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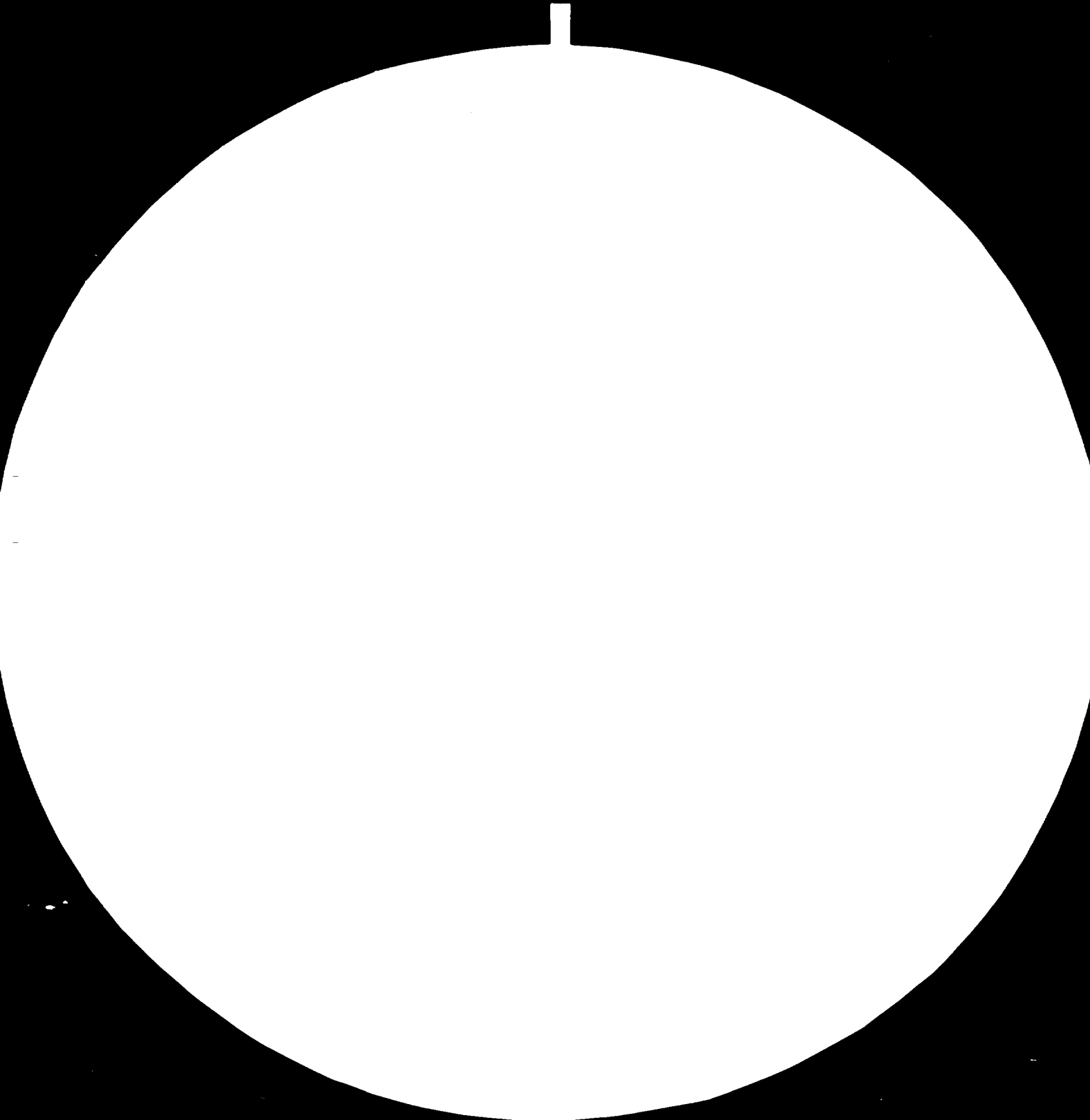

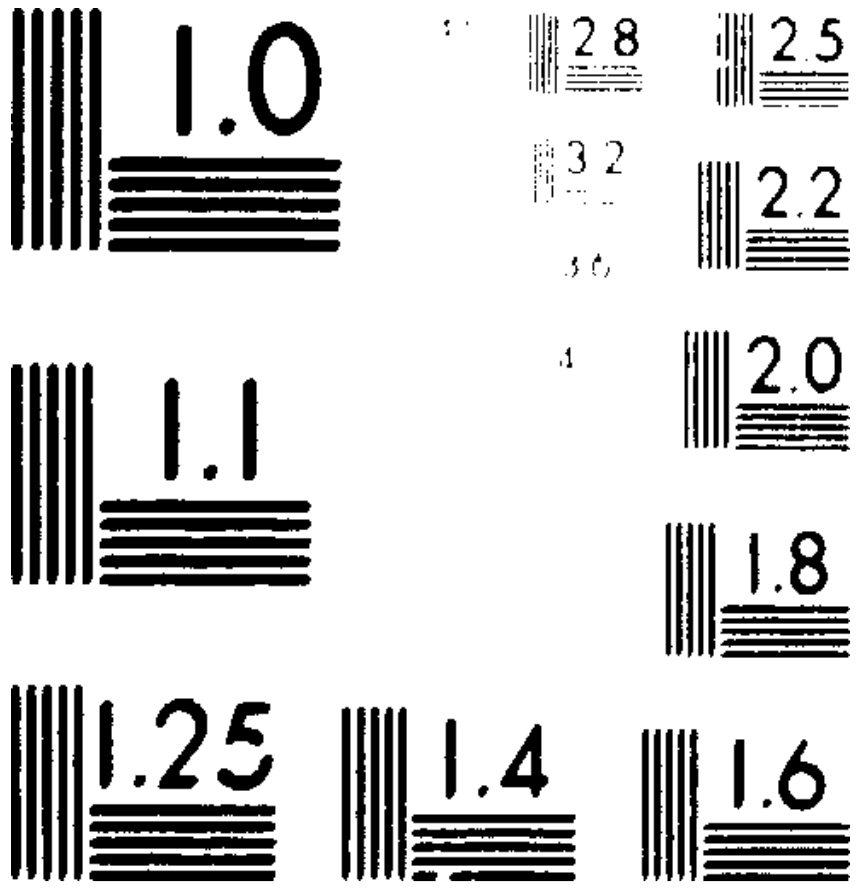

REPORT

ON THE

10539

TECHNO-ECONOMIC EVALUATION STUDY OF THE VEGETABLE OIL INDUSTRIES SECTOR IN NIGERIA

Prepared for UNIDO
By

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CHAPTER 1

INTRODUCTION

The purpose of this study is to examine the Vegetable Oils Industry Sector as an integral part of the Nigerian economy. Further, it is to evaluate selected industries in the sector and identify appropriate methods and areas for the better utilization of existing industrial capacity.

The report is divided into three parts. Part A deals with an overview of the sector and presents Government Policy and Control for its Operation. It also gives a survey of the various raw materials available to the vegetable oils industry, their sources, quality and prices, and reviews the current processing techniques and general marketing and product distribution practices. Part B contains an evaluation of some selected vegetable oils industries regarding raw material supply, technology applied, plant efficiency and the market situation of the products produced. Conclusions are drawn and recommendations made for each factory studied. Part C summarizes and draws together conclusions of the study and presents overall recommendations for the future development of each sub-sector of the Vegetable Oils Industry.

PART A

OVERVIEW OF THE SECTOR, GOVERNMENT POLICY, RAW MATERIALS, PROCESSING TECHNIQUES AND MARKETING PRACTICES IN THE INDUSTRY.

CHAPTER 2

OVERVIEW OF THE VEGETABLE OILS INDUSTRY SECTOR

The vegetable oils industry is one of the oldest industries in the country, having existed long before the advent of modern processing technology. The major oils processed are palm oil, palm kernel oil, groundnut oil and cocoa butter, and to a lesser extent, coconut oil, melon seed oil and cotton seed oil. Two of these oils, groundnut and palm oil are important sources of food while at the same time up till a few years ago they were also essential export commodities. The other two, palm kernel oil and cocoa butter, are essentially export oils and fats which are later processed into various food pharmaceutical and cosmetic items imported into Nigeria. The vegetable oils industry could therefore be considered as a major foreign exchange earner for the country before the intensive commercial exploitation of petroleum.

2.1 Economic Importance

In recognition of the economic importance of vegetable oils various Produce and Marketing Boards were established in the early sixties to control the supply of raw materials to the industry and handle exports. At that time, Nigeria was the world's major supplier of palm oil and palm kernel oil, supplying 186,000 tonnes or over 30% of world output.

By 1966, however, the local demand arising from population and industrial growths led to a drop in exports to 146,000 tonnes (Lynam, 1972). In 1967, the civil strife in the country nearly completely terminated this trade. Today, although Nigeria still exports palm kernel oil, it has become a net importer of palm oil (Table 1a).

Table 1a

Export Commodities Purchased by the Nigerian Produce Marketing Board

Year	Cocoa	Groundnuts	Palmoil	Palm kernel oil
1968/69				
Quantity ('000 tonnes)	189	776	3	192
Value (₦m.)	37.7	38.9	0.3	11.0
1969/70				
Quantity ('000 tonnes)	224	648	28	299
Value (₦m.)	64.6	38.2	2.3	17.1
1970/71				
Quantity ('000 tonnes)	302	307	31	307
Value (₦m.)	89.8	19.2	2.8	18.1
1971/72				
Quantity ('000 tonnes)	254	307	19[a]	235[a]
Value (₦m.)	71.3	24.3	1.7	13.9
1972/73				
Quantity ('000 tonnes)	241	559	14	231
Value (₦m.)	101.1	19.1	-	-
1973/74				
Quantity ('000 tonnes)	215	44	26	306
Value (₦m.)	159.0	6.8	-	-
1974/75				
Quantity ('000 tonnes)	205	162	66	250
Value (₦m.)	181.0	0.2	-	-
1975/76				
Quantity ('000 tonnes)	225	100	35	170
Value (₦m.)	218.9	0.1	-	-
1976/77				
Quantity ('000 tonnes)	121	12	-	154
Value (₦m.)	321.3	-	-	-

[a] = January - October only

- = Not available

Source: Economic and Financial Review, Central Bank of Nigeria Vol.2 No.1, 1970.

The importance of vegetable oils in the economy derives from their simultaneous uses as basic local foods and as raw materials for local and foreign processing industries. Consequently when world prices fall there is still a growing market within the country to attract producers. Besides, the local processing of oilseeds into oils and by-products has created more industries, employment opportunities coupled with increased facilities for the acquisition of technical skills so much needed for the development of the country.

State of the Industry

2.2 *Palm Oil*

Over sixty-five large palm oil mills exist, while many state-owned 'Pioneer Oil Mills' are scattered mainly in the Eastern States (Anambra and Imo States) and Cross River State, Bendel and Oyo States. Production of palm oil in the East is recovering as witnessed by the increasing purchases of palm kernels by the States Marketing Board to 60 percent of the pre-war normal in 1971. This recovery in palm oil production is being channelled to domestic consumption rather than to the marketing boards, as the producers obtain a much better price from the local markets or to small middle-men than to local buying agents (LBA's) at the basic producer prices. Palm oil that can be directly controlled by the marketing board is that relatively small amount produced on a few estates and by the functioning pioneer oil mills.

Current production capacity is estimated at over 500,000 tonnes ffb, (Palm Pro. Board, 1980). However, the high domestic prices now compared

to the pre-civil war prices seem to indicate a continuing deficit in domestic consumption requirements that could absorb the further recovery in production. Added to this are domestic industrial requirements of oil of some 35,000 tonnes (Palm Pro. Board '80) primarily for the manufacture of soaps and candles. Relatively smaller amounts are used in the manufacture of edible products, principally cooking fats and margarine. At present, there are about four soap and one margarine manufacturing industries in the country which require palm oil. Three of the soap manufacturers are located in the East and one soap and margarine manufacturer in Lagos. They all purchase their oil from the marketing boards. Producing palm oil to meet domestic needs is therefore a major concern.

2.3 Palm Kernel Oil (PKO)

The palm kernel oil industry is relatively new in the country. Lacking a vast home market, its prices are determined by the world market trend which sometimes could be less than the cost of production.

There are five palm kernel crushing mills which process PKO for the Palm Produce Board at an agreed fee per tonne of raw materials crushed. The palm produce board in turn exports the palm kernel oil. These plants produce a reasonable tonnage of palm kernel oil for export and domestic market each year.

The quality of the oil export, in terms of the colour and free fatty acid content, is not easily controlled by the processors who process only on behalf of and for the Palm Produce Boards.

Palm kernel oil is used locally primarily in high-quality soap and cosmetics, and to a lesser extent in the manufacture of magarine and cooking fats by a few local users and a multinational company. The local demand has been on the increase judging by the sales record of Vegetable Oils Nigeria (Limited).

2.4 Groundnut Oil Processing

Nigeria has been one of the largest producers of oil from groundnuts, dating as far back as the early forties. Although there are discrepancies in production figures, it is estimated that on the average, about 144,583 tonnes per year of groundnut oil was exported during the booming period (1960-1974), while sufficient quantity was available for domestic consumption. Nigeria has also been a leading exporter of the crop with generally 60 to 70% of production being exported as a key foreign exchange earner.

Although there are about ten groundnut oil mills in the country, all located in the North for proximity to the production areas, they are partly owned and controlled by expatriate investors with the exception of one which is controlled by a state Government (Kano State). Eight of the mills can be found in Kano with one each located in Zaria and Maiduguri. The industry which originally was established to crush groundnuts and produce crude oil and cake, had expanded its production programme to include semi-refined groundnut oil, groundnut cake and edible groundnut flour. These products are sold within Nigeria mainly to indigenous traders. Institutions and households form the bulk of the consuming market for groundnut oil, while the livestock

feed industry and government research institutes utilize the groundnut cake for the manufacture of livestock feed.

Although the crushing industry has a capacity for processing about one million tonnes of oilseeds per year, at present no groundnuts are being processed and about three percent of the capacity is being used for cotton seed.

Today, neither groundnut oil nor groundnut crop is being exported as production of the crop has declined to a very low level. Instead, the country now allows importation of a blend of vegetable oils which is packaged by a few of the oil mills to meet domestic demand.

2.5 Cocoa Butter

Cocoa beans are currently processed into cocoa butter, cake and powder in a well-equipped and modern plant, owned by the Cocoa Industries (Nigeria) Limited located in Ikeja, Lagos State. The cocoa butter and cake are exported to various parts of the world, while the cocoa powder is sold to local as well as foreign industries for the manufacture of a number of beverages.

Cocoa butter presently has no home market as its processing into finished goods has not been established in the country. It is an essential ingredient in the chocolate industry and at the same time has a wide applicati· in the pharmaceutical and cosmetic industries.

2.6 Future Developments in the Vegetable Oil Industry

There is scope for expanding the vegetable oil industry to cover other oilseeds such as soya beans, coconut, melon seeds and benniseeds all of which are available and can offer further opportunities for investment. This will further expand the secondary processing sector including the manufacture of margarine and bakery fat.

CHAPTER 3

GOVERNMENT POLICY AND CONTROL OF THE VEGETABLE OILS INDUSTRY SECTOR

3.1 Policy Issues and Objectives

In recognition of the crucial importance of public policy for the growth, development and stability of the economy, the Federal Military Government enunciated a set of general policy measures as an important complement to the investment programmes articulated in the various industrial sectors of the economy. In respect of the agricultural sector, the government policy has been greatly influenced by the issues of income to farmers, raw material supply, and the export trade. In order to reduce the degree of income inequality as well as the rural to urban migration, policy measures have been taken to ensure higher producer prices to farmers as an incentive for higher income and production. The resulting increase in raw material supply will not only satisfy the domestic requirements but will greatly improve the sagging export trade of primary produce, semi-finished and finished products. In the agricultural sector, the export proceeds fell, for example, from a base of ₦375.6 million in 1970-71 to ₦247.8 million in 1972-73 from where it climbed back to ₦319.5 million in 1973-74. Since then the export trade has been dominated entirely by increases in both the price and output of crude oil.

Thus the overriding objectives of the government policy in respect of the various sectors of agriculture are:

(i) Ensuring food supplies in adequate quantity and quality to keep pace with increased population and urbanization, having regards to changing tastes and the need for fair and stable prices;

(ii) Expanding the production of export crops, with a view to increasing and further diversifying the country's foreign exchange earnings;

(iii) Significantly increasing the production of agricultural raw materials to support domestic manufacturing activities, especially in the field of agro-based industries in addition to export.

(iv) Creating rural employment opportunities to absorb more of the increasing labour force in the nation, and minimizing the tendency for inadequate and inefficient use of human resources in the rural areas generally; and

(v) Evolving appropriate institutional and administrative apparatus to facilitate a smooth integrated development of the agricultural potential of the country as a whole.

3.2 Commodity Boards

In pursuance of the above policy objectives, the main thrust of the policy measures taken by the then Federal Military Government was the reorganisation of the marketing board system. By Decree 29 of 1977, the Federal Military Government established the following seven Commodity Boards:-

1. The Nigerian Palm Produce Board which is responsible for palm oil, palm kernel and copra;

2. The Nigerian Groundnut Board to deal exclusively with groundnuts, soya, benniseed and sheanuts;

3. The Nigerian Grains Board which is responsible for maize, millet, wheat, rice, beans, and guinea corn;

4. The Nigerian Cocoa Board to deal with cocoa, coffee and tea;

5. The Nigerian Tuber and Roots Crops Board, whose main responsibility is for yam and cassava;

6. The Nigerian Cotton Board, which deals with cotton seed, cotton lint, and Kenaf; and

7. The Nigerian Rubber Board, dealing primarily with rubber.

These Boards, which were fashioned on the previous model of Marketing Boards, are entrusted with the task of:

a) buying crops at rural buying stations directly from producers at government fixed prices. The prices are fixed by the Head of State on the advice of the Technical Committee on Producer Prices.

b) ensuring the best conditions for the collection of the products and for their sale either on the domestic market or abroad at prices dictated by the Board;

c) collecting the largest possible amount of the commodities of the specified quality;

d) promoting the development and improvement of the areas in which the commodities are produced, and in particular, ensuring the supply of fertilizers, seeds and other technical pre-requisites for the various crops; and

c) collaborating in the implementation of the Federal Government's decisions as regards prices.

The implications of this decree with respect to the Vegetaboe Oils Industry are discussed below under the relevant Boards while its effects on the industry are discussed later in other chapters.

3.2.1 The Nigerian Palm Produce Board

The Nigerian Palm Produce Board (NPPB), with its headquarters in Calabar, purchases palm kernels from the palm oil/palm kernel crushing mills as well as local farmers. The crushed kernels are then sent by the NPPB to the processing mills to be processed for a fee dictated by the Board. The NPPB is responsible for the evacuation of the p/k oil and its sale in the local market and overseas. However, the decree does not prevent the processors from purchasing palm kernels directly from farmers and crushing mills. The main constraint is that the p/k oil emanating from such purchase must be sold by the processor either locally or to the NPPB which handles exclusively all overseas trade.

3.2.2 The Nigerian Groundnut Board

The Nigerian Groundnut Board (NGB), with its headquarters in Kano, purchases groundnuts from farmers and sells to processors on the basis of the ruling world market prices. The Board is also responsible for overseas sales of groundnut oil and cake. It is particularly important. in iew of the present acute shortage of raw materials, to note that the NGB is responsible for promoting the development and rehabilitation of the producing areas and ensuring adequate supply of fertilizers, improved seedlings and other technical inputs.

3.2.3 The Nigerian Cocoa Board

The Nigerian Cocoa Board (NCB), with its headquarters in Ibadan, consists of a chairman, a representative each from Ogun, Oyo and Ondo states (the major producing areas). The Central Bank of Nigeria, the Federal Ministries of Co-operatives, Agriculture, Rural Development, and Trade also have a representative each on the Board. In pursuance of the spirit of Decree 29 establishing the Board, the NCB carries out the following functions:

(a) Purchasing cocoa from farmers in conformity with the grades and standards of quality as prescribed under any enactment and at the price stipulated by the Federal Government.

(b) Supplying cocoa to processors for processing for a fee dictated by the Board.

(c) Engaging in the evacuation and subsequent sale of processed and semi-processed products for the domestic market and for the export of any surplus.

As in the case of other Boards, the NCB is also not invested with exclusive rights in relation to the purchase, sale or processing of these commodities in so far as the domestic market is concerned. The Board, however, has exclusive responsibility for the sale of any surplus of these commodities meant for export trade.

3.2.4 Financial Provisions

In the performance of their functions, the various Boards are financed by the Federal Government by way of loans or grants or otherwise howsoever.

Each Board is responsible for drawing up and presenting to the Federal Government for funding, its general development programme within the framework of the functions stipulated in the Decree 29 setting it up. Other resources of the Boards include money derived from the sale of commodities, and moneys earned or arising from any property or investments acquired by or vested in the particular Board.

3.3 Other Government Policies Relevant to the Vegetable Oils Industry

3.3.1 Overseas Purchase of Goods

There had been many reported cases of old machineries or sub-standard new machineries and spare parts being sold by foreign manufacturers to various industries in the country. In order to eradicate such practice, the then Federal Military Government promulgated a decree making it imperative for overseas manufacturers to subject any item costing more than ₦1,000 to inspection prior to shipment to Nigeria. A Swedish firm was entrusted with the responsibility of carrying out this pre-inspection of goods at some specific ports in the world. It is the responsibility of any company importing such goods to get firm quotations from the manufacturers and later process, through the Central Bank of Nigeria, the pre-inspection procedure form popularly called "Form M" in the country. Thus, such goods are never shipped to Nigeria until the formalities of Form M as well as the pre-inspection by the Swedish firm have been completed.

3.3.2 Indigenisation Policy

In pursuance of the free enterprise policy of the Federal Government of Nigeria, private as well as government ownership of plantations and processing mills are actively encouraged. However most of the mills and

plantations are owned by the various state governments. Participation by non-indigenes is normally guided by the Nigerian Enterprises Promotion Act (Schedule II) which restricts foreign participation in any industrial sector to a maximum of 40%. However, under the current Fourth National Development Plan (1980-85), the Federal Government has transferred agricultural production and processing from Schedule II to III of the Act which means that foreigners can now own up to 60% of the equity in an agricultural enterprise. This is intended to attract foreign private investment into this sector.

