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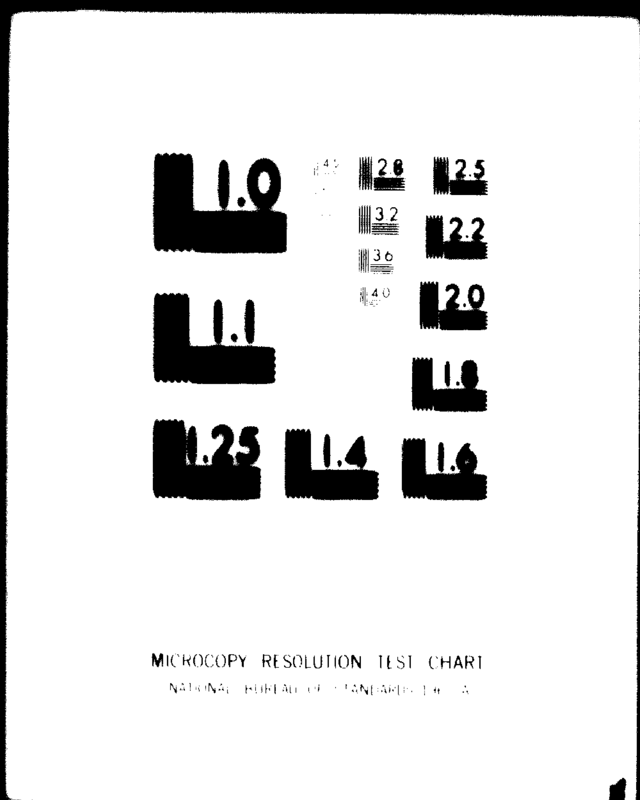
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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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GHANA INDUSTRIAL HOLDING CORPORATION

REPUBLIC OF GHANA

VEGETABLE OIL INDUSTRY

CONTRACT N° 71/10

FINAL REPORT

VOLUME I

AUGUST 1971

RESEARCH & DEVELOPMENT
[illegible]
BRUXELLES

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

GHANA INDUSTRIAL HOLDING CORPORATION

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FINAL REPORT

VOLUME 1

RESEARCH & DEVELOPMENT

RUE BRÉDERODE 2

BRUSSELS

AUGUST 1971

1. SUMMARY

1. SUMMARY AND RECOMMENDATIONS

At the request of the Government of Ghana, the UNIDO decided to bring assistance to the Ghana Industrial Holding Corporation (G.I.H.O.C.) Vegetable Oil Industry (V.O.D.) in order to provide a complete and detailed industrial production and market analysis of the Vegetable Oil Industry resulting in specific recommendation for its technical, technological and economic development.

The UNIDO has entrusted this study to the Belgian Association "Research and Development" who has set up a team of five experts specialised in oil industry, agronomy and economy.

The G.I.H.O.C. oil factories situation in March 1971 was as follows : only three oil factories on the six ones holded by G.I.H.O.C. were still operating. These three factories were only processing copra and groundnuts. No one was working at full capacity, their processing techniques needed to be improved. The experts had to analyse this situation from the following points of view : raw material, needs in oil and sub-products, markets and technology. For the needs of the study, the two Industrial Specialists, the Agronomist and one of the Economist make a long stay in Ghana while the second Economist remained in Europe to study the International Market. During the remaining time spend in Europe, the experts have collected the missing information and wrote down the report.

For the clearness of the summarised report here after given, the classification is made in the same way as duties statements.

A list of the agronomical economic and technological recommendations is given at the end of this summary.

1.1. The 1970 domestic consumption of vegetable oils in Ghana is estimated at about 38,500 tons, of which 36,000 are used for human consumption and 2,500 consumed by the various industries.

Production estimates for 1970 amount to 39,000 tons of which 7,200 (18 %) are processed industrially. These estimates are detailed below :

Palm Oil	: 18,000 tons	(4,000 t indust. processed)
Coconut Oil	: 11,000 tons	(2,200 t " processed)
Groundnut Oil	: 8,000 tons	(800 t " ")
Palm Kernel Oil	: 2,000 tons	(200 t " ")

Only some 500 tons were refined and even less deodorized (the bulk of it by Crystal Oil Mills). In 1971, V.O.M.D.(1) might realize the same figure on its own bringing deodorized oil production up to about 800 tons. These high quality oils are mainly coconut and groundnut oils. But the bulk of the high quality oils is still imported (about 3,000 tons in 1970). Palm oil is almost never refined.

At the moment, some 94,000 tons per year for human consumption (30 grams per man/day) are needed and some 32,000 tons for the industry. The requirements increase at an estimated rate of 3.6 % per year.

The market for high quality oils is concentrated in the towns, where the total oil consumption may be estimated at about 20,000 t.

Because of its domestic oil shortages we cannot advice Ghana to try to export oil or oilseeds (an exception should however be made for sheanuts and sheabutter).

(1) V.O.M.D. = Vegetable Oil Mill Division of GIHOC

Besides the domestic prices are usually much higher than the prices on the international market.

1.2. The demand for oil cakes in Ghana amounts to about 3,500 to 4,000 tons. That demand might double in the next five years. Groundnut cakes are most asked for (85 % of the total) and presently more than the half is imported. The local prices are well above the world market prices (about 20 %). Local production in 1970 was about 1,000 tons.

Copra cake production in 1970 was about 1,000 tons too. Almost half of it is exported at an average price of about 90 US $ more per ton than the local price.

1.3. On the national level the protein food situation is satisfactory but local shortages occur. These shortages are located in remote and backward areas with low income and high transportation costs. Use of protein coconut flour could only add 0.5 gram protein per man/day to the diet. Until today people who lack protein are only willing to use protein flours as long as it is given to them at no cost. Family poultry yards appear to be the sensible solution to these local protein deficiencies.

1.4. Raw Material

1.4.1. Copra

The Copra production in the West part of the country is abundant and estimated at 24,000 tons in 1970.

The Esiama factory purchases have progressed very successfully this last months and will probably rise 5,000 t in 1971.

Copra production will increase with the coming in bearing of the coconut fields planted during the last years and from an improvement of the cultural practices.

This should authorize Esiama, following an optimistic assumption, to increase her purchases up to 10,000 tons in 1974 and 20,000 tons in 1980.

For the Denu area their is no hope at all, before a long term, to see an increase in the production which falled because of a fatal disease of the coconut trees. To favorize the production it is recommended to the Government to hasten introduction of new, high yielding varieties and to stimulate the use of fertilizers.

1.4.2. Groundnut

The present production fluctuates around 38,000 tons; after deduction of the needs in seed and of the autoconsumption of peanuts, about 17,000 t are utilized for oil production. The G.I.H.O.C. share is low, 2,000 t as an average for 1969 and 1970.

In spite of the existence of good selected varieties, of the knowledge of the right fertilizers to be used and of the appropriate cultural practices we may not be optimist on production increase. This should only happen if the Government makes an effort to improve this culture and it is recommended to realize this effort as soon as possible.

With a better commercialization system, G.I.H.O.C could nevertheless double her purchases. With an optimistic hypothesis the purchases could rise 4,300 t in 1972 and increase gradually up to 7,900 t in 1975.

1.4.3. Palm Oil

The present palm oil production is very low, more or less 18 000 t in 1970. It covers only a small share of the needs. Owing to the programmes foreseen by the State Farm Corporation, the farmers and taking in account a Government scheme for the palm oil development, the production will increase and double in 1978.

This production will be very easily absorbed by the internal market needs.
G.I.H.O.C., who presently has no interest in palm oil, could integrate herself in the development projects to take charge of the processing. With regards to palm kernel, this recuperation is insufficient where their is a potential of 2,000 t to 3,000 t that should be bought and processed.

1.4.4. New Raw Material

Sheanuts and seeds of cotton are the only sources of new raw material that must be taken into consideration for the oil industry in Ghana.

Sheanut, a natural product of savanna's tree (Butyrospermum parkii), mainly utilized for the traditional sheabutter fabrication and an important tonnage of nuts is yearly exported. The nuts harvest could be doubled. The industrial oil extraction must be taken into consideration.

The cotton crop, which has been recently introduced in Ghana (1968) is developed under the cotton Board Supervision. The last is helped by the F.A.O. and the C.F.D.T (Compagnie Française de textiles), a french organization supervising the cotton crop in all the neighbouring countries.

The programme has good chances to succeed because it makes use of well known selected varieties, cultural practices, fertilizers and pesticides and also because of the C.F.D.T. high experience. The seed production which was 250 t in 1970 will most probably reach 3,000 t in 1973. As it is presently done the seeds should not be exported but first processed by G.I.H.O.C.

No other raw material must be taken in consideration.

1.4.5. Prices

Prices for palm fruit are very high about 28 US $ per ton to the farmer. Usually prices to the farmer do not exceed 12 US $ (e.g. Congo-Kinshasa, Togo..).

Groundnut prices to the producer are high also up to 212 US $ in 1970. Average world prices (CIF London) were about 230 $.

Prices for copra and palm kernels are respectively 150 US $ and 135 US $ per ton. They are competitive with the international prices.

Sheanuts are paid 50 US $ per ton to the producer.

There are still no prices fixed for cotton-seed. But the 1970 production was sold to Japan at about 40 U S $ per ton F.O.B Tema.

1.5. Production of sheabutter should be started in Ghana. An annual average up to 5,000 tons of sheanuts is exported at prices which generally are well below the average world price of the moment. As sheabutter does not become rancid, major West-European importers declared themselves willing to import sheabutter rather than sheanuts to save freight costs.

1.6. Our survey has shown that it is necessary, in general, to carry out a preventive maintenance of the equipments. It is evident that this aspect has been principally neglected for budgettary reasons. As a consequence of this situation, some plants are mechanically in bad conditions. As the quantities of raw material were rather limited until now, this problem has never been critical. The Esiama plant has nevertheless been confronted with it : for the first time the supplies of the purchases service have been superior to the quantities the plant has been able to process.

If we take into account the forecasted evolution of the agricultural production, and if an effort is done at the level of purchases, it is clear the situation of the plants will become critical in the short term.

In consequence, as we have suggested at the chapter 4.3., it is absolutely necessary :

- 1°) to repair completely the presently utilized installations, and at this end, to call upon specialists's help,
- 2°) to improve the fabrication chains of Tamale and Atebubu in order to increase their efficiency and capacity,
- 3°) to process new oil seeds, and in particular cotton-seeds and sheanuts.

An exception being made for the Esiama plant, these interventions must be limited to limit the financial impact of these operations, the character of which will anyway be more conservatory than definitivo.

Inasmuch, the dispersion, the small size and the mechanical situation of the plants, (Atebu, Tamale), it would be illusory and expensive to restructure units, the final efficiency of which is more than doubtful.

We are of the opinion this first intervention programme should be limited to the minimum and only constitute a step towards the definitive phase in which all activities, an exception being made for copra and palm fruits, would be concentrated in a single plant to be located in the region of Tema (harbour near Accra).

As we pointed it out, this first phase would require an investment of US $ 365,000 (technical assistance costs included : prestation of 40 months).

1.7. Given the factors exposed hereabove, it is essential to develop a general middle-term programme tending to regroup the V.O.M.D. (1) activities in one single plant.

In this context, the Esiama plant would be the only presently existing plant to be maintained in activity. All other activities would be concentrated in a new plant to be build in the region of Tema.
This plant should be designed to process all oil-products except copra and palm fruits. The oil-refining and conditioning sections would also be regrouped in this new unit. It should be operational in 1974 and should have an annual processing capacity of 20,000 t. This solution offers all the advantages of the concentration of means, and this will automatically lead to an improved efficiency and rentability. On the same occasion Esiama would not have any more to carry out the actual complementary activities (refining and conditioning) it has not been designed for.

(1) V.O.M.D. = Vegetable Oil Mills Division

The building of this plant would demand investments ranging about 2,780,000 U.S.$.

1.8. In order to reach rapidly these objectives, it would be advisable to appeal to a technical assistance, charged of restructuring the entirety. As we pointed out in other parts of the text, this assistance could be assured in two stages, namely :

1°) A preliminary stage (total prestation : 40 months), during which the techniques of the presently utilized plants could be improved. The main objective of this phase should be to repair the equipments, to mechanize some operations by applying minor changes, to improve the working and control process.

2°) The second phase will include the realization of the specific studies of the Tema plant, from the choice of the implantation to the starting of the installations and a posterior assistance for 12 months. The total costs of this second operation can be evaluated at some 2,780,000 U.S.

LIST OF RECOMMENDATIONS

1. AGRONOMICAL RECOMMENDATIONS

1.1. Appointment by G.I.H.O.C. of an agronomist technician to pursue his agreements policy with the farmers growing coconut palms, and take out profit of it to make fertilizer demonstrations on coconut palm and copra driers introduction (cfr p. 18).

Estimation costs : 8,000 NC

1.2. Appointment by G.I.H.O.C. of an agronomist technician to pursue, extend and improve the conclusion of contracts with groundnuts producers and to assist them for the improvement of their yields (cfr p. 35).

Estimation costs : 5,000 NC

1.3. Government of Ghana should open recycling periods for the agronomists in charge of extension work in the groundnuts area (p. 37).

1.4. Government of Ghana must try to start as soon as possible the programme it intends to carry on for the improvement of groundnut production (cfr p. 38-39).

1.5. The Ghana Government must give a high priority to the production of palm oil and palm kernel oil for which the needs of Ghana are very high.
G.I.H.O.C. should be integrated in the new government project for its industrial aspects (cfr p. 52).

1.6. Introduction by Ghana Government of a request to the United Nations to obtain one expert in sheanuts method of drying to rise both the production and the quality of nuts (cfr p. 61).

Estimation costs : 36,000 US $

1.7. G.I.H.O.C. should conclude agreements with the Cotton Board for the buying of the whole seeds production of cotton (cfr p. 67).

2. ECONOMIC RECOMMENDATIONS

In the short term we recommend that :

2.1. for oils and fats

- the main effort should be made to market first quality refined and deodorized oils in the towns (p. 134). This implies :
  - better packaging (p. 95-96)
  - cleaning up the depots (p. 99)
  - choosing better location for the direct retail sales or working the big town markets with vans (p. 99)
- the sheanuts should be processed locally (p. 121)
- the milling of palm kernels, cotton seed and palm fruits should be started again (p. 86)
- no edible oils should be exported (p. 86, p. 131)

2.2. for cakes and meals

- groundnut cakes should be sold in Ghana
- coconut cakes exports should be promoted and essentially directed to Western Germany
- palm kernel cakes sales should be directed to Western Germany
- cotton seed cakes should find outlets in Great Britain (and perhaps later on in Ghana)
- the evolution of the foreign demand from cakes to meals should be followed very attentively
- the transformation of oil cakes (especially copra) into a protein rich human aliment should not be undertaken for the time being.

3. TECHNIC RECOMMENDATIONS

It would be recommended to :

- Make the lists of the spare-parts needed.
- Repair the equipments with these spare-parts.
- Increase the capacity of Tamale and Atebubu with the existing machinery.
- Standardize the fabrication and increase the efficiency of the plants.
- Promote new fabrications (cotton seeds and sheabutter).
- Make the feasibility study of a new plant in Tema.

CONVERSION OF THE ENGLISH MEASURES
IN THE METRIC SYSTEM

I. WEIGHTS

1 Once (O2)	= 28.35 grammes	1 kilogrammes (kg)	= 2.205 lbs
1 Pound (lb)	= 453.59 grammes	100 kilogrammes	= 1.968 cwts
1 Hundred-weight (cwt)	= 50.8 kilogrammes	1000 kilogrammes (t)	= 2,205 lbs
1 Ton (metric)	= 1.000 "		
1 Ton (long)	= 1.016 "		

II. LENGTHS

1 Inch	= 25.4 millimeters	1 millimeter (mm)	= 0.039 inch
1 Foot	= 30.4 centimeters	1 centimeter (cm)	= 0.3937 inch
1 Yard	= 0.914 meter	1 meter (m)	= 39.37 inches
1 Mile	= 1.609 kilometer	1 kilometer (km)	= 0.621 mile

III. AREA

1 Sq. yard	= 0.836 sq. meter	1 sq.meter (m2)	= 1.196 sq.yards
1 Acre	= 40.47 ares	1 are (a)	=119.6 sq.yards
1 Hectare	= 0.404 hectares	1 hectare (ha)	= 2.471 acres
1 Sq. mile	= 259 hectares	1 sq. kilometer (km2)	=247 acres

IV. **CAPACITY**

1 Pint	= 0.473 liter	1 liter (e)	= 1.760 pints
1 Quart	= 1.136 liters	1 decaliter (10L)	= 2.2 gallons
1 Gallon	= 4.546 liters	1 hectoliter (100 L)	=22 gallons

V. **POWER**

1 B.H.P.	= 1.0133 CV	1 CV	= 0.986 B.H.P.
		1 KW = 1.36 CV	= 1.342 B.H.P.

VI. **VOLUME**

1 Cub yard	= 0.764 cub meter	1 Cub meter (m3)	= 1.308 cub yard

VALUE OF THE GHANA CURRENCY

1 New Cedi (NC) = 1 US $

1 Pesewa = 0.01 US $

B. TABLE OF CONTENTS

2. TABLE OF CONTENTS

B. INTRODUCTION

3. INTRODUCTION

3.1. Aim of the Project

At the request of the Government of Ghana, UNIDO has decided to bring assistance to the Ghana Industrial Holding Corporation (GIHOC) by providing a complete and detailed industrial production and market analysis of the vegetable oil industry resulting in specific recommendation for its technical, technological and economical development.

Six oilseed processing factories exist in Ghana under the responsabilities of GIHOC (cfr enclosure 4.3.22)

ESIAMA	in the Western region
DENU	in the Volta region
ASESSEWA	in the Eastern region
TAMALE	in the Northern region
ATEBUBU	in the Brong-Ahafo region
BAWKU	in the Upper region

However, only three are still in operation in 1971, processing copra and groundnuts, ESIAMA, TAMALE and ATEBUBU; the others are closed. The processing of palm fruits and palm kernels has been stopped.

The study will appraise the nature and the state of the existing equipment and the technics of processing, and survey the situation of oil-seed, raw material produced in the country, the methods and possibilities of commercialization for oil as well as for sub-products, on national and on international markets.

The project will help GIHOC to rationalize and to improve her production methods, to appreciate the opportunities of developing new sources of raw material to foresee the future evolution in the supply of raw material and the possibilities of marketing for processed products and finally to set up a comprehensive program of work for the next years as well as to evaluate the means which will be required to umplement it. The experts carrying out the study were expected to give all necessary recommendations to GIHOC and help the organization to find a solution to the existing problems.

The Government of Ghana also wished to receive suggestions about a wider utilization of the by-products in order to correct the proteinic deficience in the human consumption in Ghana.

3.2. Performances of the Mission

3.2.1. Personnel

On March 31, 1971 UNIDO, by the contract n° 71/10, entrusted the carrying out of this study to the Belgian Association, Research and Development. Research and Development has set up for this purpose a team of five Experts.

1 Expert in Agronomy and Agricultural Planning, team leader.
1 Expert in Vegetable Oil Industry (processing)
1 Expert in Vegetable Oil Industry (mechanics)
2 Economists and marketing Experts.

Each expert tackled the problems corresponding to his speciality, the coordination being achieved by numerous meetings and coordination sessions.

The agronomist studied the availabilities in raw material, either already utilized or deserving an analysis; the industrial experts appraised the equipment, the processing methods, the general situation of the factories and examined the possibilities of improvement and increase of capacities, assessed the costs of production and of the suggested changes.

The two economists had to analyse the marketing and financial sides of the study.

3.2.2. Implementation of the study and performances of the experts

In agreement with UNIDO, Research and Development divided the study in two parts. The first was carried out in Ghana by the team leader, the two industrial specialists and one of the economists. It was mainly devoted to contacts and discussions with GIHOC and the Government agencies and departments, to the collection of informations and data and to visits on the spot with a preliminary analysis and survey of the equipment, and to discussions wit the departments in charge of the oil seed production

The second part was carried out at the home office and consisted in a study of International Market, in the analysis of collected informations and in the working out of technical and economic suggestions and recommendations, in cost pricing and finally in the writing and translation of the report.

The experts arrived in Ghana in mid-April

The agronomist and the economist (the second economist worked on marketing data in Europe) remained two months in Ghana while the two industrial experts stayed one month each.

Each expert travelled extensively and established numerous contacts to acquire a fair on-the-spot knowledge of the problems he was entrusted with. The Agronomist has seen all the eight regions producing oil-seed. He visited the Research Centers, some of the State farms, the GIHOC factories, the feedstuff factories, and also contacted the Department of Agriculture, Livestock and Forestry, the specialists of F.A.O. and numerous experts, officials and industrialists.

The two industrial experts inspected the factories and collected a vast amount of informations from the different departments of GIHOC and from official and private sources. The economist interviewed the management of GIHOC and several Government offices : Trade, Industry, Public Health, Agriculture etc., and visited the three factories in operation. He was mainly busy with marketing problems and for this purpose spent some time in the most important cities of the eitht regions, in order to analyze the local market prices, to have discussions with local traders and to collect marketing informations.

The second economist worked on data collected in Brussels, Paris and other sources. He analyses international prices and prospects of marketing in industrial countries as well as in West Africa.

3.2.3. List of persons and organization contacted by the team

This list is given in enclosure 3.1/1. We wish to express our sincere appreciation for their courtesy and the assistance given to the team, and we pray all those who may have been accidently omitted in the report to forgive us

During their stay in Ghana, the experts have benefited from a friendly and efficient collaboration from the UNIDO staff in Ghana. They wish more particularly to thank Mr. Stoarsveen, the Head Representative of the UNIDO in Acc Mr Baner, his administrative assistant and their staff.

Their thanks go also to Mr. Ackom-Mensah, Director Manager of GIHOC, and to Mr. Larbi Odam, Director of GIHOC Vegetable Oil Division and also to all Heads of departments who have patiently and kindly shared with all the informatio at their disposal. Mr. Antoun of UNIDO, specialist in oil factories and adviser to GIHOC, has personally accompanied our experts during their visits to the factories and in the field, and showed himself as a tireless and efficient advise

3.3. Plan of the report

The technical part of the report is divided in three parts.

- The agro-economic part, analysing the actual situation of the production of raw material and the prospects for the future and assuming the possibilities of developing new sources of oil-seed.

- The economic part, studying succesively the internal and external markets for oils, seeds and cakes and surveying the protein food situation of the country's population.

- The technical part describing the present situation in existing vegetable oil industry, and issuing specific recommendations with cost pricing for the technological and technical improvement or development.

The conclusion of each part are thus coordinated and summarized in the final recommendations.

4. TECHNICAL REPORT

4.1. AGRO-ECONOMIC SURVEY - AVAILABILITIES IN RAW MATERIAL

4. TECHNICAL REPORT

4.1. Agro-economic Survey - Availabilities in raw material

The requirements for oil and vegetable fats in Ghana are essentially covered by coconuts, palm oil, groundnuts and sheanuts.

These crops are grown in specific ecological zones of the country; coconut trees are concentrated in the coastal area, the palm - trees are found in the forest area, while groundnuts are important only in Guinean and Sudan savannas Sheanut trees grow entirely in the Savanna zone (cfr map of vegetation zones in enclosure).

The extraction of oil and butter is mostly realized by traditional processes, involving important oil losses.

For groundnuts and the two palm trees a part of the production is nevertheless processed in some modern factories, and among others in the oil factories of G.I.H.O.C.

For the shea butter, the production is entirely traditional and made on a small scale. It should be useful to introduce an industrial production.

The cotton, recently introduced, is the only crop whic we can consider with some likelyhood as a new source of raw material for the next ten years in Ghana.

In this chapter we will tackle in succession the prese situation of the vegetable oil crops, the possible evolutic in production, according to the existing or foreseeable development projects and to the agronomic possibilities ; we shall also give our opinion on new sources of raw materi and their chances to be produced and utilized.

4.1.1. Coconut palm

4.1.1. Coconut palm

4.1.1.1. Existing situation of coconut trees

4.1.1.1.1. Acreage under coconut palm and their location

The Ghanaian coconut area has evolved as showned in table n° 4.1/1 and 4.1/2.

Table n° 4.1/1

The principal coconut areas in 1960

(Survey of the Ministry of Agricult.)

Area	Region	Surface ha	in production %	young %	Average Number of trees per hectare
Keta-Denu	Volta	6,600	81	19	115
Nzima	Western	4,000	62	38	120
Ankobra-Pra	Western	800	58	42	135
Pra-Densu	Central	1,080	69	31	160
Densu-Ada	Eastern	560	70	30	175
Others	-	2,960	-	-	-
Total	Ghana	16,000	72	28	125

The current agricultural statistics (1967) and the census of agriculture (1970) give the following data :

Table n° 4.1/2

Surfaces in 1967 and 1970

Region	Surface in hectare	
	1967	1970
Western	28,000	30,800
Central	4,000	5,200
Eastern	400	
Volta	400	

The surfaces have steeply progressed between 1960 and 1970. This expansion has taken place mainly in the Western Region and in the Central Region, whereas the Volta Region's production has nearly collapsed as a consequence of the undiagnosed disease known as Cape St.Paul wilt.

The factory of Esiama is favourably located in the Takoradi district of Western Region while, unfortunately, the factory of Denu has been set up in Volta Region.

The district of Takoradi has 28,800 hectares representing 80 % of the total Ghanaian coconut area and supplies the Esiama oil mill.

The district of Takoradi is the most suitable region of Ghana cultivation of coconut palms; rainfalls are plentiful (more than 2000 mm per year) and evenly distributed without a too hard dry season (cfr table n° 4.1/3 of monthly rainfalls).

The number of growers is evaluated at about 10,000 and the average size of individual fields amounts to 2.88 ha. There is no important industrial plantation.

The oldest coconut plantations are established on sandy soils, the more recent ones have been moved inland on forestry soils (oxysols) with a somewhat heavier texture and of good fertility.

The Keta-Denu belt (Eastern Ghana) has a relatively low rainfall, which is marginal for coconut palms and extensions are also limited by unsuitable soil types and disease.

In the Central Region "State farm Corporation" has established between 1962 and 1968 an estate of 620 hectares which will come in production in 1971, but this area is very marginal as rainfall is concerned (850 mm as an yearly average at Winneba) and we do not think that the yield will ever be important.

The State farm intends to process the production.

4.1/3

MEAN MONTHLY RAINFALL AND NUMBER OF RAINDAYS (in mm per month)

Station	janv.	febr.	march	april	may	june	july	aug.	sept.	oct.	nov.	dec.	year
Accra	15_{2}	34_{2}	58_{5}	86_{6}	139_{10}	180_{13}	46_{7}	15_{5}	36_{7}	67_{8}	33_{4}	22_{2}	733_{71}
Axim	51_{4}	62_{5}	129_{9}	142_{11}	420_{18}	555_{19}	156_{11}	54_{9}	87_{12}	205_{14}	192_{13}	96_{8}	2129_{133}
Cape Coast	16_{1}	28_{1}	80_{3}	82_{5}	158_{10}	252_{13}	76_{6}	24_{2}	39_{6}	103_{8}	58_{4}	28_{2}	924_{61}
Ejura	11_{1}	56_{4}	117_{7}	141_{9}	200_{12}	203_{14}	104_{8}	71_{6}	203_{14}	216_{17}	65_{7}	5_{2}	1424_{101}
Half Assini	33_{3}	59_{3}	126_{7}	150_{8}	383_{13}	383_{16}	136_{6}	36_{5}	68_{7}	210_{11}	190_{12}	121_{7}	2099_{98}
Ho	36_{2}	78_{5}	139_{9}	145_{10}	177_{12}	183_{15}	110_{10}	83_{9}	150_{13}	191_{15}	80_{7}	50_{4}	1422_{111}
Keta	14_{1}	28_{1}	60_{3}	99_{6}	166_{9}	128_{9}	62_{4}	17_{2}	47_{5}	106_{8}	44_{3}	15_{1}	833_{52}
Koforidua	29_{3}	68_{6}	146_{10}	141_{11}	178_{12}	238_{15}	90_{10}	57_{10}	162_{14}	183_{15}	100_{10}	59_{5}	1451_{119}
Kumasi	17_{2}	59_{5}	137_{10}	143_{10}	182_{13}	234_{17}	126_{13}	74_{11}	177_{17}	202_{28}	98_{11}	31_{3}	1480_{140}
Navrongo	$0,5_{1}$	6_{1}	15_{1}	49_{4}	112_{7}	144_{9}	201_{11}	253_{13}	229_{15}	68_{7}	6_{1}	1_{1}	1094_{75}
Sunyani	12_{1}	38_{3}	118_{7}	150_{9}	177_{11}	192_{13}	107_{8}	61_{7}	185_{14}	205_{15}	78_{6}	15_{1}	1358_{95}
Takoradi	33_{3}	37_{4}	79_{7}	95_{8}	245_{17}	220_{17}	89_{11}	36_{10}	30_{14}	120_{15}	83_{9}	38_{5}	1185_{120}
Tamale	2_{1}	7_{1}	52_{4}	83_{7}	119_{9}	144_{11}	145_{12}	193_{14}	223_{18}	96_{10}	14_{2}	4_{1}	1035_{90}
Yendi	2_{1}	7_{1}	43_{3}	95_{6}	134_{8}	144_{10}	156_{10}	190_{12}	261_{15}	135_{11}	18_{2}	8_{1}	1193_{81}

4.1.1.1.2. Used varieties

The selection of coconut is made at the Princess Town Station (district of Takoradi); unfortunately, few local "Elites" have been found and only six trees show an annual yield of more than one hundred nuts, which is the minimum grade for an elite.

The station is thus compelled to deliver lineage of trees bearing only 70 nuts or a little more and when the demand is high, even less productive lineage is delivered. The gap in the selection is thus considerable.

Many farmers utilize, for their extensions, nuts of local trees which appear to be productive; however, because of the cross-polination, this material is in fact of small value.

Practically no introduction of selected material from other countries have been done in the Western Region up to now. It has also not been possible to find out varieties resisting the Cape St.Paul wilt in the Volta Region.

4.1.1.1.3. Cultural practices

Coconut plantations are established in intercropping with maize(1) and cassava.

The vegetation is cut and burned, the food crops are sown and the coconut seedlings are planted.

The seedlings are mostly unselected and older than the tree-leaf stage usually recommended.

(1) Ghana currently produces 200-250,000 tons of maize annually. This production is made on a familial scale and it is not sufficient to be substracted for industrial purposes (oil extraction) from the human consumption for which, after cassava, maize is the most important source of calories.

When the intercrop is harvested, the bush is allowed to grow, but ring-weeding protects the palms.
After 3 or 4 years, the bush is cleaned again and a new intercrop is grown, missing coconut palms are replaced and ring-weeding is repeated once a year.

This method has its drawbacks but requires a minimum investment in labour. Its application delays the coming in production by one or two years.

There is no doubt that a correct application of manure is beneficient for the coconut palm. The trials carried out by the Research Station of Princess Town are very conclusive in this respect, and show a response to potash and phosphate (cfr table 4.1/4 in enclosure).

Unfortunately,no fertilizer is used by the growers as yet; one of the reasons for this situation is the lack of credit facilities.

It is suggested that G.I.H.O.C. offers its guarantee for the loans granted by the Agricultural Development Bank for the purchase of fertilizers.

4.1.1.1.4. Diseases and pests

The coconut-trees in the Eastern part of the country (Keta and Denu) have been nearly completely destroyed by the Cape St. Paul wilt. The specialists have not yet succeeded in determining the etiology of this disease.

The introduction of varieties of Malaysia and Ivory Coast, which were supposed to be resistant, has disappointed, but some hopes have been set on varieties introduced from Santa Lucia (West Indies), which is the main origin of resistant Malayan dwarf coconut seed.

Fortunately, Cape St.Paul wilt did neither spread over Western area nor over west of Accra.

Among the insects detrimental to the coconut palm, the Rhinoceros beetle (Oryctes monoceros) is the most noxious but the damages are still limited.
Some attacks of Pseudotheraptus tapoluris, pricking the nuts and causing their fall before maturity, are harmful some years.

Neither treatment nor pest control are usually applied.

4.1.1.1.5. Estimated production, its quality destination

We will take into consideration the production of the Western Region, which is the only one supplying Esiama. The agricultural census of 1970 (cfr 4.1.1.1.1.) shows that the 30,800 hectares of this region are divided in :

17,200 hectares in pure cultivation
11,200 hectares in mixed cultivation with coconut predominant
2,400 hectares in mixed cultivation with coconut subsidiary.

On the other hand, if we compare the census of 1960, 1967 and 1970 we notice that

4,800 hectares are more than 12 years
23,200 hectares are between 5 and 12 years
2,800 hectares are less than 5 years.

This means that about 70 % of plantations are actually in production.

We estimate that the average yield of one hectare of coconut of local variety, cultivated as described above amount to :

1,300 kg of copra in pure culture
975 kg of copra in mixed culture with coconut predominant
325 kg of copra in mixed culture with coconut subsidiary.

When applying those yields to the respective areas and taking in account the percentage of palms in production (70 %) we arrive at a production of about 23,840 tons of copra under present conditions.
10 % of this tonnage is utilized in fresh nuts and this represent 2,384 tons of copra.
12,8 % or an average of 3,066 tons are purchased by the Esiama mill, if we refer to the monthly table of the purchases made since 1962 (cfr enclosure n° 4.3/1).

On the other hand, we estimate that the Crystal Oil factory has bought an average of 500 tons per year.

There was no export of copra in 1969 and 1970.

The balance, amounting to 17,890 tons of copra has probably been used for oil extraction by traditional processes; as the rate of extraction of the factories and by traditional process are respectively of 60 % and 42 %, the loss of oil for the country, due to the use of old methods, amount to $\frac{(60-42) \times 17,890}{100}$ = 3,220 tons (in value with the 1970 wholesale price : 1,680.840 NC).

It appears from those figures that row material is abundant in the Region, but factories meet a very strong competition from the small local processing units.

These have the advantage to utilize fresh nuts, which the producers prefer to sell, even if the price is more favourable for copra. It seems that the traditional farmer is more interested in saving labour than in increasing his income.

Annual purchases of the factory

1969	: 3,067 tons
1970	: 3,767 tons
1971 (4 months)	: 1,589 tons.

These figures show a marked increase and if this trend continues, the purchases of copra will rise to 5,000 tons in the near future.

From the point of view of the quality, the copra product in Ghana seems to be good, but with a high content of humidity. The Esiama factory estimates at 4,5 % the loss after 3 months.

The Crystal Oil factory buys his copra with a moisture content of 11 % and has to dry it down to 5 %.

This too high moisture of the copra (about 10 % instead of 5-6 %) proceeds from the method used for the preparation that we describe hereafter :

The copra preparation, in Ghana, is made as per following method : the harvested nuts are put in a heap in border of the fields and after some days they are splitted with a machette in two or three pieces ; those pieces are laid a few hours in the sun to allow the shrinking of the pulp under the evaporation effect and this makes easy the separation of the pulp from the shells which has to be done later.

The pulp pieces are put then in the sun on a clean area and in order to be perfect, the drying requests 5-6 consecutive sunshine days. Seeing that such a condition is not met very often, the drying is sometimes defective.

The repartition of the production throughout the year can be deduced from the tables received from the Research Station of Ayinisi, 25 miles from Esiama (average for four years) :

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
5.2	4.9	3.9	5.6	7	9.7	11.5	11.7	10.7	11.9	10.7	7.[illegible]

Those figures correspond with the data obtained by I.R.H.O. (Institut de recherches pour huiles et oléagineux) for Ivory Coast, where the coconut plantations are located in similar ecological conditions.

It must be noted that the percentage of copra is a little higher during the low production period.

If we compare those percentage of production with the montly average percentage of the purchase of copra by Esiama factory (cfr Enclosure 4.3/2) :

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
6.5	6.1	7.6	10.2	12.6	5.8	2.3	5.1	9.8	15.1	10.7	7.[illegible]

we find out that there is no clear relationship between the production of nuts and the sale of copra by the farmers. This is easily explained if we take into account that the farmers pick the nuts only three or four times a year and that the picking takes place in the dryest season, in order to facilitate the preparation of copra.

To regularize the supply throughout the year and thus bring down the cost of purchase, stocking and transport to the factory and also to favour a better copra making, groups of farmers should be equipped with dryers.

At Princesstown Station we could see a small drier, locally constructed, of a 3000 - 4000 nuts capacity, using the shells as fuel and who had costed only 280 NC (80 NC for the fire-place and the drying area, and 200 NC for the roof in corrugated sheets).

Little driers of this type, and well localized, could be of a great help for the producers.

4.1.1.1.6. Prices of copra and nuts

Following the informations given by the Ministry of Agriculture in Sekondi (Western Region), copra is sold by the farmers at 8.50 NC a bag (51 kg) and fresh nuts at 2 NC a hundred.

The factory of Esiama buys its copra at 7.50 NC a bag, but, on the one hand, the product is collected by the purchaser and the producer does not bear the cost of transport. On the other hand, the factory gives a bonus to the farmers depending on their deliveries (cfr the Bonus Chart, in eclosure n° 4.1/2). The producer price amounts thus to 7,65 NC a bag and the cost for the factory to about 8,25 NC a bag.

The factory purchases also the fresh nuts at 2.00 NC a hundred. As about 300 nuts are required for a bag of copra (50 kg) and as one workman paid at 0.75 NC daily can break and dry 400 nuts, the copra obtained by this method costs only 6.00 NC a bag plus 0.60 NC for labour, which makes 6.60 NC . However, taking into account the transport cost of nuts and copra, the cost price to the factory amounts to 7.50 NC, which does not differ substantially from the figures given above.

The factory has also concluded agreements (cf enclosure n° 4.1/3) with some farmers, taking charge of the maintenance of their plantation with its own labour and buying nuts at 1.50 NC a hundred.

Under such agreement, the cost of 50 kg of copra comes to :

300 nuts at 1.50 NC a hundred	=	4.50 NC
labour for weeding (1)	=	0.60 NC
preparation of copra	=	0.60 NC
sentry	=	0.60 NC
charges 10 %	=	0.63 NC
Total	=	6.93 NC

Actually those contracts cover 160 hectares and are popular among the farmers because they save labour and furthermore, because a good weeding rises the production by 10 to 15 %.

The formula should be extended to bigger areas.

G.I.H.O.C. could perhaps, on opportunity of identical contracts, when it takes in charge coconut plantations, provide some fertilizer applications. Besides, in addition to the yield increase proceeding from that application, the plantation could also look as an exhibition field for the other farmers.

Jointly, G.I.H.O.C. could construct some small driers of the type used at Princesstown Station (see p. 17).

We thus recommend a yearly programme of manuring and of building driers.

A Ghanian agronomist technician could be applied for this purpose and subsidies could be requested to the United Nations for his wages and expenses and also for the costs of fertilizers and driers.

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(1) The price of the weeding of one hectare of coconut palm can be estimated at 15 NC a year; one hectare yielding an average of 7500 nuts, the cost for 300 nuts is 0.60 NC.

The needs in currency would be of about 8,000 NC the first year and of about 5,000 NC the following years, i.e. :

1,800 NC	wages
3,000 NC	little lorry
1,200 NC	expenses
500 NC	fertilizers (40 NC per hectare)
1,500 NC	driers (300 NC per drier).

4.1.1.2. Future prospects of the production

The cultivation of coconut palms has not as yet attracted much attention from the Government.

Nevertheless, the development of this activity has been rather successful in the Western Region, because it is economically attractive and does not require large investment for interplantation in food crops. The weeding as it is traditionally carried out, just before the picking, does not require much labour and the picking itself can be done at leisure, without climatic or other constraints. As the selling price of nuts amounts to 150 MC per hectare, the work of the farmers is very well paid.

The Government intends to prepare a development project for coconuts in 1972; the first estimations come to a cost in foreign currency of about 2 millions dollars.

The project will be carried out between 1975 and 1980 and includes the establishment of an Extension Agency, serving the invidual growers and the planting of up to 8,000 hectares of high yielding hybrid coco palms in areas close to the existing processing factories.

A limited distribution of selected seedlings will soon begin; those seedlings will come from Ivory Coast for the Western part of the country, while for the Eastern part, nuts of Santa Lucia, supposed to be resistant to the Cape St. Paul wilt, will be imported and planted in demonstration fields.

If it is carried out according to plans, the part of the project concerning new plantations will give its first results after 10 or 12 years for the Western part of the country and 12 to 14 years for the Eastern part, these delays representing the time needed for the installation and the growing of new estates. Thus, they cannot be taken into account in this report.

Therefore, a production increase can only be expected from the "extension" part of the project.
Spectacular results could be achieved in a short time; the use of fertilizer (potash and magnesium) alone could increase the yields by 50 % (cfr the result of the trials in Princess Town) ; better weeding, a thinning of the existing palm stands in the old plantations or a transformation of mixed plantations into pure ones by additional planting can also contribute to an increase of yields of about 30 %.

To be realistic, we will admit that the total increase will not exceed 50 % in yields and 5 % annually in surface and will start in 1973.

In addition to this, the production of copra will be influenced :

- by the coming into production of the 30 % of young coconut palms; this will take seven years, at a annual ratio of 1/7
- by the establishment of new plantations.

On the basis on the data collected by the services of the Ministry, we can estimate that at least 500 hectares will be established every year in the Takoradi district, and will come to maturity 7 years later and to their peak production 9 years later.

It is desirable that an effort be made to group these plantations near the factory or the buying centers.

The yields per hectare in traditional agriculture are evaluated at :

Age in years	Pure cultivation	Mixed cultivation
7	500 kg/ha	300 kg/ha
8	1,000 kg/ha	600 kg/ha
9 and more	1,300 kg/ha	975 kg/ha

In improved plantations (fertilization, introduction of high producing varieties and better cultivation) the yields can increase up to 1,950 kg of copra by hectare. Even those figures are moderate if compared with results obtained in Ivory Coast, but it is better not to be overoptimistic.

On this basis, we can evaluate the copra production in the Takoradi region for the next ten years. (table n° 4.1/5).

It appears that the tonnage of copra produced in 1980 will exceed the actual output by more than 20,000 tons.

4.1.1.3. Utilization of the estimated production 1971-1980

In the paragraphe 4.1.1.1.5. we have seen that the Esiama factory had bought in 1970 3,767 tons of copra and will probably buy 5,000 tons in 1971.

If we admit that the factory will purchase every year 50 % of the supplementary productions, the supply will rise from 5,000 t. in 1971 to 15.090 t. in 1980. :

Table n° 4.1/5

AREA UNDER COCO PALM AND PRODUCTION OF COPRA

1970 - 1980

Years	Coco palm in production (more than 7 years of age)			Young coco palms (less than 7 years)		Total area under coco palms	Production of copra
	Trad. Cultivation		Improved cult.				
	pure ha	mixed ha	ha	pure ha	mixed ha		tons
1970	12,040	9,520	0	5,180	4,060	30,800	23,640
1971	12,780	10,100	0	4,940	3,480	31,300	24,384
1972	13,520	10,680	0	4,700	2,900	31,800	25,472
1973	12,670	11,260	1,590	4,460	2,320	32,300	28,053
1974	11,795	11,840	3,205	4,220	1,740	32,800	30,310
1975	10,895	12,420	4,245	3,900	1,160	33,300	33,203
1976	9,970	13,000	6,510	3,740	580	33,800	35,812
1977	9,520	13,500	8,200	3,000	0	34,300	39,338
1978	8,305	13,580	9,915	3,000	0	34,800	40,094
[illegible]	7,265	13,5[illegible]	11,3[illegible]	[illegible]	0	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3,000	0	35,[illegible]	[illegible]

1971	5,000 tons
1972	5,540 tons
1973	6,820 tons
1974	8,110 tons
1975	9,400 tons
1976	10,700 tons
1977	12,140 tons
1978	13,140 tons
1979	14,140 tons
1980	15,090 tons

Thosefigures are probably underestimated because it seems improbable that the markets of tradionally processed oil will be able to absorb every year the remaining 50 % of the supplementary production.

If we take a more optimistic view, 75 % of the supplementary production will be sent to the factory. This means the processing of 10,000 tons in 1974, 15,000 tons in 1977 and 20,000 tons in 1980.

As we have already stated, it is hopeless that the copra production increase during the 12 next years in the Eastern part of the country, where Denu factory is located.

For the Central Region, which is marginal for coconut because of the insufficiency of rainfall, the State Farm intends to increase the acreage under coconut by 200 hectares up to 800 hectares.

The farmers of this region, according to the Ministry of Agriculture, do not plant more than 50 hectares yearly and this is quite negligible.

4.1.1.4. Conclusions

The growing of coconut palm in Ghana is made by traditional and non intensive methods with a swift progress in the Western part of the country (Takoradi district) and a swift regression in the East.

The actual production, in spite of the low yields, comes to more or less 24,000 tons of copra equivalent, of which Esiama factory has bought an average of 13 % during the last years.

The progress of the purchases in 1970 and 1971 is very encouraging and these will probably amount to 5,000 tons this year.

The increase of supply will proceed from the gradual coming into production of the coconut plantations established during the last 7 years, from an improvement of the cultural practices on about 5 % of the area under cultivation every year, and from new plantations.

The increase can be estimated at 20,000 tons in ten years.

This should authorize Esiama to increase its processing capacity to 10,000 tons in 1975-76 (pessimistic assumption) or in 1974 (optimistic assumption) and to 15,000 tons in 1980 or 1977.

4.1.2. Groundnuts

4.1.2. Groundnuts

4.1.2.1. Existing situation

4.1.2.1.1. Surface and localization

The table n° 4.1/6. shows the area under groun[illegible] in the mean growing season of 1970.

The areas are classified in three categories : [illegible] cultivation, predominant and subsidiary crop. (*)

Table n° 4.1/6

Area under groundnuts (hectare) (1)

Regions	Districts	Pure	Mixed (2)		[illegible]
			Predominant	Subsidiary	
Upper	all	13,200	40,800	8,800	[illegible]
"	Navrongo-Bolgatanga	1,200	18,400	2,800	22,[illegible]
"	Bawku	7,200	2,400	4,400	14,[illegible]
"	others	4,800	20,000	1,600	[illegible]
Northern	all	1,600	7,600	11,600	20,[illegible]
	Tamale	1,200	1,200	5,600	8,[illegible]
	Yendi	-	1,200	400	1,[illegible]
	others	400	5,200	5,600	11,[illegible]
Brong-Ahafo	all	2,000	1,200	1,600	4,[illegible]
Volta	all	1,600	1,600	1,600	4,[illegible]
Ashanti	all	400	400	1,200	2,0[illegible]
Rest of Ghana	--	400	-	1,200	1,[illegible]
Total Ghana		19,200	51,600	26,000	96,[illegible]

(1) Issue : Ghana Census of Agriculture 1970

(*) Pure = Groundnut grown in pure stand

Predominant = Groundnut mixed with an other crop, but in a dominant percentage

Subsidiary = Groundnut mixed with an other crop, but in a lower percentage.

