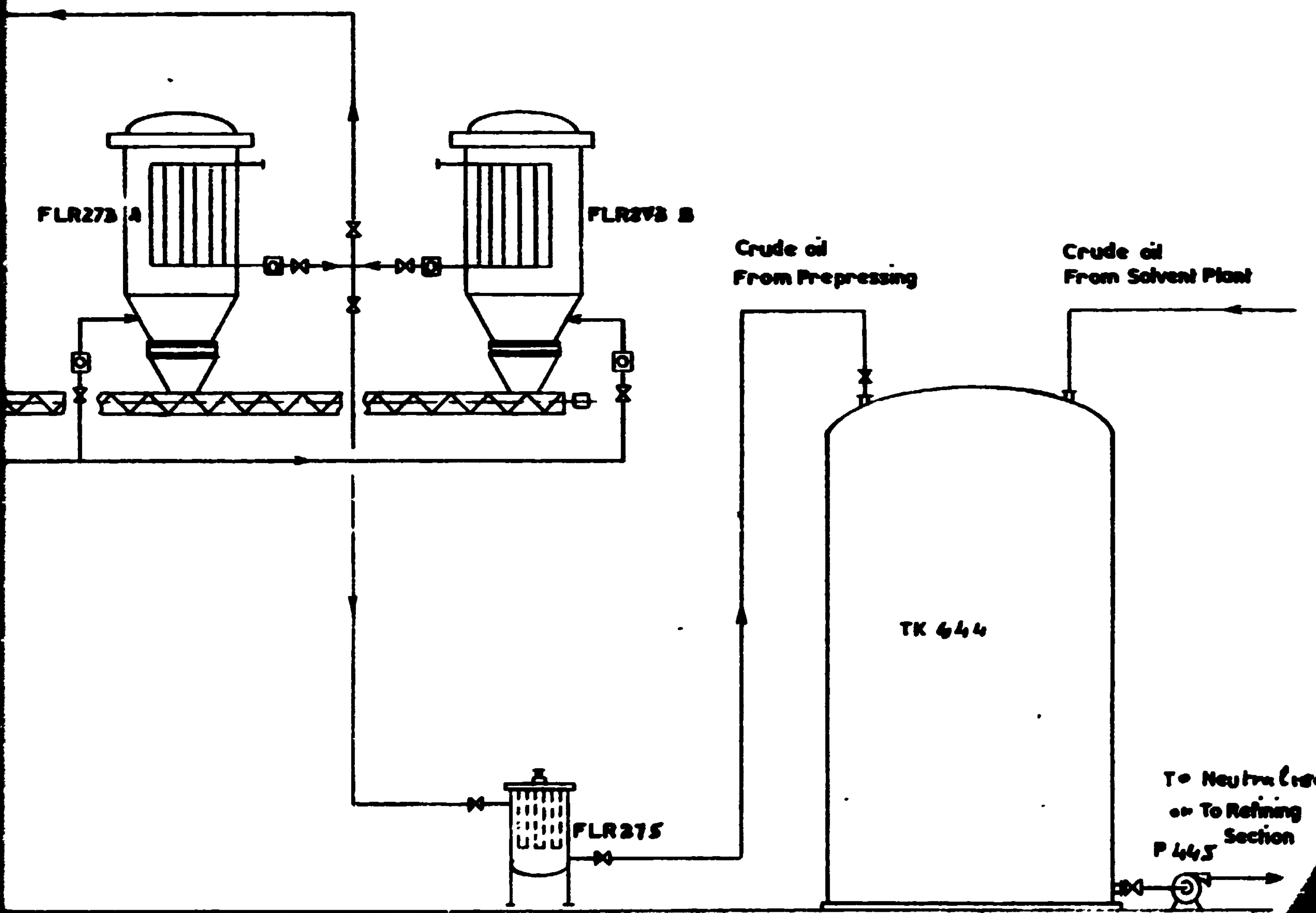
SECTION 3


SC 262 B
SC 264
SCP 263 B
RFL 268
BC 266
To Solvent Plant
Foots Separation
Crude oil Filtration

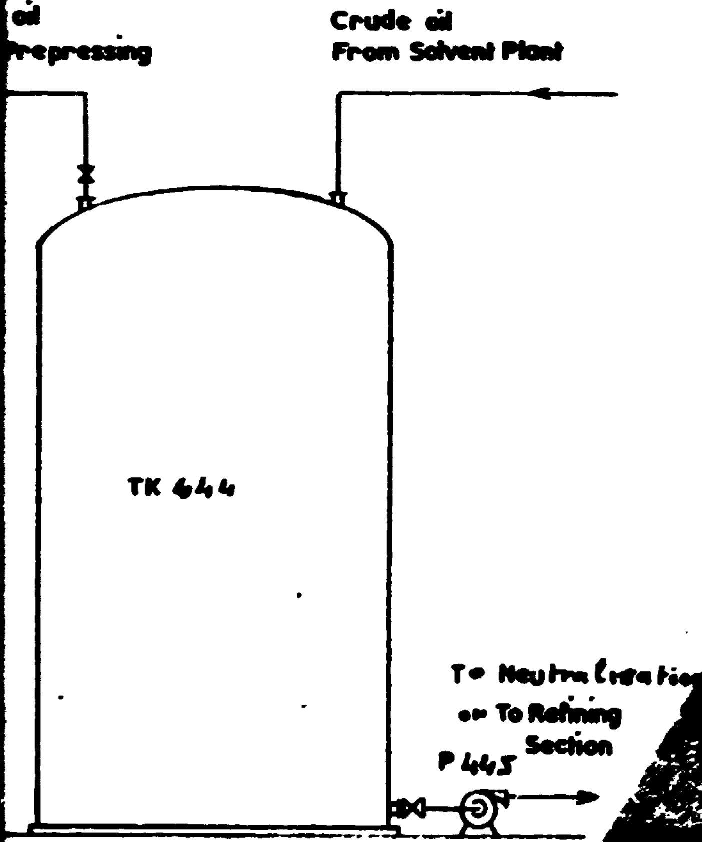


SCR 270
FLR273 A
SRC 274
To "SRC 261"
From Screw Presses "SCP 263 A/B"
SRC 267
TK 274
P 272
AGT 268 B
P 268
A
B
MXT 268 A

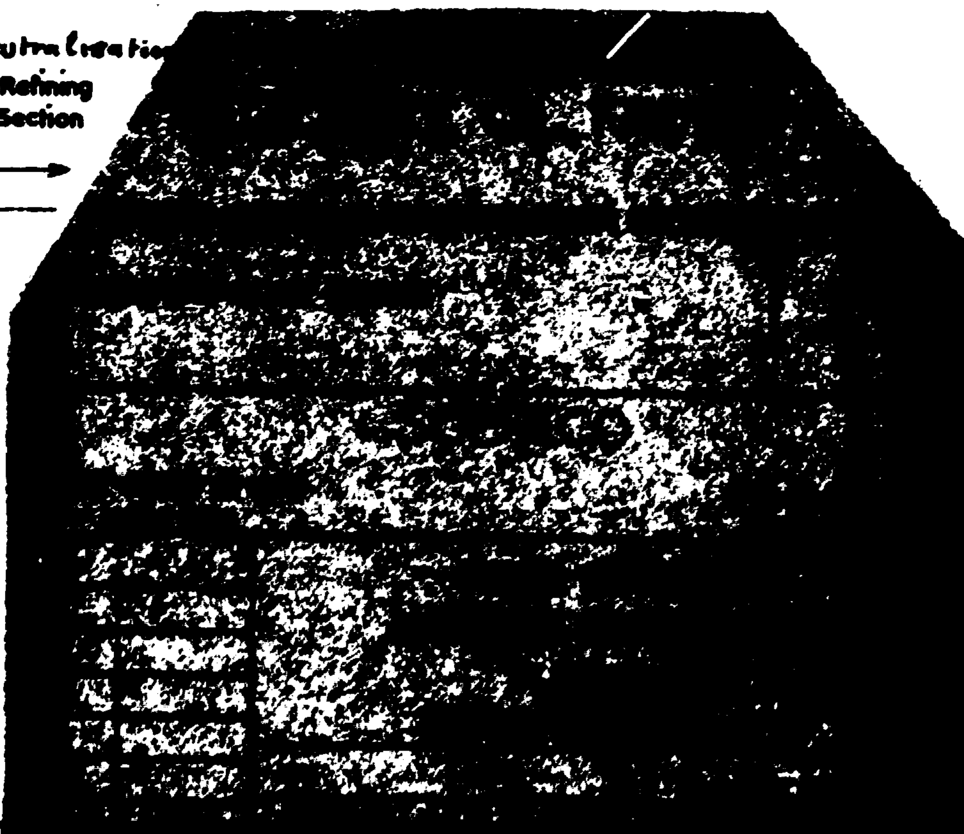
SECTION 1

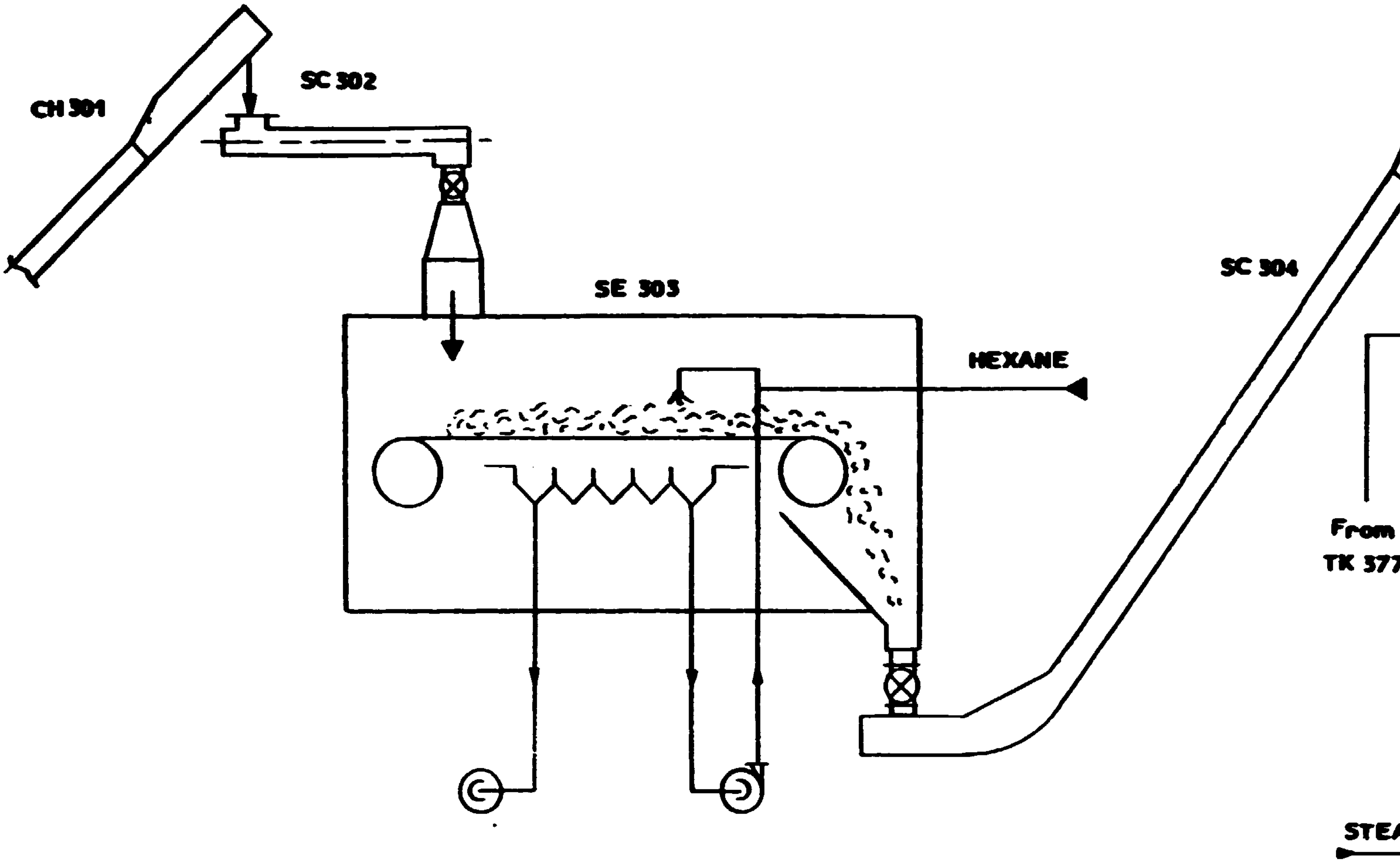

FLR273 A
FLR273 B
Crude oil
From Prepressing
Crude oil
From Solvent Plant
TK 444
To Neutralizer
or To Refining
Section
P 445
FLR275

SECTION .2

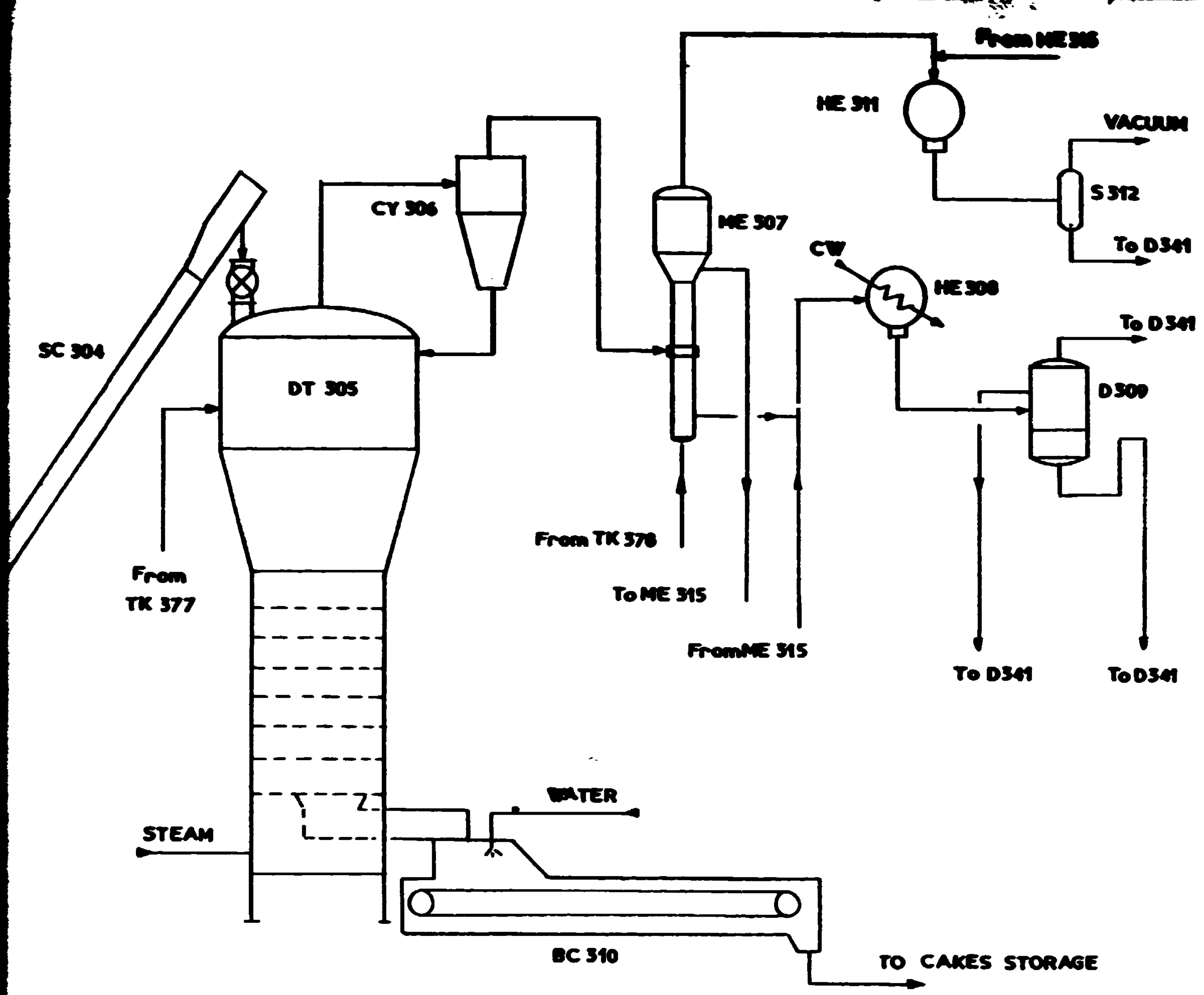

oil
Prepressing
Crude oil
From Solvent Plant
TK 444
To Neutralizatio
or To Refining
Section
P 445

SECTION 3





SECTION 1



ZIMBABWE

VEGETABLE OIL FACTORY

350MT/D COTON SEEDS, SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SECTION .2

SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

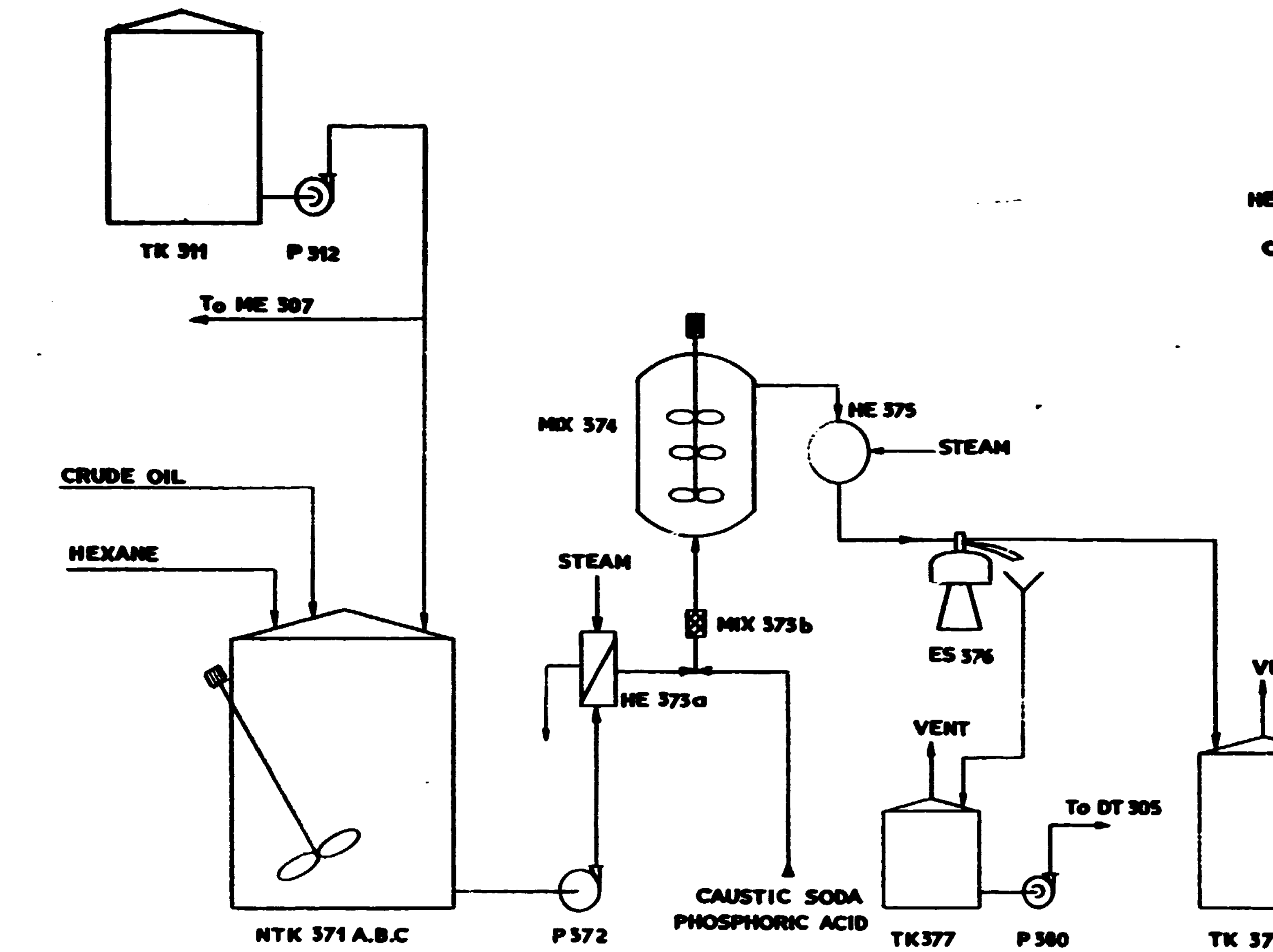
TEL (1) 45 22 19
TELEX 641

SOLVENT EXTRACTION AND MEAL DESOLVENTIZING

FLOW DIAGRAM
SECTION 300

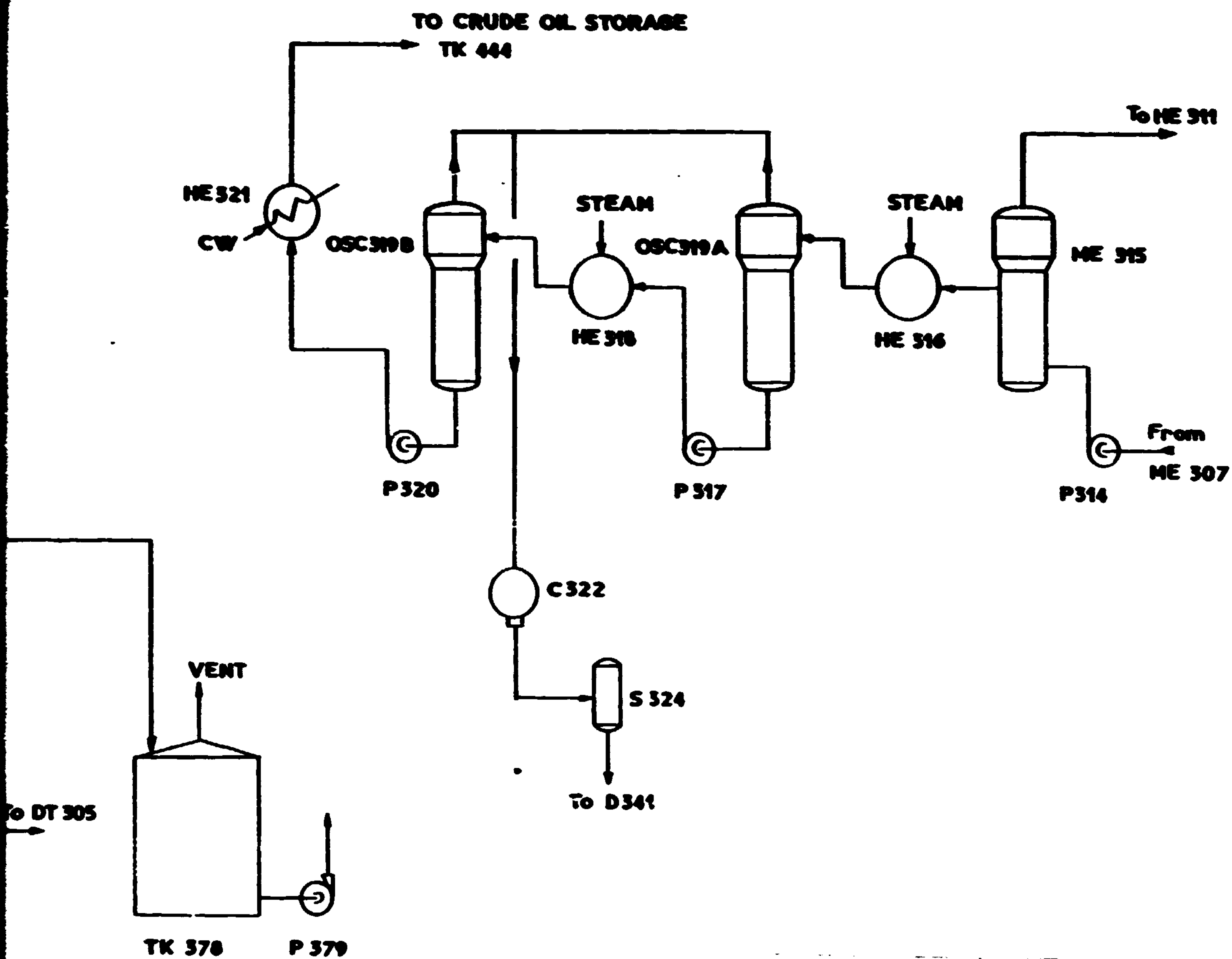
ECH. DATE:

C228_A301



TK 311
P 312
To ME 307
MIX 374
HE 375
STEAM
CRUDE OIL
HEXANE
STEAM
MIX 373b
ES 376
HE 373a
VENT
To DT 305
CAUSTIC SODA
PHOSPHORIC ACID
NTK 371 A.B.C
P 372
TK377
P 380

SECTION 1



SECTION 2

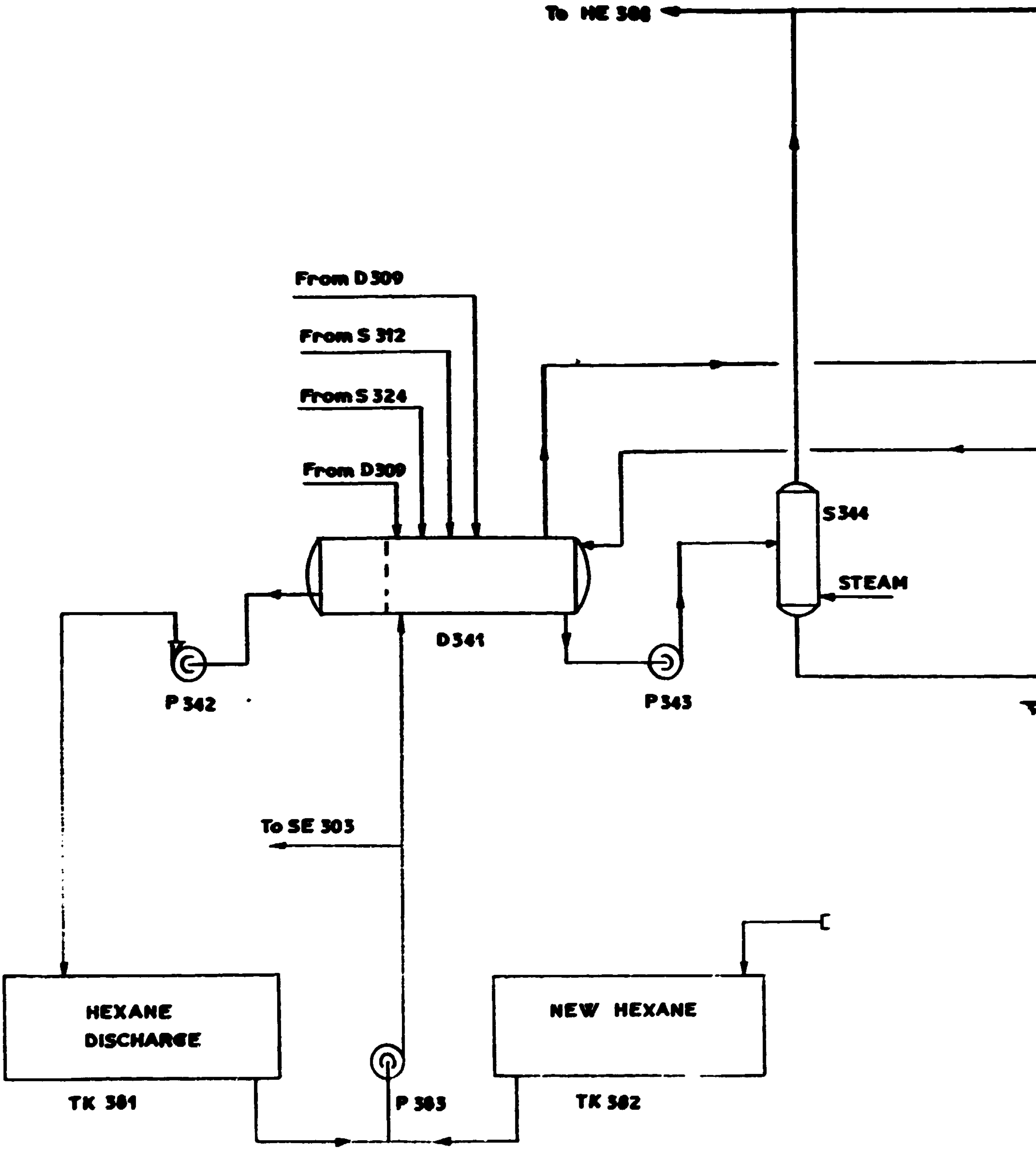
ZIMBABWE

VEGETABLE OIL FACTORY

330MT/D COTON SEEDS,SUNFLOWER SEEDS,GROUNDNUTS

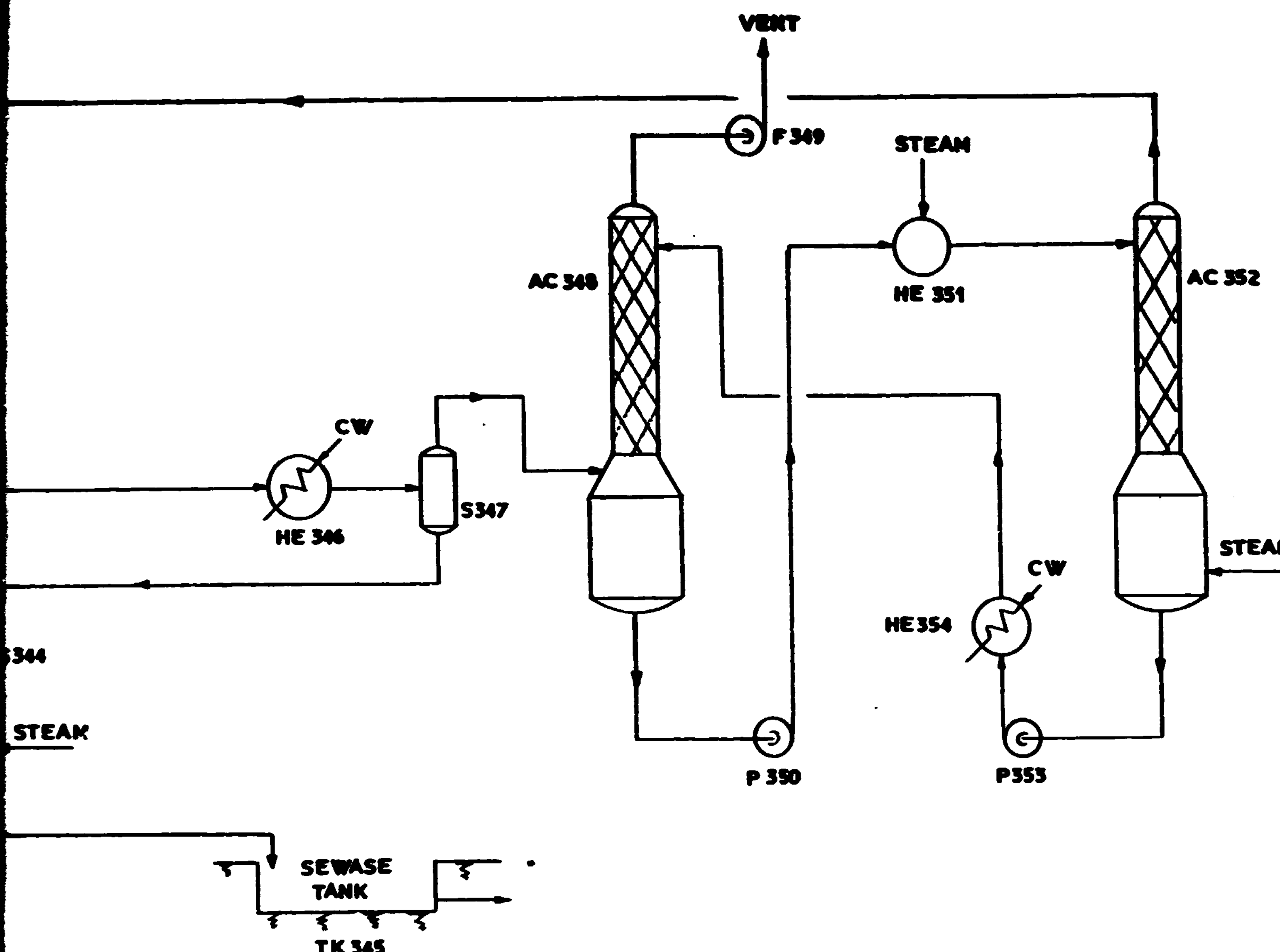
250MT/D SOYA BEANS

SOFRECO 9, RUE ALFRED DE ... 75008 PARIS TEL (1) 46 22 ... TELEX 641 610 F	
	MISCELLA NEUTRALIZATION AND DESOLVENTIZING FLOW DIAGRAM SECTION 300
ECH.	DATE:
	C228 A302



To HE 308
From D309
From S 312
From S 324
From D309
S344
STEAM
D341
P342
P343
To SE 303
HEXANE DISCHARGE
NEW HEXANE
TK 301
P 303
TK 302

SECTION 1



SECTION .2

ZIMBABWE

VEGETABLE OIL FACTORY

330MT/D COTON SEEDS,SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

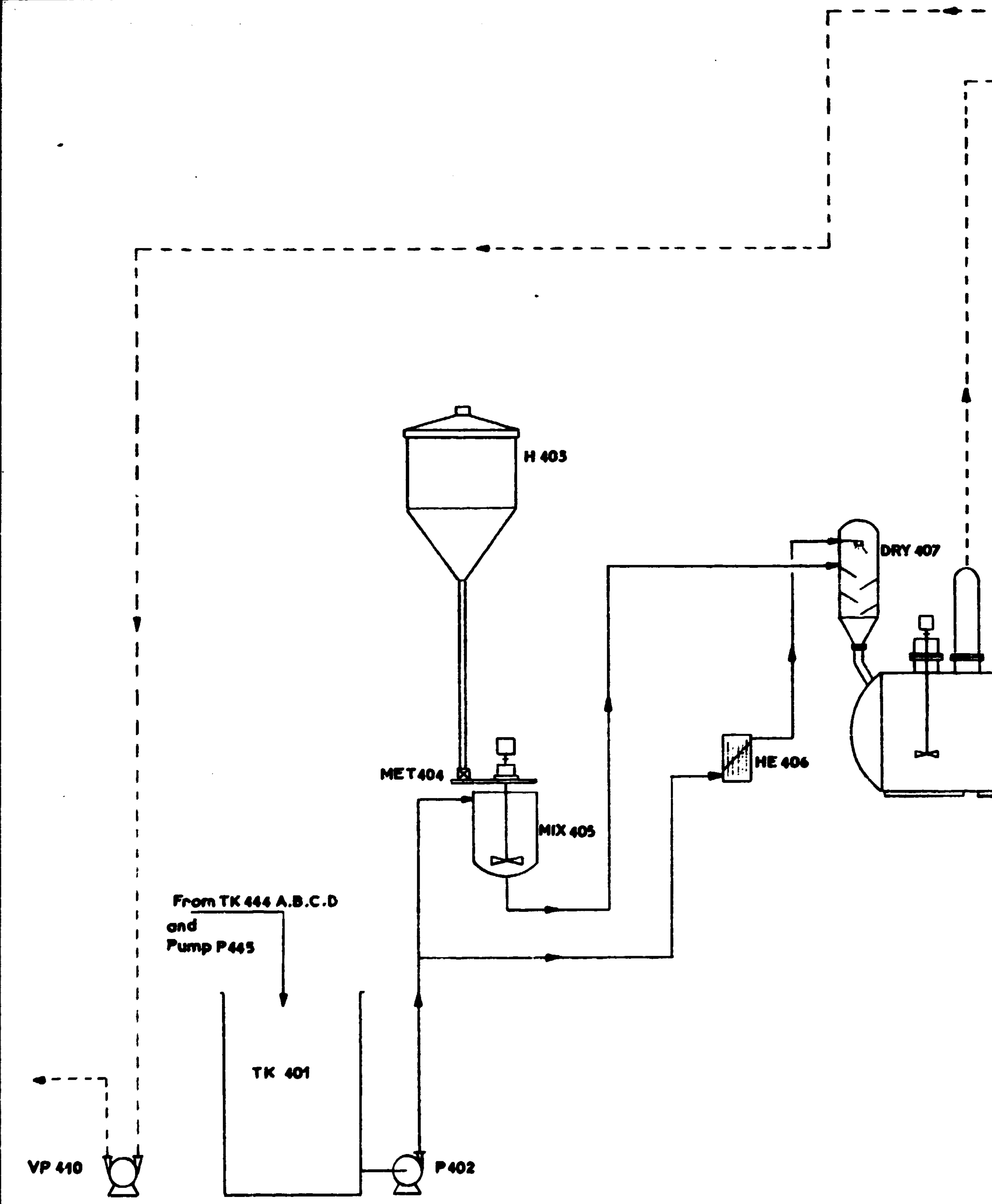
SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