CHAPTER 4

RAW MATERIALS FOR THE VEGETABLE OIL INDUSTRY IN NIGERIA

This section presents a survey of the oil-bearing fruits and nuts which are available for the production of vegetable oils in the country.

The major sources from which the processing industry derives its raw materials include palm fruits, palm kernels, groundnuts, cotton seeds and cocoa. Others, which are available and not used at present but form potential sources of raw materials are the soya beans, benniseeds, melon seeds and coconuts.

Most of these crops are cultivated, but there are a few of them, especially palm and coconut fruits that are harvested from well-tended plantations as well as wild groves.

These oil-seeds and oil fruits are important sources of edible and non-edible industrial oil, cake and meal that are processed in Nigeria, and each one of them is treated with its description as follows.

4.1 OIL PALM

4.1.1 Sources

Field interviews indicated that the primary supply of oil palm fruits is from the small-holder plantations or from those that are owned by private farmers or Government Agricultural Corporations. Some fruits can also be harvested from the wild groves. Table 1b shows the yields obtained from four Government-owned plantations or estates which were visited.

4.1.2 Availability

Table 1b implies that the lowest yield is 3.86 tonnes of fresh fruit bunches (f.f.b.) per hectarage, while the highest stands at 6 tonnes, from the mangrove areas of the country. Further, it was also envisaged that it is possible to improve cultivation to a yield of 11 tonnes per hectare through careful and proper treatment of the farms.

Table 1b : Cultivation of Oil Palm in Four Government-Owned Estates

Name of Estate	Ecological Location	Hectarage (Hectares)	Annual Yield (tonnes)	Yield per Hectare (tonnes)
1. Calaro oil palm Estate	Mangrove (Cross river State)	4,700	28,200	6.00
2. Okitipupa Oil Palm Estate	Mangrove and fresh water (Ondo State)	7,700	30,000	3.90
3. Cowan Oil Palm Estate	Mangrove fresh water (Bendel State)	2,400	9,252	3.86
4. Ijebu Farm Project	Forest regrowth (Ogun State)	1,556	6,047	3.89

The total hectarage of the existing established oil palm plantations are given in Tables 2(a) and 2(b) while the estimated hectarage for the wild oil palm groves are given in Table 3. There are currently about 128,804 hectares

of established plantations and 75,460 hectares for the small holders plantations. Utilizing the approximate value of 4 tonnes/ha from the data provided in Table 1(b), the established and small holders plantations are capable of yielding respectively 515,216 and 301,840 tonnes of ffb every year. If these plantations are well tended such that the yield per hectare is increased considerably to 11 tonnes, they can potentially yield 2.25 million tonnes ffb every year. There are about 3,052,551 hectares of estimated wild oil palm groves which are capable of yielding annually between 4.08 and 5.46 million tonnes ffb, calculated on the basis of 1.34 to 1.79 tonnes per hectare.

Thus, if the over-mature palm groves are rehabilitated and new plantations are developed with new palm seedlings from the Nigerian Institute for Oil Palm Research, an estimated projected resource of well over 3 million tonnes per year of fresh fruits can be anticipated.

4.1.3 Quality

The quality of fresh fruit bunches (FFB) is classified into four grades:-

(a) Unripe bunches

(b) Ripe bunches

(c) Over-ripe bunches and

(d) Poorly pollinated bunches.

Ripe bunches have high oil extraction rate with reasonable amount of free fatty acids (3-5%).

Unripe bunches produce oil with low extraction rate but with minimum free fatty acid content (0.2-0.3%).

Over-ripe bunches have reasonable oil extraction rate but contain very high percentage of free fatty acids (7-10%).

A conservative estimate puts the production of about 2 tonnes of oil and kernel from 6 tonnes of fresh fruit bunches, while the by-products of 4 tonnes consist of shells, fibre and empty bunches.

It has been established that the relative proportion of oil to kernel from the fresh fruit bunches (ffb) differs slightly when the fruits are harvested from the wild palm groves, but they differ greatly (ratio 5 to 1) when the fruits are harvested from the well-tended plantations.

4.1.4 Price

The price per tonne of ffb from the plantations varies between ₦20.00 and ₦27.50 while that for ffb from the wild groves ranges from ₦18.00 to ₦22.50. The price to be paid for the processed palm oil is dictated by the free fatty acid (ffa) content. The best quality with very low ffa attracts a price per tonne of ₦840.00 while the type with high ffa (greater than 5%) attracts a price of ₦400.00 per tonne. The high ffa content of oil from a mill such as the Calaro can be ascribed to the rather long period of delay between harvesting and processing due to transportation problem. A user industry such as the Lever Brothers (Nigeria) Limited import oil with low ffa since the ffa contents of most of the oils from the various mills are considered by the company to be rather high.

Table 2 (a). Established Oil Plantations

State	Hectarage (Ha)	POTENTIAL YIELD TONNES/YEAR				
		FFB	PALM OIL	PALM KERNELS	P/K OIL	CAKE/PELLETS
Anambra	9,984	109,824	22,564	4,393	2,021	2,196
Bendel	19,424	213,653	43,897	8,546	3,931	4,273
Benue	125	1,375	283	55	25	27
Cross River	46,473	511,203	105,028	20,448	9,406	10,224
Gongola	300	3,300	678	132	61	66
Imo	21,298	234,278	48,135	9,371	4,311	4,685
Kwara	85	935	192	37	17	18
Lagos	305	3,355	689	134	62	67
Niger	59	649	133	26	12	13
Ogun	5,616	61,776	12,692	2,471	1,137	-
Ondo	13,863	152,493	31,330	6,100	2,806	3,050
Oyo	813	8,943	1,838	358	165	179
Plateau	-	-	-	-	-	-
Rivers	10,459	115,049	23,267	4,602	2,117	2,301
Total	128,804	1,416,833	290,726	56,673	26,071	27,099

Table 2 (b). Small Holders (Established Plantations)

State	Hectarage	POTENTIAL YIELD TONNES/YEAR				
		FFB	PALM OIL	PALM KERNELS	P/K OIL	CAKE/PELLETS
Anambra	7,250.6	79,757	18,852	3,190	1,467	1,595
Bendel	9,431.5	103,747	21,315	4,150	1,909	2,075
Benue	125.0	1,375	283	55	25	28
Cross Rivers	32,960.3	362,563	74,490	14,503	6,671	7,251
Gongola	194.0	2,134	438	85	39	42
Imo	15,533	170,862	35,104	6,834	3,143	3,417
Kwara	84.8	933	191	37	17	18
Lagos	15.0	165	34	67	3	3
Niger	59.0	649	133	26	12	13
Ogun	367.1	4,038	830	161	74	80
Ondo	1,720.0	18,920	3,387	754	348	378
Oyo	260.4	2,864	588	114	52	57
Plateau	-	-	-	-	-	-
Rivers	7,459.0	82,049	16,857	32,282	1,510	1,641
Total	75,459.7	830,056	172,502	33,201	15,270	16,598

Table 3. Wild Oil Palm Groves

State	Estimated Hectarage	POTENTIAL YIELD TONNES/YR.				
		PALM OIL	PALM NUT	PALM KERNEL	P/K OIL	CAKE
Anambra	167,271	38,472	119,433	39,811	18,913	19,906
Bendel	596,055	137,093	425,583	141,861	65,256	70,930
Benue	597,400	160,402	497,943	165,981	76,351	82,990
Cross Rivers	600,000	138,000	428,400	142,800	65,688	71,400
Gongola	40,992	9,756	29,268	9,756	4,488	4,878
Imo	197,715	45,475	141,168	47,056	21,646	23,528
Kwara	3,500	805	2,499	833	383	416
Lagos	73,562	16,919	52,524	17,508	8,054	8,754
Niger	2,450	564	1,749	583	268	291
Ogun	136,000	31,280	97,104	32,368	14,889	16,184
Ondo	144,000	33,120	102,816	34,272	15,765	17,136
Oyo	264,000	60,720	188,496	62,832	28,903	31,416
Plateau	94,050	21,632	67,152	22,384	10,297	11,192
Rivers	134,556	30,948	96,072	32,024	14,731	16,012
Total	3,051,551	724,858	2,250,207	750,069	345,032	375,033

Table 4. Quality and Price of Palm Oil and Kernel

Name of Estate	Nature of Free Fatty Acid content (ffa)	Price per Tonne of Palm Oil	Price per tonne of Palm Kernel
Cowan Oil Palm Estate	Very low ffa (special grade palm oil - S.P.O.)	₦840.00	₦169.74
Okitipupa Oil Palm Estate	Low ffa	650.00	200.00
Calaro Oil Palm Estate	High ffa (technical palm oil - T.P.O.)	400.00	180.00

4.2 GROUNDNUTS

4.2.1 Source and Variety

Groundnuts (Arachis hypogea) are grown on commercial basis in small-holder farms in the Northern states where ecological conditions are more suited to their cultivation. The crop thrives well in light and well-drained soils, short, wet seasons and plenty of sunshine. The producing states are mostly Kano, Bauchi, Kaduna, Niger, Gongola and Plateau (see map). Small subsistence cultivation is practised in Kwara state and some parts of Eastern Nigeria.

Small-kernelled Virginias are the most commonly grown varietal group, but spanish groundnuts have been introduced in an attempt to improve the stock.

4.2.2 Availability

The total groundnut production in the country in 1968/69 excluding wastage, was 1,363,190 tonnes (Federal Office of Statistics, 1969). Making allowance for a substantial export trade in groundnuts, nearly 763,393 tonnes were available within the country for internal uses like oil pressing, seed purposes and consumption as food. Out of the available groundnuts remaining in the country, about 134,113 tonnes were purchased by local crushing mills

for processing into oil and cake. Table 5 shows the decreasing trend of availability of groundnuts for crushing in the mills.

The production of groundnuts since the 1971/72 season has declined very sharply to the extent that the demand of the local crushing industry had scarcely been met in each subsequent season. Production figures since 1970/1971 season dropped below the 400,000 tonnes mark except during the 1972/73 season. The trend in export of groundnuts has similarly been adversely affected. Since the 1972/73 season no exports have been reported.

The decline in overall production can be attributed to the following reasons:-

(i) Unfavourable weather, particularly too short growing seasons, the drought of 1973/74 and the serious local shortages of seed which followed the drought of 1973.

(ii) The rosette virus epidemic of 1975 which affected about 0.7 million hectares and resulted in a total or near total loss of crop and seed to most farmers involved.

(iii) Scarcity and cost of labour and lack of cash to pay for labour and other inputs.

(iv) The production of other cash and food crops and the rural to urban migration of farmers for other employment opportunities rather than growing groundnuts.

(v) Inadequate extension and advisory services to farmers.

(vi) Scarcity of fertilizer, seed dressing and improved seed.

(vii) Losses of crop through smuggling to neighbouring countries for foreign exchange rather than for better prices.

(viii) Monetary arrangements for groundnuts purchase which tend to discourage farmers.

It can be seen that there are so many factors which tend to militate against the production of groundnuts. In order to reverse the decreasing trend, the Federal and State Governments have initiated programmes which if successfully carried out will restore increased production. Among the measures being considered are:-

(i) Breeding varieties resistant to rosette and foliar diseases.

(ii) Breeding varieties for short season and dry areas.

(iii) Chemical control of pests, diseases and weeds and provision of such chemicals and sprays to farmers.

(iv) Development of labour saving devices to make farmers less dependent on hired labour for planting, weeding, harvesting and shelling.

(v) Supply of appropriate fertilizer to farmers.

(vi) Multiplication and distribution of improved varieties with high yield and disease resistance.

(vii) Strengthening of agricultural extension services in all fields.

(viii) Reviewing the pricing policy taking into account inflation and the price of competing products rather than only the world market price.

(ix) Re-introduction of checking points by Produce Inspectors in order to curtail illegal movements of groundnuts.

FIGURE 1- MAP OF NIGERIA SHOWING VEGETABLE OIL SEEDS

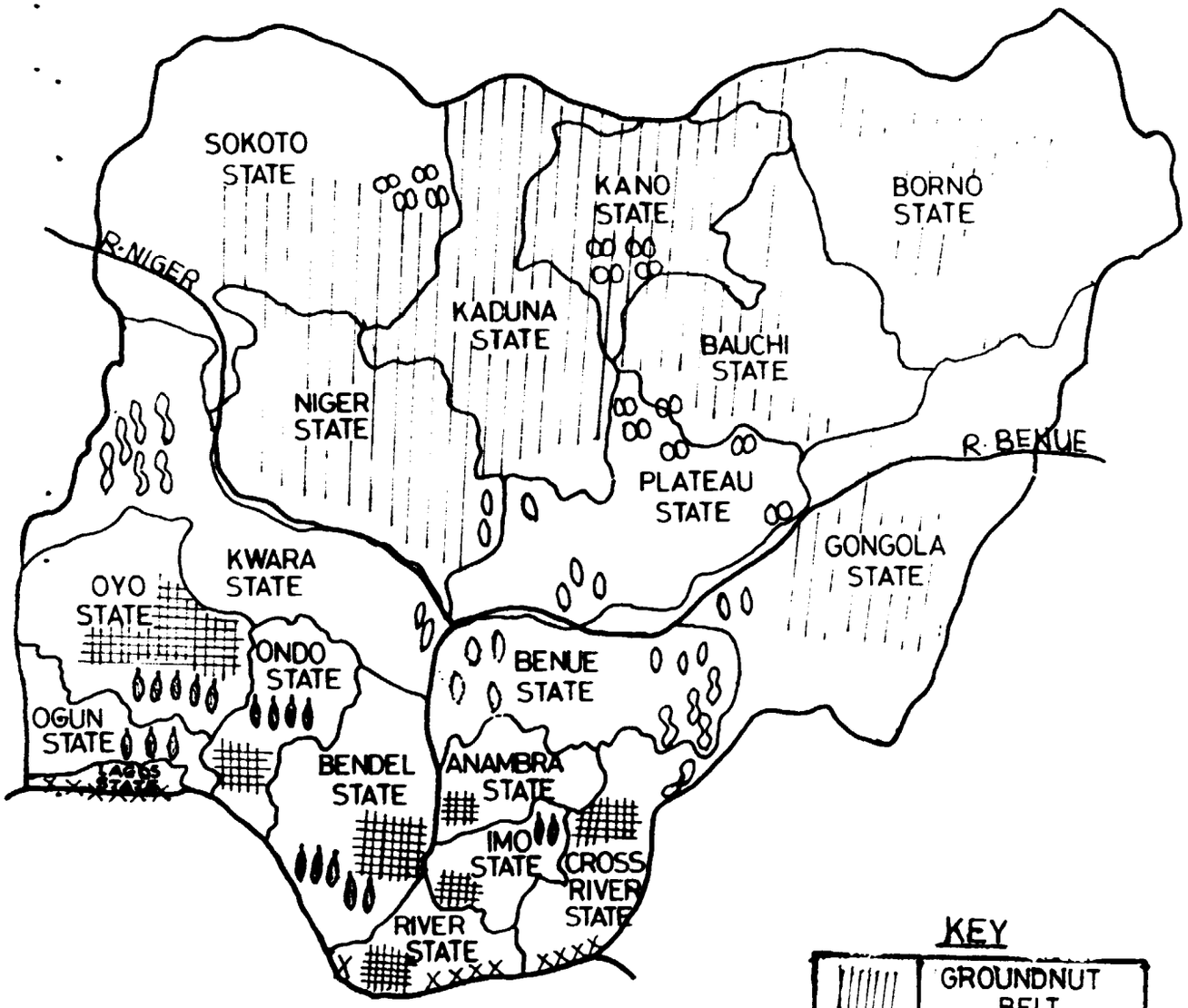


Table 5. Production Statistics of Groundnuts as determined by total Purchase during the period 1966/67 - 1978/79 (Tonnes)

Year	Marketing Board Purchases	Purchases by local processors	Produce Prices (₦/tonne)	Exports
1966/67	1,026,426	302,951	64.28	723,476
1967/68	683,720	285,617	58.00	399,103
1968/69	763,373	134,113	52.00	629,260
1969/70	645,000	348,623	60.00	285,000
1970/71	381,000	191,306	63.00	88,000
1971/72	301,000	209,321	67.00	91,800
1972/73	501,000	298,500	80.00	242,500
1973/74	42,202	42,202	94.25	-
1974/75	161,376	161,376	165.00	-
1975/76	42,166	42,166	250.00	-
1976/77	12,000	12,000	250.00	-
1977/78	50	50	275.00	-
1978/79	184	184	290.00	-

Source: Nigerian Groundnut Board, Kano.

4.2.3 Prices and Purchases of Groundnuts

Prices and purchases of groundnuts are controlled by the Nigerian Groundnut Board (NGB), a body formed from the Northern States Marketing Board. The NGB acquires groundnuts through Licensed Buying Agents (LBAs) who buy from farmers at a fixed producer price and deliver to the nearest depot. Produce Inspection Staff grade the groundnuts and issue to the LBAs a Board store receipt after certifying the weights to be correct. The LBAs are paid for the groundnuts after presenting the Board's store receipt to their nominated banks.

Over the years (Table 5), despite the declining production, there has been an upward trend of producer prices. For example, in 1967/68, when over 1 million tonnes were purchased, the producer price was a mere ₦68.00 per tonne. In 1976/77 with production levels below 40,000 tonnes, producer prices increased to ₦250.00. Many reasons have been attributed to the high increase in producer price, the major ones being:-

(a) increase in production cost of groundnuts as a result of high labour cost and the increase in selling prices of alternative crops,

(b) the freedom for middle men to buy groundnuts directly from farmers, and the tendency for them to pay much higher prices than fixed producer price and the world market price, thus aggravating the inflationary cost of groundnuts.

Prices for local processors are normally based on agreed CIF world market prices minus Board's export expenses.

4.2.4 Quality Requirements

Quality requirements for groundnuts processed in Nigeria have been based on international requirements introduced for the export trade. Thus groundnut kernels destined for domestic processing are expected to be in good condition and conform to these specifications.

(i) Cleanliness

Extraneous matter normally allowed should not exceed 2 percent. Groundnuts should also be treated to ensure they are free from insect infestation at time of processing.

(ii) Moisture Content

The maximum moisture content which is normally acceptable is 9-10 percent. A moisture content above that level encourages mould growth and leads to an unacceptable loss in weight on processing.

(iii) Oil Content

Groundnuts for oil extraction should have a relatively high oil content at least not less than 47 percent. Edible groundnuts of the Hand Picked Selected (HPS) grade are however, expected to have lower oil content, that is of 42 to 45 percent range.

(iv) Free Fatty Acid (FFA)

Free fatty acid content of the oil must be less than 3 percent. Any excess above 3 percent is to be paid for by the seller at the rate of 1% of the contract price for each 1% FFA up to and including 7% FFA. Over 7% FFA and up to 10% FFA is to be paid for by the

seller at the rate of 2% of the contract price. This penalty for FFA content of groundnuts is not strictly adhered to when dealing with domestic buyers, but for the export trade, it is very important.

4.3 COCOA BEANS

4.3.1 Sources

The unfermented cocoa beans are cropped from the cocoa trees (cocoa) that abound extensively in privately owned plantations in Ogun, Oyo and Ondo states where the growing conditions as required by the cocoa tree are conducive to fungus attack on the pods. The local farmers that own these plantations make use of artificial drying methods for the fermented beans. Most of the plantations are inter-cropped with patches of kola-nut trees and palm trees.

Yields vary a great deal and can be as low as 90 kilogrammes per acre which is equivalent to about a kilogramme of dried fermented beans, while in some very fertile plantations the yield can be as high as over 300 kilogrammes per acre.

4.3.2 Availability

Although it is difficult to estimate the total hectarage of the existing plantations, it is on the other hand easy to determine the level of production of cocoa beans through the Nigerian Cocoa Board which is the main purchasing and distribution agency of the product. In order to improve the production level which is presently declining, the Cocoa Development Units controlled by the

states and the Extension services of the states Ministries of Agriculture are indeed primarily responsible for cocoa regeneration and production.

Cocoa production in Nigeria which had reached a peak of about 308,000 tonnes during the 1970/71 season has steeply declined to 165,000 tonnes by the 1976/77 season. However, the level of production rose to about 206,000 tonnes during the 1977/78 season and it again declined to 140,000 tonnes by the end of 1978/79 season which witnessed very poor weather conditions.

According to the forecast from the Nigerian Cocoa Board, the output during the current 1979/80 season, is expected to register about 15 percent above the previous season's crop. This increase in production is likely to occur inspite of the relatively poor weather conditions during the current season.

4.3.3 Quality

Majority of the raw (fermented) cocoa beans produced by the local farmers are generally made to be clean, plump and well fermented before they are ever accepted by the various categories of licensed buying agents who purchase these cocoa beans for the Nigerian Cocoa Board. The cocoa beans are subjected to regular check tests so that when cut, the nib should range in colour from purple to full brown. Hence these cocoa beans are generally found to be uniform in flavour and quality and chocolate made from them is similarly constant if a specific process is used.

Nigerian cocoa beans are grouped into two grades according to their quality. The top quality beans are classified as Grade I cocoa whose composition consists of fully fermented beans with less than one percent of this composition as either slatty or mouldy or shrivelled beans respectively.

4.3.4 Price

The quality of cocoa beans has some economic importance as Grade I cocoa was purchased at a price of ₦1,200.00 per tonne by the Nigerian Cocoa Board during 1979/80 season while Grade II cocoa was purchased at ₦1,170.00 per tonne.

However, before exportation or distribution to the cocoa processing industry in Nigeria, the cocoa beans are subjected to regular check tests commensurate with international standards. Generally, the graded cocoa beans leave the Nigerian Cocoa Board to the market whether at home or abroad at a world price of ₦1,030.00 per tonne and this price has been consistent since 1978 when it rose from the 1977 world price of ₦660.00 per tonne.

4.4 COTTON SEED (GOSSYPIUM HIRSUTUM)

4.4.1 Source

To the economy of the country, cotton seed is perhaps next in importance to groundnuts. About 95 percent of the cotton produced in Nigeria is grown in the North, being particularly concentrated in the North-Western states (see map).

4.4.2 Availability

Due to continuous increase in the cotton crop, there has been a corresponding increase in the output of cotton seeds by the ginneries. In 1970, a total quantity of 94,501 tonnes of cotton seeds valued at ₦4,197,920.00 was exported from the country. Available quantities purchased by the Cotton Board, the controlling body during the period 1972/73 to 1977/78 are shown in Table 6. It will be seen that quantities purchased by the Board fluctuated indicating an unstable production pattern during the period. The largest

purchase made by the Board was during the 1976/77 season (212,576 tonnes).