Rem. 1) 76 % of the pure and predominant categories lie within the upper Region

12 % of the pure and predominant categories lie within the Northern Region

10 % of the pure and predominant categories lie within the Brong Ahafo, Volta and Ashanti Regions.

Rem. 2) In the Northern Region groundnuts, when mixed with other crops, are usually associated with one or more cereals, although groundnuts and beans can also be found as a common mixture in parts of the Upper Region.

In the Savanna areas the culture is generally concentrated in the East part of the country.

The factories of Bawku, Tamale and Atebubu are located in the production area.

The climate of the Upper and Northern regions, with an alternance of humid and dry seasons, high temperature and much of sunshine, is well suited for the growing of groundnuts.

Moreover sandy loam or sandy clay soils with a slightly acid pH which are particularly suited to groundnut cultivation, are common in the Upper and Northern Regions.

4.1.2.1.2. Varieties

The Crops Research Institute Experimental Station at Nyankpala has made several trials on groundnuts varieties The best varieties are Mani Pintar, a red colored seed with a high contents of oil (47 %). She suits almost all [illegible] of Northern Ghana and Tirik which proved to be the highest yielder in the Upper Region.

The utilization of those varieties could at least double the production. But, unfortunately, the farmers are still planting numerous local low production strains.

It seems that coordination between the research and the seed multiplication division of the Ministry of Agriculture has to be improved; for instance, the Research Center at Nyankpala was not able this year to supply large quantities of seed of the varieties mentioned.

On the other side, there is only one center of seed multiplication in the Northern Region and one in the Brong-Ahafo Region and no one in the Upper Region.
The unit near Tamale (the only one producing seed of the recommended groundnuts varieties for resale to growers has not been able in 1969 (according to Nathan Report) to harvest the totality of the area planted with Mani Pintar, due to a shortage of manpower. Only 18 tons of improved seed were available for planting, less than 1 % of the needs of the country.

We make ours the suggestion of the "Crops Research Institute" Director in Kwadoso (1) : " that while the supply of improved seed is the responsability of the Ministry of Agriculture, seed multiplication should be given to seed

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(1) Comments and suggestions by the Research Officers of the plant breeding agronomy section C.R.I. on the Ministry of Finance and Economic planning's draft for the 1970-71 Annual plan to increase crop production in Ghana (30/6/1970).

contractors under the strict supervision of qualified plant breeders agronomists from the Crops Research Institute".

4.1.2.1.3. Methods of cultivation

The table n° 4.1/7 shows for the main groundnuts the growing areas, the number of growers, the percentage of growers regarding the total number of farmers and the average area per grower.

Table n° 4.1/7

Number of Farmers growing Groundnuts (1)

Region	District	Number of growers	% of farming population	Mean [illegible] per [illegible] in [illegible]
Upper	all	69,200	58	0.[illegible]
"	Navrongo-Bolgatanga	40,000	76	0.[illegible]
"	Bawku	8,100	30	1.72
"	Other areas	21,000	54	1.[illegible]
Northern	all	20,200	33	1.[illegible]
"	Tamale	6,000	32	1.[illegible]
"	Yendi	2,200	16	0.[illegible]
"	Other areas	11,400	43	1.[illegible]
Brong Ahafo	all	8,000	11	0.[illegible]
Volta	all	12,000	11	0.4[illegible]
Ashanti	all	3,200	2	0.[illegible]
Rest of Ghana		6,000	2	0.[illegible]
Total Ghana		118,600	15	0.[illegible]

58,3 % of the growers reside in the Upper Region and 17,3 % in the Northern Region.

The average area per grower varies between 0.40 ha in the Volta Region and 1.72 ha in the Bawku district.

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(1) Report of Ghana Census of Agriculture (1970)

Four conditions are particularly important to obt[illegible] good yields :

- Early planting in the growing season. In the Northern [illegible] Upper Region , mid-May plantings are optimum. Later [illegible] (up to mid-June) reduces the yields by one half.
  This means that the ploughing must be done in time [illegible] cultivation with cattledrawn plows should be further [illegible] couraged, especially in the districts of Ba[illegible] and [illegible] where the area per grower is important.
  Up to now, most of the fields are hoed by handtools [illegible] only a few are ploughed by tractors.

- Respect of an optimum planting distance.
  The variety Mani Pintar gives an optimum yield when [illegible] are planted per hole with a 15 cm distance between [illegible] on ridges spaced 60 cm apart.
  The approximate quantity of seed required to grow one hectare amounts to 100-170 kg. But the farmers have [illegible] a shortage of seeds and utilize only one seed per hole [illegible]

- Correct weeding. Experiments showed the following re[illegible] :

Number of weedings	shelled nuts/[illegible]
0	868
2	1515
4	1940

These results speak for themselves and necessite no co[illegible].

- Use of fertilizer.
  In the savanna area sulfur is deficient.

244 fertilizer trials showed that the average yield increased by 29 or 50 % when using 50 kg (1 bag) or 100 kg (2 bags) triple superphosphate per hectare.

The price of 1 bag of Single Super is 1.90 NC
1 bag of Compound 11/52 is 2.00 NC.

In the spring of 1971 the Services of the Ministry of Agriculture in Bawku had no stock of single super, and supplied the farmers with 11/52; when we visited their offices on 13th May, they had sold 150 bags to the groundnut farmers, and their stock was still of 290 bags.
As there are 14,000 hectares under groundnut cultivation in the Bawku district, this means that a maximum of 240 hectares received fertilizers in 1971 (less than 2 %).

An acute deficiency in nitrogen must also be noted in cleared high-grass savanna.

4.1.2.1.4. Diseases and pests

The most common disease is Rosette (virus carried by Aphis cracoivora), leaf spot (Cercospora) and wilt (Sclerotium rolfsii).
Correct cultivation, adequate spacing and rotations, are usually sufficient to control these pests.
Disinfection of seeds with dieldrex is nevertheless profitable. For instance, an application at a rate of 100 grams for 60 kg of seed produced a 15 % higher yield than with undressed seed.

Yet no pesticide is utilized by the groundnuts growers.

4.1.2.1.5. The production and its utilization

Production

The present yield per hectare is rather low, which results from the lack of :

- organized effort to multiply seed of improved varieties
- generally poor practices of cultivation
- the fact that no fertilizers or pesticides are used by
- the large majority of farmers.

According to the statistics of the Ministry of Agriculture (Oct. 1969) the average yield in shelled nuts for Ghana was in :

was in :	1966	0.572 t/ha
	1967	0.510 t/ha
	1968	0.617 t/ha

In 1970 the average for the different regions was :

0.550 for the Upper Region
0.750 for the Northern Region
0.700 for the Volta Region
0.800 for the Brong-Ahafo Region.

For the mixed crops we take 3/4 of the yield in pure stand when groundnuts are dominant and 1/4 when they are subsidiary.

By applying these figures, which are credible, to the area under cultivation in 1970, we may estimate the total production.

The table n° 4.1/8 shows the estimated production per regions in tons of shelled nuts.

Table n° 4.1/8

Regions	Districts	Production in tons of shelled nuts
Upper	Navrongo-Bolgatanga	8,635
"	Bawku	5,555
"	Others	11,110
Northern	Tamale	2,625
"	Yendi	750
"	Others	4,275
Brong-Ahafo	all	2,640
Volta	all	2,240
Ashanti	all	750
Total Savanna area		38,580 tons

Quality of nuts

In the savanna area groundnuts are only cultivated from May-June to August-September and the harvest starts at the beginning of the dry season so that the drying is generally easy.

The quality of the groundnuts processed in the factories was good. We saw two varieties :

- Konkomba variety - pink seed of high quality, oil content is 47 %
- Nkatepa variety - red colored big seeds mixed with a few seed presenting mustiness and of less quality. The oil content is about 45 %.

The manager of Atebubu estimates the loss by dessication at 6 % ; this seems to be high.
The purchase of groundnuts begins in August-September and ends in March - April, with a peak in December-January.

Utilization of the production

The production is utilized for the following purposes :

a) Seeds for the next season
The needs in seeds may be estimated at about 80 kg per hectare, which is not an optimum but a realistic evaluation.
The total requirement of seeds may thus be reckoned at 5,152 tons.

b) Home consumption by the growers
Investigations made in Togo and other savanna countries by AUTRET, PERISSE and JACQUOT show that the yearly consumption of groundnuts averages 6 kg.per capita (16 gr. per day per capita).
The groundnuts are utilized as dried nuts, meal, paste or after extraction of oil as Kuli Kuli (fried cake).

Taking into account the number of growers given above and the average composition of their families, i.e. :

6.8. in Upper Region
7.1. in Northern Region
5.9. in Brong Ahafo Region
5.2. in Volta Region

the home consumption by growers family may be evaluated at 4,710 tons.

c) Home consumption by other Ghanaians

The national nutrition survey (1960-62) indicates a consumption of 3 grams per head and per day ; this seems to be a slight underestimation, as groundnuts are often bought for small snacks and thus escape the nutritional surveys.
If we take 4 grams (1.46 kg per year), than the 7,738,000 Ghanaians who do not grow groundnuts should consume 11,297 tons.

d) Purchases for processing

If we deduce from the production the above estimated need the remaining 17,421 tons are available for processing.
In 1969 and 1970 Tamale and Atebubu factories supplied respectively 2,535 t. and 1,451 t., an average of 2,000 t i.e. 11.4 % of the availabilities.

This percentage is low and could be improved with a better prospection of the market.
The information we received about the marketing of groundnuts, shows that only the districts of Bawku, Tamale, Bimbila and some places in Brong-Ahafo Regions and North of Volta Regions are actually prospected ; districts of Lawra, Bolgatanga-Navrongo, Kete-Krachi, Yendi, Gambraga seem to be left out of the main trade-circuits.
This point will be developed in the economic chapter of the report.

The fluctuations of yields due to climatic conditions can be important, and differences of 20 % have been reported. However, this is a maximum as droughts are

usually local.
The spreading of the purchases throughout the calendar year is also favourable to a regularization of the supply, as a bad harvest is often compensated by a better one in the next season.

The factories could certainly buy about 25 % of the nuts available for the market, i.e. more or less 4,300 tons, as compared to 1,451 tons purchased in 1970.
This year the Atebubu factory has made contracts with a group of groundnuts growers and has guaranteed the purchase of their total production.
Such a guarantee enables the farmers to obtain loans and seems to be an excellent and efficient system which should be largely extended in the next years (a model of this agreement is shown in enclosure n° 4.1/4).

We strongly recommend to pursue on this way and we therefore suggest that G.I.H.O.C. appoints for this purpose one Ghanean agronomist technician who would be applied fo

- choosing new groups of progressive farmers and advising them
- helping them to obtain or to produce selected seeds
- assisting them to obtain loans for the purchase of draught bullock, implements and also fertilizers.

A subsidy could perhaps be obtained from the United Nations as wages and expenses for this agronomist.
Estimation for one year : 3,000 NC (wages and expenses)
2,000 NC (vehicle price).

4.1.2.1.6. Prices

The factories purchase the groundnuts at 16 NC, but it seems that some buyers give short weight.

With an average yield of 600 kg/ha, this crop brings a gross return of about 130 NC which, in spite of poor yields and of high requirements in manpower, exceeds the return from any other annual food crop.

4.1.2.2. Prospects for future

The potential possibilities for increasing the groundnuts production in Northern Ghana are certainly important. High yielding varieties have been selected, cultural practices improving the yields are known, fertilizers have been tested and it has been proved that the requirements per hectare are nor high nor too expensive. It is also importan to point out that the farmer of Northern Ghana is interested in this activity and wants to be informed and assisted by the extension services.

Up to now, the Government has not devoted many efforts to foster this production, but the Ministry of Agriculture intends to launch and supervise the cultivation of up to 8,000 hectares of high yielding groundnuts every year. The Government also hopes that groundnuts can be integrated with cotton or maize for which development projects are also contemplated, and we entirely approved this intention.

We did not find accurate data about the 8,000 hectares project. In our opinion, it should concentrate on an improvement of cultural methods and particularly :

1°) on the respect of the dates of plantations. This will be possible only if the farmer clears and prepares his field in due time.
Therefore, bullock-plowing should be extended, by improving the system of credit for the purchase of bullocks and equipment and also by a better education of the farmers.
Some encouragement could also be given to private contractors who own and operate tractors with implements. The installation of workshops, well distributed throughout the regions of production, would be helpful in this respect.

2°) On the use of selected seeds of improved breed.

This requires the reinforcement of the multiplication and distribution system with adequate staff, equipment and financial means (cfr p. 27). Demonstration fields must be established to help the farmers to appreciate the value of the seeds and of the recommended cultural practices.

The exchange of improved seed against the old ones can be made without resorting to credit.

3°) On an increased use of fertilizers and desinfectants for seeds, but only by the farmers who utilize the recommended cultural practices. Stocks of those products must be sufficient to satisfy the seasonal requirements of farmers and their sales should be entrusted to private traders, for instance to the groundnuts buyers, under adequate control. The Government subsidies for sales (yet 50 %) should be maintained.

4°) On the education of the farmers by a qualified Extension service. There is no better way to improve and increase the production.

To obtain better agronomist "Advisors on field" being able to explain to the farmers the reasons why new husbandry methods should be adopted it should perhaps be usefull that the Ghana Government asked to the United Nations a help to allow some agronomists to follow a recycling period at the Crop Research Institute.
The agronomists of the most important groundnuts area could be concerned by this request.

5°) Mechanization of the harvest has been recommended by some experts. We do not think that this is a capital point as the man-power is abundant in the growing regions and also as the drying and the shelling of the pods can be done during the months when the family labour is underemployed.
Moreover, the small size of the plots forbids the use of big machinery.

Estimates of future production

As long as the problem of groundnuts cultivation will not receive a higher priority from the Governmental Services, there is no serious chance to increase the production above the immediate needs. Of course the growing of rural population will bring a parallel extension of the acreage but also of the local consumption and the increase of the tonnage available for industrial needs will be slight.

A significant improvement of the supply will require an intensification of the cultural methods.
If we are reasonably optimistic and admit that the plan of the Government will be carried out successfully, we will arrive to following figures.
An annual improvement on 8,000 hectares (i.e. 10 % of the total area under groundnuts) will increase the average yield from 600 kg to 900 kg per hectare (which is a realistic evaluation).
The rise of production will not start until 1973, and, out of an annual increase of 2,400 tons (8,000 ha x 0,3) 50 % will probably be purchased by the mills in addition to the 25 % who could be bought at the present time from the present production.

The supply of the mills can thus be estimated at the following figures :

Years	Total production in tons	Available share for processing	Share to be purchased by the mills
1972	38,580	17,420	4,300
1973	40,980	19,820	5,500
1974	43,380	22,220	6,700
1975	45,780	24,620	7,900

4.1.2.3. Conclusion

The available production of groundnuts after deduction of the requirements for seeds and for local consumption, can be estimated at about 17,400 t. per year.

G.I.H.O.C. processes only 2,000 t. per year (average of 1969 and 1970) but could increase his share from 11,4 to 25 %, i.e. to 4,300 tons.

No significant change can be expected in the immediate future, but, if the Government succeeds in carrying out his programme, the supply will increase by 1,200 t. per year, up to more or less 8,000 tons in 1975.

We recommend to hasten the starting of this programme.

4.1.3. Oil palm

4.1.3. Oil palm

There is an important deficit of palm oil in Ghana, as it is traditionally the most appreciated vegetable oil for human consumption as well as for industrial uses.

4.1.3.1. Existing situation

4.1.3.1.1. Area and localization of palm plantations and groves

The Ghana census of Agriculture - 1970 - gives for each region the area under palm either pure or predominant or subsidiary.

Table n° 4.1/9

Area of oil palm trees

Region	Oil Palm Trees planted areas (hectares)(1)		
	Pure	Predominant	Subsidiary
Western	8,000	800	2,800
Central	800	400	6,000
Eastern	1,800	800	11,200
Volta	3,600	400	6,400
Ashanti	400	800	50,400
Brong-Ahafo	800	-	15,200
Total Ghana	15,400	3,200	92,000

To these figures, we must add the area under spontaneous palms, which are traditionally utilized by rural populations and for which it is impossible to obtain adequate informations.

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(1) Pure = Palm trees grown in pure stand
Predominant = Palm trees mixed with an other crop, but in a dominant percentage
Subsidiary = Palm trees mixed with an other crop, but in a lower percentage.

For the pure or predominant plantations which are the most productive, we must analyze the figures given, if we want to have a more precise knowledge of the potential of production.

a) State Farms Plantations

1) in production	PRESTEA (Western region)	2,880 ha
	SESE (" ")	neglected area
	KWAMOSO (Eastern region)	255 ha
	Depending on KWAMOSO	120 ha
	MONUKRUM (Eastern region)	80 ha
	JUASO (Ashanti region)	200 ha
		3,535 ha
2) not in production	PRESTEA	760 ha
	KWAMOSO	405 ha
		1,165 ha

b) Public Institutions

Workers Brigade - Universities - Crop Research Institute - Agriculture Settlements Division 1,600 ha

c) Plantations belonging to farmers and planted with improved seedlings (*)

(*) A proposal for an oil palm prospect in Ghana - Nov. 1970

Table n° 4.1/10

Farmers Plantation

Region	Surfaces according to age of trees							Total
	1-2 years	2-3 years	3-4 years	total non bearing	4-5 years	5 or more	total bea-ring	
Western	162	157	156	475	328	-	328	803
Central	319	74	42	435	28	195	223	658
Eastern	95	111	46	252	11	559	570	822
Ashanti	120	11	8	139	86	342	428	567
Brong-Ahafo	26	47	32	105	25	101	126	231
Volta	24	10	18	52	4	14	18	70
Total Ghana	746	410	302	1458	482	1211	1693	3,151

d) Plantations belonging to farmers and planted with local seedlings (estimation)

Western region	:	4,000 ha
Volta region	:	3,900 ha
Brong-Ahafo region	:	300 ha
Eastern region	:	500 ha
Central region	:	150 ha
Ashanti region	:	350 ha
		9,200 ha

We can consider that the 3,200 ha of predominant oil palm trees are included in this total.

The figures above given indicate that there are only two Industrial Palm Estates with processing units, in Ghana, both managed by the State Farm Corporation

	PRESTEA	3,640 ha
and	KWAMOSO	780 ha

Country farmers are scattered all over Ghana, but are found in majority in the Western region (39 %) and in the Volta region (32 %).
If the Western region has favourable climate conditions for palmtrees , Volta region has a lower rainfall and is rather marginal, except the eastern part of the Ho and Jesikan district near Togo.

4.1.3.1.2. Improved seedlings

The Oil Palm Research Center (O.P.R.C.) at Kusi near Kade is mainly working on the production of high quality seeds for planting.

The Center applies the well known technics of pollination. Actual seed production amounts to 1 ½ million seeds per year and it is expected that the O.P.R.C. alone will produce more or less 3 millions of special grade seeds by 1975. This seems to be sufficient to meet the demand.

In the past, the O.P.R.C. has supplied the following quantities of selected seeds :

1967	1,050,000
1968	1,000,000
1969	1,300,000
1970	1,500,000

Enough seedlings were produced to establish 25,000 ha and the comparison with the surfaces really planted those years is disappointing.
Resently the O.P.R.C. delivers germinated seeds, which reduces the loss to less than 5 % in the nurseries.

In 1971 the O.P.R.C. has sold 1,048,900 seeds out of 1,462,500 which were requested :

Eastern region	: 450,000
Western region	: 200,000
Central region	: 160,000
Brong-Ahafo region	: 180,000
Ashanti region	: 40,000
Ghana State farm Corp.	: 232,500
Agricultural Settlements Division	: 100,000

The price of seed is 1 NC for one thousand.

4.1.3.1.3. Cultural Practices

Usually, oil palms are interplanted with annual crops during the first years and later on, tend to pure stand. In the Western region they are frequently planted in pure stand from the start.

The improved seed are DURA and DELI DURA crossed by PISIFERA.

The yield is estimated at a minimum of 10 tons of bunches by the 8th year after planting having a 22 % oil extraction.

Palmtree growers can, without difficulty, obtain loans from the Agricultural Development Bank on the condition that their estate comprises a minimum area of 20 hectares.

The loans are not given directly in cash, but are utilized to pay the invoices for seedlings, fertilizers, chemicals, etc. The reimbursement of the capital and interest due does not go into effect until 5 years pass, at which time the rate of interest is 7 %.

Farmers buy their seedlings at nurseries from the Department of Agriculture at a cost of 0.20 NC each. In addition, they can buy wire collars at 0.06 NC in order to protect the young plants from rodents.

Until the beginning of production some ring-weeding takes place. The first yield is obtained within a 4 to 5 years period and full production is achieved within 8 to 9 years.

A complete study of fertilizers has been carried out. Forest soils from the oil palm region show a lack of phosphate and an occasional deficit of potash and magnesium - Nitrogen has to be tested from time to time through leaf analysis. Presently only State Farms utilize fertilizers.

Oil palms considered as a subsidiary culture follows the establishment of other plantations.
The majority of those being cacao (63 %) and root crops (19 %) the average size of oil palm farms is approximately 2 ½ ha with extremes of 1/2 ha in the Western region and 5 ha in Ashanti. In the Western region 5 farmers have an estate of more than 40 ha while 9 others have estates of 20 to 40 ha

4.1.3.1.4. Pests and diseases

There is no remark.

4.1.3.1.5. Production (1970)

Some informations has been collected in Ghana.

A. State Farms

The State Farm of Prestea has had a yield of 10,254 ton of bunches. Their oil mill has also treated 862 tons of bunches from the old estate of Sese, as well as 5,221 tons from the neighbouring farmers and 941 tons from native trees.

The percentage of extraction has been about 19 % on bunches.

The 17,276 tons treated at the mill have thus given nearly 3,280 tons of palm oil.

The other State Farms processed nearly 3,000 tons of bunches with the same rate of oil extraction, and obtained 570 tons of oil.

B. Public plantations

From 1,600 ha of plantations, we consider that only 800 are producing with an average output of 6 t/ha of bunche with 18 % of extraction. Thus, the total production of palm oil is 864 t.

C. Farmers utilizing improved varieties

1,963 ha with an output of 6.25 t/ha of bunches, tot. 10,581 t. from which 5,221 t. are processed at Prestea.

Some 5,360 t. are processed with tradional methods, with a rate of extraction of 12 %, yielding 645 t. of oil.

D. Farmers using local unimproved varieties

6,000 ha in pure cultivation with a yield of 5 t/ha = 30,000 t. bunches.

3,200 ha in mixed culture with a yield of 4 t/ha = 12,800 t. of bunches.

Oil extraction rate (traditional methods) 12 % or 5,136 t. oil.

E. Subsidiary culture

Those 92,000 ha have a very low rate of production, as well as an inferior bunches quality. The production is estimated at 2 t. of bunches/ha or 184,000 t.
Half of this production is sold in bunches, the other half being processed by the farmers with a rate of extraction of 8 %.

Oil production = 7,360 tons.

F. Spontaneous groves

The surface of the spontaneous groves is unknown, however, their utilization serves 2 purposes :

a) the tapping of palm wine
b) the picking of the bunches for direct consumption or traditional extraction.

G. Recapitulation

The total for these productions comes to :

165,236 t.	of bunches processed giving an output of 17,835 t. of oil
92,237 t.	of bunches utilized for direct consumption
257,236 t.	

Kernels

As bunches give a minimum 4 % of kernels, the potential yield amounts to 10,284 t.

a) The DENU mill has treated an average of 500 t. kernels in 1969 and 1970, with an annual output of 280 t. oil.

b) 626 t. of kernels were exported in 1969.

c) State Farms and public groves have recovered 1,100 t. of the kernels.

d) The peasants do not process their kernels, or process a very small part, say 1,000 t.
The gross total of kernels utilized is thus 3,226 t., approximately 7,000 t. of kernels being lost in spite of an attractive price.
We recommended that the Government devote some attention to this wastage and definitely attempt to incite the farmers to collect and sell kernels.

4.1.3.1.6. Prices

The prices presently paid for bunches are 28 NC per ton, while those paid for palm kernels are 142 NC per ton.

4.1.3.2. Future prospects

Looking ahead, the following factors may very well effect a yield increase :

1°) The young plantations coming in production or increasing their yield.
2°) The annual establishment of new plantations by independent farmers in several regions.
3°) The State Farm Programme.
4°) The government scheme for oil palms sets

Taking those factors into account, we have established the evolution of the surfaces under young or productive palms and the forecasts for productions.

4.1.3.2.1. Evolution of surfaces under oil palms
cfr table 4.1/11

a) State Farms

1. PRESTEA

2,880 hectares in production.
760 hectares still not in production. Production will start at a rate of 33 % during the next three years. The State Farm of Prestea plans to arrive to 4,800 ha by 1975 at a rate of 290 ha of new plantations each year.

2. KWAMASO

375 hectares in production.
405 ha of young plantations will enter into production at a rate of 135 ha each year. The area under oil palms will reach 1,900 ha by 1977.

3. Other State Farms

Will arrive at 500 ha by 1975.

b) Public institutions
No change is foreseen.

c) Plantations belonging to farmers and established with improved seedlings.
The table n° 4.1/10 gives the surfaces of productive and young plantations.
An assessment of the seedlings available in the public nurseries throughout the Forest region shows that about 1,000 ha may be planted in 1971, and 1,500 ha by 1972. From 1973 on, the supply of seed from the KADE station will make possible the establishment of 5,000 ha per annum.

Table 4.1/11. Evolution of the surfaces under Oil Palms (hectares)

Localizations	Quality	1971	1972	1973	1974	1973	1976	1977	1978	1979	1980
a) State Farms a.1. Prestea	in production	2880	3140	3390	3640	3640	3930	4220	4510	4800	4800
	young	760	790	330	870	1160	870	580	290	–	–
a.2. Kwamoso	in production	375	510	645	780	780	980	1180	1380	1580	1820
	young	405	470	535	600	800	840	720	520	320	80
a.3. Others	in production	280	330	380	430	500	500	500	500	500	500
b) Public palm groves	in production	800	1100	1400	1600	1600	1600	1600	1600	1600	1600
	young	800	500	200	–	–	–	–	–	–	–
c) Private farms with improved varieties	in production	1693	1995	2405	3151	4151	5651	6651	7651	8651	9651
	young	2458	3656	4246	5246	5246	4746	4746	4746	4746	4746
d) Private farms with local varieties	in production	9200	9200	9200	9200	9200	9200	9200	9200	9200	9200
e) Subsidiary plantation	in production	92000	89000	86000	83000	80000	77000	74000	71000	68000	65000
f) Government scheme	in production	–					280	1080	3280	5880	8000
	young	–	280	1080	3280	5880	7720	6920	4720	2120	--

However, as the farmers will have to be informed and trained as to the planting of those surfaces, we think that it would be far more realistic to preview an annual rate of 2,000 ha of new plantations.
Furthermore, if the government scheme, mentioned hereafter is to be carried out, some of these farmers will be included in the programme; thus it would be wise to limit the extensions in this category to 1,000 ha per year.

d) Idem but with local seedlings

We do not foresee an increase in these areas.

e) Mixed groves or subsidiary plantations

These surfaces will be reduced in the next years and progressively replaced by improved seedlings. We estimate the rate of decrease at about 3,000 ha per annum.

f) Government scheme

The scheme is divided into 2 sub-projects of 4,000 ha each : one near KADE (Eastern region) and the other near TWIFU PRASO (Ashanti and Central region).

When selecting the locations the Government took into consideration the ecoclimatic conditions, the existence o roads and railways, the system of land tenure, and the av lability of labor. The 2 sub-projects will be managed by corporation which will be set up by both the Government (through its two investment banks : The Agricultural Development Bank and the National Investment Bank) and private shareholders.
Plans are that the two sub-projects will assist farmers by providing them with credit in order to establish oil palm plantations utilizing some of the best planting

materials available, as well as setting up 2 centrally located mills in order to process the farmers' harvest. Plantations of an industrial nature will play a much smaller part in the supply of the mills. The average surface of the individual plantations will be 20 ha.

Such a solution is not wholly satisfactory as the supply coming from individualistic farmers can be rather erratic and, therefore, unfavourable insofar as a smooth and profitable operation of the mills is concerned. It would be preferable to put a somewhat heavier emphasis on the industrial estates which could provide a strong technical support to individual farms and guarantee the feasibility of the entire scheme.

Nevertheless, the project is good and we think Ghana will be able to find the necessary financial help to realize it.

The plan must be carried out within 7 years, beginning in 1972. The KADE mill is to be built in 1975-1976 and the TWIFU-PRASO mill 3 years later. Their yearly capacity will come to approximately 40,000 t. of bunches during full production years.

The oil production, starting in 1976, will reach its optimal point in 1985, with an output of 17,000 t. of palm oil and 2,000 t. of kernel oil.
We think that G.I.H.O.C. should be integrated in this project, and take on the responsibility of its industrial aspects.

4.1.3.2.2. Prospects for future production
(cfr tables 4.1/12 and 4.1/13)

Our forecasts are based on the following figures :

a) Bunches

1. For every new plantation with new materials, the yield is :

4th year after planting	- 2	t/ha bunches
5th " " "	- 3	" "
6th " " "	- 5	" "
7th " " "	- 7,5	" "
8th " " "	- 10	" "

2. For groves already in production :

in 1972 = 5 t/ha bunches
in 1973 = 7,5 t/ha bunches
in 1974 = 10 t/ha bunches

3. For groves planted with local varieties :

5 t/ha bunches for pure cultivation
4 t/ha bunches for predominant cultivation
2 t/ha bunches for subsidiary cultivation.

The forecasts for production are given in table n° 4.1/12.

b) Rate of oil extraction

1. Improved varieties and correct cultivation methods : 19 % rising to 20 % in 1975.

2. Improved varieties but traditional methods : 16 % rising to 18 % in 1974, if the concentration of plantations increases.

Table 4.1/12 - Estimation of Future Production (tons of bunches)

Localizations	1972	1973	1974	1975	1976	1977	1978	1979	1980
a) State Farms									
a.1. Prestea	14,920	22,880	31.350	32,750	35,105	37,225	39,300	41,475	43.[illegible]5
a.2. Kwamoso	2.145	3,485	5,100	5,840	7,185	8,450	9,800	11.300	13.[illegible]
a.3 Other	1,400	2,100	2,800	2.800	2.900	3,050	3,300	3,715	4.[illegible]
b) Public palm groves	4,600	7.500	10,800	12.350	14,250	15,500	16.000	16,000	16,000
c) Private farms with improved varieties	9,069	14,425	19,670	23,245	29,025	35,550	44,050	55.500	66.5[illegible]
d) Private farms with local varieties	42,800	42,800	42,800	42,800	42,800	42,800	42,800	42,800	42,[illegible]
e) Subsidiary plantations	178.000	172,000	166.000	160,000	154,000	148,000	142,000	136.000	130,000
f) Government Scheme	-	-	-	-	360	2.440	8,200	17,900	31.[illegible]
Total Ghana	252,934	265,188	278,520	279,785	285,825	293,025	305,450	324,490	348.[illegible]

Table 4.1/13 - Estimation of Future Production (tons of oil)

Localizations	1972	1973	1974	1975	1976	1977	1978	1979	1980
a) State Farms									
a.1. Prestea	2,834	4,347	5,956	6,550	7,021	7,445	7,860	8,295	8,7[illegible]
a.2. Kwamoso	407	662	969	1,168	1,437	1,692	1,960	2,260	2,[illegible]
a.3. Others	266	399	532	532	551	580	627	705	785
b) Public palm groves	874	1,425	2.052	2,346	2,707	2,945	3,040	3,040	3.040
c) Private farms with improved varieties	1,451	2,307	3,147	4,184	5,224	6,399	7,829	9,954	11,9[illegible]
d) Private farms with local varieties	5,136	5,136	5,136	5,136	5,136	5,136	5,136	5,136	5,136
e) Subsidiary plantation	8,900	8,600	8,300	8,000	7,700	7.400	7,100	6,800	6,500
f) Government scheme	-	-	-	-	117	512	1,722	3,759	6,[illegible]
Total Ghana	19,868	22,876	26,092	27,916	29,895	32,109	35,374	39,949	45.561

3. Local varieties and traditional methods :
   12 % for pure and predominant cultivations
   10 % for subsidiary cultivation (moreover, we consider that in this case only 50 % of the bunches will be processed).

Palm oil production will thus increase from 20,000 tons in 1972 to as much as 45,000 tons by 1980.
Out of this tonnage, the oil produced industrially will increase from its current 3,241 tons to 12,121 tons.
On the other hand, the kernel potential will rise from 11,380 to 15,680 tons, out of which 4,000 tons have to be collected by the State Farm and the Government Scheme mills.

A mere 25 % recuperation rate of the remaining kernels would still allow for 2,500 to 3,000 tons of raw materials to be placed at the disposal of the G.I.H.O.C. mills.

4.1.3.3. Conclusions

- Palm oil production is actually very limited (approximately 18,000 t.) and unable to satisfy Ghana's needs. The major part is supplied by farmers and traditionally processed.

- Ghana's farmers' groves are generally small, widely dispersed and quite difficult to organize and assist.

- The State Farms with their industrial mills, have a programme of expansion and will triple their output in the next 10 years.

- Ghana's Government has developed and coordinated an important oilpalm scheme, having a production goal of 7,000 t. of oil by 1980 and approximately 17,000 t. by 1985.

The G.I.H.O.C. should be integrated into the industrial activities of this project.

- Kernels, which are for the most part wasted today, will have to be recuperated. A minimum of 2,000 to 3,000 t. could be collected if the necessary steps were taken.

- A very high priority must be given to the production of palm oil and palm kernels oil of which the needs of Ghana are very high, as it will be shown in the next chapter ; consequently, the Government must do all its possible to completely realize the plan he has established.

4.1.4. Peanuts

4.1.4. Sheanuts

4.1.4.1. Production

Shea tree (Butyrospernum parkii) is a wild tree largely represented in the Guinea savanna of Northern Ghana. Shea tree shows a remarkable adaptation to environment; it is fire-resistant, well adapted to withstand the long droughts and strong desiccating winds.

The farmers in the Savanna region protect these trees, providing for most of their needs in fat products and bringing a good income when the kernels are sold for export.

Where cultivation cycles are short, the trees are generally far bigger than in uncleared conditions and could be termed as "super mature".

The density of trees per hectare varies considerably from more than 200 in scarcely populated savannas to a few units or even to nil in heavily populated regions as those surrounding Bawku and Navrongo for instance.

In his report on "Grass land and Livestock" Rose Innes describes four sub-types of guinea savanna woodland in the Northern and Upper region (covering about 37,000 sq. miles).

- The first is a fire proclimax savanna where the trees are scarce; this zone covers about 22,000 sq. miles.

- The second, sub-type, a somewhat degraded savanna, is estimated at roughly 12,000 sq. miles. The predominant species are Butyrospermum (shea-tree) and Parkia; both are economically important, the first providing sheabutter and the second edible seeds. This is a zone located between the intensively cultivated and populated area and the sporadically cultivated and scarcely populated one.

- The third sub-type, showing a further stage of degradation, covers 1,200 sq. miles.

  The vegetation consists of perennial and annual grasses with less numerous Butyrospermum and Parkia consisting of over-matured trees in the fields. This type is found mostly around Tamale, Lawra and Yendi.

- The fourth sub-type is in the final stage of degradation and practically treeless. Its estimated area is 1,950 sq. miles and it is located in the extreme north-east of the country around Bawku, Navrongo and Bolgatanga.

We take into account only the 2nd and 3rd sub-types, amounting to 13,200 sq. miles (3,318,000 ha) and if we admit a density of only 20 trees per ha, the total number of trees can be estimed at about 68,360,000.

The production of nuts per tree is low (one or two thousands nuts, equivalent to 3 to 6 kg of kernels); as the trees are often subject to yearly variation of production and also as an important percentage of nuts is attacked by a larva of a small moth which eats the seeds, we will take into account only 2 kg per tree and per year in order to avoid an overestimation. Thus the estimated production capacity of shea kernels lies around 136,000 tons. We must immediately draw attention that an important part of these is not harvested under present conditions.

4.1.4.2. Utilization

The production has two destinations : the first and the most important is the extraction of butter by local means, the second is the collecting for export.

a) Local extraction of butter

Kernels are rich in oil 45 - 55 % by weight; in the traditional processing, the rate of extraction drops to 15 % to 20 %.

The women begin by treating the fruits in order to eliminate the pericarp and the shells and to obtain dry kernels. The dry kernels are crushed in an ordinary wooden mortar, and roasted; then they are grinded to an oily, chocolate coloured paste, which contains tannin and is not edible until it has been boiled and the oil skimmed off, since most impurities must be removed with the scum. The shea butter is used as food, for burning in lamps and for anointing the body.

The consumption per capita/year of shea butter is about 10 kg in the North of Ghana. With an extraction rate of 20 %, this corresponds to 50 kg of shea kernel.

Thus, for the total population of the Upper and Northern region, who are the main consumers of shea butter (1,585,867 inhabitants), the requirement amount to 79,293 tons of kernels (15,858 tons of shea butter). This figure can be compared with the consumption of 14,000 tons of shea butter indicated in the household expenditure survey of 1961.

b) Exports

During the last years, the exports of sheanuts in tons amounted to :

1964	3,133 tons
1965	384 tons
1966	538 tons

1967	5,464 tons
1968	4,773 tons
1969	5,644 tons

The average figure for the three last years is 5,293 tons.

The sheanuts are collected by the Cocoa Marketing Board, who pays 50 NC per ton to the farmers, the bags being supplied to them without charge.

c) Balance

If we reduce (136,000 tons) from the estimated production capacity the quantity locally processed and the exports, we find a surplus of about 50,000 tons which are not harvested.

4.1.4.3. Future opportunities

Some tests of shea-tree plantations have been made, years ago; the results were disappointing because shea tree needs about 15-20 years to produce with rather poor yields, and thus cannot compete with other vegetable oil crops.

There is moreover no need to plant shea trees which are found naturally in abundance.

The best possibility to increase production should be to encourage the picking from wild trees. The fruiting season starts from the middle of June till the end of September, say 90 days. If each woman of the producing regions, i.e. roughly 200,000 women, could be induced to collect, with the help of children, 500 to 600 kg of kernels each, the production would increase up to 100,000 tons and more than 20,000 tons would be made available for exportation.

An encouragement to the production could nevertheless consist by the establishment of driers built with local materials to help the collectors for the sheanuts improve the drying. This could facilitate the producers work and improve the nuts quality.

In the Tchad Republic, United Nations have applied at the disposal of the Government one expert in charge of extending this drying method and we recommend to the Ghana Government to introduce a similar request for a period of one year to the United Nations.

Estimation costs : 36,000 US $.

The yields could moreover be increased, by giving some protection to the trees, such as spraying pesticides. The forestry department should make investigations and trials on this subject.

4.1.4.4. <u>Conclusion</u>

Shea nuts are abundant in all the North of Ghana and could be an excellent raw material for extraction of shea oil.

It is a wild production costing nothing to be produced and requiring only light labor for the harvesting.

The tonnage available for processing amounts at least to the present volume of export, i.e. 5,300 t/ per year and could very easily be increased with a little effort of the population by at least 100 %, and thus exceed 10,000 tons per year.

4.1.5. Cotton

4.1.5. Cotton

4.1.5.1. Existing situation

Consumption of cotton in Ghana is important. About 3,500 tons in 1968, with a probable increase to 16,300 tons in 1975 and 19,500 tons in 1980.

Until now, the needs were entirely covered by importations. However, the situation is changing and, after successful trials conducted by the F.A.O. in 1966, Ghana started his own Cotton Pilot Scheme in 1968, under the responsibility of the Ministry of Agriculture. The organization in charge, the "Cotton Development Board", is based in Tamale.

The Cotton Development Board is an independant body subsidized by the Government and directly responsible before the Ministry of Agriculture.

The Board receives assistance from :

1°) the U.N.D.P., which has put at its disposal one F.A.O. expert as Acting Manager and four experts for technical matters (one has left). These experts are in charge of research, development of new techniques, seed multiplication and pest control.

2°) French bilateral aid through the C.F.D.T. (Compagnie Française des Textiles) which offers his cooperation in matters of organization, extension, marketing and ginning.

The C.F.D.T. has 4 experts in 1969, only two remain in 1971.

The results achieved since 1968 can be summarized as follows :

<u>1968</u> - 180 hectares were planted : 80 hectares in State Farms and 100 hectares by farmers.
Average yields were 340 kg/ha of seed-cotton, with more or less 65 % of seed.
Total production in seed-cotton amounted to 61 t. and to 40 t. in seeds.

<u>1969</u> - a) Farmers : 636 farmers planted 307 ha in the districts of Wa - Tamale - Bolgatanga and Yendi.
The yields were approximatively 260 kg seed cotton/ha with a total production of 80 tons of seed-cotton.

b) State Farms at Zongo-Macheri - about 337 ha which were only partly harvested because of labour shortage.
The yields amounted to 501 kg per hectare (770 kg if only the harvested fields were taken into consideration).
Total production of seed-cotton came to 169 tons.

c) Farmers in the Volta district : 52 ha gave an average yield of 247 kg/ha and a total production of 13 tons of seed-cotton.

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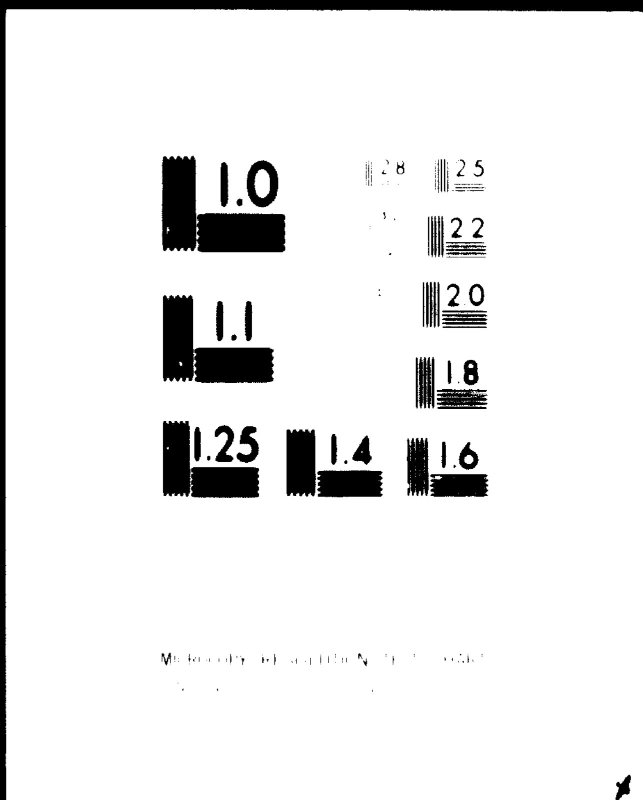

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All together, 696 ha were established, giving an average yield of 379 kg/ha and a total production of 264 tons of seed-cotton or 161 tons of seed.

1970 - Only farmers grew cotton on 880 ha, with an average yield of 411 kg seed-cotton/ha and a production of 362 tons of seed-cotton or 225 tons of seeds. Those seeds have been exported to Japan at a price of NC 40 for 1 ton (Togo).

Comments :

The yields are low, although rising from 340 in 1968 to 379 in 1969 and 411 in 1970.
This is due to serveral reasons :

1) The best fertilizer, with a formula of 20-37-0 - 7 etc. was not available and had to be replaced by a mixture of less value.

2) Field preparation was often delayed and consequently the sowing was late.

3) The spacing was too wide.

4) Pest were abundant.

5) Some fields were not picked and a portion of the seed-cotton was not sold at the organized markets.

On the basis of the results achieved so far, the C.F.D.T., experts consider that a yield of more or less 700 kg of seed-cotton per hectare can be obtained.

4.1.5.2. Future prospects

Forecasts for the next 3 years are :

1971	:	2,400 ha
1972	:	4,800 ha
1973	:	8,000 ha

If we admit that the yield will increase to 700 kg/ha in 1973 with 500 and 600 kg/ha as intermediary results, the production will be respectively :

in 1971	: 1,200 tons of seed-cotton	i.e.	750 tons of see
in 1972	: 2,800 " "	i.e.	1,785 " "
in 1973	: 5,600 " "	i.e.	3,470 " "

How realistic are these expectations ? In order to answer to this question, we must consider both favourable and unfavourable factors.

1) Favourable factors

a) Comparison with neighbouring countries

If we analyse the cotton output of these countries during the last ten years (see table n° 4.1/14) we notice a fast increase of productivity.

The cotton zone of Ghana is located in an area which can be compared with those of Ivory Coast - Togo - Dahomey - Nigeria and the Cameroon and we have reason to believe that Ghana's farmer should arrive to comparable yields. As Ivory Coast has obtained an output of more than 800 kg/ha since 1963, and Dahomey 789 kg/ha in 1968, it is reasonable to expect that Ghana, utilising the same varieties (Allen 333 and B.J.A. 592), will reach 700 kg/ha in 1973.

b) Sanitary conditions and cotton pest are similar to those of above mentioned countries and require as much pesticide and sanitary control.
However, Ghana is quite capable to solve these problems, if technical assistance to farmers is adequate.

A new cotton disease is often mentioned in Western Africa, the "Phyllodia" ; its causes and ways of transmission are still very poorly known, but the symptoms are easily recognizable. This disease has been observed in Upper Volta - Mali - Northern Togo, but until now the rate of damages did not exceed 5 %, and it is still unknown in Ghana.
However, the matter is now studied by specialists and we can confidently expect that methods of control will be worked out in due time.

c) The C.F.D.T., a highly specialized organization, has put its experience at the disposal of Ghana, and probably will be as successful here as in other countries.

2) Unfavourable factors

a) Cotton requires more pest control than rice or groundnuts. These additional costs are still supported by the Cotton Board, but this is only a temporary measure.

b) Rice and groundnut cultivation is still more profitable than the growing of cotton.
This depends naturally on comparative yields, costs and prices of these crops.
Seed-cotton is usually purchased from the farmer at a price of NC 155 a ton, which is not very attractive as long as the yields are low. However, we must not forget

that the food crops, when they are cultivated with traditional methods, also give poor returns.