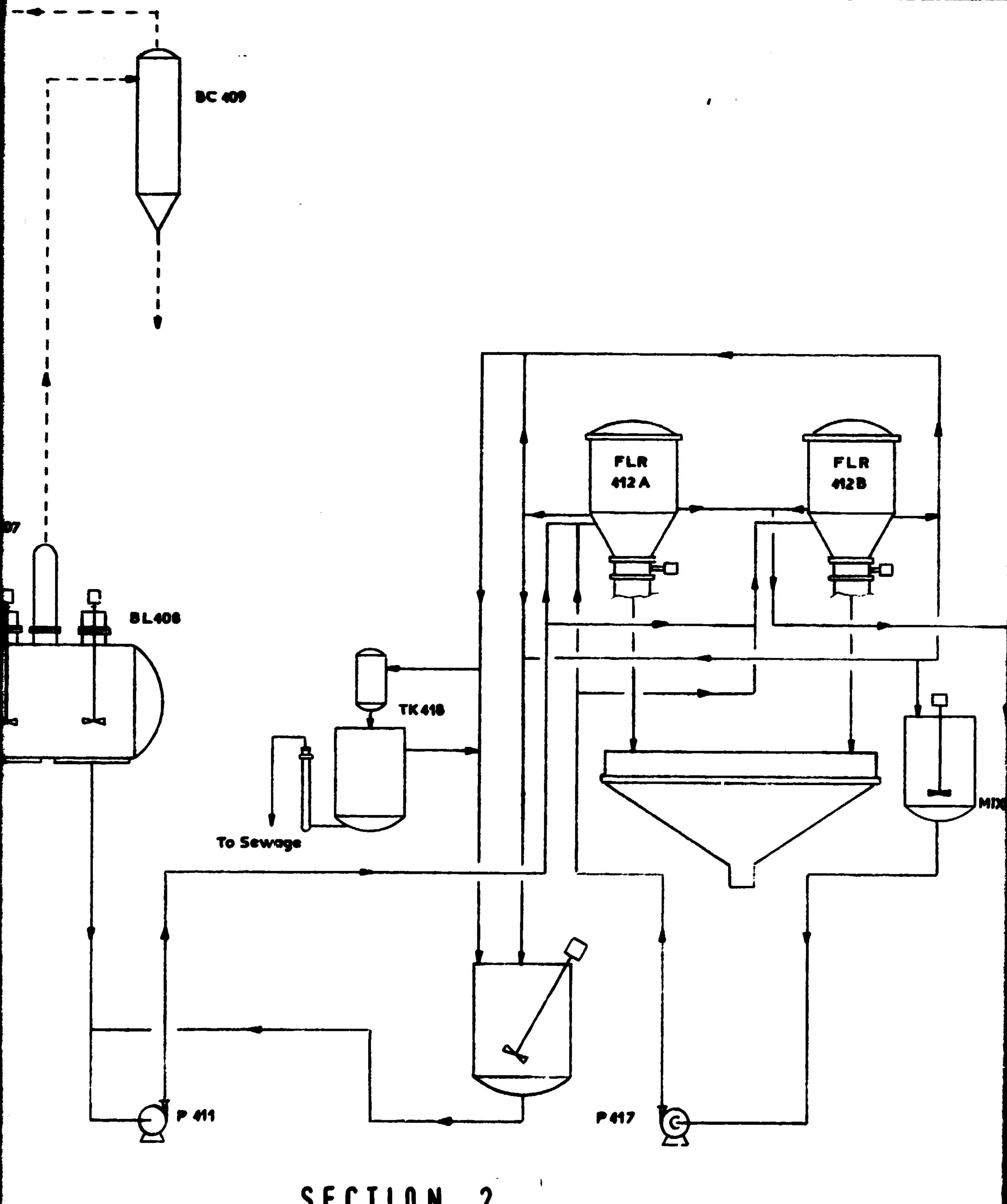
TEL (1) 46 22 19.
TELEX 641 610 F

HEXANE RECOVERING

NO.	DATE	OBS.	ECH.	DATE :	
			DESS. C.C.	DOSSIER.C228	C228 _ A 30

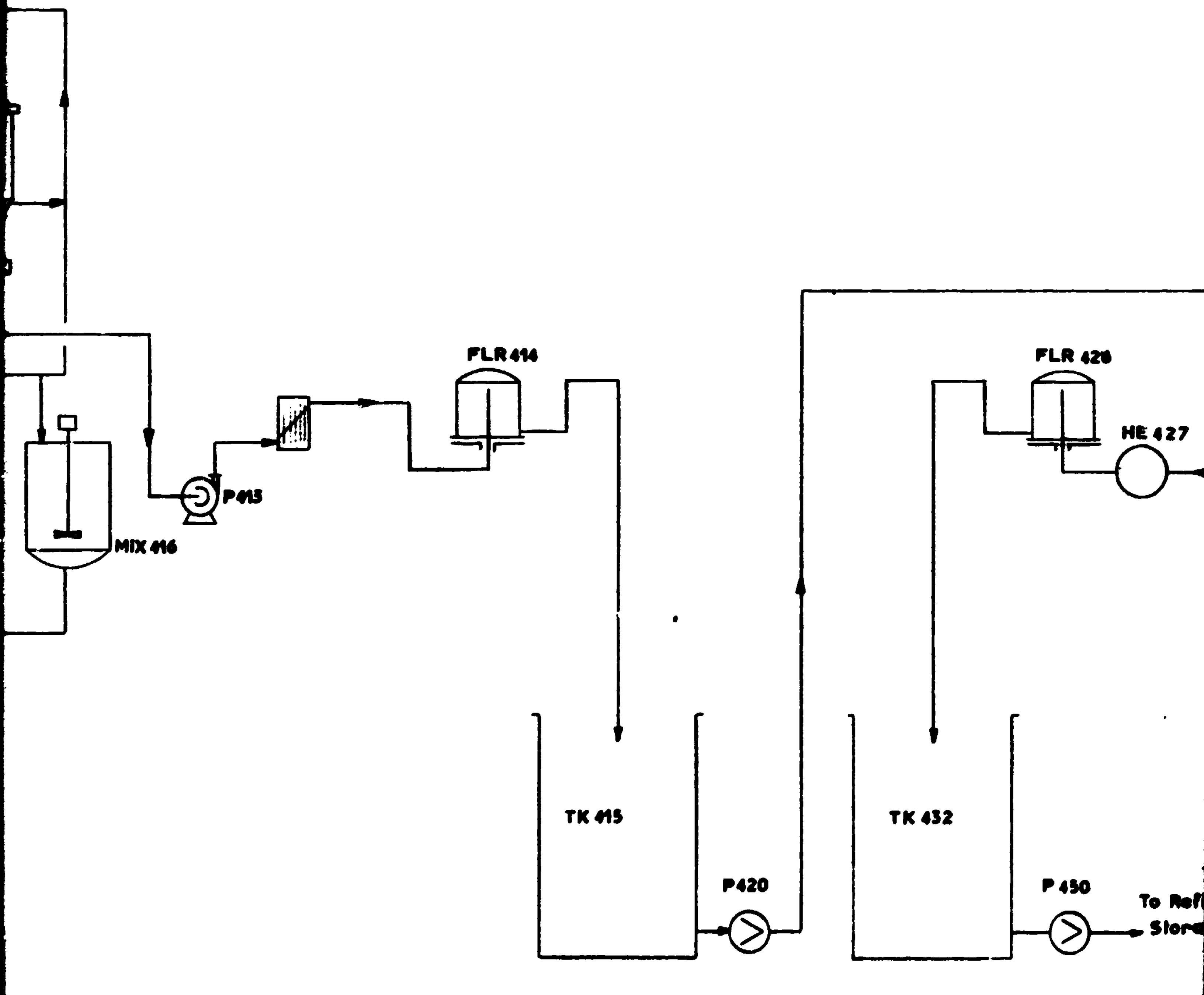

H 403
DRY 407
MET 404
HE 406
MIX 405
From TK 444 A.B.C.D
and
Pump P445
TK 401
VP 410
P 402

SECTION 1

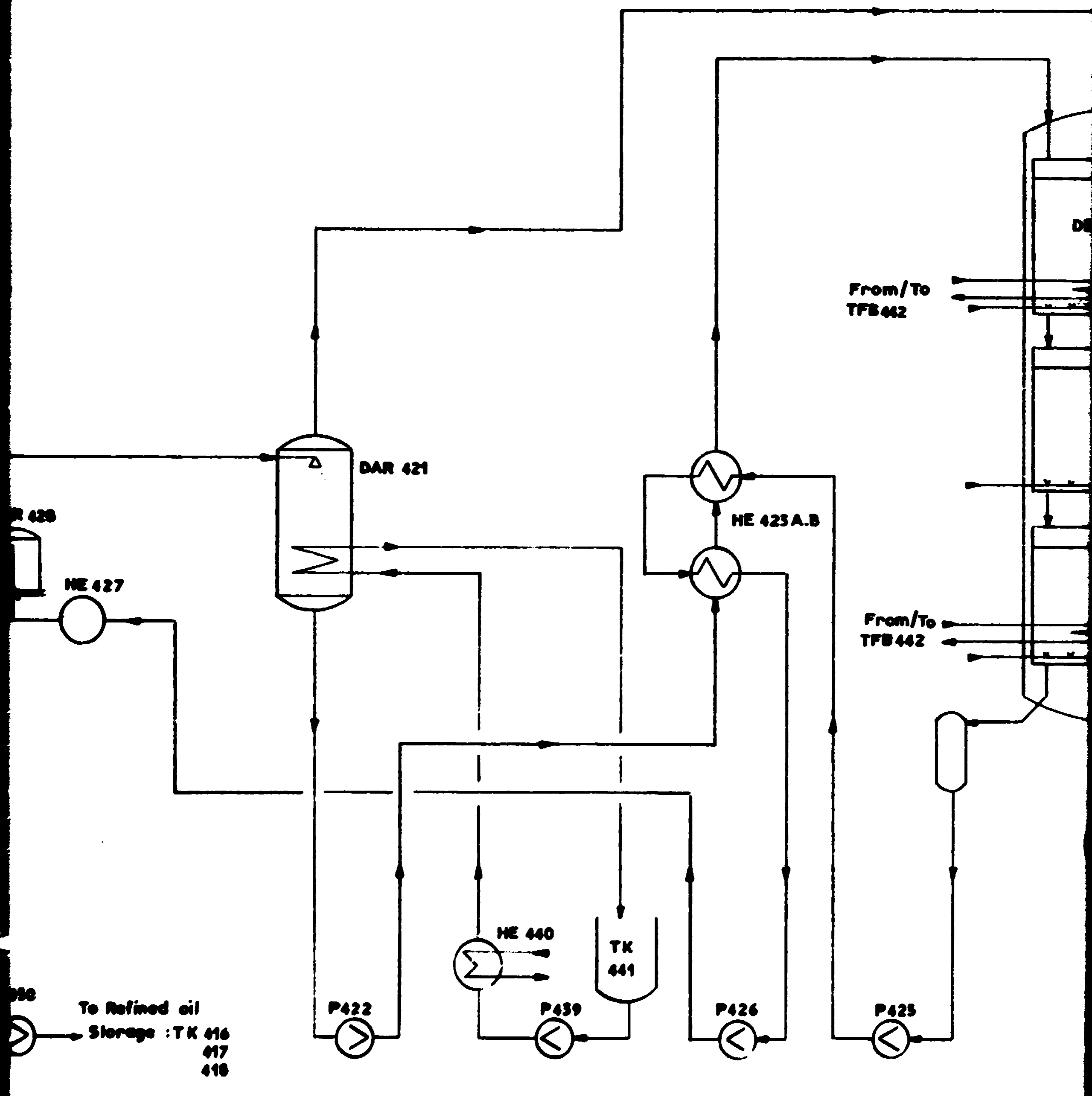


BC 409
07
BL408
TK418
To Sewage
FLR 412 A
FLR 412 B
MIX
P 411
P 417

SECTION .2

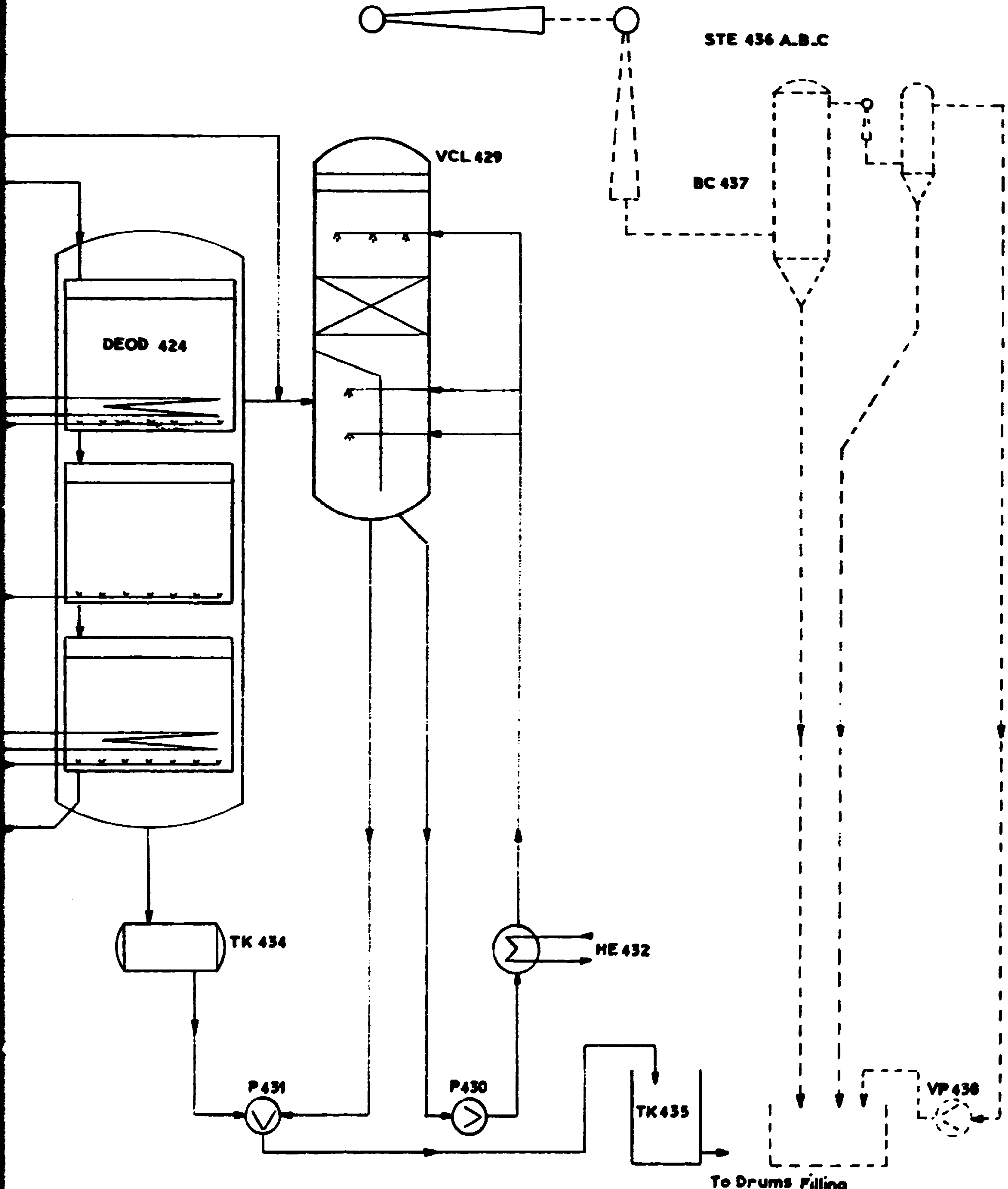

FLR 414
FLR 428
HE 427
P 413
MIX 416
TK 415
TK 432
P420
P 450
To Ref
Stora

SECTION 3

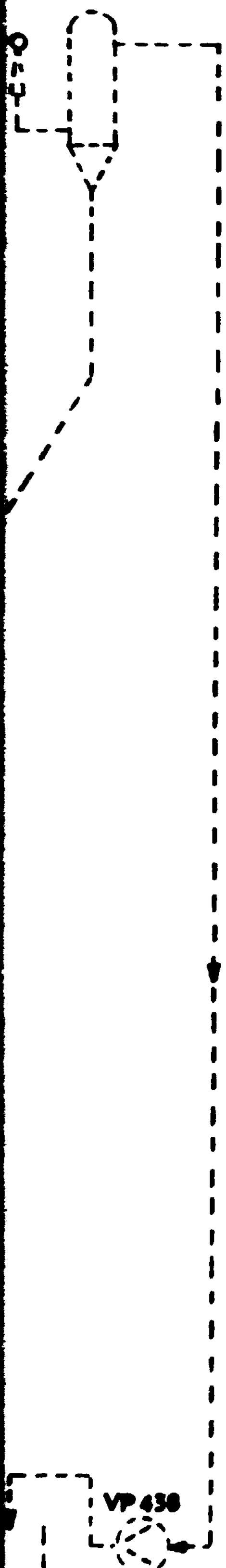


DAR 421
HE 427
HE 423 A.B
From/To
TFB 442
From/To
TFB 442
HE 440
TK
441
P422
P439
P426
P425
To Refined oil
Storage : TK 416
417
418

SECTION 4


STE 436 A.B.C
VCL 429
BC 437
DEOD 424
TK 434
HE 432
P431
P430
TK435
VP 438
To Drums Filling

SECTION 5



SECTION 6

ZIMBABWE

VEGETABLE OIL FACTORY

330MT/D COTON SEEDS, SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SOFRECO

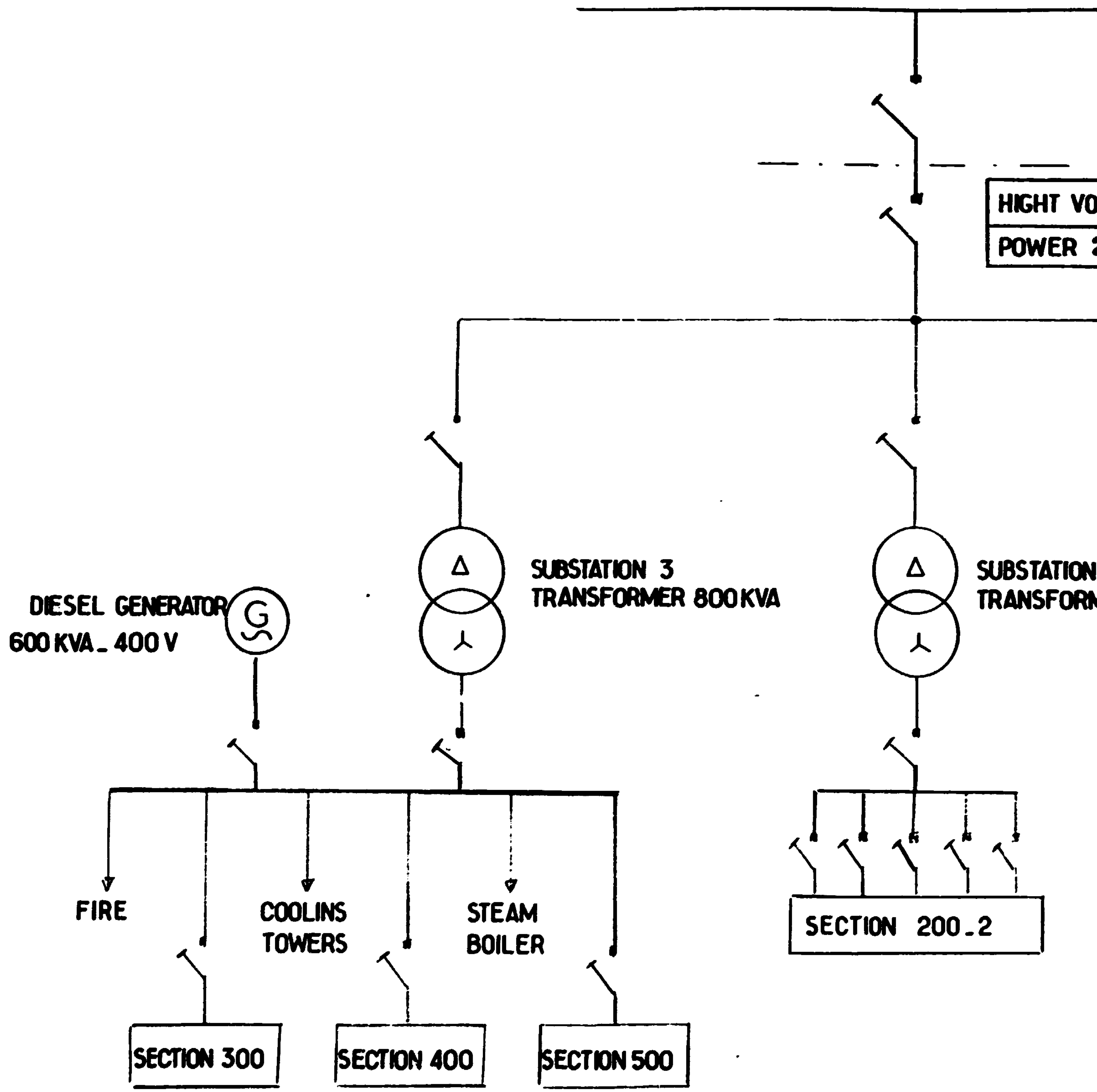
9, RUE ALFRED DE VIGNY
75008 PARIS

TEL (1) 46 22 19 ..
TELEX 641 610

CRUDE OIL REFINING
BLEACHING – DEODORIZATION
FLOW DIAGRAM
SECTION 400

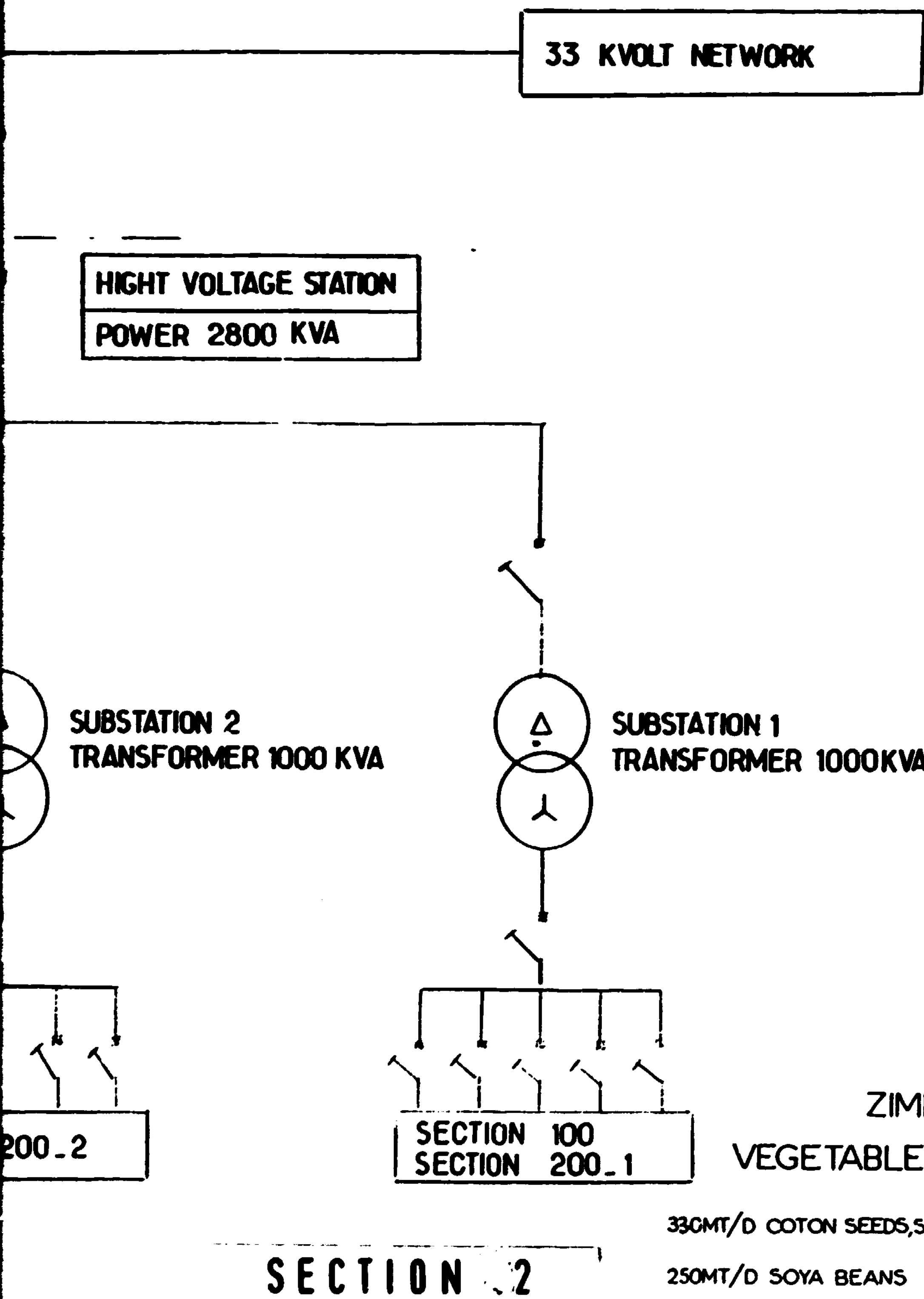
ECH. | DATE: | C228.A401

DESS. C.C. | DOSSIER C228



HIGHT VO
POWER 2
SUBSTATION 3
TRANSFORMER 800 KVA
SUBSTATION
TRANSFORM
DIESEL GENERATOR
600 KVA _ 400 V
FIRE
COOLINS
TOWERS
STEAM
BOILER
SECTION 200_2
SECTION 300
SECTION 400
SECTION 500

SECTION 1



ZIMBABWE

VEGETABLE OIL FACTORY

330MT/D COTON SEEDS,SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

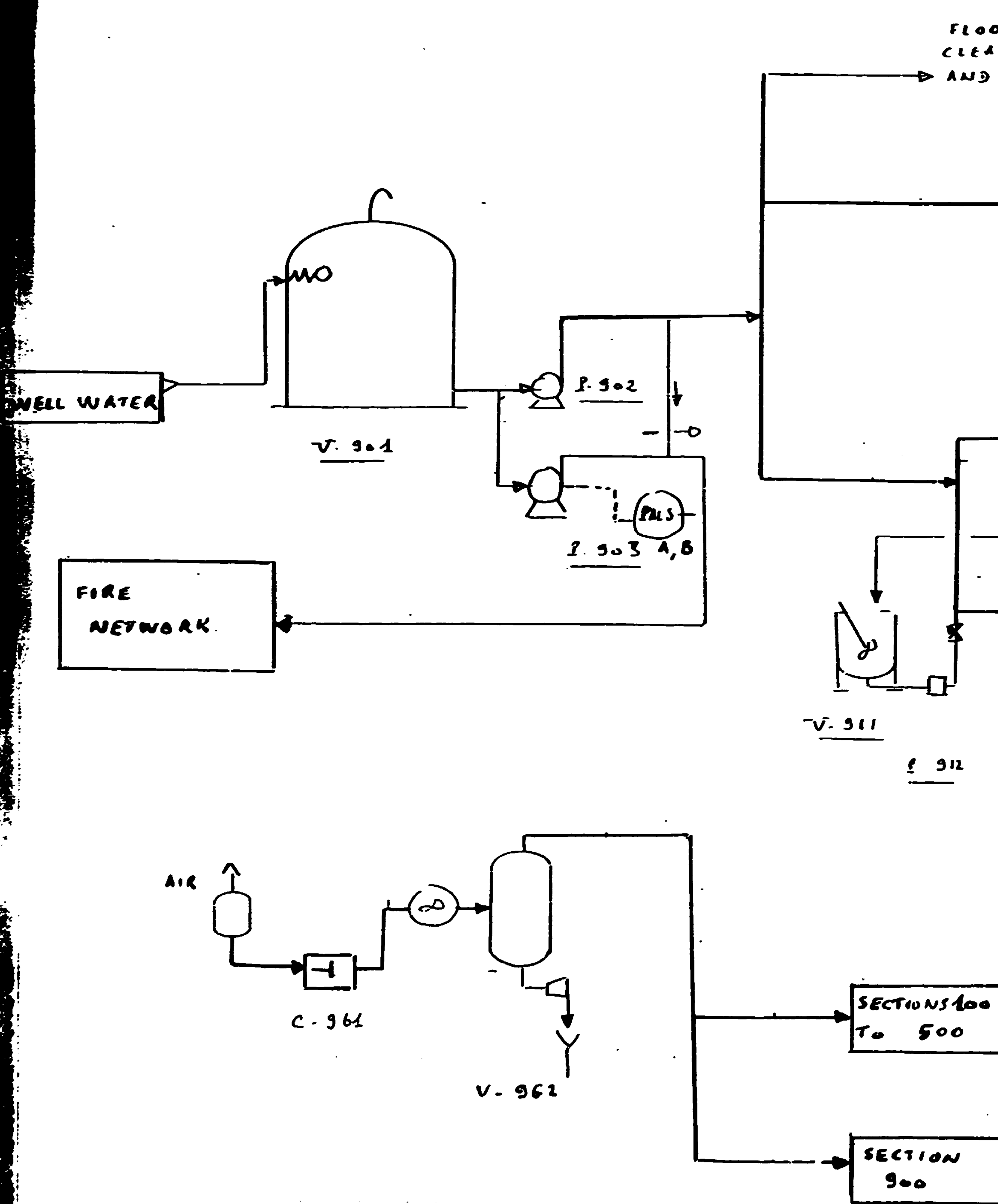
TEL (1) 46 22 [illegible]
TELEX 641 610 F

GENERAL SINGLE LINE DIAGRAM

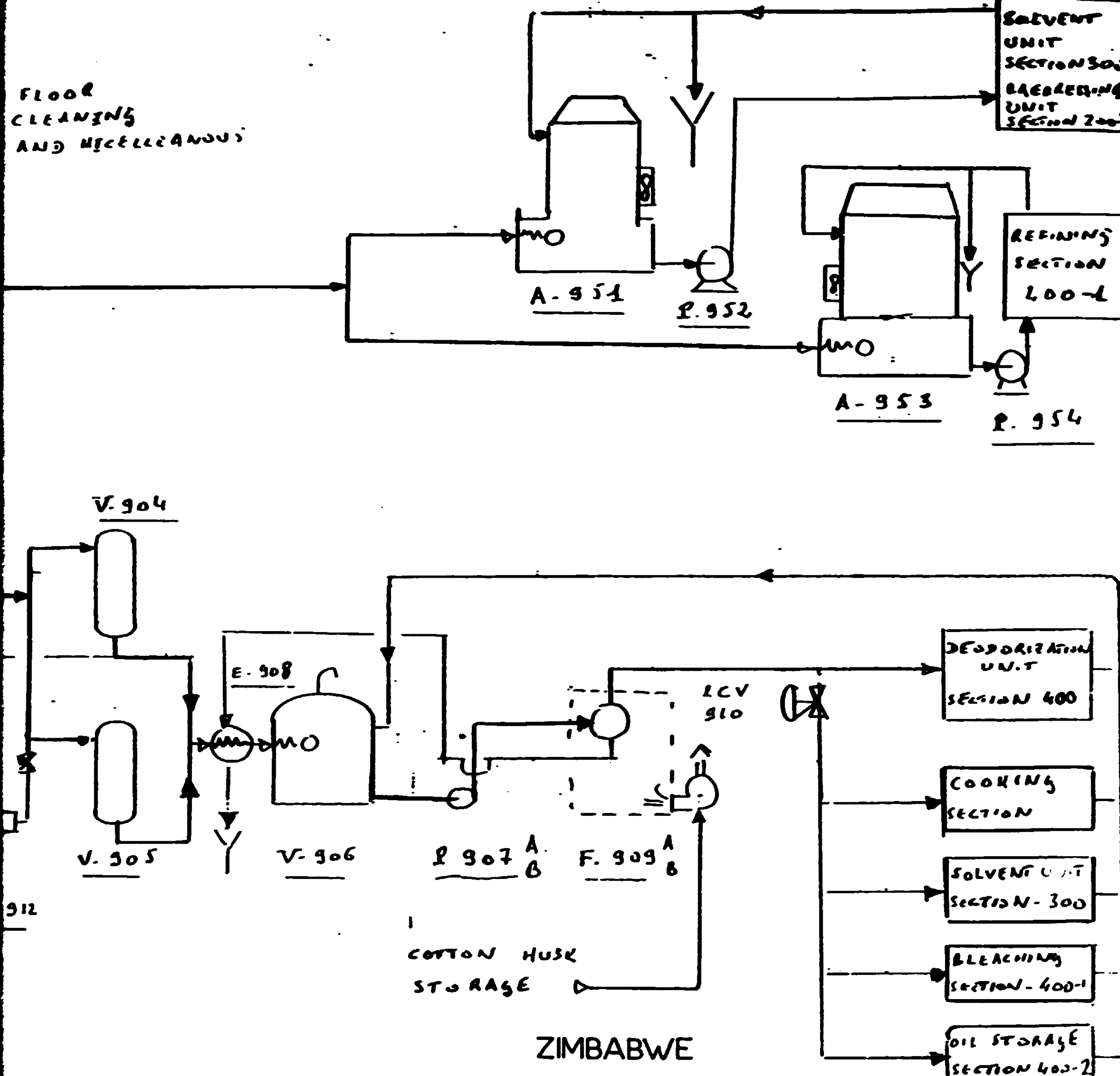
ECH.
DATE:
DESS. C.C.
DOSSIER: C228

C228.A901

IND. DATE OBS.


FLOO
CLEA
AND
WELL WATER
V. 901
P. 902
P. 903 A,B
FIRE
NETWORK
V. 911
P 912
AIR
C - 961
V - 962
SECTIONS 100
To 500
SECTION
900

SECTION 1



ZIMBABWE

VEGETABLE OIL FACTORY

330MT/D COTON SEEDS,SUNFLOWER SEEDS, GROUNDNUTS

250MT/D SOYA BEANS

SECTION .2

SOFRECO

9, RUE ALFRED DE VIGNY
75008 PARIS

TEL (1) 46 22 19 ...
TELEX 641 610 F

UTILITIES – STEAM – WATER – AIR

FLOW DIAGRAM

ECH.	DATE:		
DESS. C.C.	DOSSIER.C228	C228.A902	

IND.	DATE	OBS.