4.4.3 Quality Requirements

Quality characteristics for Nigerian cotton seed generally follow those used in world trade.

Extraneous matter not more than 2 percent.

Oil content not less than 19 percent.

Free fatty acid (as Oleic acid) not exceeding 2.8 percent.

Moisture content not more than 12 percent.

4.4.4 Prices

Producer prices paid by the Cotton Board are given in Table 6. Prices have more than doubled since the 1974/75 season.

Table 6. Purchase and Producer Prices of Cotton Seed - 1972/73 to 1977/78

Year	Cotton Board's Purchases (tonnes)	Producer Prices (₦ per tonne)
1972/73	143,490	132.00
1973/74	86,110	132.00
1974/75	140,026	308.00
1975/76	70,125	308.00
1976/77	212,376	330.00
1977/78	N.A.	330.00

Source: Extracted from Economic and Financial Review, Central Bank of Nigeria, Vol.16, No.1, 1978.

N. A. = Not Available.

4.5 SOYABEANS

4.5.1 Source

Soyabean (Glycine Max) is a relatively new crop in Nigeria where production is at present concentrated in the "middle belt" especially in Benue State. The producing belt coincides with the Tiv beniseed region, but there is little direct competition between the two crops since soyabeans are normally planted on newly broken fallow in July and August.

4.5.2 Availability

Present production (Table 7) is all exported. The slow development and cultivation of soyabeans have been due to lack of interest by prospective processors and the limited local market. Further, little local taste has been developed for soyabeans and therefore it becomes difficult to hold the interest of local farmers.

Benue state has recently expressed interest to encourage and increase its production to support an oil mill industry soon to be established.

4.5.3 Prices

The Nigerian Groundnut Board at present is the sole purchaser of soyabeans for export. Producer Prices as shown in Table 7 have remained low in comparison with those for other oil seeds. The 1977/78 season, however, saw a sharp increase in price. Current producer price (not shown in Table 7) has been fixed for ₦300.00 per tonne.

4.5.4 Quality

No quality standards have been prescribed for soya beans grown in Nigeria. The crop is highly resistant to insect infestation and can withstand long storage periods without deterioration when unhulled.

Table 7. Purchases and Producer Prices of Soya Beans

Year	Marketing Board's Purchases (tonnes)	Producer Prices (₦ per tonne)
1972/73	2,003	47.00
1973/74	872	49.00
1974/75	558	99.00
1975/76	1,100	99.00
1976/77	-	99.00
1977/78	-	290.00

Source: Extracted from Economic and Financial Review, Central Bank of Nigeria. Vol.16, No.1, 1978.

- = Not available.

4.6 BENNI-SEED

4.6.1 Source

The cultivation of benniseed (sesamum indicum) is restricted to a few districts in the "middle belt" where it is practically the monopoly of the Tiv People. In this area, benniseed is an important cash crop, but the low yields of 68.2 to 90.9 kg per acre give a poor cash return. It is usually planted within the first rains on land previously occupied by corn or soyabeans.

Experimental work to improve production indicates that farm yields could readily be doubled or trebled. Up to 364 kg per acre have been recorded in experimental trials.

4.6.2 Availability

Purchases made by the Marketing Board (Table 8) give an idea of available quantities. Less than 4,000 tonnes were purchased annually throughout the 1972/73 to 1974/75 seasons. Purchases for 1975/76 season were relatively high (5,000 tonnes) but suddenly dropped to less than 2,000 in the following season. Although a few thousand tonnes are consumed as a cooking ingredient, it will presumably continue to be produced mainly for export. The government would like to see more benniseed grown for animal feed so as to encourage the livestock industry.

Table 8. Purchases and Producer Prices of Benniseed

Year	Marketing Board's Purchases (tonnes)	Producer Prices (₦ per tonne)
1972/73	3,648	102.00
1973/74	3,131	109.00
1974/75	3,919	264.00
1975/76	5,000	264.00
1976/77	1,802	264.00
1977/78	-	290.00

Source: Extracted from Economic and Financial Review, Central Bank of Nigeria. Vol.16, No.1, 1978.

- = Not available.

Table 9. Availability of Selected Oil Seeds.

Commodity	Quantity Available in 1968/69 (1,000 tonnes)	Percentage Increase		
		1975	1980	1985
Groundnuts	263.139	18.3	33.2	33.3
Soyabeans	38.914	18.3	33.2	33.3
Melonseeds	52.510	18.3	33.2	33.3
Benniseeds	38.185	18.3	33.2	33.3

Source: Extracted from Economic and Financial Review, Central Bank of Nigeria. Vol.16, No.1, 1978.

4.7 COCONUT (COCOS NUCIFERA)

4.7.1 Source

Nigeria apparently has good conditions along the coastal sands West of Lagos, and the fresh water coastal swamps for production of coconuts. Similar areas have also been identified as suitable for coconut cultivation. These are the sandy soils along Badagry, Eje, Ijeji, Opobo and Eket in the Cross River State and the Delta.

4.7.2 Availability

Currently no significant large scale coconut projects exist. Developments so far in coconut plantation are about to be commenced in what could become one of the more important sources of export earnings in the form of copra, coconut oil and cake.

The Palm Produce Board in Calabar has plans to begin a large-scale plantation which will support a processing plant.

Lagos State Government has similarly placed coconut growing high on its list of projects. Already, a company - The Coconut Industries Limited - has been established for an intergrated plant. This will include coconut cultivation, oil extraction and coir fibre processing.

CHAPTER 5

EXISTING PROCESSING TECHNIQUES

5.1 General

Out of the available oil-bearing seeds and nuts in the country only palm fruits, palm kernels,groundnuts, cotton seed and cocoa beans are processed on a commercial scale into oils and fat. Melon seeds to a limited extent are processed into oil but only on a cottage level.

5.2 Palm Oil

The major share of palm oil produced is processed using traditional methods, although in recent years modern methods have been introduced.

In the traditional process, fruit bunches are sterilized in large drums or earthen-ware pots with pounding before and after boiling. This loosens the fruit and ruptures the cells to enable oil to be extracted. The pounded fruit is treated with water and heated to allow the oil to rise to the top. The oil is then skimmed off and finally boiled to remove water. This process is inefficient and produces oil with high free fatty acid content which is not suitable for industrial application.

Power-operated screw and hand presses were later introduced and are operated by some producers. Many of these presses, however, have been overtaken by the well-known Stork hydraulic press which enables a much higher extraction of oil from the fruits. The oil produced by this process is of better quality, being lower in free fatty acid.

Palm oil plantations integrated with fully mechanised oil mills have recently emerged. They produce oil of a much better quality and many of

them are well managed and are profitable investments.

5.3 Palm Kernel Oil

Palm Kernel Oil is produced by passing palm kernels through various stages. The kernels are shelled prior to arrival at the crushing factory. This is accomplished either by hand or by machines. The former method is done by women and children in the villages and is slow and irksome. The latter method is usually followed in the commercial oil mills and involves power driven centrifugal mills. It is fast, but unfortunately it produces highly bruised and damaged kernels. This defect seriously affects the quality of the oil obtained. In contrast, the village method rarely gives damaged kernels and a good, quality oil can be obtained from them.

In some oil mills, the kernels are passed into breakers which break them into bits before they are encrushed into a meal. Expellers are used to extract the oil after the meal has been heated in kettles. The extracted oil goes through a clarification process before passing into storage tanks.

In the modern solvent extraction plant, the pre-pressed cake and hydrocarbon solvent are brought into contact at a temperature of 55°C. The resulting miscella (mixture of oil and solvent) is then separated in a distillation column. Out of the five existing oil mills for palm kernel oil in the country, only one (VON) uses mechanical expellers. All the others use the more efficient and energy saving solvent extraction process.

5.4 Groundnut Oil

Both the traditional and modern technologies for processing groundnuts into oil exist. The village process involves boiling and pounding to extract the

oil. This system is inefficient and the oil so extracted is crude and low in quality.

On the commercial scale, mechanical screw expellers only or pre-pressing with expellers followed by solvent extraction are in use. The latter gives higher yields of oil with less than 2 percent of a residual oil content in the cake. Oil refining using open kettle process is employed.

5.5 Cotton Seed Oil

Cotton seed oil can be extracted by both the expeller and solvent processes. Prior to being fed into the expeller or coming into contact with solvent, the lint must be removed from the seeds and the seeds decorticated and reduced to flakes are then fed into expellers or brought into contact with hexane and later distilled to obtain cotton seed oil.

CHAPTER 6

MARKETING AND DISTRIBUTION OF VEGETABLE OILS AND BY-PRODUCTS

The marketing and distribution of some vegetable oils are entrusted to various Commodity Boards like the Nigerian Palm Produce Board, the Nigerian Cocoa Board and the Nigerian Groundnut Board and Nigerian Cotton Board.

The Nigerian Palm Produce Board evacuates Palm Kernels from various mills all over the country to other processors to produce palm kernel oil and meals/pellets. The Board exports the bulk of these products including palm kernels that could not be sold locally to world markets. During the last trading year, the Board handled 200,000 tonnes of palm kernels for which it could not provide adequate storage facilities, and so, over 50,000 tonnes of Palm Kernel cake/pellets were left in the open with the attendant risk of loss or deterioration. None the less, during the current trading year, the Board plans to handle 300,000 tonnes of palm kernels and 80,000 tonnes of palm oil and palm kernel cake/pellets. The price stabilization policy of the Board has not helped the processors to break-even because the production cost which is higher than the purchasing price of the processed product, has been continuously on the increase. Most of these processors manage to break even from income resulting from auxilliary services.

At any rate, it is obvious that Nigeria loses substantial foreign exchange annually by its export of palm kernel and by its imports of such consumer goods such as edible oils, soap, candles and cosmetics.

The Cocoa Board handles the exportation of cocoa beans after the product must have been graded according to international standards. After regular check tests to confirm grades the huge bulk that cannot be processed locally by the only cocoa processing industry (the Cocoa Industry Ltd.), is exported by the Board to world markets at a price below the purchasing price, because of the Board's policy of price incentive to the producers of cocoa beans. On the other hand, the home processor of cocoa beans, has not benefitted from the price stabilization Policy of the Board because the home industry buys cocoa beans from the Board at the world's price which does not reflect the increasing production cost at home.

During the 1978/79 season, the Board handled about 137,000 tonnes of cocoa beans, inclusive of the 24,000 to 30,000 tonnes for home consumption. The forecast for cocoa production for 1979/80 season has been put at 175,000 tonnes by some world experts. This figure is more or less unchanged during the season, according to the "April 22 Report" of the London Cocoa Traders, (Gill and Dunfus, 1980).

The Groundnut Board is in charge of distribution of groundnuts to the local industries processing them into groundnut oil, and the Board also has the sole responsibility of exporting the leftover that could not be processed locally. This used to be the situation before the disappearance of the huge pyramids of groundnuts.

Currently, the production of groundnuts cannot even meet the domestic demands. Hence processors have resulted to importation of groundnut oils and other vegetable oils from other countries. The last major exportation

of groundnuts and allied products occured in 1974 when Nigeria exported about ₦45 million worth of groundnuts, about ₦18 million worth of groundnut cake and about ₦27 million worth of groundnut oil. As the exportation of the groundnuts and allied products continued to fall, the importation of Animal and Vegetable oils continued to rise from an average monthly importation of ₦$\frac{1}{2}$ million worth of these commodities in 1974 to over an average monthly importation of over ₦3 million worth by 1977. According to the report from the Central Bank of Nigeria, the actual importation in 1977 was about ₦43 million (₦42,849,000.00), and this has increased to about ₦82 million (₦81,856,000.00) worth of the commodities by 1978. The quantity imported has continued to rise steadily up till now.

Other vegetable oils like melon seed oils and imported Soya bean oils are sold directly to the public through wholesalers or retailers, who purchase them directly from the processors. Some other imported vegetable oils are currently found in the local markets and shops at various prices.

In Lagos, which is a highly-industrialised and major commercial centre in the country, the following current prices for certain vegetable oils do prevail. One type of imported vegetable oil, labelled "NOREX" and packaged in Nigeria, attracts a wholesale price of ₦17.00 per 18 litres while its retail price is ₦18.00. Another imported type labelled "ANGEL" and similarly packaged in Nigeria, also attracts a wholesale price of ₦15.50 per a package containing 4 units of 3.785 litres each, while its retail price is ₦16.00. Yet another imported type of vegetable oil, considered to be superior, is labelled "GOLDEN CUP" and packaged in the country. Its wholesale price is ₦21.50

per a package containing 4 units of 3.785 litres each, while its retail price is ₦22.00. Generally, the prices vary according to transportation costs, and increase along the distribution channel from either the centre of off-loading on boardship (Lagos) or packaging Centre (Kano), to the various far distant localities.

The situation for the home-produced vegetable oils like palm oil, is more or less the same whereby the price increases from the production centre along the distribution channel to the other far distant areas. For example, unrefined palm oil in Cross River State with a factory price of ₦12.00 per 18 litres, attracts a retail price of ₦13.00 per 18 litres (when refined), at the same area which is far distant from Lagos. As soon as the same palm oil arrives in Lagos, its wholesale price is fixed at ₦14.00 per 18 litres, while its retail price is ₦15.00 if the purchaser provides his own container, or ₦16.00 if the purchaser has to obtain the seller's packaging materials.

There is generally no price stabilization for these vegetable oils as their prices are subject to supply and demand.

The effect of the first system of price structure which is stabilization, has been its successful implementation at the expense of the processors. The implementation has been possible because each one of the various Boards is a permanent part of the marketing and distribution system, enjoying monopoly powers. Although the Boards aim at reducing seasonal prices, it may also be encouraging to the processors for the Boards to also aim at equalizing market prices and production costs.

In the second system whereby there is no administrative machinery to enforce the general level of prices for any of the products, purchases are combined with buffer stock operations or hoarding which brings about higher consumer prices. In order to minimise this situation, the opening of Government "fair price shops" is desirable. Although the Federal Government has established the National Supply Company to combat higher consumer prices, the operational activities of the Company have to be improved and intensified, and include control of prices of the oil seeds that have not been placed under the jurisdiction of any Produce Board.

PART B

EVALUATION OF SELECTED VEGETABLE OIL INDUSTRIES

CHAPTER 7

METHODOLOGY

Questionnaires were developed and administered by mail to some selected processing industries. The questionnaire sought information in the following areas:-

(i) Basic information on each factory including year of commissioning, ownership, and factory location.

(ii) Raw materials processed, source of supply, prices, storage including problems encountered in procurement.

(iii) Management structure and employment strategy.

(iv) Production operations, plant capacity and efficiency.

(v) Products and by-products of each processing unit and their marketing.

(vi) Quality control facilities and tests undertaken.

(vii) Relationship of the factory with other industries.

(viii) Infrastructure including utilities.

(ix) Maintenance facilities and accessibility to spare parts.

The returns from the questionnaire were rather discouraging. Twenty two questionnaires were sent out and only five returned completed. Therefore, additionally,field visits were undertaken to three commodity Boards (Cocoa, Palm and Groundnuts) and six selected oil processors and one user industries. The industries studied represented a national coverage as they were selected from a wide geographical area of the country (the South, West, East and the North). The basis of selection was determined by the size and the level of

sophistication of the plant. Care was taken to include, for each type of vegetable oil processed a small and a large scale plant; as well as old and modern plants.

The data from the questionnaire were used as a supplement to the information gathered from the field visits. These formed the basis of information which provided an insight into the character of major problems faced by each factory and indicated possible solutions.

CHAPTER 8

PALM OIL SUB-SECTOR

8.1 Case Study 1: OKITIPUPA OIL PALM COMPANY LIMITED

8.1.1 Basic Information on Factory

The oil palm company whose location is at Okitipupa, about 100 kilometres from the nearest similar factory, has its mill commissioned in 1974 at a cost of two million Naira (₦2 million). The mill now owned by Ondo State was initially financed jointly by the World Bank, the Federal Government of Nigeria and the Ondo State Government. It is now financially dependent of the above sources and relies solely on self-generated revenue.

8.1.2 Management Structure and Employment Situation

The oil mill's management structure is divided into four distinct levels in the following order:

(i) the top management,

(ii) the middle management,

(iii) the skilled workers, and

(iv) the unskilled workers.

The top management level is made up of seven Nigerians and three expartriates with good educational background and adequate expertise in vegetable oil processing and marketing.

The middle management is composed of highly trained fourteen Nigerians who are mostly in the supervisory category. The skilled workers who man the processing equipment and machinery total up to 461, while the

number of unskilled workers is in the range of 3,765 and are basically involved in most of the phases of processing the oil palm.

The gross remuneration for all the employees total up to ₦3.4 million and divided up as per the following categories:-

No.	Group	Renumeration
10	Top Management -	₦121,000.00
14	Middle Management -	84,000.00
461	Skilled Workers -	708,420.00
3,765	Unskilled Workers -	2,541,372.00

The company's staff appear to be well paid and encouraged judging from the above figures. The management also expends 10 and 0.5 percent of the total payroll on housing facilities and medical care respectively. Aside from the fringe benefits, the company also contributes immensely to the level of employment in Okitipupa township.

8.1.3 Raw Material Supply

The company owns four plantations which cover an area of 7,700 hectares. There is an annual supply of 30,000 to 40,000 tonnes of raw materials both from the Company's own plantations and from the local farmers that operate under the auspices of the Small Holder Management Unit (SMU). The company mills palm oil fruits to produce palm oil and kernel, with fibre, shells and empty bunches as by-products.

These waste by-products are used as fuels to generate steam for thermal generation of electricity, while the empty bunches are burnt and the ashes used as fertiliser.

It is a good closed production system for the Company to make use of the waste products as its boilers source of fuel, since the total tonnage turn-over of waste products is greater than that of the finished products. For example, about 20 tonnes of fresh palm fruit bunches would yield 4 tonnes of palm oil, one tonne of palm kernel, and the remaining as waste products.

There is no storage facility provided for the raw materials. These fresh fruit bunches are received and tested for ripeness before processing.

The price paid by the Company for raw materials varies according to the market price of the palm oil. For example, during the first three months of this year, the Company paid ₦65.00 per tonne for the raw materials purchased from the local farmers.

8.1.4 Production Operation

In order to avoid rapid deterioration, the fresh fruits are processed daily. The daily receipt of consignment to the mill is generally between 100 and 150 tonnes while during the peak season (March - September) the consignment can increase to between 250 and 300 tonnes per day.

The mill operates on an eight-hour shift per day for 25 working days of the month throughout the year, so that an average daily processing of 120 tonnes of fresh fruit bunches is usually the target. However, during the peak periods (March - September), a daily processing of 250 to 300 tonnes on two shifts per day can be achieved.

The main constraint for expanding production is the problem encountered by the Management in acquiring more land for cultivation of raw materials.

Although the Land Use Decree of 1978 vested ownership of all lands in the Government, the original owners have simply refused to relinquish their ownership of the land. Another constraint coupled with the fore-mentioned one, is the lack of sufficient funds for operational costs of running the mill.

8.1.5 Technology Applied and Technical Efficiency

The first operation in the production process after receiving the fresh fruit bunches is to sterilize them by cooking in two steam sterilizers for about $1\frac{1}{2}$ hours at $140^{o}C$ at a pressure of 45 pounds per square inch. The purpose of sterilization is to soften the pericarp to facilitate oil recovery during digestion and pressing, to facilitate nut cracking by shrinking the kernels and to arrest the development of acidity which increases rapidly after cutting the fresh fruit bunches. The sterilizer door seal is the major part of the sterilizer needing frequent replacement and it has an estimated capacity expectancy of 4,000 tonnes FFB. After this, the required process temperature and pressure may be difficult to attain.

The next process after sterilization is to mechanically strip or separate fruits from the bunches. The separated fruits go into the fruit digester while the empty bunch is incinerated to ashes which are used as potash fertilizer on the Company's estate. The digester which operates at 90% efficiency mashes the fruits and detaches the pulp from the nut and the oil from the pulp. Oil separation from the digested mash is obtained using a hydraulic double screw press. The extraction efficiency of each press is tested regularly by examining the fibre for residual oil. The crude oil from the press is then

passed to a settling tank and then to a clarification tank where the oil is separated from water, sludge, vegetable debris and sand at a temperature of 100°C.

The sand and laterite content of the Okitipupa Oil Mill is quite high because there is no fruit washing system to remove abrasive foreign materials. The average sand content is about 2% of FFB. This means that 3.0 tonnes of sand pass through the expellers for every 150 tonnes FFB processed daily.

8.1.6 Quality Control

In order to ensure and maintain good quality of the finished products, the Company carries out laboratory tests during processing and afterwards. Further, a produce inspection is effected for the palm kernels before being evacuated by the Palm Produce Board.

8.1.7 Product Storage and Packaging

The Company has only one oil storage tank of 1,000 tonnes capacity which is sufficient for about 50 days of production. It has been included in the future expansion programme to have two nut conditioning/storage silos which will have a minimum storage capacity of thirty cubic metres each.

The palm oil is usually sold in drums or tins or tankers supplied by the purchasers while palm kernels are packaged in jute bags.

8.1.8 Infrastructure

The mill makes use of the water from the nearby river, although it is sometimes flooded. The Company generates its own power by steam turbines which make use of the waste products, shell and fibre as the boiler's source

of fuel. The steam from the turbine is also used for sterilization, digestion and the like. In actual fact, the power as generated from the steam turbine is just not sufficient for the factory, domestic and office uses. This is because the two steam turbine-driven alternators (installed in parallel), each have a capacity to supply the oil mill with 60 percent of the full load at maximum throughput, plus 20 percent additional capacity for domestic use. In addition, the company has a diesel generator to augment the power for both the domestic and office use. There is also a plan by the Company to install yet another diesel generator in parallel with the others.

The two palm estates owned by the Company, are situated in the riverine areas and are quite close to one another. However, due to the lack of bridges and poor road network, the raw materials are either conveyed through long distance and bad routes in the Company's own vehicles or by rafts owned by the Company.