Cotton cultivation has comparatively better prospects, due to the work of excellent specialists and the assistance given without charge by the Cotton Board. But a sharp increase in productivity will be necessary in a near future, when a larger participation of the farmers to the costs will be required (the inputs amount to more or less NC 50/ha).

4.1.5.3. Conclusions

The future of cotton will largely depend on the results achieved in the next two years and in our opinion there are good reasons to be optimistic, although the Government of Ghana intends to launch an important Rice development scheme. However, as the scheme will not start before 1973, cotton must not fear competition for the next two seasons.

The managers of the G.I.H.O.C. (Ghana Industrial Holding Oil Corporation) must be very attentive to the development of cotton cultivation and should conclude agreements with the Cotton Board, for the buying of the whole production of seeds.

Taking the above mentioned forecasts as a basis, and after deduction of the seeds required for sowing, G.I.H.O.C. can expect to purchase :

600 to 650 tons of seeds in 1971
1,500 tons in 1972
and 3,000 tons in 1973.

If the prices fixed by the Cotton Board (NC 40/ton at Tamale) are maintained, cotton seed will be one of the cheapest sources of vegetable oil.

It must be mentioned that the ginnery at Tamale does not outlint the seeds. Therefore G.I.H.O.C. should equip itself with machinery, and produce lint (4 to 5 % of the weight of seed), which has a large and profitable market (felt - mattress material - strings - wicks - etc...).

Table n° 4.1/14

EVOLUTION OF THE COTTON PRODUCTION IN SOME OF WEST AFRICAN COUNTRIES

(in tons of seed cotton)

		1961/ 62	1962/ 63	1963/ 64	1964/ 65	1965/ 66	1966/ 67	1967/ 68	1968/ 69	Average year production 1961/ 1969	% increase 1961/ 1969
Mali	(**)	5,893	12,343	15,763	21,772	16,185	21,731	29,888	40,890	20,458	593
Upper Volta	(**)	2,352	6,621	8,048	8,775	7,463	16,297	17,274	31,980	12,331	1260
Ivory Coast	(**)	3,300	6,243	4,349	8,563	10,261	24,486	33,252	42,240	16,632	1180
Togo	(**)	5,360	8,794	4,098	6,437	8,164	9,498	10,033	6,000 (***)	7,338	87
Dahomey	(**)	1,425	4,405	3,999	3,286	6,418	9,287	12,783	23,070	8,085	1520
Cameroun	(**)	25,100	41,432	45,581	43,963	57,545	55,810	49,085	68,010	48,316	171
Nigeria	(*)	86,120	147,952	131,432	132,700	-	-	-	-	124,551 (4 years)	53

Sources :

(*) Agricultural Development in Nigeria 1965-1980 - F.A.O. 1966
(**) Bulletin of The Compagnie Française pour le Développement des Fibres Textiles (1949-1969)
(***) 1968-1969 - Specially bad season in Togo - % is only calculated from 1961 to 1968

4.1.6. New production for the vegetable oil industry

4.1.6. New production for the vegetable oil industry

We will summarize the options existing for new sources of raw material for the vegetable oil industry in Ghana.

4.1.6.1. Soya Bean

There is no doubt that the soya bean can be grown in Ghana, as the cultivation has been successfully tried at the Crop Research Institute in Kwadoso (Kumasi).

As it is well known, soya beans are rich both in oil (18-23%) and in protein (40%). Unfortunately, neither the farmers nor the consumers are familiar with this crop, and it is doubtful whether a wide market at good prices can be found in the near future.

Furthermore, the extension of the new crop requires programming, trained field workers and financial means which, in this case, would be more valuable and profitable when applied to the existing activities such as the cultivation of groundnuts or of the recently introduced cotton

4.1.6.2. Benniseed (Sesamum indicum)

Benniseed is not quite unknown to the Ghanian farmers, and is sometimes cultivated in very small plots for domestic purposes; it grows spontaneously in most tropical countries including Ghana.

It can thus be considered that the cultivation of the Benniseed is possible. Experiments conducted by the FAO at Nyankpala (1) concluded that low yields from Dulce

(1) Applied Agronomic Research on Field Food Crops in Northern Ghana Report to the Government of Ghana in 1968.

Sesamum and its susceptibility to top rot and other diseases do not justify further tests at Nyankpala (near Tamale) but that coordinated research was required. However some trials have been led by the Crops Research Institute at Kwadoso and seem to be very successful.

The State Farm Corporation ad Tadzevu planted a 3-acr plot in 1968 and a yield of about 500 kg per hectare was obtained. The seed was supplied by the firm Drevici, whose intentions are to buy the oil for the manufacture of margari In spite of these slightly encouraging results, State Farm did not continue its activities the following year. We think that the difficulties already reported for the soya bean will occur for the Benniseed. In addition, we should mention that due to a heavy seed loss, the harvest of the Benniseed is difficult to carry out.

Our conclusion is the same as for the soya bean.

4.1.6.3. Rice bran

Oil can be extracted from rice bran and therefore an oil factory is sometimes added to the rice mill. As the rice bran often shows a high content of humidity and is subject to fermentation reducing the quality of oil, the industry is compelled to dry the bran as soon as it is produced at the rice mill.

The rate of humidity guaranteeing safe storage and transport does not exceed 10 %.

One ton of paddy gives about 100 kg (10 %) of bran and the bran contents 12 to 15 % of oil.

There are actually in Ghana 10 rice mills belonging to the Government and one of them is located in Tamale in the vicinity of the oil factory. This rice factory has worked 3060 tons of paddy in 1970 and its capacity amounts t 5000 tons.

The other factories all together have processed 975 tons of paddy. Not far away from the Government mill at Tamale a private rice mill is operating, with a capacity two times as big as the first mentioned. However, we have not found data concerning its output.

The Ghana Government intends to set up a development project for rice in Northern Ghana. This project will last 5 years and its purpose is to increase the yields of paddy from of 800 kg. to 2.250 kg/ha. The project covers 36,000 hectares from which 22,000 hectares are located in the Tamale district. When it is carried out, the production will increase by 52,200 tons, out of which 31,900 tons for Tamale. Thus, it is possible that in three to four years the two rice mills in Tamale will work at their full capacity (15,000 tons per year).

The other factories in Northern Ghana will benefit from a similar increase of supply.

At that moment the rice bran production in Tamale will come to 1500 tons (10 % of 15,000) which, with a rate of extraction of 12 %, will provide nearly 200 tons of oil. Such an output does not justify the equipment of Tamale rice mill with drying facilities or with new processing machinery. If we add that the brans are actually commercialized by the factory for human or poultry consumption (depending on their quality), the extraction of oil does not seem to be an interesting proposition, at least as long as the capacity of the rice mills has not been increased by 200 or 300 %.

Conclusion

The production of rice bran is too small at Tamale and will not increase sufficiently in the near future; thus, it would not be advisable for the GIHOC to envisage the extraction of rice bran oil.

4.1.6.4. Cashewnuts

In the Volta region, the Ministry of Agriculture has encouraged the plantations of cashewnuts (Anacardium occidentale)

Presently 400 hectares have been planted and in 1970 the Government has distributed seeds for more than 10(hectares. In 1971, 57,000 seeds have been delivered, which is enough to plant 125 hectares.

Government intends to take up the processing when the production will be sufficient and will continue to encourage the plantation by providing fertilizers and seeds free of cost. The final target is to arrive at 4000 hectares, which seems rather far away at the present rate of plantations.

As the young trees produce only since their fifth year, the output on industrial scale (and on a modest one) will start only in about ten years. The question is thus not urgent but G.I.H.O.C. should remain informed about the development of the programmes.

4.1.6.5. Miscellaneous

A few trials have also been made in Ghana with Castor oil trees, but the results were not encouraging. Some other wild or cultivated species bear fruits with an interesting content of oil :

Kapok seeds (Ceiba pentandra) : fat content 24 %
Dawa (Parkia Filicoïdes) abundant in the Savanna of Northern Ghana, with a seed fat content of 23 %.
Both seeds are appreciated by the rural population

Cucumeropsis edulis :
Dried and shelled, the seed has a fat content of 54 %.

The collecting of these seeds is difficult and costly, as the plants are widely scattered.

4.1.6.6. Conclusions

With the exception of sheanuts, it doesn't seem realistic to recommand even in a mid-term future, the utilization by GIHOC of new sources of raw material.

However, GIHOC should remain informed about the progress of the governmental schemes, more particularly for rice and cashew nuts.

4.2. ECONOMIC ANALYSIS

4.2.1. Demographic and Expenditure Data

4.2. Economic Analysis

4.2.1. Demographic and Expenditure Data

4.2.1.1. Demographic Data.

Before analyzing the Ghanian edible vegetable oils and fats market and forecasting its future trends it is necessary to study the situation and evolution of the country's population.

The population census of 1960 and 1970 (1) allows us to do so.

The table 4.2/1. gives the absolute population figures for 1970 by region together with the growth rate.

Table 4.2/1. GHANA : Population. Evolution by region from 1960 until 1970

Region	1960 Population	1970 Population	% increase 1960-1970	average growth rate (per year) (in %)
All regions	6,726,815	8,545,561	27.04	2.4
Western	626,155	768,312	22.70	2.1
Central	751,392	892,593	18.79	1.7
Greater Accra	491,817	848,825	72.59	5.6
Eastern	1,094,196	1,262,882	15.42	1.5
Volta	777,285	947,012	21.84	2.0
Ashanti	1,109,133	1,477,397	33.20	2.9
Brong Ahafo	587,920	762,673	29.72	2.7
Northern	531,573	728,572	37.06	3.2
Upper	757,344	857,295	13.20	1.3

(1) Central Bureau of statistics. Census Bureau. For the 1970 census only the general figures are available. Breakdown according to age sex has still to be made.

Table 4.2/2 lists the population by region in percentages of the total population and the population density.

Table 4.2/2 GHANA : Population by region in percentages and population density

Region	1960 (in %)	1970 (in %)	Density (man/km2) (1970)
All regions	100.000	100.000	36
Western	9.31	8.99	32
Central	11.17	10.44	90
Greater Accra	7.31	9.93	328
Eastern	16.27	14.78	63
Volta	11.55	11.08	46
Ashanti	16.49	17.29	60
Brong Ahafo	8.74	8.92	19
Northern	7.90	8.53	10
Upper	11.26	10.04	31

Exception made for the Western region, where the population of Sekondi-Takoradi remained almost stable, the regions with the major towns (2) increased their share in the country's total population.

A move to the towns is proceeding.

In 1960 1,631,814 people lived in towns of 5,000 or more inhabitants (24.3% of the population); in 1970 their number was 2,542,340 or 29.8%.

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(2) Greater Accra, Ashanti region (Kumasi), Northern region (Tamale)

As shown in table 4.2/3 the urban population increase is the strongest in the capital and in the Northern part of the country.

The Brong Ahafo, Northern and Upper regions, however, started from a very low level of urbanization in 1960.

Table 4.2/3. GHANA : Urban population in towns of 5,000 and more

Regions	1960	1970	% increase 60-70	Yearly growth rate
All regions	1,631,814	2,542,340	55.80	4.5 %
Western	149,869	203,137	35.54	3.1 %
Central	203,577	247,373	21.51	2.0 %
Greater Accra	491,817	848,825	72.59	5.6 %
Eastern	219,676	317,988	44.75	3.9 %
Volta	103,240	154,257	49.42	4.1 %
Ashanti	276,767	395,648	42.95	3.6 %
Brong Ahafo	85,229	164,410	92.90	6.8 %
Northern	69.063	148,556	115.10	8.0 %
Upper	32,576	62,146	90.77	6.7 %

The population growth in the larger urban units is even faster than in the smaller ones (see table 4.2/4). It is important to keep these features in mind as they mean that there is a fastly increasing market of agricultural products. As a consequence of the concentration of the consumption centers, industrial processing becomes more interesting, as the distribution costs become less heavy.

Table 4.2/4. GHANA : Population in towns of 20,000 and more

Regions	Population 1960	Population 1970	% increase 60-70	Yearly growth rate
All regions	933,019	1,600,714	71.56	5.5 %
Western	75,602	114,115	50.94	4.2 %
Central	66,606	82,564	23.96	2.2 %
Greater Accra	491,817	848,825	72.59	5.6 %
Eastern	55,096	118,561	115.19	8.0 %
Volta	-	22,446	n.r.(X)	-
Ashanti	203,455	265,292	30,39	2.7 %
Brong Ahafo	-	23,872	n.r.(X)	-
Northern	40,443	81,612	101.79	7.4 %
Upper	-	43,427	n.r.(X)	-

4.2.1.2. Expenditure Data

In order to visualize the evolution of the internal consumption it is necessary to pay attention to the evolution of the income per capita or rather to the expenditure per inhabitant. Table 4.2.5. gives the evolution of the "private consumption expenditure" from 1960 until 1969 at constant prices of 1960 (3). Although there has been a nation wide growth of the private consumption expenditure, per capita .

(X) not relevant

(3) Source: Republic of Ghana: Economic Survey 1969, Central Bureau of Statistics, Accra.

Table 4.2/5. GHANA: Private Consumption Expenditure (P.C.E) (at constant prices of 1960)

Year	P.C.E. in N₵ Million	% Increase		Population	P.C.E. per head (N₵)	%Increase
1960	694	-	19	6,726,815	103	- 5.8
1962	710	2.3		-	-	
1963	744	4.8		-	-	
1964	717	- 3.6		-	-	
1965	722	0.1		-	-	
1966	689	- 4.6		-	-	
1967	724	5.1		-	-	
1968	757	4.5		-	-	
1969	797	5.3		-	-	
1970 (x)	828	3.9		8,545,561	97	

There has been a decrease of nearly 6 % from 1960 until 1970. However since 1966 there has been a steady increase at a rate of about 3.9% per year. For the 1960 decade, the private consumption expenditure had a growth rate of 1.75 %, per capita it decreased by about - 0.6 % per year. During the period 1960-1969, the gross national product increased by 22.4 % from N₵ 946 million to N₵ 1,158 million at 1960 prices (4); per capita it fell from 141 N₵ to 135 N₵. Growth rates were 2.3% and - 0.5% for the whole period.

(x) Estimate

(4) G.N.P. at current market prices in 1969: N₵ 241.5 million; inflation was thus nearly 100%.

The fall of the gross national product per inhabitant started in 1965 and went on since then at a rate of - 1.3% per year.

As a consequence, there have been two opposite movements during the last five years : the private consumption expenditure per capita increased by about 1.5% year (5) and the gross national product (G.N.P) fell by about - 1.3 % year. These movements are made possible by severe cutbacks in the gross domestic fixed capital formation. The general consumption expenditure doubled between 1962 and 1969. If the capital formation is not increased in the next years a further decrease in the G.N.P per inhabitant should be expected; the upward trends of the consumption expenditure will reverse themselves also.

4.2.1.3. Trend forecasts

In the absence of a long or middle term development plan it is difficult to establish previsions of population growth and national income.

However, we think that the current family planning programme may succeed in curbing down the population growth rate to a certain extent. We therefore, will take into account a future growth rate of 2.3 % per year for the next decade. It should not be forgotten that the population of Ghana is a very young one (nearly half of it is 16 year or less). It consequently has a very high growth potential.

As to income, we will make two hypothesis : the first one allowing for no growth of the per capita private consumption expenditure, the second one assuming that the private consumption expenditures per capita will increase at the rate they did since 1966 i.e. 1.5 % per year.

(5) Global P.C.E. growth population growth : 3.9 - 2.4 = 1.5

4.2.2. Oils and Fats

4.2.2. Oils and Fats

4.2.2.1. Survey of the domestic market

4.2.2.1.1. Present requirements

4.2.2.1.1.1. Human consumption

The present human consumption may be estimated at some 11.55 grams of oil per day and per head. This figure appears from the National Nutrition Survey 1960 - 1962 (1) and includes a 10 % majoration for estimated underrecording. The private consumption expenditures per head have not increased since then.

As a result, we may now assume that the present oil consumption in Ghana for human food amounts to some 11.55 gr x 8,545,561 x 365 = 36,026 tons per year. To these quantities its is neccesary to add the oil absorbed by direct consumption of palmnuts, groundnuts and coconuts, which amounts to about 35,330 tons per year. Consumption of palmnuts accounts for about 85 % of that additional oil supply ; groundnuts for about 12 % and coconuts for 3 % only.

As was expected, oil consumption in the towns is larger than in the villages. Although no statistically reliable figures are available in the three major towns (Accra, Sekondi- Takoradi and Kumasi), the consumption of oils and fats appears to be about 20 or 25 grams per man/day. This balances the impossibility for inhabitants of the towns to consume large quantities of fresh palm fruits.

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(1) P. WHITBY : A review of information concerning food consumption in Ghana. Section 5. A Food Balance Sheet, 1968. Food Research Institute Accra.

It is very likely that the towns of 20,000 or more inhabitants consume about 13,000 tons of oil (2).

The total urban population should then consume some 19,500 tons (3). The rural population would consequently have at its disposal 16,500 tons of oil and the bulk of the fresh consumed oilseeds and oilnuts. Table 4.2/6 gives a summary of the oil consumption (in human alimentation) in the country.

Table n° 4.2/6

GHANA : Oil consumption (by degree of urbanization)

	Consumption in grams per man/day	Population (in 1,000)	Total consumption in ton/year
GHANA	11.5	8,545	36,000
Towns ≥ 20,000	22.0	1,601	13,000
Towns 19,999 - 5,000	20.0	941	6,500
Country side	7.5	6,003	16,500

(2) Calculated on 22 gr. man/day.

(3) Add 940,000 people at 20 gr. man/day.

The demand for oil is not a global demand. The various oils available on the market have their own specific customers, as long as these oils keep a particular smell and taste. Once they have been refined and deodorized, their interchangeability becomes very high. Therefore the industrially processed oils (refined and deodorized) may be considered as a single product. The traditionally processed oils cannot, as each of them keep its own particular scent and taste.

The preferences are strongly influenced by local factors. Groundnut oil will be most in demand in the Northern half of the country. The demand for palm oil is concentrated in the Southern half, but extends more and more to the north Coconut oil is less appreciated than the two previous ones but holds a market along the coast.
In the town stores where the branded oils are sold, the price has become the main factor. As good quality refined and deodorized oils are quite similar regardless of their origin, the "cross price elasticity" has become very high. This was confirmed by all the retailers we interviewed ; however, no information accurate enough to allow us to calculate the cross elasticity was available.

4.2.2.1.1.2. Industrial Requirements

The industrial requirements are not met by the country's present production. Thus the potential customers have to import their oils or substitute products from abroad.

The present needs of crude palm oil amount to about 32,000 tons, mainly for the production of soap.

At the moment, only about 2,000 tons can be purchased in the country. The rest is purchased in Dahomey. However, tallow imported from the U.S.A. covers the bulk of the soap production.
The industrial market for the other oils is less important. Groundnut oil outprices itself. Requirements of palm kernel oil amount to 1,200 tons per year ; demand for coconut oil is about 800 tons per year.

Undertakers complain that they are only able to meet a small proportion of their requirements with local supplies they can only buy about 5 % of their palm oil requirements in Ghana. Their requirements of coconut oil are met by the local production. They would, however, prefer to replace coconut oil partly by palm kernel oil.
Consumption by industry amounts to 2,500 tons ; coconut oil and palm oil represents to about 50 % each.

4.2.2.1.1.3. Summary

Table 4.2/7 gives a synthesis of the oil consumption and requirements in Ghana.

Table 4.2/7

GHANA : Oil consumption and requirements (in tons per year)

	Consumption	Requirements
Consumed in human alimentation (1)	71,300	94,000 (2)
Oil as such	36,000	
Oil in oilseeds	35,300	
Consumed by industry (local product)	2,500	
Palm oil : 1,250		
Coconut oil : 1,250		
Required by industry		32,000
Palm oil : 30,000		
Coconut / Palm Kernel Oil : 2,000		
TOTAL	73,800	126,000

As a consequence, the present consumption only covers about 60 % of the actual requirements, implying a more than 50,000 tons shortage.

(1) Data as obtained from the national nutrition survey.
(2) Based on 30 gr. per man/day direct intakes of oils and fats.

4.2.2.1.2. Current supply

4.2.2.1.2.1. Domestic production

The production of oilseeds and nuts has been treated in point 4.1. Here we will only try to make an estimation of the oil production.

Table 4.2/8 gives oil production estimates for the last years. An estimation for 1969 could not be established as there are no published agricultural production statistics for that year, their quality being too poor.

Table 4.2/8

GHANA : Oil production estimates (in tons)

Oil \ Year	1966 - 1967 (average) (a)		1968 (a)		1970 (b)	
	Total	Industrial	Total	Industrial	Total	Industrial
Groundnut oil	8,000	250	10,000	500	8,000	800
Palm Oil	15,000	1,750	20,000	2,000	18,000	4,000
Palm Kernel Oil	7,000	240	5,000	340	2,000	200
Coconut oil	5,000	2,100	5,000	2,000	11,000	2,200
TOTAL	35,000	4,340	40,000	4,840	39,000	7,200

(a) Source : F.A.O.

(b) Estimates made by the R & D team.

Almost 30 % of the industrially processed palm oil goes to the industry. About 1,200 tons of palm kernel and coconut oil are purchased by the factories also. Finally, there are only about 4,700 tons left for human consumption, which should be added to the 31,800 tons traditionally processed oil.

Table 4.2/9 shows the procedure of our estimated oil production figures for 1970

Table 4.2/9

GHANA : Oil seeds and nuts : production and consumption 1970 (in tons)

Crop	Production	Direct consumption	Industrial mills	Traditional processing
Groundnuts	38,000	14,400 (a)	2,000	21,600
Palm fruits	258,000	101,000	21,000	135,000
Palm Kernels	13,000	5,200 (b)	600	7,200 (c)
Coconut (coprah)	30,000	3,000	4,000	23,000

Besides there is also a production of sheabutter. No accurate figures are available. But we may estimate it at about 14,000 tons.

(a) Including seeds : 3,000 tons.

(b) Used as fuel.

(c) 600 tons are exported.

4.2.2.1.2.2. Imports

Part of the requirements not met by the domestic production are covered by imports. It should however be noticed that, in addition to the imports of oil, there are also imports of finished products in which oil is the basis raw material, of substitute products as tallow, and of by-products of the oil industry.

Table 4.2/10 lists the Ghanian oil imports since 1966.

Table 4.2/10

GHANA : Vegetable oil imports (in Tons)

Product \ Year	1966	1967	1968	1969	1970 (a)
Soyabean oil	945	990	838	1,479	1,216 (1,460)
Cottonseed oil	1	1	-	-	8 (9)
Groundnut oil	204	111	395	715	403 (485)
Oline oil	108	51	356	210	59 (72)
Sun-flowerseed oil	-	5	1	9	- (-)
Lineseed oil (b)	7	14	2	5	4 (4)
Palm oil	3,105	556	152	105	736 (882)
Coconut oil	59	30	20	83	27 (31)
Palm Kernel Oil	357	406	404	508	- (-)
Castor oil (b)	76	172	160	130	31 (36)
TOTAL	4,779	2,150	2,166	3,109	2,449 (2,939)

(a) Ten months: figures between brackets give the estimate for the year.

(b) Not included in the total.

Vegetable oil imports are consequently up to about 8 % of the local production. They stay mostly in the larger towns or are bought by industrial companies for further processing.

Table 4.2/11 shows the major suppliers of oils and fats to Ghana.

Table 4.2/11

• GHANA : Major suppliers of Oils and Fats Imports (in Tons)

Product	Origin	Year		
		1968	1969	1970 (10 months)
Tallow	U.S.A. (1)	18,645	24,320	11,665
Soyabeen oil	U.S.A.	670	1,080	950
Groundnut oil	Nigeria	240	440	210
Palm Oil	U.K.	105	-	-
	Ivory Coast	-	55	-
	Dahomey	-	-	690
Palm Kernel Oil	U.K.	400	500	-
TOTAL		1,415	2,075	1,850
Share of total imports		2/3	2/3	3/4

(1) About 95 % of the imported tallow comes from the U.S.A.

About 1/3 of the oil imports is covered by soyabean oil from the U.S.A. In 1970 owing to the halting of the palm kernel oil imports from the U.K., the share of the soyabean oil even increased. It should also be noticed that there are oil imports from neighbouring countries which enjoy roughly the same conditions of soil and climate as does Ghana.

4.2.2.1.3. Marketing

4.2.2.1.3.1. General

Nearly all the not home consumed traditionally processed vegetable oils are marketed by the women themselves. Some of them act as wholesalers and detain quite a large share of the market using market women as retailers.

Only a very small part of the traditional production goes to the oil consuming industries. The bulk is used in human alimentation.

The factories have to address themselves to the industrial oil mills to buy their raw materials. As a consequence about a third part of the industrial oil production goes to the other industries for further processing (margarine, soap, cosmetics, pharmaceuticals) while at least 95 % of the traditional oil goes to human alimentation.

This means that in the edible oil market, the household have the choice between about 34,000 tons traditional oils (mainly coconut, palm and groundnut oil) and about 5,500 tons industrially processed oils of which 2,500 tons are imported (deduction made for the amounts imported by the industrial customers).

If all the industrially processed oils were marketed in the towns of 20,000 inhabitants or more, these towns have to rely for 55 % of their requirements on the supply of traditional oil.

Without increase in the consumption per capita, there is a market of 7,500 tons in the larger towns which can be taken away from the traditional oil processors.
In the smaller towns (down to 5,000 inhabitants) there should then be an additional market of 6,500 tons.
The demand in the rural areas is mainly for small quantities at once. The one pint (0.56 l) and 0.65 l bottle are the best suited containers.
In the towns demand goes increasingly to larger containers and purchases of 1 gln (4.5 l) at once are quite usual.
In the rural areas the income is too low to immobilize even small amounts (about 5 ₵) in a private oil stock.
This explains why the smaller containers are more successful although the oil price per litre is higher in those packings

The industrially processed oils are distributed through both the traditional and modern channels.
Here too, the market women take a very important share of the market. Although no accurate figures are available, information gained from G.I.H.O.C. - V.O.M.D.(1) allows us to estimate it at 1,700 tons per year for the V.O.M.D. oils only. For the industrially processed oils used by the households the share detained by the market women (mamies) is consequently well over 50 % too.
Even the large merchant houses engaged in wholesale and retail, handle part of their retail sales by "mamies".

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(1) V.O.M.D. = Vegetable Oil Mills Division

Only those consumers who adopted a western pattern of shopping, buy their oil from shops, stores, department store and supermarkets. But the market share of these retailers is small in comparison with the share held by the mamies.

4.2.2.1.3.2. Competitive products

In fact V.O.M.D. (1) oils have to fight two kinds of competitive products.

The first ones are the traditional oils on the traditional markets. The two elements playing a role a r e
1) the price of the products and
2) its taste and scent.
In the rural or low income areas the price definitely appears to be the decisive factor. At equal price only, the scent will tip the balance one side or another.
As long as people do not mind a crude taste in the oil or maybe prefer it the industrially processed products outprice themselves.
At the present price rates, it should not be attainable, but in the long run, to take a large share in the oil supply of the rural areas.

The second kind of competitive oils are the industrially processed oils, both the local and the imported ones.
The most reputable local product is the "CRYSTAL OIL" from the Crystal Oil Mills in Accra. They market refined and dedodorized coconut and groundnut oil.
Imported oils are marketed (salad oil, palm oil) under the same brand. The container is a 80 cl transparent PVC bottle for the salad oil, the palm oil and the groundnut. The coconut oil is sold in a plain white PVC bottle. The manager of the Crystal Oil Mills switched to PVC bottles after continuous troubles with the containers in polyethylen.

(1) V.O.M.D. = Vegetable Oil Mills Division

The containers used at the moment are considered attractive and strong by all the retailers we met. They form a true on the spot sales promotion device. They are larger than the V.O.M.D. bottles and give the impression to be much larger than the usual oil bottles.
In the stores there is generally a large stock of Crystal Oi bottles exposed to the customers. The yellow and red colour of the salad, groundnut and palm oil attract the eyes from quite a large distance. The plan white bottle of the coconut oil is more discreet.
Crystal Oil is also sold in 1 gallon jerrycans (4.546 litre)

A second local competitor is ADIT (1). This firm sells palm kernel oil in glass bottles. It is, however, much less important than Crystal Oil.
ADIT palm kernel oil is only retailed by G.N.T.C. (2) for the modern commercial circuits. A.D.I.T. is located in Koforidua.

"Elephant Oil" might also be classified as a local competitor although the oil is imported. Elephant oil is the brand name given by the importer and bottler (El Nassr, Accra). It is sold in bottles of 0.5 l ; advertisements are made in the towns.
The containers used for both A.D.I.T. and Elephant oil are very common glass bottle (large beer bottles). They are not very attractive and cannot form an inducement to buy for the customer used to go to modern retailing stores. But the solid bottle might be valued by the lower income consumers.

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(1) ADIT is a small oil factory
(2) G.N.T.C. = Ghana National Trading Corporation.

The imported brands are mainly sold in larger containers gallon (4,546 litres) and ½ gallon (2,273 l).
We only saw smaller containers for

Kraft Corn Oil	: 0.908 l (glass bottle)
	0.454 l (glass bottle)
and	
Mazola Corn Oil	: 0.568 l (1pt - glass bottle)
	1.136 l (1 pt- glass bottle)
	1.705 l (3pt - glass bottle).

On basis of the predominance of large containers and their prices, which are from 30 % to 50 % higher than the prices of the local oils (Crystal, Makola, Elephant), we assume that the imported brand are only bought by the higher income people and consequently mainly in the larger towns.

4.2.2.1.3.3. The V.O.M.D. - Oils

At the moment the V.O.M.D. markets crude, refined and deodorized oils of various origins.

The competitive product in the stores is the MAKOLA cooking oil. It is a refined and deodorized coconut oil. For retail sales it is marketed in containers of 65 cl and 1/2 gln (2 273 l). These containers are delivered to the stores in cartons of 12 bottles (65 cl) or of 6 jerry-cans (½ gln).

The quality of the oil is considered to be good by all the customers. Only one salesman talk us of one single customer complaining : the oil should have contained water. Delivery times were considered fair. There were however complains about the quality of the packing material.

One customer complained that the cartons he got were all oil-soaked without exception. As a large part of his retails sales is done by market women who consider the carton a part of their benefit, the loss of the carton is a serious handicap in promoting Makola oil sales.

All customers agreed to declare the 0.65 l polyethylen bottle, in which the Makola oil is sold, is unattractive. We too noticed in several stores the poor aspect of the bottle on the shelves. Its faults are :

- the shape does not give the impression of containing more than 1 pint (0.57 l) as in fact the content is more than 0.65 l.
- the bottle has to be filled more than the indicated 0.65 l, otherwise the customers thinks he has been cheated as there remains some empty space
- the colour of the bottle is not attractive. Even when the bottles are thoroughly cleaned a number of them put together give an impression of clumsiness.
  For any other oil than coconut oil we should strongly advise using transparent PVC bottles. For coconut oil a plain and shiny bottle might be preferable
- the labels become to easily oil stained, even when no leakages occur. Plain paper labels are not suited for oil bottles. A kind of vinyl coated label should be used.

The 1/2 gallon jerrycans (2.273 l) are of a poor quality and sometimes leakages occur at the weld spoiling whole loads of cartons.
We found some of these jerrycans leaking on the shelves in the stores. It seems to attract the dust and other dirt immediately and it definitely is not a good sales promotion element.

The 1/2 gln jerry-can should be replaced by a higher quality container. Maybe a more severe quality control of the currently used ones could avoid most of the troubles. But the leakages should be avoided at any cost as they create very huge losses in spoiled cartons, repacking and cleaning. Otherwise, the jerry-can has the right size and shape and, when in good condition, is more appealing than the bottle. But anyhow, its outlets are chiefly limited to the towns. All the sales people who worked the traditional markets told us of the difficulties they encountered in those markets, because the at once required expense is too high for the low income people.

The other products (1) are only sold in tins (4 gln - 18.184 l) and drums (44 gln - 200 l) and sometimes in tanks. These products are :

groundnut oil	- crude
	- filtered
	- refined
	- deodorized
coconut oil	- crude
	- filtered.

They go mainly to mamies (in 1971 : about 160 tons per month) to Lever Brothers (1,800 tons per year), to Saka Manufacturing Co (120 tons per year), to institutions (schools, institutes, prisons) and to the State Hotel Corporation.

The tins and drums we saw in the various V.O.M.D. depots were not always as clean as might be expected of foodstuff containers.
Table 4.2/1 2 shows the evolution of the oil sales made by the V.O.M.D.
No figure is available for years anterior to 1970. No account has been made of the kind of packing used or the size of the container.

(1) Makola oil is sold in tins and drums too.

Table 4.2/1 2

<u>V.O.M.D. : Oil Sales (in tons)</u>

Period	Copra oil				Groundnut oil		palm kernel oil	Palm oil	Total
	crude	refined	deodorized	Makola	crude	deodorized			
1970 (1 - 6)	649.9 (a)	48.8 (a)	-	-	151.0 (a)	-	109.8 (a)	-	959.5 (a)
	(325.0)	(24.4)			(75.5)		(54.9)		(479.8)
(7 - 9)	441.2	16.2	-	1.2	162.0	-	178.6	2.6	801.8
(10-12)	690.9	- 1.5 (b)	-	108.8	123.9	-	69.7	2.1	993.9
1971 (1 - 3)	749.5	0.2	1.1	111.1	130.5	6.0	22.9	12.2	1,033.5

(a) reported on three months to make comparison easier
(b) returns from customers.

In one year the sales have more than doubled. That increase was made possible by a very sharp increase (about 140 %) in the sales of coconut oil and especially of the refined and deodorized Makola cooking oil. The other oils did not follow the good example as the palm kernel oil sales fell by 80 % (production was halted in February) and as the groundnut oil sales fell by about 10 %.

The very quick rise in the sales shows that there really is a market of refined and deodorized cooking oil and that an active sales policy can also overcome the supposed consumer's distaste of the cruder coconut oils.

4.2.2.1.3.4. The V.O.M.D. Marketing Organization

The marketing and sales organization of the V.O.M.D. is headed by a marketing and sales manager. He is assisted by 4 supervisors, 8 salesmen and three propagandists. Those employees are dispersed over three sales depots : Accra, Kumasi, Takoradi (see table 4.2/1).

Table 4.2/1

V.O.M.D. : Marketing Organization

marketing manager

ACCRA-depot	TAKORADI-depot	KUMASI-depot
- 2 supervisors	- 1 supervisor	- 1 supervisor
- 4 salesmen	- 2 salesmen	- 2 salesmen
- 1 propagandist	- 1 propagandist	- 1 propagandist
	+	+
	export officer (cakes)	TAMALE (sales branch)

Some additional administrative personnel is also workin in the sales service.
The marketing manager handles personally the contracts with the large merchant houses, the institutions and the most important mamies. The supervisors handle the medium large wholesalers. The salesmen handle the small retailers.
A new effort is being made to penetrate the traditional markets : to that effect 3 or 4 mobile vans visit those markets and offer Makola oil for sale.

Wa are afraid that this sales method is very expensive and does not yield any benefits. It may however be helpful in a sales promotion campaign or to visit the urban markets. But we noticed that the only van we actually saw, was quite dirty and had not been transporting oil only. An effort should be made to keep the vans clean.

The TAMALE factory handles some deliveries itself to avoid unnecessary transport costs. But the sales are made through the Kumasi-depot. As the urban markets in the Northern part of the country are growing rapidly it might be interesting to make Tamale the fourth sales depot of the division in near future.

The sales depots were generally in a poor state of maintenance, not very clean and badly located. We do not believe they are an efficient sales promotor. Those depots should be cleaned and painted.

More adequate locations should be looked for, unless the mobile vans should take charge of the direct sales to the final customers and the depots should only have to handle the wholesale business.

4.2.2.1.4. Price structure

The prices generally paid in Ghana for oilseeds and oil are well above the world prices.

The prices paid to the farmers are not completely known, but we gained knowledge of the prices paid by the oil mills, the estimates of the prices paid by middlemen (those estimates were given by the oil mill buyers), the wholesale prices and the retail prices for several markets.

4.2.2.1.4.1. Copra Oil

Price paid to the farmer by G.I.H.O.C. - V.O.M.D. is 2 NC (1) per 100 fresh nuts. Mamies who process oil in the traditional way pay 2.5 NC. Prices paid for copra by the mill are 150 NC per ton (long ton) or about 150 US $ per metric ton.
Mamies pay 170 NC per ton or 8.5 NC per cwt (50.8 kg).

The wholesale price for traditional coconut oil is about 10 NC per kerosene tin of 4 glns (0.55 NC per litre). Table 4.2/13 gives the annual average wholesale prices for coconut oil (crude).

Table n° 4.2/13

GHANA : Annual Average Wholesale Prices for Coconut Oil (crude) in US $ per ton

Year	Price
1963	371.84
1964	372.38
1965	509.26
1966	553.45
1967 (2)	504.41
1968	549.68
1969	539.89
1970	522.73

(1) 1 NC (new cedi) = 0.98 US $

(2) The price fall in 1967 is general for Ghanian oil products (except palm oil). We were not able to find the reasons of that price movement.

The retail prices vary much from one season to another(1) They are very high in the Northern part of the country, where copra oil is scarce and not much in demand (up to 1.05 ∅ per litre). The lowest price was found in Axim (near Esiama) : 0.35 ∅ per litre. The main price is between 0.70 and 0.86 ∅ per litre. Append.4.2/1 gives more details about the retail prices of coconut oil on the markets. It appears that the evolution is different from one region to another and that even in the same region the pattern is different in towns and in the rural communities.

The price for refined and deodorized coconut oil in the Accra stores amounts to about 1 NC per litre in bottles. For direct sales to large customers V.O.M.D. offers its Makola oil at 0.67 NC per litre in 200 litre drums. Crude copra is sold at about 0.53 NC per litre in 4 gln tins (18 l).
Import prices in 1969 were about 400 ∅ per ton C.I.F. Tema.

4.2.2.1.4.2. Groundnut oil

The price paid by the Tamale and Atebubu factories for shelled groundnuts was 14.00 NC per bag of 180 lbs (168 NC or 165 US ∅ per ton) in 1969.
On the wholesale markets the price was 192 NC or 188 US ∅ per ton. As many middlemen who buy the groundnuts on the markets resell them to the mills there must be much cheating of the farmers by manipulating the weights.

In 1970 the price paid by the mills was 192 NC per ton (188 US ∅) when bought outside ; if the groundnuts were delivered to the factory, the price paid was 204 NC (200 US ∅) per ton. Average wholesale price was 282 NC (275 US ∅) on

(1) Those prices concern the period from March 1970 until February 1971.

the markets.

Import prices (C.I.F. Tema) of Nigerian groundnuts were 220 US $ in 1969.

Table 4.2/14 shows the evolution of the wholesale prices of groundnuts for the whole country.

Table n° 4.2/14

GHANA : Average Annual Groundnut Wholesale prices (in US $ per ton)

Year	Price
1963	158.47
1964	193.28
1965	279.00
1966	225.33
1967	189.20
1968	244.30
1969	264.95
1970	281.64

The retail prices for groundnuts are about 0.22 US $ per kg in the main producing areas (Bawku) and 0.40 US $ in the Atebubu area. They average about 0.23 $/kg in the Ashanti region and about 0.30 $/kg in the southern part of the country, where there are very large local difference. The variations are mainly larger and the prices higher on the small rural markets.

The average annual wholesale prices for groundnut oil are listed in table 4.2/15.

Table n° 4.2/15

GHANA : Groundnut Oil. Annual Average Wholesale Prices (in $ per Ton)

Year	Price
1963	414.95
1964	447.29
1965	666.62
1966	614.35
1967	522.73
1968	628.36
1969	637.52
1970	667.16

The retail prices for groundnut oil are generally increasing from the north to the south. The highest prices are found in the areas with bad transportation facilities. The lowest price is found in Bawku which is the center of the groundnut growing area (0.60 $ per litre). The highest prices are in Twifu Praso (Central Region) and reach 1.26 $ per litre. The average price is between 0.86 or 1.05 $ (see append. 4.2/2).

In the retail shops in Accra the prices of Crystal groundnut oil vary from 0.65 to 0.85 NC per bottle of 0.80 litre (i.e. from 0.80 to 1.04 US $ per litre).
In gallons it costs 1.05 $ per litre. Imported groundnut oils costs about 1.40 $ per litre in 1 gallon tins, according to the brand.

G.I.H.O.C. sells its deodorized groundnut oil at about 720 ₡ per ton in 200 l. drums and its filtered groundnut oil at about 650 ₡ per ton.
In 1969 imported groundnut oil costed about 225 ₡ (a) C.I.F. Tema; in 1968 some 310 ₡.

4.2.2.1.4.3. Palm oil

In 1969 the average price paid to the farmer was 28 NC per ton of palm fruits.

The average wholesale prices per year are listed in table 4.2/16.

Table n° 4.2/16

GHANA : Palm Oil. Average Annual Wholesale prices (in ₡ per ton)

Year	Price
1963	307.17
1964	301.78
1965	431.12
1966	446.21
1967	446.75
1968	466.69
1969	458.60
1970	441.90

Append.4.2/3 shows that the lowest retail prices can be found in the most important palm fruit growing area (Asesewa): 0.345 ₡ per litre. The highest prices are met in the remote areas : Banda, Twifu Praso, Wiawso (0.78 ₡/litre). The average price is about 0.60 ₡/litre.

(a) The NATHAN report says 350 ₡ imported Accra. The price of 225 ₡ is beneath the world market price at that moment.

In the retail stores of Accra, Crystal Palm Oil is sold at 0.60 NC per 0.8 l. bottle, i.e. : about 0.75 ₵ per litre. There was no other palm oil sold in the Accra stores during our stay.
The import price of palm oil was about 208 ₵ C I F Tema in 1969.

4.2.2.1.4.4. Palm Kernel Oil

In 1968 Asraku sold the palm kernels 135 NC per ton to the Atebubu mill. The 1969 export price was about 140 ₵ per ton.
The wholesale prices for palm kernel oil are listed in table 4.2/17.

Table n° 4.2/17

GHANA : Palm Kernel Oil. Average Annual Wholesale prices (in ₵ per ton)

Year	Price
1963	280.23
1964	274.84
1965	402.56
1966	410.10
1967	349.21
1968	398.79
1969	397.71
1970	398.25

The retail prices (1) are very different in the various regions. They were cheapest in Ejura (0.345 ₵ per litre).

(1) see appendix 4.2/4.

They were highest in Banda (1.04 ₵) as the supply in Bawku is too irregular to be taken into account. The national average price varies between 0.5 and 0.6 ₵ per litre.

Only a small quantity of palm kernel oil is sold through the modern distribution channels. A.D.I.T. oil was sold at 0.45 NC per 0.56 l. bottle or about 0.80 ₵ per litre at the G.N.T.C. (1) stores.

In 1969 the import value (CIF) of palm kernel oil was about 400 ₵/per ton.

Palm kernel oil prices in Ghana are lower than the prices for palm oil. The only explanation we found is that palm oil is a much asked for product whereas palm kernel oil is not as much in demand. This might also explain why palm kernels are exported, though there is an oil shortage in the country.

(1) G.N.T.C. = Ghana National Trading Corporation

4.2.2.1.4.5. Sheanuts

Since 1968 the price paid to the farmer is 50 NC per ton.

The exports and export values of the sheanuts are listed in the table below :

Table n° 4.2/18

GHANA : Exports of Sheanuts

Year	Quantities (in ton)	Value (in N ¢)	Value per ton (in $)
1966	711	60,043	83
1967	5,623	353,335	61
1968	5,161	404,430	77
1969	5,734	395,278	67

No figure is available about local prices. There is probably no wholesale. In the retail trade the price paid for a calabash of ± 40 cm diameter (containing about 15 l. or 14 kg sheabutter) is about 7.5 NC or about 0.5 NC per litre.

4.2.2.1.5. Evolution of the Requirements.

Present incomes in Ghana are still too low to take into account an income increase induced fall of the income elasticity of the demand for edible oils. So we may calculate the consumption (C) as a function of the population (P), the income per head (Y) and the income elasticity of the demand (ey), and assume this last datum to be constant at 0.8 (1)

$$C = f\ (P,\ Y,\ ey)$$

Consequently, we can establish the forecasts for the coming next years. The mathematical elaboration of these forecasts is explained in more details in appendix 4.2/27.

(1) F.A.O. estimate for Africa South of the Sahara.

TABLE 4.2/19

GHANA : Forecast of the demand for edible vegetable oils and fats (national) (in tons)

Year	1st. Hypothesis	2nd. Hypothesis
1971	36,855	37,298
1972	37,703	38,614
1973	38,570	39,977
1974	39,457	41,388
1975	40,364	42,849
1976	41,292	44,361
1977	42,242	45,927
1978	43,213	47,548
1979	44,206	49,227
1980	45,223	50,965
1985	50,667	60,636
1990	56,767	72,142

For the 70 decades these figures obtained through a national approach should be compared with the following ones obtained by making a separate calculus for large towns, small towns and rural areas. For that calculus the method is the same as the one applied previously. The hypotheses are the same too. The population growth rate in the towns of 5,000 to 20,000 inhabitants is 3 %, in the rural areas it is 1.6 % per year.

TABLE 4.2/20.

GHANA : Forecasts of the demand for edible vegetable oils and fats (by degree of urbanization)(in tons)

Year	1st. Hypothesis				2nd. Hypothesis			
	$\geq 20{,}000$	$20{,}000 > x \geq 5{,}000$	$< 5{,}000$	Total	$\geq 20{,}000$	$20{,}000 > x \geq 5{,}000$	$< 5{,}000$	Total
1970	13,000	6,500	16,500	36,000	13,000	6,500	16,500	36,000
1971	13,715	6,695	16,764	37,174	13,879	6,775	16,965	37,619
1972	14,469	6,896	17,032	38,397	14,819	7,062	17,443	39,324
1973	15,265	7,103	17,305	39,673	15,822	7,361	17,935	41,118
1974	16,105	7,316	17,582	41,003	16,892	7,673	18,440	43,005
1975	16,991	7,535	17,863	42,389	18,035	7,998	18,960	44,993
1976	17,925	7,761	18,149	43,835	19,255	8,337	19,494	47,086
1977	18,911	7,994	18,439	45,344	20,558	8,690	20,043	49,291
1978	19,951	8,234	18,734	46,919	21,949	9,058	20,608	51,615
1979	21,048	8,481	19,034	48,563	23,434	9,442	21,189	54,065
1980	22,206	8,745	19,338	50,289	25,020	9,842	21,786	56,648

This approach made by degree of urbanization shows a faster increase in the demand than the global method. This is due to the fact that, in the same way as the population growth rate, the oil consumption per head is the highest in the towns. It should be also noticed that the income increase is likely to be higher in the towns than in the rural areas and that we did not take that probability into account. As a consequence, we are convinced that the forecasts of the second hypothesis as they appear in table 4.2/20. will be nearest to the reality.