17243 (3 of 3)

**FEASIBILITY STUDY FOR INCREASING
THE OIL PRODUCTION CAPACITY
FROM COTTON SEED IN ZIMBABWE**

MULTIPURPOSE FACTORY

-=oOo=-

3 **EXECUTIVE SUMMARY
FINAL REPORT**

(208)

SOFRECO

SOCIÉTÉ FRANÇAISE DE RÉALISATION, D'ÉTUDES ET DE CONSEIL

9, rue Alfred de Vigny - 75008 PARIS - FRANCE

Tél. 46.22.19.11 + - Télex 641.610 F - Télécopie 46.22.32.12

UNIDO CONTRACT N° 88/19 APRIL 12TH, 1988
PROJECT N° US/ZIM/87/117
ACTIVITY CODE : J 12516

FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED IN ZIMBABWE

MULTIPURPOSE FACTORY

-=oOo=-

3

EXECUTIVE SUMMARY
FINAL REPORT

(208)

November 1988

FOREWORD

-=oOo=-

1. DEMAND

1.1. DEMAND FOR OIL

In ZIMBABWE, the demand for edible oil exceeds the local production by 20 % to 50 %.

The imports are negligible due to the foreign exchange shortage. Therefore, the production of oil is by no way limited by the market but by the availability of oil seeds.

(In 1986 : population 8.6 million - Edible oil production 50,000 t/year Consumption per capita 6 kg/year).

Due to the increase of the population (12 million by 2000) and the possible improvement of the lower income classes, a strong demand will continue up to the year 2000.

1.2. DEMAND FOR MEAL

The local demand is very sensitive to the price, fixed by the Government, but the surplus can be exported easily to the near region (especially RSA) at the international price.

(In 1986 : production 140,000 t - Export 42,000 t)

2. AGRICULTURAL PRODUCTION

The local production of oil seeds (cotton seed, soya, sunflower) is expected to grow from 251,000 t in 1986 to some 500,000 t in the year 2000.

There is also some maize oil produced and there is a development project for palm oil which will start production in 1993.

3. LOCAL INDUSTRY

ZIMBABWE has a good edible oil industry with 4 companies. If all rehabilitation is carried out, the production capacity is estimated at 340,000 t/year of oil seeds or 369,000 t/year if the new expeller is installed at Blue Ribbon Foods in Bulawayo.

4. LACK OF PROCESSING CAPACITY BY 1990/1991

Up to the years 1990/1991 the production of oil is not limited by the processing capacity, but by a lack of oil seeds. This situation will change in 1990 and up to the year 2000, 2 new units with a capacity of 330 t/day of oil seeds each will be required to process the total production of oil seeds.

5. THE FEASIBILITY STUDY

The present feasibility study is relative to one plant with a capacity of 330 t/day only, which could be installed in KADOMA, between HARARE and BULAWAYO in the immediate proximity of a ginnery.

The investment is estimated at around 30 million US $ of which 20 million in foreign exchange.

The financial study shows an Internal Rate of Return on investment of 12 % under the conditions of May 1988 and more likely 15.4 % if we consider a probable increase of about 10 % both on the sales price of the oil and on the cost price of the seeds.

This investment bears very low risks, both commercially and financially.

It allows to valorize an important local resource and to improve the consumption of an essential commodity (edible oil).

It allows the creation of 363 direct jobs in a decentralised area.

The Consultant SOFRECO recommends therefore the implementation of this project.

CONTENT OF THE STUDY

1. EXECUTIVE SUMMARY

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COMFAR SCHEDULES

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1.1. PROJECT BACKGROUND AND HISTORY

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1.1.5. THE PROJECT IDEA

- Existence of natural resources with potentiel for processing :
  - . cotton
  - . other oil seeds

- Strong local demand for oil
- Exports potential for meals
- Existing local industry
- Appearance of a lack of capacity by 1990.

1.1.6. THE PROJECT PROMOTION

- Special position of the CMB
- Downstream complementary activities
- Downstream opportunity for the CMB
- Interest of the French Government.

1.1. PROJECT BACKGROUND AND HISTORY

1.1.1. ZIMBABWE - BASIC DATA

1.1.1.1 Geography

Situated in South-Eastern Africa, between the 16 th and the 22nd southern latitudes and between the 25 th and 33rd eastern longitudes, ZIMBABWE has a total area of 390,757 km^2.

It is a landlocked country which shares borders with ZAMBIA, MOZAMBIQUE, REPUBLIC OF SOUTH AFRICA and BOTSWANA.

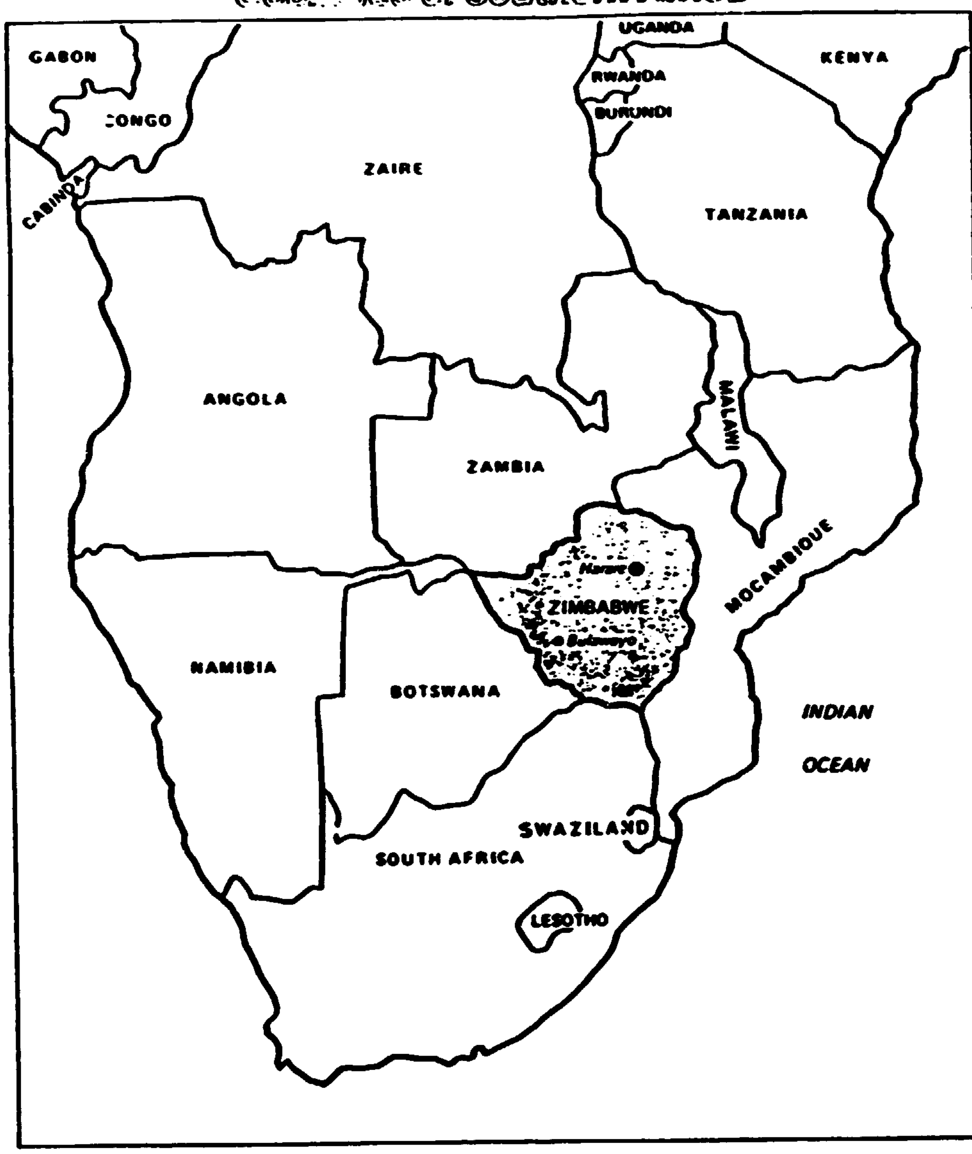
The land is devided into 4 natural regions :

- the "High Veld" that runs from South-West to North-East ; this plateau is 650 km long and 80 km wide (altitude between 1,200 and 1,500 m),
- the "Middle Veld", with an altitude between 600 and 1,200 m,
- the "Low Veld" which consists of the ZAMBEZI valley and the LIMPOPO and SABI basins (altitude below 600 meters),
- the "Eastern Higlands" at the Mozambican border, which is extremely mountainous with many peaks exceeding 1,800 meters (the INYANGANI : 2,599 meters).

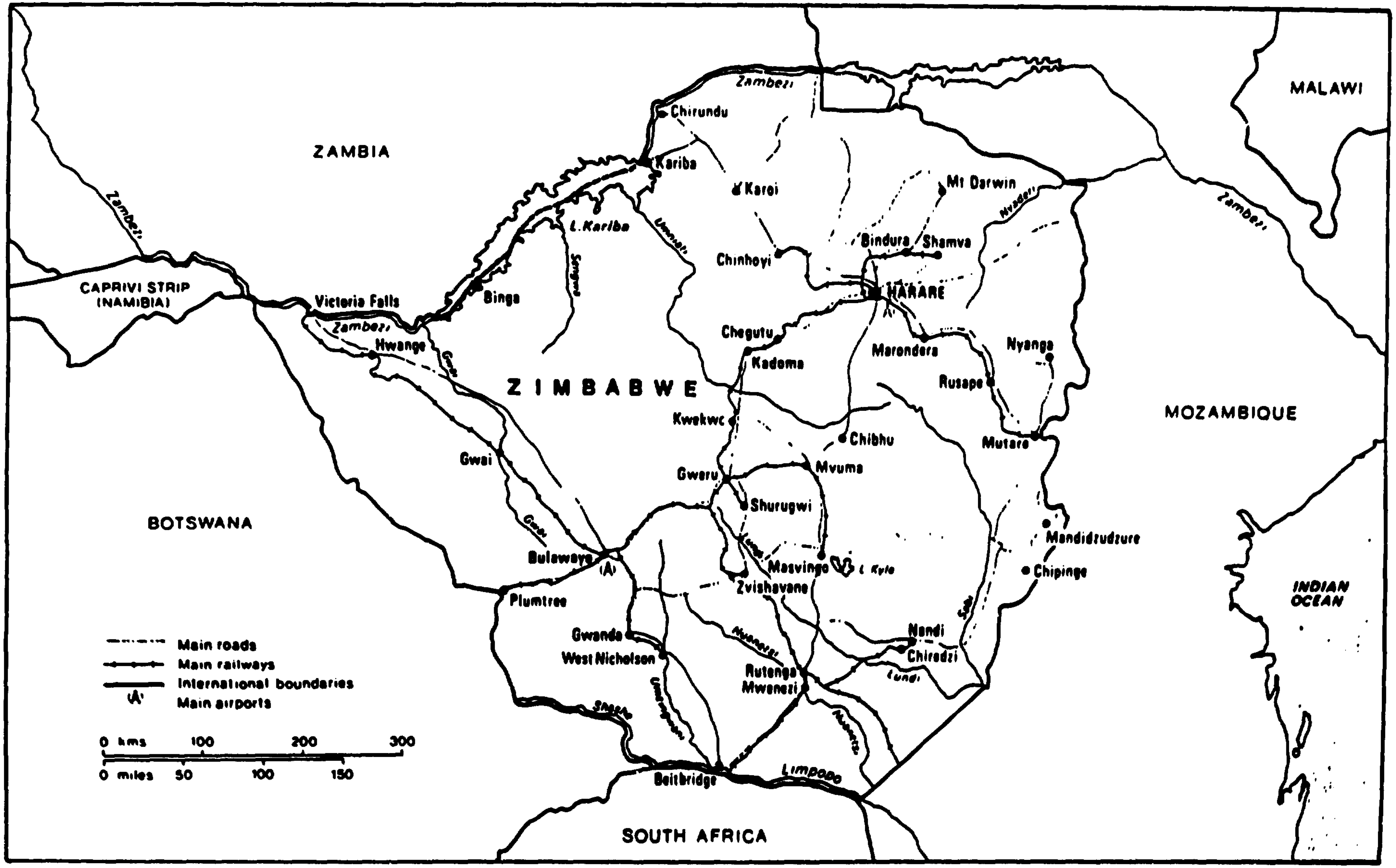
The climate of ZIMBABWE is tropical continental changing by altitude, specially on the central plateau.

The average annual rainfall varies from 300 m (BEIBRIDGE IN THE SOUTH) to 1,000 mm and over (INYANGA near the Mocambican border) ; at HARARE, the capital, the annual rainfall varies from 440 mm (1982/83) to 1,100 mm (1980/81).

Countries of southern Africa



Zimbabwe


ZAMBIA
MALAWI
CAPRIVI STRIP (NAMIBIA)
BOTSWANA
MOZAMBIQUE
SOUTH AFRICA
INDIAN OCEAN
ZIMBABWE
Zambezi
Chirundu
Kariba
Karoi
Mt Darwin
L. Kariba
Chinhoyi
Bindura
Shamva
HARARE
Victoria Falls
Binga
Hwange
Chegutu
Kadoma
Marondera
Nyanga
Rusape
Kwekwe
Chibhu
Mutare
Gwai
Gweru
Mvuma
Shurugwi
Mandidzudzure
Bulawayo
Masvingo
L. Kyle
Chipinge
Plumtree
Zvishavane
Gwanda
West Nicholson
Nandi
Chiredzi
Rutenga
Mwenezi
Lundi
Shashe
Beitbridge
Limpopo
Main roads
Main railways
International boundaries
Main airports
0 kms 100 200 300
0 miles 50 100 150

1.1.1.2. Population

The last population census, taken in 1982, enumerated a total population of 7 517 165 persons with a growth rate of 2.93 % between 1969 and 1982.

The following table gives the figures for population and growth rates by mid 1987 and mid 2000 respectively for the medium and the high variant.

	1987	2000	1987 / 2000 growth rate % per year
Medium variant	8 639 674	11 942 622	2.52 %
High variant	8 662 506	12 375 111	2.78 %

Source : Population projections of Zimbabwe 1982 to 2032.
Central Statistical Office - Harare - January 1986.

Social indicators : (1985)

. Life expectancy at birth : - male : 55
- female : 59
. Crude birth rate : 47°/oo
. Crude death rate : 12°/oo
. Infant mortality rate : 77°/oo
. Urban/rural population % : 27/73

Source : World Development Report 1987

ZIMBABWE is divided in 8 administrative regions :

MANICALAND, MASHONALAND CENTRAL, MASHONALAND EAST, MASHONALAND WEST, MATABELELAND NORTH, MATEBELELAND SOUTH, MIDLANDS, MASVINGO.

The capital is HARARE.

The principal towns are (population figures of 1982) :

HARARE (656 000), BULAWAYO (414 000), CHITUNGWIZA (173 000), GWERU (79 000), MUTARE (70 000), KWEKWE (48 000), KADOMA (45 000).

1.1.1.3. Political background

ZIMBABWE, previously SOUTHERN RHODESIA, finally achieved official independence in 1980, the last of the british colonies in AFRICA to do so. This followed several years of guerrilla warfare. Since 1980 reconstruction has helped to overcome the consequences of the war.

The constitution involves a Parliament with a prime minister heading the executive ; ZIMBABWE is a Republic within the Commonwealth, with a President as Titular Head.

The government stresses in particular close cooperation with ZIMBABWE's neighbours in the context of the Southern African Development Coordination Conference (SADCC) and the Preferential Trade Area (PTA) for East and Southern Africa.

ZIMBABWE is also an active member of the Organisation of African Unity and a signatory of the Lome Convention Linking African, Carribbean and Pacific (ACP) countries with the EEC.

1.1.1.4. Economy

a/ Currency :
Zimbabwe dollar (Z\$) = 100 cents. Average exchange rate for :
1987 \$1 = Z\$ 1.669
May 1988 \$1 = Z\$ 1.7.

b/ GDP at current prices and factor costs :
1986 : Z\$ million 8 323

c/ GNP per capita in 1985 US\$: 680
Source World Bank Development Report 1987

The World Bank classes Zimbabwe in the category of "middle income country".

d/ Structure of production

Constant prices (1980) factor costs	1984
- Primary production to total GDP	14.0 %
- Secondary production to total GDP	35.3 %
- Tertiary production to total GDP	50.7 %
- (Manufacturing).	(22.8 %)

The structure of ZIMBABWE's GDP differs markedly from that of most neighbouring countries, because of the relative importance of the manufacturing industry and the "Services".

e/ Foreign trade

- Export 1986 Total value : 2 170.3 Z$ mn
  Main goods : Tobacco, ferro-alloys, maize, cotton lint, nickel metal, asbestos.
  Main destinations : SOUTH AFRICA, U.K., WEST GERMANY, NETHERLANDS, ITALY.

- Import 1986 Total value : 1 640.4 Z$ mn
  Main goods : petroleum products, chemicals, transport equipment.
  Main origins : SOUTH AFRICA, U.K., WEST GERMANY, USA.

- Import cover rate 1986 : 132 %.

1.1.2. STUDY FOR INCREASING THE EDIBLE OIL PRODUCTION CAPACITY-ORIGIN OF THE REQUEST

The project was identified at UNIDO's Regional Investment Promotion Meeting for SADCC countries held from 3-7 November 1986 in HARARE. The Government of Zimbabwe through its Government supported Cotton Marketing Board (CMB) has requested UNIDO by their letter dated 7 November 1986 to prepare a feasibility study. This was reconfirmed officially by the Ministry of Lands, Agriculture and Rural Resettlement and, finally, the Ministry of Finance endorsed the official request in October 1987.

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1.1.3. CONTRACT UNIDO/SOFRECO

The contract for the study, entitled "FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED, IN ZIMBABWE", was awarded by UNIDO to the French Consulting Company SOFRECO in PARIS, through :

UNIDO Contract n° 88/19 of April 12th, 1988
Project N° US/ZIM/87/117.

The terms of reference are attached as annex I to this volume.

1.1.4. MISSION TO THE PROJECT AREA

According to the Contract entered into between UNIDO and SOFRECO, a team of experts went to ZIMBABWE from April 21st to May 27th, 1988.

The composition of the team was the following :

- M. BRUN, Industrial Economist, Team Leader,
- T.J. SIEREVOGEL, Agro-Economist,
- R. LEBLANC, Oil Technologist,
- D. DELWAULLE, Mechanical Engineer,
- I.C. BRYTOW, Financial Analyst,
- in the Project Area, Peter FAHY, resident Manager of COMMERCE PROMOTION INUDSTRIE (C.P.I.) in ZIMBABWE.

During all the stay in ZIMBABWE, the team of experts maintained a close contact with the counterpart, the Cotton Marketing Board and also with the resident representation of UNDP/UNIDO.

The main organisations visited were the following :

a/ Agricultural part of the study - organisations visited

- Ministry of Lands, Agriculture and Rural Ressettlement
- Agricultural Marketing Anthority (AMA)
- Cotton Marketing Board (CMB)
- Grain Marketing Board (GMB)
- Agricultural Technical and Extension Services (AGRITEX)

- Commercial Farmers Union
- Commercial Cotton Growers Association
- Commercial Oil seeds Producers Association
- The MWENEZI Development Corporation (Palm oil Project).

b/ Market Study for oils and fats : organisations visited

The four oil expressors :
- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS.

The wholesalers and Retailers :
- JAGGERS WHOLESALERS
- Supermarkets (WOOLWORTH, TM, UK) in HARARE, BULAWAYO, MUTARE KADOMA...

For various informations :
- The Ministry of Health - Nutrition Department.

For imports and exports :
- Statistical Department - Ministry of Industry
- Customs and Excise.

for General Information :
- Government publications.

c/ Market Study for oil cakes and oil meals. Organisations visited

- AGRIFOODS (main stockfeed producer)
- NATIONAL FOODS - Stockfeed Division.
- Commercial Cattle producers Association
- Cold Storage Commission in BULAWAYO.

d/ Industrial part of the study - Organisations Visited

Visit of the plants of the four expressors :

- OLIVINE INDUSTRIES in Harare
- LEVER BROTHERS in Harare
- BLUE RIBBON FOODS in Bulawayo
- NATIONAL FOODS in Harare and Bulawayo.

e/ Packaging - Organisations Visited

- ZIMGLASS in GWERU (glass bottles)
- Van Leer Packaging (Drums)
- Metal Box (Tins)
- Soltrama Partex (Plastic)

f/ Utilities - Organisations Visited

- ZIMBABWE ELECTRICITY SULPPLY AUTHORITY
- BP - SHELL
- WANKIE COLLIERY (Coal supply)

g/ Transports

- NATIONAL RAILWAYS of ZIMBABWE
- SWIFT) Road Transport
- CLAN Transport Cy).

h/ Sites

- TOWN CLERK of KADOMA
- RURAL COUNCIL SECRETARY of BINDURA.

i/ Mechanical Engineering - Organisations Visited

- Scott Wilson Kirkpatrick and Partners (Consulting Engineers)
- Wade Adams (Civil and Mechanical engineering)
- Antwood Holdings (Sheet Industries)
- John Hook and Sons (Steel Construction)
- Cochrane (vessels).

j/ Manpower Costs - Income taxes - Local loans etc

- CMB Finance Division
- Deloitte Haskins and Sells (Auditors).

k/ Financing

- French Trade Commission
- Deloitte Haskins and Sells.

The detailed list of persons met is attached as annex II to this volume.

1.1.5. THE PROJECT IDEA

1.1.5.1. Existence of National Resources with potential for processing

a/ Cotton

Cotton growing is widely practised in ZIMBABWE since it is one of the few cash crops which can be produced successfully and profitably with little capital outlay.

More than 190 000 farmers from all sectors are now registered with the Cotton Marketing Board, a dramatic increase from the 30 000 registered at Independance in 1980.

The Government Policy on the production of cotton is very positive and expansionary as cotton is an important source of foreign exchange, it fits very well in the policy of rural development and it produces raw materials for the local textile and vegetable oil industry.

The crop of 250 000 t of seed cotton in 1985/1986 is expected to grow to 450 000 t by the year 2000, that is an anuual growth rate of 4.3 per cent.

b/ Other oil seeds

- Soya beans

  In ZIMBABWE, soyabeans have become an increasingly important oil seed crop, grown principally by large scale commercial farmers. There is a vast potential of use of the crops, in the domestic market for oil and meal and on the export market for meal.

  The crop of 84 000 t in 1985/86 is expected to grow to 160 000 t by the year 2000, that is an annual growth rate of 5.6 per cent.

- Sunflowers

  Sunflowers are grown predominantly by the small scale and communal farming sectors.

  The crop of 18 400 t in 1985/86 is expected to grow to 50 000 t by the year 2000, that is an annual growth rate of 7.4 per cent.

c/ Maize

Maize is the staple food in ZIMBABWE. The major producer of maize meal, NATIONAL FOODS, has an oil division and produces maize oil from maize germs.

1.1.5.2. Strong local demand for oils and fats.

In ZIMBABWE, edible oil is classified as "essential commodity" and consequently, the sales price to the public is strictly controlled at a relatively low level.

Imports are very low, due to the general shortage of foreign exchange.

In the last years, the purchasing power of the lower-income group was improved with the injection of higher wages.

All these factors resulted in a strong demand for edible oil, largerly higher then the local production.

In 1986, the production was 50 000 t (of which cotton seed oil : 50 %) for an estimated demand of 60 000 t, i.e. a gap of 20 % or 10 000 t/year.

Up to the year 2000, the increase of the population and the possible improvement of the income per capita will maintain a steady demand for oil, constantly above the production, up to the arrival on the market of significative quantities of palm oil from the MWENEZI project (1995). To summarise, the demand is by no way the limiting factor for the edible oil production in ZIMBABWE.

1.1.5.3. Possible export for oil cakes and meals

The situation is different for meals.

The present production of oil meal, approximately 140 000 t in 1986, is not completely absorbed by the local market, which is very sensitive to the price, which is also fixed by the Government.

But there is no problem to export the surplus to the neighbouring countries, of course at a price which cannot exceed the international market price.

In 1986, approximatively 45 000 t of cotton seed meal and soya bean meal were exported, chiefly to the R.S.A.

1.1.5.4. Local Industry

The oil and fats industry in ZIMBABWE is a relatively sophisticated and well developed processing sector, with four companies, namely :

- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS

At the present moment, the oil production is not limited by insufficient processing capacity, but by a shortage of oil seeds.

Supplies to users continue to be on an allocation basis. But this situation will change with the increase of the agricultural production.

1.1.5 6. Lack of processing capacity by 1990/91

Taking into account the general increase of the cotton and other oil seeds production up to the year 2000 on the one hand, and the present existence of a spare processing capacity in the existing on the other hand, the study shows that a lack of processing capacity will appear by 1990/91, justifing the implementation of new capacities with a domestic market orientation for the oil and export market orientation for the meal.

1.1.6. THE PROJECT PROMOTION

1.1.6.1. Project Promoter

In ZIMBABWE, the commercialisation of oil seeds, like most of the main agricultural products, is strictly controlled by the Government, (Ministry of Agriculture), through its Agricultural Marketing Authority (AMA), which in turn, coordinates the operations of four Marketing Boards :

- Cotton Marketing Board
- Grain Marketing Board
- Cold Storage Commission
- Dairy Marketing Board.

The Cotton Marketing Board has the monopoly of purchasing seed cotton from all categories of growers. It operates 9 ginneries around the country. The Board sells cotton lint to spinners on the local and the export markets and sells cotton seed to the local oil expressors.

The Grain Marketing Board operates in the same way for the other grains, including soya beans, sunflower and groundnuts.

At present, the AMA and the CMB envisage an Agro-Industry Development programme through complementary activities downstream.

1.1.6.2. Complementary activities- Downstream

In its First Five Year National Development Plan, the Government called for state participation in strategic enterprises and in joint ventures. The agricultural sector can therefore contribute to this policy thrust by venturing into new dimensions or downstream industries.

Downstream inudstries can be defined as those activities which bring about a change in-form of the product and are the result of forward and vertically integrated operations.

The advantages of downward vertically integrated operations are that the company can :

- Add value to its product through further processing
- Benefit from reduced imput costs
- Save foreign exchange through export opportunities or import Substitution.

1.1.6.3. Downstream opportunity for the CMB

Controlling the whole market for seed cotton (and therefore cotton seed) in ZIMBABWE and being close to the grain Marketing board which controls the market of other oil seeds, it is obvious that the Cotton Marketing Board could consider developing downstream into oil expressing.

The CMB could set up an oil processing plant near a ginnery. This would create employment and would also reduce transportation costs of bulky cotton seed to the urban areas for processing. Since transportation of the cotton seed will be minimal, this would reduce the costs of production and increase competitiveness of their product against the already established companies. This is because the plant will be situated in a place where both the raw material and the market are found.

1.1.7. INTEREST OF THE FRENCH GOVERNMENT

It is important to note that the Government of France is said to be ready to make investment funds available, provided the techno-economic feasibility study results in a documented and calculated recommendation on the profitability and liquidity of the project.

1.2. MARKET AND PLANT CAPACITY

1.2.1. DEMAND AND MARKET FOR OILS AND FATS

1.2.1.1. The local consumption

a/ Products

Edible oils and fats commercialized in ZIMBABWE are essentially :

- Pure sunflower oil

- Blended oil. The blend is based on cotton seed oil plus variable quantities of soya bean oil and/or groundnut oil and or/maize oil.

- Small quantities of pure maize oil are also sold.

Over the last years, cotton seed oil represented approximately 50 % of the total output, soyabean oil approximately 30 %, and the remainder being sunflower oil and maize oil. Groundnut oil, the share of which was very important in the sixties, is no longer important as a vegetable oil.

It is very important for this study to note that cotton seed oil, in spite of representing the largest proportion of edible oil produced in ZIMBABWE, is never marketed in its pure form, but always blended. This is for reasons of taste and colour. Cotton seed oil is indeed much darker than the other oils.

Consequently, any new plant must be designed to produce not only cotton seed oil, but also other oils.

Taking into account this important point, it was decided with UNIDO to complete the heading of the study with a sub-title : MULTIPURPOSE FACTORY.

Besides edible oil, margarines and cooking fats are also produced and sold in ZIMBABWE.

Edible oils are sold in :

- Bottles of 375 ml, 500 ml and 750 or 738 ml
- Tins of 2.5 l, 5 l and 20 l
- Drums of 200 l.

Margarine and cooking fats are sold in :

- Packets of 125 g, 250 g, 500 g, 1 kg, 2 kg
- Tubs of 42 g, 250 g, 500 g (magarine only).

Conditionning is a real problem in ZIMBABWE because of the shortage of foreign exchange to import raw materials.

In fact, plastic bottles and tins have to be imported, so most of the oil conditionning is made with glass bottles, locally produced by the Company ZIMGLASS in GWERU.

b/ Local production

Production and distribution of oils and fats

All edible oils and fats in ZIMBABWE are produced by four companies, namely :

- OLIVINE INDUSTRIES
- LEVER BROTHERS
- BLUE RIBBON FOODS
- NATIONAL FOODS

OLIVINE INDUSTRIES are by far the largest oil expressor with 43 % of the total production.

They also produce the largest quantity (75 %) of soya bean oil.

LEVER BROTHERS contributes a quarter to the total production.

BLUE RIBBON FOODS and NATIONAL FOODS are smaller, but production of oil is only a relatively small part of their total activity.

NATIONAL FOODS are the sole producers of maize oil.

Margarine and cooking fats are produced only by OLIVINE INDUSTRIES and LEVER BROTHERS.

Based on allocations of oil seeds to the expressors, the productions of refined oil between 1983/84 and 1987/88 were the following :

1983/84	35 000 t
1984/85	46 000 t
1985/86	49 800 t
1986/87	50 300 t
1987/88	54 700 t

c/ Imports - Exports

Compared to the local production, imports of oil are very low : 2 000 t in 1986 - 2 400 t in 1987.

They essentially consist of :

- Import of crude oil, which is then refined in ZIMBABWE and reexported, chiefly to BOTSWANA and ZAMBIA (1 200 t in 1986 - 1 600 t in 1987) through a revolving fund.

- Import of coconut oil, for the soap industry.

Therefore, import of edible oil for local consumption are neglectable.

Some margarine and fats are exported : 400 t in 1986 and 400 t in 1987.

Imports are very low because of the shortage of foreign exchange. Also the rates of duty are high : on vegetable oils 20 % import duty plus 20 % surtax.

d/ Consumption per capita

For the last five years, the main figures are :

	83/84	84/85	85/86	86/87	87/88
Local production t	35 000	46 000	49 806	50 328	54 700
Net imports t	9 150	NA	1 200	800	800
Global consumption t	44 150	46 000	51 000	51 128	53 500
Population 1 000	7 949.0	8 174.8	8 405.5	8 639.6	8 878.1
Consumption per capita - Kg/year	5.55	5.62	6.06	5.92	6.25

For the last three years, the average consumption per capita was 6.07 kg/year.

Say 6 kg per capita per year.

This level is relatively low compared to the developped countries, but relatively high compared to the region (average consumption for SADCC countries, 2 kg per capita per year).

1.2.1.2. The prices

a/ Local prices

In ZIMBABWE, vegetable oils and fats are classified as "Essential Commoditites". Consequently, the prices from distributors or wholesalers are "stabilised" and officially published in so called "statutory Instruments", which are regularly updated.

The Basic Control of Goods (price control) Order is published in the Statutory Instrument 116 of 1987 (see annex in the main study) still applicable in May 1988.

Generally, two categories are considered :

- Blended oil and associated products
- Sunflower oil and associated products, which are more expensive.

EXAMPLES OF PRICES Z $

	BLENDED OIL				SUNFLOWER OIL			
	Unit price	Price of conditionning	Oil price	Oil price per liter	Unit price	Price of conditionning	Oil price	Oil price per liter
Bottle of 750 ml	1.89	.40	1.49	1.986	2.19	.40	1.79	2.336
Drum of 200 l	356.39	48.42	307.97	1.54	412.37	48.42	363.95	1.82
Variation bottle/drum price of oil				29 %				31 %

This table shows that, when conditioned in bottles, the same oil is sold 30 % more expensive than in drums. The return for the company is therefore much better when the oil is sold in retail packs.

If we consider that the oil price in drums is the real price ex works of this oil, we can calculate this price in US $/t.

	Z $/l	US $/l ($1 = Z$ 1.7)	US $/t (1 l= 0.9 kg)
Blended oil	1.54	0.9059	1 006
Sunflower oil	1.82	1.0705	1 189

We make the assumption that local blended oil is comparable to international soya bean oil.

b/ Comparison with the international prices.

Prices of oil, ex tank Rotterdam, in US $/t

October/September	Soya bean Oil	Sunflower Oil
1982/83	463	
1983/84	722	
1984/85	625	632
1985/86	377	406
1986/87	324	356
Sept 88	485	515

Import Parity price — US $/t

Example for soya bean oil

	Base	84/85	86/87
Oil ex tank Rotterdam		625	324
Sea freight Rotterdam Durban		45	45
Port charges		25	25
Rail Road transport to Harare		90	90
TOTAL........................		785	484
Import duty 20 %)) 44 % Surtax 20 %)		345	213
Other costs		40	40
Import parity price		1 170	737

Local price 1 006 $/t

This example shows that, at present, the local price in ZIMBABWE is higher than the international price. This was the contrary in 1984/85.

1.2.1.3. Estimation of the present demand

Several factors have to be considered :

- The prices
  The prices of vegetable oils and fats, classified as "essential commodities", are strongly controlled at relatively low levels.

  Edible oil is not a luxury commodity in ZIMBABWE.

- The shortage of foreign exchange.

  As seen above, imports of edible oils for local consumption are maintained at very low levels through the limitation of import licences and dissuasive rates of duties (20 % plus [illegible]0 % surtax).

- The improvement of the income of lower income families.

  For families with an income of up to 3 600 $/year, the increase of income has been 15 % on the 1.7.85, 10 % on the 1.7.86, 15 % on 1.3.88.

  These figures are higher than the increases of the price indexes in the same period.

  Even if the real rate of inflation is higher than the increase of price indexes, there is probably an improvement in buying power for the lower classes.

- The distribution network
  As said in the study, there is a good distribution network in ZIMBABWE.

As a result of these main factors, all the marketing people we met :

- The Marketing Managers of OLIVINE INDUTRIES, LEVER BROTHERS, BLUE RIBBON FOODS, NATIONAL FOODS.

- The wholesalers, for instance the Managing Director of JAGGER.

- The Agricultural organizations etc...

- The retailers (surpermarkets).

All agree that one should consider that the present demand is largely above the present production and that the demand is increasing sharply every year.

The consumption is limited now by a shortage of oilseeds and a strong control of imports. It is therefore clear that the present consumption of 6 kg per capita per year is below the actual demand.

- Publications by the Agricultural Marketing Authority estimate the global demand in 1986 at 60 000 T, with a population of 8,405,577 (medium variant), this would give a figure of 7.14 kg per capita per year.

- The Ministry of Industry considers that production could meet the demand with one litre of cooking oil per person over the age of five, per month, that would give 9 kg per person per year.

  Finally, we propose to consider two variants - medium variant : 7,2 Kg per capita per year, which is 20 % more thant the present consumption. High variant : 9 kg per capita per year, which is 50 % more than the present consumption. These figures are based on 1986.

1.2.1.4. Evaluation of the future demand

There is considerable evidence that the price elasticity of the demand for edible oil is very low.

Therefore, for the evolution of the demand, two main factors have to be considered :

- The increase in demand due to the increase of the population
- The increase in demand due to the increase of income (through the income elasticity).

a/ Income elasticity of demand - concepts and definitions

It is well known that income plays a significant role in determining the composition of diets in general.

With regard to fats and oils, the apparent consumption tends to increase very sharply at low levels of income and very slowly at high levels, approaching saturation at around 30 Kg per capita per annum.

The following figure shows the relation between GNP in US $ and apparent consumption of fats and oils in kg per capita per year, in selected countries in 1980.