8.1.9 Repair and Maintenance Facilities

The problem of availability of spare parts is something the company has been considering seriously. In Table 10 is a list of vital components that require frequent replacement and the estimated life expectancy of these critical components in terms of FFB throughout. This information allows the mill to place order for spare parts at the appropriate time and not to wait until a component malfunctions before ordering. The projected cost for spare parts replacement during each year of the 1980-85 quinquennum comes to ₦106,500, ₦115,980, ₦124,620, ₦153,440 and ₦196,320

Table 10. Life Expectancy of Vital Components in the Okitipupa Palm Oil Mill

Components	YEAR		1980-1981	1981-1982	1982-1983	1983-1984	1984-1985
	Anticipated ffb Throughput (tonnes)		43,501	53,188	64,208	73,599	84,658
	Unit Cost (₦)	ffb (tonnes)					
Steriliser Door Seals	70.00	4,000	700(10)*	700(10)	1,120(16)	1,260(18)	1,470(21)
Bucket Elevator	1,500.00	40,000	1,500 (1)	1,500 (1)	2,550(1½)	2,250(1½)	3,000 (2)
Digestor Arms (2)	6,200.00	15,000	15,500(2½)	15,500(2½)	24,800 (4)	24,800 (4)	37,200 (6)
Digestor Liners (2)	300.00	60,000	-	300 (1)	300 (1)	600 (2)	600 (2)
Press Screws (2)	6,100.00	25,000	12,200 (2)	12,200 (2)	12,200 (2)	18,300 (3)	18,300 (3)
Worm Lengthening for above(2)	1,000.00	25,000	2,000 (2)	2,000 (2)	2,000 (2)	3,000 (3)	3,000 (3)
Strainers for above (2)	1,600.00	30,000	1,600 (1)	1,600 (2)	1,600 (2)	4,800 (3)	4,800 (3)
Press Cages (2)	7,800.00	30,000	15,600 (2)	15,600 (2)	15,600 (2)	15,600 (2)	23,400 (3)
Nut Cracker Imbellers (2)	600.00	15,000	1,800 (3)	2,400 (4)	3,000 (5)	3,600 (6)	3,600 (6)
Nut Cracker Belts (2), Sizes 52 x 6 x 180	50.00	4,000	500(10)	500(10)	600(12)	700(14)	850(17)
Nut Elevator Belts	200.00	40,000	200 (1)	200 (1)	300(1½)	400 (2)	400 (2)
Pump Herstal (HCR 65 (2)	4,000.00	25,000	4,000 (1)	4,000 (1)	4,000 (1)	8,000 (2)	8,000 (2)
Spares for above Pumps:							
Herstal (RCR)	1,800.00	25,000	1,800 (1)	1,800 (1)	1,800 (1)	3,600 (2)	3,600 (2)
RCR 150' x (2)	12,000.00	40,000	12,000 (1)	12,000 (1)	-	-	12,000 (1)
Spares for above	3,000.00	40,000	3,000 (1)	3,000 (1)	-	3,000 (1)	3,000 (1)
Pulley Belts 70 x 20 x 250	250.00	20,000	500 (2)	500 (2)	750 (3)	750 (3)	1,000 (4)
Hydrocyclone Cones	1,300.00	2,500	23,400(18)	26,000(20)	31,200(24)	39,000(30)	44,200(34)
Centrifuge Wear Lines, Top and Bottom	2,400.00	25,000	4,800 (2)	4,800 (2)	7,200 (3)	7,200 (3)	9,600 (4)
Centrifuge Nozzles	240.00	10,000	960 (4)	1,200 (5)	1,440 (6)	1,680 (7)	1,920 (8)
Vibrating Screen Cloth Mesh 61	740.00	10,000	2,960 (4)	3,700 (5)	4,440 (6)	5,180 (7)	5,920 (8)
Vibrating Screen Cloth Mesh 3	740.00	20,000	1,480 (2)	1,480 (2)	2,220 (3)	2,220 (3)	2,960 (4)
Pipes and Fittings	5,000.00	-	5,000 (1)	7,500(1½)	7,000(3½)	7,000(3½)	8,000 (4)
TOTAL COST (₦)			106,500	115,980	124,620	153,440	196,320

( )* = Number required.

respectively. These figures have not taken inflation and in predictable price increases into consideration.

The mill has also investigated the possibility of having some of the spare parts manufactured locally by companies such as Werhan (Nigeria) Limited. Although these components will be manufactured locally at considerable savings to the company, their life expectancy invariably will be much shorter than imported ones. The considerably lower unit cost, however more than compensates for the shorter life expectancy. Some of the parts that the mill expects to be manufactured locally are:-

digester arms, digester liners, nut-cracker impellers, nut elevator belts, hydrocyclone cones, pipes and fittings.

Under the present situation, it is taking the Company between 12 to 15 months from the time an order is placed to the time a spare part is actually received. This period is distributed as follows:-

(i) 3 months to receive firm quotation from overseas manufacturers.

(ii) 3 - 4 months to process Form M (pre-inspection procedure form) with the Central Bank of Nigeria.

(iii) 3 - 4 months for manufactur packaging and overseas inspection prior to shipment to Nigeria. As of April 1, 1980, approved spare parts have been exempted from pre-inspection.

(iv) 2 - 3 months for final transportation and delivery to site.

For example, some important parts for which order was placed as far back as January 1979 had not been received as of March 1980. This implies

a partial shut down of the factory with possible retrenchment of some of its unskilled workers.

It is expected that with the recent waiver of pre-inspection requirement for spare parts and raw materials by the Federal Government, the waiting time for spare parts will be reduced by 6-8 months.

8.1.10 Marketing

After processing, the Company sells palm kernel to the Produce Board at ₦200.00 per tonne. This price fixed by the Palm Produce Board, has been constant for the past two or three years, although the cost of production has risen considerably. The palm oil is sold locally at ₦650.00 per tonne and this is a better price in comparison with the price of ₦400.00 per tonne fixed by the Palm Produce Board.

The evacuation of the palm kernels is by the Palm Produce Board but the Oil Mill provides the lorries for the transportation, which is paid for by the Board. The palm oil is sold to local purchasers who come directly to the mill with their containers to buy.

8.1.11 Major Constraints and Future Prospects

The Company could improve considerably its capacity utilization, if it were not because of the following pressing constraints.

(i) Difficulty in acquiring land for more plantations and even if the land is made available,

(ii) Limited funds for maintaining existing plantations and for purchasing mechanised implements for plantations.

(iii) The mill is yielding good revenue because its major product which is palm oil, attracts a high market price in the home market, unlike the Palm Produce Board's fixed price for export which is lower.

(iv) Another storage tank of at least 5,000 tonne capacity is required as a standby to the only one that is currently available to the mill.

(v) The long delay in obtaining the necessary spare parts for the various critical components of the processing plant.

(vi) Problem of transportation of fresh fruit bunches from estates which are on the eastern side of the river with the mill on the western side.

The Company hopes for a full capacity utilization and possible expansion when the items that had been ordered are received. These items include the required spare parts for the existing machinery, standby equipment, press-digester pumps, standby generator units, steam pipelines, weigh bridges, horizontal sterilisers and the kernel plant machineries. Also, one ramp with 12 loading badges with a capacity for storage of 120 tonnes of ffb, and an incinerator suitable for the disposal of 20 tonnes/hr of spent ffb would be built.

On the other hand, the Company is currently considering the possibility of building another mill on the eastern side of the river to eliminate the need for transportation of ffb over the river.

8.1.2 Conclusions and Recommendations

There is an urgent need to incorporate a fruit-washing system which will remove abrasive materials such as sand and laterite from the fruits before they enter the processing line. This will increase the life expectancy of the various components such as expeller worms. A fruit-washing system for the mill is estimated to cost ₦34,000.00, whereas a production shut-down leads to a loss of ₦20,000.00 per day, apart from the cost of replacing broken-down parts.

The Company is at present operating at about 30% full capacity. That being so, the Company should gear its efforts toward achieving a full capacity utilization of the present mill. The plan to establish a second mill should be shelved meanwhile.

8.2 Case Study 2: AGRICULTURAL DEVELOPMENT CORPORATION (ADC) PALM ESTATE AT CALARO

8.2.1 Basic Information on Factory

The Calaro Oil Palm Estate is owned by ADC. It has a total of 4,700 hectres of cultivated land giving rise to a potential production capacity of 10,575 tonnes of palm oil and 2,068 tonnes of palm kernels.

The Calaro Oil Palm mill is one of more than five mills owned by the Agricultural Development Corporation. This was an organisation established during the Federal Government's Third Development Plan; and it is delegated with the management and development of government-owned rubber, cocoa and oil palm mills.

Calaro is situated about 50 kilometres East of Calabar, the headquarters of the Palm Produce Board, and less than thirty kilometers away from any of the other A.D.C.'s oil palm mills. The Oil Mill was commissioned in 1963. It initially had a capacity of 6 tonnes/ffb/hr but it has since 1976 been expanded to 12 tonnes/ffb/hr. The plant was manufactured by a Dutch Company (Stork Amsterdam). It consists of a bunch digestor, expeller and a hydraulic system of oil extraction. The plant is definitely in bad shape as it breaks down quite often.

8.2.2 Management Structure and Employment Situation

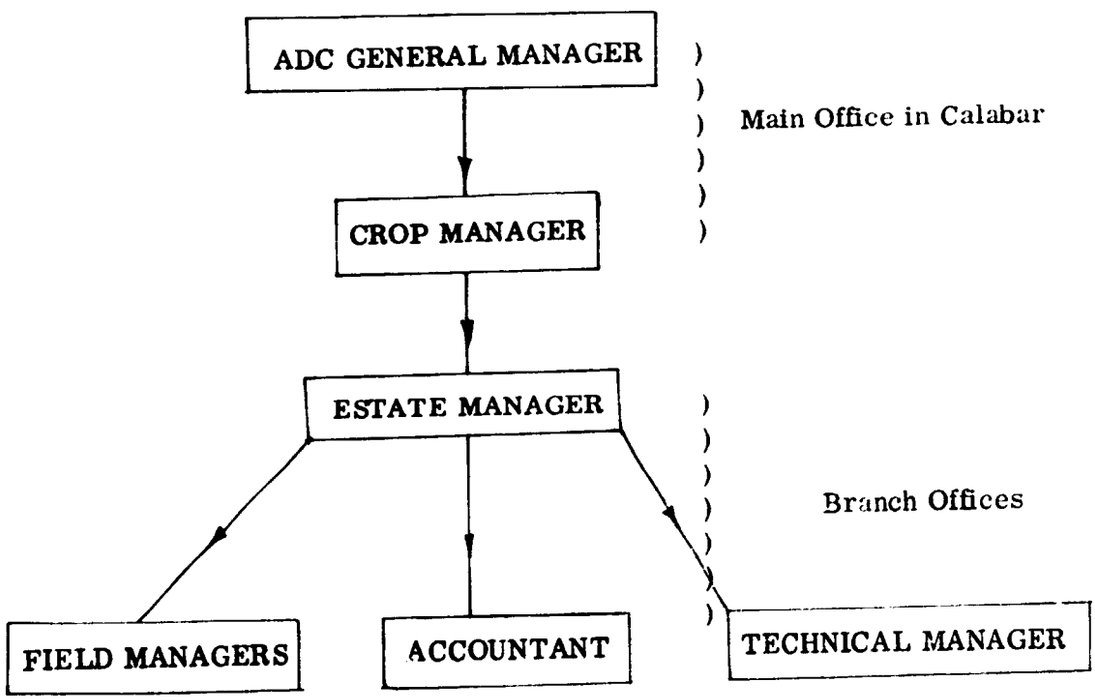
Each of the A.D.C.'s estates operates under five Divisional Managers, and these are the Technical Manager, the Accounting Manager, and three Field Managers, (Fig.2). All these five Divisional Managers are in turn responsible to the Estate Manager, who has the Root Crop Manager as his immediate supervisor. The Root Crop Manager is in charge of the administration of an agricultural estate, which is subjected to supervision and remote control by the A.D.C.'s General Manager at Calabar.

The A.D.C. started up with a contiguous form of management structure, whereby committees were set up to make decisions. The resultant effect was that the committee's bureaucratic approach usually delayed policy making and affirmative actions. The A.D.C. has changed the style of management to the Root Crop Management system. This is a method that encourages a Root Crop Manager to make on the spot decisions. Despite the new approach in policy making and implementation, it is obvious from the survey that most of the mills of the A.D.C.'s estates are not as efficient

Figure 2.

ORGANIZATIONAL CHART

ADC - CALARO



and productive as they should be. The efficiency ratings of the estates is below par.

The economic and social impact of the A.D.C. Projects are hard to evaluate in view of the lack of information on the total number of employees and remunerations. Thus the impact of the projects on the employment situation in that particular area of Cross-River State cannot be accurately measured.

8.2.3 Raw Materials Supply

The Calaro Oil Palm Estate is about the most productive under the jurisdiction of the Agricultural Development Corporation (A.D.C.) since majority of the other estates are allowed to lie fallow. The estate covers about 4,700 hectares of land which is productive while about 92 hectares that need to be replanted and refertilized, are abandoned. The best hectarage yield of the plantation is 6 tonnes of fresh fruit per year, although the target hectarage yield of 11 tonnes of fresh fruits per year is possible.

The receipt of the harvested raw materials to the mill is ad-hoc since there is no established daily receipt of consignment. The fresh fruit bunches are usually left on the ground for a long time before processing and so the free fatty acid of the finished product is usually high. Also the fresh fruits become over-ripe, lose weight and deteriorate.

Therefore, there are some major problems encountered in the cultivation of the raw materials. There is non-application of fertilizers to the plantations, most parts of which are abandoned. The labourers are not efficient because they are not regularly paid due to insufficient funds

made available to A.D.C. The cost of labour in Nigeria is four times higher than that in a neighbouring country, such as for example Cameroun.

8.2.4 Equipment and Production

The efficiency of most of the mills, which are equipped with 'Pioneer' type of plant, is down to ten percent. This is because the equipment are obsolete and cannot produce high quality and large quantity of oil as modern equipment could produce. Most of the mills lack processing facilities and so the meagre revenue realised from Calaro mill is reploughed to run the expenses of other mills.

In February of this year, 280 tonnes of oil and 50 tonnes of palm kernel were processed in the mill. Production figures had been rather erratic for reasons earlier mentioned. Suffice to say that until all is well with the estate in general by way of proper maintenance of the plantation, there is not much one can expect from the mill. Things have never gone smoothly for the mill to be fully utilized at any time. At the present condition of the mill it is doubtful if it can successfully cope with the present rate capacity of 12 tonnes FFB/hr. without some major repairs and replacements of parts. Most noticeable is the boiler chimney which can easily collapse if subjected to further intense heat.

The problem of this factory can be ascribed to organizational deficiencies, shortage of skilled personel to assist the only qualified engineer on site, as well as poor training scheme for technical staff by way of refresher courses and exposure to similar factories for useful exchange

of ideas. For example, the engineer on site has never attended any of the frequently organized workshops for technical personnel in West Africa.

8.2.5 Infrastructure

There is a free housing scheme for the workers on the estates. The mills and the residential areas are well provided with good ammenities like reliable power supply and water. Each mill has its own power generator units.

The harvested fruits are usually transported to the mill in the A.D.C.'s lorries. The evacuation of the finished products is paid for by the Palm Produce Board.

8.2.6 Marketing

The Palm Produce Board evacuates palm oil at a price of ₦400.00 per tonne and palm kernel at a price of ₦180.00 per tonne. It is discovered that the revenue from the sales of these products, especially realised from the Calaro mill is just a little bit over the production cost of ₦500.00 for a tonne of oil.

8.2.7 Major Constraints and Future Prospects

Some of the inherent problems of Calaro mill in particular and other A.D.C.'s mills in general, are enumerated below:-

(i) Labour is scarce for the labourers prefer other privately-owned plantations where wages are adequate and regularly paid.

(ii) Due to scarcity of labour the maintenance of the plantations is poor because weeding is lacking.

(iii) There are not enough access roads to carry out harvested fruits and even where there are access roads, there are not enough vehicles to collect the harvested fruits.

(iv) Procurement of spare parts is difficult because of insufficient funds and prolonged delivery time. Some spare parts are however, fabricated at Calaro's Engineering section and others such as impellers and beater arms at the Nigerian Foundries, Lagos. However, these do not last long. Any spare parts that cannot be fabricated at Calaro are now ordered through Topez Engineering Company in Lagos which operates on cash and delivery basis. This inter-relationship with Topez Engineering Company has improv the former 18 month delivery period of spare parts ord. directly by Calaro to 6 month delivery period as handlec the Topez Engineering Company.

(v) There is an acute shortage of skilled manpower especially in the Engineering set-up. There are only two Engineers, and one of them is the Chief Engineer (Production), while the other is a Senior Engineer (operation). This Senior Engineer is also the workshop Manager as well as the officer in charge of vehicles and equipment. There is no electrical engineer, and the artisans and operatives have very low educational background.

8.2.8 Conclusions and Recommendations

Conclusions

For survival, the A.D.C. needs funds to carry out the following essential services in all the estates:-

(i) Fertilising and rejuvenating the barren plantations.

(ii) Pruning of the palm trees and weeding before harvesting.

(iii) Construction of more evacuation roads.

(iv) Modernisation of the plant.

(v) Prompt payment of salaries of workers.

Recommendations

The afore-mentioned commitments would help to increase production before increasing productivity. On the other hand, productivity can be improved if A.D.C. can rechannel her priorities by:-

(i) improving the organizational structure of the company.

Existing communication system is only upwards.

(ii) providing incentives to the staff,

(iii) improving educational facilities available to its staff,

(iv) being articulate in forecasting its budgetary commitments.

CHAPTER 9

PALM KERNEL OIL SUB-SECTOR

9.1 Case study 1: PAMIL INDUSTRY, ABAK

9.1.1 Basic Information on Factory

The PAMIL Industry situated at Abak in Cross River State was incorporated on 31st July, 1972 under the Company Decree of 1968, as a limited liability Company. The aim of its establishment was to engage in the business of crushing palm kernel so as to produce palm kernel oil and meals/pellets which can be exported after the home consumption has been satisfied. Later on, and still at the planning stage, it was decided that the company should also refine the palm kernel oil so produced to manufacture soap, margarine and any other ancillary products.

The business of PAMIL was undertaken initially as a joint venture between the then Government of South Eastern State of Nigeria, holding 60 percent equity share and John Holt Properties Limited, a company based in the United Kingdom, holding the 40 percent of the equity share. So, the fully paid share capital of the company has been to the tune of over one and a half million naira, at 11 percent depreciation value of its assets. In 1975 the government's share holding was transferred to the Investment Trust Company, which was completely owned by the Cross River State Government. The Board of the PAMIL Industry comprises of five Directors two of whom are nominated by John Holt, and three, including the Managing Director nominated from the Investment Trust Company by the Cross River State Government.

9.1.2 Management Structure and Employment Situation

The operational activities of PAMIL have been carried out through minimum labour force, right from the inception of the company. Each member of top management performs three different functional activities. The breakdown of the organisational structure shows that the General Manager doubles also as the Company's Secretary/Accountant; the Electrical Engineer is also the Personnel Manager. The two expatriate Production Engineers also supervise the maintenance of both the solvent and pellet plants, with a Nigerian Engineer assisting them as the need arises. The obvious reason is that the management is either trying to be cost-effective in terms of salaries or just that there are inadequate qualified manpower to share the work-load.

The training programme organized by the management operates under the Technical Management Training Scheme. This scheme offers the middle management on-the-job training to improve their understanding of the mill's operation, and to alleviate the shortage of manpower required to operate the sophisticated solvent extraction machinery and equipment.

9.1.3 Raw Material Supply

The main raw material processed is palm kernel, and this commodity is supplied by the Nigerian Palm Produce Board at Calabar. Supply is well over 50,000 tonnes of palm kernels per year.

There is no price paid for the palm kernels delivered to the company by the Board since the former acts as a processing agent to the latter. In retrospect, for the previous two years period ending in October, 1979, the

Table 11. Data for two year period ended at March, 1979
Crushing Cost of Palm Kernel Oil Mills in Nigeria.

MILL	PERIOD COVERED	TONNAGE CRUSHED	TOTAL COST	AVERAGE CRUSHING COST PER TONNE
EVOC	Dec.77-Dec.78	33,689	1,899,270	56.07
	Jan. 79-Oct. 79	26,668	1,773,046	66.49
	Dec.77-Oct.79	60,397	3,672,316	60.84
NIPROC	Dec.77-June 78	13,634	865,182	63.45
	July 78-June 79	27,470	1,573,000	57.26
	July 79-Oct. 79	3,583	306,371	85.50
	Dec.77-Oct. 79	44,687	2,744,533	61.42
PAMIL	Dec.77-Dec.78	33,042	1,752,562	53.64
	Jan.78-Oct. 79	29,162	1,797,169	61.63
	Dec.77-Oct. 79	62,204	3,549,731	57.07
VON	Nov.77-Feb.78	5,788	506,513	87.51
	Apr.78-Mar.79	26,093	1,936,611	74.22
	Apr.79-Nov. 79	27,460	1,463,286	53.29
	Nov.77-Nov. 79	59,341	3,906,410	65.83

EVOC - Edewon Vegetable Oil Company, Warri.

NIPROC - Nigerian Industrial and Produce Company, Arondizuogu

PAMIL - Palm Kernel Oil Processing Company, Abak.

VON - Vegetable Oil (Nigeria) Limited, Lagos.

company had not been able to break-even. The simple reason was that the crushing fee paid by the Produce Board was not sufficient to meet the cost of production. For example the crushing fee per tonne on the PAMIL machine was forty-two naira (₦42.00), whereas the cost of production per tonne on this machine was estimated at fifty-seven naira, and seven kobo (₦57.07). Hence there was a loss of fifteen naira and seven kobo (₦15.07) per tonne, as shown in Table 11. The tabulated data have been extracted from the report of the monthly operating returns submitted by the processors to the NPPB. This loss would amount to over nine hundred thousand naira (₦937,414.28) for the 62,204 tonnes of produce processed on that particular machine. In comparison with other processors with a similar crushing fee of ₦42.00 per tonne, the loss was nineteen naira and twenty-three kobo (₦19.23) per tonne, and this totalled up to over a million naira (₦1,089,321.87) for the 56,647 tonnes of produce processed. The crushing fee has since improved to ₦47.00 per tonne since April, 1979.