The largest part of the forecasted consumption increase comes from the towns. Consequently, we may be sure that an increasing part of the demand will go to industrially processed, refined and deodorized oils. It is not impossible that some share of the increased expenses for oils will go to the purchasing of better oils and not to more oil. But the available data don't allow us to make any tenable forecast of the importance of the switch from traditional to industrially processed oils. A thorough consumer behaviour enquiry should be made to figure this out.

To the forecasts of the oil demand for human consumption it is necessary to add the oil demand of the various industries. At the moment, it amounts to about 32,000 tons and it will increase to about 40,000 tons at the end of the decade. The industry requires mainly palm oil (about 90 % of its total consumption).

So, the solvent demand, which today stays at about 68,000 tons will have increased to about 97,000 tons in 1980.
This means a yearly growth rate of 3.6 %.

4.2.2.2. Study of foreign markets

The study of the domestic market has shown an important shortage of oilseeds in Ghana. As a consequence, the study of the foreign markets has an essentially information value. For the time being Ghana is a net importer of vegetable oil and substitude products and that situation is likely to last for several years. Only for some products (e.g. sheanuts) or by products (e.g. copra cake) is the Ghanian supply larger than the local demand. It is only for those products that it is sensible to look for foreign markets at the moment.

4.2.2.2.1. Composition of the main oilseeds

The following table (4.2/21) reviews the composition of the main seeds, almonds or nuts under study (1).

(1) Document extract from "Les Oléagineux et leurs tourteaux" by Juillet, 1955 ; "Les principales Cultures du Congo Belge" by M. Van Den Abeele and R. Vandenput, 1956 ; "Matières premières usuelles du règne végétal, thérapeutique, hygiène, industrie" by E. Perrot, 1943-1944 ; "Les Produits coloniaux d'origine végétale" by G. Capus, Paris, 1930.

Table n° 4.2/21

Specis	Water	Ashes	Cellulose	Starch content	No nitrogeneous extr.	Fat content	Nitrogeneous content	Miscellaneous
Soya	6.3 to 13.9	3.10 to 6.50	3.6 to 11.7	5.0	20.00 to 35.50	12.0 to 23.0	-	-
Sheanuts								
a) after fermentation	5.80	2.39	7.00	6.62	-	51.62	9.00	17.57
b) aft. desic. in the sun	7.18	2.54	6.44	7.22	-	46.30	8.81	21,51
Sunflower (dry product)								
a) with full seeds	-	2.76	30.48	-	27.75	19.67	19.34	-
b) with husked seeds	-	3.41	3.07	-	27.85	34.62	31.05	-
Maize	10.00	1.22	2.09	70.0 to 80.0	-	1.0 to 2.0	7 to 8	-
Sesame seed	7.1 to 7.9	3.70 to 5.80	12.7 to 18.8	17.2 to 18.8	-	36.7 to 41.4	13.70 to 17.20	-
Groundnut (almond)	3.9 to 15.8	1.93 to 4.29	-	11.5 to 15.7	5.99 to 21.86	41.0 to 55.0	22.97 to 37.37	1.61 to 4.83
Cotton	11.0	3.00 to 4.00	21.0 to 22.0	23.0 to 24.0	20.00 to 22.00	18.0 to 25.0	-	-

4.2.2.2.2. The following table (4.2/22) shows the world production (in metric tons) of oilseeds that have been surveyed from 1966 to 1968.

Table n° 4.2/22

Seeds, almonds or nuts	1966	1967	1968
Groundnut	14,605,017	15,353,331	13,944,286
Soya	31,115,644	32,609,296	34,828,335
Cottonseed	18,663,353	18,339,167	19,857,635
Oil palm seed	490,331,000	272,675,000	317,807,000
Sesame seed	1,095,956	1,135,000	1,380,160
Copra	1,214,988	1,075,238	1,101,064
Sunflower	8,277,328	8,582,416	8,626,000

4.2.2.2.3. Characteristics of vegetable oils

The table has been annexed as appendix 4.2/16.

A few definitions relate to several terms used in the above table (1) :

Saponification index
Amount of milligrams of potash needed to neutralize the totality of free and combined fatty acids and contained in one gram of fat.

(1) "Lexique des huiles végétales" by Paul H. Mensier, Oléagineux coloniaux, Série Scientique n°2, Inst. de Recherches pour les huiles de Palme et Oléagineux nov. 1946.

Iodine index

Number of iodine grams which may be fixed per 100 grams of fat.

Hehner index

Total amount in grams of fatty acids insoluble in water and of non volatile unsaponificable contained in 100 grams of fat.

Reichert - Meissl index

Number of cubic centimeters of decinormal alkaline solution needed to neutralize the volatile acids, soluble in water, contained in 5 grams.

Polenske index

Number of cubic centimeters of decinormal alkaline solution needed to neutralize the volatile acids, insoluble in water, contained in 5 grams.

Acetyl incidence

Number of potash milligrams needed to neutralize the acetic acid obtained through saponification in one gram of acetyhic fat.

Maumenée test

Measure of rise in temperature resulting from the addition of 20 grams of sulphuric acid at 66° B to 50 grams of fat.

This table was drawn up after a document mentioned in (1)

4.2.2.2.4. <u>Productions, imports, exports, consumption</u>

For the time being, the E.E.C. is the largest single importer of oilseeds, oils and fat E.E.C. market situation is a major determinating factor of the world oil market. As a c it is important to have an idea of the pattern of the E.E.C. oil market.
The table recorded from Appendix 4.2/7 to 4.2/15 have been adjusted.
The tables mentioned above have served to establish a general table which records for a member countries of the E.E.C. and for each oilseed, the productions, imports, exports consumption of seeds, almonds and nuts and their equivalents in crude oils and oilcakes.

Table n° 4.2/23

Oilseeds in the E.E.C. in 1968 (P = production, I = Imports, E = Exports, C = Consumptio T.M. = Metric tons).

SPECIES	Seeds, almonds or nuts				Crude oils				Oilcakes		
	P	I	E	C	P	I	E	C	P	I	E
Soya	-	2996,347	2,270	2994,077	461,198	57,652	80,115	438,735	2530,312	1641,226	501,
Cottonseed	3,000	10	-	3.010	467	26.023	2,061	24,429	1,367	294,493	1,
Groundnut shells	4,000	906,792	-	910.792	282.289	242.388	57,807	466,870	435,848	385,305	66,
Maize (grinded)	1930.500	-	-	1930,500	58,500	22,000	15,000	65,500	292,500	-	-
Sesame	1,100	325,726	119	326.707	142,208	-	-	142,208	184,693	-	-
Sunflower	27,000	2540,084	4,556	276,528	77.161	247,831	54,347	270,645	188,109	351,720	16,
Coconut	-	425,106	-	425.106	267,961	111,864	50,830	328,995	157,145	903,712	-
Oil palm	-	-	-	-	-	303,419	21,181	281,238	-	-	-
Palm kernel oil	-	229,643	18	229,625	103,321	-	22.214	81,117	126,336	204,500	53,

SECTION 1

.2.2.2.4. **Productions, imports, exports, consumption**

For the time being, the E.E.C. is the largest single importer of oilseeds, oils and fats. The E.E.C. market situation is a major determinating factor of the world oil market. As a consequence, it is important to have an idea of the pattern of the E.E.C. oil market.
The table recorded from Appendix 4.2/7 to 4.2/15 have been adjusted.
The tables mentioned above have served to establish a general table which records for all the member countries of the E.E.C. and for each oilseed, the productions, imports, exports and consumption of seeds, almonds and nuts and their equivalents in crude oils and oilcakes.

Table n° 4.2/23

Oilseeds in the E.E.C. in 1968 (P = production, I = Imports, E = Exports, C = Consumptions, T.M. = Metric tons).

	Seeds, almonds or nuts				Crude oils				Oilcakes			
	P	I	E	C	P	I	E	C	P	I	E	C
	-	2996,347	2,270	2994,077	461,198	57,652	80,115	438,735	2530,312	1641,226	501,280	3670,258
	3,000	10	-	3.010	467	26,023	2,061	24,429	1,367	294,493	1,486	294,374
ls	4,000	906.792	-	910.792	282.289	242.388	57,807	466,870	435,848	385,305	66,710	754,443
	1930.500	-	-	1930,500	58,500	22,000	15,000	65,500	292,500	-	-	292,500
	1,100	325,726	119	326.707	142,208	-	-	142,208	184,693	-	-	184,693
	27,000	2540,084	4,556	276,528	77.161	247,831	54,347	270,645	188,109	351,720	16,820	523,009
	-	425,105	-	425.106	267,961	111,864	50,830	328,995	157,145	903,712	-	1060,857
	-	-	-	-	-	303,419	21,181	281,238	-	-	-	-
	-	229,643	18	229,625	103,321	-	22,214	81,117	126,336	204,500	53,750	2780,086

4.2.2.2.5. The following table (4.2/24) gives a survey of the specific applications of vegetable oils

Almost all the important vegetable oils are used in the food and soap industry. The more specific applications are listed below.

Table n° 4.2/24

Kind of oil	Applications
Palm oil Palm kernel oil	Metallurgy
Copra oil	Chemical industry
Sunflower seed oil	Varnish, Oil cakes (cattle)
Sesame Oil	Perfumery ; Lubrification ; Insecticids; Pharmaceutical products
Maize Oil	Paints; Lubrification
Groundnut Oil	Almost only food industry
Cottonseed Oil	Lubrification
Soya Oil	Lighting ; Paints
Sheanuts butter	Cosmetics ; Confectionery

It is very important to know that owing to the sole discovery of hydrogenization through which most fats have become interchangeable, the market has been revolutionized. Formerly, groundnuts were indispensable in the production of margarine, which constitutes one of the basic European fats. Today technological progress allows to use all fluid oils foı the manufacturing of margarine.

As to its uses in alimentation, for instance, as far as cooking and table oils are concerned, we note that all fluid oils (soya - groundnuts - cotton - olive - colza and sesame) are practically interchangeable.

In the production of margarine and shortening, fluid oils, lauric oils, solid oils and lard are to a great extent interchangeable.

4.2.2.2.6. The following table (4.2/26) gives a survey of the world production of the main vegetable oils under study (in 1000 metric tons)

Table n° 4.2/25

Oils	1963 (1)	1964 (2)	1965 (2)	1966 (2)	1967 (3)	1968 (3)	1969 (3)	1970 (4)	Prospects 1975 (5)
Fluid alimentary oils									
Cottonseed	2,288	2,438	2,497	2,465	2,300	2,310	2,460	2,420	2,950
Groundnut	2,715	2,842	3,019	2,910	3,145	3,220	2,935	3,120	4,000
Maize	-	-	-	-	249	240	249	258	365
Soya	3,809	3,959	4,163	4,549	5,235	5,265	5,810	6,700	6,880
Sunflowerseed	-	2,116	2,756	2,715	3,510	3,645	3,625	3,600	3,650
Sesame seed	531	558	608	563	560	600	590	600	675
TOTAL	9,343	11,913	13,043	13,202	14,999	15,280	15,669	16,698	18,520
Solid oils									
Copra	2,197	2,211	2,143	2,270	2,066	3,074	2,065	2,120	2,390
Palm kernel	372	413	418	404	341	343	365	400	460
Palm	1,262	1,199	1,212	1,258	1,121	1,267	1,040	1,180	1,635
TOTAL	3,831	3,823	3,773	3,932	3,528	4,684	3,470	3,700	4,485
COMPOUND TOTAL	13,174	15,736	16,816	17,134	18,527	19,964	19,139	20,398	23,005

(1) in "Marchés tropicaux et méditerranéens" - February 1968 ;
(2) in "Marchés des produits tropicaux en 1968" - March 1969 ;
(3) in "Oléagineux" - April 1970 ;
(4) in "Marchés tropicaux et méditerranéens" - Aprix 1971 ;
(5) in "Oléagineux", le marché des oléagineux tropicaux dans les Etats membres de la C.E.E. -May 1970

4.2.2.2.7. In the following table (4.2/26) the 1968 consumption are given by country and oil (in metric tons) (1)

Table n° 4.2/26

Country	Population (1968)	Vegetable oil consumption potential										
		Palm	Palm kernel	Ground-nut	Cotton-seed	Sesame seed	Sun-flower seed	Maize (2)	Sheanut	Copra	Soya	Total
United-States	201,152,000	46,851	53,856	368,091	476,344	12,853	31,886	202,993	-	371,104	2,318,568	3,8[illegible]
United-Kingdom	55,449,000	106,856	23,269	160,738	14,965	35,064	66,365	10,000	910	75,810	51,373	945,3[illegible]
France	49,920,000	34,427	3,114	295,523	13	11,320	13,710	14,000	-	61,735	20,012	453,8[illegible]
West-Germany	60,165,000	122,414	37,528	71,386	22,831	51,088	122,188	16,000	-	158,412	197,461	7[illegible]
Netherlands	12,743,000	59,797	31,252	22,445	991	11,329	41,776	3,000	-	55,779	86,252	312,[illegible]
Italy	52,750,000	42,754	135	59,580	594	65,560	69,830	17,000	-	28,863	108,710	383,0[illegible]
Belgium & Lux.	9,955,000	22,846	9,088	30,005	-	2,911	23,141	15,500	-	24,206	26,310	154,0[illegible]
Ivory Coast	4,616,000	31,397	29,800	65,838	1,860	-	-	-	-	482	-	159,3[illegible]
Upper Volta	5,025,000	12	-	41,049	2,229	240	-	-	1,635	-	-	47,3[illegible]
Togo	1,772,000	2,784	2,800	6,173	-	-	-	-	-	445	43	12,2[illegible]
Dahomey	2,571,000	33,067	-	3,760	1,221	-	-	-	2,730	-	26,236	67,0[illegible]
Mali	4,737,000	5	-	25,115	2,297	-	-	-	-	191	-	27,[illegible]
Senegal	3,685,000	-	-	89,947	923	-	-	-	-	-	-	90,[illegible]
U.A.R.	31,680,000	-	-	11,160	153,859	4,350	-	-	-	2,854	40,987	213,2[illegible]
Ghana	8,376,000	20,152	5,404	10,395	-	-	1	-	2,730	5,020	838	4[illegible]
Israel	2,745,000	2,119	-	3,201	4,883	174	1,575	-	-	100	77,398	[illegible]
Japan	101,090,000	38,153	9,294	51,646	38,030	17,636	248,670	-	-	-	234,552	657,[illegible]

(1) According to informations found in the "Annuaire de la production and the annuaire de la consommation of the FAO" - 1969, Vol

(2) Informations kindly communicated by the Federation of oil mills of the E.E.C.

SECTION 1

.2.2.2.7. **In the following table (4.2/26) the 1968 consumption are given by country and oil (in metric tons)** (1)

Table n° 4.2/26

Population (1968)	Vegetable oil consumption potential											By person (kg)
	Palm	Palm kernel	Ground-nut	Cotton-seed	Sesame seed	Sun-flower seed	Maize (2)	Sheanut	Copra	Soya	Total	
201,152,000	46,851	53,856	368,091	476,344	12,853	31,886	202,993	-	371,104	2,318,568	3,882,546	19.3
55,449,000	106,856	23,269	160,738	14,965	35,064	66,365	10,000	910	75,810	51,373	545,350	9.8
49,920,000	34,427	3,114	295.523	13	11,320	13,710	14,000	-	61,735	20,012	453,854	9.1
60,165,000	122,414	37,528	71,386	22,831	51,088	122,188	16,000	-	158,412	197,461	799,308	13.3
12,743,000	59,797	31,252	22,445	991	11,329	41,776	3,000	-	55,779	86,252	312,621	24.5
52,750,000	42,754	135	59,580	594	65,560	69,830	17,000	-	28,863	108,710	393,026	7.5
9,955,000	22,846	9,088	30,005	-	2,911	23,141	15,500	-	24,206	26,310	154,007	15.5
4,616,000	31,397	29,800	65,838	1,860	-	-	-	-	482	-	189,337	28.0
5,025,000	12	-	41,049	2,229	240	-	-	1,635	-	-	47,326	9.4
1,772,000	2,784	2,800	6,173	-	-	-	-	-	445	43	12,245	6.9
2,571,000	33,067	-	3,760	1,221	-	-	-	2,730	-	26,236	67,014	26.1
4,737,000	5	-	25,115	2,297	-	-	-	-	191	-	27,608	5.8
3,685,000	-	-	89,947	923	-	-	-	-	-	-	90,870	24.7
31,680,000	-	-	11,160	153,859	4,350	-	-	-	2,854	40,987	213,210	6.7
8,376,000	20,152	5,404	10,395	-	-	1	-	2,730	5,020	838	41,376	5.8
2,745,000	2,119	-	3,201	4,883	174	1,575	-	-	100	77,398	89,450	32.6
101,090,000	38,153	9,294	51,646	38,030	17,636	248,670	-	-	-	234,552	637,981	6.6

(1) informations found in the "Annuaire de la production and the annuaire de la consommation of the FAO" - 1969, Vol 23, Rome; kindly communicated by the Federation of oil mills of the E.E.C.

SECTION 2

4.2.2.2.8. Price rates of oils (1)

The following tables (appendix 4.2/17 to 4.2/24) review the last years world market price rates of certain oil seeds, almonds, nuts and oils. These rates converted in US $, figure in graphs 1 to 14 in appendix.

There exists a close correlation between the rates of palm oil on one hand, and those of whale oil and oleine (1). The price levels of palm oil and whale oil are nearly the same.

Palm kernel oil has a very high content of lauric acid, in consequence of which it is fundamentally different of palm oil and is on the contrary comparable with coconut oil, with which it competes directly.

There is an apparent correlation between the rates of palm kernel oil and coconut oil on one hand, and between those of copra and palm almonds on the other one. There also is a certain correlation between palm kernel oil and soya oil as both are commonly used in margarine making. The latter, however is not as close a correlation as that between palm kernel oil and coconut oil.
Prices of soya oil are highly dependent on prices of other fluid oils and soya flour.

Sesame culture is impeded by a high cost-price which is due to harvesting methods, which cannot easily be mechanized, and to a low output per hectare.
Sesame oil is an excellent edible oil which, owing to the presence of anti-oxydation products that prevent rancidity, offers good conditions of conservation.

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(1) In "Marchés tropicaux et méditerranéens" ;
in "Vegetable oil and oilseeds" a review published by the Commonwealth Secretariat - London 1968.

4.2.2.2.9. A few informations about sheanuts (1)

The sheanut is the fruit of a sub-spontaneous tree which grows in the dry areas of West-Africa and in some regions of Uganda.
The nut consists for about 45 % of an oil with the solidity of butter, known in commerce as "sheabutter". This product is used in cooking, chocolate-mills, lighting and cosmetics.

The total West-African shea butter production is estimated at a 500,000 tons per year, though the harvest is low.

Local consumption stands for about half the production, only a small part of the total production being marketed. Industrialization of milling methods would favour exportation of shea butter.
The principal sheanut exporting countries are Nigera, Ghana, Mali, Ivory Coast, Upper Volta and Dahomey ; small quantities however having been shipped in Togo.

Small quantities of shea butter are also be exported from these areas.

For these last years, the main importers have been the United Kingdom, Japan, Sweden and Denmark.

The exports of sheanuts from 1962 till 1967 in 1,000 tons, are given in the following table (4.2/27).

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(1) In "Vegetable oils and oilseeds, a review" - Commonwealth Secretariat, 1970.

Table n° 4.2/27

Producing country	1962	1963	1964	1965	1966	1967
Ghana	1	-	9	1	1	6
Nigeria	9	23	7	25	9	-
Dahomey	3	1	7	5	3	6
Ivory Coast	-	-	5	-	3	-
Upper Volta	5	-	7	4	11	3

During the same period imports of sheanuts amounted to (1)

Table n° 4.2/28

Importing country	1962	1963	1964	1965	1966	1967
United Kingdom	4	1	5	1	3	2
Denmark	11	13	16	12	10	5
Japan	6	5	16	15	15	11
Sweden	6	1	1	4	5	2

An important foreign firm with a regular purchase of sheanuts is ready to buy shea butter, as the oil content of the nuts is extremely variable and as shea butter, owing to its solidity and content, is little subject to rancidity. Shea butter was rated (in US $ per ton) at 297 in 1968, at 385 to 440 in 1969 and at 300 to 420 in 1970.

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(1) in "Vegetable Oils and oilseeds, A review" Commonwealth Secretariat, 1970.

The relation of the world prices of the sheabutter to the prices obtained for the exported sheanuts is about 4.7 (350/75), whereas the relation between the prices of other oils and seeds is about 2.4.

As the milling costs of the sheanuts should not be very different of the oil extraction costs for other oilseeds, the rentability of processing the sheanuts locally appears very clearly.

4.2.2.2.10. Foreseeable evolution (1)

The invention of new procedures (particularly : hydrogenization, refining and deodorization techniques) and the development of their use, have lead to uniformization of a great number of fats which compete on the market. Margarine for instance, which is composed of various animal and vegetable fats, competes with butter, shortening competes with lard, fish oil is sometimes substituted to lineseed oil, in some regions refined coconut oil competes with lard, margarine and other cooking fat. Owing to this competition and the educative actions of the boards of health, tradition little by little gives way to the factor "price" which tends to prevail with the consumers.

Competition of fats does not only occur in the sector of alimentary consumption, but also in the production of industrial goods. Margarine production, for instance, which was primarily based on oleine of the first milling, is now more and more directed towards solid refined and deodorized vegetable oils or hydrogenized oils.
Fats used in margarine production also vary from country to country according to the nature of the available supplies, the comparative prices of the products and national regulations. The same goes for the production of soap or glycerine. Modern soap works are equipped to use all kinds of fats and oils, according to the state of the market.
To conclude, it seems that the use of palm oil in tin industry may decrease whereas previously processed oleine, animal fats and lard may be more applied.

A most striking fact is the development of synthetic detergents, which, especially in the countries with a well developed mineral oil industry, have taken the place of a good deal of soap, so as to reduce considerably the outlets of greases in soap industry.

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(1) Les oléagineux, les productions principales des territoires d'outre-mer, Organisation européenne de coopération économique, Paris, Octobre 1957.

During these last years, this trend has been even more pronounced, hitting severely the production of soap ; toilet soap, however is not concerned by the process.
The Commission of the European Communities (General Directorate "Development Assistance") has recently published a consistent econometric analysis of the tropical oilseeds market. The important scientific undertaking was executed by the consultant's group "Metra International".

The document reviews the world prices, the evolution of supply on the world market and price prospects, final demand in the E.E.C., the composition of the products and the importation prospects.
It also studies the impact of the European olive oil policy and the American soya policy on the prospects of oilseeds importation, as well as the influence of margarine and butter prices.

Its analysis of the production and exportation prospects shows the following results : world production, which in the 1953 - 1965 period had a yearly increase of 860,000 t., might from 1963 till 1975 increase at a slightly faster rhythm and rise to a yearly 950,000 t., this corresponds with an available quantity of 39,200,000 t. in 1975.

The expected production increase of 11,500,000 t. will come from :
- principally : soya, oleine, sunflowerseed and groundnuts ;
- partly also from : fish, cottonseed, rape seed, palm an lard ;
- very little from : copra, palm kernel, olive and whale oil.

In the chapter on consumption expectations, the document states that the expected production increase should be absorbed by consumption, so that for the 1965 - 1975 period there would be no notable excess production. The slight acceleration of production will only influence the availabilities in the developing countries, where, owing to palm, copra, fish, rape seed and soya oil, the increase would undergo a certain acceleration. The 1964 availabilities of 11,960,000 t. would rise to 16,500,000 in 1975.

The study expects that the consumption of fats per capita (butter not included), amounting to 7 kg in 1953 and 9 kg in 1965, would rise to 10 kg in 1975. As a consequence, taking into account the population growth, the development rhythm of consumption per capita would continue its downward trend. Certain differences among the geographical entities are not shown in this general evolution. The document foresee a per capita consumption of 23,6 kg in the developed countries. Though the present level is extremely low in the developing countries, the increase should not be very important : 4.4 per capital in 1953 ; 5.1 kg in 1964 ; 5.4 kg in 1970 and 5.7 kg in 1975.

The document also states that up to 1975, notwithstanding the expansion of the tropical oil-seed market in the E.E.C., their share in the supplies will bend.
This decrease is due to solid oils, groundnut oil, however, increases slightly.

In 1966 (1) it was held that the relative importance of groundnut, copra, palm kernel and palm oil declined, whereas products related with meat processing (soya, oleine, lard, fish oils) were in full expansion. This evolution goes hand in hand with a significant change in the flows

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(1) idem p.

of trade traffic as a result of a geographical redistribution of the production areas, favouring the temperate climate countries, especially the United States.

In the community organization, groundnuts are bound to meet on the French market a rather tough competition on the part of fluid oils, penetration of which has been hindered up to now.
An existing favoured consumption behaviour should be of such nature as to set a limit to a further decline of consumption. The only producers to benefit by the European outlet, will be those disposing of good access to sea.

The applications of palm kernel and copra oil are of a fairly similar nature, so that their prospects should not be dissociated.

Their application in margarine and soap works declines. Their prices, which are rather high, make them sensible to the fluctuations of price-rates. The position of palm kernel oil, however, is less vulnerable, as its rates are not as high as the copra ones. Palm oil lost its soap outlet, while its margarine position has been attached by competition on the part of less expensive oils of sea-animals.

From our studies and the contacts we made it appears that :

- the consumption of groundnut oil declines more in France than elsewhere ;
- palm oil contains saturated fatty acid, while the trend is to use oils with a high content of unsaturated fatty acids, as a result consumption may be expected to bend ;

(2) During a conversation in May 1971.

- palm kernel oil will defend a solid position, though it is a by-product of palm oil which is its principal disadvantage.

The prospects of copra are not very brilliant, as its applications in industry, once representing 40 %, is regressing.

An increase in consumption of fluid oils (salad oils and margarine) prejudicing solid oils, should be foreseen. To conclude, margarine will be progressively replaced by salad oil, i.e. : fluid oils. The colloquium at Dakar, Market of alimentary oils is more and more dominated by three products, which,owing to national or regional guarantee systems, are safe from extreme price fluctuations (soya in the United States ; sunflowerseed oil in the Soviet Union, rapeseed in the E.E.C.).

As a result groundnut oil is totally exposed to the fluctuations of supply and demand and, in the long run, to the effects of deteriorating terms of exchange. Moreover, these effects are aggravated by the extremely heavy marketing structures in the producing countries. At the moment in France, groundnut oil stands for a more 50 % of the total consumption of alimentary oils, whereas its 1965 share was as high as 85 %. Hereafter are given some quotations of the chairman's speech at the congres of the International Association of Seed Crushers, held in London from July 6 till 9 1970.

In 1967 and 1968 a surplus of liquid oils on the world markets competing with soya oil coincided with large quantity of fish flour, which competed with soya flour.

Competition with soya products becomes sharper ; especially where proteins are concerned, urea, fish flours and cereals with a high protein content may be considered as a potential menace for the soya markets. As a consequence, to be competitive, prices of soya products should be rather low, being in the mean time high enough to incite the producers to go on with cultivation.

In the E.E.C. rapeseed production increased considerably, this however was due to a politic decision and not to demand, as is the case for soya in the United States.
One of the most decisive factors with a major influence on the world oil markets since 1962, was the appearance of the Soviet Union as an exporter of sunflowerseed oil. In 1962 the sunflowerseed harvest amounted to 4.8 million tons, in 1970 it exceeded 6 million tons.

Together with the increasing role of the United States, the E.E.C. and the Soviet Union on the world markets, the importance of the developing countries declined.

Their share in the oil-seeds market has not only decreased, the available quantity is at the moment even smaller than in 1962. This is a result of a relatively slow growth of production accompanied by an expansion of their proper milling facilities. The increasing importance of the developing countries' exports of oil becomes more and more apparent. Since 1962, their oil exports have increased with 25 %, whereas oil seeds exports decreased with 8 %.

During the last years, the evolution in demand, at the different levels of economic development, has stressed the contrasts between countries with an high level of income and countries with a lower one.

In the United States for instance, consumption of oils and fats has reached its level of saturation for long. In Europe too, economic development has reached a point where consumption approaches saturation.

In the developing countries, on the contrary, consumption of oils and fats has still not reached the treshold of saturation, as the increase of supply does only meet the needs created by population growth.

4.2.2.2.11. Conclusions

An examination of the rates of oilseeds over the last years, shows that in :

1967, the market was overloaded with fluid oils, this in spite of the military and monetary events (Vietnamese war, conflict in the Middle-East, closing-down of Suez Canal, war in Nigeria, devaluation of the pound sterling, effectiveness in July of the Common Market of fats and oils : a document on this last question is given in appendixes). For almost 10 years, world production of fats has been increasing constantly. The group of edible oils, especially soya and sunflowerseed oil has plaid a major role, compensating large and by the regression of solid and industrial oils.

1968, the market was characterized by a large number of competitive products, as the possibilities of interchangebility increased during the last years ; this lead to a thorough change in the relations of supply and demand. On the market of fluid edible oils, soya holds a more and more important position. In production, both soya and sunflowerseed oil are leading before groundnuts, cotton seed and rapeseed. It should also be stressed that the rise in prices of copra, as a result of the production deficit in the Philippines dominated the Market of solid oils, the problem of the outlets being posed sharper than ever.

1969, during this campaign, oilseeds prices rose considerably towards the end of the year. The rates at the end of the year of all oils, fluids as well as solids, were much higher than at the beginning of the year.
This rise in prices is principally due to a reduction of the exportable quantities of some of the main edible fluid oils sunflowerseed, groundnut, rapeseed, as well as copra and fish oil.
It should also be noted that there are less offers and especially less sunflowerseed oil, that demand is more active than has been foreseen and that U.S. soya and soya oil hold a more and more important position in the world exportations.

This very rapid progression of soya illustrates the established domination of the market by what is called the "by-products". It is the result of a boom in world demand of proteins. Soya with a comparatively low content of oil was directly favoured by this boom.

1970, prices are high. In spite of some rare exceptions, the most significant one being copra, oils, as well fluids as solids, were characterized at the end of the year by a rise in prices, which was often considerable rise comparison with prices at the beginning of the year. It should also be noted that edible fluids were less available as the 1969 world production did not show the regular increase.
Moreover, the evolution is deepened, especially where soya is concerned.

In the developed countries there was a rapid growth of production.

During the last decennium on the other hand, the world's evolution of fats has been characterized by a slow progress of production in comparison with that of consumption in the developing countries as a whole.
In the developed countries with a centrally planned economy, on the contrary, production of soya, sunflowerseed, rapeseed, lard, oleine and other products increased at much a faster rhythm. As a consequence, the developed countries constituted the major source of supply, to which the importing countries (most of them being developed ones) had to turn to fulfil their increasing needs.

For 1975 the world production of oil (in 1,000 tons) is estimated at : (1) Table 4.2/29

Species	Production
Copra	2,390
Palm kernel	460
Palm	1,635
Groundnut	4,000
Soya	6,880
Cottonseed	2,950
Sesameseed	675
Sunflowerseed	365
Maize	365

(1) In "Oléagineux", mai 1970.

The increase in 1975 will be principally caused by soya, sunflowerseed an maize oil. Cottonseed and palm oil will also be characterized by an increase. The copra and palm kernel increase will be the weakest.

As to the growth rate of the different products, palm oil will have the most rapide rate ; soya, groundnut, copra and cottonseed a less rapid, and sunflowerseed a still less rapid. The same reference (1) reviews as follows the rates of the different oils given in U.S. $:

Table n° 4.2/31

Species	Average 1954 - 1956	Average 1964 - 1966	Estimation for 1975
Soya	324	254	200
Cotton seed	298	266	206
Groundnut	350	312	260
Copra	289	323	340
Palm kernel	279	295	289
Palm	222	253	248

Only the prices of copra oil are expected to increase in the next few years. But copra oil does not have competitive prices in comparison to the oils of other vegetable origins. This means that Ghana will have to produce at prices even lower than the current world prices (already below the Ghanian price levels), if it wants export profitably.

(1) In "Oléagineux", mai 1970.

- The E.E.C. (1) is the world's first importer of fats, her production covers only 22 % of her consumption of vegetable oils. The E.E.C. is a very good market for a producer of tropical oilseeds. In Germany, France, the Netherlands and the B.L.E.U. oils from tropical oilseeds constitute 46 to 54 % of the total, in Italy 71 %.

The difficulty consists in supplying the market at a price which should be acceptable for both the producers and the consumers.

As a result, it is clear that a profitable development of the production of oils and oilseeds in Africa should be established on intensive cultivation, research being of an essential importance in this respect.

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(1) European Economic Community

4.2.2.3. Conclusions and Recommendations.

In Ghana the oil consumption is presently about 36,000 tons for human alimentation and about 2,500 tons for industrial processing. The requirements are about 32,000 tons for the industry and about 59,000 tons for alimentation (not including 35,000 tons consumed directly). Demand increases by about 3.6 % per year. The industrial demand goes mainly to palm oil.

The oil is produced for about 85 % in the traditional way. In 1970 only 7,200 of the 39,000 tons oil were milled in industrial plants. Oil imports average about 3,000 tons per year. The oil market for human consumption is for 80 % in the hands of "mamies" (market women) who control a large share of the distribution of the industrially processed oils too.

The markets for refined and deodorized oils are concentrated in the large towns. Here only, incomes are high enough to afford those more expensive products. The presence of highly prices imported oils, proves that the demand for high quality oils exists. The rapid increase in the V.O.M.D's sales figures confirms it.

The prices of the locally produced oils are generally higher than the world prices. Consequently, it is not possible to export oils in the present conditions. Anyhow, with the existing shortage within the country, it would be a bad policy.

With the existing par value of the New Cedi, Ghana is only competitive for two products : sheanuts, and palm kernels.

Consequently we recommend that :

1) the main effort should be made in the towns concerning the market of first quality oils. The packing should be made very attractive to compete directly with the existing local and imported products. Potential sales of imported products only represent some 2,500 tons.

   Therefore it is necessary to :

   - replace the existing polyethylen bottle by a PVC one with a better shape and size (either looking bigger than 0.65 l. or 0.80 l). At the moment the size difference with the 0.56 l. bottles is not sharp enough. The bottle should be colourless and transparent for groundnut oil and palm oil and plain for coconut oil (or if possible transparent gold colour).

   - Use labels which do not get oil stained.

   - Avoid delivering oil soaked cartons and consequently to be very strict on the quality control of the packing (especially the ½ gallon jerrycan) material.

   - The sales depots should be thoroughly cleaned. Better locations should be looked for if they are to handle the retail sales. Otherwise, the recently introduced vans could be used to tour the local markets. The buildings of the factories, which should be closed when TEMA (see recommendation 3.2) starts operating, could be used as depots for both raw materials and finished products.

As it is at present not possible to produce much oil, it is essential to produce high priced oils : deodorized and refined. A special attention should be given to deodorized groundnut oil.

2) The sheanuts should be processed locally into sheabutter. As sheabutter does not become rancid, the importing countries are willing to replace their imports of nuts by butter. The prices applied in Ghana make a profitable industry possible.

3) To increase more rapidly its oil output the V.O.D.M. should try to start the palm kernel oil production again and prepare itself to process cotton seed in Tamale.

4) Attention should be paid for the industry's demand for palm oil. A market of at least 30,000 tons should not be let to foreign or local competitors.

5) From a strict business point of view, sales to the rural areas should only be promoted when the urban markets are definitely saturated. Production and distribution costs are too high to compete efficiently with the traditional products.

From a national standpoint the large oil losses due to the traditional processing might justify an effort to replace traditionally processed oils by industrially processed ones even on the rural markets.

4.2.3. Oil Cakes

4.2.3. Oil Cakes

4.2.3.1. Study of the Domestic Market

4.2.3.1.1. Present Production

In 1970 the GIHOC factories produced 882 tons of copra cake, 988 tons of groundnut cakes and about 100 tons of palm kernel cakes. We give the sales figures of those cakes for 1970 in table 4.2/31 . Figures for previous years are not available.

TABLE 4.2/34.

V.O.C.D. : Oil Cake sales (1970)

Destination	Copra Cake tons	Groundnut Cake tons	Palm Kernel Cake tons
Agricare Kumasi	-	397	-
Special project Tema	223	132	-
Pioneer Animal Feed Mill Tema	174	40	-
Ghana Poultry Feed Mill Accra	132	15	-
Undetermined Local Purchasers	-	409	15
Exports	400	-	557
TOTAL	929	993	572

It appears from those data that the totality of groundnut cakes has been sold on the home market, but that more than 40 % of the copra cakes has been exported and that the palm kernel cakes had to be exported.

Owing to the lack of information on purchases made before 1970 by the different buyers, we were not able to judge of the evolution of their purchases.

4.2.3.1.2. Ghana's Oil Cake Requirements

The cake requirements of Ghana are essentially bound with poultry, the pigs are only a small outlet and cattle if of no interest at all. Three approaches may serve to estimate the needs of cakes; the first consists in taking into consideration the capacity of the factories making forage, the second is to examine the imports and the third to analyze the evolution of the number of animals which will consume the cake forage. We will successively throw a look at those points.

A. Feedstuffs factories

The experts have paid a visit to the principal factories in Ghana.

a) [illegible].

This factory makes almost only mixed feeds for broilers and layers; its capacity is 7,500 tons per year. A new factory of a tripled capacity is on the way to be achieved and will be the biggest in the country.
According to the use of the feedstuff, the percentage content of cake varies between 10 to 17 %, an average of 13.5 %.

The current requirements are of about 1,000 tons The manager of the factory estimates his needs at 100 t per month. Till now, the factory has only used groundnut cakes imported from Nigeria.
In the future they expect to import also soya cakes.
The production of pig and cattle forage is very low.

b) Ghana Poultry Feed Accra.

The capacity of the factory is 3 tons/per hour. Actually the factory makes 20 tons per day, or 5.000 tons per year, and utilises about :

200 t of copra cake
400 t of groundnut cake.

The factory has made some analyses of those cakes and the results were favourable.

c) Special Project Tema.

This factory makes special poultry feedstuff and since a few months feedstuffs for pigs. It is interested by both copra and groundnut cakes. We could not know the real capacity.

d) Prima animal feed Tema.

It must be a factory of the same type as the Ghana poultry feed in Accra, the experts had not the possibility to pay a visit.

e) Agricare Kumasi.

There also poultry feedstuffs are the only production. The monthly needs in cakes amount to 120 tons, 55 % of which are imported from Nigeria. Only groundnuts cakes are utilized.
The factory has no intention to carry up its present capacity.

If we make the total of the present needs of those factories, we obtain about :

3,200 t of groundnut cakes and
600 t of copra cakes.

B. Imports.

In 1969 the imports were :

Poultry feed and egg laying mixture	: 3,525 t
Feeding stuffs for stock animals	: 863 t
Prepared animal feed including meat and fish meals and oilseed cake	: 212 t

Supposed that those different feedstuff contain about 20 % of different cakes, the imports will represent almost 920 tons of cakes.

C. Needs of the breeding

a) Poultry.

The next table 4.2/32. shows the evolution of poultry in the country.

TABLE 4.2/32

Ghana : Poultry (Cross breed) by regions

Years	REGIONS								Ghana	
	Eastern	Central	Western	Ashanti	Volta	Upper	Northern	Brong Ahafo	Total	% of 1966
1966 (1)	306	315		154	51	-	-	115	941	100
1967 (1)	219	502		250	45	181	346	117	1.660	176
1968 (1)	505	682		168	162	175	403	133	2.228	237
1970 (2)	-	-		-	-	-	-	-	3.140	333

(1) Statistics : Ministry of Agriculture.
(2) Source : Animal Husbandry.

The progress made in 5 years is very significative and the Ministry estimates that the number will increase to 4,000,000 in 1972 - 1973 and to 6,000,000 in 1975 - 1976. The 3,140,000 heads of poultry are divided approximatively in :

2,000,000 broilers,
1,000,000 layers.

The forage consumption is respectively for the :

- broilers about 5.5 kg with a content of 12 % of cake.
- layers about 36 kg with a content of 12 % of cake.

If we translate in cake, this represents about 5,600 tons of cake.
Not all the animals are yet feeded with processed feedstuffs. There is still a high percentage which receives only cereals and other surplus. The livestock department estimates the present needs at 3,000 tons of groundnut cakes. In three years, it will rise to 5,000 tons.

b)Pigs

The following table 4.2/34 shows the evolution of pigs the last years.

TABLE 4.2/33

Ghana : Pigs by Regions

Years	REGIONS								Ghana total	% of 1966
	Eastern	Central	Western	Ashanti	Volta	Upper	Northern	Brong Ahafo		
1966 (1)	8,088	7,296		1,583	569	24,900	22,836	7,301	72,573	100
1967 (1)	12,057	9,154		-	2,201	18,872	34,467	6,101	82,852	114
1968 (1)	4,789	11,991	947	3,739	18,713	20,831	32,390	7,472	100,872	139
1970 (2)	-	-	-	-	-	-	-	-	139,800	192

(1) Statistics : Ministry of Agriculture.

(2) Source : Animal Husbandry.

Most of the pigs are not bred on a commercial deal, but as the needs in towns are growing very fastly year after year, there is no doubt that commercial breeding of pigs will become more common. The town of Accra, referring to the department of livestock should need for itself 5,000 pigs per year.

They should be fattened in a commercial way, they should represent an outlet for about 1,000 t copra or palm kernel cake every year.

c) Cattle.

The needs are very low, the only buyers are the breeding farms and the only dairy farm in the vicinity of Accra. These last farm has only 120 cows, offering very small out-let for cakes, perhaps 100 t a year. All the cattle of the country are bred following the traditional methods and never receive feedstuff bought outside. The government intends to develop the four ranches that it has in the country. Together they total 3,685 heads and it is hoped to bring them at 21,000 heads in 7 or 8 years. It is not planned to breed them with feedstuff, but it is probable that during some periods of the year cake will be usefull offering an outlet of some 1,000 t per year.

Conclusion : The present needs are around 3,500 - 4,000 t of cakes, those needs could double in the 5 next years, owing to the quick increase of poultry. The majority of those needs, about 85 % are for groundnut cake, the other cakes could increase if cattle and pigs were bred on a commercial basis.

4.2.3.1.3. Prices and Marketing

The groundnut cakes are sold within the country at N ₵ 118.00 per ton, excluding freight and packing.

The local demand is sufficient to absorb all the production increase in a foreseeable future.

No special marketing effort is made as the demand surpasses the supply.

The copra cake doesn't find sufficient customers in Ghana. As a consequence surplusses are to be exported. At the moment the main customer is the Federal Republic of Germany and nearly all shipments go to Hamburg.

The reason of the difficulties to sell the copra cake in Ghana is its comparatively low protein content. The animal feedstuff manufacturers have to add imported high protein concentrates if copra cakes are used. This enhances the cost price, so that it is cheaper to import the whole feedstuff or all the required nutritive elements at once.

For the time being copra cake is sold at 65 N Ø to the local customers. Export prices appearing from the international trade statistics were about 100 N Ø per ton in 1969. In 1970 the prices obtained by GIHOC were 87 N Ø per ton and 101 N Ø per ton.

Exports of copra cakes should be promoted. They yield an average 27 N Ø more per ton than sales to local customers.

4.2.3.2. Study of the foreign markets

Here too it is important to notice that Ghana is a net importer of oil cake components. Only a part of the copra cake is exported as the local consumers object its relatively low protein content.
The study of the foreign markets for the other oil cakes is interesting as background information.

4.2.3.2.1. Composition of the main oil cakes

In the following table 4.2/34, the composition of the main cakes is given in percentage (1)

Table 4.2/34

Kind of cake	Water	Proteins	Fats	Hydrocarbonic substances	Cellulose	Mineral substances
Palm kernel	11 to 13	13 to 20	2 to 14.5	29.4 to 50	11 to 27.8	3.7 to 6.3
Copra	13.12	20	9.11	40.88	10.09	6.80
Cotton	6.62	40.29	7.41	28.63	10.84	6.21
Husked groudnuts	10 to 12	40 to 50	5 to 8	20 to 30	2 to 6	5 to 6
Soya	12.82 to 14.85	44.65 to 45.92	5.32 to 8.12	19.50 to 24.32	5.47 to 5.71	5.7 to 6.55
Sunflower seed	7.68	23.80	7.94	27.49	28.05	5.03
Sesame seed	12.45	36.57	11.86	21.12	8.12	9.88
Sheanuts	12.5	15.02	3.50	51.79	10.50	6.69
Maïze	15.0	9.2	3.8	50.0	2.60	1.4

(1) from : "Les Oléagineux et leurs tourteaux" par A. JUILLET 1955.