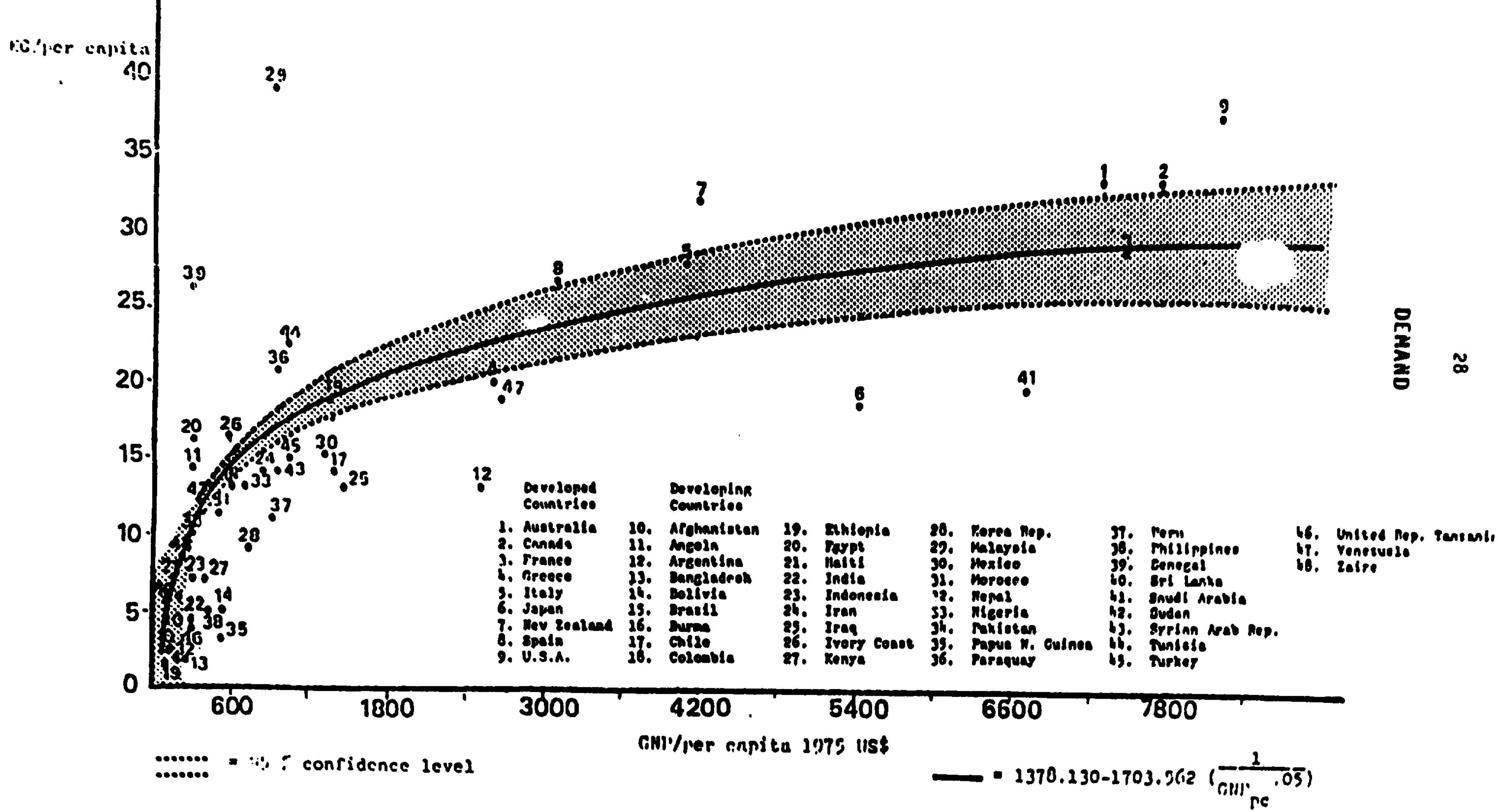
Source : United Nations - Industrial Development Organization.
Sectoral study
The vegetable Oils and Fats Industry in developing Countries - Outlook and perspectives.

The income elasticity of demand is defined by the ratio between the variation of consumption of edible oil in percentage to the variation of income (measured for instance with GDP per capita) also in percentage.

The World Bank estimates GNP per capita is ZIMBABWE in 1985 at US $ 680 (World Development report 1987).

At this level and taking into account the income distribution in ZIMBABWE (Lorentz Curve - Income tax Statistics), we consider that the income elasticity of the demand of edible oil is 0,5.

Figure 4.1. Per capita apparent consumption of fats and oils in selected countries in 1980



b/ Variation of the GDP up to 2000

The first five-year National Development Plan 1986 - 1990 is based on an annual growth in GDP of 5.1 per cent.

A recent mini boom in 1985, with a real growth rate of 9.3 % slowed down to close to zero in 1986. Preliminary figures for 1987 suggest nearly 2 per cent. Prospects for 1988 are much better and figures of 5 % and possibly more are expected.

We made the assumption that the GDP growth rate would exceed the population growth rate by 2 % per year.

Considering an elasticity coefficient of 0.5, that would give an increase of the edible oil demand of 2 % x 0.5 = 1 % per year. (increase of consumption per capita).

c/ Projection of demand

Taking into account the factors developped above :

- We consider two figures for the edible oil demand per capita in 1986.

  Medium variant : 7.2 kg/year
  High variant : 9 kg/year

- If we consider that these figures will grow of 1 % per year, we are able to calculate the demand per capita, up to the year 2000, for the two variants.

- With the population growth, we arrive, for the projection of the global demand at the following table.

EDIBLE OL IN ZIMBABWE - EVOLUTION OF DEMAND

	1986	1990	1995	2000
Population 1 000 Medium variant	8 405.6	9 369.4	10 633.7	11 942.6
Coefficient 1 % per year	1	1.0406	1.0937	1.1496
Demand per capita Medium variant Kg/year	7.2	7.49	7.86	8.26
Demand per capita High variant Kg/year	9	9.37	9.84	10.35
Global demand t/year Medium variant round figures	60 520 60 000	70 177 70 000	83 687 84 000	98 884 100 000
Global demand t/year high variant round figures	75 650 76 000	87 791 88 000	104 636 105 000	123 606 124 000

1.2.2. DEMAND AND MARKET FOR OIL MEALS

1.2.2.1. The local production and consumption

a/ Products

Note : "Cake" is defined as the product coming out of the expellers. "Meal" is defined as the products coming out of the solvent plant.

Oil cake/oil meal is utilised in the stockfeed industry as a very important source of protein (cotton seed cake : 40/45 % - soya cake (44 - 50 %). Production in ZIMBABWE is essentially cotton seed meal and soya bean meal.

Of course, cotton seed meal is principally used for the beef and the dairy industry because of the problem of gossypol for monogastrics (poultry and pigs).

On the contrary, soya bean meal is used in all stockfeeds. Soya bean meal is well known as an important product on the international market.

b/ Local production

Derived from oil seeds allocation, the oil meal productions were the following :

	TOTAL	COTTON MEAL	SOYA MEAL
1983/84	125 000	-	-
1984/85	137 000	-	-
1985/86	137 000	-	-
1986/87	140 000	68 000	63 000
1987/88	154 000	66 000	78 000

c/ Exports

ZIMBABWE exports significative quantities of oil meals, principally to the RSA. The figures were

		to RSA
1986	42 000 t	98.7 %
1987	57 000 t (first 9 months)	97.9 %

The following table gives the figures for production and disappearance (domestic and export) in the last years.

(1000 t)

YEAR	PRODUCTION (1)	DISAPPEARANCE (2)	
		Domestic	Export
1983/84	125	107	4
1984/85	137	75	40
1985/86	137	75	75
1986/87	140	98	42
1987/88	154	97	57

(1) Derived from oil purchases

(2) No account taken for stock carry-over

Source : Agricultural Marketing Authority Oilseeds Situation and Outlook Report 1986-87.

d/ Local consumption

In ZIMBABWE, the stockfeed industry is very concentrated in 3 companies :

AGRIFOODS
NATIONAL FOODS (stockfeed Division)
RUMEVITE (smaller)

A relatively small quantity of meals is also sold directly to farmers.

The final consumer is of course the Commercial Agriculture, large scale and small scale commercial farmers, generally organized in associations such as :

Cattle Producers Association
National Association of Dairy Farmers
Commercial Poultry Producers Association

The demand for stockfeed is very sensitive to the price, consequently, the production varies widely from one year to the other.

1.2.2.2. The prices

a/ Local prices

Similarly to the prices of oils, the prices of oil meals are fixed by the Government. The evolution of the prices in the recent years has been the following :

Oil meal prices Z $/t and US $/t ($1 = Z$ 1.7).

YEAR	COTTON MEAL		SOYA MEAL	
	Z$	US$	Z$	US$
1983/84	152	90	165	109
1984/85	291	171	328	194
1985/86	291	171	328	194
1986/87	291	171	328	194
1987/88	251	148	330	194

NOTA

- Sunflower seed meal prices are similar to cotton seed meal prices.
- Groundnut meal prices are similar to soyabean meal prices.

The meal prices were tremendously increased in October 1983.
As this resulted in a drop of domestic offtake, the Government recently reduced the price of cotton seed meal from 291 to 251 Z$ per ton.

b/ International prices
(Source oil world) US $/t

	82/83	83/84	84/85	85/86	86/87	15/4/88	15/9/88
Cotton seed meal CIF Rotterdam	172	174	99	115	134	157	165
Soyabean meal CIF Rotterdam	224	221	155	183	189	240	309

Because of the draught in the United States, the price of soya meal increased sharply in the recent period (April, May, June 1988).

The comparison between the figures of paragraphs a/ and b/ shows that the local prices of cotton meal, up to the recent reduction, were higher than those of the international market.

The local prices of soya meal were comparable.

1.2.2.3. The demand

a/ Factors Governing the demand

As mentioned above, the final consumer for oil meals is the Commercial Agriculture and for cotton seed in particular, the cattle and dairy industries. It seems that there is a good correlation between the cotton meal demand and the ratio : price of beef (Cold Dressed Mass CDM) to the price of cotton meal.

The cattle Industry in ZIMBABWE comprises two systems :

- the communal herd comprising about 3.3. millions head
- the commercial herd comprising about 1.8 millions head (in 1986). For the stockfeed Industry, only the commercial herd has to be taken into account.

In 1982, the commercial beef herd was 2.1 millions head. There has been a decline between 1982 and 1986 (droughts - long awaited entry into the European Market). Its seems now that the herd will increase again.

In the winter of 1982, the price of cotton seed meal was approximately $ 152 per ton. The price of beef (Cold Dressed Mass : CDM) was 1 360 $/t. The ratio was therefore 9 to 1.

In September 1983, cotton seed meal almost doubled in price (291 $ per ton). The situation in 1985, with a price of beef (CDM) of 1 560 $/t was therefore a ratio of 5 to 1.

There was consequently a dramatic fall off in sales of stockfeed in 1985. The drought of the previous two years prevented this fall happening sooner.

In such a situation, beef producers tend to reduce their winter feeding levels and are looking at lighter stocking rates to improve individual animal performance. Stockfeed manufacturers tend to use more urea, molasses and milling residues to cut down the costs of the rations.

We think that, in order to maintain relatively low prices for oil (essential commodity), the Government increased the price of meal to allow a reasonable return to the oil expressors.

In fact, the local meal market dropped and the expressors were obliged to export the surplus of meal, at the international prices, which were much lower than the local prices.

This situation has now been corrected. The price of cotton seed meal has been reduced to 251 \$/t.

The price of beef (CDM) was in May 1988 at 2 320 \$/t.

The resulting ratio is now therefore 9 to 1 again.

For soyabean meal, the problem is different since the local price has always been kept close to the international price and because soya bean meal is easier to use, particularly for poultry and pigs. Additionally, poultry production is one of the fastest growing industries in ZIMBABWE. Day old chick production increased from about 15 million in 1985 to over 20 million in 1986. The pig industry is still relatively small, with a commercial sector estimated at 100 000 pigs, but the country is suited for pig production because of its climate and this industry is therefore growing.

The following table show the stockfeed production in ZIMBABWE from 1980 to 1987, and the prices of cotton seed meal.

	STOCKFEED PRODUCTION t/y	PRICE OF COTTON MEAL \$/t
1980	510 000	117
1981	525 000	152
1982	510 000	152
1983	660 000	152
1984	580 000	291
1985	450 000	291
1986	512 000	291
1987	575 000	291

Between 1983 and 1985, the price of cotton seed meal has been increased by 91 % and the stockfeed production dropped 32 %.

b/ Evaluation of the future demand

The Cattle Producers Associations assumes that, once the right price ratio is found between beef and cotton seed meal, the industry could possibly use in excess of 100 000 tons of meal per annum. That right ratio is thought to be in the order 8 to 1.

It is clear that, since the local stock feed industry does not absorb the total quantity of cotton seed meal produced, the local prices of cotton seed meal (and soyabean meal) should not be too different of those of the international market.

This factor being taken into account, it seems that there is no problem to export additional quantities of oil meal to RSA, a natural Market to ZIMBABWE because of the importance of the transport costs for meals.

We do not think it appropriate to produce a chart showing the demand for oil meal up to the year 2 000, because the sensitivity of this market to various factors is very high.

However, considering :

- the improvement of the situation of the cattle industry.
- the good situation of the dairy industry,
- the increase in production of the poultry and pig industries,
- the fact that the prices of cotton seed meal are now fixed at reasonable levels, taking into account the local price of beef and the international prices of meals,
- the fact that Export of meals to neighbouring countries, specially RSA creates a natural market for the surplus of the oil meal production.

We estimate that, provided the prices, fixed by the Government are not too far from the international prices, there will be no problem for the oil expressors to sell their oil meals, either on the local market or the export market in the region.

1.2.3. OTHER MARKETS

a/ Soap industry

The soap industry in ZIMBABWE is controlled by the same producers as those for Edible oils, plus a small company, which is a subisidary of the COLGATE-PALMOLIVE Group.

The four producers confirmed that no vegetable oil was used for soap production. The main raw material for soap is tallow, either sold by the Cold Storage Commission or imported. Also a small quantity of coconut oil is imported from MALAYSIA for soap production.

Consequently, we have not taken into account the soap industry in our market study for vegetable oils.

b/ Industrial uses

The informations from the marketing managers of the four expressors indicate that industrial uses, such as paints, only represent a very small proportion of the vegetable oil production. This proportion is estimated at 5 %.

1.2.4. PLANT CAPACITY

1.2.4.1. Evaluation of the existing industry

The oils and fats industry in ZIMBABWE is a relatively sophisticated and well developped processing sector.

Consequently, any study for increasing the oil production capacity must take into account the existing capacities. This is a difficult subject since installed capacities generally differ from actual capacties, and also we have to consider the applications for modernization, or rehabilitation, which need foreign exchange.

In order to estimate the actual and installed capacities, we visited the four oil expressors, had discussion with their production staff and visited the plants, either in September 1987 during the study for SADCC or during the present study.

At the present moment, there is still a shortage of oil seeds. Consequently, the supply of oil seeds to the users continue to be on an allocation basis, with the exception of crusher groundnuts which are sold on a tender basis to the oil expressors. Thanks to informations given by the CMB for cotton seed an by the Grain Marketing Board for soya bean, sunflower and groundnuts, regarding the allocations of oil seeds to the expressors, it was possible to calculate with accuracy the actual productions for the last three years, and to compare them with the informations given directly by expressors and with our own opinion after the visits of the industrial facilities.

Peculiar is the evaluation of the capacity of NATIONAL FOODS since this Company, a major producer of maize meal, can use its oil expressing facilities either for maize germs or cotton seed, soyabeans or sunflower.

Two variants are also considered for BLUE RIBBON FOODS, either without or with a new expeller.

Detailed calculation and justifications are given in Chapter III, industrial part, of the main study. We give hereby only the conclusions.

a/ Actual operating period

We assumed that the mills were running 320 days per year.
We also assumed that the actual productions were 90 % of the installed capacities.

b/ Oil mills

<u>NOTA</u> : CS : Cotton seed
SB : Soya bean
SF : Sunflower
GN : Groundnut

- NATIONAL FOODS NORTH

Production capacity : 90 t/d in Cotton seed - 180 t/d in maize germs.

Hypotheses : an allocation of 10 000 t/y of Cotton seed, which corresponds to 111 days of production.

Then there would remain a capacity of :
180 (320 - 111) = 37 620 t/y for maize germ.

- NATIONAL FOODS SOUTH

Production capacity : 50 t/d in Sunflower and Groundnut
140 t/d in Maize germs.

Hypotheses : an allocation of 4 000 t/y of Sunflower and
2 000 t/y of Groundnut
corresponding to 120 days of production.
Then there would remain a production capacity of :
140 (320 - 120) = 28 000 t/y for maize germ.

- TOTAL NATIONAL FOODS

CS + SF + GN : 16 000 t/y
Maize germs : 65 620 t/y

- OLIVINE INDUSTRIES

Line N° 1 : Cotton seed + Sunflower + Groundnut
Possible production : 240 t/d
or 240 x 320 = 76 800 t/y.

Line N° 2 : Soya bean
Possible production : 300 t/d
or 300 x 320 = 96 000 t/y.

- LEVER BROTHERS (all seeds)
Possible production : 300 t/d
or 300 x 320 = 96 000 t/y.

- BLUE RIBBON FOODS
Hypothese 1 : with the new solvent plant only.
Possible production : 175 t/d
or 175 x 320 = 56 000 t/y.

Hypothese 2 : Hypothese 1 + additional new expeller
Possible production : 265 t/d
or 265 x 320 = 84 800 t/y.

- SUMMARY t/y

Total production capacity (all oil seeds).

NATIONAL FOODS		16 000
OLIVINE	1	76 800
	2	96 000
LEVER BROTHERS		96 000
		284 800

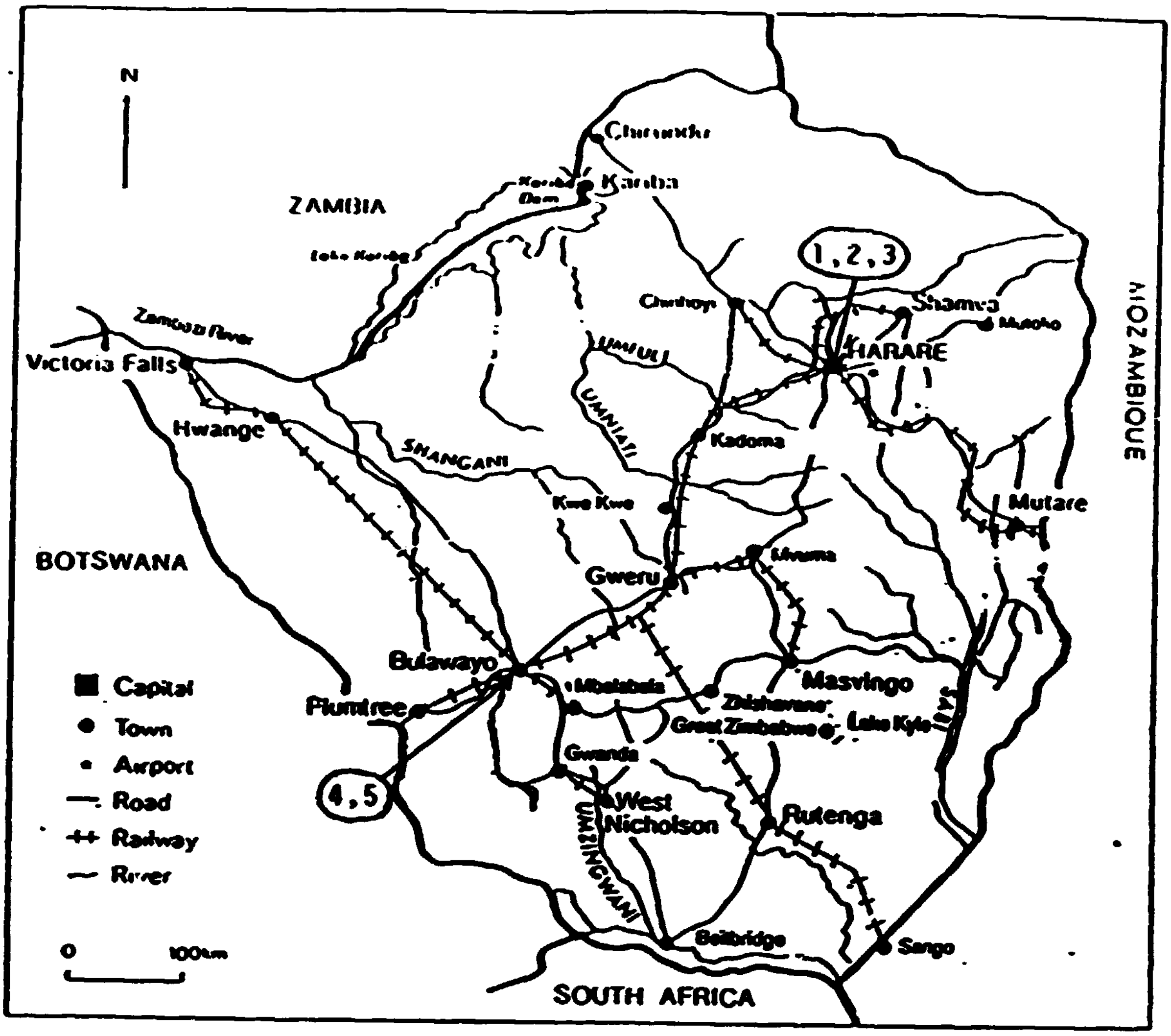
BLUE RIBBON FOODS		
Hypothese 1	56 000	
Hypothese 2		84 800
TOTAL	340 800 t/y	369 600 t/y

Plus Maize germ 65 620 t/y

Considering that the figures above are all at an optimal level, we assumed for the possible production of the existing industry in ZIMBABWE the first figure of 340 000 t/y of CS + SF + GN + SB plus 66 000 t/y of maize germs.

It must be understood that the figure of 340.000 t/y includes rehabilitations, in some places of the plants, which are not made at the present time.

The present feasible normal capacities in ZIMBABWE are therefore less than 340.000 t/y, but it is normal, before considering an additional capacity, to assume that the possible bottlenecks have been eliminated.



OIL SEEDS MILLS LOCATION IN ZIMBABWE

1 OLIVINE INDUSTRIES LTD - HARARE
2 LEVER BROTHERS ZIMBABWE LTD - HARARE
3 NATIONAL FOODS LTD, NORTHERN REG. - HARARE
4 NATIONAL FOODS LTD, SOUTHERN REG. - BULAWAYO
5 BLUE RIBBON FOODS LTD - BULAWAYO

1.2.4.2. Evaluation of the agricultural production

The production table is extracted from Chapter III, agricultural part, of the main study.

AGRICULTURAL PROJECTIONS TOWARD 2 000 (1 000 tons/YEAR)

	1988	1990	1992	1994	1996	1998	2000
Cotton seed	190	205	225	242	255	263	270
Sunflower	22	20	26	32	38	44	50
Groundnuts (for oil)	8	8	8	8	8	8	8
Soyabean	100	100	116	132	148	164	180
TOTAL	320	333	375	414	449	479	508

Compared with the maximal possible production of 340 000 t/y, this Table indicates that there will be :

- a lack of processing capacity for the oil seeds as from 1990/1991.

- a surplus of oil seeds by the year 2 000 of 508 000 - 340 000 = 168 000 t/y.

1.2.4.3. New plant capacity

Translated into daily crushing capacity, 168 000 tons per year are equivalent to 600 t per day.

It is obvious that one only 600 t/day expressing plant, which will reach its full capacity only by the year 2 000, could not be viable.

This has formed the basis for the idea of two plants of 300 t/day, the first working at full capacity by 1994/95 and a second by 2 000.

We, therefore, propose to concentrate the detailed feasibility study on this assumption of a 300 t/day processing plant,

or more precisely :
330 t/d installed capacity based on CS + SF.

or 250 t/d installed capacity based on SB.

The difference between these two figures comes from the weight of cotton husks and moisture.

In order to answer the request of CMB to consider the smallest possible capacity, we made with the Comfar a sensitivity analysis for a plant of half capacity, 164/225 t/day, which is technically viable.

However, the IRR is very low and this capacity is too low also to follow the agricultural production.

Consequently we would not recommend it.

1.2.4.4. Capacity definitions (see UNIDO's Manual p. 63-64)

- Nominal maximum capacity

  This is the technically feasible capacity which corresponds to the installed capacity as guaranteed by the supplier of the plant.

For this study, the corresponding figures are, as indicated before :

330 t/d based on CS + SF

or 250 t/d based on SB.

- <u>Feasible normal capacity</u>

This is the capacity achievable under normal working conditions, taking into account :

. the installed equipment (figures above),

. the actual operating period. It is generally considered that an oil mill must run continuous 7 days a week (4 shifts), the maximum possible number of days during this year.
Generally the oil mill stops 30 days for maintenance, about 10 days for public holidays and an other 5 days to modify the equipment from one oil seed to another and cleaning.
Consequently, we assume that the mill will operate 320 days per year.

. The general working conditions. Here we chose a coefficient of 90 % of the daily capacity.

Consequently, if we consider the annual production figures, the ratio between Feasible Normal Capacity and Nominal Maximum Capacity is :

$$\frac{320}{365} \times 0.9 = 0.789$$

i.e. 78.9 %.

This figure is quite reasonable, even conservative under the industrial conditions in ZIMBABWE.

In the next calculations, we consider that the production in the first four years will be 30 %, 60 %, 90 % and 100 % of the capacity.

All these percentages apply to the Feasible Normal Capacity, i.e. they include already a reducing coefficient of 78.9 % on the Nominal Maximum Capacity.

1.2.4.5. New plant versus rehabilitation

At the end of 1987 and the beginning of 1988 the same SOFRECO team (Industrial Economist, Edible Oil Specialist, Agronomist) carried out a study, financed by the EEC, on the "Rehabilitation of the Edible Oils Industry in the SADCC Countries", which included ZIMBABWE.

Therefore, when starting this present study, the team had already a good knowledge of the required rehabilitations of the existing oil plants in ZIMBABWE and this question was examined into more details during the present feasibility study.

We would like to indicate that the figure of 340,000 t/y, as expressed on page 43, takes into account rehabilitations (except new expellers at BLUE RIBBON FOODS) and will saturate the existing solvent plants.

Any additional capacity over the 340,000 t/y (except at BLUE RIBBON FOODS) would require additional solvent extraction plant, which is the heart of a factory.

Consequently, the choice between rehabilitation and a new plant is not really there.

Of course the new line could be installed at an existing plant, which has some advantages ; for instance infrastructure, manpower, etc. but also drawbacks, for instance the existing plants are in Harare and Bulawayo, an extension would be adverse to the Government's policy of decentralization.

The new plant has many advantages :

- the proximity of a ginnery,
- a good, efficient lay out,
- the creation of employment in a decentralized area, etc.

We therefore assumed in this study that the new production capacity would be a new plant.

1.2.5. PROJECTED SALES - PRODUCTION PROGRAMME - BASE CASE

1.2.5.1. Production programme

Nota : Capacity means Feasible Normal Capacity.

We considered that the plant would run 1/3 of the time for SB and 2/3 for the other seeds. That is a quantity of seeds at full capacity of

CS + SF + GN : 330 x 0.9 x 320 x 0.67 = 64.000 t/y
SB : 250 x 0.9 x 320 x 0.33 = 24.000 t/y

We excluded groundnut to simplify the programme and assumed that the annual breakdown would be, at full capacity :

Cotton seed : 56 000 t/y
Sunflower : 8 000 t/y
Soya bean : 24 000 t/y

We assume that it will take 3 years to obtain the full capacity at the following ratios :
1st year : 30 %
2nd year : 60 %
3rd year : 90 %
4th year and following 100 %.

Taking into account the yields for refined oils and meals for the various seeds given in the main study (Chapter III schedule 3.3.A), we arrive at the following Tables :

125 A : Production Programme.
125 B : Sales - blended oil - normal year
125 C : Sales - pure sunflower oil - normal year.

PRODUCTION PROGRAMME

TABLE 125 A -

PRODUCTS Metric Tons	YEAR 1 30 %	YEAR 2 60 %	YEAR 3 40 %	YEAR 4 and following 100 %
1 - INPUTS - SEEDS				
Cotton seeds	16 800	33 600	50 400	56 000
Soyabeans	7 200	14 400	21 600	24 000
Sunflower	2 400	4 800	7 200	8 000
	26 400	52 800	79 200	88 000
2 - OUTPUTS				
Refined oil				
- Cotton seed oil 16.5 %	2 772	5 544	8 316	9 240
- Soyabean oil 17 %	1 224	2 448	3 672	4 080
TOTAL blended oil	3 996	7 992	11 988	13 320
Sunflower oil 31 %	744	1 488	2 232	2 480
TOTAL REFINED OIL	4 740	9 480	14 220	15 800
3 - OUTPUTS				
Oil meals				
- Cotton meal 48 %	8 064	16 128	24 192	26 880
- Soya meal 81 %	5 832	11 664	17 496	19 440
- Sunflower meal 33 %	792	1 584	2 376	2 640
TOTAL MEAL	14 688	29 376	44 064	48 960

SALES - BLENDED OIL - NORMAL YEAR

TABLE 125 B

Blended oil 13 320 t
or 14 800 000 l (1 l = 0.9 kg)

PACKAGING	PROPORTION	QUANTITY (l)	NBER OF UNITS	PRICES/UNITS	TOTAL SALES $/Y
Drums (200 l)	10 %	1 480 000	7 400	356.39	2 637 286
Tins (5 l)	5 %	740 000	148 000	11.51	1 703 480
Tins (2.5 l)	5 %	740 000	296 000	6.19	1 832 240
Bottles of which	80 %	11 840 000			
750 ml	70 %	8 288 000	11 050 667	1.89	20 885 761
500 ml	20 %	2 368 000	4 736 000	1.48	7 009 280
375 ml	10 %	1 184 000	3 157 333	1.12	3 536 213
				TOTAL	37 604 260

Year 1 : 30 %
2 : 60 %
3 : 90 %
of the above values

SALES - PURE SUNFLOWER OIL - NORMAL YEAR

TABLE 125 C -

Pure sunflower oil 2 480 t
or 2 755 556 l -(1 l = 0.9 kg)

100 % in bottles

PACKAGING BOTTLES	PROPORTION	QUANTITY (l)	NBER OF UNITS		
375 ml	10 %	275 556	734 815	1.30	955 260
500 ml	20 %	551 111	1 102 222	1.71	1 884 799
750 ml	70 %	1 928 889	2 571 852	2.19	5 632 356
					8 472 415

Year 1 : 30 %
2 : 60 %
3 : 90 %
of the above values

RECAPITULATION OF SALES - NORMAL YEARS

OILS		SALES
Blended oil	13 320 t	37 604 260
Sunflower oil	2 480 t	8 472 415
TOTAL OIL	15 800 t	46 076 675

- Meals

Taking into account the recent important increase of oil meals prices on the international market (see above table page 35) and the prices levels on the long term (see volume I page 27 the chart in the paragraph International Context), we chose for the export prices :

. For CS meal and SF meal

165 US $/t or 281 Z $/t

. For SB meal

240 US $/t or 408 Z$/t

With a percentage of export of 40 %, the meal sales are therefore the following at normal capacity :

	Quantity	Unit price Z $/t	Total price Z $
Export			
CS + SF	12 000	281	3 372 000
SB	7 800	408	3 182 400
Local			
CS + SF	17 520	251	4 397 520
SB	11 640	330	3 841 200
Total			
CS + SF	29 520		7 769 520
SB	19 440		7 023 600
TOTAL	48 960		14 793 120

- Linters

Selling price ex factory gate : 0.2 $/kg

Quantities : 40 kg per ton of cotton seed

Cotton seeds : 56 000 t

Linters : 56 000 x 40 x 0.2 = 448 000

TOTAL SALES NORMAL YEAR........................ 61 317 795

RECAPITATULATION OF SALES FROM YEAR 1

	YEAR 1 30 %	YEAR 2 60 %	YEAR 3 90 %	YEAR 4 FOLLOWING 100 %
REFINED OIL	13 823 003	27 646 005	41 469 008	46 076 675
MEALS	4 437 936	8 875 872	13 313 808	14 793 120
LINTERS	134 400	268 800	403 200	448 000
TOTAL	18 395 339	36 790 677	55 186 016	61 317 795

1.2.6. SUMMARY FOR AGRICULTURAL PRODUCTION, MARKET AND PLANT CAPACITY

To compare the various figures of demand, agricultural production, processing capacity, and their trends, it is interesting to use a graphical presentation.

With the graphical presentation, it is possible to see at a glance the respective values of the different parameters, and the corresponding gaps. However, all these parameters must be expressed in the same unit. We choose as the common unit the tonnages of refined edible oil (E.O) in metric tons per year.

1.2.6.1. Agricultural production

The contents of edible oil in the various seeds are the following :

CS	:	16.5 %
SB	:	17 %
Sunflower	:	31 %
Groundnut	:	41 %

- For maize germs, the content is 8.5 % (10 % crude oil - 85 % refining yield).

- For palm oil, the refining yield is also 85 %.

The agricultural production, expressed in edible oil with the above coefficient, is showed in the following table.

AGRICULTURAL PRODUCTION AND CORRESPONDING EDIBLE OIL

	1986	1990	1995	2000
Production t				
Cotton seeds	150 000	205 000	250 000	270 000
Soya bean	83 000	100 000	140 000	180 000
Sunflower	18 000	20 000	35 000	50 000
Groundnuts	-	8 000	8 000	8 000
Total oil seeds	251 000	333 000	433 000	508 000
Maize germs *	66 000	66 000	66 000	66 000
Crude palm oil **			9 000	44 000
Corresponding refined oil t				
CS oil 16.5 %	24 750	33 825	41 250	44 500
SB oil 17 %	14 110	17 000	23 800	30 600
SF oil 31 %	5 580	6 200	10 850	15 500
GN OIL 41 %	-	3 280	3 280	3 280
TOTAL 1	44 440	60 305	79 180	93 880
Maize oil 8.5 %	5 610	5 610	5 610	5 610
TOTAL 2	50 050	65 915	84 790	99 490
Palm oil	-	-	7 650	37 400
TOTAL 3	50 050	65 915	92 440	136 890

* Difference for NATIONAL FOODS between the total processing capacity and the assumed allocation in cotton seeds and sunflower.

** The production begins in 1993.

1.2.6.2. Existing processing capacity

In 1990, the agricultural production is estimated at 333 000 tons of oil seeds corresponding to 65 915 tons of edible oil.

The existing processing capacity has been estimated at 340 000 tons per year.

Consequently, expressed in edible oil, this capacity is :

$$65\,915\ \frac{340}{333} = 67\,300\ t/y$$

1.2.6.3. Demand

The demand is directly expressed in edible oil. The values are :

Demand t	1986	1986	1986	1986
Medium variant	60 000	70 000	84 000	100 000
High variant	75 000	88 000	105 000	124 000

DIAGRAM

The diagram presents :

- On the X axis, the years from 1986 to 2000
- On the Y axis.