Pamil uses hexane as solvent in the solvent extraction plant, the diesel oil for the electrical power generation, and boiler oil for the oil-fired boiler to raise the process steam. Availability of these fuels, most especially the solvent hexane, now constitutes a major constraint on production. The company lost a total of 32 days due to lack of hexane and boiler oil in the first year of production. This amounts to approximately 20% of the total production days lost in the first year of operation. However in the first half of the second

year the company lost 73 days due to lack of these fuels. This accounts for 75% of the shutdowns during the period. For the supply of these fuels, the company signed a 5-year contract with the National Oil Chemical Marketing Company based in Lagos. Special tankers are hired at a cost of ₦500.00/day to collect hexane from the National Oil Chemical Marketing Company depot in Lagos and cases of these tankers returning empty abound. There was an eye-opening incidence on the 7th of February 1980 in which the Pamil special tankers were returned empty whereas tankers from other solvent extraction plants were filled immediately after. Thus, it would seem that the contractual agreement for the supply of these fuels which worked reasonably well in the first year has since broken down. The reason for this may not be unconnected with payment of dues or the other processors (there are four other solvent extraction plants for palm kernel oil) having a better working relationship with the supplier. Or another instance of scarcity since National Oil Company imports hexane. However, it is necessary to investigate problems confronting the National Oil Company in meeting the demand for these fuels.

The solvent extraction plant at PAMIL uses on the average 35 litres of haxane, 2,600 litres of diesel oil, and 90 litres of boiler fuel oil per tonne of palm kernels. These fuels are supplied by the National Oil Chemical Marketing Company on a contractual basis. The prices of these fuels have increased considerably since 1977. For example, the price of diesel oil for the generator increased from 0.088k/litre in 1977 to 0.11k/litre with effect from October, 1978. The price of the boiler fuel oil has

similarly increased from the initial cost of 2.6k per litre to 5.43k/litre with effect from July, 1979. The price of hexane has been subjected to much variation, as the first noticeable one was from 21.2k/litre in 1977 to 24.0k/litre in 1978 while the second variation was from 29.3k/litre in March, to 38.4k/litre in June of 1979 and the current price of 51.0k/litre came into effect as from January, 1980. With this high consumption, there is a need for the buffer stock of these essential items and so PAMIL operates storage capacities of 400,000 litres and 120,000 litres of diesel and hexane respectively.

9.1.4 Technology and Technical Efficiency

Pamil receives palm kernels from the Nigerian Palm Produce Board in bags. These bags are manually emptied on a loading bay whence the kernels are taken through a conveyor into a storage tank. Processing starts with the removal of impurities such as stones, metallic materials, sticks, stems etc. by revolving screens and magnetic drum. The impurity-free kernels are passed into the milling rolls where the kernels, under progressively increasing pressure, are reduced to thin flakes to aid the process of oil extraction.

The process of oil extraction is effected by utilizing the solvent hexane (boiling point 63.1^{o}C - 68.9^{o}C) to remove oil from the flakes. The solvent and the flakes are brought continuously in contact in the percolation extractors to produce a very clean miscella. The crude oil is extracted from the miscella in a vertical tubular cylindrical shell steam heat exchanger The oil is then filtered to remove impurities prior to storage in big cylindrical tanks.

The solvent extraction process is a very efficient process which yields, 48% palm kernel oil and 50% palm kernel meal. In addition to higher extraction rate, the solvent extraction process consumes far less power than the process of mechanical expression such as used by Vegetable Oils of Nigeria (VON) in Lagos.

9.1.5 Maintenance Facilities

The company has a small workshop with lathes and welding equipment. The workshop is managed by a few people who have so far carried out, successfully, repair jobs involving fabrication of simple parts. There is a qualified electrical engineer responsible for the maintenance of the diesel generating plant and other affiliated electrical problems.

Undoubtedly the company does not at the moment have adeauate qualified staff and facilities to carry on effectively the work of maintenance of the plant as more troubleshootings occur in the future. There are at present two expatriate members of staff from the plant supplier on contract to work on the plant. As a matter of fact, their contract will expire by August, 1980. As aforesaid, the plant is still relatively new. The critical parts such as the impellers, the sprockets, fan blades etc. are beyond the manufacturing capacity of the Company, and hence such parts are purchased from abroad. It is in recognition of this major problem, as well as the rather sophisticated level of technology involved in the solvent extraction process, that the Company has decided to enter into what is called the "Technical Management Agreement" with Rosedowns and Thompson Ltd., the supplier of the plant.

Under this agreement the latter will:-

(i) supply all the necessary spare parts on a regular basis; and

(ii) train the technical staff of Pamil in the production process and maintenance of the mill.

Upon the availability of trained personnel from the above scheme, the company will hopefully be in a position, assuming improved financial strength, to purchase additional equipment for the maintenance workshop.

It is worth pointing out that as at the time of visitation to the Pamil Industry, the company had an impressive stock of essential spare parts. The company does not have as much problem now as other companies in the purchase of spare parts from overseas due to the expertise of John Holt, one of the major shareholders, in handling such purchases for the company. Moreover, with the present government relaxation of the previous stringent conditions for ordering spare parts for machinery, future problems in this respect will shift to one of availability of funds.

9.1.6 Capacity Utilization

The solvent extraction plant was designed by Rosedowns and Thompson Ltd., UK with an actual specified capacity of 350 tonnes/day (100,000 tonnes per annum). Towards the completion of installation work which started late in 1974, it was discovered that for the plant to operate satisfactorily and with the safety necessary for a solvent plant, modifications to the original plant had to be made. These modifications took one year to complete. The first trial run in October 1976 was not successful. Consequently, additional modifications had to be carried out before the plant

had its first successful trial run in 1977. Even then on the basis of production records so far the plant was only able to acheive between 50 to 65% of the above specified design capacity. This, in Pamil's evaluation of capacity utilization,is based upon the maximum practically realizable capacity of 65,000 tonnes/year as opposed to the design capacity of 100,000 tonnes/year since all things being equal the plant has not been able to achieve anything significantly higher than 65,000 tonnes/year rate of processing.

However, the statistics of production for the first 20 months since the plant had been commissioned in November 1977 showed that the company crushed a total of 62,204 tonnes of palm kernels with an average operational extraction rate of 48% palm kernel oil and 50% meal with residual oil content of approximately 1%. This figure represents, on the basis of operational capacity of 65,000 tonnes/year, a capacity utilization of only 57.4% over the period of 20 months considered. Further detailed analysis of the production records for the above period shows that in the first year the company lost a total of 170 production days distributed as follows:-

15 days due to non-availability of hexane

17 days due to non-availability of boiler oil

21 days for maintenance

75 days due to lack of spare parts

35 days due to lack of evacuation of pellets by the NPPB.

9 days due to shortage of palm kernels.

In the following period of six months (January - June, 1979) the company lost a total of 95 production days in the following manner:-

42 days due to non-availability at different times of hexane,

7 days due to non-availability of diesel oil for the generator,

24 days due to non-availability at different times of boiler fuel oil,

13 days for maintenance,

9 days due to shortage of palm kernels.

9.1.7 Maintenance and Spare Parts

From the above data on plant shut downs, it can be seen that although the company lost a total of 75 days in the first year of operation due to lack of spare parts, it however, did not have any shutdown for lack of spare parts in the following year. This is due to the expertise of the John Holt Properties Limited, a major share holder, in handling overseas purchases of the essential parts for the plant operation. Also, in this respect, the company is about to enter into a firm agreement with the manufacturer to supply on a regular basis all the essential spare parts. This is to be coupled with the fabrication of some simple parts in the company workshop.

9.1.8 Infrastructure

Some supportive operations of PAMIL include the generation of its own electricity and the provision of water from its chemically treated water plant.

9.1.9 Marketing

The finished products, that is palm kernel oil and pellets are handled by the Nigerian Palm Produce Board, which pays currently a crushing fee of

₦47.00 per tonne of palm kernels. This is a loss to the Company because the actual cost of crushing a tonne of palm kernels is about fifty-seven naira.

9.1.10 Major Constraints and Future Prospects

Despite the active operations being carried out, the company still experiences the following constraints:-

(i) Inconsistent supply of palm kernels for crushing by the Nigerian Palm Produce Board, and the slow operation of the Board to evacuate the finished products. The problem has however been overcome. The company lost 42 days in the first year of operation due to the non-evacuation of pellets by the Board. This could reasonably be ascribed to the initial problems of take-off by the Board (created in 1977) and also at a time that the PAMIL Industry itself started production. The Company also lost 9 days in the first half of its second year to production, due to shortage of palm kernels.

(ii) Irregular supply of boiler oil and diesel oil and hexane by the National Oil and Chemical Marketing Company based in Lagos. The company lost a total of 32 days due to lack of hexane and boiler oil in the first year of production and about 73 days in the first half of the second year of its operation. Thus it would seem that the contractual agreement for the supply of these fuels which worked reasonably well in the first year has since broken down.

(ii) Lack of spare parts for the plant, which had caused the company a total shutdown of 75 days in the first year of its operation has now been taken care of. The critical parts such as the impellers, the sprockets, for blades and the like, are beyond the manufacturing capacity of the company, and hence such parts are purchased from abroad.

(iv) Inadequacy of manpower to handle the rather sophisticated level of technology involved in the solvent extraction process.

These constraints have contributed 50 percent loss of time in production for the past three years. These losses were made up of 10 percent on technical breakdown, about 5 percent on evacuation problem of pellets by the Nigerian Palm Produce Board and about 45 percent on lack of fuel. It is estimated that the Company used to experience a loss of ₦1,000.00 per hour for shut down due to this organisation problem.

For its future development, there is the desire to introduce a Research and Development Department to delve into the industrial utilisation of the Company's main and waste products.

9.2 Case study 2: VEGETABLE OILS OF NIGERIA LIMITED (VON)

9.2.1 Basic Information on Factory

Vegetable Oils (Nigeria) Limited is an integral part of Odu'a Investment Co. Limited owned by the former Western State Government. And so, Odu'a Investment Company Limited has 100 percent share in VON's equity. The Company is located at Ikeja in Lagos State which is about 618 kilometers distant from a similar factory at Warri in Bendel State.

9.2.2 Management Structure and Employment Situation

VON's labour force is basically made up of indigenes at both the top and middle management groups, including the skilled and unskilled workers. The total staff strength stands at 182 and this is made up of 4 University degree holders in the top management; about 7 employees with intermediate professional qualifications in the middle management group; 165 skilled workers; and 6 unskilled workers.

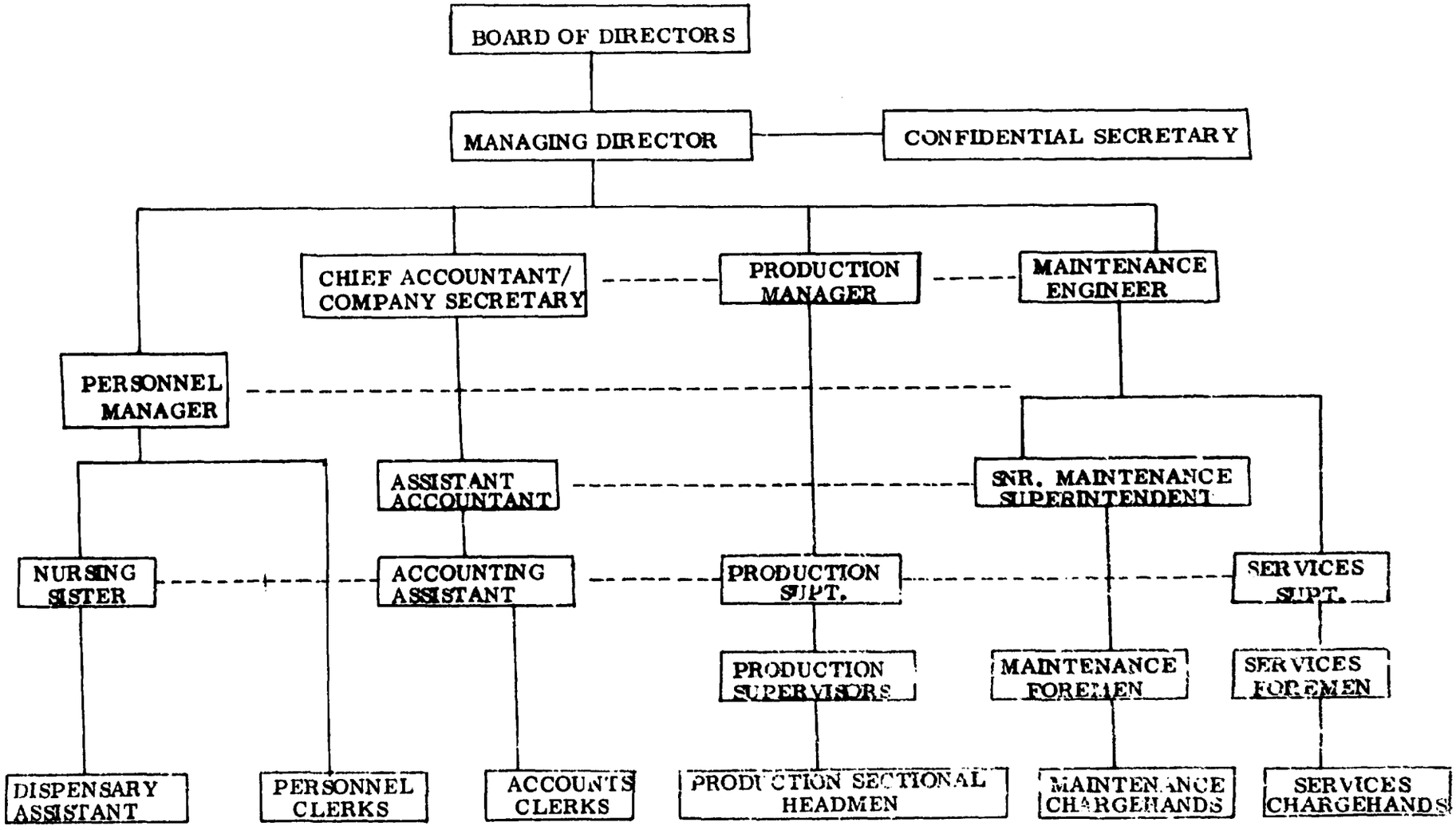
The group gross remunerations for both the top management and middle management amount to ₦40,120.00 and ₦30,780.00 annually respectively, while the skilled and unskilled employees earn up to ₦357,129 and ₦6,864. Hence the total payroll for the Company amounts to ₦434,893 per annum. This figure is exclusive of additional expenditures on medical care, housing, Industrial Training Fund, and National Provident Fund for the employees. The percentage breakdown of these expenditures shows that about 2.3% of the total payroll is expended on medical care; about 2.3% on housing; roughly 1% for Industrial Training Fund, while about 2.7% is for the National Provident Fund.

The employees are reasonably well paid and the incentives offered by the company are quite encouraging. The flow of information between the different hierachies in the organisation points towards management by objectives and high degree of flexibility in both policy-making and implementation. The organizational structure is shown in Fig. 3.

9.2.3 Raw Material Supply

The raw materials processed are palm kernels and these are obtained

FIGURE 3: VEGETABLE OILS (NIGERIA) LIMITED
PROPOSED ORGANISATION CHART



from the Palm Produce Board. The supply of 200 to 250 tonnes of these palm kernels per month, is consistent throughout the year. Sometimes the quantity supplied is much more than the amount required for processing during a normal 5 day working period of three shifts per day. Therefore, the company engages in overtime activities so as to minimise the storage of the supplied raw materials which are usually stacked in well aerated stores before processing.

With the establishment of the Palm Produce Board, the Company receives her bulk of supply of raw materials from the Board which pays ₦47.00 per tonne for processing.

There is no price paid for the raw materials delivered to the Company by the Board since the former acts, as a processing agent for the latter. This commodity when processed, is mostly exported, although any remaining small quantity is sold to the public on behalf of the Board at a price not below the production cost.

The Company is also allowed to buy Palm Kernel directly from Okitipupa and Apoje Oil Mills. In this case, the processed products can be sold directly to the public without the intervention of the Palm Produce Board. Before processing, the raw materials are subjected to vigorous quality control tests to determine the percentage of oil, moisture content and the free fatty acid. Also foreign bodies in the raw materials are removed.

9.2.4 Technology Applied and Technical Efficiency

Prior to crushing, non-ferrous impurities are normally separated from the kernels. Ferrous materials are magnetically separated to prevent damage

to processing equipment. After this, the kernels go through breakers and flaking rolls into double-jacketed steam heating kettles at 80°C for ½ or 1 hour retention time.

After cooking, the palm kernel oil is separated from the cake by screw press expellers which leave about 6-8% oil in the cake. The average minimum residual oil content for mechanical expression is about 3% even under optimum conditions and this means that there is a 3-5% minimum loss of oil to the cake compared to 1% for solvent extraction. In addition to this, more losses of oil are suffered due to the age of the plant which was commissioned in 1965. For instance, the efficiency of the screw presses due to bad or worn out worms is only 64%.

As a result of the problems being encountered with the screw presses; the company is planning in the near future to change to the more efficient hexane solvent extraction process. The change is planned to take place gradually until the screw presses are eventually phased out completely. Incidentally, of the five palm kernel oil production companies (RIVOC - Port Harcourt, EVOC- Warri, NIPROC - Arondizuogu, PAMIL - Abak and PALMKE, Enugu, which is now extinct) Vegetable Oils (Nigeria) Ltd is the only one not using the solvent extraction process. The reluctance of VON to change over to the more efficient solvent extraction process is however understandable because of the frequent shortage of hexane and uncontrollably high cost of this chemical. The price of hexane and the crushing fee are both dictated by the supplier and the Nigerian Palm Produce Board respectively. For instance, during the period, December 1977 to October 1979,

the range of crushing cost per tonne in the Palm Kernel Oil Mills ranged from ₦53.00 to ₦77.00 (Table 11). While the processing mills are therefore running at a loss, VON has been able to break even by charging for subsidiary services such as transportation, weighing and storage.

9.2.5 Equipment and Capacity Utilization

The mill has a miximum capacity of 150,000 tonnes of palm kernel per year but processes only 30,000 tonnes. This is due to the age of the plant which is old and obsolete, an inefficient process, frequent power failure and lack of spare parts.

9.2.6 Repair Maintenance

The Mill maintenance department is well-staffed and kept busy due to the age and frequent breakdown of equipment. However, because the Mill lacks a well-qualified maintenance engineer, supervision of the maintenance department is carried out by the Managing Director in addition to his other administrative duties. The Mill also has a reciprocal maintenance agreement with a PK Oil Mill in the neighbouring country of Republic of Benin (about 2½ hours drive from Lagos) and on a number of occasions, both factories have benefitted from this agreement. In addition, a few local engineering companies have fabricated some spare parts for the Mill although these have usually been of inferior quality. The company in the Republic of Benin has assisted VON with the installation of new grinding and flutting machines and manufacture of screw housing while VON has assisted the Benin company with the manufacture of conveyor. The local engineering companies that have manufactured parts for VON are Moleson which

manufactures Conveyor Housing and Super Engineering Company Limited feeder pulley gears.

The expellers are the major maintenance problems experienced in this mill. Infact, well over ₦½ million (about US $0.84 million) is spent annually on spare parts and maintenance alone and the company is finding it extremely difficult to break even, because of the very high maintenance cost. Considerable production time is lost when blocked expellers are shut down for maintenance. Usually, about six out of the twenty expellers are out of order at any time.

9.2.7 Quality Control

The mill's laboratories are well-equipped to carry out quality control tests. But since the inception of the Nigerian Palm Produce Board, which supplies the kernels and markets the oil, it has become unnecessary to carry out extensive quality control tests. The mill has no control over the quality and quantity of palm kernels but it carries out routine tests for moisture content, oil content and free fatty acid content (ffa). Prior to the formation of NPPB, the Mill had an ffa of 5-6% depending on contractual agreements for which there was always a penalty clause. The temperature control system of the steam heating kettles does not appear to function satisfactorily due to blocked steam governors and blocked exit pipe for condensate.

9.2.8 Infrastructure

Infrastructural problems facing VON are water and electricity. VON has however solved its water supply problem by drilling bore-holes. There are three bore-holes, one of which is out of order due to accidental

submersible blockage. The other two bore-holes produce a total average of 45,000 gallons of water per day. A bore-hole is essential in Lagos where VON is located due to the frequent disruption of mains water supply and the inability of supply to keep up with the demand in general.

Electricity is a major problem as its reliability is unpredictable. At the time of the first visit to the mill, electricity supply was quite reliable but during a follow up visit to the industry, this was not the case. There were 48 hours downtime during the month of April, 1980 alone due to power failure and over the last seven months the factory had been shut down for 11.5 days for this reason.

Although the company has a 108 KVA standby generator, this is only capable of clearing one expeller at a time and running the administrative offices. Even when electricity supply is reliable, its cost is prohibitive as the Nigerian Electric Power Authority (NEPA) has just increased the unit cost to be paid by industrial consumers. VON spends between ₦23,000 to ₦30,000 per month (about three times what it budgetted for). Running the screw presses is a power-intensive process. This partly accounts for the higher unit crushing cost of VON with other millers using the hexane solvent extraction process (Table 12). Self generation of power has not solved the problem as power so generated is charged by NEPA at the same rate as the city power supply. In addition, the company has to bear the cost of running and maintaining the generator.

VON has a storage tank for Palm Kernel Oil with a capacity of 4,000 tonnes on site and 4 x 10,000 tonnes storage tanks at the wharf. Frequently,

the oil has to be stored for long periods due to the inability of the Nigerian Palm Produce Board to sell and transport the oil. Consequently, the exported oil quality is low and the free fatty acid content is relatively high. VON also has to cut back in production when the available storage is filled up. The milling company therefore suffers and has to absorb the inefficiency of the Board.