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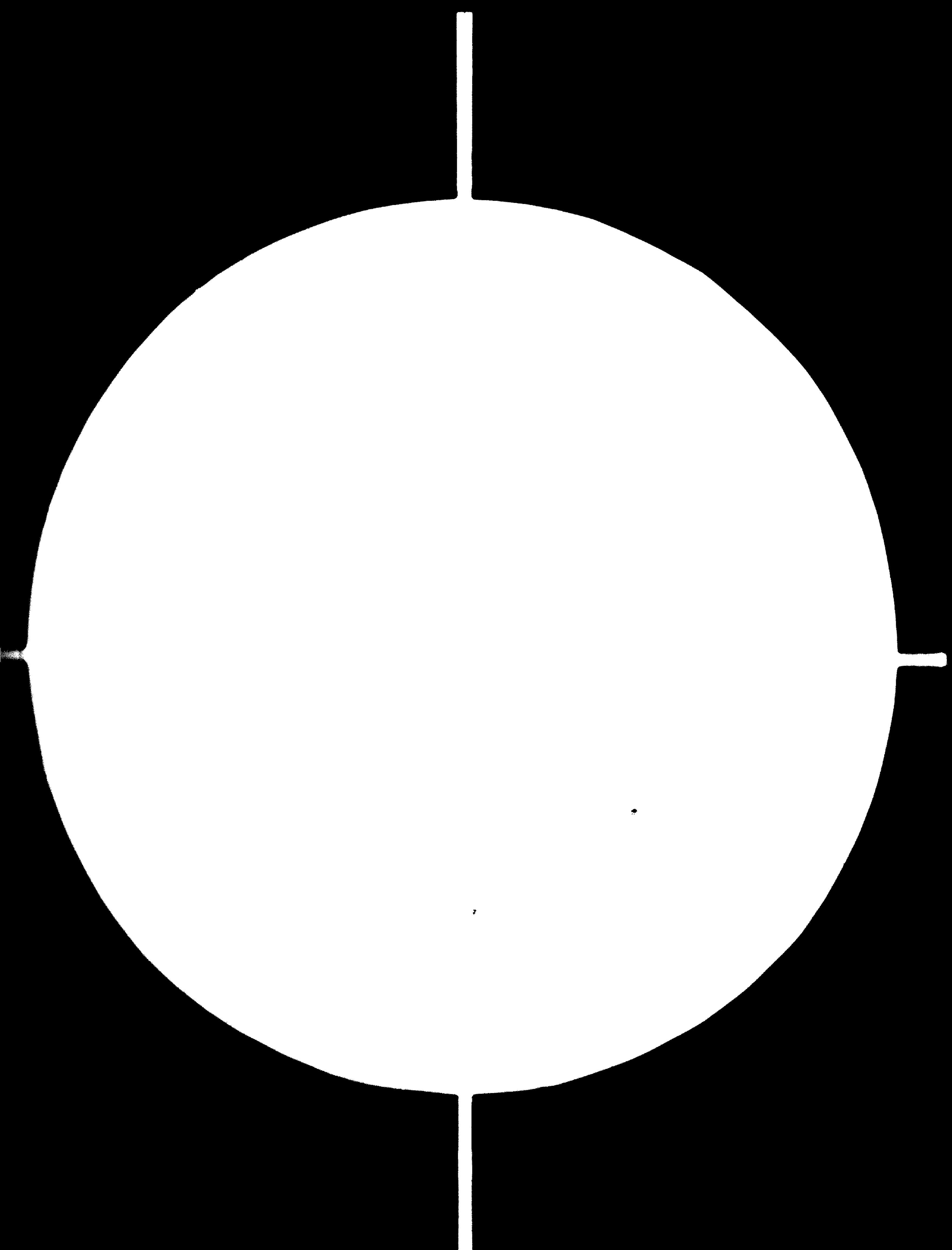

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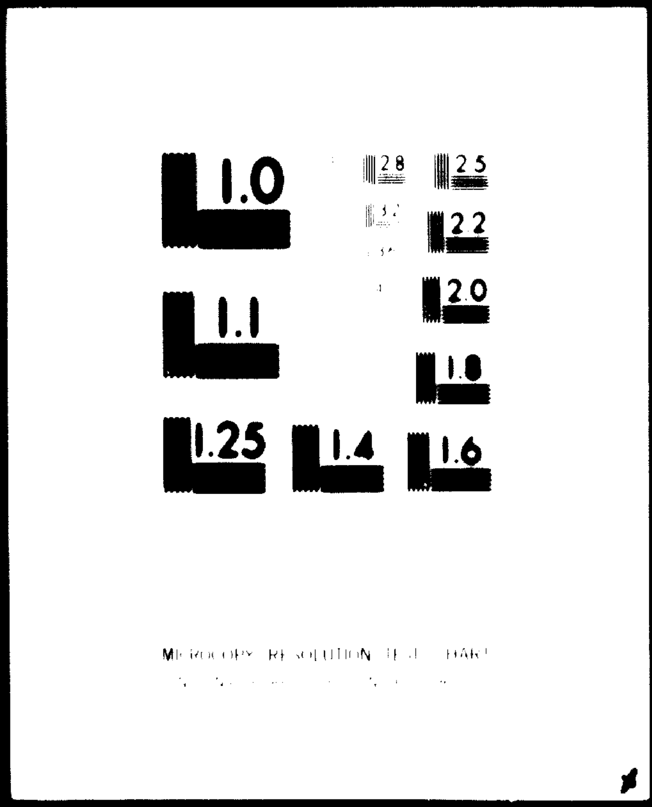
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MICROCOPY RESOLUTION TEST CHART

24x

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4.2.3.2.2. <u>World production of oil cakes</u> (2)

Table n° 4.2/35

The data listed in the following table 4.2/35 are given in 1,000 tons.

Oil cakes	1961	1962	1963	1964	1965	1966	1967	1968	Prospects 1975 (2)
Groundnuts	3,426	3,552	3,744	3,794	4,066	3,790	3,900	4,072	5,755
Soya	15,304	17,963	17,806	18,406	18,744	21,608	23,271	24,271	37,50[illegible]
Cotton	5,366	5,457	5,649	5,998	6,169	6,374	5,646	5,476	7,995
Sunflower seed	3,309	3,847	3,697	3,484	4,655	4,400	5,095	5,245	6,77[illegible]
Sesame seed	574	636	672	676	744	682	677	710	722
Copra	1,137	1,068	1,142	1,192	1,135	1,186	1,103	1,068	1,305
Palm kernel	456	414	432	440	447	425	320	312	562
Maize	-	-	-	-	-	-	-	-	-

(1) in vegetable oils and oilseeds, Arevirio, Commonwealth, Secretariat, 1970

(2) Calculated on basis of the world production of the main oils under study.

The E.E.C. again is the main outlet for oil cakes. As no common quality and composition regulations exist for the time being, it is sensible for a would be exporter to the E.E.C. to adapt his products to the strictest of the national regulations of the member countries.

At the moment the Belgian laws are the most severe ones.

4.2.3.2.3. Belgian Legal Regulations concerning forage cakes are given in the following table (4.2/36)

Oil cakes	Botanic purity	Humidity	Total of mineral substance per dry matter	Cellulose per dry matter	Insoluble ahses per dry matter	Chlorine per dry matter	Minimal percentage of proteins per dry matter
Copra	93	12,5	8,0	-	2,0	1,2	-
Groundnuts	93	12,5	5,5	-	2,0	-	-
- husked	93	11,0	7,5	8,0	2,0	-	38
- parthy husked	93	11,0	8,0	-	-	-	38
Cottonseed :							
- husked	93	11,0	9,5	15,0	2,0	-	38
- parthy husked	93	11,0	9,5	-	2,0	-	30
Sunflower seed :							
- husked	93	12,5	9,0	-	2,0	-	40
- parthy husked	93	12,5	9,0	-	2,0	-	31
Soya beans	93	12,5	8,0	8,0(x)	2,0	-	-
Sesame seeds	93	11,0	16,0	-	4,5	-	-
Maize seeds :							
- maize	93	13,0	9,0	8,5	2,0	-	12,5
- starch	93	13,0	7,5	-	2,0	-	20.0

(x) Category "b" to be constituted might contain 10 % of pulp per dry matter.

Informations from the Royal Decree of June 10, 1959, as modified by the Royal Decree of August 30,19[illegible]. Owing to its precision, Belgian legislation, may be considered as a norm for other countries. In the Netherlands, norms have only an indicative value and cannot be considered as legal matter. France h[illegible] produced laws on dryes, vitamins, etc... The German norms are similar to the Belgian.

The E.E.C. envisages less strict norms than the Belgian ones.

4.2.3.2.4. Production - Imports - Exports and Consumption.

These information are to be found in the addendum, in the tables Appendix N° 4.2.7 to 4.2.15 concerning seeds, nuts or almonds, crude oils and cakes.

4.2.3.2.5. Characteristics and uses of cakes. (1)

These informations are mentionned in the table below (4.2/37

Table 4.2/37

Species	Characteristics and Uses
PALM KERNELS	Proteins have a high degree of amino-acids ; West-Germany is practically the only European markets which imports oil-cakes. Methionin content is higher than in groundnut cakes.
COPRA	Higher content of proteins than in cakes of palm kernel ; methionin content is variable. West-Germany is the main importer in Europe.
SESAME	Higher degree of proteins than in cakes of palm kernel. High content of proteins, glucids and oils. Used for animal feeding.
MAIZE	Higher degree of proteins than in cakes of palm kernel.
COTTON	Used, but likely to be contamined by gossypol.
GROUNDNUTS	Without vitamins A. Contains as many proteids are soya cakes. But, may contain aflatoxin the effect of which may be very dangerous for animals, and more particularly for poultry. Used for human alimentation because of its high content in proteids.
SOYA	High content of proteids. These proteids are of a better biological quality than other usual vegetable proteids. The presence of urase may lead to interesting applications in the alimentation of the cattle when the use of urea is provided. Advantage : regular supplies. Rich in vitamins B Used in the poultry and pig forage.
SHEANUTS	The presence of toxic elements such as arginin and a sapotoxin.
SUNFLOWER	Presence of proteids, amino-acids, glucids, mineral salts and vitamins.

(1) In "Oléagineux et leurs tourteaux" par A. JUILLET 1955.

4.2.3.2.6. Consumption for all oilcake products in the E.E.C.

These informations are recorded in the table below (4.2/38).

Table 4.2/38

Year	Tons	Progress (%)
1955	1,885,000	100
1956	2,374,000	121
1957	2,448,000	130
1958	3,061,000	162
1959	3,616,000	192
1960	3,772,000	200
1961	3,875,000	205
1962	5,087,000	270
1963	5,234,000	278
1964	6,066,000	322
1965	7,216,000	383
1966	7,864,000	417
1967	8,155,000	440

In principle, West-Germany is by far the biggest consumer, followed by France, the Netherlands, B.L.E.U. and Italy.

Imports of palm kernel cakes in West-Germany can be listed as follows (1) and (2).

Table 4.2/39

Year	Tons	Year	Tons
1956	76,500	1964	219,500
1958	109,500	1965	217,900
1961	161,900	1966	247,800
1962	181,100	1967	207,400
1963	162,600	1968	193,700

As to imports of copra cakes in West-Germany, they amount to : (1)

Table 4.2/40

Year	Tons
1954	200,058
1955	260,587
1956	296,476
1957	333,900
1958	248,660
1959	163,226
1960	249,804
1961	269,230
1962	232,646
1963 (2)	246,370
1964	284,840
1965	320,530
1966	382,730
1967	322,780
1968	366,190

In West-Germany, two of contracts are used for oilcakes :

- the most important being the contract N° 15 (CFTA n°15) of the Cattle Food Trade Association (London) according to which the arbitrage centre is London.
- the second type being the German Cattle Food Contract n° III according to which the arbitrage centre is Hambourg. Contracts are nearly always concluded for future deliveries. The minimum volume treated by contract is 100 tons. These contracts generally stipulate the various admitted contents i.e.: proteins, fats, cellulose, humidity, etc...

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(1) In "Annual Review for 1968 of Oilseeds, Oils, Oilcakes and other Commodities, Frank Fehr and Co. Ltd., London, E.C.3.

(2) A partir de 1963 in "Annuaire de Commerce, Vol. 23, 1969, F.A.O. Rome.

Transport in bulk is becoming more important.

The minimum number of tons for a transport in bulk is 500 tons.

4.2.3.2.7. Prices of Oilcakes.

Average annual prices (in US $) for the years 1955 - 1956 are recorded below (1) :

Table 4.2/41

Year	Groundnut	Copra	Palm Kernel	Soya
1955	112	85	75	103
1956	109	87	79	99
1957	97	76	69	90
1958	87	72	68	94
1959	101	94	89	94
1960	99	87	77	90
1961	93	71	70	100
1962	102	94	88	106
1963	97	91	91	95
1964	95	81	76	97
1965	101	90	85	97

The following table (table 4.2/43) shows for the oilcakes of soya, groundnuts, cotton and sunflower prices in $ for the period 1966 - 1970. (2)

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(1) From "Oléagineux" Paris.

(2) Friendly communicated by the "Compagnie Belge de Commerce extérieur (Cobelex) at Antwerp.

Table 4.2/42

Time	Soya	Groundnut	Cotton	Sun-flower
1966				
January	100.-	96.50	80.50	80.-
March	97.-	93.-	73.-	72.50
June	107.50	98.-	82.-	74.50
September	111.50	105.-	88.-	83.-
December	108.-	100.-	84.-	82.-
1967				
January	104.-	97.-	83.-	81.-
March	101.-	93.50	79.-	76.-
June	100.-	99.50	80.50	79.-
September	101.-	99.50	81.-	76.-
December	98.50	98.50	80.50	78.-
1968				
January	97.50	96.50	81.-	81.50
March	97.50	94.-	76.50	76.50
June	102.-	93.-	73.50	74.50
September	98.-	92.-	72.50	74.50
December	95.50	92.-	73.-	79.50
1969				
January	96.-	90.50	73.-	82.-
March	96.-	88.-	70.-	74.50
June	99.50	97.-	68.-	73.-
September	94.50	100.-	73.-	76.-
December	95.-	96.-	81.-	81.50
1970				
January	99.50	94.-	82.-	82.-
March	100.-	94.-	75.-	75.50
June	105.-	102.-	83.-	79.50
September	108.50	112.-	94.50	92.-
December	109.-	107.50	93.-	93.50

Other informations have been collected which next to the prices recorded above, have served to draw up the graphics (1) concerning the prices of oilcakes.

(1) Graphic n° 15 to 20 (in annex)

4.2.3.2.8. Foreseeable Evolution

Soya meal, which is produced on the largest scale and most exported, practically represents half of all meals sold abroad. In order of importance, it is followed by groundnut meal, fish meal, and more or less on the same level, by cotton and line seed meals; then come copra, palm kernel, and sunflower meals.

The amount of exported meals compared with the amount of meals that is produced, varies considerably for each kind, and sometimes, even for one of them, from one year to the other.

It is, for instance, held that 100 % of copra meal is exported because there is no local consumption for the producers. In decreasing order, comes then groundnut meal, 69 % of its production was exported in 1966, then comes fish meal (59 %),then lineseed meal (49 %), and then, finally, soya meal. However, only a small proportion of sunflower meal and cotton meal that is produced, is handled by international trade.

The trade of oilseed meals, which is likely to replace the trade of oilcakes which has long been underestimated because of its association with forage, is one of the most expanding sectors of forage-economy.
For the stock breeder, oilseed meals are no longer a facultative supplement or a winter added portion, but one of the essential bases of forage which becomes more and more sophisticated. In the same way fertilizers are indispensable to cultivation, cakes are to stock-breeding. They are becoming part of human alimentation, but very progressively and slowly, but is certain that the present trends will go on.

A sub-product of today will become a necessary food product of tomorrow. The variety of meals, their various proteidic compositions suggest mixtures, and substitutions needed for a balanced diet. The trade of meals can no longer be surveyed as one block.
Each one of these flours has some opportunity; the most traditionally exported flour-products may be questioned by biochemists and dieticians.

As a result, it may be clear that this sector is a very dynamic one and that its activities are bound to expand, be it by the entry on the market of better cotton, groundnut or copra meals be it, from the industrial point of view, by the increasing number of links between traditional oil-milling and production of composed forage, the latter apparently being a natural extension of the former.

In the same way as entire soya flour, oil cakes and residuary flours of soya - with their surect taste reminding of chick peas or nuts - are a pleasant constituent of human alimentation. They should be prefered to entire seeds, cooking of which is often difficult. They may be proposed, either as basic staple food, either as a supplement in bread-stuffs (a percentage of 6 to 24 %).
As soya cakes dispose of a high edible proteid and vitamin B content, it is a food of a high nutritive quality, which is able to replace part of the animal proteids.

During the last years, computers regularly recommended the use of soya cakes, rather than groundnut cakes, especially where pig-forage is concerned. The low price-level of cotton seed and rape seed cakes have certainly played a role in this phenomenon (1). The later progression of sunflower cakes and their competitiveness are related with competitiveness of synthetic amino-acids, particularly lysine.

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(1) In "Oléagineux, Juillet 1969.

Soya cakes is very appreciated, and will continue to be so, thanks to its intrinnic qualities (e.g.: as poultry forage), the large available quantities in the United States, bulky from the United States and the regularity loads of supply.
The disadvantage of groundnut cakes, resides in the possible presence of aflatoxine develops in a humid surrounding and that it may be avoided successfully by better stocking in the port of loading and by shorter distances between the mills and the port.

4.2.3.2.9. Conclusions (1)

Until the beginning of the sixties, the American consumption of cakes and fish meal increased rapidly, for some years now, however, it seems to have reached its stabilization point. In Europe, there is a boom in cake and flour consumption. Indeed, its level is almost 50 % higher than 8 years ago. Demand and production in the sector of stock-breeding increased, so that, in spite of higher oil cake rates, the demand of the sixties led to a higher consumption.

In the developing countries, however, consumption of oil cakes did not even reach its starting point. The inevitable expansion of forage industry still offers good prospects, especially where poultry is concerned. Moreover, cakes are useful where under-norished populations are in need of proteins. During the next years, soya will play a double role in providing these proteins : the former, as soya flour in the expanding stock-breeding sector, the latter, as an important direct source of proteins in human alimentation.

(1) In "Oléagineux" Août-Septembre 1970.

Some new products are especially conceived for undernourished children; they have a minimum content of 20 % proteins and 6 % fats. In the future, many other products will enter the market, and it is encouraging that, during the last quarter of this century, the diet of the developing populations will improve considerably. It should, however, not be forgotten that within the next 25 years, the world population will reach 7,000 millions, the double of the present figure.

As a matter of fact (2), the rise in American consumption of soya flours (cakes) was higher in all fields than had been foreseen. This was partly due to shortage of competitive products, but also to a more general familiarization with the product and an increased consumption.

Other sources of supply may also enter in competition. One of them will doubtlessly be maïze with a high content of lysin, or maïze with changed protein. The development in this field is very impressive, there is no doubt that maïze with changed protein will play an important role in the world. It may, for instance, contribute to satisfy the needs of lysin, which is provided at the moment - e.g.: in pig forage - by soya flour. Maïze with changed protein will be available within 4 or 5 years.

4.2.3.2.10. Recommendations

- The exports of palm kernel and copra cakes must be directed to West-Germany, as this country is the almost exclusive importer of palm kernel cakes and the main importer of copra cakes.

- Groundnut and cotton seed cakes must be exported to Great-Britain, for she is the main groundnut cake importer and also a big cottonseed cake importer.

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(2) In "Oléagineux" le soja aux Etats-Unis par J.M. Moore, Mars 1971

4.2.3.3. Conclusions and Recommendations.

The Ghanian market for oil cakes is very small. It is not possible today to make very hopeful forecasts of a strong development of that market in a near future. The Ghanian market will however, be able to absorb the whole groundnut cake production of the oil mills even if they succeed in realizing the purchasing forecasts given in point 4.1.

Anyhow, a serious effort will have to be made to sell the total groundnut cake production in Ghana itself as the local prices exceed the world prices by about 35 %.

The national demand for copra cake is even lower than the one for groundnut cake. Luckily the prices on the world market are much higher than the selling prices in Ghana. For sales to Germany (Federal Republic) the prices obtained in 1970 averaged US $ 90 F.O.B. Tema, whereas the price charged to local customers is only NC 65 (US $ 64). The export prices are 40 % higher than the local ones. Consequently, a strong effort should be made to export as large an amount of the copra cake production as possible. That effort should principally be directed to the West German Market.

The German Federal Republic is an important importer of palm kernel cakes too. Prices, however should not exceed US $ 80 per ton F.O.B. Tema, if a stable outlet should be created.

Cotton cakes are a very speculative product. The average world price is some US $ 85 and shows a slowly increasing trend. The main export market is the United Kingdom.

It should be noticed that livestock breeding in the developed countries is evolving rapidly towards balanced diets for animals and that consequently the demand of the feedstuff industry is turning from expellers to flours and meals. These flours are also in demand, for human consumption where they are being introduced by the modern dietetics.

4.2.4. Study of the Protein Nutrition in Ghana

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4.2.4.1. Present Situation.

The nutritional situation in Ghana can be studied from two points of view. The first one relies on the food supply i.e. production + imports - exports = consumption. The second method consists in making direct inquiries in a sufficient number of households, and over a period long enough to be able to generalize their food consumption pattern to the whole country. Both these approaches have been used in Ghana. The results of these are shown in details in appendix 4.2/5 (1).

The first approach was realised by bringing together the production estimates of 1963 and the import figures for 1961. In appendix 4.2/6 we will use the same method but take the 1968 production and international trade figures as a base for the estimation, because those figures are the most recent available ones. The 1969 agricultural production statistics don't exist and 1970 trade statistics are still not completed. The 1968 population is estimated at 8,140,000 men.

The second approach is based on the national nutrition survey of 1960 - 1962.
We list in the following table the final results of the three studies.

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(1) P. WHITBY : A review of information concerning Food Consumption in Ghana.
A Food Balance Sheet - 1968. Food Research Institute- Accra.

TABLE 4.2/43

Nutritional Situation of the Ghanian Population (1)

Source	Intakes per man/day		
	Calories	Protein (grams)	Fats (grams)
Production 1963, import 1961	2,248	46.3	19.1
National Nutrition Survey	1,726	39.3	35.1
R & D estimation 1968	3,588	48.4	40.8

Our estimates show a better situation than the one which appeared from the estimation made in 1961-63. Although it is possible that the agricultural production statistics contain some estimates that are too high, generally they are quite realistic. On the other hand it should be noticed that the consumption of milk, oil cakes (from traditionally processed oils), bush meat, poultry and fruits has not been taken into account.

Consequently, we are quite sure that in Ghana a general food shortage doesn't exist, although the protein and fat intakes do not exceed the minimum requirements very much. That conclusion is confirmed by the fact that we didn't see any obvious cases of kwashiorkor or marasmus during our travels through the countryside. However, we only visited the areas with good communication facilities. If malnutrition occurs it will be caused by a bad distribution of the available alimentation.

Our statements suit with the views of the Ministry of Health - Nutrition Division - where we were told that malnutrition exists,but mainly in the remote areas. The reasons are :

- lack of transportation facilities
- lack of diversity in the diet
- lack of income to buy products from other areas. As a matter of fact, the remote areas are poorer than those with good transportation facilities and the prices are higher too as the transport costs of outside products are more important.

Consequently, the protein shortages which at the moment exist in Ghana are not caused by a general lack of protein production, but by a bad distribution of the existing supplies.

4.2.4.2. Foreseeable Evolution.

A comparison of the 1962 and 1968 situations shows that an evolution to the better is proceeding. The available quantities of proteins do not follow the favourable evolution as fast as the calories and fats. As we did not take into account the consumption of poultry (chicken, eggs, guinea fowls) milk and bush meat (including not registered slaughters), it is very likely that the protein supply is actually higher than the estimated 48.4 gram per man/day. Moreover, poultry farming is becoming quite popular and development schemes are being drawn up. The number of broilers and layers will be doubled in the next five years (1).

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(1) See point 4.2.3.1.2. C

Cattle ranches are also being developed and the fish landings (2) are increasing continuously. A 10 % per year increase in the national supply of animal proteins origin may consequently be expected, without being over-optimistic. As the expected population growth rate is 2.3 %, there will be an increase of the protein supplies per head even if the other branches of the agricultural production remain at their present level per head. That increase may be estimated per year at about 0.5 gram protein per man/day.

4.2.4.3. By-products of the Oil Mills as Sources of Protein.

Both groundnut and copra cake have a high protein content (about 42 and 22 %). We do not think, however, that the extraction of that protein, to make it suitable for human alimentation, would be beneficient for the country in general and for the V.O.M.D. in particular :

- Only a small amount of groundnut cakes are produced in the country (exception made for the cakes produced at home and which are already consumed in soup or fried). They are the basis for the nascent feedstuff manufacturing industry and the modern livestock breeding. If they are diverted towards human alimentation purposes both the young economic activities may suffer a severe setback.

- F.A.O. nutritionists are not sure that the Ghanian groundnut cakes are suited for human consumption. Although the food Research Institute didn't find any aflatoxine in the cakes produced by GIHOC, the nutritionists we met are afraid those cakes still might contain some, as the Food Research Institute should not dispose of the required laboratory equipment to detect small amounts of aflatoxine.

(2) The Volta (registered) fish production increased from 606 tons in 1966 to 5,298 tons in 1970; marine fish landings increased from 30,967 tons in 1961 to 91,550 tons in 1966 and up to 172,942 tons in 1970.

- Copra cake produced in Ghana loses a large amount of its protein content because the oil is extracted by hot processing. The costs of concentrating the protein still present in the cakes would be very high as the quantities of available cakes will not exceed 8,000 tons in a foreseable future (about 1,600 tons protein). Moreover, the cake would lose its present value and would no longer be useful as forage. That loss of income should be added to the cost of processing the cake to human aliment when determining the sales price : it is very likely to be excessively high (see point 4.5). Any-how, the quantities of protein which would become available would not exceed 0.5 grams per man/day.

- More proteins could be saved if another oil extraction method would be used, enabling to extract oil from fresh coconut. At the moment, this would be very expensive, as a complete new machinery should have to be bought and new staffs to be trained. Besides, in the present conditions of Esiama, where copra is transported from a distance of some 60 km, it would almost be impossible to have a sufficient supply of fresh coconut pulp unless complete nuts where stored at the mill and broken there. It means that transport costs would be multiplied by 7 or 8 (copra weighs 12 to 14 % of its fresh nuts equivalent). And again the cake would be of almost no value.

- It should not be forgotten that the protein shortages occur in remote areas with bad communications and a low monetary income. Even if protein flours based on coconut cake could be produced at an acceptable price, that price would be charged with high transportation costs before reaching the areas where the product is most needed.

It might consequently be offered at a price which is far beyong the reach of the population it is intended for. At the moment, the government distributes flours with high protein content (soya flours imported from North America). People accept it willingly as long as they receive it, but when the price is charged they tell they cannot afford it.

4.2.4.4. Conclusion and Recommendations

Transforming the oil cakes into a protein rich human aliment would be very expensive and could mean at setback for the animal feedstuff industry and husbandry. The danger of aflatoxine in groundnut still exists. Proteins produced from copra cakes could only supply 0.5 gram protein per man/day in any foreseeable future, at a cost which the people who lack proteins cannot afford.

In our opinion the most sensible solution to increase the protein supply in the backward areas is to start a campaign promoting family chicken raising. In that way animal proteins will be produced at home.

4.3. TECHNICAL STUDY

4.3.1. Present position as regards the various factories

4.3.1. Present position as regards the various factories

4.3.1.1. Esiama factory

1°) Location

This factory, the largest of the "GIHOC Vegetable oil mill division", is situated on the Western Region coast to the west of Sekondi on the road linking this latter to the Ivory Coast frontier (see map, appendise 4.3/20). Movement to Sekondi is hindered, however, by the ferry at Ankobra and this has led the local management to develop its main towards the west. In any event, this factory is established in an area whose traditional agricultural trend is towards the cultivation of the coconut palm.

2°) Raw materials

The factory is equipped for processing copra and palm kernels; its actual location in the coastal zone, however, has meant that it is engaged solely in processing copra.

Copra supplies are ensured by a department which buys the produce of the village plantations spread along the coast. In a few specific cases, the oil mill management is tied by contract to owners for whom it processes nuts to convert them into copra. From various sources of information on the spot, it would appear that this formula finds favour with the producers who prefer to sell the nuts and so avoid all the handling required to produce copra. The buying department, however, has only limited facilities both as regards drying and transport and is therefore unable to extend the application of this formula.

If we look at the results shown in table 4.3/1, it emerges that maximum deliveries were effected in 1963 (4.043 tons) and the minimum reached in 1968 with purchases of 1.221 tons. Since 1968, the position has undoubtedly changed for the better, and purchases in 1970 reached a total of 3.800 tons. During the first three months of this year, purchases have exceeded 1.100 tons which allows for the assumption that deliveries this year will exceed 5.000 tons (on average, deliveries over the first quarter represent about 20 % of the year's purchases - see appendix 4.3/2).

As regards the quality of the raw material, it is far superior to what is usually processed in Europe. Certain reservations must however be expressed as to the copra water content. In effect, a shrinkage of over 4 % is found during storage, and it would be advisable for the buying departement to avoid this by trying to get drier copra.

3°) Seasonal variations in purchases - stocks

The copra is stored in bags of 50.8 kg (112 lbs) in various warehouses with the following capacities :

Princess Town	5 tons (metric)
Factory	800
Krisin	350
Eikwe	25
Atuabo	25
Beyin	30
Kangan	25
	15
Einabo	525
Bongeri	35
Egbwaso	25
Edobo	45
Half Assini	60
Anlomatuope	400
Efasu	90
Tikobo II	45
TOTAL :	2.500 tons

This capacity is amply sufficient, and it may even be said to be disproportionate to the total volume of purchases. In fact if we take into account the seasonal fluctuations (appendix 4.3/2) it can be estimated that the maximum storage capacity (between September and August) should be at the most 20 % of annual deliveries. This means that the existing storage capacity is sufficient to meet annual purchases exceeding 12.000 tons. Rational stock control should therefore enable the number of warehouses to be reduced and consequantly a reduction in storage costs. The success of such an operation will depend essentially on proper organisation and close coordination between purchases, transport and mill.

As regards the seasonal fluctuations in purchases, graph 4.3/3 clearly shows that these go in cycle which is marked by two periods, May and October, when deliveries are on a larger scale.

4°) Transport and geographical distribution of production

On the basis of figures supplied to us for the years 1969 and 1970 (appendices 4.3/4 and 5), it is possible to arrive at the transport facilities needed to move the production from the various purchasing centres. On the basis of appendices 4.3/4 and 5, we can draw up the following table which gives us the average supplies % from each village and also the t.km % for transport to the factory.

Location	Distance in km	Relative production in %	t.km %
Princess Town	54,0	1.38	74.52
Factory	0.0	8.72	0.00
Krisin	36.0	6.16	221.76
Eikwe	37.5	4.39	164.58
Atuabo	46.0	9.33	429.18
Beyin	50.5	4.29	216.65
Kangan	56.0	2.66	148.96
Tokobo II	37.0	2.72	100.64
[illegible]inabo	61.0	11.06	674.66
Bonyeri	66.0	12.55	828.30
Egbwazo	72.0	3.89	280.08
Edobo	77.0	5.46	420.42
Eipu	83.0	1.21	100.43
Half Assini	85.5	6.73	575.42
Anlomatuope	90.0	8.85	798.50
Mpeasam	96.0	0.95	91.20
Efasu	101.0	9.65	974.65
TOTAL	-	100.00	6,098.00

It thus emerges from this table that the removal of 100 t of copra from the various production centres to the factory calls for 6,098 t.km of transport. To this figure however must be added the pick-up transport for each centre. To arrive at this latter, we are however reduced to making some assumptions. The average distance between villages being 5 km, it must be taken that the pick-up areas have an average radius of 2.5 km. (R). As an initial approximation, we can also liken each area to a circle with a 2.5 km radius. Taking this latter assumption, the average pick-up radius will be :

$$r = \int_0^{2\pi} \int_0^R \frac{r^2 dr d\alpha}{\pi R^2}$$

which shows that r = 2/3 R, or approximately 1.7 km. This means that the pick-up of 100 t of copra will call for additional transport equivalent to 170 t.km In all, therefore, to supply the factory with 100 tons of copra will require some 6,300 t.km (6,098 + 170), viz an average transport distance of 63 km (126 there and back).

This being so, it is possible to arrive at the quantity which can be carried per year by one truck. To do this we will take the following factors into account :

- a truck with a payload of 5 tons,
- average speed of travel : 40 km/h.,
- time for loading and unloading at the rate of 1.25 t per hour per man (25 bags of 50 kgs).

Under those conditions, taking an 8-hour working day, a truck can make two trips and thus carry 10 t of copra; its operating time will be made up as under :

- road travel 2 x 3 h = 6 h (+/- 250 km),
- loading with 8 men : 2 x 0.5 h = 1 h (1 x 8 x 1.25 = 10 t),
- unloading with 8 men : 2 x 0.5 h = 1 h (1 x 8 x 1.25 = 10 t).

Given these conditions, if we take it that moving takes place 5 days a week and 52 weeks a year, a 5-ton truck can move each year :
5 x 52 x 10 = 2,600 tons of copra.

Now at present the buying department has three 5-ton trucks and a stand-by truck; this means that the facilities available should easily allow for the moving of over 7.000 tons of copra per year.

From details supplied to us, it would seem however that the department in question often has to turn to private haulage contractors who are paid a fixed rate of 3 N¢ per cwt bag, whatever the distance covered.

Although we were unable to get a precise idea of the reason for the poor transport efficiency, we can suggest that it must result from :
- inefficient organisation, especially as regards the provision of information by the various centres to the factory,
- inadequate maintenance of the rolling stock, mainly due to lack of spares,
- lack of coordination between transport departement and buying departement.

5°) Buying department personnel

The figures given to us appear to be contradictory, in the sense that those provided by technical departement only seem to relate to part of the strength as given to us by the Esiama Administrative Manager (as per letter ADYF 19/145/71).

From the figures shown on appendix 4.3./6, it emerges that the labour employed by the buying department has increased considerably (by over 40 %) since September 1969. This increase in numbers has however been reflected in a reduced unit cost (from 12.52 N¢ to 10.69 N¢), which enables us to testify that the department's efficiency has improved.

However this may be, in the light of the present volume of purchases (706.1 tons in January and February for 252 men/month), the personnel posted to this department still seems excessive (2.8 t purchased per man/month) and it would be advisable to look again into this question. It does however involve a particularly ticklish problem which should be analysed very carefully. For the immediate future, we feel that the reconstruction efforts undertaken should be continued and that a reduction in personnel, especially at junior level, will have to be considered at a subsequent stage.

6°) Description of plants and manufacturing processes

The industrial complex has been built on a site covering some 8.000 square metres situated alongside the Esiama-Nkrofro road. The absence of plans meant that we had to draw up a general ground sketch which, although fairly rough, is neverthless sufficient to give a general idea of the complex. In any event, the unit consists of the following buildings (sketch 4.3/7) :

- offices and laboratories,
- the oil mill,
- a boiler-room and power supply room,
- a workshop and pumping station,
- a spare parts store,
- a soap-works,
- a warehouse for raw materials,
- various outbuildings.

Power supply

All the power required for the industrial complex is produced by generating sets, namely :

- a Demag diesel unit (1963), 8-cylinder, 600 r.p.m. with a 500 KVA, 400/231V, 722 Amp alternator type RJ 1209/100. During our visit, this unit was out of action because of damage to the self-regulating mechanism.

- two Demag diesel units (1959), 6-cylinder, 600 r.p.m. with 165 KVA, 380/220 V, 250 Amp alternator type CA 110 cs/10. These alternators can work in parallel. During our visit, however, one of them was out of action because of a failure in the injection pump, and this only allowed the factory to work with a maximum of two presses.

In addition to the above generating sets, the factory also has two auxiliary generators of Ruston manufacture ; one 4-cylinder 65 Amp, and the other 11.5 HP. These two units however are no longer in working condition.

Boilers

The oil-mill is equipped with two boilers, one vertical and the other horizontal; both are fitted with automatic operating fuel burners. These "Standard Kessel SK6 Duisburg" boilers have the following features : No. 1679 (1963) pressure rating 228 lbs (16 kg/cm2): No. 9912 (1959) 32 m2 pressure 8 kg/cm2.

This disparity in equipment has meant complicating the plant unit which is completed by two pressure-reducing stations, one bringing pressure down from 16 to 8 kg and the second to 3 kg.

Although steam production is ample for processing the copra, it is still inadequate to allow for simultaneous work on refining and deodorising. The result is that these two operations must be carried out in succession, which undoubtely lowers working efficiency. As will be seen later, the shortage of steam does not allow of the rational use of available plant.

Water supply

The water supplies come from the Franza stream which flows to the north of the industrial estate. The pumping station is equipped with :

- a "Godwin" piston pump with a 7 1/2 HP electric motor supplying a water tower with a capacity of some 25 cubic metres,

- a stand-by pump with diesel engine, the latter being out of action.

The installation is completed by a cooling tower and a reservoir with about 50 cubic metres capacity. As regards the water used, this is not treated but would not appear to present any problems, although we were unable to inspect the inside of the boilers.

Workshop and carpenter's shop

The engineering workshop is extremely modest and its equipement totally inadequate for it to be able to undertake the normal maintenance of the factory machinery. At the most it can be used for carrying out minor repairs. It is equipped with :

- 1 x 12" Swing Harrison lathe,
- 1 pedestal mounted drilling machine,
- 1 dual grinding machine with small wheel,
- 1 drying over for electric motors,
- 1 wooden bench,
- a limited number of miscellaneous small tools.

As for the carpenter's shop, this has a circular saw and 3 benches.

Production and processing line

All in all, the production line is fairly homogeneous and well laid out; it should be capable of producing good results and dealing with hourly flow-rates of 1.2 tons of copra. The unit comprises two separate lines which are practically identical and consist of :

- a conveyor for the copra - feed is done manually,
- a disc grinder with ring motor (Briton grinder seize B 7/2 No. 36901, 3.000 rpm, 15 HP). The second line is equipped with an H.E.B. grinder.
  These grinders are fed by oscillating tables fitted with magnetic separators.

- on leaving the first crushers, the crushed material is picked up by an elevator which feeds a spiral conveyor linked to a roller crusher of the H.E.B. 24 type. This operation is practically non existent because of a simple problem of adjustment ; particles up to 10 mm are found in the bulk material. This lack of efficient rolling has an undoubted, and even vital, effect on the proper extraction of oil. In any event, it can be stated that the preparation of the material is poor, to such an extent that it casts serious doubts on the results shown from analyses. In any case, this comment was made to the people in charge of the factory ; these are conscious of the fact but claim that finer adjustment calls for more power, which is not always available.
  A test was carried out however but it was impossible to continue it since only one generating set was on service.

- Following this symbolic crushing, the material is picked up by an elevator and conveyed towards the heaters via a spiral conveyor. The heaters and presses, two to each production line, are the D.P. type and supplied by E.E.B. The temperature of the material reaches 80°C, which is normal. As regards the presses, although their condition seems generally good, it is certain that they need a thorough overhaul. In effect, the staff is afraid to increase the power input and to close outlet cone partly because of available power and partly because of the abnormal noises which can be heard in the reducing gears. The fact remains that the oil cakes are firm and appear to have the oil properly extracted despite initial copra preparation which leaves much to be desired. During our visit at Esiama, two presses were undergoing repair, one was in continuous service and the other in intermittent service for mechanical reasons and also because of shortage of available power.

- the oil cakes are picked up by a screw conveyor and elevator and stored in a small capacity tank from which they are put in bags by hand.

- As regards the crude oil, this is collected in a reservoir of some 1.500 litres capacity from which it is pumped to the H.E.B. filters. The filtration section works normally ; reservations must however be made regarding the recycling of residues. At the moment, the filtration cakes are collected in drums and then processed at an open fire with water. This operation is carried out by women outside the oil works. In theory, the oil recovered in this way is recycled to the oil works ; in practice, as we shall see later, there is reason to fear that this operation gives rise to considerable losses. To avoid these laborious operations, it would be desirable for the filtration residues to be recycled to the presses after introducing, if necessary, some bulk material which might dry them (oil cakes for instance)

- After filtration, the oil is stored in tanks, for this purpose the oil works has :

  . 7 crude oil tanks with a total capacity of 145 tons,

  . 7 tanks for refined and deodorised oil with a total capacity of 90 tons.

In addition to the two H.E.B. production lines mentioned above, the Esiama factory has some incomplete equipment of Rosedown manufacture. This equipment consists mainly in a press and a few accessories, but could not be made operational unless considerable modifications and repairs were carried out (part of the original equipment is no longer available).

Refining and deodorising

The oil works has been completed by a refining plant (H.E.B.) and a deodorising unit (Rosedown). Although not homogeneous, this installation has been laid out in a rational manner. The neutralising and blanching tank can handle five tons in eight hours and the deodorising plant can handle about 3,5 tons in 12 hours. Lack of steam does not however allow work to be carried out simultaneously with these items of equipment, a fact which obviously reduces the efficiency of their use.

Soap works

The factory is also equipped with a soap works whose equipment is uncomplete from what we are told. It was however impossible to make a detailed check of the nature of the equipment since the premises are at present used as a warehouse.

In any event, the staff at Esiama informed us that this section had never operated. To some extent, it would have been desirable to be able to complete this section so as to enable the oil works to make good use of the soap stocks produced during neutralisation.

Preparing the oil for depatch

The factory is equipped with a packaging line made by Anker Maschinen bau of Hamburg. This unit, designed for filling glass bottles, consists of :

- a conveyor belt,
- a 12 head automatic filling machine,
- a bottle capping machine,
- a labelling machine.

For reasons which are not obvious at first sight, the management has decided to use plastic bottles of 0,65 litre instead of glass ; the result is that the machine works under very poor conditions and consequently calls for a considerable amount of labour (14 people at the time of our visit).

Since this line no longer operates continuously, output is obviously reduced.

In addition to putting up in bottles, there is also the manual filling of containers of 1 and 4 gallons. In addition, recipients are placed in cartons by hand. An examination of the stocks showed us that many cartons were soaked with oil, a fact which leads us to express the greatest reservations as to the quality of the packaging and method of sealing.

7°) Labour and organisation

The organisation graph for the Esiama oil works is given at appendix 4.3/8. If we look at this chart, there appears to be overlapping between the technical department and the administrative departments. This situation is particularly well illustrated on the spot where, in spite of the undoubted goodwill of the interested parties, it would appear that actions are not always coordinated as much as might be expected. To improve this situation, it would be desirable to be able to place at the head of the industrial complex a man whose ability would be incontestable and whose personality would be sufficient to enforce the solutions, both technical and administrative, which are vital to the proper functioning of the factory and the associated departments. It should be noted that this comment does not in any way detract from the merit of the existing senior staff who are undoubtedly competent but who are too young to be able to bring to bear all the necessary authority, particularly as regards foremen with longer service.

Incidentally, the labour employed at the oil works is definitely excessive ; it consists of :

Management	1
Clerical	31
Production and maintenance	120 (40 per shift)
Other labourers	16

i.e. a total of 168 men to whom there must also be added all the buying department which, as we have seen, amounts to 126 men. This means that the total labour amounts to 294, which obviously is enormous for processing an average of less than 15 tons of copra per day.

The fact remains that the skilled labour is fully versed in the normal operational process and knows the adjustments for the machines. The staff however has to adopt haphazard solution on many occasions on view of the poor condition of the machinery and the lack of spares. Such attitudes are undoubtedly normal, but their frequency unfortunately leads to the introduction of habits which persist even after the defective equipment has been repaired (this is notably the case for the copra crushing).

8°) Manufacturing control and flow-through of the plant

The raw material is weighed solely by the buying department in the villages. Since the factory does not have a weighbridge, it is unfortunately impossible to check the quantities received and even to weigh the oil and oil cakes removed. To remedy this state of affairs, it would therefore appear vital to install at the factory a weighbridge of thirty or forty tons so as to be able to weigh all the trucks both on entry and exit. In addition it would be highly desirable to introduce automatic scales in the production line, both for the copra and for the oil cakes and oil. This would enable manufacturing controls to be increased and avoid having to make random checks whose accuracy is doubtful. Indeed, this is how shrinkage during storage is estimated, whereas a simple calculation shows that unassessed losses are particularly heavy. In point of fact on the basis of the results shown in appendix 4.3/9, it is possible to draw up a general balance sheet of the manufacturing process which gives us the following results :

Raw materials

Oil	4.623,26 x 69,68/100 =	3.221,49 t
Water	4.623,26 x 4,39/100 =	202,96 t
Dry matter		1.198,81 t
Total		4.623,26 t

Initial oil 4.623,26 x 69,68/100		3.221,49 t
Oil extracted	2.714,05	
Oil in the oil cakes 1.327,97 x 7,39/100	98,14	2.812,19 t
Unassessed losses		409,30 t
Original water 4.623,26 x 4,39/100		202,96 t
Water in the oil cakes	68,12	
Water in the oil	5,70	73,82 t
Losses in water on extraction		129,14 t
Initial dry matter		1.198,81 t
Dry matter in the oil cakes		1.161,71 t
Unassessed losses		37,10 t

This balance sheet shows us that the total of unassessed losses is 446,4 t out of 4.623,26 t of raw materials ; that is to say that the loss is 9,66 %.

This loss is considerable and although it is not possible to determine the exact causes, several assumptions can be made, namely :

- faulty results from analyses,
- inaccurate initial weight,
- various losses during packaging,
- losses during the processing of filtration residues by the women.

As we have already seen, the results of analyses can in fact be doubtful in the sense that the sampling technique is extremely haphazard. Sampling is left to the initiative of the workmen who tend to select only the best samples. In addition the weights of the materials are also subject to caution since they are determined in small quantities and hence further errors creep in.

During packaging, it is also certain that the oil measurement is based essentially on the accuracy of the recipient capacity. In point of fact we were informed that the 0,65 litre bottles had an actual capacity of over 0,70 litre ; yet for both psychological and commercial reasons, the bottles must be completely filled. This difference alone can entail an error of over 7 %. In addition, there is practically no control over the filtration residues processed by the women and in addition, although the oil is partially recovered, the solids are lost. Consequently, it is highly desirable to increase the checks carried out in the factory at various levels.

It should also be pointed out that the water content of the oil cakes is particularly low ; in fact it is scarcely more than 5 % whereas in Europe oil cakes are sold with water contents of 10 % - 12 %.

Thus the loss of humidity could be compensated partially by humidifying. This operation should however be carried out with great prudence to avoid jeopardising the proper preservation of the oil cakes in the climatic conditions existing in Ghana.

As regards the flow through of the plant, it is astonishing to find that for the first time in 1970 the volume fo purchases (3.800 t) exceeded the quantity processed by the oil works (3.058 t). The most disquieting aspect of this situation is the psychological effect which it can have on the efforts of the buying department to increase the volume of copra. This situation is mainly attributable to the general mechanical condition of the factory. In fact it should be realised that the existing plant should allow for processing 1,2 tons an hour, i.e. with an hourly output of 0,85, 24,5 tons of copra per day. At the rate of six working days per week, the capacity of the existing factory would thus be :

$$24,5 \times 52 \times 6 = 6.744 \text{ t}$$

Now in 1970, the Esiama oil works only processed 3.058 tons, which means that it worked at less than 50 % of its capacity. However, for the first three months of 1971, the position seems to have improved.

In fact, the factory processed 1.564,4 tons, which would correspond to an annual capacity of 6.261,6 tons representing a working efficiency of over 90 %. Although the situation has considerably improved, the capacity of the factory will nevertheless continue to be closely tied up with the general mechanical condition of the equipment.