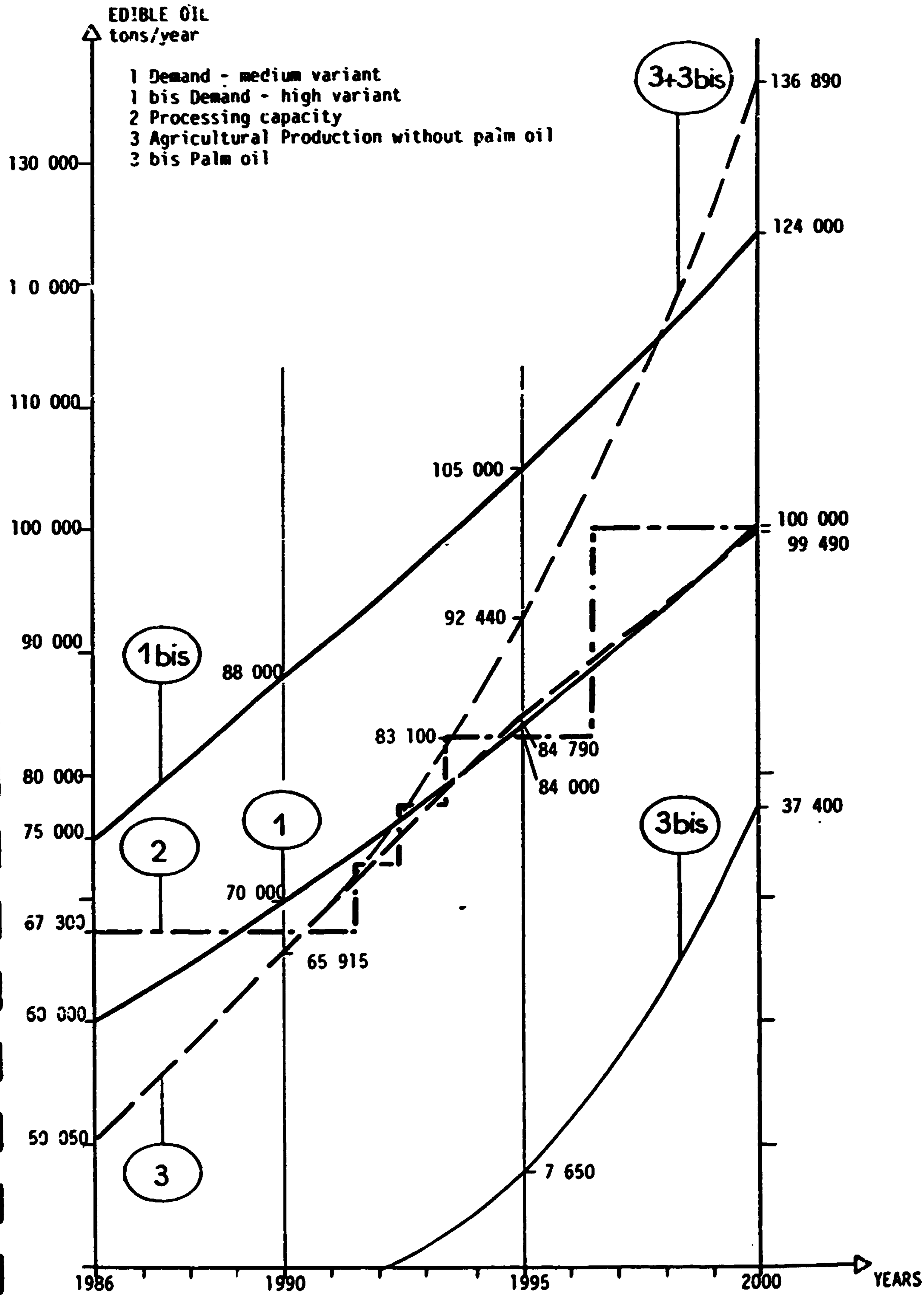
1 Demand medium variant
1 Bis demand high variant
2 Processing capacity
3 Agricultural production (without palm oil)
3 Bis palm oil
3 + 3 bis total agricultural production.

All values are expressed in refined edible oil (metric tons per year).

Nota : The tonnages of edible oil are not presented in round figures. This does not mean that the precision is accurate at the ton, but this allows, if one wishes, to return to the original figures, either in crude oil or in oil seeds.

	1986	1990	1995	2000
1 Demand - medium variant	60 000	70 000	84 000	100 000
1 Bis demand - high variant	75 000	88 000	105 000	124 000
2 Processing capacity	67 300	67 300	67 300 + 15 800 83 100	83 100 + 15 800 98 900
3 Agricultural production without palm oil	50 050	65 915	84 790	99 490
3 Bis Palm oil	0	0	7 650	37 400
3 + 3 bis total	50 505	65 915	92 440	136 890

ZIMBABWE


EDIBLE OIL
tons/year
1 Demand - medium variant
1 bis Demand - high variant
2 Processing capacity
3 Agricultural Production without palm oil
3 bis Palm oil
130 000
1 0 000
110 000
100 000
90 000
80 000
75 000
67 300
60 000
50 050
3+3bis
136 890
124 000
105 000
100 000
99 490
92 440
1bis
88 000
83 100
84 790
84 000
1
2
3bis
37 400
70 000
65 915
3
7 650
1986
1990
1995
2000
YEARS

COMMENTS

A/ DEMAND VERSUS AGRICULTURAL PRODUCTION, WITHOUT PALM OIL

If we compare the curves of the demand (1 and 1 bis) with the curve of the Agricultural Production (3), we can see that :

- The high variant of the demand is constantly and largely above the agricultural production.
- The medium variant of the demand joins the Agricultural Production by the year 1994 and then follows it.

If we assume that the actual demand is between the curves 1 and 1 bis, we can say that the demand is by no way a limiting factor for the production of edible oil.

B/ AGRICULTURAL PRODUCTION WITH PALM OIL

The curve (3 + 3 bis) will cut the curves 1 and 1 bis respectively in 1993 and 1998.

Consequently, according to the actual demand, palm oil (or other oil by substitution) could be exported at a date situated between 1993 and 1998.

C/ PROCESSING CAPACITY VERSUS AGRICULTURAL PRODUCTION

If we compare the curve of the processing capacity (2) and the curve of the agricultural production (3),

We can see that :

- Up to 1990, the processing capacity (taking into account rehabilitation) is higher than the agricultural production.

- A lack of processing capacity appears in 1990/91.

- An investment in a 330 t/day processing plant (or 15 800 t/Y of edible oil), will allow to follow the increase in agricultural production up to 1995.

- At this date a new processing capacity of approximatively the same volume will be necessary to follow the increase in seeds production up to 2000.

1.3. MATERIALS AND INPUTS

1.3.1. RAW MATERIALS

General

As said in the paragrah 1.2 of this Executive Summary, edible oil production in ZIMBABWE was in the range of 50 000 t in 1986.

Over the last years, cotton seed oil represented approximately 50 % of the total output, soya bean oil approximately 30 %, the remainder being sunflower oil and maize oil. Groundnut oil, the share of which was very important in the sixties, is no longer an important source of vegetable oil.

The TOR of the study focussed on oil from cotton seed only. But very quickly, it became apparent that there is no market for pure cotton seed oil, not blended, in ZIMBABWE.

For reasons of taste and chiefly of colour, only blended oils (cotton seed oil with soya bean oil) are sold. Cotton seed oil is indeed much darker than the others. This question is studied in more details in the Market Study.

Therefore, taking into account this important point, it was necessary to study the increase in production, not only of cotton seed, but also of other oil seeds.

1.3.1.2. Organisation of Commercial Agriculture in ZIMBABWE

Commercial Agriculture in ZIMBABWE is classified in different categories, namely :

- Large scale commercial farmers (approximately 2 000 farm units of more than 2 000 ha).

- Small scale commercial farmers (approximately 13 000 farms averaging 125 ha each).

- Communal farmers (for cotton, approximately 200 000 farmers).

- Agricultural and Rural Development Authority (ARDA); parastatal which is the largest single agricultural employeer with some 24 000 workers.

- Resettlement Areas.

Agricultural extension is the responsibility of the Ministry of Lands, Agriculture and Rural Resettlement, through its Department of Agricultural, Technical and Extension Services (AGRITEX).

Commercial farmers generally form part of specialized associations such as (for oil seeds) :

- Commercial Farmers Union of ZIMBABWE
- Commercial Cotton Growers Association
- Commercial Oil Seeds Producer's Association
- Commercial Cattle Producer's Association
- etc.

An important report, called "Commercial Agriculture in ZIMBAWE", is published every year.

1.3.1.3. Commercialisation of oil seeds in ZIMBABWE

In ZIMBAWE, the commercialisation of oil seeds, like most of the main agricultural products, is strictly controlled by the Government, (Ministry of Agriculture), through its Agricultural Marketing Authority (AMA), which in turn, coordinates the operations of four Marketing Boards :

- Cotton Marketing Board
- Grain Marketing Board
- Cold Storage Commission
- Dairy Marketing Board.

The Cotton Marketing Board has the monopoly of purchasing seed cotton from all categories of growers. It operates 9 ginneries around the country. The Board sells cotton lint to spinners on the local and the export markets and sells cotton seed to the local oil expressors.

The Grain Marketing Board operates in the same way for the other grains, including soya beans, sunflower and groundnuts.

The following Table shows the annual offtake of oil seeds by expressors, for the past five years (oil seed year runs from April through March).

'000 t	COTTON SEED	SOYA BEAN	SUNFLOWER	GROUNDNUTS	TOTAL
1983/84	101	71	4	1.3	177.3
1984/85	123	84	11	0.2	218.2
1985/86	163	80	12	0.4	255.4
1986/87	141	77	18	6.6	242.6
1987/88	136	96	22	8.0	262

Maize is not included in this Table. Anyhow, maize as a source of edible oil has a certain importance in ZIMBABWE. At present, NATIONAL FOODS produces approximatively 4/5 000 t per year of maize oil from maize germs.

The oil palm project :

It must be mentioned here that an important project for future production of palm oil in ZIMBABWE exists.

It has been agreed with the Government of ZIMBABWE that a major irrigated agricultural development project will be established in an area of the loweld of ZIMBABWE, which will be serviced by an integrated dam project.

The core of the agricultural development is 12 000 hectares of oil palms which will produce 50 000 to 60 000 t/y of crude palm oil by the year 2000.

The development Company is the MWENEZI Development Corporation (M.D.C.).

1.3.1.4. Agricultural Projections towards the year 2 000 - oil seeds

a/ Cotton

Cotton seed is by far the most important source of edible oil in ZIMBABWE.

Cotton is grown throughout the country, but the major production areas are : South East (Save Valley), North East (Glendale, Bindura, Mt Darwin) and Midlands (Chegutu, Kadoma, Gokwe, Sanyati). Cotton was traditionnally grown by large commercial farmers, but production by smallholder farmers in the communal and ressettlement areas has been on the increase since 1981, from a share of 8 per cent in 1980 to about 50 % in 1986. Somme 200 000 farmers are now registered as cotton growers and its is growing at a rate of some 2 000 per month.

The following Table shows the cotton production for the two production groups (tons/year) in the recent years.

YEARS	COMMERCIAL	COMMUNAL + RESETTLEMENT ARDA	TOTAL
1983/1984	107 916	60 545	160 461
1984/1985	148 198	102 136	250 334
1985/1986	154 144	141 336	295 480
1986/1987	111 512	136 644	248 156
1987/1988	116 108	124 005	240 113

The Government policy on the production of Cotton is very positive and expansionary as cotton is an important source of foreign exchange, it fits very well in the policy of rural development and its produces raw materials for the local textile and vegetable oil industry.

The major future expansion of the cotton production is expected to come from the communal areas.

Up to the year 2 000, the projections are the following : (1 000 t/year).

	1986	1988	1990	1982	1964	2000
Seed cotton	248	310	340	375	402	450
Cotton seed (60 %)	150	190	205	225	242	270

b/ <u>Soya beans</u>

As soya beans cultivation is a capital intensive crop, which requires also a certain level of agro-technology (inoculation of seed), the production in ZIMBABWE has remained mainly a large commercial farmers crop. About 95 % of the product is accounted for by the large commercial farmers.

The productions in the recent years were the following :

1984	86 800 t
1985	85 500 t
1986	83 400 t
1987	101 600 t

Up to the year 2 000, the projections are the following :
1 000 t/year.

	1986	1988	1990	1982	1984	2000
Soya bean	83	100	100	116	132	180

c/ Sunflowers

Most of the sunflower is grown by the small scale and communal farming sectors because it is suited to the lower rainfall areas and is cheap to grow.

The small scale commercial and communal farming sectors account for more than 90 % of the total production.

The following table shows the sunflower seed production in ZIMBABWE (tons/year) in the recent years.

Harvest year	Large scale	Small Scale	C.F.A	Total
1983	714	228	2 400	3 342
1984	917	1 100	6 400	8 417
1985	1 280	1 000	16 065	18 345
1986	960	1 000	16 400	18 360
1987	3 783	1 000	16 548	21 331

Up to the year 2 000, the projections are the followings : ('000 t/y)

	1986	1988	1990	1992	1994	2000
Sunflower	18	22	20	26	32	50

d/ Groundnuts

Groundnuts are traditionally produced in the communal farming areas and the small scale commercial sector.

Most of the production in these communal areas is retained for auto consumption and therefore sales to the Grain Marketing Board represent only a very small part of the national production.

Up to the year 2 000, the production for oil processing is estimated to 8 000 t/year.

e/ Maize

Maize contains oil which is mainly located in the maize germ.

NATIONAL FOODS, the main miller in ZIMBABWE, has started to utilise this source of vegetable oil.

The oil is extracted from the bran and germs, a by-product of the flour milling industry. The bran + germs form about 18 % of total maize milled. The extractable oil content from the bran + germ is about 10 %. This produces a factor of 1.8 % vegetable oil available in maize (crude oil).

In the Paragraph 1.2.4 above, the quantity of maize germs processed by NATIONAL FOODS has been estimated at 66 000 t/y i.e 6 600 t/y of crude oil or 5 610 t/y of refined oil (refining yield : 85 %) in the next years.

f/ Palm oil

As said above, the palm oil project is established by the MWENEZI Development Corportion.

The dam is reaching completion and land clearing of the 12 000 ha area has started to allow 2 000 ha to be planted per year as from 1989.

The projected yields at full maturity of the project seem very optimistic at 25 tons of bunch/ha at 22 % of oil at the age of 8 years.

A figure of 20 tons bunch/ha at 20 % of oil at the age of 8 years seems more realistic.

With these assumptions, the palm oil production (crude oil) would be the following (1 000 t/year).

	1993	1994	1995	1996	1997	1998	1999	2000
Palm oil (crude)	1	5	9	16	24	32	39	44

1.3.1.5. Summury of agricultural projection towards the year 2000

A summary of the previous paragraphs is presented in the following Table (1 000 t/y).

	1988	1990	1992	1994	1996	1998	2000
Cotton seed	190	205	225	242	255	263	270
Soya bean	100	100	116	132	148	164	180
Sunflower	22	20	26	32	38	44	50
Groundnut (for oil)	8	8	8	8	8	8	8
TOTAL SEEDS	320	333	375	414	449	479	508
Palm oil (crude oil)	-	-	-	5	16	32	44
Maize oil (crude oil)	6.5	6.5	6.5	6.5	6.5	6.5	6.5

1.3.1.6. Prices of Raw Materials

The prices of raw materials are generally fixed by the Government. One has also to consider the prices for transportation and also the prices of bags which are relatively important (20 $/t for cotton seed and sunflowers bags and 10 $/t for soya bean bags).

The prices of the seeds themselves are the following in Z $/ton.

Cotton seeds

Ex ginnery gate	195
Transportation	2
TOTAL	197

Note : the average present transportation cost is 18 $/t. Anyhow, we consider that the new plant will be close to a ginnery, reducing therefore considerably the transportation cost to 2 $/t.

Sunflower seeds

Ex farm + transportation	456

Soya bean

Ex farm + transportation	448

Groundnuts

ex farm + transportation	847

The prices of raw materials for the projected plant are therefore the following, for the normal year :

OIL SEEDS	QUANTITY PROCESSED t	PRICE/t $/t	TOTAL COST $
Cotton seed	56 000	197	11 032 000
Soya bean	24 000	448	10 752 000
Sunflower	8 000	456	3 648 000
TOTAL	88 000		25 432 000

1.3.2. OTHER INPUTS

1.3.2.1. Utilities

The necessary utilities are mainly electricity, water, coal.

Cost for the normal year : 965 000 $ local.

1.3.2.2. Chemical products

The necessary chemical products are mainly : caustic soda, citric acid, phosphoric acid, bleaching earth, hexane.

Cost for the normal year :

Foreign	1 148 000 $
Local	319 000 $

TOTAL.................... 1 467 000 $

1.3.2.2. Packaging materials

This important section mainly consists of : drums and tins, bottles with also caps, labels, cartons, shrink wraps and also the bags for seeds and meals.

Cost for normal year : 11 634 000 $ Local

1.3.2.3. Others

In this section are lubricants, laboratory parts, vehicles and handling equipment.

Cost for the normal year :

Foreign	855 000
Local	85 000
TOTAL....................	940 000

1.3.3 RECAPITULATION - NORMAL YEAR

	COSTS Z $ '000		
	FOREIGN	LOCAL	TOTAL
Raw materials		25 432	25 432
Utilities		965	965
Chemicals	1 148	319	1 467
Packaging and bags		11 634	11 634
Others	855	85	940
TOTAL	2 003	38 435	40 438

1.3.4. RECAPITULATION - ALL YEARS

Materials and inputs costs are not strictly proportional to the productions. The details calculations are made in Chapter 4 of the study.

The recapitulation is the following :

Materials and inputs - costs Z $ '000.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4 AND FOLLOWINGS
Foreign	771	1 202	1 888	2 003
Local	11 905	23 256	34 649	38 435
TOTAL	12 676	24 458	36 537	40 438

1.4. LOCATION AND SITE

1.4.1. PRINCIPAL DATA AND REQUIREMENTS

1.4.1.1. Land

An edible oil factory of 330 MT/D of cotton seeds or 250 MT/D of soya-beans requires an area of about 10 hectares. This surface is necessary for the plant itself, for the storage of raw materials, intermediate materials (crude oil), refined oil, blending and packaging, packaging materials.

Although the actual study is considering only the oil factory, it is necessary to provide for the future extensions, such as soap and margarine production.

Consequently, an area of 15 hectares would be preferable.

1.4.1.2. Raw materials

88 000 t of oil seeds, of which 56 000 t of Cotton seed, have to be transported to the plant each year. Therefore, the proximity of a ginnery is an obvious advantage.

1.4.1.3. Finished products

The plant will produce 15 800 t/y of edible oil, mainly in retail packs, to be transported to the consumption centers. The packaging will need also nearly 10 000 t/y of glass bottles, coming from ZIMGLASS in GWERU.

The plant will also produce nearly 50 000 t/y of meals to be transported, part to the stockfeed compounders plants (Harare, Bulawayo and in the future GWERU) and part to the export markets, chiefly to the RSA.

1.4.1.4. Manpower

The plant will employ approximatively 400 persons of various levels, which need housing and a socio-economic environment.

1.4.1.5. Utilities

The production needs of course utilities such as electric power (2 000 KVA), water (50 m^3/h) and various products such as chemicals, hexane, which are generally imported.

1.4.1.6. Role of public policies

Of course, the Government is encouraging decentralization, and municipalities offer advantages, mainly on the cost of land.

The first conclusion after this enumeration is that, for this type of plant, there is not really a dominant factor.

However, the importance of transportation shows that the plant must be connected to the railway network and the road network.

1.4.2. CHOICE OF LOCATION

HARARE being excluded for reasons of decentralisation, two possible locations have been studied, in agreement with the Cotton Marketing Board, KADOMA and BINDURA.

1.4.2.1. Kadoma

KADOMA is a town of about 80 000 inabitants situated along the main rail and road routes between HARARE (141 km) and BULAWAYO (298 km).

Three ginneries are situated in this area, KADOMA itself, CHEGUTU and SANYATI. From the cotton seed transportation point of view this is therefore very good.

For soyabean on the contrary, it is situated on the southern limit of the production area.

From the transportation of oil meals point of view the location is good as HARARE (Agrifoods), Bulawayo, and the RSA are with direct railways.

The proximity of GWERU (135 km), where the bottles are produced (ZIMGLASS) and where a possible future stockfeed plant is planned, form an additional advantage.

The town of KADOMA itself is a consumption center for oil and as it is also an industrial center with gold mining, cotton industry (ginnery, spinning and weaving mills), textile manufacturing works, CSC's abattoir, brewery, dairy industry..., there is already a socio-economic environment.

As the municipality encourages new industries to develop, land is available at low cost.

Manpower, unskilled and semi-skilled workers, is available.

Housing for the staff has to be studied, but generally living conditions (schools, medical welfare, shopping facilities...) are good.

1.4.2.2. Bindura

BINDURA is a Rural Council of less than 30 OCO inhabitants, situated at 87 km to the North of HARARE.

The main advantages are the good location for the supply of cotton seed and soyabean, and the status of "Growth Point", which gives special financial conditions to new developments.

For the other factors : oil distribution, living conditions, the situation is not as good as for KADOMA.

1.4.2.3. Conclusion

For the feasibility study of a 330 MT/D vegetable oil factory, we would consider that KADOMA is the optimum location. The site of BINDURA could be envisaged for the second factory (a new 330 MT/D factory will be necessary by the year 1977/1998 to be operational by 2000) or if the alternative of two small factories of 165 MT/day would be considered.

1.4.3. SITE SELECTION - COSTS

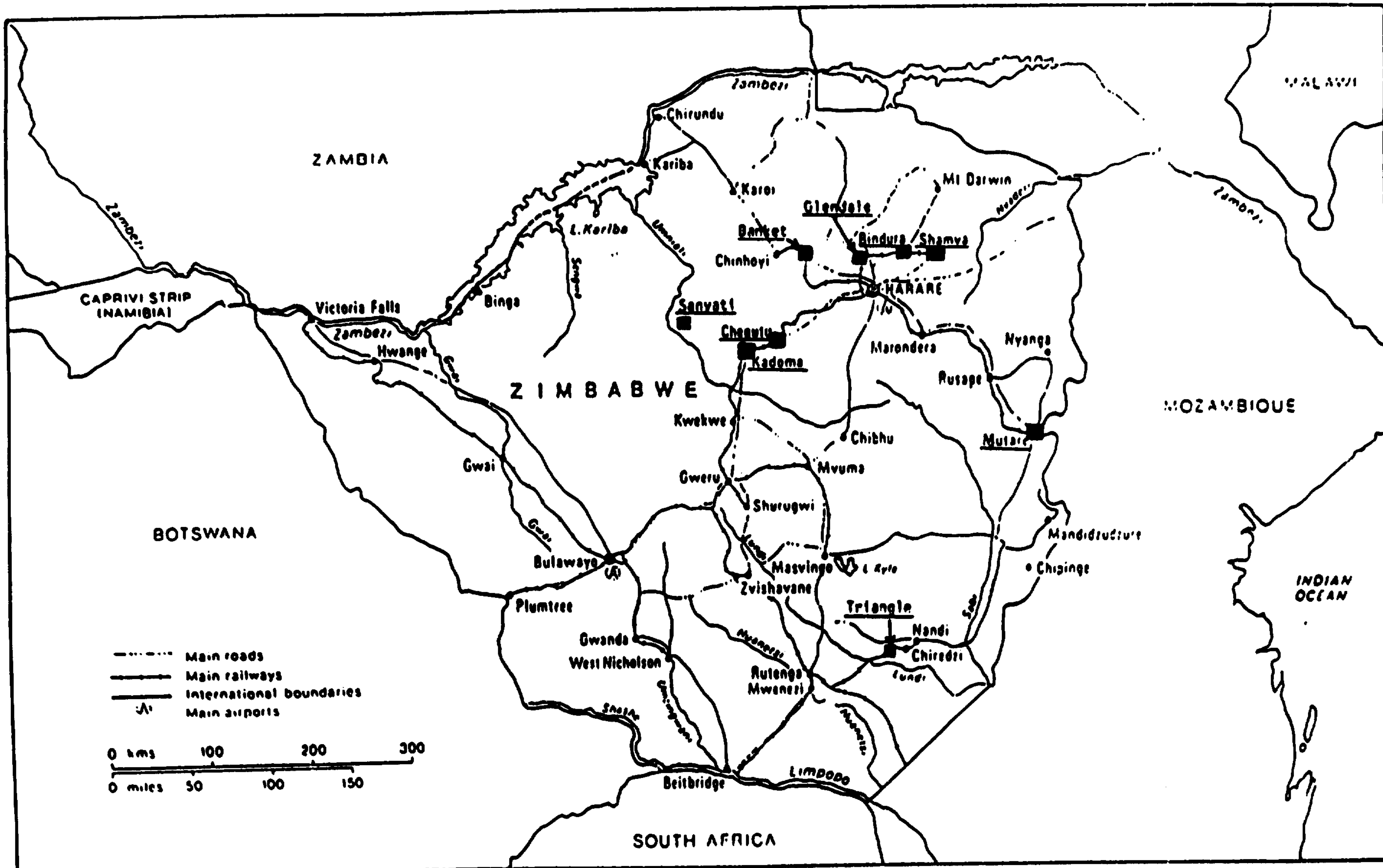
The location of KADOMA has been favoured by the Cotton Marketing Board Management and a piece of flat land of 32,3 hectares is available just alongside the new ginnery. This would allow to double in the future the present projected plant.

The Municipality agrees to sell the land at the cost of Z$ 1 500 per hectar, i.e $ 50 000 for the total land.

The preparation of the land itself (roads, electricity, water, sewers, railway connection) is estimated at $ 2 150 000, i.e a total initial cost of $ 2 200 000.

An additional annual cost for various charges is estimated at $ 6 541.

COTTON MARKETING BOARD GINNERIES



LOCATION

Zimbabwe

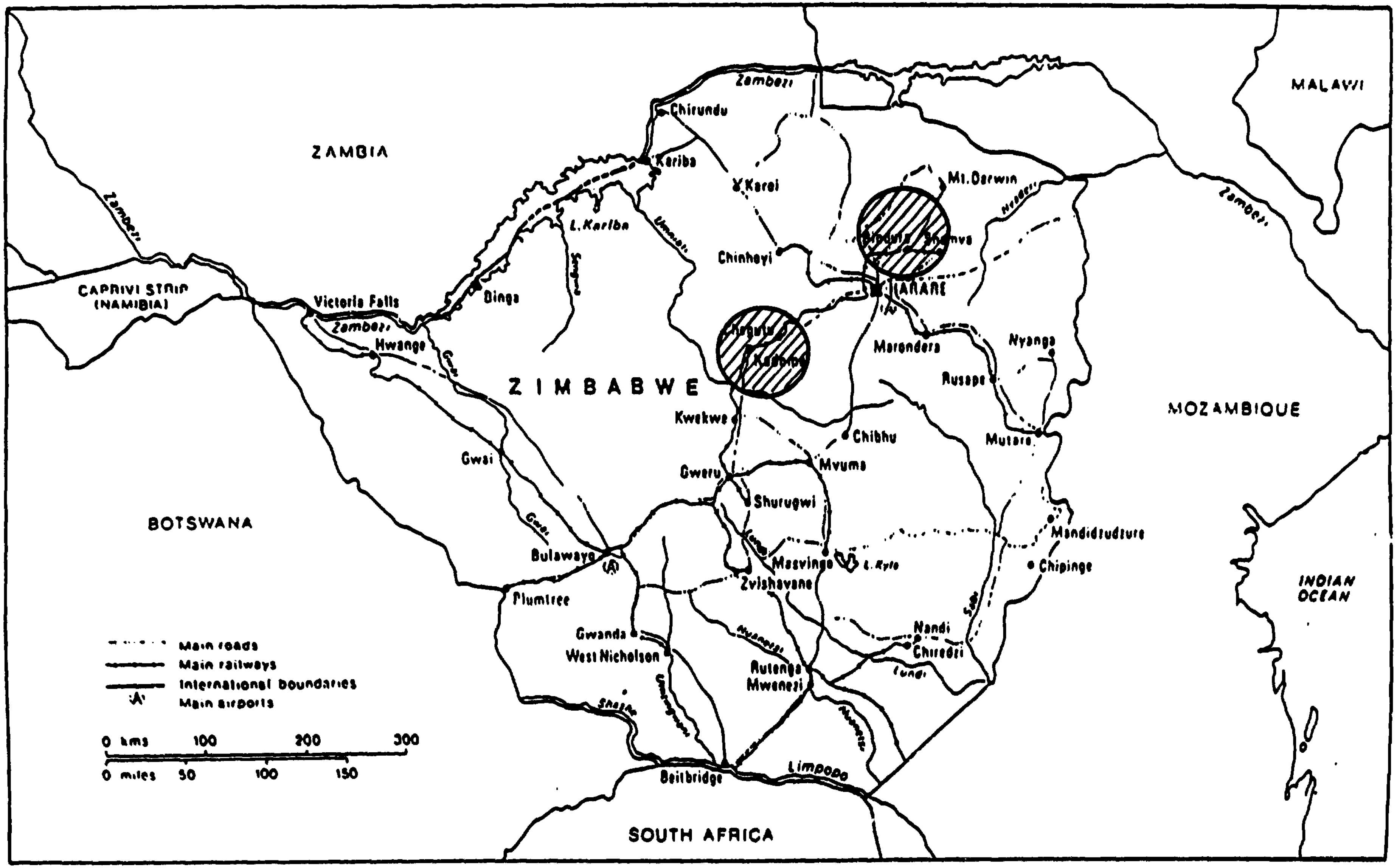
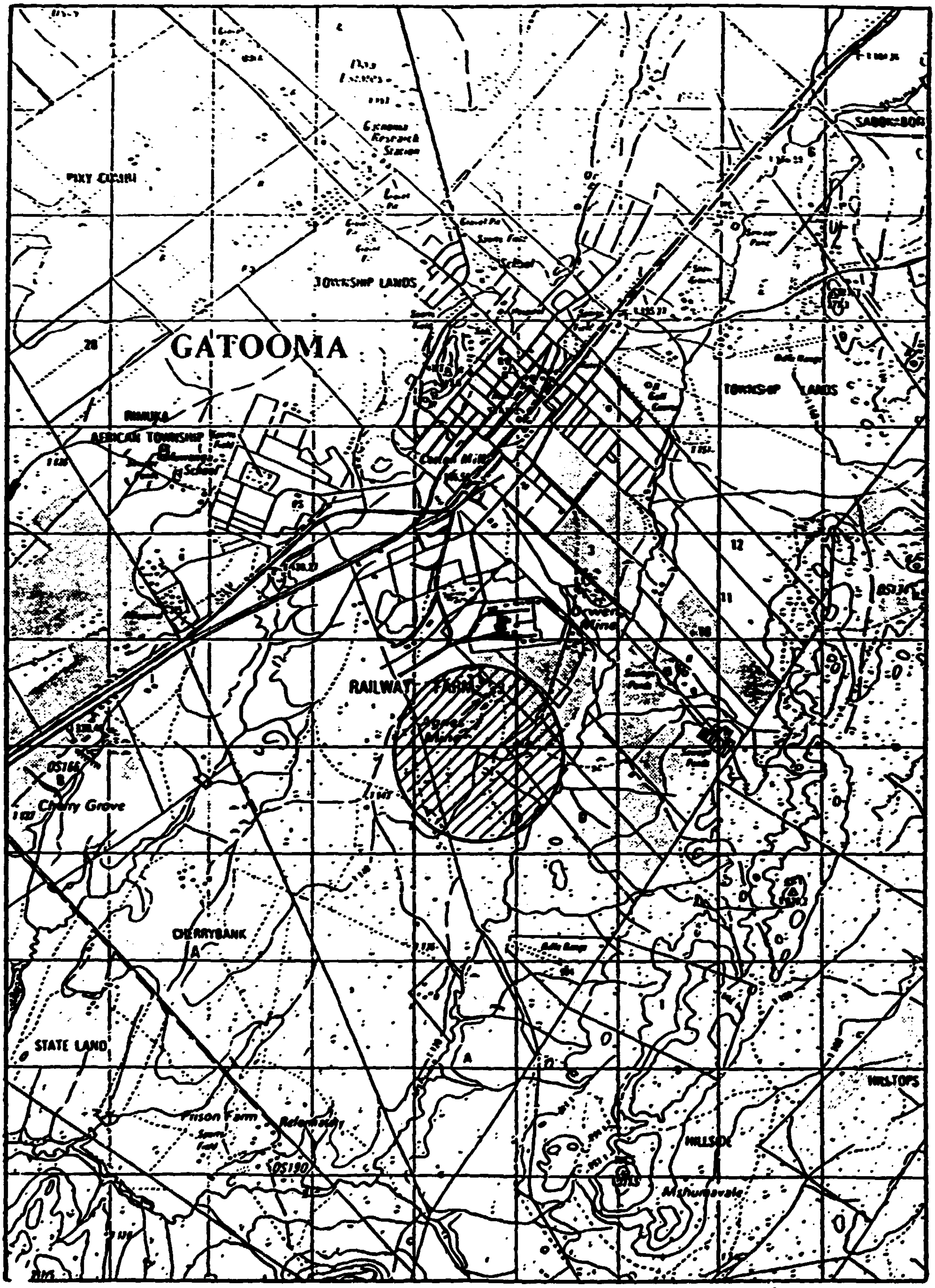


TABLE 5.5.

TABLE 5.8

KADOMA

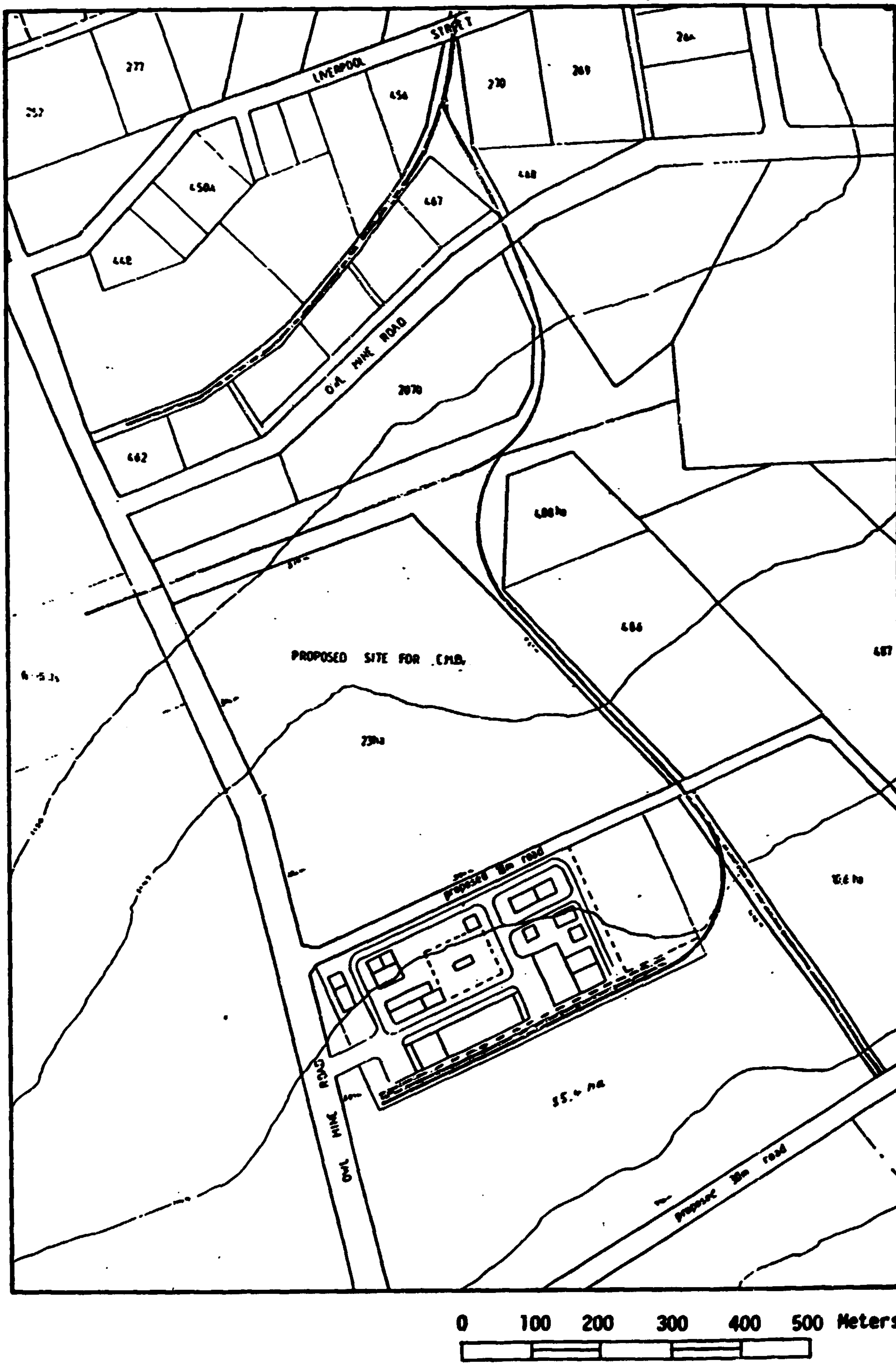
AVAILABLE LANDS



Scale 1 : 50 000

TABLE 5.9

SITE OF KADOMA



1.5. PROJECT ENGINEERING

1.5.1. SUMMURY OF THE ANNUAL PRODUCTION PROGRAMME (Normal year)

1.5.1.1. Oil seeds inputs (tons per year)

Cotton seed	56 000
Soya bean	24 000
Sunflower	8 000
TOTAL..............	88 000

1.5.1.2. Refined oil output (tons per year)

Cotton seed oil	9 240
Soya bean oil	4 080
Sunflower oil	2 480
TOTAL..........	15 800

1.5.1.3. Oil meal output (ton per year)

Cotton seed meal	26 880
Soya bean meal	19 440
Sunflower meal	2 640
TOTAL	48 960

This programme corresponds to a nominal maximum capacity of :

330 tons per day in cotton seed or
250 tons per day in soya bean.