9.2.9 Marketing

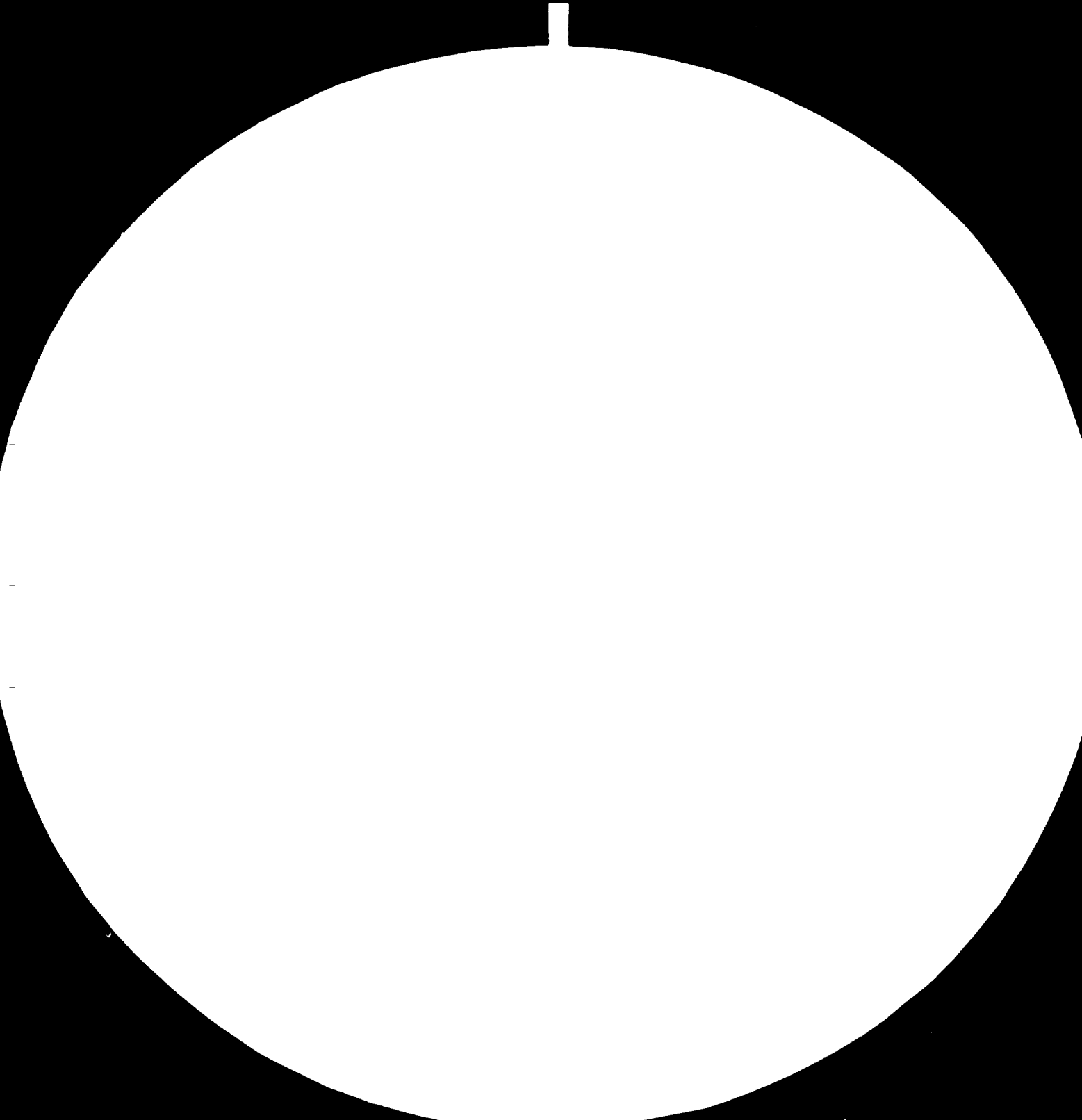
Some of the finished products are sold directly to local purchasers and some industries while the huge consignment of these finished products are handled by the Produce Board that finds ready market in Europe and America.

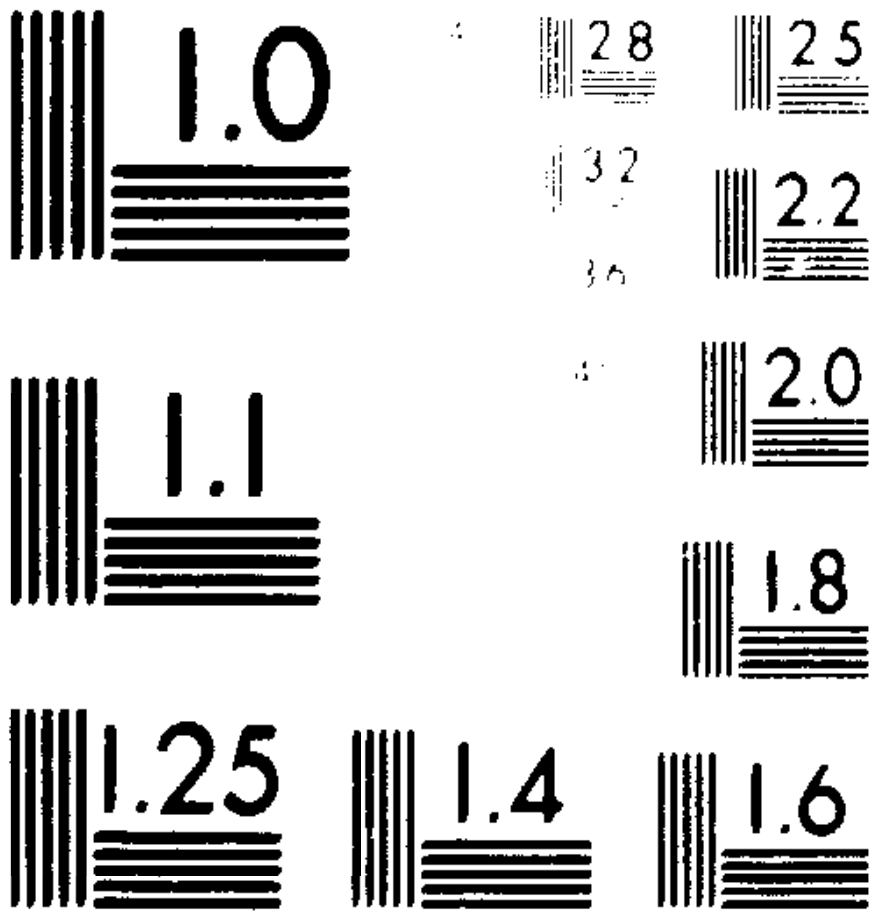
The wholesale price for a tonne of palm kernel oil is ₦550.00 while palm kernel cake is sold at ₦76.00 per tonne for bulk purchase and at ₦80.00 per tonne for retail purchase.

The sales of the finished products to the private concerns is by "cash and carry" method, although previously the company allowed a thirty day credit facility. The company now sells to local purchasers at Ogun, Oyo, Ondo, Lagos and Kano states at the above quoted prices.

9.2.10 Major Constraints and Future Prospects

The company is faced with financial constraints. However, if there is enough fund, the company hopes to establish a Research and Development Department. Also the company anticipates to establish an oil refinery, especially as the machinery which is already available is good for diversification.





9.2.11 Conclusions and Recommendations

(i) Conclusions

The VON mill is producing on the average about 20% of maximum capacity due to old equipment, frequent breakdown and downtime, lack of readily available spare parts, unreliable and high cost of electricity supply.

(ii) The operating cost, maintenance cost and technical efficiency of the mill which has the highest unit cost in the country, will improve considerably by its planned change-over to the solvent extraction process which is less power intensive.

(iii) The pre-inspection procudure which has just been waived by the Government will reduce losses and downtime due to the long wait for spare parts and equipment.

(iv) The employment of a well qualified maintenance engineer for which a vacancy exists at VON will improve the running of the maintenance department.

(v) Local utilization of palm kernel oil is on the increase with VON's sale of about 50% of its product to the local cottage industry and 25% to Lever Brothers (Nigeria) Limited. It therefore means that the sale of P.K. Oil is not determined solely by external factors which frequently bear no relationship to internal inflationary trends, labour costs and operating costs.

Recommendations

(i) Crushing fee should be determined jointly by the Palm Kernel Processors in collaboration with the Nigerian Palm Produce

Board rather than by the NPPB alone as is being done.

(ii) The mill should be allowed to purchase palm kernels directly from the suppliers at mutually agreed prices and to sell directly to local industries. The mill can still process for the Board for export.

(iii) A seed-cleaning equipment or de-sander should be installed at the mill. The present procedure of removing foreign materials is inefficient. Although larger materials may be removed the finer materials get away undetected. Despite their small size they may be very abrasive and this may be responsible for the frequent breakdown of expeller worms and other equipment.

CHAPTER 10

GROUNDNUT OIL SUB SECTOR

10.1 Case Study 1 - P. S. Mandrides and Company Limited

10.1.1. Basic Information on Factory

P. S. Mandrides and Company Limited is a subsidiary of John Holt Limited and its shares are owned 60% by the public and 40% by an individual. The mill was established in 1949 and in 1964 the company started another mill in Maiduguri as a wholly owned subsidiary. The factory is situated in central Kano among other crushing mills within one half kilometer apart.

Before the sahelian drought of 1972-1974 the mill processed 200-250 tonnes of groundnuts daily. After the drought, it processed about 12,000 tonnes in the 1976/77 season. Since then the mill has ceased production and now deals in imported vegetable oils.

Since the mill has ceased production, the evaluation that follows applies to the period when the mill was operational.

10.1.2 Management Structure and Employment Situation

There are currently ten people in the top management group, comprising seven Nigerians and three expatriate personnel who form the nucleus of the technical staff. The decision-makers in the company are the three expatriate employees, who are the Managing Director, the General Manager and the Plant Engineer, with expertise in the oil mill industry.

The middle management cadre consists of 10 - 12 workers, while the skilled workers totalled up to 60. The total labour force of the mill stood at

82 at the time of the survey. The total staff of the company was close to 400 in 1975 when the Mill was in full operation, but had since been reduced to under 100 due to raw material shortage. The company envisaged increase in manpower requirement as soon as the raw material situation improves.

The social impact of the lay-offs is hard to measure because of the inability to conclude whether the laid-off workers are now engaged in other jobs or are still unemployed. But the decrease in production level points to overall national economic relapse in terms of the contribution of the company to total industrial production index.

10.1.3 Raw Material Supply

This oil mill was established to process oil and cake from groundnuts and other available oilseeds in the North. However, so far, its raw materials have mainly been groundnuts. At present, the mill is not processing due to non-availability of groundnuts.

The location of the mill could be assumed to be suitable for its raw material supply for three reasons.

First, it is situated in Kano, a major groundnut production area, which puts it right in the heart of the raw materials. Secondly, its location brings it closer to the Nigerian Groundnut Board which controls the marketing of raw materials to all the crushing mills. Further, the net-work of good roads leading to the mill, access to the railway line and the close proximity to other crushing mills make it suitably located and put the mill at an advantage for receiving raw materials and transporting finished goods for marketing and export.

10.1.4 Sources of Supply

When the mill was in full production approximately 70 percent of its total supply came from the Nigerian Groundnut Board, while the remaining 30 percent was purchased directly from farmers or the local market.

Availability of groundnuts depended on local output of production, which seems to have declined very sharply since 1971/72 season (Table 5).

The factory seemed to encounter no problem in procuring raw materials from the Nigerian Groundnut Board, so long as they were available. About 200 - 250 tonnes of groundnuts were supplied daily on contract.

10.1.5 Cost of Raw Materials

The price of raw materials purchased from the Nigerian Groundnut Board was normally according to the producer price as stipulated by the Nigerian Groundnut Board, which currently is at ₦420.00 per tonne. Since the 1970/71 season, the price of groundnuts from the Commodity Board has risen by nearly seven fold. Cost of transporting the groundnuts from the depot was between ₦30.00 - ₦40.00 per tonne.

When purchasing was made from the local farmers, the price paid was negotiable and ranged from ₦350.00 - ₦500.00 per tonne which was sometimes higher than offers from the Groundnut Board.

10.1.6 Storage Facilities for Raw Materials

The mill has a warehouse of 1,400 cubic metres for storing raw materials, however, during the peak season bags of groundnuts are kept in the

yard covered with taupaulin.

10.1.7 Technology Applied and Technical Efficiency

Despite the lack of raw materials for processing, the mill's machines are still kept in good condition.

After weighing and sorting out the good nuts from the bad ones on a screen, the good nuts are conveyed to a mechanical vibrator from where solid impurities (sand, stones, etc.) are manually removed. The good nuts are then passed via a screw conveyor to the heating kettles and steam heated to 220°F before being passed through the screw press expeller. The oil in the nuts is extracted in two stages. The first extraction is at low pressure and cake thickness settings of 30 mm and 20 mm. The oil obtained from the low pressure extraction is comparatively pure and is only filtered and pumped to the storage tank without further refining.

The relatively cool powder from the first extraction is conveyed into the elevator and into another set of kettles which are also steam heated up to 220°F. The powder is then passed through another set of screw press. This second batch of oil is refined and clarified before being stored in storage tanks. This two-stage screw press expeller process ensures that 4-7% more oil is recovered than the single stage expeller and less quantity is refined. However, because of the low pressure of the first expeller, only a small quantity (15-20%) of the oil is recovered from the first expeller. The mill has 3 low pressure expellers and 15 high pressure expellers. Recovery was between 40-45% oil from processed groundnuts.

10.1.8 Equipment and Capacity Utilization

Although the plant was commissioned in July 1949, the equipment appeared to be in good condition. This was because various items were replaced continuously and constantly as soon as they became obsolete or broke-down. For instance, the mill's old coal-fired boiler which is still present at the mill had been replaced by a more modern oil-fired boiler. From the percentage of oil (40-45%) recovered from the groundnuts, it can be summarised that the equipment has more than 90% oil recovery.

The capacity utilization is and has been since 1978, zero. There just had not been enough nuts to eat let alone run a mill which has a 300 tonne groundnut maximum capacity. Before 1974, the capacity utilization was between 65-85%. Although the company is unhappy about its mill being idle, it is apparently doing a thriving business in importation and marketing of vegetable oil from Europe.

10.1.9 Quality Control

The mill has adequate facilities including a well-equipped laboratory for conducting quality control tests on the raw materials, during processing and on the finished goods.

Raw materials were physically examined to separate the good nuts from the bad ones. Also, determinations were made for moisture, oil and free fatty acid (FFA) contents.

At intermediate stages of processing, analyses were made for moisture, and free fatty acids on the crude oil. The oil and protein contents of the cake were also determined in order to assess expeller efficiency. Expellers functioning below expected tolerance were shut off for maintenance.

Finished products were examined. Analyses covered free fatty acids on the oil, and oil and protein contents on the cake. At the time of the visit, the quality control laboratory appeared out of use.

10.1.10 Repair and Maintenance Facilities

The mill is well-equipped to carry out electrical repairs like motor winding. Occasionally however, when the mill was very busy, motor winding repairs were contracted out to outside contractors. The machine workshop is also very well-equipped and the mill has two very large stores containing a large inventory of spare parts which have been kept in good condition. The mill is able to manufacture part of its own screw conveyor although the spiral part is ordered from abroad. It was quite clear from looking at the spare parts store and repair and maintenance facilities that the mill could cope with many routine problems provided it has the staff which have now been laid off due to the lack of raw materials.

10.1.11 Infrastructure

The mill's electricity is obtained usually from the city power supply. While the mill was operational, the power supply was reliable, however, there is a 660 KVa, 920 amps, 12-cylinder V-type standby generator for unplugging the screw presses and running the mill during power failure.

Water is obtained from the city mains and no problems were encountered in this respect. The mill has water storage tanks to cope with water shortage for short periods.

Two 1,000-tonne tanks and two 500-tonne tanks are available on site for oil storage.

10.1.12 Relationship with other Vegetable Oil and Related Factories in Nigeria

As stated earlier, the mill relies on the Nigerian Groundnut Board for the bulk of its raw materials. However, the marketing situation for groundnuts is open enough to allow processors to purchase groundnuts directly from local farmers. Thus there was no cause for the mill to have any conflict with the NGE at the time raw material supply was regular.

The mill seems to have very little relationship with other vegetable oil factories nearby except for occasional request for spare parts and purchasing of unwanted equipment.

It relies on two packaging industries (Vanlare and Metal box) which are both located in Lagos for all its packaging materials. Vanlare supplies the 18-litre tins while Metal Box supplies the 1-litre tins.

The mill is also a member of the Oil Millers Association which is just across the street from the factory. One of the main objectives of the Oil Millers Association is to bear on the Nigerian Groundnut Board to improve on the price and raw material supply.

10.1.13 Products of the Mill

The mill had two main products, groundnut oil and cake and a by-product, sludge. Quality specifications prescribed for the products were:-

Groundnut Oil - 3 - 5% FFA

Groundnut Cake - 5 - 7% Fat

40-52% Protein

These criteria seem to fall within acceptable range for Nigeria and are of great importance for world trade. The mill could not say with any

certainty if these were acceptable to the local buyers of its products.

10.1.14 Packaging and Labelling

Oil is packed into 1-litre, 4-litre and 18-litre tin cans, while the cake is packed into jute bags.

The brand name for the oil was PYRAMID which was stated on the label in addition to the volume content. This brand of groundnut oil was quite acceptable and met local consumer taste judging from the popularity of the name particularly around its Lagos distribution depot.

Although the mill is not processing groundnuts now, it is packing imported vegetable oil under the same label 'Pyramid Groundnut Oil'. This appears misleading although the company explained that it is using old packaging materials and labels in stock. The company is obviously riding on the popularity of its earlier product, groundnut oil, in order to capture the market for imported vegetable oil, a relatively new product in the Nigerian market.

10.1.15 Market Situation of the Mill's Products

The mill operates two depots for the marketing of its products which it seems to have maintained in order to retain relationship with its old customers, even though it is now dealing in imported vegetable oil. There is one depot in its Kano factory where packaged oil is distributed in wholesale units to supermarkets and other businessmen in the Kano area and other urban centres in the North. The other depot is in Apapa, Lagos which receives oil in drums, repacks in retail sizes for distribution in the Lagos area.

10.1.16 Distribution

The oil was widely distributed through retail outlets - supermarkets and central depot stalls (Kano, Zaria, and Apapa). Distribution was also through middlemen who in turn sold to hotel and catering institutions. Supermarkets handle mostly 1-litre and 4-litre tins, while the depot stalls, hotels and catering institutions prefer the 18-litre tins. Oil packed in drums was sold by the buyer bringing his drum to transfer the contents into his own drum. He in turn retailed the oil by repacking in either new or used 18-litre tins. Alternatively, the buyer paid a deposit for the drum and returned it later for refund. The repacked oil was usually sold through the normal retail channels. The oil was also exported to neighbouring African Countries.

Retail outlets, particularly local markets and small open counter tops in neighbourhood stores offer litre bottles. This selling of groundnut oil helps to increase overall sales since many house-wives cannot afford to buy the 18-litre tins.

When the mill was processing groundnuts, a substantial quantity of the cake was exported to Europe, while a small portion was retained and sold to government institutions on request. This was used for animal feed formulation.

The sludge from the oil was sold locally and used for leather tanning.

10.1.17 Pricing

Wholesale prices quoted by the mill for its brand of oil - PYRAMID - were ₦17.00 per 18-litre tin and ₦140.00 per 80 kg drum respectively.

Upon investigations at Iddo, a majcr oil distributing depot in Lagos for vegetable oils coming from the North, it was found that wholesale prices for Pyramid oil ranged from ₦15.70 to ₦16.00 when collected at the wharehouse in Apapa. The prevailing retail price for the oil is ₦17.50 for 18-litre tin. If the distributor pays 50k per tin for transportation and 25k per tin for renting the stall at Iddo, his profit for selling this brand of oil is 75k per tin.

Prices seem to depend on the cost of raw materials, festival periods and geographical location.

Producer prices of groundnuts from 1972/73 showed a rising trend, the largest increase taking place from 1978/79 season (Table 5) when even groundnuts were available only in small quantities Producer prices effect the ex-factory price of groundnut oil.

Groundnut oil from the mill is cheapest at its central depots (Iddo, Apapa, in Lagos and Zaria).

10.1.18 Impact of the Factory on the Local Market Supplies

The factory would be considered as making an impact on the local market supplies as its product (groundnut oil) is one of the leading brands on the market. However statistics are not available to show its contribution to the local market supplies, but from evidence of its over thirty years operation and its output of about 33,750 tonnes per annum of groundnut oil, it is possible to venture that this factory has a fair share of about 30-40% of the local market. Infact, it is for this reason of maintaining this share

of the market that the factory has resorted to importation of vegetable oil which it sells under its previous brand name Pyramid-Groundnut oil, even though it is not processing groundnut oil.

When it comes to groundnut cake the factory cannot be said to have made any impact on the local market supplies. This is because the bulk of its total output of cake about 41,250 tonnes per year was exported for the factory to earn foreign exchange.

This country has need for oilseed cake for its livestock feed industry.

10.1.19 Conclusions and Recommendations

Conclusions

(i) Due to shortage of raw materials, the 300-tonne a day plant is unoperational and the Company is now surviving on importation and packaging of imported vegetable oils from Europe.

(ii) The mill seems well located for procurement of its raw materials (groundnuts) for crushing into oil and cake.

(iii) It is well favoured by a good road network and a connecting railway line from Kano to Lagos. Both systems place the mill at an advantage for receiving raw materials and distributing its products.

(iv) The mill has a good stock of spare parts, adequately equipped machine, electrical and welding workshops and does not appear to have experienced any down-time due to malfunctioning equipment.

(v) The mill has relatively good facilities for storage of its raw materials, processing and quality control of its products.

(vi) The marketing of the mill's products seems to have captured a good share of the local market because of the popularity of its product.

Recommendations

(i) Instead of allowing the plant to lie idle, the mill could explore the feasibility of crushing other oil bearing seeds available in the North such as cotton seeds and soya beans. However, this may be possible subject to the provision of adequate facilities for delinting the cotton seeds prior to crushing.

(ii) The mill's facilities could also be better utilized if conditions conducive to the importation of groundnuts from neighbouring African countries (low freight charges, cost, etc.) are available.

(iii) The factory could also look into an integrated approach. Since land in Kano is a major problem, the company can look into the possibility of cultivating groundnut by the Maiduguri branch to ease the raw material shortage.

(iv) If in future there is sufficient supply of raw materials, the mill should consider running a hybrid process by adding a solvent extraction plant to the screw expeller. This will allow the recovery of otherwise lost oil from the cakes and also the production of low-fat meals for animal-feed formulations. This process also increases the protein content of the cake.

(v) It will also have to divert the marketing of its cake to the domestic market (the livestock feed industry) instead of exporting it.

(vi) The mill seems to have problems of waste disposal. It is suggested that adequate facilities should be provided for disposing of its wastes.

10.2 Case Study 2 - Kano State Oil and Allied Products Limited

10.2.1 Basic Information on Factory

The Kano State Oil and Allied Products (KSOAP) was established in 1973 to process mainly groundnuts into groundnut oil and meal. Due to an acute shortage of groundnuts, the company has since diversified its activities to involve the processing of other oilseeds such as cotton and sunflower seed. The company is owned jointly by Kano State Government (with its 55% shares transferred to the Kano State Investment Corporation) and 45% private ownership. It uses a pre-pressed solvent extraction plant manufactured by Speichim, a French Company. The maximum capacity of the plant is 360 tonnes/day. As at now the company processes cotton seeds into cotton seed oil for local consumption since groundnuts are no longer available and the company had faced logistic problems in importing sunflower from the United States.