In view of the definite effort made by the purchasing department and the increase in quantities of available raw materials (probably over 5.000 tons in 1971), it is vital that energetic steps be taken immediately to put all plant including the power supply in good condition. For this purpose, it is essential to acquire as soon as possible all the equipment necessary for repairs and to get this work carried out by a specialist team. The success of any effort undertaken will depend essentially on measures taken in this direction.

A similar situation arises with the refining and deodorising section (appendix 4.3/10). In the case of refining, the daily capacity is 15 tons ; for deodorising it is 7 tons. If it is realised that to be marketed on proper terms, copra oil must be absolutely odour free, it is immediately seen that the present capacity of the plan is inadequate. At the moment, still on the basis of six working days per week, the annual processing capacities should be :

Refining	: 15 x 6 x 52 =	4.680 tons of oil
Deodorising	: 7 x 6 x 52 =	2.184 tons of oil

From these figures it emerges that although refining is adapted to the capacity of the oil works, the same does not apply to the deodorising. In this latter case, subject to the availability of more steam, the operating cycle could be reduced from 12 to 8 hours and thus the annual capacity would be 3.276 tons.

Assuming an extraction rate of 58,70 % (the average for fifteen months) and a refining and deodorising output of 91,7 %, this deodorising capacity would correspond to the processing of 3.276/0,587 x 0,917 = 6.086 tons of copra.

This means that even in such a case, the deodorising capacity would be only just sufficient to meet the theoretical capacity of the existing factory (4 presses). In any event, during the year 1970, the factory refined 206 tons of oil whereas the annual potential is 4.680 tons, which means that the utilisation coefficient is particularly low. As regards deodorising, it was able in eight months to process 229 tons of oil out of a corresponding minimum potential capacity of 1.450 tons. In both cases, it is obvious that an effort is needed to increase the use of this plant which, as it happens, is capable of producing oil whose quality is beyond all question.

To round off, it should also be noted that in addition to copra oil, the refining and deodorising plant also processes ground nut oil produced by the Tamale and Atebubu factories. This operation however is only temporary since Tamale will shortly be equipped with a self contained line for this processing.

9°) Spares and maintenance

As we have already said, the personnel responsible for maintenance more often than not knows the defects of the equipment and the solutions to be adopted to alleviate these defects. The almost total lack of spares or more simply or materials together with the inadequacy of facilities usually oblige the personnel to take haphazard solutions which althoug temporary often take on a permanent character. This situation is reflected not only by general lassitude but even by quite excusable lack of attention.

In this specific field, it is vital that the general management should make a very special effort if it wishes to retain the working instrument which the factory provides.

In this connection, after our return to Europe, we were informed indirectly that the VMOD had placed a large order for spares. If this information is accurate, we can only regret not having been advised of this decision and especially the purpose of this order. Under these conditions, it is difficult for us if not impossible to give definite recommendations on this point, except to avoid the intermediaries, and to order the materials directly to the constructor.

10°) Analysis of cost price and viability

Despite our insistence and the promises made to us, the operating results for the year 1970 have never been sent to us. We have only had the profit and loss account for 1969 and the budget forecast for 1970 (appendix 4.3/11). This being so, the analysis which we are making is necessarily a rough one and based on figures whose accuracy is open to debate.

However this may be, by grouping the figures in table 4.3/11, an approach can be made to the problem of the factory's viability. It can be taken that the following costs are separate from production, namely :

Salaries, wages and S.S.F.	100.124 N¢
Travelling and transport	4.500 N¢
Postages, ground rent, medical and sanitary and miscellaneous	10.300 N¢
Bank charge and insurance	8.000 N¢
Building repair and maintenance	3.000 N¢
Total	125.924 N¢

At first sight, in view of the present size of the labour force, it can br accepted that this figure is a fixed upper limit which we will round off for convenience to 126.000 N¢.

As regards the proportionate costs, table 4.3/11 having been prepared in the case of Esiama for a quantity of copra of 5.100 tons, they can be extracted from it as follows :

Plant repairs and renewal
14.000/5.100 — 2,75 N¢/t

Power, fuel and water consumed
45.000/5.100 — 8,82 N¢/t

Sundry material and chemical consumed
15.680/5.100 — 3,07 N¢/t

Vehicles repairs and maintenance
35.000/5.100 — 6,86 N¢/t

Vehicles fuel and oil consumed
27.000/5.100 — 5,29 N¢/t

Amongst these figures, there are some which are considerably underestimated with particular reference to the spares and repairs costs which should at least at the moment be in the region of 10,00 N¢ per ton of copra.

In addition, account must also be taken of the cost price of the copra which is 148 N¢/t (7,50 per bag of 112 lbs) :

- the buying department costs which can be estimated at 12,0 N¢/t (appendix 4.3/6),
- as regards transport cost, this will be calculated on the basis of the above figures, namely 6,86 + 5,29 = 12,15 N¢/t of copra, which corresponds to a unit cost of 0,062 N¢/tml. The figures used in practice being comprised between 0,06 and 0,08,
- the cost of oil transport at the rate of 15,00 N¢/t,
- the cost of carrying the oil cakes to Takoradi : 5,00 N¢/t.

As regards the cost prices, these are :

425,00 N¢ (Lever per ton of crude oil (in bulk)

565,00 N¢ per ton of refined oil (in drums).

In this latter case, there must also be added the cost of the drums (1,00 N¢ per 44 gallons drum) i.e. 6 N¢/t.

45,00 N¢ per ton of oil cake.

In the light of the above items, we will have briefly :

Fixed costs

Factory and general services	126.000 N¢/year
General services in Accra	100.000 N¢
Sales and advertising department	30.000 N¢
Total	256.000 N¢

Variable costs per ton

Copra	148,00 N¢	
Plant repairs and renewal	10,00 N¢	
Power, fuel and water	8,52 N¢	
Transport of raw material	12,15 N¢	
Buying cost	12,00 N¢	
	190,97 N¢	for crude oil
Materials and chemicals	3,07 N¢	
	204,04 N¢	for refined oil

In addition, the sheets can be established as follows :

a) Crude oil in bulk

Value per ton	425,00 N¢
Cost of transporting the oil	15,00 N¢
Net value ex works	410,00 N¢

b) Refined oil in 44 gallon drums

Value		565,00 N¢
Transport	15,00	
Packaging	6,00	21,00 N¢
Net value ex works		544,00 N¢

c) Oil cakes

Oil cake delivered Takoradi is sold at 45,00 N¢/t from which must be deducted 5,00 N¢ for transport, the net value ex works is therefore 40,00 N¢/t.

On the basis of the results recorded, it can be established that 1 ton of copra will produce :

Crude oil	1 x 0,587	0,587 t
Refined oil	1 x 0,587 x 0,926 x 0,99	0,538 t
Oil cakes	1 x 0,287	0,287 t

This being so, for 1 ton of copra, receipts will be respectively :

a) Production of crude oil

Value of the oil 0,587 x 410 =	240,67 N¢
Value of the oil cakes 0,287 x 40 =	11,48 N¢
Total	252,15 N¢

b) Production of refined oil

Value of the oil 0,538 x 544 =	192,67 N¢
Value of the oil cakes 0,287 x 40 =	11,48 N¢
Total	304,15 N¢

On the basis of all the above figures, it is possible to arrive at the viability threshold of the Esiama oil works depending on whether it produces exclusively crude oil or refined oil. For this purpose, all that is needed is to determine the quantity of copra which must be processed for receipts to balance costs. In the case of crude oil, we will have :

252,15 x = 256.000 + 190,97 x i.e. x = 4.184 t

In the case of the refined oil, we will have conversely :

304,15 x = 256.000 + 204,04 x i.e. x = 2.557 t.

It is therefore beyond any doubt that the interest of the factory lies in producing essentially refined oil which will enable it to increase to a very considerable extent its viability.

The above figures have been arrived at without taking into account depreciation which is mainly a matter for the financial policy of the VOMD ; if hawever account is taken of the figures inclued in the 1970 budget, the fixed charges will be increased by 61.000 N₵ and thus the viability threshold will be found at :

1) For crude oil	5.181 tons of copra
2) For refined oil	3.167 tons of copra

The results are shown on graphs 4.3/12 and 13.

By basing ourselves on the foregoing equations, it is also possible to determine the quantity of copra to be processed to reach the viability threshold whilst taking into account the proportion of oil whether refined or otherwise.

The quantity of copra will be given by the equation :

$$x = 317.000 \left(\frac{a}{61,18} + \frac{b}{100,11} \right)$$

where

x is the number of tons of copra to be processed

a is the proportion of crude oil

b the proportion of refined crude oil

a + b being always equal to 1.

The results of this analysis are shown in graph n° 4.3/14.

4.3.1.2. Denu

1°) Localization

This plant is situated in the Volta region, on the Accra - Lome road, near the Togoland border. Communications are easy ; normally copra is grown along the coast in this region whereas palm kernels are produced in the direction of Ho.

2°) Raw material

This plant has been equipped in order to treat palm kernels and copra, and occasionaly peanuts. The scarcity of raw materials on the one hand, the lack of palm kernel oil market at the other hand, have induced the GIHOC authorities a short time ago to close this plant (letter MMA/SC5 from 28/9/70). In the past, the lack of raw materials has often brought about the closing down of the workshops.

3°) Description of the equipments

This works is essentially localized in masonry and concrete buildings. The construction principale is mentionned in the 4.3/15 scheme, in appendix. The same construction principles have moreover been applied in Atebubu, Tamale and Bakwu.

The oil works is constituted by :

- a laboratory,
- two offices,
- one pump-room and a workshop (symbolic),
- one boiler house,
- two stocking rooms for raw materials and oil cake (capacity ± 1.250 t),
- a processing hall (crushers, presses, heaters),
- a hall for filtration and berelling,

- complementary installations (toilets, dining-hall, etc ...).

The equipment :

- a tiny, but sufficient pumping station,
- a " Perkins " Pantomatic boiler, with smoke tube, pressure 3,5 Kg/cm2, heating by fuel oil burner. When we examined it, the automatic device for the water feeding and for the heating process was out of gear, and when the plant was working, it was impossible to keep a constant pressure.
- the power is supplied by a Heinschel generating set 1.500 r.m. connected to an alternator of 60 KVA, 87 Amp, 400 V.
- the fabrication is carried out by :
  - . a copra crusher D.D.R. 1961 (Ernst Thälmann),
  - . a disk crusher D.D.R. 1962,
  - . D.D.R. 1962 crushing rolls (250 x 350) - (Ernst Thälmann)
  - . a feeding elevator for the heater,
  - . a treble D.D.R. heater (1958) with simple press ; the extraction is supposed to be carried out in two stages : a preliminary reduction followed by a definitive pressing. The oil cake is taken up by a screw conveyor and an elevator, feeding a small capacity metallic silo.

The oil is pumped towards a H.E.B. filter press and from there towards two intermediary tanks of a capacity of ± 6.300 l (2 x 700 gallons) from which the product is put into barrels (44 gallons).
It is worthwile quoting the feeding of the crushers is exectuted only manually.

The process capacity was evaluated at an average of 200 Kg palm kernel an hour.

In this case too, the lack of spare-parts did not allow the maintenance of the equipments.

Besides the fittings installed in the plant, we have found new material un Denu, dating from 1964 and badly conserved :

- two Muller expellers (preliminary pression) with uncomplete heaters,
- a crushing roll, the upper being grooved, the inferior pair looking smooth,
- different parts of elevators, filters, presses, etc...

Having not been pretected from the weather, this material is generally in a bad condition (rust, broken parts, engines taken away, etc...).

Anyway, this oil-works could work in rather good conditions, if it had enough raw materials (± 1.500 t/year) at its disposal. At the moment their is no hope at all, before a long term, because a fatal disease of the coconut trees in this area.

4.3.1.3. Plant of Asesewa

1°) Localization

This plant is situated in the Eastern region, on a secondary road passing at the North-East of Koforidua and linking this town with Bosuso over Bisa. This localization had been choosen on the basis of the regional development programs, that have been elaborated a few years ago and proved to lack realism.

2°) Raw material

This plant has been designed in order to treat palm fruits palm kernels and copra. Inspite of the limited output of this oil-works, it was impossible to find sufficient quantities of raw materials in the region to allow a normal functionning of it. Those different reasons have induced the responsibles to put and end to the activity of this plant.

3°) Description of the equipments

The major part of the equipment is new and apparently in a good condition. It is nerverthеless clear that if this works should be sold, it must be entirely revised, especially the electric part which has been conserved in precarious conditions.

It is constituted by :

- a copra crusher, engine included,
- a disk-crusher,
- a crushing-rolls (Muller),
- an elevator with the heater's feeding screw,
- two presses (1 D.D.R. and 1 Muller) ; the Muller press is exclusively designed to carry out the preliminary pressing (type 0 x 16 - 1964),
- a filtering press and its accessories (the filtered oils tanks have been taken away).

This section for the treatment of palm kernels and copra is identical to the one of the Denu, Tamale and Atebubu plants.

The way palm oil is treated is more a question of handicraft than an industrial matter ; the palm oil section is constituted by :

- a heating-malaxator by dubble covering and manual loading-up (Schroers and C° Hamburg) the capacity of ± 500 l,
- a suspended device to load and unload the centrifuge baskets,
- a " Ellewerke " centrifuge, speed 1.100 r./m., loaded by baskets containing 60 Kg of fruit ; the baskets are unloaded through openings in the bottom,
- an oil decantation set with pump, 2 tanks of ± 5 m3. This set is completed by a centrifugal clarifier : Westfalia type 00 M 100 4 ; speed : 7.800 r./m.

In its present state, this installation must have a capacity of 200 Kg/fruits/h. e.g. an average regime of 350 Kg, this is evidently a very small unit, for works of 10 t/h are generally considered as small. Moreover we have not seen any sterilizers or fruit crushing and stalk removal machines. The palm kernel oil section is also uncomplete ; for example, the grinder lacks. On the other hand, we have seen two crushers with screener-drums and a (new) clay bath separator which had clearly never been used.

The power was provided by :

- a vertical boiler, Eisenwerk Theodor Loos, service pressure 6 Atü, heating surface 8 m2, automatic water feeding designed to use the palm oil fabrication waste, manually loaded,

- an air cooled generating set, type Deutz A.B.L. 514 of 35,5 HP, with autoregulated alternator, 30 K.V.A. 43,3 A, 400 V,

- a second generating set with Deutz engine, 8 water cooled cylinders, type BA8M517, connected to an alternator, Crem type SDG 111 - 4 of 200 KVA, 289 Amp, 400 V at 1.500 r./m. This set is new and has apparently never been used.

- this set was completed by an Henschel generating set which has been recovered for the Atebubu oil works.

We have not been able to visit the repair-parts store for the keepers missed the key.

4.3.1.4. Bakwu plant

1°) Localization

This plant is situated in the Upper region, at the East of Bolgatanga, not far from the border with Upper-Volta.

2°) Raw material

The oil works was originally conceived in order to treat peanuts. Because of the insufficient local production, the V.O.M.D. authorities have been induced to put an end to the production.

3°) Description of the fittings

This installation has been built on the same model as the works of Denu, Tamale and Atebubu.

The equipment is also similar which has induced people to use some elements of it as repair-parts for the other plants ; as a consequence, it is evident the machines cannot work anymore. For instance, as well the boiler as the alternator of the generating set have been taken away.

In these conditions, we must consider the oil works as totally out of year, the buildings can only be used as warehouses for the locally bought peanuts.

4.3.1.5. Tamale plant

1°) Localization

The oil works is situated in the town of Tamale, regional headquarter of the Northern region. Thanks to its situation, this plant has good communications with the different centres of the country, ensured by generally excellent roads.

2°) Raw materials

The plant treats exclusively shelled peanuts. A very reduced purchase service handles the supplying, in some centres in particular in Bakwu, Bolgatanga and Tamale ; part of these purchases is moreover transfered to Atebubu. As far as Tamale is concerned, we have not been able to obtain statistics anterior to 1970. Anyway, the supplied figures showed that the purchase campaign was concentrated on a few months, from October until March (appendix 4.3/16). The material is bought in 72,5 Kg sacks (160 lbs) at an average price of 17,00 N₵/sack, e.g. 234,5 N₵/metric ton.

The raw material is principally bought in the centres, and farmers deliver themselves their production. It is clear that a more intense production of the region could increase the purchase volume.

3°) Seasonnal variations of production and storing

Despite the fact the figures we have obtained do not always correspond, it is evident that the production peak is reachedbetween November and January ; this shows clearly, the storing capacity has to be important. On the basis of the available figures, the storing capacity must be estimated at 65 % of the annual capacity of the works. The actual total capacity reaching an average of 1,600 t (Tamale and Bakwu 730, Bolgatanga 140) is sufficient to face supplyings amounting to 2.500 t/year. The storing capacity is thus largely sufficient to cover the actual needs of the Tamale plant.

4°) Description of the installations and fabrication process

As we have seen before, the plant is situated in the town of Tamale. The buildings are similar to those of Bakwu, Atebubu and Denu ; it has been impossible to obtain draughts of the works, and hence we cannot give a more detailed survey of it. The building is U-shaped ; one of the wings is reserved to the production-activities, the other one to the offices and the laboratory, the pumping station and the boiler being installed in the central part.

Power

The power of the plant was supplied by a generating set Henschel, with a Van Kalk alternator of 60 KVA ; now, it is essentially used as a reserve set. Since april 1970, the current is supplied from the mains, the available power being of 50 KVA. The negociations related to the connection started on 12/7/66 ; it has taken four years to conclude an agreement (cost of the connection : 1,900 N¢) The electricity consumption has evolued as follows since April 1970 :

Month	Light 0.10 N¢/Kwh	Power 0.25 N¢/Kwh	Fixed fee N¢
1970			
April	1,022	2,405	57.00
May	951	2,657	57.00
June	1,224	3,198	45.60
July	1,280	3,480	45.60
August	1,572	2,928	45.60
September	1,671	3,437	45.60
October	1,472	3,157	45.60
November	1,222	3,340	45.60
December	1,314	4,974	45.60
1971			
January	-	-	-
Februari	200	2,330	45.60
March	1,067	3,831	45.60

The total cost amounts to 2,717.33 N¢ for 1,155.33 t (metric) corresponding to 2.35 N¢/t.

Interviews with the Electric Corporation engineer have shown that by simply modifying the wires (cost ± 300 N¢), the available power could be easily raised to 250 KVA. The oil-works could receive its own under-station if it used more power in which case, the cost of the Kwh would amount 0.05 N¢.

Boilers

The plant is equipped with a small automatic Pantomatic fuel-oil boiler, produced by Perkins and similar to the boiler of Denu ; pressure 3.5 Kg/cm3. In present conditions, the steam output is sufficient, but it is evident that it is unthinkable to extend the plant without raising the steam-production capacity. The works has two other identical boilers, but for the moment they are out of gear.

Water supply

The Tamale works must regularly face water shortage which is general to this town ; this causes important difficulties and provokes even sometimes the stopping of the production. As people consider the possibility to complete this installation with a refinery, this matter is even more complex. GIHOC has examined this problem and rightly contemplates the possibility to recirculate the water through cooling devices ; the cost of such an installation would amount to 18,000 N¢ and should be written off in five years ; the annual cost would be :

- working costs	13,500 N¢
- writing-off 18.000/5	3,600 N¢
- maintenance	500 N¢
- interest of the capital at 7 %	1,260 N¢
e.g. an annual cost of	18,860 N¢

The VOMD-survey has shown this solution could be replaced by a raising of the water supply by the Water and Sewerage Corporation. In this alternative, the annual water consumption is estimated at 236,000 m3 (52,000,000 gal. at 0.90 N₵/1,000 gal.) e.g. a total annual cost of 46,800 N₵. If the available figures are exact (a water consumption of 750 m3/day seems exaggerated), it is evident the first solution must be preferred. It should nevertheless be noted other possibilities must be taken into account, either to drill a deep, well or to cool the oil in closed circuit by a mechanically cooled liquid. It is not the purpose of this survey to study those problems ; a particular survey should take all elements into account on the basis of the draughts of the planned installations (draughts not communicated).

Workshop

The maintenance workshop is only cited for the sake of the matter, for it is essentially constituted by a wooden bench, installed in the boiler room. In fact, Tamale has no maintenance workshop.

Production equipment and process

The fittings are identical to those of Denu and Atebubu and, in consequence, needs not be described.

The plant is equipped by :

- a disk crusher,
- crushing rolls,
- a set of elevators and screw conveyors,
- a Thälmann press, with triple heating, exclusively designed to work in double pressing,
- a HEB filtering press with accessories and an intermediate tank of ± 3,000 l.

- a storing tank of 45 t (10,000 gal) outside the plant ; besides this accomodation, the works also stores oil in 1 gal. barrels and tins.

The production is realized as follows :

- the peanuts are poured manually in the disk crusher, which is exclusively functionning.

On the basis of gathered information, we have been able to verify the heater is mostly fed directly with non-crushed peanuts. In any case, if the grains are prepared at all, the preparation is very hasty. The crushing rolls have never been used, and are apparently new. On the spot, we have advised people to tighten the cylinders and to set them with an interstice of 5 mm for the upper cylinders and of 2,5 to 3 mm for the interior cylinders.

The resting operations are carried out as follows :

The three stages of the heater are filled through the elevator and the whole is brought at a temperature of 60°C. This operation is not continuous, and we have constated many times the discontunuous way the heater was fed. After the preliminary pressing, the very rich oil cakes are some 8 to 10 mm thick. After a preliminary pressing, the output is set in order to obtain oil cakes with a 2 to 3 mm thickness. In these conditions, the first pression is carried-out at 200 Kg/hour. The second pression is realized at the same speed. This means the real output is not superior to 100 Kg/hour.

The last produced oil cake is in a good condition : it is put into sacks without cooling. Their quality standard is very high, which has been confirmd by preparators of compounded food, who only complain they cannot buy greater quantities.

The oil is filtered and stored, either in bulk, in drums (396 l) or in tins (1 gal.) to be sent partly to Esiama where it is refined.

In order to prevent those transports and to answer more adequatly the market's needs, GIHOC has ordered a complete installation to carry-out the refining in Tamale self. This material is on the spot (value ± 230,000 N₵) ; it is moreover completed by a bottling chain. The draughts not being available in Ghana, we got into touch with the supplier (Coutinho Caro & Co) who told us he was exclusively an intermediary, and had no draughts of the installation at his disposal.

Besides the hereabove described material, Tamale had also new, partly unpacked material :

- 4 Müller presses 0 x 16 - 1964,
- 2 crushing-rolls type W 225 and W 235,
- 4 double heaters H 8625,
- an oil cake tank,
- 4 elevators ± 6 m high,
- 2 screw-conveyors ± 6 m long.

However these fittings have never been used, they should be revised very seriously before an eventual utilization.

5°) Manpower and organization

This plant being of a more reduced size, the labour is subsequently limited and as a consequence homogeneity and coordination are increased.

In total, the personnel comprehends 46 people :

Administrative and buying staff	10 (costs in April 71 625,42 N₵)
Transport	4 drivers (168,95 N₵)
Bakwu staff	3 (128,39 N₵)
Technical staff	26 (977,91 N₵)

Daily an average of 0,12 t/day are treated, which is evidently superior to the results of Esiama. Nevertheless, the general efficiency could be improved highly, especially by reducing the technical staff.

6°) Fabrication control and output of the installation

Draught 4.3/17 shows the oil extraction rate reaches 39,06 % (average for 15 months).

The results of those analyses are more than doubtful ; a detailed calculation shows indeed that there are important non determined losses as well in oil (74.3 t) as in cake (8 t). Moreover, if we take into account the fabrication process, it is doubtful the oil cake contains less than 8 % residual oil.

The output, taking account of the effective working days, would reach 5.44 t/day, which corresponds more or less to 225 Kg/hour. This value does not correspond to the real output we have constated, when the plant is effectively working in double pressing. WE must conclude the plant is not always working in double pressing, which provokes naturally greater losses in the oil cake.

On the other hand, in 15 months (385 working days), the plant has been working for 257 days, proportion representing an efficiency of 66 % ; these stopping are principally due to mechanical breakdowns and accessorily to the water shortage. As for the other oil-works, it is necessary to repair the available machine and to do a special effort in order to take the necessary steps to ensure a permanent water-supply to the works.

7°) Analysis of the cost price

By taking over the values cited in the schedule 4.3/11, it is possible to determine the fixed costs of the plant ; they run as follows :

Salaries, wages and S.S.F.	36,000 N₵
Travelling and transport	3,000 N₵
Postages, ground rent, medical sanitary and miscellaneous	5,400 N₵
Bank charges and insurance	5,500 N₵
Building, repairs and maintenance	1,200 N₵
Total	51,100 N₵

The variable costs can be defined in the following way :

Plant repairs and renewal 1,200/1,380 = 0.87 N₵/t

We think this is strongly under-estimated and should be raised to 5.00 N₵/t

Power, fuel and water	7,000/1,380 =	5.07 N₵/t
Sundry material and chemical consumed	2,840/1,380 =	2.06 N₵/t
Vehicles repairs and maintenance	5,000/1,380 =	3.62 N₵/t
Vehicles fuel and oil	10,000/1,380 =	7.25 N₵/t

The two last positions represent a total of 10.87 N₵/t, sum we consider underestimated ; we think it more appropriate to base our evaluations on a figure of 14.00 N₵, we can find back in other documents. The oil transport amounts to 21.00 N₵/t.

The cost of the raw material is of 17.00 N₵ per bags, e.g. 234.5 N₵ metric ton (purchase costs inclued).

Selling price of the crude oil	563.49 N₵/t
Realization price of the oil cake	118.00 N₵/t

In these conditions, the costs can be defined as follows :

<u>Fixed costs</u>

Plant and general services	51,100
Accra general services	36,000
Sales and publicity services	12,500
Total	99,600 N¢

<u>Variable costs</u>

Raw material	234.50
Plant repairs and renewal	5.00
Power, fuel and water	5.07
Sundry material	2.06
Transport of raw material	14.00
Total	260.63

<u>Receipts</u>

- per oil ton 563.49 N¢ minus 21.00 for transport costs equals 542.49 per oil ton which corresponds to an extraction rate of 39.06 (average of 15 months) at 211.90 N¢ per ton peanuts,

- per ton oil-cake, the realization value amounting to 118.00 N¢ a ton peanuts will give (52.73 %) 62.22 N¢.

Subsequently, a ton of treated peanuts will produce 274.12 N¢.

In these conditions, the rentability threshold lies higher than 7,000 t peanuts (7,383) which is not compatible with the capacity of the plant.

If on the contrary, the oil is refined and deodorized, the selling price will amount to 907.80 per ton, taking account of a refining rentability of 89.35 % a ton of raw material, the plant will produce 369 Kg of oil and the receipts will raise to 316.82 N₵.

In this alternative, the total product of a ton of peanuts will be of 379.04 N₵ and the rentability thershold will be reduced to 841 ton.
This proves that it is indispensable for the Tamale plant to produce exclusively refined oil.

4.3.1.6. Atebubu plant

1°) Localization

This plant is situated in Kumasi, the Brong Ahafo Region (Fury). If the communications towards the South are excellent, towards the North they are complicated by the Volta river, the crossing of which takes at least an hour ferry, plus a rather long waiting (± 1 hour).

2°) Raw material

Since April 1970, this plant treats exclusively shelled peanuts ; before, it treated palm kernels. The raw material we examined was of an outstanding quality.
The plant is principally supplied from Tamale, the purchases on the spot being rather rare. So, during the 69/70 and 70/71 campaigns, Tamale has sent respectively 942.5 and 296 t transferts not being ended for this last campaign. From April until December 1970, Atebubu has treated 898.65 109.27 only (1,507 bags) being supplied by the sector self. These figures show clearly the Atebubu sector is supplying the plant only for a very small part (± 12 %). Taking those facts into account, the local direction has launched a campaign in order to promote the local production. It is too early to evaluate the results of this very interesting initiative. The peanuts purchase evolued as follows :

1969	October	54.52 t
	November	4.93 t
	December	9.79 t
		69,24 t
1970	January	49.74 t
	Februari	35.38 t
	March	3.99 t
	April	5.44 t
	December	14.72 t
		109.27 t

1971	January	15.01 t
	Februari	6.74 t
	March	6.31 t
	April	4.47 t
		32.53 t

Despite the fact it is difficult to express a definitive opinion, if we compare the results of the first four months of 1971 to those of 1970, we have the impression, the sector's production is diminishing. Such a conclusion cannot be definitive at this stage, but this problem should be looked at very attentively by VOMD.

3°) Seasonnal variations of the production - storing

The seasonnal variations are identical to those recorded in Tamale, the maximum being rached between November and January. The storing capacity is of 700 t, which is largely sufficient, not only for the local purchases, bet also to receive the material transported from Tamale.

4°) Description of the equipments and production process

The equipment and the production process are similar to those described for Tamale.

Nonetheless, Atebubu is not connected to the mains (not existing) and produces its own power a Henschel generating set of 60 KVA.

On the whole, Atebubu is certainly the best managed plant ; the visitors are very favourably impressed by the orderly fashion caracterizing it.

Water supply is no problem here ; on the contrary, production has happened to be stopped after inundations.

Besides the existing material, the plant, as the other oil-works, has new material (dating from 1964) at its disposal ;

the greater part of it is still in packing cases :

- a precrusher : Müller type B 414,
- two crushing-rolls (Müller),
- two elevators (± 6 m high),
- a screw-conveyor (± 6 m long).

A second Henschel generating set has been transferred from Asesewa ; this set is actually used to replace the working engine.

5°) Manpower and organization

The manpower of all services is constituted by :

- Administration and buying staff	3
- Technical staff	39
Total	42

In a period of 13 months, the plant has really been working for 200 days, during which it has treated 1,241.07 t peanuts, e.g. an average of 0.15 t per day and per man, these figures are slightly higher than those recorded in Tamale.

6°) Control of the production and output of the installation

Schedule 4.3/18 shows the oil extraction rate is of 38.64 % (average for a period of 13 months) and the oil-cake output amounts to 51.43 %, figures who are very similar to those recorded in Tamale.

Because of the lack of reagents, the analyses have not been carried out since a few months. However, the results must be very comparable to those of Tamale.

On the basis of effective working days, the output has reached 6.21 t per day, results that are slightly superior to those recorded in Tamale. On the other hand, in 13 months (336 days), the plant has worked effectively during

200 days, which represents an efficiency of 59.5 %. The stoppings are principally due to a lack of raw material to a lack of oil storing capacities and mechanical break-downs, which where nonetheless not numerous.

7°) Analysis of the cost-price

By grouping the values of schedule 4.3/11, the oil-works' fixed costs can be defined as follows :

- Salaries, wages and S.S.F.	24,000
- Postages, ground rent, medical sanitary and miscellaneous	2,900
- Travelling and transport	2,500
- Bank charges and insurance	5,500
- Building repair and maintenance	1,200
Total	36,100 N₵

The variable costs and the receipts are similar to those calculated for Tamale. Under these conditions, the costs will amount to :

Fixed costs

- Plant and general services	36,100
- Accra general services	35,000
- Sales and publicity services	12,500
Total	83,600 N₵
Variable costs per ton peanuts	260.63 N₵
Receipts for crude oil	274.12 N₵
Receipts for refined oil	379.04 N₵

Under these conditions, the rentability threshold will be reached by :

6,197 t peanuts if crude oil is produced

706 t peanuts if refined oil is produced

4.3.2. Industrial prospects

4.3.2. Industrial prospects

4.3.2.1. Raw material

The preceding chapters show clearly the greatest obstacle to the development of the industry lies in the insufficient supply of raw material. This has induced GIHOC to close the Denu, Asesewa and Bawku plants. The situation of the other plants is directly related to the quantities supplied by the purchase services.

We have seen the plants' rentability depends principally from the supply in raw materials. Nonetheless, the technical aspects, and more especially the mechanical maintenance, are not to neglect.

As we wrote elsewhere, the production prospects can be evaluated as follows :

- Copra : from 5,500 t in 1972 to 15,000 t in 1980 in the Esiama region

  The situation in the East zone (Denu) is not likely to change before 1983.

- Peanuts : If an efficient rural animation is carried out, the potential being evaluated at 17,000 t, it would be possible to reach the following results :
  4,300 t in 1972
  5,500 t in 1973
  6,700 t in 1974
  and 7,900 t in 1975

- Sheanut : The spontaneous production is very important and actually Ghana exports 5 to 6,000 t grains per year ; these grains would be available for the local transformation.

- Cotton : However on a small scale, the Tamale region is producing cotton-seed ; the production of 1972 will amount 1,500 t. and it could reach 3,000 t. in 1973.

- **Palm-oil :** 8,000 ha of palm-trees are planned to be planted before 1976 which will undoubtfully contribute to increase the oil-potential of the country.

4.3.2.2. Amelioration of the actual techniques and prospects

1°/ Actual techniques

It can generally be stated that :

Maintenance and reparations

The maintenance of the machines leaves much to be desired and this is principally due to the scarcity of repair parts and to the mechanical means available to carry out the reparations. In order to resolve this difficult problem, it is indispensable to devote an important budget to the reparation of the fittings. These measures must be taken as rapidly as possible. This fundamental question is clearly illustrated by the example of the Esiama plant, which has not been able, for the first time in 1970, to treat the whole material supplied by the purchase services. It has been proved that in most cases, the mechanical breakdowns induced the plants to work with an efficiency which is slightly superior to 65% of their normal capacity.

Fabrication process

General remarks for the three working plants :

- insufficient preparation of the raw materials before the feeding of the heaters. To resolve this important problem, it is indispensable to use the existing precrushers and crushers in all the fabrication chains. They have to be regulated as follows :

  Upper cylinders, interstice 5 mm
  Inferior cylinders, interstice 2,5 - 3 mm

This technique will not only increase the output of the presses, but will also ameliorate the extraction rate.

- The filtration residues must be recycled in the fabrication chain by mixing them with the oil-cakes or with any other substance authorized by the legal prescriptions.

Fabrication control

In general, the fabrication control is not followed up as it should be. The analysis are generally doubtful and the checking is not representative at all. For instance, the error related to the oil-rate of the cake reached 16% (6 = 0,55) in Tamale ; this shows it is necessary to increase the number of checkings.

On the other hand, it would also be useful to analyse the raw material when delivered by the competent service; such a control would allow a better orientation of the purchases, and the water-rate of the raw-material could be more specially looked after. Moreover, the plants have only small weighing machines on which the sacks are weighed individually or even by soundings when the storing losses have to be evaluated. It would be useful to equip the plants, and in particular Esiama with a lorry-weighing device; this system would not only improve the control but would also reduce the manpower that is necessary to carry out this control.

It would be highly useful to introduce automatic weighing machines in the course of the fabrication, in particular :
- at the entry of the chain for the raw material
- before the packing of the oil-cakes
- before the storing of the oil

Those controls would allow to make a clear balance and would prevent the non-determined losses that are constated now.

Organization and manpower

It is evident that a better internal organization, especially an improved coordination of the different services should increase considerably the efficiency of the plants and ameliorate the manpower situation which seen as a whole is plethoric. These measures must be carried out very cautiously and subsequently need a certain time in order to synchronise the purchase, technical and sales services.

In the field, taking account of the choices that will be done in the future, it is more than likely that it will be necessary to modify profoundly the general organisation.

2°/ Prospects

Taking account of the likeliness to increase the raw material production volume, we find necessary to make a distinction between the short term and middle term prospects. The proposed solution are essentially linked to the possibilities of utilizing the country's production potential. This shows the great problem of the plant lies in finding the raw materials to reach the rentability threshold of the installations.

a/ Specific measures to be taken at short term

Esiama

- To set further the undertaken action in order to increase the purchase's volume,
- to install a weighing bridge,
- to install an automatic weighing machine on each fabrication chain in order to record the quantities of treated raw material,
- to install an automatic weighing machine for the oil-cake packing. Another one should be fitted for the oil-storing,
- to constitute a sufficient stock of repair-parts in order to repair perfectly the actually utilized heaters and presses. This should be achieved by specialists who would assist the maintenance teams

of the plants. Thanks to this method the machines would be in a perfect condition and the maintenance chiefs would be informed of the methods to use.

After the reparation of the machines, the oil-works would have a treatment capacity of 1.2 t/h (4 presses of 0.3 t/h) capacity that would allow to treat an average of 7,500 t of copra per year (24 hours a day, 6 days a week, 52 weeks a year, efficiency 0.85). On the basis of these production forecasts (4,321) this capacity would be largely sufficient to treat the copra supplies until 1974.

- to revise very seriously the generating sets in order to prevent accidental production stoppings.

Tamale

- To suppress the manual loading of the crushers by installing a feeding elevator. The elevators are available in this plant but they are not employed. The mechanization would simplify the handling and would allow an easier utilization of the crushers.

- To install a new "Müller" press in order to carry out the first reduction which is to be followed by the definitive pressing to execute with the actual presses. (The press is available at Denu or Asesewa as pre-press).

In this alternative, it would be necessary to have two "Th[illegible]n" presses at its disposal to obtain a homogeneous output; the supplementary press could be recover in Denu or Asesewa.

The presses need obviously to be seriously revised, and it will be necessary, as it was the case for Esiama, to care for the needed spare-parts. In this alternative, the plant's capacity could reach 700 Kg/ hour or 4,500 t/year.

This solution could easily be adapted to Tamale, without power - or steam problems (three small boilers are available).

Atebubu

The modifications can be limited to the installation of an elevator for the feeding of the crushers. If necessary in a later stage, the changes recommended for Tamale could be applied to Atebubu. As we will see later on, this does not seem to be an ideal solution.

Anyway, on the basis of the proposed modifications (Tamale and Atebubu), those units would have a capacity of 5,800 t which would certainly be sufficient to satisfy the market's needs until 1972 (cottonseed 1,500 t; peanuts 4,300 t).

If later on, the production continued to grow, it could be possible to reutilize the Denu plant to treat the peanuts surplus.

However, the proposed solutions would only constitue a transitory solution which would have to be followed by next measures :

b/ Specific measures at middle term

If the problem is considered in its general context, we are forced to note that the oil works of Esiama is the sole plant to constitute a valid industrial unit, established in the copra-production zone. The other oil-works are far more heterogeonous, and they can hardly be ameliorated while maintaining a reasonable economic rentability. On the other hand, except for copra, the other productions are very diversified and spread over rather important zones.

Given the great importance of the concentration of the means, we think that it would be advisable, at middle term, to concentrate the whole of the production means (an exception being made for Esiama) near an important centre like Accra. Such a solution would obviously reduce considerably the present difficulties (control, maintenance, power, water, etc...) as well as the exploitation costs.

Practically, we suggest to found in the neighbourhood of Accra, Tema for instance, a plant which would be equipped to treat all oil seeds, but copra, which would still be treated in Esiama.

This unit would also have the necessary equipment at its disposal to refine and deodorize oils, coconut oil included. The packing and storing accomodations would also be concentrated in this new unit.

The actual plants would be used exclusively as regional warehouse and commercial center to improve the commercial activity of the VOMD (1), or in some cases as peanuts-shelling centres.

This second stage would be executed as follows :

New industrial unit of Tema

This newly designed and homogeenous unit should be highly mechanized and should treat on the spot the oil products which are exported in grains now or even abandonned ; this solution could be applied to cotton-seeds and sheanuts. This plant should have a sufficient capacity in order to treat :

	Peanuts	Cotton-Seed (1)	Sheanuts (2)	Total
1973	5,500	3,000	6,000	14,500
1974	6,700	3,000	6,000	15,700
1975	7,900	3,000	6,000	16,900

(1) Those values are taking exclusively account of the programmes known at the moment of the survey.

(2) Only exported quantities, the real potential being far more important.

Given the probable evolution of the oil-production and the palm programmes, it is evident the production will grow very rapidly. In consequence, this plan should be extended very easily and answer in a better way the production's evolution.

---

(1) Vegetable Oil Mill Division.

The scarcity of commercial data related to sheanuts do not allow us to evaluate the success chances of the local commercialization. On the other hand, it is clear now that the international market could easily absorb the produced shea butter.

Practically, this new plant should be equipped in order to treat 20,000 oil-grains a year from 1974 on. The whole should be constituted by :

- warehouses for the different grains
- an extraction set with filtration presses and crude oil storing accomodations
- a refining and deodorizing group to treat the total production (Esiama included) should be installed. The actual equipment of Esiama and the new installations of Tamale could perhaps be used at this end . In the future, this section could be completed by a palm oil device for the separation of liquid oil
- a packing section for the retail sale with bottling or using of recipients.

In this case, the Esiama equipments could perhaps be reco[illegible].

- a largely dimensionned workshop, equipped for the carrying out of the maintenance, included the regulating of screw presses.

This problem should quite normally be examined in the frame of a particular study taking into account of the wishes of the local authorities and the economic imperatives as far as the implantation is concerned.

It seems from now on that the ideal localization should be situated in the Tema region that offers very evident advantages, namely :

- proximity of the port for the exportation of finished products of the importation of raw materials ;
- proximity of Accra, offering an evident advantage for distribution and marketing ;
- water supply available at advantageous conditions ;

- reduction of the transport costs; presently, the packings are transported in the different plants, whereas, they could be produced on the spot in the new installations;
- proximity of the GIHOC and VOMD seats; VOMD (1) could even be transferred in premises adjacent to the plant which would contribute to reduce the general expenses and would easy the management.

c/ New_productions

As we stated hereabove, the only interesting new production are :

- cottonseed
- sheanuts

which could rapidly be treated in existing installations taking into account some minor changes, in particular for sheanuts.

Besides, among the great oil-cultures, Ghana is actually developping a rather important palm programme, part of which is essentially treated by the State Farms. Another programme, the production of 8,000 ha will be operationnal. The definitive structures of the programmes have not been fixed yet, and it would be useful to provide the units to treat the production of these plantations. If this were the case, it would be necessary to build two plants treating 12 or 15 t/hour. It is worthwile quoting at this occasion, that the palm kernels produced by these plants could easily be treated by the plants proposed hereabove. Moreover, thanks to winterization, it would be possible to produce fluid oil on the basis of palm oil, and this would satisfy in a better way the needs of internal market.

(1) Vegetable oil mill division.

4.3.3. Conclusions

4.3.3. Conclusions

In the actual conditions, the GIHOC oil works are principally faced with two fundamental problems :

- an insufficient supply in raw materials (except for Esiama)
- a scarcity of spare-parts not allowing an adequate maintenance of the equipments.

We must mention in second place :

- heterogeneousity of the equipments and small size of the units not allowing to work rationally,
- the excessive manpower resulting from an internal organization which is not always adequately distributed, especially as far as the coordination of the different services is concerned,
- insufficient fabrication controls.

In order to solve this problems, it would be recommended to carry out a restructuration in two stages, namely :

4.3.3.1. At short term

- to ask the help of specialized technicians to make the lists of the spare-parts needed to repair the equipments,
- to invite the same technicians, assisted by the oil-work's services, to repair and to take care of the maintenance of the equipments in order to eradicate totally the causes responsible for the actual stoppings. Accurate instructions could be elaborated for the later maintenance of the equipments and for the maintenance of the spare-part stores,
- simultaneously, the working methods could be ameliorated and the complementary material recorded from the existing equipments could be put onto place, in order to increase the capacity of Tamale and Atebubu,
- to establish realistic fabrication standards and develop the necessary (technical control). Simultaneously, accurate instructions in order to standardize the fabrication and increase the efficiency of the plants,
- such an assitance should also be provided in order to coordinate the functionning of the different services, in particular at the level of purchasing and transformation with the installation of regional management organs facilitating the decision-making of the general direction in Accra;

- to promote new fabrications, in particular cotton-seeds and perhaps sheabutter.

However it is only a temporary solution, it is absolutely necessary to increase the capacity of the plants of Tamale and Atebubu. The new plant we propose to build in Tema will not be operationnal before the end of 1974. Now, we have seen the annual production will increase in an important proportion, namely :

	Sheanuts	Cotton	Total
1972	4,300 t.	1,500 t.	5,800 t.
1973	5,500 t.	3,000 t.	8,500 t.
1974	6,700 t.	3,000 t.	9,700 t.

On the other hand, the annual capacity of each of the three plants (Tamale, Atebubu, Denu) represent a maximum of 1,500 t., + 4,500 t. for the three plants, capacity which cannot cope with the increased production. It is indispensable to take temporary measures ; we propose to raise the capacity of the plants of Tamale and Atebubu to 4,500 t. by adding the material which is anyway available on the spot.

In these conditions, the annual capacity of the plants could be evaluated as follows :

	Tamale	Atebubu	Total
1972			
Modifications in Tamale	4,500 t	1,500 t.	6,000 t.
1973			
Modifications in Atebubu	4,500 t.	4,500 t.	9,000 t.

1974. If necessary, the plant of Denu could resume its activity which would bring the total capacity to 10,500 t.

4.3.3.2. For the future

To undertake from now on, the studies for the construction of a new plant to replace gradually the marginal plants of Tamale and Atebubu. This survey should be realized in collaborations with the services of GIHOC, it should comprehend

- the choice of an implantation on the basis of economic and technical criteria;
- the determination of the means to solve the transport problems related as well to the supplying of raw materials as to evacuation of the production;
- the determination of the technical means to utilize in order to reach the objectives defined by GIHOC. The plan will take into account the different extensions stages; the detailed analysis of the financial repercussions, the elaboration of a forecast exploitation count, and the determination of the rentability rate of the whole;
- the determination of the structures and general organization the implement, in order to improve the efficiency and reach the maximum efficiency.

At the end of this initial study, elaborate the technical specifications needed to consult the suppliers. The received offers should be examined by GIHOC assisted by experts who would decide upon their technical aspects and formulate recommendations before the order is passed.

To carry out the buildings and the fitting of the equipment these works could be executed either by a supplier or by a general contractor. This last solution offers greater warrants and the advantage to define accurately the responsabilities. During this stage it should be useful to ask the help of one of different advisers in order to control permanently the undertaken works and to the tests carried out before the starting of the plant.

After the activities are launched, it would be useful to ask the help of foreign technicians who could develop the fabrication during 1 or 2 years and help the direction of the plant in their daily work.

4.3.3.3. Timetable of the operations

On the basis of the programmes defined hereabove, the following timetable could be respected :

First stage

- detailed survey of the equipments; ordering of the spare-parts : 3 months,
- amelioration of the techniques and installations of the complementary equipment : 5 months,
- revision and repairing of the equipments : 8 months,
- technical assistance, lauching of new fabrications, coordination and general organization : 24 months (12 in [illegible] and 12 in Atebubu).