See paragraph 1.2.4.4. page 46.1

1.5.2. TECHNOLOGY

1.5.2.1. General

The technology is based on a multi seeds oil mill. The heart of this mill is the solvent plant which produces :

- Crude oil, which is further transformed into edible oil through the refining.

- Oil meals, which are raw materials for stockfeed compounding.

For the sections preceeding the solvent plant, the technology is different, according to the type of seeds.

Cotton seeds are treated in the following steps : cleaning, delinting, decorticating, preparation, pre-pressing, then solvent plant.

Soyabeans are treated in cleaning and cooking sections only. The other parts of the equipment is by-passed.

However, soya beans require a flaker after cooking, but it is a small piece of equipment.

1.5.2.2. Description

The alternatives which have been selected and the reasons for the choices are the following :

a/ Storage

In the existing mills in ZIMBABWE, all oil seeds are delivered and stored in bags.

For this project, we choose to empty the bags and to store the seeds, after cleaning, in a well ventilated warehouse, for cotton seeds and sunflowers.

In ventilated silos, for soyabeans,. Under these conditions, the seeds will be protected against contamination and mold attack. They will also be protected against possible fire due to fermentation.

b/ Delinting

Cotton seeds will be delinted.

Some deliveries have a high linter content, up to 15 %. Delinting will allow to recover the linter and will make the decorticating easier.

c/ Decorticating

Cotton seeds will be decorticated.

The advantage is that meals will be produced with a high protein content.

80 % of the husks will be used as fuel for the steam production in the boiler. The remaining 20 % will be recycled at the pre-pressing section to make it easier.

d/ Oil extraction

The oil extraction from cotton seeds and sunflower seeds will be done through the following procedure :

- Preparation through roller mills.
- Cooking
- Pre-pressing
- Foot seperation and recycling
- Solvent extraction.

This process is the most modern one, already utilized in the existing oil mills in ZIMBABWE. It allows to obtain a low oil content in the meals. The minimum economical size for such a process is 100 MT/day. Consequently, it can be used for this project.

The soya beans will not be pre-pressed, as is the case in some of the existing oil mills in ZIMBABWE. The pre-pressing of soya beans is decreasing the quality of oil and destroys some of the proteins in the meals. For this project, the soya beans are only cooked and then flaked through a roller-mill and oil is directly extracted in the solvent plant.

The cooking of cotton seeds destroys to its maximum the gossypol, which could remain in the meal and which would not be acceptable on the meal market.

e/ Neutralizing

Two variants have been considered.

1. Neutralization in the miscella

In that case, the crude oil dissolved in miscella is mixed with the crude oil from pre-pressing, neutralised and freed of soap in a centrifugal separator. The neutralized miscella is sent to the distillation plant where the hexane is removed from the neutralized oil.

The advantages are : better quality and better colour of the oil, as it is neutralized immediatly, without intermediate oil storage and heating and better yields, as production of soapstocks is reduced.

The drawback is that this relatively new process is not yet well established.

2. Traditional neutralization

With this traditional process, an additional investment of 1.27 million Z$ is required. This case is worked out as a variant with COMFAR.

f/ Bleaching and deodorising

After solvent neutralisation, the cotton seeds oil will be bleached and deodorised, continuously, in the most modern existing equipment. The refining section of this project will be very much advanced compared to the existing plants in ZIMBABWE.

Soya oil and sunflower oil will not be neutralized in miscella, but physically refined through the bleaching and deodorizing plant.

The 2 following charts show the processing flow diagrams respectively or cotton seed and soyabeans.

1.5.2.3. Comments on other alternatives

a/ Direct oil extraction of cotton seeds without delinting and decorticating

The advantage of this process is to reduce the capital investment, and the manufacturing costs, but it produces a meal with less than 31 % profat (proteins + fats) which cannot be sold on the export market and is probably not interesting for the local market. This alternative is therefore rejected.

b/ Direct oil therefore extraction of cotton meat obtained after delinting and decorticating

The meat is directly sent to the solvent plant without pre-pressing. The advantage is a reduction of the capital investment for the screw presses and in the manufacturing costs, but to a lesser extent than the preceding alternative. But the meal obtained will contain less than 38 % profat (proteins + fats) and gossypol content will remain betwen 0,03 % and 0,10 %. This quality will be difficult to sell on the export market and therefore this alternative is also rejected.

TABLE VI - 1.1.

Cotton seeds Process Materials and Quantity Flow Diagram

INPUT : 1000 kg COTTON SEEDS

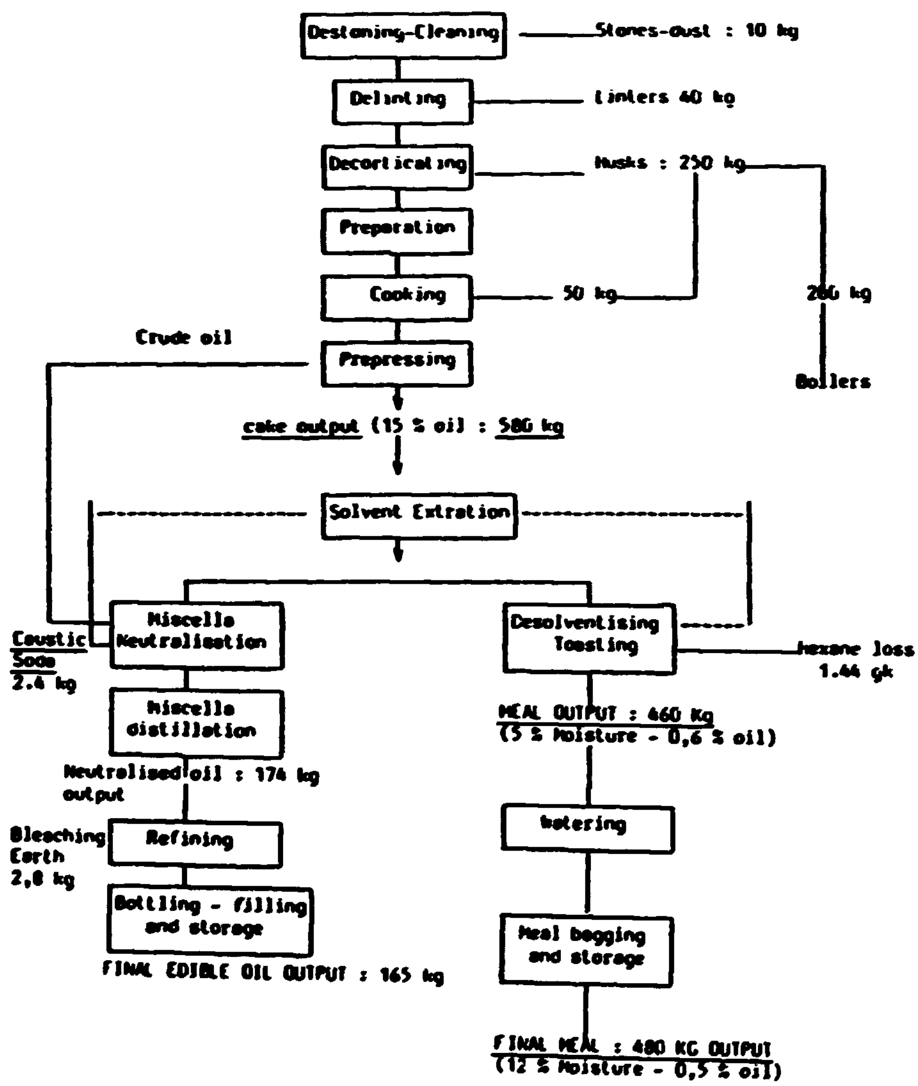
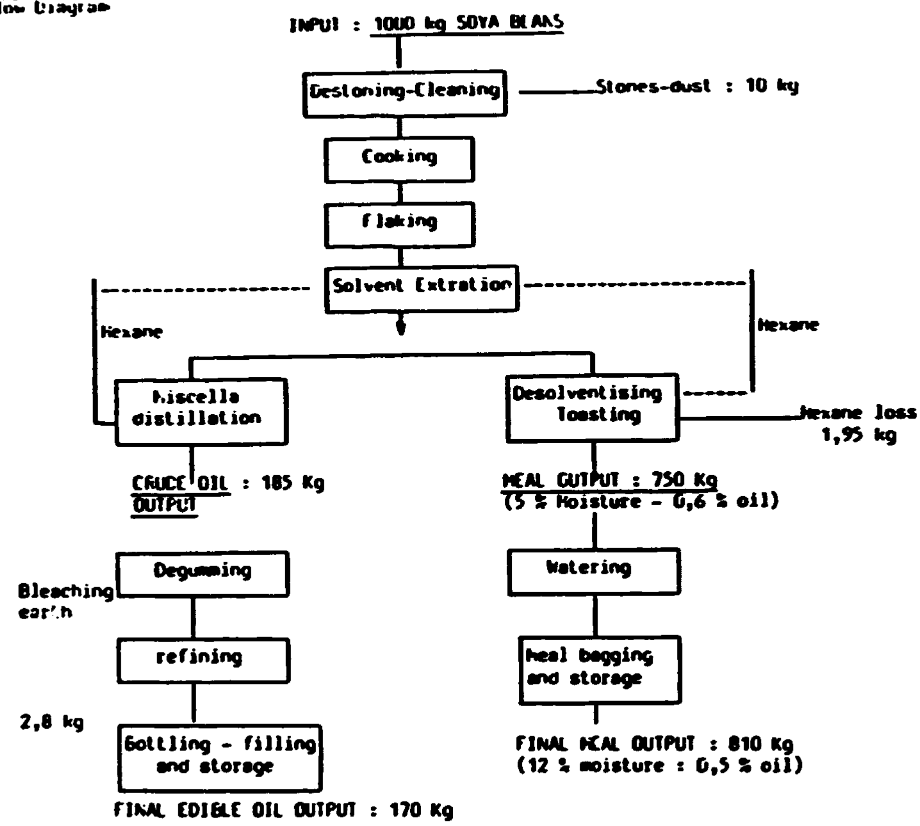


TABLE VI - 1.7

Soya beans Process Materials and Quantity
Flow Diagram



1.5.3. PLANT DESCRIPTION

The plant is described in detail in chapter 6.3 of the main study. We will not repeat this descrition in this General Summary.

1.5.4. GENERAL LAY-OUT

The attached drawing shows the general lay-out for the oil mill.

The attached list gives the breakdown of the various buildings and installations with their surface and area.

The buildings distribution has been contemplated in order to obtain through the process a regular flow of material from the oils seeds receiving to the finished products shipping which are located on the same side of the railway line and main trucks road.

An emergeny area is provided all around of solvent plant according to the safety regulations.

Auxilliary services are installed close to the main Consumers.

With provision for an eventual extension of activity such margarine plant, soap manufacturing, stock feeds ect...it is foreseen a rectangular area of 520 M x 220 M # 120 000 m^2 or 12 hectares.

The land of 32 hectares which has been described in paragraph 4 : location and site, is therefore very confortable and could allow to double the initial capacity of the plant.

1.5.5. SCOPE OF THE PROJECT

Unless otherwise specified, the project includes all civil works, buildings, machinery, equipments inside the factory boundaries (battery limits) and excludes everything being outside these boundaries except staff accomodation.

Some more precisions are necessary for particular fields :

The battery limits are considering that the future oil mill will be installed in the site of KADOMA, located near the industrial area close to a piece of land which has been recently acquired by the Cotton Market Board for its new ginnery.

The limitation factors which we will examine hereafter are the following :

- Boundaries
- Roads
- Railway
- Transport
- water supply : local or boreholes
- Electricity supply
- Combustible
- Waster disposal
- Communications system
- Manpower living conditions.

a/ Boundaries

The fence enclosing the rectangular area of 520 m x 220 m.

b/ Roads

The oil mill is bordered on its west side by the existing owl mine road. All works of improvement or widening this road is not included in the project. Only, the connection with the oil mill entrance is included.

c/ Railway

The railway line feeding the neighbouring ginnery will be extended to the oil mill, however, only the tracks installed inside the property boundaries are included in project engineering.

d/ Transport

The supply of raw materials, chemicals, packaging materials, etc.. and shippping of finished products will be done through local organization, private road transporters as : SWIFT, CLAN etc... or ZIMBABWE National railways.

Only two trucks, capacity 30 MT are foreseen for emergency transports.

e/ Water supply

The water pipe will be connected to the city water main located 1 km from the oil mill. Therefore, a pipe of 3 inches will be foreseen. A water storage of 600 m^3 including a water surpressor is also foreseen. Only the water storage, the surpressor and connection pipe inside the property boundaries are include in the scope of project.

f/ Electricity suppl

The electricity line will be connected to the 30 KV ZESA (Zimbabwe Electricity Supply Authority) main line which will be extended to the ginnery and then to the oil mill. This line will be connected to the oil mill substation. Only the substation and connection line inside the property boundaries are included in the scope of project.

A diesel generator is foreseen in emergency for security reasons in case of ZESA supply shutdown.

g/ Combustible

The oil mill will be normally self sufficient with its husks production from cotton seed decorticating. They will be used to produce the necessary steam. An additional supply of coal could be contemplated in emergency.

Gas-oil will be necessary for the thermo-oil boiler and trucks and diesel generators.

h/ Waste disposal

Wastes are consisting of water which will be thrown to the sewage system. The city sewage system will be extended to the oil mill but only the connection line located inside the property boundaries is included in the scope of project.

i/ Communications systems

The oil mill will need to be equipped with telephone and telex for local and international communications. The scope of project include the connections and telephone/telex equipment installed inside the property boundaries. All connections with the city main lines out of the property are not included.

j/ Manpower and staff

The whole manpower will be self accomodated and transported. Staff housing is included in the scope of the project.

Nota : the infrastructure costs outside the battery limits are considered to be beared by the town and the Government as an encouragement to new investment.

It has to be noted that these infrastructures must anyway be installed for the new ginnery and that the oil plant will from this point of view benefit from the immediate proximity of this ginnery.

1.5.6. CIVIL WORK AND BUILDING DESCRIPTION

See general lay out - drawing N° C 228 -A-001.

The installation includes :

1.5.6.1. Production industrial buildings (total area 9 400 m^2)

- Cotton seeds unloading : 400 m^2
- Soya bean unloading : 200 m^2
- Cotton seed delinting : 1 000 m^2
- Cotton seed decorticating: 600 m^2
- Oil seeds preparation and pre-pressing : 800 m^2
- Solvent plant : 600 m^2
- Oil refining : 600 m^2
- Conditionning : 1 000 m^2
- Meal bagging and storage : 1 800 m^2
- Edible oil and linter storage : 1 200 m^2

The main features of these buildings are : steel structure,floor in reinforced concrete, roofing in asbestos cement or profiled steel sheet, siding profiled steel sheet with lower part brick work or equivalent.

1.5.6.2. General services building (total area 1 500 m^2)

- Boiler and water treatment compressed air : 400 m^2
- General stores : 600 m^2
- Maintenance shop : 200 m^2
- H.V power and Low Voltage substation : 200 m^2
- Diesel and L.V substation : 100 m^2

The main features of these building are similar to the Industrial Building but the building ridge is lower (4 to 10 m).

1.5.6.3. Offices (total area 1 150 m^2)

- Offices : 800 m^2
- Laboratory : 300 m^2
- Watchman house : 50 m^2

Standard features : walls in brick work or masonry, roofing in asbestos cement - height : 2.8 m.

1.5.6.4. Specific building (area : 4 000 m^2)

Cotton seed storage (100 x 40 x 20)

Divided in two bays, steel structure, floor in reinforced concrete with air ventilation (load : 3 T/m^2) siding in profiled steel sheeet wiht lower part brick work, and roofing in asbestos cement or profiled steel sheet.

1.5.6.5. Storage areas (total areas : 3 250 m^2)

- Soya beans storage : 900 m^2
- Husks storage : 1 000 m^2 (side walls 1 m - pit depth : 2 m)
- Cooling towers : 200 m^2
- Crude oil storage : 400 m^2
- Refined oil storage : 300 m^2
- Coal storage : 300 m^2 (side walls 2 m)
- Water storage : 100 m^2 (side walls 1.5 m)
- Weight bridge : 50 (depth 1 m)

construction in reinforced concrete (load from 0,5 to 3 T/m^2.

1.5.7. TECHNICAL INVESTMENT COSTS

All technical costs have been calculated within the economical conditions prevailing in May 1988, with the following exchange rates :

1 US$ = 1.7 Z$
1 Z$ = 3.7 FF

For these technical investment costs, all the figures are expressed in ZIMBABWE dollars in order to facilitate the calculations, but the reference currency remains the French Franc.

The values of the technical investment costs are indicated in the following tables.

Taking into account the other investment costs, such as land preparation, and expressed in round and simplified figures, it is possible to say that the total investment is :

US$ 30 million

of which foreign US$ 20 million

and of which local US$ 10 million.

This excludes pre-production expenditures and working capital (see page 130)

1.5.7.1. Total investment cost (1 000 ZW $)

	FOREIGN	LOCAL	TOTAL
TECHNOLOGY	7 540	564	8 104
EQUIPMENT	23 417	17 647	41 064
TOTAL	30 957	18 211	49 168

Nota : with the traditional neutralization technique, an additional foreign equipment investment of 1 270 kZ$ is required.

1.5.7.2. Schedule - estimate of technology costs

We consider here the costs for design, engineering, technical assistance :

Foreign	7 540
Local	564
TOTAL	8 104

1.5.7.3. Estimate of investment cost : equipment and Civil Works

ITEM DESCRIPTION	COST		
	FOREIGN	LOCAL	TOTAL
PRODUCTION EQUIPMENT	15 513	3 039	18 552
AUXILIARY EQUIPMENT	3 307	1 573	4 880
SERVICE EQUIPMENT	462	188	650
PRIMARY STOCK OF SPARE PARTS, WEAR AND TEAR PARTS, TOOLS	1 613	123	1 736
CIVIL WORKS AND BUILDINGS	-	11 108	11 108
CONTENGENCIES	2 522	1 616	4 138
TOTAL	23 417	16 647	41 064

CHAPTER 6

FACTORY ORGANIZATION AND OVERHEAD COSTS

1. FACTORY ORGANIZATION

The Type of operations and services required to achieve the production objectives of the Factory are the following :

- Management services

- Production process :

  . Seeds storage
  . Seeds preparation and pressing
  . Solvant plant
  . Refining plant
  . Bottling and conditioning plant
  . Laboratory process control
  . Utilities.

- Maintenance services

  . Repair and maintenance of machinery and equipment, buildings, vehicules.

- Commercial services

  . Handling and internal transport
  . Handling and external transport
  . Stores for purchased spare parts, packing material, supplies and equipment.
  . Purchasing of raw material, spare parts and other supplies.

- Financial services

  . Budgeting
  . Planning control and performance evaluation
  . Accountancy
  . Finance .

- Administrative services

  . General administration
  . Social and welfare services
  . Security
  . Wages and salaries
  . Personnel training.

These operations and services correspond to the main lines of the factory organization as indicated in the organization chart.

These operations and services correspond also to cost centers. However, for the purposes of this study detailed costs center accountancy has not been undertaken. They will take place after the start-up of the Factory and the final distribution of cost centers will be adapted to the local requirements and to the preferences of the future management.

2. OVERHEAD COST ESTIMATES

Schedules 7 shows all overhead costs of the Factory, on an annual basis. Total overheads, on a financial cost basis, for a typical steady state year are Z$ 587 000 devided as follows :

2.1. MAINTENANCE OF BUILDINGS AND CIVIL WORKS

Maintenance of buildings and civil works has been calculated for at an annual rate of 0.70 % of the "at site" value of the fixed assets (from SCHEDULE 6.7 : Project Engineering). An allowance of Z$ 52 000 has been made.

2.2. INSURANCE

An annual insurance charge of Z$ 360 000 has been assessed. This is equivalent to a rate of 1.25 % of the "at site" value of the initial fixed assets (buildings, civil works, plant and equipment).

2.3. COMMUNICATION

An annual overhead allowance of Z$ 50 000 has been made for telex and telephon charges.

2.4. TRAVEL

Annual allowance of Z$ 40 000 has been made ; this covers all travel not provided for by the factory car pool.

2.5. EFFLUENT DISPOSAL

No annual allowance has been made, the factory does not generate exceptional pollution.

2.6. PROTECTIVE CLOTHING

An annual allowance of Z$ 35.000 has been made, at an average allowance of Z$ 100 per employee.

2.7. OFFICE SUPPLIES

Offices supplies have been estimated at Z$ 50.000 per year;

2.8. HOUSING

No annual allowance is foreseen for housing. The housing will only be supplied to the managerial staff and its cost is included in Chapter VI, project engineering.

SCHEDULE 7 : OVERHEAD COST ESTIMATES

ZIM $'000, June 1988 Prices

Insert total in Schedule 10.2

ESTIMATE OF PRODUCTION COST		
No.	ITEM DESCRIPTION	COST '000 Z$ TOTAL
1.	Maintenance, buildings and civil works	52
2.	Insurance	360
3.	Communication	50
4.	Travel	40
5.	Effluent disposal	-
6.	Protective clothing	35
7.	Office supplies	50
8.	Housing allowances	-
TOTAL		587

1.7. MANPOWER

1.7.1. FACTORY ORGANIZATION

1.7.1.1. ORGANIZATION CHART

Under the authority of the General Manager, with the assistance of a Deputy General Manager, the organization chart includes the following departments :

- Technical (seeds storage, production, maintenance and utilities)
- Laboratory and quality control
- Security (fire brigade, general safety, watchman)
- Commercial (purchasing, general store, marketing, depots and transports)
- Financial (accountants, computers, cashier)
- Administration (general, personnel, social welfare, training)

1.7.1.2 Manpower requirements

a/ Labour

Production at full capacity

- Full capacity

Raw materials : 88 000 t/y of seeds

Production : 15 800 t/y of edible oil and 48 960 t/y of meals.

- Working in continuous, 24 hours per day, 7 days a week, 320 days per year (45 days are used for maintenance, holidays, cleaning, shutdowns, etc..).

- Shifts organization

  The total number of workers is : 351

  The number and assignment of the personnel are defined in the following schedule 8.2.9.

b/ Staff

The staff requirements are detailed on following schedule 8.3.

It includes the top ten men (Managers, Engineers, etc..) in the organization chart. They shall have a University degree and a good experience in industry in general, and oil seeds milling and edible oils in particular.

We also included the 2 secretaries in the staff. Therefore this staff represents 12 persons.

Consequently, the total personnel of the plant will be : 363 persons.

SCHEDULE 8.2.9. - MANNING TABLE - LABOUR SUMMARY

DEPARTMENT	WAGES CATEGORIES (no of workers)								
	Skilled D4	Skilled D3	Skilled D1	Semi-skilled C4	Semi-skilled C3	Semi-skilled C1	Unskilled B4	Unskilled B1	TOTAL
- Seeds receiving and storage			2		15			20	37
- Production		4	13			67		67	151
- Maintenance and utilities	2	5	8			14		7	36
- Laboratory	1		4			5		1	11
- Commercial	3		1	5		25	4	14	52
- Finance and Administration		3	3	11	1	12	8	4	42
- Security		1	1	12			8		22
TOTAL	6	13	32	28	16	123	20	113	351

SCHEDULE 8.3. - MANNING TABLE - STAFF

FUNCTION	SALARIES CATEGORIES (N° of staff)								
	E7	E6	E5	E4	E3	E2	E1	Secretaries C3	TOTAL
- General Manager	1								1
- Deputy General Manager		1							1
- Technical Manager			1						1
- Commercial Manager				1					1
- Financial Manager		1							1
- Administration Manager					1				1
- Head Production						1			1
-Head Maintenance/utilities						1			1
- Head Laboratory							1		1
- Head seeds receiving/ storage							1		1
- Secretaries								2	2
TOTAL	1	2	1	1	1	1	2	2	12

1.7.1.3. Salaries structure

For this study, we used the Salary Structure Schedule of the Cotton Marketing Board referenced : 3rd December 1987 which is summarized in the following Table :

GRADES	EXAMPLES OF FUNCTIONS
E	- General Manager - Deputy General Manager - Head of Department
D	- Head of Sections - Shift leaders - Supervisors - Foremen
C	- Process operators - Maintenance Operators - Accountants - Secretaries
B	- Typists - Assistants - Labour

The details are given in the main study - Chapter 8 - Schedules 8.4.1 to 8.4.4.

A summary is given in the following table :

Z$/year

GRADE	E 4	D 2	C 3	B 4
Annual basic salary	45 000	23 000	15 000	10 000
Holidays, pensions, Medical aid, ect...	9 688	5 545	4 038	2 994
TOTAL ANNUAL COST	54 688	28 545	19 038	12 994

1.7.2. COSTS ESTIMATES

1.7.2.1. Costs estimates at full activity (from year 4)

a/ Production costs-wages

For the labour (351 persons), the production costs - are estimated as follows :

. Variable : Z$ 2 818 400
. Fixed : Z$ 2 455 434

TOTAL .... Z$ 5 273 834

See schedules 8.5.1 and 8.5.2. in the main study.

b/ Production costs - salaries

For the staff (12 persons), the annual production costs salaries are estimated at : Z$ 561 192,84.

See schedule 8.6 of the main study.

c/ Total wages and salaries (total annual costs)

Wages :	Z$ 5 273 834
Salaries :	Z$ 561 193
TOTAL.............	Z$ 5 835 027

1.7.2.2. First years of production

Of course, these costs are lower at the beginning of the production, as indicated in the following table (Z$).

Year 1	Year 2	Year 3	From Year 4
5 019 832	5 019 832	5 835 027	5 835 027

1.7.2.3 Pre-production phase

During the pre-production phase, some technical personnel and staff will be necesary in order :

a/ to be informed on the new plant

b/ to be trained on the technology which will be used

c/ to participate and follow the erection works and planning

d/ to participate to the commissioning.

The costs estimates during this phase are :

	Year 1	Year 0
From the beginning of project	1 047 146	1 047 146
Before start-up	-	993 171
TOTAL......................	1 047 146	2 040 317

1.7.2.4 Training of the personnel

a/ Training abroad

The training will be carried out abroad in similar oil mills, crushing oil seeds and producing edible oils and meals.

The objective is to enable personnel in training to acquire theoritical and pratical knowledge of the type of operations necessary to perform the corresponding job.

We estimate the quantity at 27 man.months.

b/ Training on site

Training on site will be carried out during the final erection, pre-commissionning, start-up and commissionning of the plant until the take over by the Investor.

The objective is to let the personnel in training acquire direct experience of their plant and equipments and acquire or complete their theoritical knowledge in :

- Theoritical course
- Practical course on site.

The costs for the training of the personnel are considered as included in the preceding expenses during the pre-production period.

1.7.2.5. EXPATRIATE PERSONNEL FOR TRAINING, PLANT START UP AND TECHNICAL ASSISTANCE

a/ Start up of the plant

We consider that during a period of 3 months, the following personnel will be necessary :

Participation of the site manager previously in charge of the erection coordination :

2 Process Engineers
1 Mechanical Engineer
1 Electrical Engineer
1 Instrument Engineer
TOTAL : 18 man.months.

b/ Training and Technical Assistance

We consider that the following personnel will be necessary :

1 Process Engineer, coordinator of formation	: 6 months
1 Poduction Manager	: 12 months
1 Mechnical Engineer	: 12 months
1 Electrical Engineer	: 6 months
1 instrument Engineer	: 6 months

TOTAL : 42 man.months.
GENERAL TOTAL : 60 man.months.

The corresponding costs are included under the heading "TECHNOLOGY" of the chapter "PROJECT ENGINEERING".

1.7.3. MANPOWER : SUMMARY

The cost estimates for the manpower section during the life of the project are as follows :

1.7.3.1. Pre-production period

Year	:	Z$	1 047 146
Year	:	Z$	2 040 317

1.7.3.2. First years of production

Year	:	Z$	5 019 832
Year	:	Z$	5 019 832
Year	:	Z$	5 835 027

1.7.3.3. Full activity

From Year 6 : Z$ 5 835 027.

1.8. IMPLEMENTATION SCHEDULING

The implementation activities will proceed in stages, in line with the progress of the project.

1.8.1 PREPARATORY STAGE

Activities during this stage mainly include :

- A decision on the ownership and control of the new investment :

  . AMA/CMB solo or
  . Joint venture with Industrial Development Corporation (I.D.C) or
  . Joint partnership with a functioning company or
  . Any other option to be chosen by the Government.

- A decision on project financing, both foreign and local currency.
- A decision on the capacity of the new plant.
- A decision on site selection and purchase of land.
- A decision on the type of contracts required on a basis of work division between owner and contractor with two extremes :

  . Turnkey contract
  . Reimbursable contrac..

1.8.2. PROJECT EXECUTION

Project execution consists of the main following functions and stages :
Direction coordination and control of the Project :

- Engineering

  . Process engineering
  . Basic engineering
  . Detailed engineering.

- Procurement

  . Material and equipment specifications
  . Appointment of suppliers and subcontractors
  . Inspection of equipments and materials
  . Follow up of the contracts
  . Reception - Transportation of materials and equipments.

- Construction

  . Land preparation
  . Civil works
  . Equipment
  . Electrical and utilities works.

- Commissionning

  .Mechanical acceptance
  . Garantee test runs
  . Commissionning up to full operating conditions.

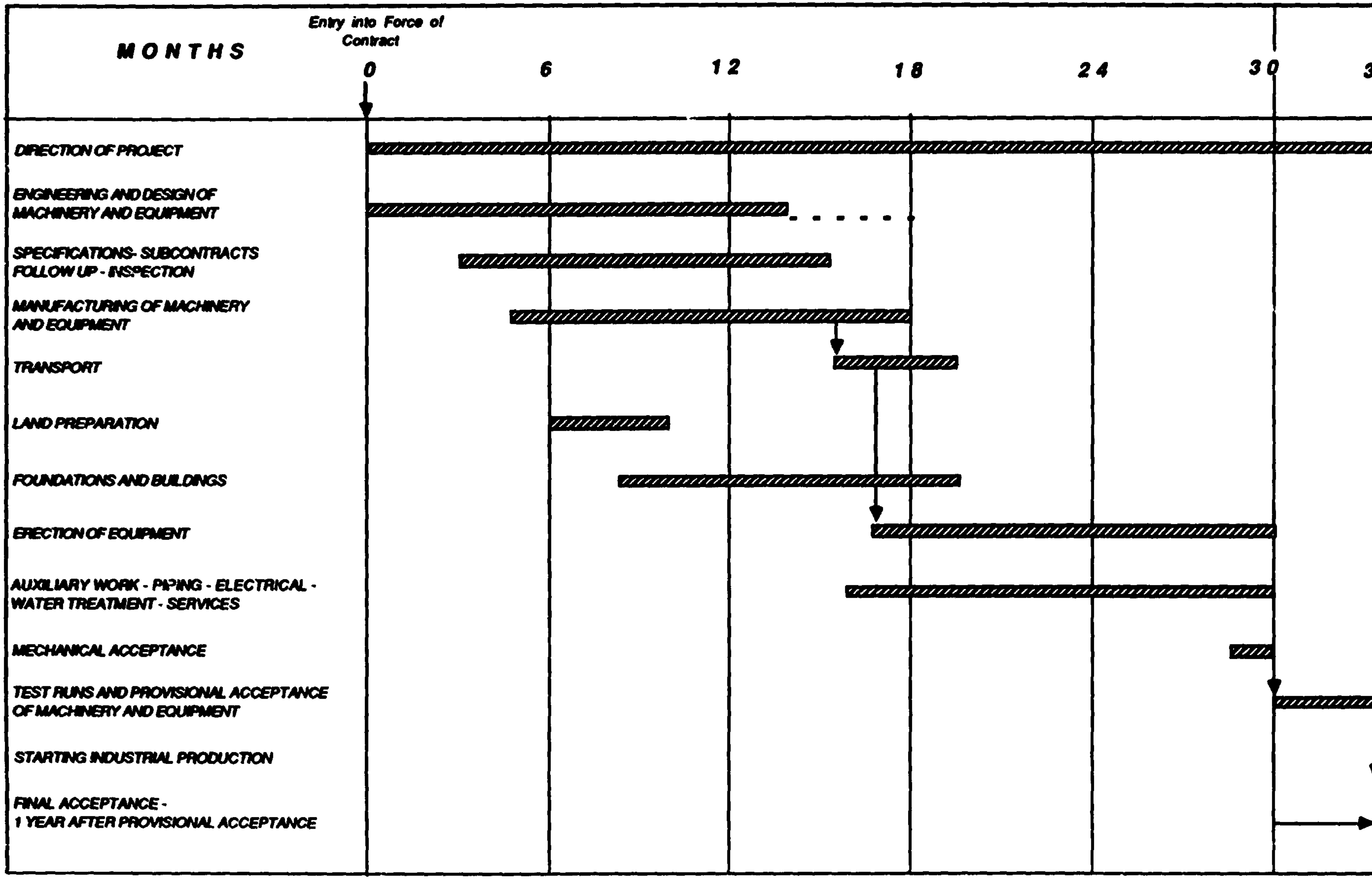
- Assistance in operation and training

After the entry into force of the contract with the contractor, we consider that the project could be complemented within a period of 33 months.

Period between the entry into force date of the contract and the beginning of Industrial operation.

The main stages of the project execution are indicated in the attached schedule.

EDIBLE OIL PLANT - PROJECT EXECUTION -



1.9. FINANCIAL AND ECONOMIC EVALUATION

This Chapter puts together the data contained in the preceding chapters in order to arrive at a financial and economic evaluation of the project. Other data are also introduced for the calculation of working capital requirements and corporate income tax. The chapter is divided in three parts, viz Basic Data, Financial Analysis, and Economic Cost-Benefit Analysis. The first part presents the basic data assembled in a systematic way under the headings : investment costs, production costs, and sales ; it then provides input data for working capital requirements, financing requirements and corporate income tax. The second part provides production costs and working capital estimates and the main project schedules which are the cash flow table, net income statement and balance sheet. Third part assesses the impact of the project on the foreign exchange balance, employment and income, rural development and public finances.

USE OF COMFAR

In the present study, we used the UNIDO's computer Model for feasibility analysis and reporting - COMFAR.

The financial results appear on 9 Comfar schedules as indicated below.

1 Summary Sheet
2 Total Initial Investment
3 Investment during production
4 Total production costs
5 Working capital required
6 Source of finance
7 Cashflow tables
8 Net income statement
9 Balance sheet.

The following documents are attached to this Chapter :

1/ For the 330 t/day plant, which was described in detail in this study as the BASE CASE, we give the complete set of Comfar schedules.

2/ For the sensivity analysis on sales prices, costs prices, inflation, etc..

We give the summary sheets, which show the IRR.