It is located in Kano City among eight other groundnut crushing mills, all within one kilometre of each other. It has access to good roads and a railway line for shipping raw materials and finished goods. Within four years of commissioning, the company was able to complete payment for the plant.

10.2.2 Management Structure and Employment

The mill is managed by a Board of Directors, with the General Manager as the executive head. Top management comprises 10 Nigerians and 4 expatriate personnel.

The organisational chart (Fig. 4) shows that that there are six departments, each of which is headed by a manager. These are, Administration and Personnel, Accounts, Sales, Production, Products and Engineering. The middle management consists of 16 supervisors and foremen, who are in charge of the 30 skilled workers and about 100 unskilled workers.

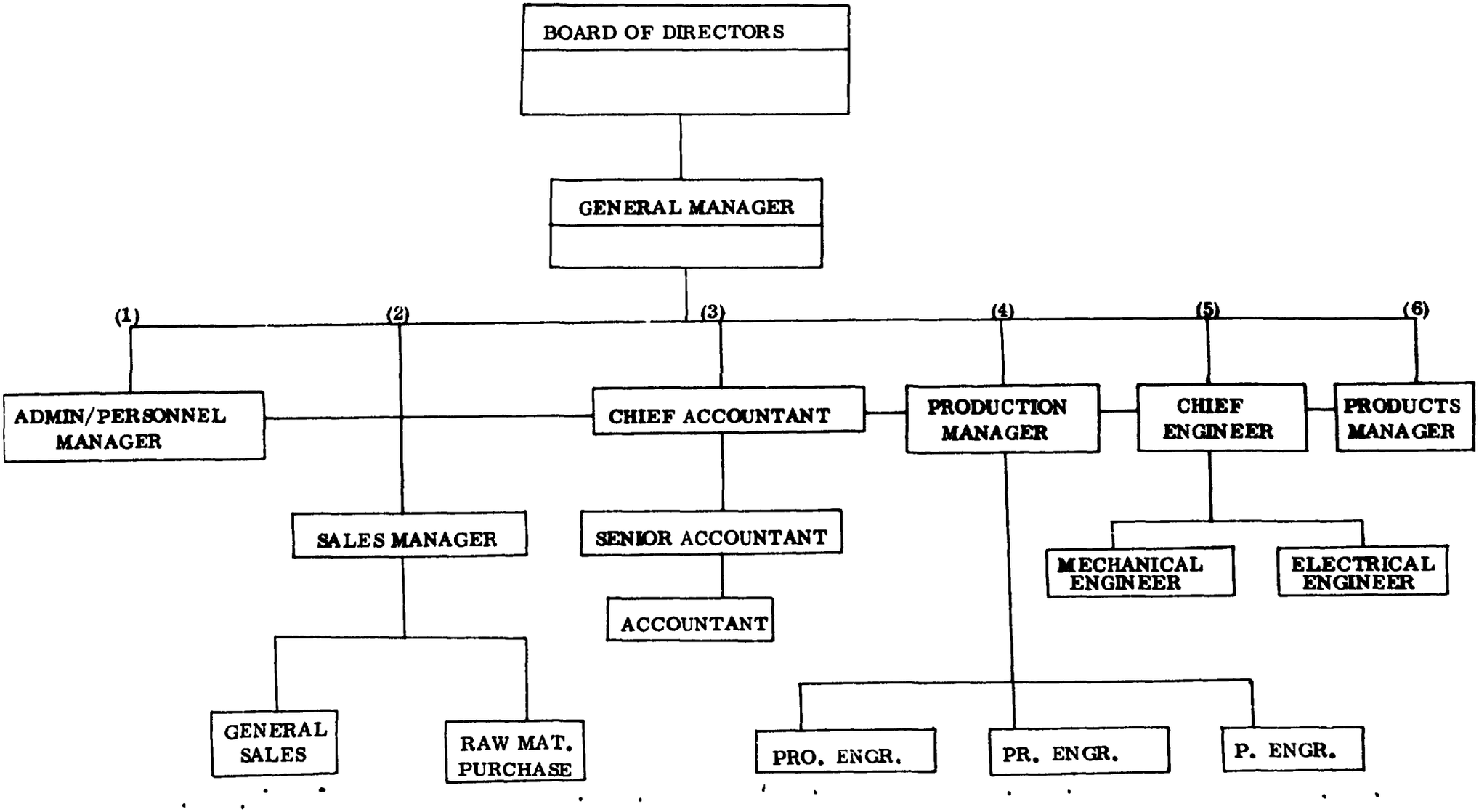
The company employs casual labour as the need arises, but the present trend in inadequacy of raw materials has slowed down production and triggered off retrenchment of several unskilled workers. The total labour force is currently about 150. All the Nigerian employees are on pensionable appointment, and the company intends to hire an estimated 150 additional workers when the factory is utilizing its full capacity.

10.2.3 Raw Material Supply

The mill processes groundnuts and cotton seeds. The groundnuts are purchased locally through the Nigerian Groundnut Board, and from local farmers. The cotton seeds are obtained mainly from the Cotton Board. Both of these oil seeds are not generally available in sufficient quantities. As a result, early this year, the mill experimented with sunflower seeds imported from the USA. However, due to difficulties of clearing from the port, it is not likely to continue processing sunflower seeds until a solution is sought. So far, over 1,000 tonnes of sunflower seeds have been received.

FIGURE 4: ORGANISATIONAL CHART

FOR KANO STATE OIL & ALLIED PRODUCTS LTD. (K. S. O. A. P.)



Prices paid vary for the raw materials. Cotton seeds cost the mill ₦500.00 per tonne, while groundnuts are purchased at the prevailing price as dictated by the Board, (₦420.00 per tonne). From local farmers, the price is usually higher, currently about ₦500.00 per tonne. Sunflower seeds cost between ₦300.00 and ₦500.00 per tonne.

10.2.4 Raw Material Storage

Bags of groundnuts and cotton seeds are usually stored in the yard covered with tarpaulin. This system of storage, though not perfect, is not risky considering the high turnover of the materials in storage.

10.2.5 Quality Control

The mill has a well equipped laboratory and well trained staff for conducting quality control tests on its raw materials, intermediate products and on the finished products.

The raw materials, in addition to visual examination are tested for moisture, oil content and free fatty acids. Quality standards expected of its raw materials are shown in Table 12.

Table 12. Quality Standards for Oilseeds Processed by KSOAP

Raw Material	Moisture (%)	Oil (%)	FFA(%)
Groundnuts	8 - 10	38 - 40	3 - 5
Cotton Seed	5 - 8	19	3 - 5
Sunflower Seeds	5 - 8	40 - 42	3 - 5

During processing, tests are carried out on the oil content of the cake in order to determine plant efficiency.

10.2.6 Relationship With Other Related Industries in Nigeria

As mentioned earlier, KSOAP purchases the bulk of its raw materials from the Commodity Boards. However, it does not see the Boards(Groundnuts and Cotton Seed) as impediments in its raw material supply. As a step further in solving the raw material problem, KSOAP has gone into agreement with the Nigerian Groundnut Board to import groundnuts from the Gambia and Senegal. KSOAP deals with other industries such as the Livestock Feed Industry and Lever Brothers (Nigeria) Limited in the distribution of its final products, cake, and groundnut oil respectively.

10.2.7 Technology and Technical Efficiency

Extraction of Oil from Cotton Seed

Cotton seeds are supplied by the cotton seed Board with considerable amount of lint still attached to the seeds. The first step is therefore the removal of the lint left over as well as the solid impurities. This is effected in a tray type magnetic shaker. The clean seeds are conveyed into silos whence they are fed into decorticators (there are ten parallel decorticators) to remove the husk. The kernels are reduced to small particles in the flaking rolls prior to cooking in a 6-stage heat chamber where temperature increases progressively from 60^{o} - 90^{o}C. The cooked flakes are fed into the mechanical press which obtains its pressure by means of a continuously rotating worm shaft and worms. At the cake discharge orifice there is a mechanism to control the

cake thickness between 0.6 and 2.5 cm. The cakes, having an average oil content of 15-19 percent are conveyed to the solvent extraction plant. Suspended impurities in the extracted oil are removed using leaf pressure filters and the crude oil is then piped to the storage tank awaiting refining.

Solvent Extraction

In the solvent extraction plant the pre-pressed cake and the solvent hexane are brought into contact in a continuous manner while the extraction chamber with 16 manifolds rotates once in one hour. The solvent hexane is preheated in a steam heat exchanger to 55°C prior to being fed into the extraction chamber. The resulting miscella, a mixture of oil and solvent, is pumped to the distillation plant where oil and solvent are separated. Distillation is effected in 2-stages to ensure a high percentage of separation of oil from the solvent. The distillation plant consists of two vertical cylinderical shells with a series of long tubes heated by steam. Temperature inside the shell exchanger ranges between 70° and 90°C. The extracted hexane is first cooled before being returned to the underground reservoir of hexane for re-use. The crude oil is passed through a finishing tank to remove the last bit of hexane and then to the cooling tank before being finally piped to the storage tank awaiting refining. The cake from the solvent plant contains approximately 30 - 35% hexane and a little bit of oil. The cake is discharged into the desolventizer where it is heated by steam to vapourize the oil and hexane. The ensuing hexane laden with oil is passed through the distillation plant where the oil and hexane are separated. The meal with approximately

1% oil content from the desolventizer is dried and made into pellets for sales to the feed manufacturers.

The crude oil is refined by a combined process of neutralization and degumming. Other refining processes such as deodorizing and bleaching do not take place.

Extraction of Oil from Groundnut

As aforesaid the plant was originally designed to process groundnuts before there was an acute shortage culminating in other seeds being processed at present instead of groundnut. However, processing of groundnuts follows essentially the same procedure as described above for cotton seeds, the major differences lie in the method of preparation of the seeds, and control of operational parameters such as temperature, pressure setting for mechanical expression, expeller cake output setting, quantity of hexane, etc. The groundnut seeds are supplied to the company already dehulled and so the first stage of processing is the cleaning of the seeds to remove foreign materials such as sticks, leaves etc. in a screen-type mechanical vibrator. The cleaned seeds are then conveyed to the central silo (the same silo is used for storing cleaned cotton seeds) which stores any seeds meant for processing. The process of oil extraction follows essentially the same steps described above for cotton seeds. That is, flaking in flaking rolls, cooking, pre-pressing for mechanical extraction of oil, solvent extraction to remove the remaining oil in the cake and finally refining of the crude oil. The cooking temperature for groundnut increases progressively from 60°C to 90°C. Distillation

temperature is 120°C for cotton seed oil whereas it is 110°C for groundnut oil. It is also worth noting that the groundnut cake is higher than cotton seed with the result that cotton in general requires more hexane for solvent extraction.

10.2.8 Capacity Utilization

The mill with a design capacity of 500 tonnes of shelled groundnuts per day and a proven capacity of 360 tonnes/day was commissioned in 1973. In the planning stage there was an abundant supply of groundnuts in the country and ready markets for the groundnut oil both locally and in the world markets. Thus, the design capacity, even with facilities for future expansion, did not envisage the calamity that was to befall the groundnut industry in the later years. Serious drought occured in 1973 leading to serious local shortages of seed. This was closely followed by the rosette virus epidemic of 1975 which affected about 0.7 million hectares of cultivated land north of 11°N. This epidemic resulted in a total or near total loss of crop and seed to most of the farmers involved.

Although the company had not been able to provide detailed statistics of production, suffice it to say that the plant had never been fully utilized due to the acute shortage of seeds for processing. At the time of our visitation there was no processing at all. Throughout last year, the company was only able to process approximately 5,000 tonnes of cotton seeds which is equivalent to 15 days production. The company has since pruned down the staff considerably to a few management staff, skilled workers and unskilled hands for casual production and maintenance.

However, the Kano State Oil and Allied Products should be commended for its efforts to keep production going. While other processors have switched over to importing vegetable oils from overseas for packaging and sales in the country, an arrangement which is probably turning out to be more lucrative than processing, the company has concentrated its efforts on the procurement of other oil seeds for processing. The pre-pressed solvent extraction plant of the company has the unique advantage of being able to process other oil bearing seeds such as cotton seeds, sunflower seeds and even palm kernels with minimum adaptation. Unfortunately, processing of cotton seeds has also suffered due to the scarcity of the basic raw material. In the search for basic raw materials, the company sometime ago imported sunflower seeds from America for processing. This also did not materialize eventually due to a combination of technical problems of preservation of the raw materials enroute and at the port as well as the rather exorbitant cost of transportation from Lagos to Kano. Although this idea has been shelved meanwhile, there are still chances that it may be revived in the nearest future under the present vigorous efforts of rejuvenating the industry. Furthermore, although the company has successfully processed palm kernels to palm kernel oil, and even gone to the extent of securing the supply of palm kernels from the southern part of the country where they are available, the idea is in the freeze meanwhile for reasons not far removed from transportation cost as well as available quantity. The latest in the series of efforts to get raw materials seems to be the plan to import groundnuts from Senegal and Gambia.

It can readily be seen that the available capacity is far from being utilized at present and even in the nearest future. But it is worth noting that the company will face the least problem of reactivation for production should raw materials become available again.

10.2.9 Repair and Maintenance Facilities

When the plant was commissioned in June 1973 the company made adequate provision for the training of maintenance staff and the establishment of machine workshop for fabrication of simple spare parts. Although the plant was manufactured by a French Company, the company has a contractual agreement for staff training with Egypt due to her experience with similar plants. Under the terms of the agreement 22 Egyptians were originally sent to Nigeria to work and train Nigerian staff on the maintenance and running of the plant. Under the present circumstance of little or no production at all, there are now only 8 Egyptian technicians left and about the same number of Nigerian technical staff whose main pre-occupation is to carry out preservational maintenance to guard against damage of sensitive parts due to non-usage.

The workshop is well equipped to manufacture and recondition simple parts when the need arises. However, the company has problems in procuring essential spare parts due to financial constraints. For example, the rollers for the revolving solvent extraction chamber are faulty and need replacement. So also are the pipings in the distillation section which continue to leak water into the hexane with the result that considerable amount of water is pumped along with hexane into the underground storage tank.

10.2.10 Marketing

Products of the mill are sold through agents for distribution and further retailed. The oil is sold in drums at a wholesale price of ₦165.00 per drum for groundnut oil and ₦160.00 per drum for cotton seed oil. The oil is further repacked by the purchasers and retailed. The cake pellets are bagged in 50kg jute bags and sold to buying agents to livestock feeds industries.

10.2.11 Constraints and Future Development

Lack of regular supply of raw materials has rendered plant under-utilized for the past two years. In addition to that, spare parts are not easily available. There are some financial constraints in purchasing spare parts coupled with the Form M problems which make procurement of spare parts from overseas even more difficult.

The company has plans to import oil seeds from neighbouring West African countries to solve the raw material problem. It is considering also plans to go into a joint venture with Benue State for processing oil from Soya beans.

10.2.12 Conclusions and Recommendations

Conclusions

(i) The mill is suitably located for its raw material supply - groundnuts and cotton seeds.

(ii) There is evidence of organizational and management structure of a high order to enable it to withstand competition, not only in terms of price and quality but also in the ability to take a large share of the domestic market.

CHAPTER 11

OTHER OILS

11.1 Case Study 1 - COCOA INDUSTRY (NIGERIA) LIMITED

11.1.1 Basic Information on Factory

The Cocoa Industry (Nigeria) Limited (CIL) has been in operation for the past 13 years. This company situated at Ikeja, in Lagos State, is very close to her supplier of raw materials which is the Cocoa Beard. The Cocoa Industry stakes a net cash flow of ₦2 million per week to buy cocoa beans without enough proceeds of outlay.

11.1.2 Management Structure and Employment Situation

The Cocoa Industry Limited functions under seven departments, namely, the Administration, Marketing, Accounting, Internal Auditory, Engineering Production and Quality Control Divisions.

The vertical pedigree of the company is from the Board of Directors, including the Chief Executive, down to the management group. The top and middle management cadre is made up of 45 well-trained personnel, 15 superintendents, and the remaining labour force of 440 consists of technicians of different disciplines and operatives.

11.1.3 Raw Material Supply

The main raw material processed is Cocoa beans, from which the company produces cocoa butter and cake, proportionate to forty percent each by weight of the starting raw material, while the remaining twenty percent of the raw material constitutes industrial wastes. These waste products consist of fifteen percent of raw material shell, two percent as moisture loss while about three percent are for extraneous matter (dirty content) The shell can be ground and pulverised for irrigation and animal husbandry.

In retrospect, the company used to buy her bulk of cocoa beans from the Western Nigerian Marketing Board before the establishment by the decree, of the Produce Board which now sells cocoa beans to the Cocoa Industry.

In this connection, the price fixture for the Board's cocoa beans is internationally determined, and so the company in return buys her cocoa beans from the Board at World price. This world price has always dominated the home industry to its disadvantage and to the extent of causing the trade dispute of 1976. The Cocoa Industry Limited was badly affected as it could not sell its products directly to outsiders.

11.1.4 Production

The end products of the processed cocoa beans are butter, cake and wastes as mentioned earlier. The high standard cocoa butter has its basic use in food applications while the substandard and inferior grade types of cocoa butter are used in pharmaceutical and cosmetic applications.

The cake is pulverised into powder of neutral and alkalised grades. The neutral grade type of cake powder to which nothing is added is further milled to cocoa powder and used in flavoured biscuits and coffees while the alkalised grade type of cake powder is used for special products.

The net yearly budgetted production of 24,000 tonnes of finished products, consists of 6,000 tonnes of butter and 18,000 tonnes of Cake powder.

In case of butter production, about 12½ percent and 87½ percent are for export and home consumption respectively while for cake powder production, about 90% and 10% are for export and home consumptions respectively.

11.1.5 Infrastructure

There are some utility constraints like shortage of power and water from the National Electric Power Authority and the Lagos State Water Corporation, respectively. In order to minimise these constraints, the

company has established internal power generation to handle about 60 percent of production capacity while there are two boreholes for water supply and cooling water. Treated water is stored in elevated tank for good distribution.

11.1.6 Relationship with Other Industries

Cocoa Industries Limited (CIL) has trade relationships with a number of industries. Notable among them are the Cadbury (Nigeria) Limited, the Biscuit Manufacturing Company (BISCO), Ikeja, Foremost Dairies, Vee Pee, BAGCO and UNIC. Cadbury, BISCO, and Foremost Dairies rely on CIL for its cake for the manufacture of a variety of Cocoa-based goods, while Vee Pee, BAGCO and UNIC are all good suppliers of packaging materials. Vee Pee specifically supplies both outer and inner polythene bags while BAGCO and UNIC provide propylene bags.

11.1.7 Marketing

The Produce Board exports the finished products on behalf of the Cocoa Industry, to Europe, the Far East, U.S.S.R., U.S.A. and Australia. It is note-worthy to mention that the Cocoa Industry is at present producing below the rated capacity but higher than what the Produce Board can sell or export. This has led the Cocoa Industry to be keeping six months inventory of 600 tonnes of milled butter (under not so congenial conditions).

The limit to what the Board can export is due to shipping and other transportation problems. In this regard, the Board has not been an efficient marketing linkage.

11.1.8 Major Constraints and Future Prospects

The Cocoa Industry experiences some constraints like administrative blockage from Governmental functionaries such as the Ministries of Trade

and Commerce as to Policy making. The governmental Policy of preventing the company from direct sales of its products, frustrates the company and prevents it from meeting production costs.

11.2 Case Study 2 - LISABI MILLS (NIGERIA) LIMITED

11.2.1 Basic Information on Factory

Lisabi Mills (Nigeria) Limited has been in operation for about 40 years and this company is situated at the very best market centre in Nigeria (Lagos) but its sources of raw materials are far away. So, the company packages and markets palm oil, vegetable oil, melon seed powder and other edible fats. Although it used to mill melon seeds to produce melon seed oil and cake, at the time of the visit (October, 1979) the mill had been shut down for a year due to hydraulic press failure. The information obtained is therefore about the production prior to shut-down.

11.2.2 Raw Material Supply

The main raw material processed is melon seeds which are usually purchased from Niger and Kwara States. The price of this raw material has not been steady over the years but has been subjected to increases. The price per tonne at the beginning of the 1974 season was only ₦750.00 whereas at the beginning of the 1979 season, the price had increased to ₦2,000.00 per tonne.

Apart from the cottage industries which manufacture at subsistence level, Lisabi Mills is the major and only commercial processor of melon seeds.

11.2.3 Infrastructure

The mill makes use of the electric power as supplied by the National Electric Power Authority and the power supply from a stand-by generator unit. The company has no water problems since its processing does not involve extensive use of water.

11.2.4 Marketing

The company packages and markets palm oil and some vegetable oils apart from its processed melon seed oil and cake. Most of these products find ready market in Lagos where they are sold at wholesale prices to retailers who proceed for their sales in the hinterland states.

11.2.5 Major Constraints and Future Prospects

Apart from inconsistent availability of raw materials, other factors that prevent any expansion in production are lack of sufficient funds, unfavourable high taxation of oil seed processors and price de-stabilization. The melon seed oil is consumed mainly in Nigeria and because its processing is alien to foreign seed crushers, the crushing of melon seed has remained mainly traditional.

11.2.6 Technology Applied and Technical Efficiency

On getting to the mill, the shelled melon seeds are dried in a forced draught convention air heat exchanger room or sometimes spread out in batches under the sun. On drying, the seeds are conveyed to a magnetically vibrated tray from where stones and other non-ferrous foreign materials are magnetically removed by a magnetic drum. The seeds are then passed through breakers and flaking rolls where they are broken into thin flakes to

facilitate cooking and oil expression. The rolled flakes are then passed through the screw presses to partially defat the flakes and then milled into flour. This partially defatted melon seed flour which is used in Nigerian soups is sold locally. Some of the items of equipment such as the forced draught air exchanger have recently been installed.

11.2.7 Equipment and Capacity Utilization

A new screw press has now been purchased from India to replace the old hydraulic press which broke down over a year ago. The mill found it cheaper to replace rather than repair the bad press.

Even prior to the break down of the hydraulic press, the mill was functioning at about 50% maximum capacity. This was due to the lack of raw materials, high cost of raw materials, selling price of products, nature of products and competition from the cottage industry. The cost of raw materials has trebled within a few years while the quality has gone down. Farmers routinely add foreign materials to their melon seeds to increase their dwindling returns.