Second stage

- detailed survey of the plan for a new installation : 5 months (2 in Ghana, 3 in Europe),
- elaboration of the offer demands, delay to record the offers and ordering : 6 months,
- carrying out the orders, engineering, mounting, launching and control of the works : 20 months,
- technical assistance after the plant is put into service : 12 months.

This timetable is reported in schedule 4.3/19. This planning shows that if the new plant is to be operational in 1974, the initial studies should be undertaken at the end of 1971, or at the beginning of 1972.

4.3.3.4. Financial repercussions of the recommendations

Under the actual economic conditions, the costs of the different stages can be evaluated as follows :

1°/ First stage

Prestations of the technicians to revise equipments and improve techniques (travel costs included)	53,000 ¢
Purchase of repair parts and miscellaneous repairs : Esiama	150,000 ¢
Tamale, Atebubu	85,000 ¢
Technical assistance (2 x 12 months) implantation of new fabrications	77,000 ¢
Total	365,000 ¢

Expenses to carry out essentially in foreign currency

2°/ Second stage

a/ Express in foreign currency

General study, examination of the offers, reception of the equipments, control of the work, included travel costs	130,000 ¢
Fittings of the equipment	1,800,000 ¢
Total in foreign currency	1,930,000 ¢

b/ Expenses in local currency

Piece of ground, arranging civil engineering, and construction	850,000 ¢
Total for the second stage	2,780,000 ¢

5. GENERAL CONCLUSIONS AND RECOMMENDATIONS

5. GENERAL CONCLUSIONS AND RECOMMENDATIONS

Taking into account the processing capacity of the G.I.H.O.C. Oil Mills there is no lack of raw materials. However, there are some deficiencies in the collecting system, especially the groundnuts one. The production forecasts of copra are good. The evolution of the groundnut production, however, will be dependent on the elaboration of a comprehending Government policy. An important extension programme should be elaborated. The present production of oil palm bunches is very low. The existing development schemes allow us to think that the present production will be doubled in a near future.

A high priority must be give to oil palm production.

The Cotton Seed production is just starting, but will increase to some 3 000 tons in 1973. The programme should be continued as intended. The production of sheanuts should not be expected to increase, but a more systematic collection of the nuts should be organised. To increase those collected quantities a promotional action will be necessary.

For the time being, Ghana can only export copra cake, palm kernels and sheanuts as the other prices cannot compete on the international market, with the prevailing ones.

Inside the country, outlets can easily be found for the refined oils and even for the crude oil, as serious shortages exist. For groundnut cakes also, the domestic demand is larger than the production.

Consequently, we can strongly recommend to concentrate on increasing the production of refined groundnut oil which is much demand in the country. As a rule, the production of refined oil in general should be [illegible] [illegible] a price advantage over the imported [illegible] whereas the crude oil of G.I.H.O.C. cannot compete with the traditional production. To compete efficiently with the imported products and the local "Crystal Oil" it is, however, necessary to make an effort to find more attractive packing material.

The use of the oil cakes should be restricted to forage, because the protein extraction is not economically interesting and because of the danger of aflatoxin in groundnut cakes. To avoid the development of the aflatoxin it is essential to make sure that the nuts are thoroughly dried from the beginning and stored in dry warehouses.

When the cottonseed extraction will start, technological procedures will have to be carefully checked to avoid the presence of free gossypol in the cakes.

With the existing demand and production forecast of oil seeds, it will be absolutely necessary to increase the present degree of efficiency of the V.O.M.D factories which at the moment only work at about 65 % of their capacity.

In the first stage it will be necessary to repair the machinery of the factories especially that of the Esiama mill. With the existing equipment the Esiama factory will be able to process up to 7,500 tons of copra after repairing; consequently it will be able to absorb the forecasted Copra purchases up to 1975.

The Atebubu and Tamale mills capacity can be increased to 5,800 tons per year with some minor adaptations of the existing machinery. These changes would allow them to process the cotton seeds and groundnut supply up to end 1975.

Costs of this first stage can be estimated at $ 5,[illegible]
(including 40 experts)
Later on it will be necessary to centralize the project in a multipurpose mill in the [illegible] area, which [illegible] process the oil seeds, other than Copra and [illegible].
In that way it will be possible :

- to have a better coordination of the different V.O.M.B. Services.

- to make the Marketing easier because of the [illegible] of the most important consumption center([illegible])

- to regroup the various services as : refining, deodorizing, bottling, [illegible], spare parts stock, etc.

That location has also the advantage to allow the processing of imported raw material whenever necessary.
The cost of this second stage can be estimated at 2,780,000 US $.

From a technical and economic point of view it is not advisable to put the Asmara, B[illegible] and [illegible] mills into operation again. Even [illegible] and [illegible] should be closed when [illegible] starts operating.
The processing of [illegible] should be situated at [illegible] to avoid unnecessary [illegible] of [illegible].

C.I.D.O.C. should also get interested in the [illegible] oil seeds development schemes to [illegible] the [illegible] of their production.

2

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

CONFIDENTIEL

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GHANA INDUSTRIAL HOLDING CORPORATION

REPUBLIC OF GHANA

VEGETABLE OIL INDUSTRY

CONTRACT N° 71/10

FINAL REPORT

VOLUME [illegible]

[illegible]

RESEARCH & DEVELOPMENT
[illegible]
BRUXELLES

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

GHANA INDUSTRIAL HOLDING CORPORATION

REPUBLIC OF GHANA

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FINAL REPORT

VOLUME 2

RESEARCH & DEVELOPMENT
RUE BRÉDERODE 2
BRUSSELS

AUGUST 1971

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ALPHABETIC LIST OF THE VISITED PERSONALITIES AND OF THE CONSULTED ORGANIZATIONS

Mr ACHEAMPONG, State Farm ASRAKU-PRESTEA

ACKOM - MENSAH, Managing Director, GIHOC - ACCRA

ADANSI, Dir. Oil Palm Research Centre - KUSI-KANDE

ADJEI, Regional Agricultural Economics Officer - TAMALE

AGBOGAH , Research Station, AYINASI

AGGREY, Crop production officer - KUMASI

AGGREY - MENSAH, State Farm Corporation, Director - ACCRA

AKORE-GNTC - Dept. Stores, Merchandise Manager - ACCRA

AKWENSIVIE, Crop production officer - KOFORIDUA

ANANE, Crop production, Ministry of Agriculture - ACCRA

ANGME, Regional Agricultural economics officer - BOLGATANGA

ARTHUR, Assistant Gen. Manager, Black Star Line - ACCRA

ASSIDI-NAHYI, Regional Agricultural Extension officer - BOLGATANGA

ASHIAGBOR, Director, Ministry of Economics - ACCRA

ATTA, Engineer, Food Research Institue - ACCRA

AZU, Crop Production officer - SUNYANI

BARTHELEMY, Belgian Ambassador - ACCRA

BASWANI, Chellaram and Sons - Managing Director - ACCRA

BLANKSOM, Engineer Forestry Department - ACCRA

BOATENG, Crop Production officer - SEKONDI

BRUN, C.F.A.O. - ACCRA

BUAHIN, Director, Crop Research Institute - KWAMOSO

COBELEX Company - ANTWERP

COMBES, Director, F.A.O. - ACCRA

DATSA, Regional Agricultural officer - CAPE-COAST

DATSON, Ministry of Economics - ACCRA

DEDOO, Managing Director, Volta Associated Combines Ltd - DENU

DONKO, G.N.T.C. Shipping Department - ACCRA

Mrs. DOOLE, Food Research Institute - ACCRA
Mr. DUTT, Adm. Manager Secretary, PHARCO - ACCRA
ESHUN, Managing Director, POMADZE Factory - WINNEBA
ESHUN. B., Director, Cocoa Marketing Board - ACCRA
ESSIEW, Ghana Poultry Feed Factory - ACCRA
Mrs. EVANS LUTTEROLI, Nutrition Officer, Min. of Health-ACCRA
Mr. EVELINE, Crop Research Institute - KWAMOSO
Miss. EWOOL, Ministry of Economics - ACCRA
Mr. Federation of the E.E.C. Oil Industry - BRUSSELS
GALLAGHER, Managing Director, Oils and Fats Ltd., -ACCRA
GYEPI, Ministry of Trade - ACCRA
G.I.H.O.C., Staff - Factories and ACCRA
Miss. GENGINA WHYTE, Ministry of Agriculture - SEKONDI
Mr. GUARECHIE, Nutritionist F.A.O. - ACCRA
HAYFORD, Regional Crop Production Officer - HO
HOOD, Crop Production Officer - CAPE-COAST
HOPP, Ministry of Economic and Planning - ACCRA
INEAC (Inst. National Etudes Agron.) - BRUSSELS
IRHO (Institut Recherches Huiles et Oléginoux) - PARIS
JACQUES, Engineer C.F.D.T. (Cotton Board) - TAMALE
KWADOSO, State Farm Director - KWADOSO
LEVER, Director - ACCRA
MAHAMA, Crop Production Officer - BAWKU
Ministry of Agriculture, Division of Raw Materials - BRUSSELS
O.B.C.E. Library - BRUSSELS
OTINKORANG-MENSAH, Regional Crop Production - TAMALE
PETIT, F.A.O. - TAMALE
OWUSU, Crop Production - SUNYANI
PIERSON, F.A.O. - ACCRA
PREMPEH, Director Crop Production Division - ACCRA
PREMPEH, Kings Way Stores - ACCRA
RATH, Managing Director, Crystal Oil Mills - ACCRA
SACHSA, U.T.C., Department Stores - ACCRA
SAKEY - BAWKU
SARKODIE, Agricult. School - KWAMOSO
SIMMONDS, Research Manager Pharco - ACCRA

Mr. TAGOE, Agricultural Planning - ACCRA
THOMPSON, Livestock Husbandry - ACCRA
THORNGREEN, U.S. A.I.D. - TAMALE
TSIKATA, Ministry of Trade - ACCRA
ULLENBROEK, Cotton Board - TAMALE
UNILEVER, - BRUSSELS
VANDERSTICHELEN, Belgian Embassy - ACCRA
S.M.P. Company - BONN
SWANKHUIZEN, F.A.O, - ACCRA
YEBOA, General Manager, Agricultural Development Bank - ACCRA
YVREMOVITCH, F.A.O, - ACCRA

Federation of the European composed forage manufactures- BRUSSELS

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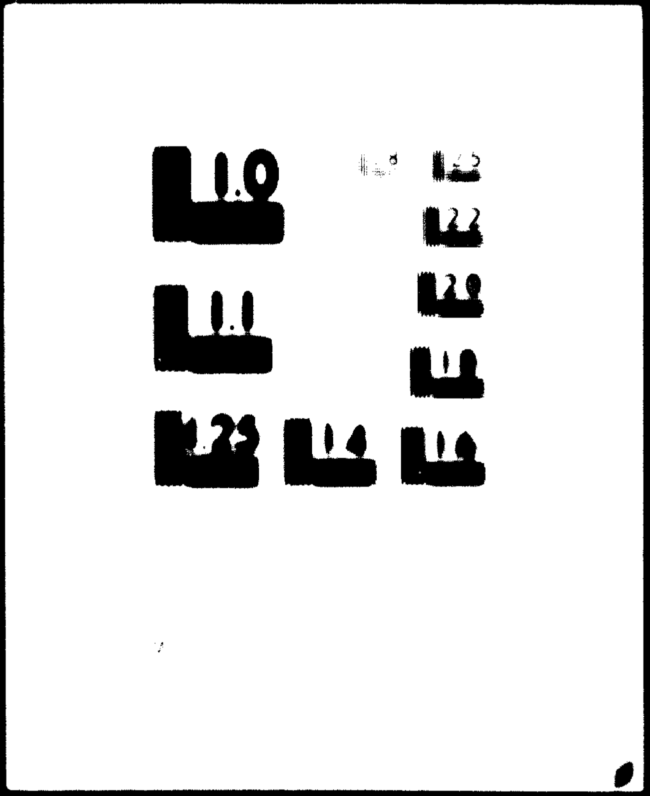

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ENCLOSURE 4.1/1

[illegible] FERTILIZER TRIAL (11 acres)

1963-1969

Fertiliser application and their rates :

107 trees - Burnt area

192 trees - Unburnt area

		Total/year/tri…
Sulfate of ammonia	N : 907 grammes/palm/year	170 kg
Triple superphosphate	P : 454 grammes/palm/year	85 kg
Muriate of potash	K : 907 grammes/palm/year	170 kg
Magnesium sulfate	Mg : 454 grammes/palm/year	85 kg

Application of fertilisers started in 1963 and ceased in September 1966.

Cost of fertilisers application per year/trial

N	Sulfate of ammonia	= 9,37	CFDI
P	Triple superphosphate	= 4,69	"
K	Muriate of potash	= 9,37	"
Mg	Magnesium sulfate	= 4,69	"

ENCLOSURE n° 4.1/2

BONUS CHART

Quantities sold	Bonus Pesos
6 - 12 lbs	1
12 - 18 lbs	2
19 - 26 lbs	3
27 - 33 lbs	4
34 - 41 lbs	5
42 - 48 lbs	6
49 - 56 lbs	7
57 - 63 lbs	8
64 - 70 lbs	9
71 - 78 lbs	10
79 - 85 lbs	11
86 - 93 lbs	12
94 - 100 lbs	13
101 - 111 lbs	14
112 lbs	15

ENCLOSURE n° 4.1/3

GHANA INDUSTRIAL HOLDING CORPORATION
(Vegetable Oil Mills Division)
ESIAMA

Mr/MAD : . . . .

The Manager,
Vegetable Oil Mills Division
P.O. Box 9,
Esiama

Dear Sir,

AUTHORITY NOTE

I . . . . of . . . .
have today the . . . . day of . . . .
willingly decided to place my coconut plantation of . . . . . acres or poles at . . . . under the care of the Vegetable Oil Mills Division (GIHOC) Esiama.

Authority is therefore given to the Division for the overall maintenance of the plantation and pay NC 1.50 for every 100 coconuts collected. Counting should be done in my presence or my representative. The balance of any such proceeds should be accumulated in the Division's chest until such time that I will ask for it.

The Division is also authorised to check for unauthorised persons who may smuggle fresh or dry coconuts from the plantation to carry out any experiment which may lead to higher yield of the plantation.

Enclosure 4.1/3 p.2

No member of my family should be allowed to interfer with this arrangement and such member of the family who will be found in the plantation at any time should be treated as unauthorised person and checked.

Signed : . . . .

cc : District Administrative Officer
<u>Axim</u>

" Ghana Police Service,
<u>Axim</u>

" Ghana Police Service,
<u>Nkroful</u>

ENCLOSURE Nº 4.1/2

AN AGREEMENT made 13th day of March, 1971, between the OIL MILLS FACTORY, ATEBUBU ACTING BY : E.D.Y. EQUAGOO THE SUPERVISOR (hereinafter called "the Purchaser") of the one part and BANTAMA GROUNDNUT GROUP, the executive of which are listed in the schedule hereto and whose signatures/thumbprinters appear against their names (hereinafter called the Producer/Seller) of the other part.

WHEREAS

(i) The members of the above group in the second party numbering 37 have agreed to raise a loan from the Agricultur Development Bank for the expansion of their groundnut farms and have decided to sell their produce during the harvest to the withinnamed Factory whose supervisor afore-mentioned and whose signature appears below, on behalf of the Factory agree to buy same:

(ii) That, at harvest time each member of the Group shall deliver all his/her produce from his/her farm, dry them at their individual houses and store them in a storage depot at Bantama:

(iii) That the Factory shall provide them with bags to convey their produce:

(iV) That a party who fails to comply with the foregoing and as stated in paragraph (i) above, shall put itself into court action:

DATED THIS : 13TH DAY OF MARCH, 1971

SIGNED for and on behalf of the OIL MILLS FACTORY IN THE PRESENCE OF:) Signed

....
(SUPERVISOR)
E.D.Y. EQUAGOO.

SIGNED for and on behalf of the [illegible] GROUP IN THE PRESENCE :-

....
(CHAIRMAN)
[illegible]

Table 4.1/4 a

[illegible] FERTILIZER TRIAL 1963-1969

Yields of nuts and fresh kernels

[illegible] AREA

Treatment	Palms dropping nuts	n° of nuts	Weight of fresh kernels (kg)	Weight of kernels per palm (kg)	%	Average weight of kernel per nut (gr)	%
Control	12	3,030	872	73	100	287	100
N	10	2,065	621	62	84,9	300	104,5
P	4	460	123	30	41,0	267	93,0
K	13	4,932	1,407	108	147,9	285	99,3
Mg	12	2,035	600	50	68,5	294	102,4
NP	13	4,350	1,275	104	142,5	293	102,1
NK	12	4,600	1,436	118	161,6	312	108,7
N Mg	13	3,167	951	74	101,4	303	105,6
PK	13	6,531	1,999	157	215,1	306	106,6
P Mg	13	4,026	1,257	97	132,9	312	108,7
K Mg	13	5,711	1,627	125	171,2	285	99,3
N P K	13	5,970	1,773	136	186,3	297	103,5
N K Mg	13	5,390	1,558	120	164,4	289	100,7
N P Mg	12	1,243	337	28	38,4	271	94,4
P K Mg	13	4,410	1,225	94	128,3	278	96,9
N P K Mg	13	7,121	2,207	176	241,1	321	111,3

Table 4.1/4 b

[illegible] FERTILIZER TRIAL

1963-1969

Yields of nuts and fresh kernels

BURNT AREA

Treatment	Palms cropping nuts	n° of nuts	Weight of fresh kernels (kg)	Weight of kernels per palm (kg)	%	Average weight of kernel per nut (gr)	%
Control	13	3,897	1,087	84	100	278	100
N	11	1,323	361	33	39.3	272	97.6
P	11	2,956	862	78	93.7	291	104.6
K	13	3,218	947	73	87.1	294	105.7
Mg	13	2,748	772	59	71.1	280	100.7
N P	12	3,173	963	80	96.1	304	109.3
N K	12	5,667	1,821	152	181.5	321	115.4
N Mg	13	4,583	1,348	104	124.0	295	106.1
P K	13	5,668	1,652	127	152.0	290	104.3
P Mg	13	2,619	742	57	68.1	284	102.1
K Mg	13	3,048	953	66	78.4	312	112.1
N P K	9	1,705	511	57	67.9	299	107.1
N K Mg	10	1,364	398	39	47.2	291	104.6
N P Mg	6	1,072	291	48	58.0	271	97.4
P K Mg	12	4,772	1,230	103	122.6	290	104.3
N P K Mg	13	5,940	1,698	130	155.9	285	102.5

APPENDIX 4.2/1

GHANA : RETAIL PRICES FOR COCONUT OIL ON LOCAL MARKETS

(in NC. per 0.568 litre)

Location	Months (March 1970–February 1971)											
	3	4	5	6	7	8	9	10	11	12	1	2
BAWKU (Upper)	(1) -	-	-	-	-	-	0.60	0.60	0.60	0.60	-	-
WA (Upper)	-	-	-	-	-	-	-	-	-	-	-	-
ATEBUBU (Brong-Ahafo)	-	-	-	-	-	-	-	-	-	-	-	-
BANDA (Volta)	-	-	-	-	-	-	-	0.46	0.47	-	-	-
SUNYANI (Brong-Ahafo)	-	-	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
EJURA (Ashanti)	-	0.40	-	-	-	-	-	-	-	-	-	-
KUMASI (Ashanti)	0.45	0.42	0.42	0.40	0.45	0.41	0.40	0.41	0.38	0.40	0.40	0.41
NKAWIE (Ashanti)	-	-	-	-	-	-	-	-	-	-	-	-
KOFORIDUA (Eastern)	0.50	0.47	0.46	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
HO (Volta)	0.41	0.43	0.41	0.45	0.49	0.50	0.50	0.50	0.50	0.48	0.50	0.50
ASESEWA (Eastern)	-	-	-	-	-	-	-	-	-	-	-	-
WIAWSO (Western)	-	-	-	-	-	-	-	-	-	-	-	-
TWIFU PRASO (Central)	0.40	0.38	0.40	0.40	0.40	0.40	0.40	0.40	0.50	-	-	0.50
AXIM (Western)	0.30	0.30	0.30	0.30	0.25	0.27	0.20	0.30	0.25	0.30	0.30	0.30
TAKORADI (Western)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
CAPE COAST (Central)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
DENU (Volta)	0.35	0.34	0.36	0.36	0.37	0.41	0.42	0.46	0.47	0.45	0.43	0.40

(1) not on the market.

Source : Ministry of Agriculture ; Division of Statistics and Marketing.

GHANA : RETAIL PRICES FOR GROUNDNUT OIL.

NC per 0.568 litre)

Location	Months (March 1970–February 1971)											
	3	4	5	6	7	8	9	10	11	12	1	2
BAWKU (Upper)	0.35	0.35	0.35	0.39	0.40	0.40	0.39	0.35	0.36	0.35	0.37	0.34
WA (Upper)	0.40	0.40	0.40	0.45	0.50	0.50	0.40	0.40	0.40	0.40	0.44	0.40
ATEBUBU (Brong-Ahafo)	0.50	0.47	0.43	0.45	0.50	0.50	0.45	0.45	0.45	0.45	0.47	0.40
BANDA (Volta)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	-	-	0.41	0.45	0.48
SUNYANI (Brong-Ahafo)	0.53	0.50	0.50	0.50	0.50	0.50	0.50	0.58	0.55	0.52	0.52	0.55
EJURA (Ashanti)	0.45	0.44	0.42	0.45	0.44	0.44	0.53	0.50	0.44	0.43	0.44	0.50
KUMASI (Ashanti)	0.54	0.50	0.49	0.56	0.50	0.50	0.58	0.53	0.50	0.56	0.55	0.59
NKAWIE (Ashanti)	0.55	0.55	0.55	0.55	0.55	0.60	0.61	0.60	0.69	0.60	0.61	0.60
KOFORIDUA (Eastern)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
HO (Volta)	-	-	-	-	-	0.50	-	-	-	0.55	0.53	0.53
ASESEWA (Eastern)	-	-	-	-	-	-	-	-	-	-	-	-
WIAWSO (Western)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
TWIFUPRASO (Central)	-	0.70	0.60	0.69	0.70	0.70	0.70	0.70	0.70	0.70	0.73	0.70
AXIM (Western)	-	-	-	-	-	-	-	-	-	-	-	-
TAKORADI (Western)	0.60	0.60	0.60	0.60	0.62	0.61	0.60	0.60	0.60	0.57	0.57	0.64
CAPE COAST (Central)	0.60	0.60	0.61	0.60	0.60	0.60	0.63	0.60	0.60	0.60	0.60	0.60
DENU (Volta)	-	-	-	-	-	-	-	-	-	-	-	-

Source : Ministry of Agriculture : Division of Statistics and Marketing.

APPENDIX 4.2/3.

GHANA : PALM OIL MARKET RETAIL PRICES.

(in NC per 0.568 litre)

Location	Months (March 1970-February 1971)											
	3	4	5	6	7	8	9	10	11	12	1	2
BAWKU (Upper)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.45	-
WA (Upper)	0.40	0.40	0.40	0.42	0.40	0.40	0.40	0.43	0.40	0.40	0.40	0.40
ATEBUBU (Brong-Ahafo)	0.40	0.43	0.31	0.36	0.33	0.40	0.40	0.40	0.40	0.40	0.42	0.32
BANDA (Volta)	0.40	0.40	0.34	0.35	0.32	0.35	0.33	0.34	0.36	0.35	0.44	0.48
SUNYANI (Brong-Ahafo)	0.35	0.32	0.32	0.40	0.33	0.35	0.35	0.35	0.35	0.35	0.37	0.38
EJURA (Ashanti)	0.35	0.35	0.30	0.35	0.30	0.33	0.35	0.35	0.35	0.35	0.36	0.35
KUMASI (Ashanti)	0.35	0.34	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.35	0.35	0.35
NKAWIE (Ashanti)	0.30	0.25	0.25	0.30	0.27	0.30	0.30	0.30	0.30	0.33	0.35	0.35
KOFORIDUA (Eastern)	0.25	0.25	0.22	0.20	0.25	0.27	0.25	0.25	0.30	0.30	0.35	0.40
HO (Volta)	0.24	0.25	0.23	0.27	0.35	0.40	0.38	0.39	0.40	0.37	0.36	0.32
ASESEWA (Eastern)	0.20	0.20	0.20	0.20	0.25	0.25	0.27	0.27	0.30	0.27	0.35	0.30
WIAWSO (Western)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.45	0.40	0.40
TWIFU PRASO (Central)	0.30	0.25	0.26	0.28	0.40	0.40	0.40	0.40	0.41	0.45	0.41	0.40
AXIM (Western)	0.38	0.30	0.26	0.30	0.30	0.30	0.30	0.25	0.35	0.37	0.40	0.40
TAKORADI (Western)	0.37	0.35	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.39	0.40	0.40
CAPE COAST (Central)	0.39	0.39	0.39	0.40	0.40	0.40	0.41	0.40	0.40	0.40	0.41	0.41
DENU (Volta)	0.22	0.25	0.23	0.29	0.34	0.34	0.34	0.34	0.36	0.36	0.30	0.26

Source : Ministry of Agriculture : Division of Statistics and Marketing.

APPENDIX 4.2/4.

GHANA : PALM KERNEL OIL MARKET RETAIL PRICES.

(in NC per 0.568 litre)

Location	Months (March 1970-February 1971)											
	3	4	5	6	7	8	9	10	11	12	1	2
BAWKU (Upper)	-	-	-	-	-	-	-	0.50	-	-	-	-
WA (Upper)	-	-	-	-	-	-	-	-	-	-	-	-
ATEBUBU (Brong-Ahafo)	0.30	0.30	0.30	0.30	0.27	0.28	0.32	0.30	0.30	0.32	0.32	-
BANDA (Volta)	0.40	0.40	0.34	0.35	0.32	0.34	0.36	-	-	0.39	0.44	0.49
SUNYANI (Brong-Ahafo)	0.35	0.27	0.25	0.25	0.28	0.30	0.28	0.30	0.35	0.35	0.35	0.31
EJURA (Ashanti)	0.25	0.25	0.23	0.20	0.20	0.25	0.30	0.30	0.30	0.26	0.27	0.35
KUMASI (Ashanti)	0.31	0.29	0.29	0.28	0.30	0.30	0.30	0.30	0.30	0.32	0.33	0.35
MKAWIE (Ashanti)	0.30	0.28	0.24	0.22	0.25	0.25	0.28	0.30	0.30	0.31	0.34	0.35
KOFORIDUA (Eastern)	0.27	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.30	0.30	0.30	0.35
HO (Volta)	0.25	0.25	0.25	0.25	0.23	0.25	0.25	0.26	0.30	0.30	0.30	0.30
ASESEWA (Eastern)	0.25	0.27	0.25	0.25	0.25	0.25	0.26	0.27	0.30	0.25	0.35	0.30
WIAWSO (Western)	0.40	0.40	0.39	0.33	0.35	0.35	0.38	0.40	0.40	0.40	0.40	0.40
TWIFU PRASO (Central)	0.28	0.25	0.25	0.25	0.28	0.25	0.28	0.29	0.31	0.33	0.30	0.30
AXIM (Western)	-	-	-	-	-	-	-	-	-	-	-	-
TAKORADI (Western)	0.35	0.35	0.35	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.31	0.31
CAPE COAST (Central)	0.38	0.34	0.36	0.35	0.35	0.35	0.39	0.35	0.34	0.36	0.36	0.35
DENU (Volta)	-	-	-	-	-	-	-	-	-	-	-	-

Source : Ministry of Agriculture : Division of Statistics and Marketing.

SECTION I

MEAN QUANTITIES AVAILABLE OR CONSUMED PER HEAD; PROTEIN AND FAT INTAKES IN GHANA, ESTIMATED FROM :

1. Production and Importation of Food (Production 1963 : Import 196
2. National Nutrition Survey, 1960 - 1962

	Consumption per head (G.E.P. per day) (u)		Calorie Intakes per head per day		Protein Intakes g. per head per day		Fat Intakes g. per head per day	
	1	2.	1	2	1.	2	1	2.
Maize	74	80	267	289	6.9	7.4	3.0	3.2
Rice	29	17	101	59	1.9	1.1	.2	.1
Wheat	19	7.5	66	26	2.1	.8	.2	.1
Millet	27	25	100	92	2.8	2.6	.6	.6
Sorghum	43	11	154	39	3.9	1.0	1.3	.3
Cassava	370	307	540	448	4.0	3.6	1.1	.9
Plantain	290	183	362	229	3.5	2.2	1.4	.9
Yam	278 (1)	77	300	83	6.6	1.8	.5	.2
Cocoyam	108	65	149	90	2.2	1.4	.4	.3
Beans	7	6	25	22	1.6	1.4	.1	.1
Groundnuts	11	3	65	18	2.8	.8	4.7	1.3
Davadawa	nn	2	-	10	-	.7	-	.7
Melon seed	nn	1	-	6	-	.3	-	.3
Palm nuts	nn	42	-	84	-	.8	-	8.7
Coconuts	5	1	20	4	.2	ø	1.7	.3
Tomato	6	18	1	5	.1	.2	-	-
Onion	5	6	2	2	.1	.1	-	-
Garden egg	nn	15	-	4	- 0	-	-	-
Okro	nn	12	-	5	-	-	-	-
Leave	nn	14	-	5	-	.4	-	.2
Pepper	nn	12	-	5	-	-	-	-
Meat, butcher's (A.P.)	13.5	23	21	35	2.1	3.5	1.3	2.4
Bushmeat (A.P.)	nn	9	-	11	-	1.9	-	.6
Salt meat	nn	ø	-	-	-	-	-	-
Corned beef	1	1	2	2	.2	.2	.1	.1
Chicken	1	1	1	1	.2	.2	.1	.1
Snails	nn	3	-	3	-	.6	-	-
Fish as fresh (A.P.)	27	55	14	28	2.6	5.2	.9	1.9
Salt	3	2	6	4	1.4	.9	-	-
Crustacea	nn	1	-	1	-	.1	-	-
Oil & fat	nn	10.5	-	94	-	-	-	10.5
Sugar	8	2.5	32	10	-	-	-	-
Crude totals			2248	1726	46.3	39.3	19.1	35.1
Not recorded			228		4.8		21.0	
			2468		51.1	4.0	40.1	
Est. Over-recorded (1) Plantain & yam (2) Fish and meat			132	28	2.0		0.7	1.0
			2236	1698	49.1	35.3	39.4	34.1
Est. losses in transport and storage			169		3.5		.9	
			2164		45.6		38.5	
Est. under-recorded (snacks, etc)				170		3.4		1.0
Adjusted Totals			2164	1868	45.6	38.7	38.5	3[illegible]

2. [illegible]tional [illegible]rition [illegible]rvey, 1[illegible] - 1[illegible]

	Consumption per head (G.E.P. per day) (a)		Calorie Intakes per head per day		Protein Intakes g. per head per day		Fat intakes g. per head per day	
	1	2.	1	2	1.	2	1	2.
Maize	74	80	267	289	6.9	7.4	3.0	3.2
Rice	29	17	101	59	1.9	1.1	.2	.1
Wheat	19	7.5	66	26	2.1	.8	.2	.1
Millet	27	25	100	92	2.8	2.6	.6	.6
Sorghum	43	11	154	39	3.9	1.0	1.3	.3
Cassava	370	307	540	448	4.0	3.6	1.1	.9
Plantain	290	183	362	229	3.5	2.2	1.4	.9
Yam	278 (1)	77	300	83	6.6	1.8	.5	.2
Cocoyam	108	65	149	90	2.2	1.4	.4	.3
Beans	7	6	25	22	1.6	1.4	.1	.1
Groundnuts	11	3	65	18	2.8	.8	4.7	1.3
Dawadawa	na	2	-	10	-	.7	-	.7
Melon seed	na	1	-	6	-	.3	-	.3
Palm nuts	na	42	-	84	-	.8	-	8.7
Coconuts	5	1	80	4	.2	[illegible]	1.7	.3
Tomato	6	18	1	5	.1	.2	-	-
Onion	5	6	2	2	.1	.1	-	-
Garden egg	na	15	-	4	-	-	-	-
Okro	na	12	-	5	-	-	-	-
Leave	na	14	-	5	-	.4	-	.2
Pepper	na	12	-	5	-	-	-	-
Meat, butcher's (A.P.)	13.5	23	21	35	2.1	3.5	1.3	2.4
Bushmeat (A.P.)	na	9	-	11	-	1.9	-	.6
Salt meat	na	6	-	-	-	-	-	-
Corned beef	1	1	2	2	.2	.2	.1	.1
Chicken	1	1	1	1	.2	.2	.1	.1
Snails	na	3	-	3	-	.6	-	-
Fish as fresh (A.P.)	27	55	14	28	2.6	5.2	.9	1.9
Salt	3	2	6	4	1.4	.9	-	-
Crustacea	na	1	-	1	-	.1	-	-
Oil & fat	na	10.5	-	94	-	-	-	10.5
Sugar	8	2.5	32	10	-	-	-	-
Crude totals			2248	1726	46.3	39.3	19.1	3[illegible].1
Not recorded			228		4.8		21.0	
			2468		51.1	4.0	40.1	
Est. Over-recorded (1) Plantain & yam (2) Fish and meat			132	28	2.0		0.7	1.0
			2336	1698	49.1	35.3	39.4	34.1
Est. losses in transport and storage			169		3.5		.9	
			2164		45.6		38.5	
Est. under-recorded (snacks, etc)				170		3.4		1.0
Adjusted Totals			2164	1868	45.6	38.7	38.5	3[illegible]

Gram Edible Product.

rce : P. WHITBY - A review of information concerning Food Consumption in Ghana. Part 1 : The overall pattern of Food Consumption in Ghana. Section 5 : A Food Balance Sheet. Food Research Institute - Accra.

SECTION 2

GHANA : FOOD QUANTITIES AVAILABLE AND CORRESPONDING CALORIE, PROTEIN AND FAT INTAKES

PER DAY AND PER HEAD (1)

Item	Production (in tons)	External trade (in tons)	Available (1) (gram edible product)	Calorie (1) intakes	Protein intakes (in gram)	Fat intakes (in gram)
Maize	301,040	+ 380	101.4	364	8.9	4.0
Rice	65,328	+ 30,590	32.3	118	2.2	0.1
Wheat	-	+ 64,214	21.6	75	2.3	0.2
Millet	78,949	-	24.5	93	2.0	1.0
Sorghum	83,312	-	28.0	104	2.7	0.8
Cassava	,445,565	-	486.5	817	3.4	0.5
Plantain	774,802	- 882	260.5	370	2.9	-
Yam	,351,180	- 1,461	454.3	618	8.6	4.5
Cocoyam (4)	976,782	- 1,461	306.3	597	8.5	0.6
Beans	3,739	-	1.3	5	0.2	0.1
Groundnuts (5)	37,592	-	1.0	6	0.3	-
Dawadawa	-	-	-	-	-	-
Melon seed	-	-	-	-	-	-
Palm Nuts (5)	261,112	-	40.3	81	0.8	8.5
Coconuts (5)	147,360	-	8.9	36	0.4	3.0
Tomato	40,640	-	13.7	2	0.2	-
Onion	-	-	-	-	-	-
Garden egg	18,491	-	6.2	4	0.2	0.1
Okra	26,416	-	8.9	3	0.4	0.1
Leave	-	-	-	-	-	-
Pepper	13,411	-	4.5	1	-	-
Meat, Butcher's	16,740 (2)	+ 4,400	7.1	10	1.0	0.7
Bushmeat	-	-	-	-	-	-
Salt meat	-	-	-	-	-	-
Corned beef	-	+ 750	0.2	-	-	-
Chicken (poultry)	-	-	-	-	-	-
Snails	-	-	-	-	-	-
Fish	92,016	+ 10,200	36.4	40	3.4	1.2
Salt	-	+ 400	0.1	-	-	-
Crustacea	-	-	-	-	-	-
Oil & fat	42,000	+ 2,166	14.9	133	-	14.9
Sugar	11,200 (3)	+ 87,746	33.3	133	-	-
TOTAL	-	-	-	3,588	48.4	40.8

1) Based on the agricultural production statistics and the external trade statistics of Ghana (1968) and food analyses by the Food Research Institute.

2) Calculated on the registered local slaughters.
- not available or negligible.

3) Estimate.

4) Where several nutritional values are given by the Food Research Institute the value of the raw material has been taken into account.

5) In calculating the nutritional value, the cakes have not been taken into account.

COCONUTS (1968)

(t)

a. fresh coconuts
b. dried coconuts
c. copra
d. copra oil
e. oil cakes

Country		Production	Imports	Exports	Consumption
United States	a	-	13.851	-	13.85
	b	-	68.089	-	68.08
	c	-	287.223	-	287.2
	d	175.044	198.129	2.061	371.10
	e	112.179	-	-	112.17
United Kingdom	a	-	3.209	154	3.363
	b	-	11.781	90	11.691
	c	-	47.504	-	47.50
	d	29.928	46.884	1.002	75.810
	e	17.576	-	-	17.57
France	a	-	968	10	[illegible]
	b	-	2.646	13	2.63
	c	-	80.174	-	80.17
	d	50.510	13.319	2.094	61.73
	e	29.66	-	-	29.66
West Germany	a	-	1.887	13	1.874
	b	-	7.786	193	7.593
	c	-	157.118	-	157.11
	d	98.984	60.950	1.522	158.41
	e	58.134	504.173	-	56[illegible]
Netherlands	a	-	658	427	24[illegible]
	b	-	4.095	60	4.035
	c	-	141.658	-	141.658
	d	89.245	8.803	42.269	55.779
	e	52.413	307.539	-	359.95
Italy	a	-	1.461	-	1.461
	b	-	68	-	68
	c	-	17.446	-	17.446
	d	10.991	17.872	-	28.863
	e	6.455	-	-	6.45
Belgium & Lux.	a	-	311	8	303
	b	-	1.427	-	1.427
	c	-	28.710	-	28.710
	d	18.231	10.920	4.945	24.20
	e	10.479	92.000	-	102.47
Ivory Coast	a	-	-	441	441
	b	-	-	-	-
	c	4.700	-	-	4.700
	d	2.985	-	2.985	482
	e	1.715	-	-	1.71
Upper Volta	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
	e	-	-	-	-

COCONUTS (1968) (t)

a. fresh coconuts
b. dried coconuts
c. copra
d. copra oil
e. oil cakes

APPENDIX 4.2/7 p.2

Country		Production	Imports	Exports	Consumption
[illegible]	a	-	-	-	-
	b	-	-	-	-
	c	700	-	-	700
	d	445	-	-	445
	e	255	-	-	252
Dahomey	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
	e	-	-	-	-
[illegible]	a	-	107	-	107
	b	-	306	-	306
	c	-	-	-	-
	d	-	100	-	100
	e	-	-	-	-
Mali	a	-	41	-	41
	b	-	-	-	-
	c	-	-	-	-
	d	-	991	-	991
	e	-	-	-	-
Senegal	a	-	239	-	239
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
	e	-	-	-	-
R.A.U.	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	2.054	-	2.054
	e	-	-	-	-
Ghana	a	945.000	-	-	945.000
	b	-	-	-	-
	c	30.000	-	-	30.000
	d	3.000	80	-	[illegible]
	e	1.300	-	[illegible]	[illegible]
[illegible]	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	80	-	80
	e	-	-	-	-

GROUNDNUTS (1968)

(t)

a) groundnuts in shell
b) groundnuts oil
c) cakes and milled cakes

Country		Production	Imports	Exports	Consumption
United States	a	1.153.000	53.444	-	1.206.44
	b	373.998	95	5.922	368.09
	c	501.300	-	-	501.300
United-Kingdom	a	-	116.712	-	116.712
	b	36.181	126.737	2.100	160.73
	c	50.744	365.410	640	415.51
France	a	-	590.590	-	590.590
	b	158.282	159.729	22.488	295.52
	c	261.588	163.925	23.182	402.
West Germany	a	-	83.800	-	83.800
	b	[illegible]	55.245	9.837	71.380
	c	[illegible]	162.760	16.720	182.42
Netherlands	a	-	64.065	-	64.065
	b	32.860	9.935	7.350	22.44
	c	27.854	30.740	7.670	50.85
Italy	a	4.000	177.690	-	181.69
	b	56.324	3.3[illegible]	141	59.58
	c	75.255	640	12.290	67.48
Belgium & Lux.	a	-	70.647	-	70.647
	b	21.845	14.082	5.922	30.00
	c	[illegible]	27.440	6.930	51.22
Ivory Coast	a	30.000	177.690	-	207.69
	b	[illegible]	1.456	2	65.83
	c	[illegible]	910	10	91.200
Upper Volta	a	133.000	-	-	133.00
	b	41.230	97	190	41.04
	c	[illegible]	-	370	47.430
Togo	a	10.000	-	-	10.000
	b	[illegible]	393	-	6.173
	c	[illegible]	-	3.750	2.27
Dahomey	a	20.000	-	9.000	11.00
	b	1.430	350	-	3.70
	c	[illegible]	-	-	4.8
Israel	a	11.000	-	2.312	11.
	b	3.410	1	218	3.
	c	[illegible]	-	-	4.8

GROUNDNUTS (1968)

(t)

a) groundnuts in shell
b) groundnuts oil
c) cakes and milled cakes

Country		Production	Imports	Exports	Consumpti[illegible]
Mali	a	100.000	-	19.000	81.[illegible]
	b	25.110	-	5	25.1[illegible]
	c	35.220	-	320	34.9[illegible]
Senegal	a	1.031.250	30	215.000	816.[illegible]
	b	253.047	-	163.100	89.9[illegible]
	c	354.917	-	248.740	106.1[illegible]
R.A.U.	a	36.000	-	169	35.8[illegible]
	b	11.107	-	-	11.1[illegible]
	c	15.580	-	-	15.5[illegible]
Ghana	a	38.000	-	-	38.0[illegible]
	b	10.000	395	-	10.3[illegible]
	c	600	-	-	[illegible]
Japan	a	122.000	49.480 (+)	-	171.4[illegible]
	b	53.159	-	1.513	51.6[illegible]
	c	74.557	6.303	-	80.9[illegible]

(+) in Annual Review for 1968, of oilseeds, oils, oilcakes and other Commodities.

------- Revue des oléagineux (octobre et novembre 1969).

______ Results of calculations.

OIL PALM (1968)

(t)

a) palm nut

b) palm oil

Country		Production	Imports	Exports	Consumption
United-States	a	-	-	-	-
	b	-	46.051	-	46.051
United-Kingdom	a	-	-	-	-
	b		106.050	-	106.056
France	a	-	-	-	-
	b	-	35.083	656	34.427
West-Germany	a	-	-	-	-
	b	-	126.398	3.904	122.414
Netherlands	a	-	-	-	-
	b	-	71.086	11.289	59.797
Italy	a	-	-	-	-
	b		63.075	321	62.754
Belgium et Lux.	a	-	-	-	-
	b	-	27.777	4.931	22.846
Ivory Coast	a	60.792	-	-	60.792
	b	[illegible]	8.002	605	[illegible]
Upper Volta	a	-	-	-	-
	b	-	12	-	12
Togo	a	5.712	-	-	5.712
	b	2.800	80	96	2.784
Dahomey	a	11.000	-	-	[illegible]
	b	[illegible]	10.067	[illegible]	[illegible]
Niger	a	-	-	-	-
	b	-	2.119	-	[illegible]

OIL PALM (1968)

(t)

a) palm nut
b) palm oil

country		Production	Imports	Exports	Consumption
Mali	a	.	.	.	.
	b	.	)	.	)
Senegal	a	.	.	.	.
	b	.	.	.	.
R.A.U.	a	.	.	.	.
	b	.	.	.	.
Ghana	a	2[illegible].000	.	.	2[illegible].000
	b	20.000	133	.	20.133
Japan	a	.	.	.	.
	b	.	60.070	149	[illegible].9[illegible]

------ Revue des oléagineux (octobre 1969)

______ Result of calculations

OIL PALM (1968)

(t)

a) Palm kernel
b) Palm kernel oil
c) Cakes

Country		Production	Imports	Exports	Consumption
United States	a	-	-	-	-
	b	-	53.856	-	53.856
	c	-	-	-	-
United Kingdom	a	-	51.702	-	51.702
	b	23.269	-	-	23.269
	c	28.436	-	-	28.436
France	a	-	6.920	-	6.920
	b	3.114	-	-	3.114
	c	3.806	10.590	480	13.91[illegible]
West Germany	a	-	89.589	-	89.589
	b	40.315	-	2.787	37.528
	c	59.274	193.690	100	242.864
Netherlands	a	-	112.637	18	112.619
	b	50.679	-	19.427	31.252
	c	61.982	40	47.670	14.352
Italy	a	-	301	-	301
	b	135	-	-	135
	c	166	-	-	166
Belgium & Lux.	a	-	20.196	-	20.196
	b	9.088	-	-	9.088
	c	11.108	180	5.500	5.788
Ivory Coast	a	23.000	-	8.675	14.325
	b	29.800	-	-	29.800
	c	?	-	2.550	?
Upper Volta	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Togo	a	12.900	-	12.876	24
	b	2.800	-	-	2.800
	c	?	-	-	?
Dahomey	a	42.900	-	7.153	35.747
	b	16.086	-	50.000	?
	c	-	-	-	-
Israël	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-

OIL PALM (1968)

(t)

a) Palm kernel
b) Palm kernel oil
c) Cakes

Country		Production	Imports	Exports	Consumption
Mali	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Senegal	a	3,900	-	4,605	?
	b	?	-	-	-
	c	?	-	540	?
U.A.R.	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Ghana	a	11,[illegible]	-	[illegible]	12.893
	b	[illegible]	[illegible]	-	5.404
	c	250	-	-	250
Japan	a	-	22.901	-	22.901
	b	10,305	1.122	1.505	9.294
	c	-	-	-	-

----- : Revue des Oléagineux (Octobre et novembre 1968)

——— : Result of calculations.