3/ For the scenario II (plant of 165 t/d) we give also the summary sheet.

Nota : The related case is indicated in each schedule. Ex : "BASE CASE" or "plus 10 % on sales prices".

1.9.1. BASIC DATA (FOR EVALUATION)

The basic data which follow, relate to be base case. Other alternatives such a two smaller plants have been eliminated at an early stage as being obviously less economic than the option retained.

1.9.1.1. Investment

1.9.1.1.1. Initial investment

Initial technical investment includes civil engineering and buildings, equipment with spare parts, installation, and engineering design with technical assistance ant training, totalling Z$ 49 168 000, distributed as follows (from Chapter VI) :

	000 Z$
Design, technical assistance, training..............	8 104
Equipment, including spare parts, transportation and Installation	28 845
Civil engineering and buildings.....................	12 219
TOTAL technical investment..........................	49 168

of which imported equipment.....	30 957
of which local expenses.........	18 211

For imported equipment, estimates were obtained in French Francs (FF) and converted into Z$ at the rate of 1 Z$ = 3.7 FF.

In addition to this technical investment, there is also land (Z$ 50 000) and site preparation (Z$ 2 150 000) and housing for management staff (Z$ 400,000), which are entirely local expenses.

Total initial investment will thus amount to Z$ 51 768 000 divided between :

Technical investment	49 168
Land and site preparation.........................	2 200
Housing...	400
TOTAL.................................: 000's Z$	51 768

TABLE 10.1

TECHNICAL INVESTMENT

000's Z$	TOTAL	YEAR 1	YEAR 2	YEAR 3
Design, technical assistance, training of which :	8,104	3,080	3,224	1,800
- Foreign	7,540	3,040	3,000	1,500
- Local	564	40	224	300
Equipment incl. spare parts and transportation of which :	24,512	2,452	22,066	
- Foreign	22,634	2,264	20,370	
- Local	1,878	188	1,690	
Installation of which :	4,333	-	4,333	
- Foreign	773	-	773	
- Local	3,560	-	3,560	
Civil engineering and buildings	12,219	6,110	6,109	
of which :	-			
- Foreign		-	-	
- Local	12,219	6,110	6,109	
Total : Technical investment of which :	49,168	11,642	35,726	1,800
- Foreign	30,957	5,304	24,143	1,500
- Local	18,211	6,338	11,583	300

1.9.1.1.2. Renewals and residual values

The equipment of this plant, excluding plant and road vehicles, normally has a technicel life over 15 years. Since for study purposes the project production period is limited to 15 years, no renewal of major investment will have to be considered, except for :

	000's Z$
- Several plant vehicles	339
- Two trailer trucks................................	331
- Two light truks...................................	46
- Three passenger cars..............................	122
TOTAL...	838

These vehicles will be serviceable for about 5 years and will have therefore to be replaced in the 6th year of production and again in the 11th year.

Residual values are difficult to assess and are not of much significance in this context. To simplify the case, no residual value was considered.

1.9.1.1.3. Depreciation of assets

Allowable depreciation is defined by the local tax code which in ZIMBABWE allows :

- 5 % /year for buildings
- 10 %/year for equipment
- 10 %/year for incorporate assets
- 20 %/year for road vehicles.

The depreciation to be considered for tax purposes is therefore as follows during the first ten years : Z$ 4 891 000.

After the first ten years, the depreciation schedule is reduced to Z$ 906,000. The depreciation of road vehicles is continuing over the whole life of the project because they are being renewed very five years.

1.9.1.1.4. Pre-production expenditures

They are incurred for activities preparatory to production : hiring and training of management staff and workers, test runs and start-up expenses. They have been estimated to amount to Z$ 1,047,000 in year 1 and 2,040,000 in year 2 (Chapter VIII).

1.9.1.2. Operating expenditures

Production Costs are made of Raw Materials (from CHAPTER IV), Utilities, Chemicals and Various Materials Inputs (from Chapter VI), Packaging Materials (from Chapter III), Overheads (from Chapter VII) and Manpower (from Chapter VIII).

Other operating expenditures associated to production activities are transportation of packaged oil to wholesalers, warehouses and main depot stations (from Chapter III) and some local taxes (from Chapter V).

All operating expenditures are shown on the following table (10.2). The Table also separates expenditures in local currency from imports. It can be seen that imported supplies account for only about 4 % of total operating expenditures.

TABLE 10.2
OPERATING EXPENDITURES

In 000's Z$

PRODUCTION PROGRAMME	30 %	60 %	90 %	100 %
RAW MATERIALS (local) (Chap IV)	7,630	15,259	22,889	25,432
- Cotton seed				(11,032)
- Soya bean				(10,752)
- Sunflower seed				(3,648)
UTILITIES (local) (Chap VI)	646	774	917	968
CHEMICALS (Chap VI)	440	880	1,320	1,467
- Foreign	(344)	(689)	(1,033)	(1,148)
- Local	(96)	(191)	(287)	(319)
PACKAGING MATERIALS (local) (Chap III)	3,490	6,980	10,471	11,634
OTHER MATERIAL INPUTS (Chap VI)	483	579	965	965
- Foreign	(427)	(513)	(855)	(855)
- Local	(56)	(66)	(110)	(110)
OVERHEADS (local) (Chap VII)	294	352	587	587
MANPOWER (local) (Chap VIII)	5,020	5,020	5,835	5,835
TRANSPORTATION (Chap III) (local)	213	427	640	711
TAXES (Chap V)	7	7	7	7
TOTAL	18,223	30,278	43,631	47,606
- Foreign	771	1,202	1,888	2,003
- Local	17,752	29,076	41,743	45,603
- Variable				41,507
- Fixed (a)				6,099

a/ Utilities 487 + Overheads 587 + taxes 7 + 86 % Manpower 5,018 = 6,099.

RECAPITULATION OF SALES FROM YEAR 1

TABLE 10.3

	YEAR 1 30 %	YEAR 2 60 %	YEAR 3 90 %	YEAR 4 FOLLOWING 100 %
REFINED OIL	13 823 003	27 646 005	41 469 008	46 076 675
MEALS	4 437 936	8 875 872	13 313 808	14 793 120
LINTERS	134 400	268 800	403 200	448 000
TOTAL	18 395 339	36 790 677	55 186 016	61 317 795

There is a small difference with the COMFAR calculation which arrives for total sales at 61 328 480.

For the further calculations we will take 61.329 million Z$.

1.9.1.3. Sales

The finished products for sale are packaged oils (blended or sunflower, for details see Chapter III), meals (from cotton seeds, sunflower seeds and soya beans), and cotton linters. Practically all the products are for local consumption except for about 40 % of the meals which are expected to find an outlet in export to the region.

Table 10.3 shows the values of expected sales from the first year of production when the plant will be operating at 30 % capacity to the fourth year of production when the plant will operate at full capacity (as defined in Chapter VI). Full capacity operation will thereafter be maintained for the next eleven years to complete the 15-year production span contemplated.

The figures in the table actually indicate the value of production at selling prices, which value differs form actual sales in the first years of operation by the increases in inventories of finished products, and in turn actual sales differ from actual receipts by the increases in accounts receivable (see next section on working capital).

1.9.1.4. Working capital requirements

For the proposed operation the components of working capital and the corresponding days of coverage are the following :

1/ Inventories of :

Raw materials (local)	1 month
Chemicals (imported)	3 months
Packaging materials (local)	1 month
Finished products •	1 month.

2/ Work in progress (10 days or 1/.. month mainly)

Work-in-progress is mainly accounted for by the intermediate stock of crude oil.

3/ Cash in and : 1 month

(one month of operating expenditures minus raw materials, chemicals and packaging materials).

4/ Accounts payable : 1 month

(one month of raw materials, chemicals, utilities and packaging materials).

5/ Accounts receivable

(one month of sales).

1.9.1.5. PROJECT FINANCING

Financing requirement are usually estimated by adding fixed investment expenditures with pre-production expenditures and working capital :

	000's Z$	000's US$ (1.7)
Fixed investment expenditures	51,768	30,452
Pre-production expenditures	3,087	1,816
Working capital (first year)	3,884	2,285
TOTAL................................	58,739	34,553

In addition, there will be financial costs due to interest payments on the loans.

For this project, a foreign-exchange loan is contemplated for an amount of US $ 20 million (i.e Z$ 34 million), which will be sufficient to cover the initial foreign exchange costs of the project. In these conditions, the amount of equity necessary for the project would be slightly over Z$ 24 million. This equity could be smaller if some loan financing is available locally in Z$.

Foreign financing

The Foreign exchange loan actually comprises :

- A treasury loan of US $ 10 million, bearing a 2.5 % rate of interest, with a 20 year duration, and a repayment grace period of 10 years, and

- A supplier credit also of US $ 10 million, bearing a 8 % rate of interest, with a 10 year duration and repayments beginning after commissioning.

This loan, which is in foreign exchange, will be applied to the foreign exchange share of fixed investment expenditures and to the initial financial costs in foreign exchange.

Comfar Schedule 6 shows the inflows and outflows related to this foreign loan. The amount of the treasury loan still outstanding at the end of the project is assumed to be repaid in the liquidation year 18.

1.9.1.6. Corporate income tax

According to the information received, the corporate income tax is levied at the rate of 50 % of taxable income which in turn is obtained after deduction of allowable depreciation and interest payments from operating income. It is assumed that this project which interests a parastatal organization, will be granted a 7-year tax holiday in order to make it attractive for private capital equity investment.

1.9.2. FINANCIAL ANALYSIS

1.9.2.1. Total production costs

Total production costs are obtained by adding together operating expenditures, depreciation and financial costs. The total production costs per unit have a tendency to decrease over time because of diminishing financial costs and lower depreciation after the first ten years of operation. This is shown on Comfar Schedule 4 which follows.

The division of production costs between fixed and variable is the basis for the calculation of the break-even point...

Break-even point

The break-even point indicates the risk associated with a possible reduction in the production and sales of the project. It is calculated by relating fixed costs to the difference between sales receipts and variable costs.

Here, the figures are the following :

Fixed costs	000's Z$
Depreciation (section 10.1.1.3)	4,891
Fixed operating expenditures (Table 10.2)	6,099
TOTAL	10,990

Variable costs

Variable operating expenditures (Table 10.2)	41,507
Sales receipts (Table 10.3)	61,329

The break-even point (BEPT) is therefore :
10,990 : (61,329 - 41,507) = 0,56, i.e : 56 %.

This means that the project would be able to turn out a profit as long as the rate of operation (at unchanged prices) does not fall below 56 % of the normal production programme. This rate is also called the profitability threshold.

It is interesting to consider also the liquidity threshold or cash break-even point which takes into account only curent expenditures :

6,099 : (61,329 - 41,507) = 0.31, I.e : 31 %.

The project would remain liquid as long as the rate of operation does not dip beyond 31 % of the expected level.

If financial obligations are included, the situation changes over the years. Considering year 6 (4th production year) in which operation is expected to reach its normal level, financial expenditures for debt servicing would be 2,902 thousand Z$, so that the profitability threshold would be :

$$\frac{13{,}892}{(61{,}329 - 41{,}507)} = 0.70 \text{ i.e. } 70\ \%$$

and the liquidity threshold :

$$\frac{9{,}001}{(61{,}329 - 41{,}507} = 0.46 \text{ i.e } 46\ \%$$

Altogether, the project shows a rather favourable break-even point indicating that risk is rather low from that angle.

1.9.2.2. Net working capital

Net working capital was estimated on the basis of the requirements outlined above. The total net working capital needed amounts to nearly Z$ 10.4 million and it therefore a significant element in the financial aspects of this project. The increases in working capital are :

	000's Z$
Year 1991	3 884
Year 1992	2 684
Year 1993	2 938
Year 1994	886

There is no need to increase working capital beyond year 1994 because the plant continues to operate at the same level.

1.9.2.3. Casflow tables (comfar schedules 7)

The cashflow tables show the total inflows and outflows yearly and the subdivisions thereof. The resulting net annual cashflow is negative for the first three years of the project, i.e inclusive of the fist year of production. The cumulated cash balance dips to a low at the end of 1991, but remains constantly positive. The internal rate of return on total investment (IRR) is about 12 %, indicating a moderate profitability. This figure relates to the base case.

Sensitivity analysis was carried out for various changes as described in the following paragraph 1.9.5.

1.9.2.4. Net income statement (comfar schedule 8)

The net income statement shows that the project can generate a substantial operational margin and/or gross profit. Gross profit stands at about 12 % of sales, increasing to 20 % in the later years because both depreciation and financial costs are then appreciably lower.

After the first seven years of operation, net profit suffers from the 50 % tax. However, annual net profit represents about 25 % of equity (ROE), which is quite good.

1.9.2.5. Projected balance sheets (comfar schedule 9)

The projected balance sheets have been computed on the assumption that all profits will be retained in the project. That assumption could be modified without changing the overall picture. The tables show that equity represents a diminishing share of liabitilies, from 71 % in 1989 to a healthy 22 % at the end of the project in 2005.

1.9.3. ECONOMIC COST-BENEFIT ANALYSIS

1.9.3.1. Impact of the project

The impact of the project on the national economy will be felt on (i) foreign exchange, and (ii) employment and income.

1.9.3.1.1. Foreign exchange

The project will use foreign exchange for part of the investment and operating expenditures, and for making interest payments on foreign debt. On the other hand, the project will earn some foreign exchange through the export of meals.

(All values in 000's Z$ equivalent)

Foreign exchange in investment :

Year 1	5,304
Year 2	24,153
Year 3	1,500
TOTAL	30,957
Plus renewals :	
Year 8	838
Year 13	838
GRAND TOTAL	32,633

Foreign exchange during operation :

	Chemicals	Other inputs	Total
Year 3	344	427	771
Year 4	689	513	1,202
Year 5	1.033	855	1,888
Year 6 (until 17)	1.148	855	2,003

Foreign exchange earned through meal exports (40 % of meal production) is in a current year of production : Z$ 6 654 400.

Adding up all costs of finance, repayments and operating expenditures in foreign exchange, on comes to a total of 69 350 000 Z$, compared to foreign exchange receipts of 90 617 000 Z$. The surplus in foreign exchange is threfore approximatively Z$ 21 000 000.

Moreover, in order to obtain a more complete picture of the effects of the project on the foreign exchange balance of the country, one should add :

- On the debit side : the foreign exchange (or import) content of all purchases in local currency.

- On the credit side : the import substitution achieved by making available to the national consumers edible oils which otherwise would have to be imported. On the debit side again : the interest payments on the foreign loan.

Though precise figures cannot be given because of lack of information on import contents, it can be safely advanced that the credit side would become much more important than the debit side. For example, the import content in the value of seeds (which are the main inputs) is small in percentage. The project, therefore, will be a net saver of foreign exchange.

1.9.3.1.2. <u>Employment and income</u>

The project will employ 363 people (Staff : 12 - Workers : 351) and will distribute about 5.[illegible] million Z$ annually in wages and salaries, including deferred pension benefits.

Direct value added, created by the project, will vary slightly from year to year ; in year 8 of production, it will be :

	000's Z$
Benefits distributed to manpower	5,835
Dividend and taxes	3,766
TOTAL : value added..................	9,601

Direct value added, therefore, will be quite large, but this is only part of the picture because the project will also create indirect val added upstream through its inputs.

The indirect effect will be felt most strongly in the agricultural sector where the increased production of seeds will be made possible because of the new outlet created by the project. The increase in agricultural production will improve the welfare of the rural communi of ZIMBABWE, and thus contribute to fulfilling one of the main objectives of the government.

The effect on public finances will be quite substantial. Even if a ta holiday is granted for the first seven years of production (corresponding to the pay-back period of equity after loan financing) the cumulative receipts of the government over the next 8 years will reach 42 million Z$, i.e in the average about 5.25 million Z$ annually. The government will greatly benefit from the project.

1.9.3.2. Financial profitability

In the absence of information on the tax content of inputs and the real value of foreign exchange, it is not possible to make a realistic calculation of the economic rate of return of the project. However, it is possible to arrive at some conclusion.

The tax content on the main raw materials (seeds) will be small, but somewhat more important on packaging materials. Whatever the exact size of the tax content, its elimination for cost benefit analysis will tend to make the project better from the national economic standpoint.

Concerning the exchange value of the Z$, it is periodically calculated by the Reserve Bank of ZIMBABWE by reference to a basket of currencies of the country's main trading partners. In spite of quantitative restrictions on imports, the mission team in May 1988 found no evidence of a parallel market for foreign exchange. This in an indication that the official rate of exchange at that time was not far away form the true value of foreign exchange.

All this means that the economic rate of return is probably not much different form the financial rate. The net result is that the project appears quite good from the national point of view and that it should be therefore recommended for implementation.

1.9.4. ALTERNATIVES

1.9.4.1. Scenario 2

In this scenario, we consider a plant with half capacity i.e :

165 t/d in cotton seeds
125 t/d in soya bean.

Detailed calculation are made with the COMFAR.

Following Comfar schedule 7 (cashflow tables) shows the main values for Financial Ressources, total assets, sales, operating costs etc.. and IRR.

It appears that this scenario has to major drawbacks :

1/ The IRR on total Investment is low (3.2 %).

2/ The capacity is not sufficient to follow the increase of the Agricultural production (see the graph in paragraph 1.2 above).

Therefore, we will not recommend it.

1.9.5. SENSITIVITY ANALYSIS

1.9.5.1. Sales prices of oil

a/ Local price

In the market study, chapter 3.2, we made calculations to determine the prices ex works of edible oils in ZIMBABWE.

We found the following figures :

- Blended oil : Z$/l 1.54 or US$/t 1 006
- Sunflower oil : Z$/l 1.82 or US$/t 1 189
  (1 l = 0.9 kg - 1 US$ = 1.7 Z$).

b/ Import parity prices

With the assumption that local blended oil is comparable to international soya bean oil, we also calculated the import parity prices of soya bean oil in 1984/85 and 1986/87.

More generally, the calculation of the import parity price is the following : (US $/t).

Oil price, ex tank Rotterdam	RP (Rotterdam Price)
Sea freight Rotterdam Durban	45
Port charges	25
Rail Road transport to Harare	90
TOTAL	RP + 160
Import duty 20 %) Surtax 20 %) 44 %	1.44 RP + 230
Other costs :	40

Import parity price IPP = 1.44 RP + 270

or RP = 0.694 IPP - 188

For the present prices in ZIMBABWE, the corresponding values in ROTTERDAM are (US$/t) :

	ZIMBABWE			ROTTERDAM		
Blended oil	IPP	=	1 006	RP	=	511
Sunflower oil	IPP	=	1 189	RP	=	637

c/ International prices

The prices of oil, ex tank Rotterdam, in US $/t, are the followings:

October/September	Soya bean Oil	Sunflower Oil
1983/83	463	
1983/84	722	
1984/85	625	632
1985/86	377	406
1986/87	324	325
July 88	600	622
Sept 88	485	515

After the drop between 1984 and 1987, the international prices are now increasing very sharply.

The international prices (taking into account the calculation of import parity prices) were recently higher than the local prices in ZIMBABWE.

If we also consider that the local demand is much higher than the present production, we can study the hypothese of an increase of say, 10 % of the sales prices of oil.

1.9.5.2. Sales prices of meals

For the meals, we have to consider the export point of view.

We can directly compare the local prices and the international prices, making the assumption that the main export market is the RSA and that the sea freight Rotterdam Durban is comparable to the rail road transport costs from ZIMBABWE to RSA.

Local and international prices are the following :

a/ Local prices

YEAR	COTTON MEAL		SOYA MEAL	
	Z$/t	US$/t	Z$/t	US$/t
1983/84	152	90	185	109
1984/85	291	171	328	194
1985/86	291	171	328	194
1986/87	291	171	328	194
1987/88	251	148	330	194

Nota :

- Sunflower seed meal prices are similar to cotton seed meal prices.
- Groundnut meal prices are similar to soya bean meal prices.

The meal prices were tremendously increased in October 1983. As this resulted in a drop of domestic offtake, the Governement recently reduced the price of cotton seed meal from 291 to 251 Z$ per ton.

b/ International prices

(Source oil world) US $/t.

	82/83	83/84	84/85	85/86	86/87	15/4/88	15/9/88
Cotton seed meal CIF ROTTERDAM	172	174	99	115	134	157	165
Soya bean meal CIF ROTTERDAM	224	221	155	183	189	240	309

Because of the draught in the United States, the price of soya meal increased sharply in the recent period.

The comparison between the figures of paragraphs a/ and b/ shows that the local prices of cotton meal, up to the recent reduction, were higher than those of the international market.

The local prices of soya meal were comparable.

Taking into account the recent increase of meal prices, we can also study the hypothese of an increase of say, 10 %, of the sales prices of meal on the local market.

A sensitivity analysis was therefore carried out, with the Comfar, for a 10 % increase in local selling prices both of oils and meals : the IRR jumps to 18.3 %, indicating a marked sensitivity of the project to a change in the prices of its output.

See the Comfar schedule for this variant.

1.9.5.3. Sales prices of seeds

a/ Local prices

The present oil seeds prices in ZIMBABWE are the following :

	Z$/t	US $/t (1.7)
Cotton seed	195	115
Soya bean	448	264
Sunflower	456	268
Groundnut	847	498

b/ International prices US $/t Cif Rotterdam

	Soya beans	Sunflower
1983/84	301	
1984/85	233	290
1985/86	211	214
1986/87	208	205
Sept 88	346	365

Source OIL WORLD.

Although cotton seed oil represents an important part of world oil consumption, the international exchanges are low.

Generally, cotton seed is used close to the production areas, because of the high relative cost of transportation, and the local prices vary considerably according to the countries.

In 1985/86, SWAZILAND exported 6 650 t of cotton seed to the RSA for E 1 642 000, i.e approxilmately 100 US$/t.

A recent study made by SOFRECO in SENEGAL shown local prices of 26.6 FCFA/kg ex ginnery or

532 FF/t or $\frac{532}{6.3}$ = 85 US$/t

An average estimate of 100 US$/t could be chosen.

To summarize, considering the oil seeds breakdown for the new project and taking into account the local prices and the recent international prices, it does not seem suitable to consider an hypothese of reduction on the present local prices of seeds, but on the contrary an increase of these prices.

The present prices of oil have been fixed early in 1987 (see page 21 above), so we consider that the most probable hypothesis is an increase in the near future of both :

prices of oil (favourable for IRR),
prices of seeds (unfavourable for IRR).

Consequently, a sensitivity analysis was carried out with the COMFAR, for a 10 % increase in prices of both oils and seeds.

This results in an increase of the IRR up to 15.4 %.

This figure is the most probable value to be considered for the project at the beginning of 1989.

1.9.5.4. Cost of packaging materials

As said previously, because of the foreign exchange shortage, edible oil conditioning in ZIMBABWE is mainly done with glass bottles.

This results in a high relative cost of packaging.

We consider that, with a free market for plastic, the packaging cost could be reduced considerably.

A sensitivity analysis was therefore carried out, with the Comfar, for a 40 % decrease in the cost of packaging materials.

This results in an increase in the IRR to 17.6 %.

1.9.5.5. Inflation

A sensitivity analysis was carried out for a 10 % inflation rate.

The IRR increase to 19 %, which means that the project would rather gain in inflationary conditions. This is an interesting result showing that there is no element of risk for inflation.

However, this figure must be considered with caution, because inflation has generally an adverse effect on the foreign exchange rate.

1.9.5.6. Variant - Neutralization

With the traditional technique in neutralization, an additional investment of 1.27 million Z$ is required.

Therefore, the IRR is slightly reduced to 11.6 %.

1.10. CONCLUSION

1.10.1. MAJOR ADVANTAGES OF THE PROJECT

The study shows that the project has the following advantages :

a/ High local market for oil

Taking into account the high level of the edible oil demand in ZIMBABWE, there will be no problem to sell the total oil production on the local market, even at a price higher that it is now.

b/ Export market for meal in the region

The proximity of an important consumer of meal, granting low transportation costs, allows to assume that it will be possible to sell on the export market, at good financial conditions, an important part of the meal production.

The study shows that, with a percentage of export of less than 40 % of the meal production, these exports could cover the debt service and the current imports of materials (chemicals) of the project.

c/ Use of local ressources for essential commodities

The implementation of the new plant will allow to valorise an important local resource (oil seeds) and at the same time to improve the consumption of an essential commodity (edible oil).

d/ Employment

The implementation of the new plant will allow the creation of approximatively 363 direct jobs in a decentralized area.

e/ Good ROE

The study shows a good return on equity.

f/ No sensitivity to inflation

The sensitivity study shows that the profitability is not reduced in inflation conditions.

1.10.2. MAJOR DRAWBACK OF THE PROJECT

The major drawback of the project seems to be a moderate profitability.

The internal rate of return on investment, in the conditions of May 1988, is 12 %. However, three observations could be made.

a/ Sales prices

It was showned in the study that the sales prices of edible oil in ZIMBABWE are maintained by the Government at a relatively low level, because this product is an "essential commodity". No doubt that a free supply and demand market would result in a higher price for the same consumption. The sensitivity study shows that an increase in sales prices of 10 % would result in a jump of the IRR on investment to 18.3 %.

b/ Sales and cost prices

As said above, the most probable hypothesis is an increase, in the near future, of both prices of oils and seeds.

The sensitivity study shows that an increase in these prices of 10 % would result in a value of the IRR on investment of 15.4 % .

This figure of 15.4 % is the most probable value to be considered for the project at the beginning of 1989.

c/ Abnormal price of packaging

The glass bottles used in ZIMBABWE are an important part of the production costs. Plastic conditionning is not used because of foreign exchange shortage.

The sensitivity study shows that a reduction of 40 % of the packaging costs, which is perfectly possible when using plastic without economical constraints, results in a jump of the IRR to 17.6 %.

This could give the idea of a support study to go more into detail on that subject.

1.10.3. CHANCES OF IMPLEMENTING THE PROJECT

This project appears to bear very low risks, either commercial or financial.

It would be a good downstream development for AMA/CMB.

It allows to use important local resources and to satisfy essential needs of the population.

We think therefore that the implementation of this 330 t/day edible oil plant can be recommended.

ANNEX 1

TERMS OF REFERENCE

U. Loeser/ah

15 January 1988

Annex E - Contract No. 88|19

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT US/ZIM/87/117

"FEASIBILITY STUDY FOR INCREASING THE OIL PRODUCTION CAPACITY FROM COTTON SEED"

TERMS OF REFERENCE

Prepared by the Feasibility Studies Branch

Department of Industrial Operations

A. General Background Information

1) Origin of the request for the preparation of a detailed feasibility study

The project was identified at UNIDO's Regional Investment Promotion Meeting for SADCC countries held from 3-7 November 1986 in Harare, Zimbabwe. The Government of Zimbabwe through its Government supported Cotton Marketing Board (CMB) has requested UNIDO by their letter dated 7 November 1986 to prepare a feasibility study. This was reconfirmed officially by the Ministry of Lands, Agriculture and Rural Resettlement and, finally, the Ministry of Finance endorsed the official request in October 1987. The Cotton Marketing Board also confirmed on 24 April 1987 its readiness to provide for cost-sharing. CMB will provide local transport, accommodation and food in local currency or in kind for two experts during the feasibility study for a period of up to two months.

It is important to note that the Government of France is said to be ready to make investment funds available of up to US$ 14 million provided the techno-economic feasibility study results in a documented and calculated recommendation on the profitability and liquidity of the project.

2) Agricultural preconditions for the investment proposal

It is the Zimbabwe Government policy to promote industrial activities throughout the country. Agro-based industries are of particular importance, because they process locally available raw materials and provide job opportunities to the unemployed in rural areas.

Zimbabwe's agricultural sector continues to be the backbone of Zimbabwe's economy. The major food crops are maize, wheat, soybeans, ground-nuts, sorghum and, to a lesser degree, indigenous Zimbabwean mhunga and rapoko. The main cash crops include flue-cured and burley tobacco, cotton, coffee, tea, and a wide variety of other products such as vegetables and fruit.

Cotton growing is widely practised in Zimbabwe since it is one of the very few cash crops which can be produced successfully and profitably with very little capital outlay. There are large-scale commercial cotton growers as well as small-scale cotton farmers who now contribute about 30 per cent of the nation's cotton production. The contribution of cotton to Zimbabwe's economy is quite subtantial not only in terms of providing raw materials (cotton lint) and finished products for export but also in satisfying the clothing needs of the country.

Zimbabwe accounts for 35 per cent of cotton seed production and 37.2 per cent of cotton lint production in the SADCC subregion. Approximately 44.9 per cent of total production of cotton lint is exported. The recent upturn of cotton production has created an unprecedented surplus of the crop which could not all be processed or exported given the limited existing processing facilities available and access to markets.

The cotton growing areas in Zimbabwe are:

High veld: Mazowe, Mutoko, Murewa, Zambezi valley;
Middle veld: Harare, Kadoma, Gokwe, Sanyati, Lake Kariba;
Low veld: Triangle, Burchenough Bridge, Nyamaropa, Mutare.

Ginning centres are located in:

Bindura (Sanyati), Glendale (Mutare), Banket (Triangle) and Tafuna (Kadoma).

Cotton seed is presently used for

Planting: 7,000 m/t (plus a reserve of 2,000 m/t)
Expressing: 144,000 m/t
Stockfeed: 2,260 m/t

All the above figures are based on the 1986 season. The Cotton Marketing Board informed us that recent planting of cotton has almost been doubled.

3) Existing oil expressing industry

Currently five companies operate in the oil pressing industry: four in Harare and one in Bulawayo. Their total capacity is 1,890,600 litres/annum. At present no edible oil is being imported. Locally produced oil seeds are mainly used for the production of stockfeed which satisfies this market.

New plants for cotton seed oil pressing should be located outside major urban areas, preferably close to the cotton ginneries in the Kadoma/Chedutu area.

4) Zimbabwe Cotton Marketing Board (CMB)

The strong upturn in the economy in 1985 largely reflects the positive contribution to growth of the agricultural and the industrial sector and the Government of Zimbabwe through the CMB is giving priority to the development of the agro-based industry. The CMB is an important organization in the agricultural sector in Zimbabwe, employing more than 4.000 people and co-ordinating the activities of more than 130.000 registered cotton growers in the large and small-scale commercial as well as communal farming areas. The Board has many key functions in the Zimbabwean cotton industry, which provides the country with all its cotton lint requirements, much of its cake (or meal) for stockfeed and about half of its edible oil. Exports of cotton lint by the Board also earn the country millions of dollars' worth of foreign currency each year. In the Cotton Commodity Committee are representatives of the Commercial Cotton Growers' Association, the National Farmers' Association of Zimbabwe and the Zimbabwe National Farmers' Union, who are all cotton growers themselves.

B. The scope of contracting services

A feasibility study for increasing the oil production capacity from cotton seed which will follow the approach and methodology of the UNIDO "Manual for the Preparation of Industrial Feasibility Studies" (ID/206).

The feasibility study will consist of 10 chapters, each providing detailed analyses and information in the way outlined as follows:

Chapter I	Executive summary
Chapter II	Project background and history
Chapter III	Market and plant capacity
Chapter IV	Materials and inputs
Chapter V	Location and site
Chapter VI	Project engineering
Chapter VII	Plant organization and overhead costs
Chapter VIII	Manpower
Chapter IX	Implementation scheduling
Chapter X	Financial evaluation

The feasibility study is determined by rather detailed terms of reference as are contained in the UNIDO document IO.401 "Guidelines for the Preparation of Industrial Feasibility Studies for Consulting Firms". These Guidelines provide the full scope of required work and define the details of the consultants' inputs. They are an integral part of the contractual services and are attached to these terms of reference as annex.

The feasibility study of the consulting firm should contain a complete financial evaluation, based on Chapter X of the above-mentioned "Manual for the preparation of Industrial Feasibility Studies" (ID/206) and should apply, whenever possible, computer-supported analytical methods such as the UNIDO Computer Model for Feasibility Analysis and Reporting (COMFAR).

The implementation of this project requires a team of experts in various disciplines in order to cover all aspects of the feasibility study. This task requires a high degree of professional expertise in similar projects and a proper timing of experts' inputs and project outputs. It is, therefore, recommended to subcontract the feasibility study to a consulting firm.

The team of experts provided by the consulting firm should include an industrial economist, two industrial engineers, a market analyst and a financial analyst. The team leader should be selected by the consulting firm.

For the performance of his obligation under the contract, the Contractor shall make available a total of 15 man-months of services as follows:

1 Industrial Economist	4 m/m
1 Technologist	2 m/m
1 Mechanical Engineer	3 m/m
1 Market Analyst	3 m/m
1 Financial Analyst	3 m/m
	15 m/m

C. General time schedule

The Contractor will keep the following time schedule:

- The team leader of the consulting firm will be briefed for two days in Vienna prior to the departure of the team to the project area.

- The team leader will be debriefed for two days in Vienna following the work in the project area.

- A progress report will be submitted at mid-term during the work in the project area; To UNIDO in 5 copies.

- A draft final report will be submitted to UNIDO within six months from the date of commencement of the field work.

- The final report will be submitted one month after the Contractor has received UNIDO's comments on the draft final report.

D. Personnel in the field

The Contractor's team shold consist of at least 5 specialists, viz.:

(a) One industrial economist with experience in the preparation of feasibility studies in the field of edible oil production;

(b) One vegetable oil technologist with special knowledge and practical experience in both mechanical pressing and solvent extraction of cotton seed as well as crude cotton seed oil refining and edible oil packaging;

c) One mechanical engineer with special knowledge in the oil seed processing and vegetable oil refining engineering sector and experience in the preparation of vegetable oil factory layout plans and equipment specifications;

d) One market analyst with experience in the assessment of market potential, distribution, sales and marketing of cotton seed oil; experience in African markets highly desirable;

(c) One financial analyst, with experience in project preparation and evaluation, preferably acquainted with computerized methods.

The Team should have access to specialists in other fields, as needed. All of them should have practical knowledge of developing countries. The Contractor may suggest another composition of the team and the allocation of man-months proposed above for UNIDO's consideration.

E. Participation of counterparts in the Contractor's work

UNIDO requests that the Zimbabwean counterparts be associated at all phases of the Contractor's work in order to assure their training and to familiarize them with the project from the very beginning. Potential investors, including development financing or industrial investment institutions, should also be involved as of an early stage of the Contractor's work.

F. Language requirements

The working language of the Contractor's field personnel will be English.

G. Reports

(a) The Contractor will submit to UNIDO, in line with the time schedule indicated under C), 10 copies of the draft final report in English.

(b) The Contractor will submit to UNIDO 35 copies of the final version of the feasibility study, after a discussion in Malawi has taken place and the parties concerned have had an opportunity to comment.

A N N E X E   II

PERSONS MET

a/ <u>Resident representation of UNDP/UNIDO - Persons met</u>

- Mr A. CHUMA.
- Mr A. KLAP, Agricultural Adviser
- Mrs Doris MUGWARA.

b/ <u>Cotton Marketing Board - Persons met</u>

Mr Peter DOVE	General Manager
Mr R. M. GASELA	Deputy General Manager (Administration and Finance)
Mr M. C. H. GANDIWA	Deputy General Manager (Operations and Marketing)
Mr R. CHAMISA	Operations and Marketing
Mr MANDENGU	Assistant General Manager (Finance)
Mr BEHESHTY	Assistant General Manager (Engineering)
Mr G. P. GOTORA	Crop Production Manager
Mr NYANHI	Accountant Manager
Mr CHITENJE	Assistant General Manager (Operations)
The ginneries managers	

c/ <u>Agricultural part of the study - Persons Met</u>

<u>Ministry of Lands, Agriculture and Rural Resettlement</u>

Mr T.H. GENTLEMAN

<u>Cotton Marketing Board</u>

Mr GANDIWA and Mr CHAMISA

<u>Grain Marketing Board</u>

Mr SANSOM	Grain Marketing Manager
Mr M. R. REEVES	Depot Organization Manager
Mr KAZIBONI	Oil Seeds Marketing Manager

<u>Commercial Farmers Union</u>

Mr D. P. FULKS Chief Economist

<u>Commercial Cotton Growers Association</u>

Mr R. R. MC NEIL Chief Executive

Commercial Oilseeds Producer's Association

Mr R. H. AMYOT   Production Executive

AGRITEX

Mr SILK   Assistant Chief to Crop Production

The MWENEZI Development Corporation

B.G. LEWIS   Chief Executive

d/ Industrial and market Study - Oils and fats - Persons met

OIL EXPRESSORS

OLIVINE INDUSTRIES

J. G. OSTERBERG, Purchasing Director.

LEVER BROTHERS

F. A. MILNE, Buying Manager.

BLUE RIBBON FOODS

G. BOWLER, Executive Director.

Ken J. JERRARD, General Manager.