It costs about ₦4.50 per litre to process melon seed oil while the selling price of other vegetable oils is between ₦1.20 - ₦1.30 per litre. It therefore seems uneconomical to mill melon seeds into oil especially since it is not an essential commodity and cheaper replacements can readily be found. Even at the cottage level of production the price is about ₦2.00 per litre although it can only be obtained in a few selected locations in the country. As a result of the high price, the demand for melon seed oil is not very high and only consumers in the higher income bracket with a taste

for the flavour and also those who believe in its unproven medicinal value buy it. It therefore has a limited market and this is why the mill was only able to break even by selling the partially defatted cake.

Until melon seed farming and shelling are mechanized, the availability of raw material will continue to be a major obstacle. In this respect, the recent news from the University of Nigeria, Nsukka about the development of a melon seed shelling machine is most timely although it will take a while before this machine is available in commercial quantity.

11.2.8 Repair and Maintenance

The maintenance department of the mill carries out most of the routine maintenance in the mill. For more difficult maintenance and for product and equipment development, the mill obtains assistance from the Federal Institute of Industrial Research, Oshodi, Lagos, the University of Ife, Food Science and Technology Department and Cadbury Nigeria Limited. The mill is collaborating with the University of Ife in the development of equipment and process for extracting 'Asala' seed oil and orange peel oil.

11.2.9 Major Constraints and Future Developments

As far as melon seed milling into oil is concerned, Lisabi Mills is facing multiple problems of difficulty in procuring raw materials which are in short supply, at very high cost and of poor quality. When the oil has been processed, there is also the problem of marketing due to its relatively high price and stiff competition from the cottage industry.

As a result of these problems, although Lisabi Mills has recently purchased a screw expeller, the company is not seriously contemplating

processing melon seeds into oil. It may in future decide what to do with the expeller.

11.2.10 Conclusions and Recommendations

Conclusions

(i) Availability of raw materials will improve with the Governments continuing support for mechanization of farming and liberalization of loans.

(ii) Lack of raw materials, comparatively high cost of purchases and processing of melon seeds will lead to under-capacity utilization when the mill resumes operation.

(iii) The price of raw materials (melon seeds) is not stabilized since melon seed is not sold in the international market like some palm products.

(iv) Melon seed oil from the mill is twice as expensive as the one obtained from the cottage industry.

Recommendations

(i) Incentives similar to those given to farmers should be given to the seed crushers to encourage production of melon seed oil and other purely locally consumed seed oils, otherwise extinction of those oils is inevitable.

(ii) At least one other screw press should be purchased by the mill to ensure that oil production does not cease completely when there is a problem with the only screw press now to be installed.

CHAPTER 12

RELATED VEGETABLE OIL INDUSTRY (USER INDUSTRY)

12.1 Case Study 1 - Lever Brothers (Nigeria) Limited (LBN)

12.1.1 Basic Information on Factory

LBN is a multi-national company, one of the oldest in the country, having been established in the mid-forties.

It is now owned as a joint venture between the Federal Government of Nigeria holding 60 percent and Unilever holding the remaining 40 percent. It is located in Apapa, Lagos, having a branch at Aba, Imo State.

12.1.2 Management Structure and Employment

The company is managed by a Board of Directors and its executive is the Managing Director. Top line management consists of Heads and Managers of the various departments. The technical personnel are mostly expatriates with a few well educated Nigerians. The labour force is very large numbering 2,575.

12.1.3 Raw Material Supply

Raw materials used by LBN are in two categories:-

(a) Those used for edible products such as margarine are palm oil which constitutes the bulk of the oil used, palm kernel oil and groundnut oil.

(b) Those used for inedible products such as soap are palm oil and oil wastes from the edibles line.

12.1.4 Sources

There are two sources of palm oil supply for LBN. Locally through the Nigerian Produce Board and through importation from Malaysia, Ivory

Coast and Zaire. Purchasing for imported oil is handled by Unilever Central Purchasing Department, in Great Britain. Palm kernel oil and groundnut oil are both purchased locally direct from the mills. Tonnage of oils supplied is shown in Table 13.

Table 13. LBN's Annual Tonnage of Raw Material Supply

Type of Oil	Quantity Purchased Locally (tonnes)	Quantity imported (tonnes)
Palm Oil	100	10,000
Palm Kernel Oil	5,000	-
Groundnut Oil	600	-

12.1.5 Quality

LBN is very particular about the quality of oil it uses in its refining processes. It claims that for locally purchased palm oil and palm kernel oil, the quality is often not satisfactory from processing point of view. This is tied up with the free fatty acid content in the oil. Free fatty acid in palm oil usually complicates refining processes.

LBN's FFA standard of 1-4 percent is usually met by imported oil, while local oil shows higher levels. Table 14 shows the quality of local and imported oil received by LBN. In the absence of official Nigerian standards for oils and fats, LBN has established its own. Quality Standards for LBN's refined and unrefined palm oi' are as described in Table 15.

Table 14. Quality of Oils Supplied to LBN

Type of Oil	Source of Supply	Percent Good Quality (FFA 5%)	Percent Poor Quality (FFA 5%)
Palm oil	Imported	90	10
	Local	-	100
Palm Kernel oil	Local	60	40
Groundnut oil	Local	100	-

Table 15. Quality Standards for LBN's Oils

Constituents	Unrefined Palm Oil	Refined Palm Oil
Free Fatty Acid % maximum	5	0.05
Iron, ppm max.	5	Not detectable
Copper, ppm max.	0.2	Not detectable
Iodine value	50 - 60	-
Peroxide Value	5 meg/kg	0.05 meg/kg
Moisture, max.%	0.5	-

12.1.6 Products of LBN

Among the edible products, LBN uses fats and oils for the manufacture of a range of products:-

1. Margarines (Blue Band and Planta)

This is a tropical type of margarine with very high palm oil content of which some part is hardened. Such a blend has

adequate stability to temperatures within 30 - 40°C. Planta is a refrigerated margarine containing less palm oil and groundnut oil.

2. Shortenings and Biscuit Fats (Solo and Biskin)

These are products containing 100% fat phase of the refined type which is thoroughly blended with air at the crystallising stage. They are used for the industrial manufacture of biscuits, pastries and toffees.

3. Cooking Fats (Cookeen)

These are blends of oils chilled and texturised in the same way as margarine. They are used for frying, cake making and for filling creams.

4. Cooking Oils (Covo and Oroyo)

Cooking oils are made from 100 percent palmoleen, the liquid portion obtained by palm oil fractionation. They are also made from deodorised high quality groundnut oil.

5. Ice Cream Fat (Palmin)

Lever Brothers produces an ice cream fat of a 100% palm oil base. This has replaced imported hardened liquid oil traditionally used by the ice cream industry.

6. Bakery Fats (Holsum and Special Holsum)

LBN produces two products particularly to be used in bakeries. Holsum is an all purpose bakery fat meant for cakes, buns, scones, pastries and soft biscuits. Special Holsum is a product

specially developed for bread baking. This product contains an emulsifier which provides high moisture absorption properties. Both Holsum are margarine-like emulsions and the manufacturing procudure is equivalent to that of margarine.

The quality of these products from observation is usually not quite comparable to imported ones. The difference in quality has been explained to be due to differences in formulation, quality of raw materials, processing technology and local infrastructural facilities. Presumably comparable quality can be achieved if all local facilities are better.

The non-edibles produced by LBN utilising fats and oils are soap and detergents.

12.1.7 Packaging of Products

LBN uses a variety of packaging materials for its products. Tin cans for blue band margarine are locally procured while plastic tubs for planta are imported. Wrappers for soaps are mostly locally produced. Fiberites are used for packaging other finished soaps and they are all locally manufactured.

12.1.8 Marketing of Products

LBN has a well established system of distribution in which appointed distributors buy at wholesale price and redistribute to smaller retailers such as supermarkets and shop owners in the local markets. LBN's distributorship has a national coverage particularly for the soaps and the oils and margarines which do not require refrigeration.

12.1.9 Constraints and Future Developments

The main problem of LBN is insufficiency of raw material with its attendan problem of poor quality. This has led to importation of raw materials of better quality by LBN to keep its factories going in order to satisfy local demand.

LBN has plans to expand the company but certainly not on the lines of installation of an oil crushing plant.

12.1.10 Conclusions and Recommendations

Conclusions

(i) The company is a multinational one well managed and having a high number of well educated technical personnel many of whom are expatriates.

(ii) It uses local raw materials (palm oil, palm kernel oil and groundnut oil) for manufacturing a host of edible and non-edible products. However due to insufficient quantities and poor quality of local raw materials, most especially palm oil, it relies heavily on imported raw materials of higher quality.

(iii) The company has a good distribution system for marketing its products which are well accepted.

Recommendations

(i) There is need for better communication between LBN and its raw material suppliers to ensure better quality raw materials.

(ii) In this regard, LBN should support programmes by the crushing industry in the proper handling, storage and distribution of the raw materials.

(iii) LBN should encourage and finance research and development activities in the utilization of non-traditional raw materials for edible fats and oils. It is imperative that such research be conducted in Nigeria.

(iv) To solve the raw material shortage, LBN should consider contracting some small scale producers by providing them with credit facilities for an integrated project, that is, planting and processing good quality oil to supply to LBN only.

PART C

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR INDUSTRIAL DEVELOPMENT

CHAPTER 13

PALM OIL SUBSECTOR

1. Mills will have to include a fruit washing system in their future plans, as this would help to remove abrasive materials and prolong the life expectancy of components.

2. Palm Oil Mills are seriously under-utilized due to the shortage of raw materials for processing. In order to increase the production of raw materials, existing Government-owned plantations should be rejuvenated to expand capacity while efforts should also be geared towards the establishment of more plantations. Also, local farmers should be encouraged in their cultivation of plantations through group loans, provision of fertilizers and incentives as is done at present under the small holders management unit. Newer high yielding varieties which have been found locally suitable by the Nigerian Institute for Oil Palm Research (NIFOR) should be made available to local farmers in order to increase production.

3. Majority of the mills are situated on the palm estates and so the harvested fruits could be carried over short distances for processing, if there were enough access roads. Also, lack of adequate number of vehicles to transport the harvested fruits is a major problem. For better productivity from mills, therefore, it is necessary to improve infrastructural facilities both at the mills and on their plantations, and between them.

4. Procurement of spareparts is difficult to maintain by most of the mills because of insufficient funds and the prolonged delivery time. However, some simple-to-manufacture spare parts are usually fabricated at the mill's engineering workshops since the manufacturing industries are of little help.

Hence, there is need to encourage the local manufacturing industries to extend their capabilities to the service and manufacturing of spare parts for the palm oil mills in particular and the vegetable oil industries in general.

5. Most of the mills enjoy good revenue through the sales of their palm oil which attracts high price and demand from the domestic market.

6. The user industries import considerable amount of oil at present due to the rather high FFA content of the locally processed oil. There is need to conserve foreign exchange by encouraging the local processors to increase the quantity and improve the quality of the production, while at the same time encouraging manufacturing industries to use the available oil. The Nigerian Standards Organization (NSO) might be asked to set and enforce quality standards for local palm oil.

CHAPTER 14

PALM KERNEL OIL SUBSECTOR

1. There is need to examine closely the problem arising from the provision of the solvent hexane which is imported and distributed to various solvent plants in the country. Possibility of local supply from petroleum refineries in the country as enjoyed at present only by the Kano State Oil and Allied Products Limited should be explored.
2. The Government Industrial rate for electricity and electrification programme should take cognizance of the existence of these mills which are usually situated in the rural areas, and make provision for consistent supply of power at reasonable cost.
3. In order for the mills to easily break-even, it is necessary for the Palm Produce Board to relax its rigid control over the mills' purchase of raw materials and their sales of finished products for home consumption, although the Board could still be concerned with export sales.
4. There should be a mutual agreement between the Nigerian Palm Produce Board and the National Association of Oil Seed Processors, over the crushing fee to be paid by the Board to the mills, instead of the former wholly handling the affair. In this regard, the Board should emphasize internal trade more than export.
5. The Board should be encouraged to stake some investment in the mills.
6. Since most of the mills are of the solvent-extraction type which is technologically intensive, there is a need for a dynamic staff training programme. Coupled with this, there should be greater cooperation

between the various processors for useful exchange of ideas and information. The Nigerian Palm Produce Board, by its nature, should provide the machinery for such cooperation.

7. Quality standards and controls should be established and enforced by the Nigerian Standard Organization in order to improve the quality of the local oil for the processing industry. This will prevent undue importation of better quality oil and conserve foreign exchange.

8. There is need for establishing a stronger linkage with industrial users by improving means of communication, and trading.

CHAPTER 15

GROUNDNUT OIL SUBSECTOR

1. The state of the oil crushing industry is that there is a capacity for processing about one million tonnes of oil seeds per year. The low level of production that cannot meet both the home and overseas demands, is caused by many factors such as the drought and the attack on the groundnut farm lands,by rosette disease. In this situation of deep agricultural depression for the production of groundnuts, the future of the industry implies complete closure. However, the Federal Government's Programme on the "Green Revolution" may serve as some sort of restitution for increasing groundnut production. This may require the concerted efforts of the Nigerian Groundnut Board, the processors, and the affected states Ministry of Agriculture to look into ways and means of rejuvenating groundnut production. It is only at this level that the various mitigating factors already identified can be seriously looked into with meaningful policy and action.

2. As a result of non-availability of groundnuts for processing, most of the mills do currently import other various types of oils as substitutes for the widely-consumed groundnut oil. The importation of these other types of vegetable oils is a thriving business since the oils still meet consumer acceptance.

3. If the processing of groundnut oil is to be maintained before restitution of the raw materials, it may be necessary for the Federal Government to create conditions conducive to the importation of groundnuts, from

other West African countries as a short term measure.

4. It is necessary for the Government to make land available to interested oil crushing mills, so that they can establish an integrated programme with viable agricultural projects. These projects, to be manned by highly skilled agricultural officers with specialised knowledge of groundnut horticulture, would be solely concerned with the production of groundnuts. As much as possible the Kano State Ministry of Agriculture should be actively involved with such projects based upon the experience of the ministry in the field of agricultural extension services.

5. The Nigerian Groundnut Board should be encouraged to take interest in such a scheme, by investing in the raw material production aspect.

6. When groundnuts become more available, pricing by the Groundnut Board should be reviewed and based on domestic production costs rather than world prices.

7. The mills should be encouraged to process other oilseeds such as soya beans and benniseeds by increasing importation of these oil seeds.

CHAPTER 16

OTHER OILS AND FATS

16.1 Cocoa Butter

1. The demand for the finished products is high at home and overseas markets but the limiting factor to expansion is the evacuation and sales of the finished products. The Cocoa Industry has been experiencing too much loss of its finished products especially the cocoa butter due to its poor storage facilities and delayed evacuation. It is therefore necessary for the Industry to improve on its storage facilities. This could be achieved if the financiers of the Industry would make more funds available.

   Also, it may be imperative to ensure that the Cocoa Board stakes some investment in Cocoa Industry so that highly economic yields could be aimed at by the two parties concerned.

2. There needs to be some adjustment or flexibility concerning the Government Policy of preventing the Industry from direct sales of its products. This administrative blockage contributes to the inability of the Industry to meet its cost of production since the allowance being paid by the Cocoa Board is usually less than the cost of production.

16.2 Melon Seed Oil

1. There needs to some large scale cultivation of melon seeds through cooperative farming schemes or Government-aided agricultural

projects. In order to boost production individual local farmers can also be encouraged through the liberalization of loans for farming.

2. Increased production of melon seeds should interest local processors to consider industrial extraction of the oil which can serve as a substitute to other vegetable oils or better still find application in oil blends. This should improve the marketability of the oil, as commercial processing is more likely to make the product cheaper than cottage style production.

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APPENDIX A

QUESTIONNAIRE ADDRESSED TO MAJOR PROCESSORS OF THE VEGETABLE OIL INDUSTRY

QUESTIONNAIRE ON THE TECHNO-ECONOMIC EVALUATION STUDY OF THE VEGETABLE OIL INDUSTRIES SECTOR IN NIGERIA

1. Name of Enterprise: ----------

2. Address: ----------

   ----

3. Date: ----------

4. (a) What are the basic raw materials processed?

   (i) ---------- (ii) ---------- (iii) ----------

   (b) What are the auxiliary raw materials?

   (i) ---------- (ii) ---------- (iii) ----------

5. What are your sources of raw materials?

   Buy ---------- Self cultivation -------- Importation --------

6. If self-cultivation: (a) State size of the farm and the annual yield

   ---------- Acres ---------- tons.

   (b) What major problems do you encounter in raw material cultivation? ----------

7. If raw materials are purchased/imported, state where they are obtained. Commodity Board ---------- ----------

   Local ---------- Others (Specify) ----------

8. What is your method of storage of raw materials? ----------

   ----

9. (a) How often do you receive your raw material consignment?

(b) In what quantity do you receive your consignment?

per day ---------- per month ---------- per quarter --------

semi-annually ---------- annually ----------

10. What is the price paid by Company for raw materials?

---

11. What are the products processed?

1. ---------- 2. ---------- 3. ----------

12. What is the production volume for each product?

(a) Output per day 1. ---------- 2. ----------

3. ----------

(b) Output per month 1. ---------- 2. ----------

3. ----------

(c) Output per year 1. ---------- 2. ----------

3. ----------

(d) Do you have any seasonal productivity?

High season output 1. ---------- 2. ---------- 3. --------

Low season output 1. ---------- 2. ---------- 3. --------

13. (a) Do you have any shut-down for yearly maintenance?

YES/NO

(b) If answer to (a) is Yes, for how long ----------days.

14. (a) Do you have any quality control ? YES/NO.

(b) What type of quality control is being used for:

(i) raw materials ----------

(ii) Processing ----------

(iii) Finished Products ----------

15. What is the factory capacity for production:-

1. ---------- 2. ---------- 3. ----------

16. What are the constraints for Expanding production?

---

17. Source of Power Supply

NEPA ---------- GENERATOR ---------- BOTH ----------

18. How reliable is power supply? ----------

19. Source of Water Supply (mains, river, borehole). ----------

20. How reliable is your water supply? ----------

21. How large is your labour force?

(a) Top Management (Dept./Div. Heads & Above)

(i) Number: Nigerian ---------- Foreign ----------

(ii) Gross Remuneration ----------

(iii) Educational/Professional background ----------

(b) Middle Management

(i) Number ----------

(ii) Gross Remuneration ----------

(iii) Educational/Professional background ----------

(c) Skilled Workers

(i) Number ----------

(ii) Gross Remuneration ----------

(d) Unskilled Workers

(i) Number ----------

(ii) Gross Remuneration ----------

22. What % of Payroll is expended on:-

Medical ---------- Housing ----------

NPF ---------- Others (specify) ----------

---

23. No. of shifts per day:

One shift ---------- Two shifts ---------- three ----------

24. What is the distribution system of your products?

(Commodity Board, Agents, Industries, Others (Please specify)

---

25. Is your product sold locally (YES/NO) or sent to other States?

YES/NO. Name of State if possible:- ----------

26. (a) What is your method of transportation to market?

(b) Who pays for the transportation? ----------

27. What is wholesale price of your products? ----------

28. What is the retail price of your products? ----------

29. (a) In what form do you package your products? (glass bottles, plastic bottles, drums, wax paper tins, others (please specify)

(b) What are your sources of supply of packaging ?

Materials ---------- Cost ----------

30. (a) What are tye by-products ?

(b) How are they disposed of? ----------

---

31. How far is the nearest similar factory to your own ?

----------Km/miles.

32. Company Ownership, % Equity.

33. Year of Commissioning of present production plant, 19--------

34. Any other information that you feel will be of help to our study.

APPENDIX B

QUESTIONNAIRE ADDRESSED TO COMMODITY BOARDS AND OTHER RAW MATERIAL SUPPLIERS

QUESTIONNAIRE ON INDUSTRIAL RELATIONSHIP BETWEEN VEGETABLE OIL PROCESSORS AND DISTRIBUTION CHANNELS

1. What are the raw materials sold out for processing?

---

2. From whom do you purchase your raw materials?

Local farmers ---------- Agricultural Institutes

(please specify) ---------- Cooperative Societies ------

---------- Other Marketing Boards (please specify) ----------

Importation, (Name the Countries) ----------

3. (a) What is the quantity of each raw material purchased at a time or per period?

Tons per week ---------- Tons per month ----------

for raw material ----------

Tons per week ---------- Tons per month ----------

for raw material ----------

Tons per week ---------- Tons per month ----------

for raw material ----------

(b) What is the price paid per ton for each raw material?

(i) ---------- (ii) ---------- (iii) ----------

4. What are your reasons for the purchase of the quantity of each raw material as indicated in item 3?

Shelf life of raw material ---------- Financial

Constraints ---------- Storage Facilities ----------

Transportation problem ---------- Not enough market

or demand ----------

5. What is your method of storage of raw material? ----------

---

6. Which Companies/Enterprises are your Customers? ----------

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(a) Name other markets for your products within Nigeria (please specify) ----------

Other Countries, (please specify) ----------

7. What is the quantity of each raw material sold out at a time/ or per period?

(i) Tons per week ---------- Tons per month ----------

for raw material ----------

(ii) Tons per week ---------- Tons per month ----------

for raw material ----------

(iii) Tons per week ---------- Tons per month ----------

8. (a) What is your method of transportation of raw materials to your Customers?

By road ---------- By rail ----------

Inland Water Ways ---------- By sea ------- By plane ------

(b) Who pays for the transportation? ----------

---

9. What is the wholesale price of your raw materials?

(a) Price per ton in 1977 ----------

(b) Price per ton in 1978 ----------

(c) Price per ton in 1979 ----------

10. What is the wholesale price of your raw materials?

    (a) Price per ton in 1977 ----------

    (b) Price per ton in 1978 ----------

    (c) Price per ton in 1979 ----------

11. Do your Customers have any quality specifications for the raw materials required?

    YES NO

12. What quality specifications do you have for your products before they are sold out?

    ----

13. How do you maintain the quality specifications of these products?

    ----

14. Do you supply on contract basis to your Customers?

    ----

15. What is the retail price of your raw materials?

    (a) Price per ton in 1977 ----------

    (b) Price per ton in 1978 ----------

    (c) Price per ton in 1979 ----------

16. Any relationship with other marketing Boards?

    Yes ---------- No ----------

I If yes, please specify ----------

17. Any other relevant information information that can be useful to us for this exercise? ----------

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