SHEPHERD, MANCAMA, Production Managers.

NATIONAL FOODS

R. SHUTTLEWORTH, Operations Manager.

PRIOR, Plant Manager.

JAGGERS WHOLESALERS

Y. A. HUSSEIN, Managing Director.

SUPERMARKETS in HARARE, BULAWAYO, MUTARE, KADOMA, etc..
WOOLWORTH, TM, OK.

STATISTICAL DEPARTMENT, Ministry of Industry,
Mr SIMAKAWI, Statistician.
Mr DALIWAYO, Statistician.

CUSTOMS AND EXCISE,
Mr MARANGE, Officer.

MINISTRY OF HEALTH - NUTRITION DEPARTMENT
Mrs TAGWIREYI, Director of Nutrition Department.
Mrs MUSHONGA, Assistant.

PACKAGING

- ZIMGLASS
  Glass packaging.

  . Mr GOUGH, Managing Director.
  . Mr CHOMUTARE, Sales Manager.

- VAN LEER PACKAGING
  Drums.

  . Mr Ian NEWELL, Sales Manager.

- METAL BOX
  Metal Packaging Division (Tins).

  . Mr PEARSON, Production Manager.
  . Mr BVUNZAWABAYA, Marketing Manager.

- SOLTRAMA PLASTEX
  Plastic Packaging.

  . Mr GRAHAM, Sales Representative.

e/ Industrial and Market study for cakes and meals - Persons met

The four oil expressors already mentioned or oils and fats :

AGRIFOODS

C.D. AMIRA, Managing Director

NATIONAL FOODS - STOCKFEED DIVISION

R. SHUTTLEWORHT, Operation Manager

COMMERCIAL CATTLE PRODUCERS ASSOCIATION

P. D'HOTMAN, Production Executive

COLD STORAGE COMMISSION (C.S.C.)

P.F. CHAKAUYA, A.G.M. (Marketing)

f/ Manpower costs

The team collected informations on wages during the visits to the various ginneries of the C.M.B. : MUTARE, CHEGUTU, BINDURA.

They received informations on wages and information on salaries plus information on overheads from the Assistant Manager of Finance of the Cotton Marketing Board.

They also obtained such type of informations from the Company DELOITTE HASKINS and SELLS, auditors of the C.M.B.

Persons met :

C.M.B :

C. MANDENGU, Assistant General Manager (Finance).

The depots Managers.

DELOITTE HASKINGS and SELLS

A. J. ASCHMANN, Partner.

g/ Sites and Local Conditions - Persons met

UTILITIES.

- ZIMBABWE ELECTRICITY SUPPLY AUTHORITY

. Mr NEISHER, Commercial Manager, HARARE

. Mr GAMBI, Local Manager, KADOMA

. Mr BISHOP, Assistant to Local Manager, BINDURA

- B.P. - SHELL

. Mr JAFA, Technical Advisor, HARARE

- WANKIE COLLIERY (Supply of coal)

. Mr MUTITI, Marketing Manager

TRANSPORT.

- NATIONAL RAILWAYS OF ZIMBABWE

. Mr LUGUBE, Area Traffic Manager

. Miss RAMUSHU)

. Mr SIMPSON) Good Department

- SWIFT (Road Transport)

ZIMBABWE UNITED FREIGHT

. Mr NALAN-NEYLAN, Marketing Manager

- CLAN TRANSPORT Co (Road Transport)

. Les VARKEVISSER, Marketing Manager

. Helen ST LEGER WILLIAMS, Sales and Marketing h/ Mechanical Engineering - Persons met

1. CIVIL WORK

- SCOTT WILSON KIRKPATRICK and PARTNERS
  Consulting Civil and Structural Engineers

  . Mr SIMPSON, Associate,
  . Mr RAWSON, Partner.

2. CONSTRUCTORS

- WADE ADAMS
  Building, Civil and Mechanical Engineers.

  . Mr CHADWICK, General Manager.
  . Mr GOLDSMITH, Contracts Manager.

- ANTWOOD HOLDINGS
  Sheet Metal Industries
  Mechanical Contracting and Design.

  . Mr HOLLAND, Manager Director.
  . Mr BLOODWORTH, Managing Director.

- JOHN HOOK and SONS
  Steel Construction.

  . Mr RHETT HOOK.

- COCHRANE NEI ENGINEERING
  Boilers and Pressure Vessel Manufacturing.

  . Mr COCHRANE, Sales Director.

- HIGH VOLTAGE CONSTRUCTION

  HV and LV installations and maintenance.

  . Mr FIELD-COLLMAN, Managing Director.

i/ Financing

Persons met.

French Trade Commission :

Christian SAILLARD, Economic and Commercial Counsellor
Bruno VINAY, Assistant Commercial Attached
Eric NOITAKIS, Commercial attached.

D.H.S.

A.J. ASCHMANN, Partner.

SITES

- **KADOMA**

  . Mr PRIDDY, Town Clark

  . Mr GONCSSE, Deputy Town Clark

  . Mr KAMBA, Acting Town Engineer

- **BINDURA**

  . Mr MAKONI, Rural Council Secretary

  . Mr BARRINGTON, Water Network and Waste Treatment Superintendant

ZIMBABWE, EDIBLE OIL PROJECT
18.11.1988 --BASE CASE
EXCH.RATE MAY 88. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53392.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53392.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	47606.00	47606.00	47606.00
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	53822.84	53893.30	53796.16
thereof foreign	12.25 %	12.36 %	12.20 %
total sales :	61328.48	61328.48	61328.48
gross income :	7505.63	7435.18	7532.32
net income :	7505.63	7435.18	3766.16
cash balance :	10176.62	11111.76	7442.75
net cashflow :	12884.48	13722.48	9956.32

Net Present Value at: 8.00 % = 17174.50
Internal Rate of Return: 11.97 %
Return on equity1: 11.53 %
Return on equity2: 15.56 %

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

Total Initial Investment in THOUSANDS ZIMBABWE DOLLARS

Year	1989	1990
Fixed investment costs		
Land, site preparation, development	2200.000	0.000
Buildings and civil works	6110.000	6109.000
Auxiliary and service facilities .	0.000	400.000
Incorporated fixed assets	3080.000	7557.000
Plant machinery and equipment . . .	2452.000	22060.000
Total fixed investment costs	13842.000	36126.000
Pre-production capital expenditures.	1047.000	2377.500
Net working capital	0.000	0.000
Total initial investment costs . . .	14889.000	38503.500
Of it foreign, in %	35.624	63.580

Total Current Investment in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995
Fixed investment costs					
Land, site preparation, development	0.000	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000	0.000	0.000
Incorporated fixed assets	1800.000	0.000	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000	0.000	0.000
Total fixed investment costs	1800.000	0.000	0.000	0.000	0.000
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000	0.000
Working capital	3884.250	2683.584	2937.833	886.444	0.000
Total current investment costs	5684.250	2683.584	2937.833	886.444	0.000
Of it foreign, %	30.035	5.266	6.492	4.685	0.000

ZIMBABWE, EDIBLE OIL PROJECT — 18.11.1988 —BASE CASE

COMFAR 2.1 - SOFRECO, PARIS, FRANCE

Total Current Investment in THOUSANDS ZIMBABWE DOLLARS

Year	1996	1997-2000	2001
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	838.000	0.000	838.000
Total fixed investment costs	838.000	0.000	838.000
Preproduction capitals expenditures.	0.000	0.000	0.000
Working capital	0.000	0.000	0.000
Total current investment costs	838.000	0.000	838.000
Of it foreign, %	100.000	0.000	100.000

ZIMBABWE, EDIBLE OIL PROJECT — 18.11.1988 —BASE CASE

Total Production Costs in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	7630.000	15259.000	22889.000	25432.000	25432.000
Other raw materials	440.000	880.000	1320.000	1467.000	1467.000
Utilities	646.000	774.000	917.000	968.000	968.000
Energy	483.000	579.000	965.000	965.000	965.000
Labour, direct	5020.000	5020.000	5835.000	5835.000	5835.000
Repair, maintenance	0.000	0.000	0.000	0.000	0.000
Spares	3490.000	6980.000	10471.000	11634.000	11634.000
Factory overheads	294.000	352.000	587.000	587.000	587.000
Factory costs	18003.000	29844.000	42984.000	46888.000	46886.000
Administrative overheads	7.000	7.000	7.000	7.000	7.000
Indir. costs, sales and distribution	213.000	417.000	640.000	711.000	711.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	4543.270	4723.270	4723.270	4723.270	4723.270
Financial costs	495.000	1925.000	1785.000	1687.857	1590.714
Total production costs	23261.270	36916.270	50139.270	54017.130	53919.980
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	17.8[illegible]	16.474	13.498	12.562	12.404
Of it variable,%	0.000	0.000	0.000	0.000	0.000
Total labour	5020.000	5020.000	5835.000	5835.000	5835.000

Total Production Costs in THOUSANDS ZIMBABWE DOLLARS

Year	1996	1997	1998	1999	2000
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	25432.000	25432.000	25432.000	25432.000	25432.000
Other raw materials	1467.000	1467.000	1467.000	1467.000	1467.000
Utilities	968.000	968.000	968.000	968.000	968.000
Energy	965.000	965.000	965.000	965.000	965.000
Labour, direct	5835.000	5835.000	5835.000	5835.000	5835.000
Repair, maintenance	0.000	0.000	0.000	0.000	0.000
Spares	11634.000	11634.000	11634.000	11634.000	11634.000
Factory overheads	587.000	587.000	587.000	587.000	587.000
Factory costs	46888.000	46888.000	46888.000	46888.000	46888.000
Administrative overheads	7.000	7.000	7.000	7.000	7.000
Indir. costs, sales and distribution	711.000	711.000	711.000	711.000	711.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	4723.270	4890.870	4890.870	4890.870	4890.868
Financial costs	1493.571	1396.428	1299.286	1202.143	1105.000
Total production costs	53822.840	53893.300	53796.160	53699.020	53601.870
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	12.246	12.361	12.203	12.044	11.884
Of it variable,%	0.000	0.000	0.000	0.000	0.000
Total labour	5835.000	5835.000	5835.000	5835.000	5835.000

Total Production Costs in THOUSANDS ZIMBABWE DOLLARS

Year	2001	2002	2003	2004	2005
% of nom. capacity (single product).	0.000	0.000	0.000	0.000	0.000
Raw material 1	25432.000	25432.000	25432.000	25432.000	25432.000
Other raw materials	1467.000	1467.000	1467.000	1467.000	1467.000
Utilities	968.000	968.000	968.000	968.000	968.000
Energy	965.000	965.000	965.000	965.000	965.000
Labour, direct	5835.000	5835.000	5835.000	5835.000	5835.000
Repair, maintenance	0.000	0.000	0.000	0.000	0.000
Spares	11634.000	11634.000	11634.000	11634.000	11634.000
Factory overheads	587.000	587.000	587.000	587.000	587.000
Factory costs	46888.000	46888.000	46888.000	46888.000	46888.000
Administrative overheads	7.000	7.000	7.000	7.000	7.000
Indir. costs, sales and distribution	711.000	711.000	711.000	711.000	711.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000
Depreciation	1086.050	906.050	906.050	906.050	906.048
Financial costs	986.607	868.214	361.250	340.000	318.750
Total production costs	49678.660	49380.270	48873.300	48852.050	48830.800
Costs per unit (single product)	0.000	0.000	0.000	0.000	0.000
Of it foreign, %	6.657	6.154	5.180	5.139	5.098
Of it variable,%	0.000	0.000	0.000	0.000	0.000
Total labour	5835.000	5835.000	5835.000	5835.000	5835.000

Net Working Capital in THOUSANDS ZIMBABWE DOLLARS

Year	mdc	coto	1991	1992	1993	1994	1995-2005
Coverage	mdc	coto					
Current assets &							
Accounts receivable	30	12.0	1518.583	2522.333	3635.917	3967.167	3967.167
Inventory and materials	33	10.9	799.667	1556.083	2313.833	2566.750	2566.750
Energy	30	12.0	40.250	48.250	80.417	80.417	80.417
Spares	30	12.0	290.833	581.667	872.583	969.500	969.500
Work in progress	10	36.0	500.083	829.000	1194.000	1302.444	1302.444
Finished products	30	12.0	1500.833	2487.583	3582.583	3907.917	3907.917
Cash in hand	30	12.0	734.250	1029.917	1408.333	1505.250	1505.250
Total current assets			5384.500	9054.834	13087.670	14299.450	14299.450
Current liabilities and							
Accounts payable	30	12.0	1500.250	2487.000	3582.000	3907.333	3907.333
Net working capital			3884.250	6567.834	9505.666	10392.110	10392.110
Increase in working capital			3884.250	2683.584	2937.832	886.445	0.000
Net working capital, local			3577.000	6219.278	8966.389	9811.305	9811.305
Net working capital, foreign			207.250	348.556	539.278	580.806	580.806

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

Source of Finance, construction in THOUSANDS ZIMBABWE DOLLARS

Year	1989	1990
Equity, ordinary ..	24500.000	0.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	10000.000	7000.000
Loan B, foreign..	0.000	17000.000
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	10000.000	24000.000
Current liabilities	0.000	0.000
Bank overdraft	0.000	0.000
Total funds	34500.000	24000.000

Source of Finance, production in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995-99	2000- 5
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	0.000	0.000	0.000	0.000	-850.000
Loan B, foreign..	0.000	0.000	-1214.286	-1214.286	-1214.286	-1214.286
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	0.000	-1214.286	-1214.286	-1214.286	-2064.286
Current liabilities	1500.250	986.750	1095.000	325.333	0.000	0.000
Bank overdraft	1000.000	0.000	0.000	0.000	0.000	0.000
Total funds	2500.250	986.750	-119.286	-888.952	-1214.286	-2064.286

Cashflow Tables, construction in THOUSANDS ZIMBABWE DOLLARS

Year	1989	1990
Total cash inflow . .	34500.000	24000.000
Financial resources .	34500.000	24000.000
Sales, net of tax . .	0.000	0.000
Total cash outflow . .	14889.000	38503.500
Total assets	14889.000	38166.000
Operating costs . . .	0.000	0.000
Cost of finance . . .	0.000	337.500
Repayment	0.000	0.000
Corporate tax . . .	0.000	0.000
Dividends paid . . .	0.000	0.000
Surplus (deficit) .	19611.000	-14503.500
Cumulated cash balance	19611.000	5107.500
Inflow, local	24500.000	0.000
Outflow, local	9585.000	14023.000
Surplus (deficit) .	14915.000	-14023.000
Inflow, foreign . . .	10000.000	24000.000
Outflow, foreign . . .	5304.000	24480.500
Surplus (deficit) .	4696.000	-480.500
Net cashflow	-14889.000	-38166.000
Cumulated net cashflow	-14889.000	-53055.000

Cashflow tables, production in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995	1996
Total cash inflow . .	20901.300	37783.840	56290.630	61653.810	61328.480	61328.480
Financial resources .	2500.250	986.750	1095.000	325.333	0.000	0.000
Sales, net of tax . .	18401.050	36797.090	55195.630	61328.480	61328.480	61328.480
Total cash outflow . .	25902.500	35863.330	50663.120	51719.920	50411.000	51151.860
Total assets	7184.500	3670.333	4032.833	1211.778	0.000	838.000
Operating costs . . .	18223.000	30268.000	43631.000	47606.000	47606.000	47606.000
Cost of finance . . .	495.000	1925.000	1785.000	1687.857	1590.714	1493.571
Repayment	0.000	0.000	1214.286	1214.286	1214.286	1214.286
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) .	-5001.199	1920.504	5627.508	9933.891	10917.480	10176.620
Cumulated cash balance	106.301	2026.805	7654.313	17588.200	28505.680	38682.300
Inflow, local	18870.730	33815.280	50334.500	55089.830	54774.080	54774.080
Outflow, local	22935.000	32699.110	45527.950	46763.670	45603.000	45603.000
Surplus (deficit) .	-4064.270	1116.168	4806.551	8326.160	9171.078	9171.078
Inflow, foreign . . .	2030.570	3968.556	5956.126	6563.983	6554.399	6554.399
Outflow, foreign . . .	2967.500	3164.222	5135.175	4956.254	4808.000	5548.857
Surplus (deficit) .	-936.930	804.334	820.951	1607.729	1746.399	1005.542
Net cashflow	-5506.199	3845.504	8626.793	12836.030	13722.480	12884.480
Cumulated net cashflow	-58561.200	-54715.700	-46088.900	-33252.870	-19530.390	-6645.918

Cashflow tables, production in THOUSANDS ZIMBABWE DOLLARS

Year	1997	1998	1999	2000	2001	2002
Total cash inflow . .	61328.480	61328.480	61328.480	61328.480	61328.480	61328.480
Financial resources .	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax . .	61328.480	61328.480	61328.480	61328.480	61328.480	61328.480
Total cash outflow . .	50216.710	53885.730	53837.160	54638.590	57319.800	56512.610
Total assets	0.000	0.000	0.000	0.000	838.000	0.000
Operating costs . . .	47606.000	47606.000	47606.000	47606.000	47606.000	47606.000
Cost of finance . . .	1396.428	1299.286	1202.143	1105.000	986.607	868.214
Repayment	1214.286	1214.286	1214.286	2064.286	2064.286	2064.286
Corporate tax . . .	0.000	3766.160	3814.732	3863.305	5824.910	5974.107
Dividends paid . . .	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit) .	11111.760	7442.746	7491.320	6689.887	4008.676	4815.867
Cumulated cash balance	49794.060	57236.810	64728.130	71418.020	75426.690	80242.550
Inflow, local	54774.080	54774.080	54774.080	54774.080	54774.080	54774.080
Outflow, local	45603.000	49369.160	49417.730	49466.300	51427.910	51577.110
Surplus (deficit) .	9171.078	5404.918	5356.344	5307.773	3346.168	3196.969
Inflow, foreign . . .	6554.399	6554.399	6554.399	6554.399	6554.399	6554.399
Outflow, foreign . . .	4613.714	4516.571	4419.428	5172.285	5891.893	4935.500
Surplus (deficit) .	1940.686	2037.828	2134.971	1382.114	662.507	1618.900
Net cashflow	13722.480	9956.316	9907.744	9859.172	7059.566	7748.369
Cumulated net cashflow	7076.559	17032.880	26940.620	36799.790	43859.360	51607.730

Cashflow tables, production in THOUSANDS ZIMBABWE DOLLARS

Year	2003	2004	2005
Total cash inflow . .	61328.480	61328.480	61328.480
Financial resources .	0.000	0.000	0.000
Sales, net of tax . .	61328.480	61328.480	61328.480
Total cash outflow . .	56259.130	56248.500	56237.880
Total assets	0.000	0.000	0.000
Operating costs . . .	47606.000	47606.000	47606.000
Cost of finance . . .	361.250	340.000	318.750
Repayment	2064.286	2064.286	2064.286
Corporate tax . . .	6227.586	6238.213	6248.840
Dividends paid . . .	0.000	0.000	0.000
Surplus (deficit) .	5069.352	5079.977	5090.602
Cumulated cash balance	85311.910	90391.880	95482.480
Inflow, local	54774.080	54774.080	54774.080
Outflow, local	51830.590	51841.210	51851.840
Surplus (deficit) .	2943.492	2932.867	2922.238
Inflow, foreign . . .	6554.399	6554.399	6554.399
Outflow, foreign . . .	4428.536	4407.286	4386.036
Surplus (deficit) .	2125.864	2147.114	2168.364
Net cashflow	7494.885	7484.264	7473.637
Cumulated net cashflow	59102.620	66586.880	74060.520

Cashflow Discounting:

a) Equity paid versus Net income flow:

Net present value .... 8724.63 at 8.00 %
Internal Rate of Return (IRRE1) .. 11.53 %

b) Net Worth versus Net cash return:

Net present value .... 17205.27 at 8.00 %
Internal Rate of Return (IRRE2) .. 15.56 %

c) Internal Rate of Return on total investment:

Net present value .... 17174.50 at 8.00 %
Internal Rate of Return (IRR) .. 11.97 %

Net Worth = Equity paid plus reserves

Net Income Statement in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995
Total sales, incl. sales tax	18401.050	36797.090	55195.630	61328.480	61328.480
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	18401.050	36797.090	55195.630	61328.480	61328.480
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	22766.270	34991.270	48354.270	52329.270	52329.270
Operational margin	-4365.217	1805.816	6841.359	8999.203	8999.207
As % of total sales	-23.723	4.907	12.395	14.674	14.674
Cost of finance	495.000	1925.000	1785.000	1687.857	1590.714
Gross profit	-4860.217	-119.184	5056.359	7311.348	7408.492
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	-4860.217	-119.184	5056.359	7311.348	7408.492
Tax	0.000	0.000	0.000	0.000	0.000
Net profit	-4860.217	-119.184	5056.359	7311.348	7408.492
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-4860.217	-119.184	5056.359	7311.348	7408.492
Accumulated undistributed profit	-4860.217	-4979.400	76.959	7388.307	14796.800
Gross profit, % of total sales	-26.413	-0.324	9.161	11.922	12.080
Net profit, % of total sales	-26.413	-0.324	9.161	11.922	12.080
ROE, Net profit, % of equity	-19.838	-0.486	20.638	29.842	30.239
ROI, Net profit+interest, % of invest.	-7.432	2.940	10.630	13.792	13.792

Net Income Statement in THOUSANDS ZIMBABWE DOLLARS

Year	1996	1997	1998	1999	2000
Total sales, incl. sales tax	61328.480	61328.480	61328.480	61328.480	61328.480
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	61328.480	61328.480	61328.480	61328.480	61328.480
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	52329.270	52496.870	52496.870	52496.870	52496.870
Operational margin	8999.203	8831.609	8831.605	8831.609	8831.609
As % of total sales	14.674	14.401	14.400	14.401	14.401
Cost of finance	1493.571	1396.428	1299.286	1202.143	1105.000
Gross profit	7505.633	7435.180	7532.320	7629.465	7726.609
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	7505.633	7435.180	7532.320	7629.465	7726.609
Tax	0.000	0.000	3766.160	3814.732	3863.305
Net profit	7505.633	7435.180	3766.160	3814.732	3863.305
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	7505.633	7435.180	3766.160	3814.732	3863.305
Accumulated undistributed profit	22302.430	29737.610	33503.770	37318.510	41181.810
Gross profit, % of total sales	12.238	12.124	12.282	12.440	12.599
Net profit, % of total sales	12.238	12.124	6.141	6.220	6.299
ROE, Net profit, % of equity	30.635	30.348	15.372	15.570	15.769
ROI, Net profit+interest, % of invest.	13.618	13.364	7.665	7.592	7.518

Net Income Statement in THOUSANDS ZIMBABWE DOLLARS

Year	2001	2002	2003	2004	2005
Total sales, incl. sales tax	61328.480	61328.480	61328.480	61328.480	61328.480
Less: variable costs, incl. sales tax.	0.000	0.000	0.000	0.000	0.000
Variable margin	61328.480	61328.480	61328.480	61328.480	61328.480
As % of total sales	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	48692.050	48512.050	48512.050	48512.050	48512.050
Operational margin	12636.430	12816.430	12816.430	12816.430	12816.430
As % of total sales	20.604	20.898	20.898	20.898	20.898
Cost of finance	986.607	868.214	361.250	340.000	318.750
Gross profit	11649.820	11948.210	12455.180	12476.430	12497.680
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	11649.820	11948.210	12455.180	12476.430	12497.680
Tax	5824.910	5974.107	6227.588	6238.213	6248.840
Net profit	5824.910	5974.107	6227.588	6238.213	6248.840
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	5824.910	5974.107	6227.588	6238.213	6248.840
Accumulated undistributed profit	47006.720	52980.830	59208.410	65446.630	71695.470
Gross profit, % of total sales	18.996	19.482	20.309	20.344	20.378
Net profit, % of total sales	9.498	9.741	10.154	10.172	10.189
ROE, Net profit, % of equity	23.775	24.384	25.419	25.462	25.505
ROI, Net profit+interest, % of invest.	10.178	10.224	9.845	9.830	9.814

Projected Balance Sheets, construction in THOUSANDS ZIMBABWE DOLLARS

Year	1989	1990
Total assets	34500.000	58500.000
Fixed assets, net of depreciation	0.000	14889.000
Construction in progress	14889.000	38503.500
Current assets	0.000	0.000
Cash, bank	0.000	0.000
Cash surplus, finance available	19611.000	5107.500
Loss carried forward	0.000	0.000
Loss	0.000	0.000
Total liabilities	34500.000	58500.000
Equity capital	24500.000	24500.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	10000.000	34000.000
Current liabilities	0.000	0.000
Bank overdraft, finance required.	0.000	0.000
Total debt	10000.000	34000.000
Equity, % of liabilities	71.014	41.880

Projected Balance Sheets, Production in THOUSANDS ZIMBABWE DOLLARS

Year	1991	1992	1993	1994	1995
Total assets	61000.250	61987.000	66924.080	68367.070	74561.270
Fixed assets, net of depreciation	48849.230	45925.960	41202.690	36479.420	31756.150
Construction in progress	1800.000	0.000	0.000	0.000	0.000
Current assets	4650.250	8024.917	11679.330	12794.200	12794.200
Cash, bank	734.250	1029.917	1408.333	1505.250	1505.250
Cash surplus, finance available	106.305	2026.801	7654.320	17588.200	28505.680
Loss carried forward	0.000	4860.217	4979.400	0.000	0.000
Loss	4860.217	119.184	0.000	0.000	0.000
Total liabilities	61000.250	61987.000	66924.080	68367.070	74561.270
Equity capital	24500.000	24500.000	24500.000	24500.000	24500.000
Reserves, retained profit	0.000	0.000	0.000	76.959	7388.307
Profit	0.000	0.000	5056.359	7311.348	7408.492
Long and medium term debt	34000.000	34000.000	32785.710	31571.430	30357.140
Current liabilities	1500.250	2487.000	3582.000	3907.333	3907.333
Bank overdraft, finance required.	1000.000	1000.000	1000.000	1000.000	1000.000
Total debt	36500.250	37487.000	37367.710	36478.760	35264.470
Equity, % of liabilities	40.164	39.524	36.609	35.836	32.859

ZIMBABWE, EDIBLE OIL PROJECT — 18.11.1988 —BASE CASE

Projected Balance Sheets, Production in THOUSANDS ZIMBABWE DOLLARS

Year	1996	1997	1998	1999	2000
Total assets	80852.620	87073.520	89625.390	92225.840	94024.860
Fixed assets, net of depreciation	27032.880	22980.010	18089.140	13198.270	8307.402
Construction in progress	838.000	0.000	0.000	0.000	0.000
Current assets	12794.200	12794.200	12794.200	12794.200	12794.200
Cash, bank	1505.250	1505.250	1505.250	1505.250	1505.250
Cash surplus, finance available	38682.290	49794.060	57236.800	64728.120	71418.020
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	80852.620	87073.520	89625.390	92225.840	94024.860
Equity capital	24500.000	24500.000	24500.000	24500.000	24500.000
Reserves, retained profit	14796.800	22302.430	29737.610	33503.770	37318.510
Profit	7505.633	7435.180	3766.160	3814.732	3863.305
Long and medium term debt	29142.860	27928.570	26714.280	25500.000	23435.710
Current liabilities	3907.333	3907.333	3907.333	3907.333	3907.333
Bank overdraft, finance required.	1000.000	1000.000	1000.000	1000.000	1000.000
Total debt	34050.190	32835.910	31621.620	30407.330	28343.040
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Projected Balance Sheets, Production in THOUSANDS ZIMBABWE DOLLARS

Year	2001	2002	2003	2004	2005
Total assets	97785.480	101695.300	105858.600	110032.500	114217.100
Fixed assets, net of depreciation	7221.353	7153.303	6247.253	5341.203	4435.155
Construction in progress	838.000	0.000	0.000	0.000	0.000
Current assets	12794.200	12794.200	12794.200	12794.200	12794.200
Cash, bank	1505.250	1505.250	1505.250	1505.250	1505.250
Cash surplus, finance available	75426.680	80242.550	85311.910	90391.880	95482.480
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	97785.480	101695.300	105858.600	110032.500	114217.100
Equity capital	24500.000	24500.000	24500.000	24500.000	24500.000
Reserves, retained profit	41181.810	47006.720	52980.830	59208.410	65446.630
Profit	5824.910	5974.107	6227.588	6238.213	6248.840
Long and medium term debt	21371.430	19307.140	17242.860	15178.570	13114.280
Current liabilities	3907.333	3907.333	3907.333	3907.333	3907.333
Bank overdraft, finance required.	1000.000	1000.000	1000.000	1000.000	1000.000
Total debt	26278.760	24214.470	22150.190	20085.900	18021.620
Equity, % of liabilities	25.055	24.092	23.144	22.266	21.450

ZIMBABWE, EDIBLE OIL PROJECT
18.11.1988 --BASE CASE
EXCH.RATE MAY 88. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53392.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53392.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	47606.00	47606.00	47606.00
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	53822.84	53893.30	53796.16
thereof foreign	12.25 %	12.36 %	12.20 %
total sales :	61328.48	61328.48	61328.48
gross income :	7505.63	7435.18	7532.32
net income :	7505.63	7435.18	3766.16
cash balance :	10176.62	11111.76	7442.75
net cashflow :	12884.48	13722.48	9956.32

Net Present Value at: 8.00 % = 17174.50
Internal Rate of Return: 11.97 %
Return on equity1: 11.53 %
Return on equity2: 15.56 %

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Total initial investment
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Source of finance

ZIMBABWE, EDIBLE OIL PROJECT
11.85 -BASE CASE-VARIANT NEUTRALIZATION
EXCH.RATE MAY 88. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	54962.50	57.047 % foreign
current assets:	0.00	0.000 % foreign
total assets:	54962.50	57.047 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	47606.00	47606.00	47606.00
depreciation :	4880.27	5047.87	5047.87
interest :	1493.57	1396.43	1299.29
production costs	53979.84	54050.30	53953.16
thereof foreign	12.50 %	12.62 %	12.46 %
total sales :	61328.48	61328.48	61328.48
gross income :	7348.64	7278.18	7375.32
net income :	7348.64	7278.18	3687.66
cash balance :	10176.62	11111.76	7521.25
net cashflow :	12884.48	13722.48	10034.82

Net Present Value at: 8.00 % = 15830.09
Internal Rate of Return: 11.59 %
Return on equity1: 11.17 %
Return on equity2: 15.59 %

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Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
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Working Capital requirements	Source of finance

ZIMBABWE, EDIBLE OIL PROJECT
19.11.88 -PLUS 10% ON LOCAL SALES PRICES
EXCH.RATE MAY 88. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53392.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53392.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	47606.00	47606.00	47606.00
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	53822.84	53893.30	53796.16
thereof foreign	12.25 %	12.26 %	12.20 %
total sales :	66858.04	66858.04	66858.04
gross income :	13035.20	12964.74	13061.88
net income :	13035.20	12964.74	6530.94
cash balance :	15706.18	16641.32	10207.53
net cashflow :	18414.04	19252.04	12721.10

Net Present Value at: 8.00 % = 46934.30
Internal Rate of Return: 18.29 %
Return on equity1: 21.84 %
Return on equity2: 25.43 %

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

ZIMBABWE, EDIBLE OIL PROJECT
11.88 -PLUS 10% ON SALES & SEEDS PRICES
EXCH.RATE MAY 89. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53392.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53392.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	50149.00	50149.00	50149.00
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	56365.84	56436.30	56339.16
thereof foreign	11.63 %	11.80 %	11.65 %
total sales :	66858.04	66858.04	66858.04
gross income :	10492.20	10421.74	10518.88
net income :	10492.20	10421.74	5259.44
cash balance :	13163.18	14098.32	8936.03
net cashflow :	15271.04	16709.04	11449.60

Net Present Value at: 8.00 % = 32993.65
Internal Rate of Return: 15.37 %
Return on equity1: 17.37 %
Return on equity2: 21.03 %

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

ZIMBABWE, EDIBLE OIL PROJECT
18.11.88 -MINUS 40% ON PACKAGING
EXCH.RATE MAY 89. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53392.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53392.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	42952.00	42952.00	42952.00
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	49168.84	49239.30	49142.16
thereof foreign	13.41 %	13.53 %	13.36 %
total sales :	61328.48	61328.48	61328.48
gross income :	12159.63	12089.18	12186.32
net income :	12159.63	12089.18	6093.16
cash balance :	14830.62	15765.76	9769.75
net cashflow :	17538.48	18376.48	12283.32

Net Present Value at: 8.00 % = 42884.92
Internal Rate of Return: 17.58 %
Return on equity1: 20.35 %
Return on equity2: 24.49 %

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Total initial investment
Total investment during production
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Source of finance

ZIMBABWE, EDIBLE OIL PROJECT
18.11.88 --10% INFLATION
EXCH.RATE MAY 88. Z$1=FF3.7

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	53332.50	55.784 % foreign
current assets:	0.00	0.000 % foreign
total assets:	53332.50	55.784 % foreign

Source of funds during construction phase

equity & grants:	24500.00	0.000 % foreign
foreign loans :	34000.00	
local loans :	0.00	
total funds :	58500.00	58.120 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	76669.94	84336.94	92770.64
depreciation :	4723.27	4890.87	4890.87
interest :	1493.57	1396.43	1299.29
production costs	82886.78	90624.23	98960.80
thereof foreign	9.43 %	9.06 %	8.55 %
total sales :	98770.13	108647.20	119511.90
gross income :	15883.35	18022.92	20551.07
net income :	15883.35	18022.92	10275.54
cash balance :	17032.84	20025.84	12111.09
net cashflow :	19740.70	22636.55	14624.67

Net Present Value at: 8.00 % = 67839.28
Internal Rate of Return: 19.01 %
Return on equity1: 23.77 %
Return on equity2: 24.79 %

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

ZIMBABWE, EDIBLE OIL PROJECT
[illegible].03.88--SCENARIO 2 CAPACITY 165 T/D
EXCH.RATE MAY 88. Z$1=FF3.[illegible]

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: THOUSANDS ZIMBABWE DOLLARS

Total initial investment during construction phase

fixed assets:	38717.89	54.073 % foreign
current assets:	0.00	0.000 % foreign
total assets:	38717.89	54.073 % foreign

Source of funds during construction phase

equity & grants:	18004.00	1.233 % foreign
foreign loans :	20502.00	
local loans :	0.00	
total funds :	38506.00	53.820 % foreign

Cashflow from operations

Year:	6	7	8
operating costs:	25062.00	25062.00	25062.00
depreciation :	3296.20	3463.80	3463.80
interest :	830.33	748.32	666.32
production costs	29188.53	29274.12	29192.12
thereof foreign	13.37 %	13.63 %	13.38 %
total sales :	30180.04	30180.04	30180.04
gross income :	991.51	905.92	987.92
net income :	495.75	452.96	493.96
cash balance :	1929.86	2891.66	2932.66
net cashflow :	3784.29	4665.08	4624.08

Net Present Value at: 10.00 % = -15874.55
Internal Rate of Return: 3.50 %
Return on equity1: -4.56 %
Return on equity2: 1.50 %

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