COTTON (1968)

(t)

a. seeds
b. cottonseed oils
c. cakes and milled cakes

Country		Production	Imports	Exports	Consumption
United States	a	4.563.000	13	3.099	4.559.914
	b	497.812	5.000	26.458	476.344
	c	1.915.164	52.810	2.560	1.965.414
United Kingdom	a	-	20.832	-	20.832
	b	3.229	11.736	-	14.965
	c	1.249	193.860	400	202.709
France	a	-	-	-	-
	b	-	13	-	17
	c	-	52.793	86	[illegible]
West-Germany	a	-	-	-	-
	b	-	24.869	2.038	22.831
	c	-	198.720	130	198.590
Netherlands	a	-	-	-	-
	b	-	991	-	991
	c	103	42.980	1.120	41.963
Italy	a	3.000	10	-	3.010
	b	467	127	-	594
	c	1.264	-	-	1.264
Belgium & Lux.	a	-	-	-	-
	b	-	23	23	-
	c	-	50.560	150	50.410
Ivory Coast	a	27.000	-	15.000	12.000
	b	1.860	-	-	1.860
	c	5.040	-	-	5.040
Upper Volta	a	20.000	31	5.650	14.381
	b	2.229	-	-	2.229
	c	6.040	-	-	6.040
Togo	a	4.000	-	4.443	-
	b	-	-	-	-
	c	-	-	4.440	-
Dahomey	a	13.000	-	5.122	7.878
	b	1.221	-	-	1.221
	c	3.309	-	-	3.[illegible]
[illegible]	a	53.000	-	112	[illegible]
	b	8.[illegible]3	100	3.415	4.[illegible]
	c	10.[illegible]	-	-	10.4[illegible]

COTTON (1968)

(t)

a. seeds
b. cottonseed oils
c. cakes and milled cakes

Country		Production	Imports	Exports	Consumption
Mali	a	25.000	-	10.180	14.820
	b	2.297	-	-	2.297
	c	2.920	-	-	2.920
Senegal	a	7.000	-	1.046	5.954
	b	923	-	-	923
	c	1.773	-	-	1.773
U.A.R.	a	705.000	-	-	705.000
	b	121.675	32.184	-	153.859
	c	327.700	-	840	326.860
Ghana	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Sudan	a	-	245.805	-	245.805
	b	[illegible]	-	70	38.050
	c	[illegible]	3.950	-	327.188

------- Revue des Oléagineux (Juillet 1969)
_____ Result of calculations

SOYA (1968)

(t)

a. beans
b. oil
c. cakes

Country		Production	Imports	Exports	Consumption
United States	a	28.918.518	-	7.885.358	21.033.160
	b	2.745.357	-	426.789	2.318.568
	c	26.173.161	-	2.698.000	23.475.161
United Kingdom	a	-	238.151	-	238.151
	b	36.912	14.825	365	51.373
	c	201.238	-	90	201.148
France	a	-	50.017	10	50.007
	b	7.751	13.254	993	20.012
	c	39.689	625.341	3.120	661.910
West-Germany	a	-	1.446.679	2.160	1.444.519
	b	223.900	10.336	36.775	197.461
	c	1.220.619	504.173	171.820	1.552.972
Netherlands	a	-	628.679	50	628.629
	b	93.437	13.947	21.142	86.252
	c	535.192	307.539	242.720	600.011
Italy	a	-	621.418	-	621.418
	b	97.427	11.325	52	108.710
	c	523.981	-	2.580	521.401
Belgium & Lux.	a	-	249.554	50	249.504
	b	38.673	8.790	21.153	26.310
	c	210.831	92.000	81.040	221.791
Ivory Coast	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Upper Volta	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Togo	a	-	-	-	-
	b	-	43	-	43
	c	-	-	-	-
Dahomey	a	-	-	-	-
	b	-	26.236	-	26.236
	c	-	-	-	-
Israel (+)	a	-	259.000	-	259.000
	b	40.145	26.236	11.017	[illegible]
	c	218.855	-	-	218.855

BOYA (1968)

(t)

a. beans
b. oil
c. cakes

Mali	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Senegal	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
U.A.R.	a	-	-	-	-
	b	-	40.987	-	40.987
	c	-	-	-	-
Ghana	a	-	-	-	-
	b	-	838	-	838
	c	-	-	-	-
Japan	a	168.000	2.420.770	610	2.588.160
	b	301.132(+)	-	66.580	234.552
	c	2.287.028	1.530	2.360	2.285.198

(+) Annual review for 1968 of oilseeds, oils, oil cakes and commodities.

-------- Revue des Oléagineux (July 1969).

———— Result of calculations.

SUNFLOWER (1968)

(t)

a. seeds
b. oil
c. cakes and milled cakes

Country		Production	Imports	Exports	Consumption
United States	a	91.000	-	-	91.000
	b	31.850	38	-	31.886
	c	23.205	-	-	23.205
United Kingdom	a	-	-	-	-
	b	-	66.365	-	66.365
	c	23.228	119.490	540	142.178
France	a	26.000	897	3.754	23.143
	b	8.100	6.547	937	13.710
	c	3.375	71.400	660	74.115
West-Germany	a	-	36.678	-	36.678
	b	12.837	122.633	13.282	122.188
	c	23.841	118.270	200	141.911
Netherlands	a	-	2.169	597	1.572
	b	968	79.028	38.220	41.776
	c	604	108.080	2.820	105.864
Italy	a	1.000	211.474	-	212.474
	b	54.181	15.655	6	69.830
	c	158.293	-	12.780	145.513
Belgium & Lux.	a	-	2.866	205	2.661
	b	1.075	23.968	1.902	23.141
	c	1.996	53.970	360	55.606
Ivory Coast	a	-	1	-	1
	b	-	-	-	-
	c	-	-	-	-
Upper Volta	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Togo	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Dahomey	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-

SUNFLOWER (1968)

(t)

a. seeds
b. oil
c. cakes and milled cakes

Country		Production	Imports	Exports	Consumption
Israel	a	3.000	1.500	-	4.500
	b	1.575	-	-	1.575
	c	3.352	-	-	3.352
Mali	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Senegal	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
U.A.R.	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Ghana	a	-	-	-	-
	b	-	1	-	1
	c	-	-	-	-
Japan	a	-	710.500	-	710.500
	b	248.675	-	5	248.670
	c	461.885	-	-	461.825

------- Revue des Oléagineux (Juillet 1969).

——— Result of calculations.

MAIZE (1968)

(t)

a. Non-milled maize
b. Triturated seed
c. Crude oil
d. Cakes

Country		Production	Imports	Exports	Consumption
United States	a	111.594.000	29.400	14.958.900	97.004.500
	b	6.825.500	-	-	6.825.500
	c	205.000	2.369	4.376	202.993
	d	1.025.000	-	-	1.025.000
United Kingdom	a	-	3.773.100	15.100	3.788.200
	b	330.000	-	-	330.000
	c	10.000	-	-	10.000
	d	50.000	-	-	50.000
France	a	5.400.000	3.747.400	1.629.100	7.518.300
	b	528.000	-	-	528.000
	c	16.000	2.000	7.000	14.000
	d	80.000	-	-	80.000
West Germany	a	287.000	2.464.600	23.400	2.728.200
	b	528.000	-	-	528.000
	c	16.000	-	-	16.000
	d	80.000	-	-	80.000
Netherlands	a	-	2.351.100	264.800	2.086.300
	b	264.000	-	-	264.000
	c	8.000	1.000	6.000	9.000
	d	40.000	-	-	40.000
Italy	a	3.988.000	4.891.800	4.800	8.875.000
	b	561.000	-	-	561.000
	c	17.000	-	-	17.000
	d	85.000	-	-	85.000
Belgium & Lux.	a	3.000	1.034.300	206.600	830.700
	b	49.500	-	-	49.500
	c	1.500	16.000	2.000	15.500
	d	7.500	-	-	7.500
Ivory Coast	a	285.000	-	1	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
Upper Volta	a	137.000	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-

MAIZE (1968)

(t)

a. Non-milled maize
b. Triturated seed
c. Crude oil
d. Cake

Country		Production	Imports	Exports	Consumption
Togo	a	120.000	-	1	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
Dahomey	a	200.000	1	1.200	198.801
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
Israel	a	3.000	129.800	-	132:800
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
Mali	a	72.000	-	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
Senegal	a	25.000	13.100	-	-
	b	-	-	-	-
	c	-	-	-	-
	d	-	-	-	-
U.A.R.	a.	2.295.000	-	-	-
	b.	-	-	-	-
	c.	-	-	-	-
	d.	-	-	-	-
Ghana	a.	384.000	1	-	-
	b.	-	-	-	-
	c.	-	-	-	-
	d.	-	-	-	-
Sudan	a.	51.000	-	-	51.000
	b.	-	-	-	-
	c.	-	-	-	-
	d.	-	-	-	-

Production of maize oil : in vegetable oils and oilseeds, a review published by the Commonwealth Secretariat, London (1968).

--------- : other informations communicated by the Fédération des Huileries de la C.E.E.

_________ : Result of calculations.

SESAME

(t)

a. seeds
b. oil
c. cakes

Country		Production	Imports	Exports	Consumpti
United States	a	400	29.146	-	29.546
	b	12.853	-	-	12.853
	c	16.693	-	-	16.693
United Kingdom	a	-	80.607	-	80.607
	b	35.064	-	-	35.064
	c	45.543	-	-	45.543
France	a	-	26.024	1	26.023
	b	11.320	-	-	11.320
	c	14.703	-	-	14.7[illegible]
N.F.A.	a	-	117.443	13	117.4[illegible]
	b	51.088	-	-	51.088
	c	66.342	-	-	66.342
Netherlands	a	-	26.052	8	26.044
	b	11.329	-	-	11.[illegible]
	c	14.715	-	-	14.715
Italy	a	1.100	149.613	-	150.7[illegible]
	b	65.560	-	-	65.[illegible]
	c	85.153	-	-	85.153
Belgium et Lux.	a	-	6.594	97	6.691
	b	2.911	-	-	2.911
	c	3.780	-	-	3.780
Ivory Coast	a	-	-	4	-
	b	-	-	-	-
	c	-	-	-	-
Upper Volta	a	4.000	-	3.448	552
	b	240	-	-	240
	c	312	-	-	312
Togo	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Dahomey	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Israel	a	400	-	-	400
	b	174	-	-	174
	c	226	-	-	226
Mali	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-

[illegible]

(t)

a. seeds
b. oil
c. cakes

Senegal	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
U.A.R.	a	10.000	-	-	10.000
	b	4.350	-	-	4.350
	c	5.650	-	-	5.650
Ghana	a	-	-	-	-
	b	-	-	-	-
	c	-	-	-	-
Japan	a	3.000	857.000	-	860.570
	b	17.636	-	-	17.636
	c	40.543	-	-	40.543

-------- : Annual Review for 1968 of oilseeds, oils, oilcakes and other commodities.

———— : result of calculations.

Characteristics	Palm oil	Palm kernel oil
Consistence	Solid	Solid
Colour	Orange to red brown	White to yellowish
Smell	Slight	Slight
Taste	Sweet	Sweet
Melting point	27 to 43°	23 to 30°
Solidification point	31 to 38°	20 to 24°
Maumené test	-	-
Specific gravity at 15°	0.921 to 0.945	0.952
Refractive index	at 60° 1.4510	at 60° 1.4430
Saponification index	196 to 210	242 to 254
Iodine index	44 to 58	16 to 23
Hehner index	95 to 97	90 to 91
Reichert index	0.1 to 1.9	5 to 7
Polenske index	0.25	9.4 to 11.5
Acetyl index	13.9	-
Solidification of fatty acids	40 to 45°	20 to 25°
Melting point of fatty acids	46 to 48°	23 to 28°
Unsaponifiable	-	-
Composition of fatty acids		
Palmitic acid	37.3 to 43.8 %	6 to 7.8 %
Oleic acid	38.4 to 49.3 %	10 to 16.3 %
Linoleic acid	6.3 to 10.7 %	30 to 38 %
Stearic acid	0.8 to 3.8 %	1.4 %
Myristic	1.8 to 3.9 %	12 to 16 %
Lauric acid	-	30 to 38 %
Caprylic acid	-	3 %
Capric acid	-	3 to 6 %
Linolic acid	-	0 to 1 %
Caproic acid		
Groundnut acid		
Solid fatty acids - whole composition		
Stearin and Palmitin		
Olein		
Linolein		
Palmitin		
Arachidin		
Stearin		
Lignocerin		
Stearic, Palmitic and groundnut acids		

(1) Paul H. [illegible], "Lexique des huiles végétales." Oléagineux coloniaux, Série Scientifique n° 8, I.R.H.O., novembre 1956.

4.2.2.2.4. [illegible]

Palm oil	Palm kernel oil	Copra oil	Sunflower seed oil	Sesame oil	Maize oil	Ground[illegible]
Solid	Solid	Solid	Liquid	Liquid	Liquid	Liquid
Orange to red	White to	White to dark	Pale yellow	Light yellow to	Light yellow to	Pale yel
brown	yellowish	yellow		dark	yellowish brown	
					normal	
Slight	Slight	Nut [illegible]	None	None to acid	Normal	None
Sweet	Sweet	Sweet	None	None to bitter	Sweet	Sweet
[illegible] to 45°	20 to 30°	20 to 25°	-	-	-	-
1 to 39°	20 to 24°	10 to 15°	- 16 to - 18.5°	- 4 to - 6°	- 15°	0 to 3°
-	-	-	67.5 to 73°	60°	73 to 89°	45 to 5[illegible]
.92 to 0.945	0.[illegible]	0.870 to 0.925	0.920 to 0.926	0.917 to 0.926	0.921 to 0.928	0.917 to
[illegible] 60° 1.4580	at 60° 1.4430	at 60° 1.4410	at 20° 1.4735	at 15° 1.4740	at 15° 1.470 -	at 60° 1.
[illegible]6 to 210	240 to 250	240 to 260	185 to 194	186 to 199	187 to 1[illegible]	185 to 1
[illegible] to 56	16 to 23	7 to 9.6	115 to 135	100 to 140	11[illegible] to 128.2	84 to 10
[illegible] to 58	90 to 94	80.4 to 90.5	95	95.7	0.2	95.5
1 to 1.8	3 to 7	6.5 to 7.5	0.25	0.1 to 1.2	0.2	0 to 1.
.25	9.4 to 11.5	16.0 to 17.0	0.25	-	-	0.1 to 0
[illegible].5	-	9.5	14.5	-	7.0 to 11.49	8 to 10
[illegible] to 45°	20 to 25°	20 to 26°	17 to 18°	20 to 20°	16 to 17°	25 to 28
[illegible] to 40°	20 to 28°	20 to 27°	20 to 24°	24 to 27°	17 to 20°	29 to 35
-	-	0.15 to 0.30	0.5 to 1 %	0.95 to 1.0 %	1.3 to 2.50 %	0.50 to [illegible]
[illegible].5 to 43.0 %	6 to 7.0 %	7 %	-	-	-	-
[illegible].4 to 49.5 %	10 to 16.5 %	0 %	-	60 %	-	
.5 to 10.7 %	50 to 58 %	-	-	-	-	
.2 to 5.9 %	1.4 %	3 %	-	-	-	
.2 to 5.9 %	12 to 16 %	20 %	-	-	-	
-	50 to 58 %	45 %	-	-	-	
-	3 %	9 %	-	-	-	
-	3 to 6 %	10 %	-	-	-	
-	0 to 1 %	-		14 to 20 %		
		0 %		-		
				10 to 14 %		
					3.0 %	
			present		44.0 %	Present
			present		46.0 %	present
			present			present
			present			present
			trace			present
						present

[illegible]

Sesame oil	Maize oil	Groundnut oil	Cotton oil	Soya oil	Coconut oil
Liquid	Liquid	Liquid	Fluid	Liquid	Solid
Light yellow to dark	Light yellow to yellowish brown [illegible]	Pale yellow	Light yellow to dark brown	Light yellow	White to yellow
None to acid	[illegible]	None	Slight	Slight	None
None to bitter	Sweet	Sweet	Sweet	Sweet	None
•	•	•	•	- 8 to - 7°	[illegible] to [illegible]°
- 4 to - 6°	- 15°	0 to 3°	0 to 4°	- 8 to - 16°	[illegible] to [illegible]°
[illegible]°	73 to [illegible]°	[illegible] to [illegible]°	[illegible]°	[illegible] to [illegible]°	•
0.917 to 0.926	0.921 to 0.928	0.917 to 0.925	0.923 to 0.930	0.920 to 0.930	0.927
at 15° 1.4[illegible]	at 15° 1.470 -	at 60° 1.4[illegible]	at 15° 1.4730	at 15° 1.4673 to	at 40° 1.4[illegible]
186 to 199	187 to 199	185 to 197	190 to 197	[illegible] to [illegible]	170 to [illegible]
100 to 108	11[illegible] to 128.2	[illegible] to 105	104 to 117	101 to 140	[illegible] to [illegible]
95.7	4.2	[illegible].5	[illegible]	[illegible] to [illegible].01	[illegible] to [illegible].5
.1 to 1.2	0.2	0 to 1.6	•	0.45 to 1.4	1.1 to 1.6
-	•	0.1 to 0.3	•	0.2 to 1.1	0.4 to 1.6
•	7.8 to 11.49	[illegible] to [illegible]	[illegible].1	[illegible]	•
20 to 24°	[illegible] to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°
24 to 30°	17 to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°	[illegible] to [illegible]°
0.95 to 1.8 %	1.3 to 2.50 %	[illegible] to [illegible] %		[illegible] to 1 %	1.7 to [illegible] %
•	•	•	20 to 25 %	[illegible] to [illegible] %	
[illegible] %	•		[illegible] to 30 %	[illegible] to [illegible] %	[illegible] %
•	•			[illegible] to 3 %	
•	•		[illegible]	0 to 7 %	
•	•				
•	•				
•	•				
•	•				
14 to 20 %			[illegible] to 30 %	[illegible] to [illegible] %	
•				0 to 1 %	
12 to 14 %					
	3.[illegible] %				
	[illegible] %	[illegible]			
	[illegible] %	[illegible]			
		[illegible]			
		[illegible]			
		[illegible]			
		[illegible]			

SECTION 3

[illegible], C.I.F. [illegible], PER TON

	Copra Philippines				Coconut oil, Ceylon		
	1965	1966	1967	1968	1965	1966	1967
	$	$	$	$	£ s.	£ s.	£
January	277	222	182	263	129 0	131 0	[illegible]
February	229	216	189	270	132 0	128 0	107
March	242	191	187	276	137 0	119 0	112
April	251	194	179	277	138 0	118 10	112
May	253	186	[illegible]	288	148 0	118 0	[illegible]
June	264	191	195	246	154 0	117 10	[illegible]
July	215	191	208	200	133 0	117 0	114
August	214	186	193	218	127 0	109 0	107
September	209	171	196	205	114 10	106 0	[illegible]
October	216	171	217	193	122 0	94 0	120
November	221	162	255	197	122 0	93 0	[illegible]
December	215	186	260	209	120 0	105 0	[illegible]
Annual Average	229	189	203	237	130 15	113 0	[illegible]

a. For coconut oil, nearest forward shipment, or c.i.f., Rotterdam, or ex-tank, Rotterdam.
b. Settlement price of the London Oil and Tallow Trades Association.

SECTION 1

[illegible] 6.3/17

[illegible] PRICES OF COPRA AND COCONUT OIL, [illegible] C.I.F. [illegible] PER TON (a).

	Copra Philippines				Coconut oil, Ceylon			
	1965	1966	1967	1968	1965	1966	1967	1968
	$	$	$	$	£ s.	£ s.	£ s.	£ s.
	237	222	182	263	129 0	131 0	106 0	163 10
	239	216	183	270	132 0	120 0	107 0	163 0
	242	191	187	270	137 [illegible]	119 0	112 0	151 0
	251	194	179	277	130 [illegible]	118 10	112 0	176 0
	253	186	191	288	148 [illegible]	118 0	109 0	161 0
	264	191	195	246	154 0	117 10	111 0	170 0
	275	191	200	200	133 0	117 0	114 0	154 0
	274	186	193	218	127 0	109 0	107 0	158 10
	269	177	199	205	114 10	106 0	118 0	154 0
	276	177	217	193	122 0	94 0	120 0	150 0
	221	162	255	197	122 0	95 0	138 0	135 0
	215	186	260	209	120 0	105 0	160 0	144 0
	229	189	203	237	130 15	113 0	117 5	161 10

[illegible] nearest forward shipment, or c.i.f., Rotterdam, or ex-tank, Rotterdam.
[illegible] of the London Oil and Tallow Traders Association.

SECTION 2

MID-MONTH PRICES OF GROUNDNUTS AND GROUNDNUT OIL, NEAREST FORWARD SHIPMENT,

c.i.f. UNITED KINGDOM PORTS, PER TON

	Groundnuts, Nigerian re-sellers								Groundnut oil, Nigerian[a] bulk, 3-5 per cent [illegible]					
	1965		1966		1967		1968		1965		1966		[illegible]	
	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.
January	73	10	71	5	69	10	66	5	[illegible]	0	113	0	110	[illegible]
February	80	10	70	0	67	10	67	0	[illegible]	10	109	10	107	[illegible]
March	78	10	66	12	67	15	71	0	[illegible]	0	106	0	109	[illegible]
April	73	15	67	8	66	15	70	15	[illegible]	10	102	0	106	[illegible]
May	74	0	67	10	65	0	[illegible]	0	[illegible]	0	105	10	104	[illegible]
June	72	0	64	15	66	0	70	10	[illegible]	10	104	0	105	[illegible]
July	72	0	65	8	66	0	67	15	107	0	107	10	106	[illegible]
August	72	15	69	0	67	0	67	18	[illegible]	10	109	10	106	[illegible]
September	75	0	69	0	67	10	[illegible]	15	[illegible]	0	107	0	99	[illegible]
October	74	5	66	0	60	0	[illegible]	10	120	0	107	10	94	[illegible]
November	75	15	67	5	58	0	74	0	[illegible]	0	106	0	92	0
December	71	5	70	15	65	10	83	0	[illegible]	0	112	10	106	[illegible]
Annual Average	74	10	68	0	65	10	70	15	[illegible]	0	107	10	104	0

a Nigerian/Gambian in most months of 1967 and in 1968

SECTION 1

MID-MONTH PRICES OF GROUNDNUTS AND GROUNDNUT OIL, NEAREST FORWARD SHIPMENT,

c.i.f. UNITED KINGDOM PORTS, PER TON

	Groundnuts, Nigerian re-sellers								Groundnut oil, Nigerian bulk, 3-5 per cent a							
	1965		1966		1967		1968		1965		1966		1967		1968	
	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.
	73	10	71	5	69	10	66	5	129	0	113	0	110	0	105	0
	80	10	70	0	67	10	67	0	136	10	109	10	107	10	107	0
	78	10	66	12	67	15	71	0	126	0	106	0	109	10	108	0
	73	15	67	8	66	15	70	15	118	10	102	0	106	0	109	10
	74	0	67	10	65	0	71	0	107	0	105	10	104	10	112	0
	72	0	64	15	66	0	70	10	108	10	104	0	105	10	119	0
	72	0	66	8	66	0	67	15	107	0	107	10	106	10	111	0
	72	15	69	0	67	0	67	18	108	10	109	10	106	0	113	0
	75	0	69	0	67	10	68	15	112	0	107	0	99	0	116	0
	74	5	66	0	60	0	70	10	120	0	107	10	94	10	114	0
	75	15	67	5	58	0	74	0	119	0	106	0	92	0	120	0
	71	5	70	15	65	10	83	0	112	0	112	10	106	10	137	0
Average	74	10	68	0	65	10	70	15	117	0	107	10	104	0	114	10

/Gambian in most months of 1967 and in 1968

SECTION 2

MID-MONTH PRICES OF MALAYAN PALM OIL, 5 PER CENT, NEAREST FORWARD SHIPMENT, C.I.F. UNITED KINGDOM PORTS, PER T[illegible]

	1963	1964	1965	1966	1967	1968	1969	197[illegible]
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	$	$
January	79 0	84 10	96 10	90 0	85 0	81 0	297	37[illegible]
February	79 0	84 10	103 0	90 0	83 0	81 0	295	35[illegible]
March	79 0	84 10	106 0	90 0	81 0	81 0	234	369
April	79 0	84 10	108 0	85 0	81 0	80 0	275	37[illegible]
May	79 0	84 10	110 0	82 10	81 0	78 0	272	36[illegible]
June	79 10	85 0	105 0	82 0	83 0	75 0	259	34[illegible]
July	80 10	85 10	103 0	86 0	83 0	73 0	265	32[illegible]
August	81 10	85 10	96 0	87 0	83 0	65 0	270	34[illegible]
September	81 10	86 10	88 0	87 0	81 10	60 0	270	34[illegible]
October	82 10	91 0	90 0	85 0	81 10	60 0	310	32[illegible]
November	83 10	92 0	90 0	82 0	78 0	60 0	329	35[illegible]
December	84 0	95 0	88 0	84 0	81 0	64 0	356	37[illegible]
Annual average	80 15	87 0	98 10	85 15	81 15	71 10	290	35[illegible]

SECTION 1

MID-MONTH PRICES OF MALAYAN PALM OIL, 5 PER CENT, NEAREST FORWARD SHIPMENT, C.I.F. UNITED KINGDOM PORTS, PER TON.

	1963	1964	1965	1966	1967	1968	1969	1970	1971
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	$	$	$
	79 0	84 10	96 10	90 0	85 0	81 0	297	374	362
	79 0	84 10	103 0	90 0	83 0	81 0	295	353	373
	79 0	84 10	106 0	90 0	81 0	81 0	234	369	351
	79 0	84 10	108 0	85 0	81 0	80 0	275	374	344
	79 0	84 10	110 0	82 10	81 0	78 0	272	360	
	79 10	85 0	105 0	82 0	83 0	75 0	259	342	
	80 10	85 10	103 0	86 0	83 0	73 0	265	329	
	81 10	85 10	96 0	87 0	83 0	65 0	270	342	
	81 10	86 10	88 0	87 0	81 10	60 0	270	344	
	82 10	91 0	90 0	85 0	81 10	60 0	310	328	
	83 10	92 0	90 0	82 0	78 0	60 0	329	356	
	84 0	95 0	88 0	84 0	81 0	64 0	356	372	
ge	80 15	87 0	98 10	85 15	81 15	71 10	290	354	

SECTION 2

MID-MONTH PRICES OF PALM KERNELS AND PALM KERNEL OIL, NEAREST FORWARD SHIPMENT, C.I.F. WESTERN EUROPEAN PORTS,

	Palm kernels, Nigerian, resellers				Palm kernel oil, Congo		
	1965	1966	1967	1968	1965a	1966b	1967
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
January	61 10	65 5	53 15	83 10	125 0	109 0	89 10
February	65 8	62 10	53 10	87 10	133 0	112 10	89 10
March	65 10	58 0	53 5	..	140 0	103 10	92 0
April	69 5	56 8	52 0	91 0c	139 0	101 15	92 0
May	67 0	55 10	53 5	91 5	142 0	94 10	92 0
June	68 8	57 0	56 10	..	138 0	94 10	..
July	61 5	57 12	58 10	66 0	135 0	96 10	107 0
August	61 5	56 10	59 10	67 8	127 0	95 15	107 10
September	61 5	53 10	59 10	64 7	118 0	92 15	108 0
October	63 12	52 10	62 0	65 12	118 0	87 5	117 0
November	64 10	52 0	67 8	67 0	119 0	85 15	135 0
December	64 10	54 18	83 0	71 2	118 0	88 10	163 0
Annual average	64 15	56 15	59 5	75 10	129 5	96 15	108 10

a. English, crude, ex-mill (generally £ 5 or more per ton above quotations for Congo oil).
b. Prices converted from Belgian francs; per metric ton.
c. Sierra Leone.
d. West African

SECTION 1

APPENDIX .4.2/20

-MONTH PRICES OF PALM KERNELS AND PALM KERNEL OIL, NEAREST FORWARD SHIPMENT, C.I.F. WESTERN EUROPEAN PORTS, PER TON.

	Palm kernels, Nigerian, resellers				Palm kernel oil, Congo			
	1965	1966	1967	1968	1965a	1966b	1967	1968d
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
	61 10	65 5	53 15	83 10	125 0	109 0	89 10	159 0
	65 8	62 10	53 10	87 10	133 0	112 10	89 10	174 0
	63 10	58 0	53 5	..	140 0	103 10	92 0	..
	69 5	56 8	52 0	91 0c	139 0	101 15	92 0	192 0
	67 0	55 10	53 5	91 5	142 0	94 10	92 0	187 0
	68 8	57 0	56 10	..	138 0	94 10	..	179 0
	61 5	57 12	58 10	66 0	135 0	96 10	107 0c	143 0
	61 5	56 10	59 10	67 8	127 0	95 15	107 10c	135 0
	61 5	53 10	59 10	64 7	118 0	92 15	108 0c	132 10
	63 12	52 10	62 0	65 12	118 0	87 5	117 0c	130 0
	64 10	52 0	67 8	67 0	119 0	85 15	135 0d	131 0
	64 10	54 18	83 0	71 2	118 0	88 10	163 0d	146 0
	64 15	56 15	59 5	75 10	129 5	96 15	108 10	155 5

…de, ex-mill (generally £ 5 or more per ton above quotations for Congo oil).
…rted from Belgian francs; per metric ton.
…e.
…

SECTION 2

MONTHLY AVERAGE PRICES OF COTTONSEED OIL IN THE UNITED STATES,

CRUDE, TANKCARS. f.o.b. S.E. MILLS U.S.$ t.

	1962	1963	1964	1965	1966	1967	1968	1969	[illegible]
January	287	222	198	273	282	266	244	286	[illegible]
February	282	223	200	286	290	268	-	293	[illegible]
March	275	227	207	288	299	266	232	308	-
April	273	229	216	284	319	262	-	300	-
May	204	235	227	227	328	266	241	233	[illegible]
June	262	238	223	240	354	268	252	[illegible]	-
July	255	242	231	255	341	262	-	298	[illegible]
August	240	224	227	231	344	262	-	283	[illegible]
September	233	220	224	242	343	264	-	266	[illegible]
October	233	235	238	246	[illegible]	268	248	-	[illegible]
November	227	231	210	240	[illegible]	244	-	287	-
December	218	209	[illegible]	264	[illegible]	253	-	298	-
Annual average									

SECTION 1

APPENDIX 4.2/21

MONTHLY AVERAGE PRICES OF COTTONSEED OIL IN THE UNITED STATES,

CRUDE, TANKCARS, f.o.b. S.E. MILLS U.S.$ t.

1962	1963	1964	1963	1966	1967	1968	1969	1970	1971
287	222	198	273	282	266	244	286	283	-
282	223	200	286	290	268	-	293	307	-
275	227	207	283	299	266	232	308	-	-
273	229	216	284	319	262	-	300	-	415
204	235	227	227	328	266	241	233	336	
262	233	229	240	334	268	252	311	-	-
255	242	231	255	341	262	-	298	353	-
240	224	227	231	3[illegible]4	262	-	283	359	-
233	220	224	242	343	264	-	266	353	-
233	235	233	246	2[illegible]0	268	248	-	3[illegible]5	-
227	231	[illegible]	260	[illegible]8	244	-	287	-	-
218	209	[illegible]	264	[illegible]4	253	-	298	-	-

SECTION 2

MONTHLY AVERAGE PRICES OF SOYA BEANS AND SOYA BEAN OIL IN THE UNITED STATES.

	Soya beans, N° 1 Yellow f.o.b.track, Chicago				Soya bean oil, crude, [illegible] f.o.b. [illegible]		
	1965	1966	1967	1968	1965	1966	[illegible]
	cents per bushel				cents per [illegible]		
January	296	284	296	2[illegible]3	11.6	11.9	[illegible]
February	303	291	291	273	12.1	12.0	[illegible]
March	309	286	291	271	12.2	11.3	[illegible]
April	304	298	288	271	12.2	11.5	[illegible]
May	286	303	287	274	10.4	11.3	[illegible]
June	297	338	290	271	10.2	11.2	[illegible]
July	289	359	283	271	10.0	12.3	[illegible]
August	275	373	281	272	10.5	14.1	[illegible]
September	268	319	269	261	11.4	12.3	[illegible]
October	249	296	260	2[illegible]	11.5	10.9	[illegible]
November	254	2[illegible]	261	2[illegible]3	11.2	10.3	[illegible]
December	266	300	264	2[illegible]	11.2	10.6	[illegible]
Annual average	282	313	280	2[illegible]	11.2	11.7	[illegible]

SECTION 1

MONTHLY AVERAGE PRICES OF SOYA BEANS AND SOYA BEAN OIL IN THE UNITED STATES.

	Soya beans, N° 1 Yellow f.o.b.track, Chicago				Soya bean oil, crude, tankcars f.o.b. Decatur			
	1965	1966	1967	1968	1965	1966	1967	1968
		cents per bushel				cents per lb.		
	296	284	296	268	11.6	11.9	10.3	8.7
	303	291	291	273	12.1	12.0	10.3	9.5
	301	286	291	271	12.2	11.3	10.3	9.1
	304	298	288.	271	12.2	11.5	10.3	8.8
	286	303	287	274	10.4	11.3	10.3	8.7
	297	338	290	271	10.2	11.2	9.8	7.8
	289	359	283	271	10.0	12.3	9.1	7.[illegible]
	275	373	281	272	10.5	14.1	9.6	7.5
	268	319	269	261	11.4	12.3	9.3	7.5
	249	296	260	246	11.5	10.9	8.8	7.3
	254	299	261	253	11.2	10.3	8.6	7.9
	266	300	264	25[illegible]	11.2	10.6	8.5	8.1
[illegible]al average	282	313	280	26[illegible]	11.2	11.7	9.6	8.2

SECTION 2

MID-MONTH PRICES OF SOYA BEANS AND SOYA BEAN OIL, c.i.f. UNITED KINGDOM PORTS

	Soya beans, American yellow, No. 2, bulk, per ton a								Soya bean oil, any origin ex-[illegible] Rotterdam, per metric [illegible]					
	1965		1966		1967		1968		1965		1966		[illegible]	
	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	.
January	44	10	43	14	42	10	48	5	103	0	99	10	83	[illegible]
February	46	12	44	16	42	3	43	10	112	10	101	0	81	[illegible]
March	45	13	43	9	42	4	49	5	109	10	94	0	84	[illegible]
April	44	15	44	6	42	3	47	18	107	0	96	0	82	10
May	43	2	45	5	42	6	48	10	[illegible]2	0	95	0	81	[illegible]
June	44	0	49	2	42	10	47	10	[illegible]1	0	91	5	80	[illegible]
July	43	5	50	12	42	13	47	12	88	10	96	0	79	[illegible]
August	38	18	54	2	40	3	44	5	[illegible]4	15	100	10	76	[illegible]
September	38	5	45	18	40	10	44	9	99	10	98	0	74	[illegible]
October	37	11	43	8	40	0	44	8	101	0	90	0	75	[illegible]
November	39	13	44	5	41	10	47	5	105	0	90	10	74	[illegible]
December	41	1	44	0	43	6	47	4	[illegible]	0	89	10	84	[illegible]
Annual Average	42	6	46	1	42	3	47	2	[illegible]8	0	9[illegible]	0	79	[illegible]

a [illegible] forward shipment.

b Converted from a dollar quotation.

SECTION 1

MID-MONTH PRICES OF SOYA BEANS AND SOYA BEAN OIL, c.i.f. UNITED KINGDOM PORTS

	Soya beans, American yellow, No. 2, bulk, per ton a								Soya bean oil, any origin ex-tank, Rotterdam, per metric ton							
	1965		1966		1967		1968		1965		1966		1967		1968	
	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.	£	s.
[illegible]	44	10	43	14	42	10	48	5	103	0	99	10	83	0	[illegible]	[illegible]
[illegible]	46	12	44	16	42	3	48	10	112	10	101	0	81	0	[illegible]	[illegible]
[illegible]	45	19	43	9	42	4	49	5	109	10	94	0	84	15	[illegible]	[illegible]
[illegible]	44	15	44	6	42	3	47	10	107	0	96	0	82	10	[illegible]	[illegible]
[illegible]	43	2	45	5	42	6	48	10	[illegible]	0	95	0	81	0	[illegible]	[illegible]
[illegible]	44	0	49	2	42	10	47	10	[illegible]	0	91	5	80	0	[illegible]	[illegible]
[illegible]	43	5	50	12	42	13	47	12	88	10	96	0	79	0	[illegible]	[illegible]
[illegible]	38	18	54	2	40	3	44	5	[illegible]	15	100	10	76	10	[illegible]	[illegible]
[illegible]	38	5	45	18	40	10	44	9	99	10	93	0	74	10	67	[illegible]
[illegible]	37	11	43	8	40	0	44	8	104	0	90	0	75	0	69	10
[illegible]	39	13	44	5	41	10	47	5	105	0	90	10	74	10	73	[illegible]
[illegible]	41	1	44	0	43	6	47	4	[illegible]	0	[illegible]	10	[illegible]	0	[illegible]	[illegible]
Average	42	6	46	1	42	[illegible]	47	2	[illegible]	0	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] shipment.

[illegible] dollar quotation.

SECTION 2

QUARTERLY AVERAGE PRICES OF SUNFLOWER SEED AND SUNFLOWER SEED OIL.

	Sunflower seed Kenya, Tanzania/Uganda (£ s. per ton) c.i.f. Western Europe				Sunflower seed [illegible] Any origin, ex-tank, per metric [illegible]		
	1965	1966	1967	1968	1965	1966	
	£ s.	£ s.	£ s.	£ s.	$	$	
January-March	-	-	-	-	331	273a	
April-June	-	-	-	-	295	267a	
July-September	-	52 0	-	52 0	267	266	
October-December	-	48 15	-	-	281	241	
Annual average	-	-	-	-			

a. Argentine/Uruguayan, c.i.f. - Western Europe.

QUARTERLY AVERAGE PRICES OF SESAME AND SESAME OIL.

	Sesame seed a.				Sesame oil b.		
	1965	1966	1967	1968	1965	1966	
	£ s. per metric ton				Cents per lb.		
January-March	73 15	80 10	95 5	98 5	33 0	33 0	
April-June	72 15	88 10	105 0	97 5	33 0	33 0	
July-September	73 0	92 5	101 5c	90 0	33 0	36 3	
October-December	78 15	89 15	86 10	89 0	33 0	37 0	
Annual average	74 10	87 15	97 0	93 10	33 0	34 8	

a. Sudanese, c.i.f., Western Europe.

b. Refined, in drums, New York.

c. Tanzanian, c.i.f., Japan, nominal.

n.d. Mainly c.i.f. Japan.

SECTION 1

QUARTERLY AVERAGE PRICES OF SUNFLOWER SEED AND SUNFLOWER SEED OIL.

	Sunflower seed Kenya, Tanzania/Uganda (... per ton) c.i.f. western Europe				Sunflower seed-oil Any origin, ex-tank, Rotterdam, per metric ton			
	1965	1966	1967	1968	1965	1966	1967	1968
	£ s.	£ s.	£ s.	£ s.	$	$	$	$
	-	-	-	-	331	273m	221	177
	-	-	-	-	295	267m	213	[illegible]
	-	52 0	-	52 0	267	206	214	[illegible]
[illegible]er	-	48 15	-	-	201	241	196	17[illegible]
[illegible]e	-	-	-	-				

[illegible] Paraguayan, c.i.f. - Western Europe.

QUARTERLY AVERAGE PRICES OF SESAME AND SESAME OIL.

	Sesame seed a.				Sesame oil b.			
	1965	1966	1967	1968	1965	1966	1967	1968
	£ s. per metric ton				Cents per lb.			
	73 15	80 10	95 5	98 5	33 0	33 0	37 0	35 [illegible]
	72 15	88 10	105 0	97 5	33 0	33 0	[illegible] 3	35
	73 0	92 5	10[illegible] 5e	90 0	33 0	36 3	40 8	35 [illegible]
[illegible]er	78 15	89 15	86 10	89 0	33 0	37 0	40 8	35 0
	74 10	87 15	97 0	93 10	33 0	34 8	39 2	35 [illegible]

a. c.i.f., western Europe.

[illegible] c.i.f., Japan, nominal.

b. Refined, in drums, New York.

n.d. Mainly c.i.f. Japan.

SECTION 2

COMPOSITION AND PACKAGING OF MARGARINE - LEGAL RE

	GERMANY	FRANCE	ITALY
Minimum fat content Maximum water content	(salt included)		no regulation
Dyes	Carotene Carotene + annatto	None (except for export)	Cooking margarine : carotene + annatto Industrial margarine : no dyes
Flavours	Natural and identic chemical flavours	Exclusively diacetyl diacetin (under heading "composition" must be mentioned "aromatisé au diacetyle)	Natural vegetable flavours some synthetic materials
Emulsifying agents	M/Diglycerides Iodine index max. 10	Lecithine % M/Diglyceride	M/Diglyceride saccharose esters
Conservative agents	Sorbic acid max. 0,12 %	Forbidden	Sorbic acid max.0,05 %
Butter fat	Forbidden Except for milk or cream, limited	10 %	Butter fat forbidden
Anti-oxydation agents	Ascorbic acid tocopherol natural anti-oxydation agents and identic anti-oxydation	Industrial margarine : 0,3 % of ascorbic acid, propyl gallate octyl gallate, dodecyl gallate BHA (1) and their mixtures (max. 0,01)	Palmitate of ascorbic acid 0,2 % BHA (1) 0,25 % propyl octyl, dodecyl : 0,01 % d-l alpha tocopherol 0,03 % Lecithine 0,5 %
Vitamins	Vitamines A, C, D, E not obligatory	Exclusively authorized for sale in chemist's shop	No regulation
Form and packing	Cube, cup	Cube	Parallelipiped
Weight	No regulation	Unknown	Max. 200 gr.
Revealing substances	10 % sesame seed oil or 0,2/0,3 % potatoflour and starch	At least 0,2 % rice-starch or potato-flour or manioc-starch	Cooking margarine : 5 % sesame seed oil. Industrial margarine : 5 % sesame seed oil + 0,2 % potato-flour
Regulation	Law of 15.7.1897 Law of 27.3.1939 Decree of 4. .1897 as modified on 23.10.1956	Obligations : art. 7, law of 16.4.1897 modified by law of 20.2.1934 Label : art. 7, decree of 11.3.1908 as modified by decree of 26.7.1956	Law of 4.11.1951 n° 1316 Law of 11.5.1959 n° 450

(1) Butyl - hydroxyle - anisol.

	ITALY	NETHERLANDS	BELGIUM	LUXEMBURG
	no regulation		no regulation	
	Cooking margarine : carotene + annatto Industrial margarine : no dyes	Carotene annatto	Carotene annatto	Carotene annatto
	Natural vegetable flavours some synthetic materials	Natural and identic chemical flavours and some synthetic ones	Under preparation	No regulation
	M/Diglycerids saccharose esters	M/Diglycerids and lecithine	M/Diglycerids / lecithine sugar esters	No regulation
	Sorbic acid max.0,05 %	Benzoïc acid 0,2 % or sorbic acid 0,1 %	Sorbic acid max. 0,1 %	No regulation
	Butter fat forbidden	Forbidden, cream, inclusive, except for export	10 % butter fat	10 %
	Palmitate of ascorbic acid 0,2 % BHA (1) 0,25 % propyl cetyl, dodecyl : 0,01 % d -1 alpha tocopherol 0,03 % Lécithine 0,5 %	Forbidden	1 - ascorbic palmitiate 0,3 % propyl gallate 0,01% cetyl gallate 0,01 % dodecyl gallate 0,01 % BEHA (1) 0,02 %	Unknow
	No regulation	Vit. A 20 UI/g Vit. D_2 3 UI/g	Under preparation	Unknow
	Parallelipiped	Parrallelipiped brick or cylinder (admitted exceptionnaly)	Cube	Free
	Max. 200 gr.	250 g, 500 g, 2.500 g, white iron boxes of 1/4, 1/2 and 1 kg	250 g, 500 g, 1.000 g, 2.000 g	No regulation
	Cooking margarine : 5 % sesame seed oil. Industrial margarine : 5 % sesame seed oil + 0,2 % potato-flour	No prescription. Potato-flour and starch forbidden	2,5 % sesame seed oil 0,2 % potato flour	10 % sesame seed oil or 5 % sesame seed oil + 0,2% potato-flour
	Law of 4.11.1951 n° 1316 Law of 11.6.1959 n° 450	Decree of 13.11.1961 as modified by Royal Decree of 13.12.1962 Law on Butter 1900 as modified	Law of 8.7.1935 as modified in 1939 Royal Decree of 27.1.1936 Royal Decree of 26.3.1937	Law of 1.3.1903 Law of 25.9.1953

SECTION 2

EUROPEAN ECONOMIC COMMUNITY : TARIFF FOR OILS AND OILSEEDS

With effect from 1st July, 1967 all customs duties on vegetable oils and oilseeds were abolished between member countries, and between the Community and the Associated Overseas States and Territories. At the same time the following common external tariff was applied from outside the Community.

Brussels Nomenclature	Item	Common external tariff
		per cent ad valorem
12 - 01	Oilseeds :	
	Oilseeds and oleaginous fruit, whole or broken	Free
15 - 07	Fixed vegetable oils, fluid or solid, crude, refined or purified	
	A. China-wood, tung, abrasin, olea-coca, oiticia oils, myrtle and Japan waxes.	3
	B. Other oils :	
	I. For technical or industrial use other than for food industry :	
	(a) Castor :	
	1. Intended for the manufacture of amino-undecanoic acid for the production of synthetic textile fibres or artificial plastic materials	Free
	2. Intended for other uses (a)	8
	(b) Unspecified :	
	1. Crude	
	(aa) Palm	4
	(bb) Others	5
	2. Others (a)	8
	II. Others :	
	(a) of olive :	
	1. In immediate containers with a net capacity of 20 kg. or less	20*
	2. Others	
	(aa) Virgin	17*
	(bb) Other	20*
	(b) Palm oil :	
	1. Crude	9
	2. Other	14
	(c) Not specified :	
	1. Solid, in immediate containerswith a net capacity of 1 kg. or less	20
	2. Solid, otherwise imported; fluid :	
	(aa) Crude	10
	(bb) Other	15

a Admission under the sub-heading is subject to the conditions laid down by the competent authorities.

* Duties on olive oil suspended and replaced by agricultural levies.

MATHEMATICAL EXPLANATION FOR EVOLUTION OF OIL REQUIREMENTS

The evolution of the consumption is a function of the evolution of the population, the individual income and of the income elasticity of the demand. So, to calculate the consumption of the year t + 1 will have to solve the following equation.

$$C\,t{+}1 = Ct \,.\, P\,(1{+}p)^1 \times Y\,(1 + y.\,ey)^1$$

where : Ct : Consumption in the basis year

C t + 1 : Consumption in the year after the basis year

P : Population in the basis year. As the population figure is already included in the national consumption estimate Ct, we may put :

$$P = 1$$

p : Growth rate of the population in per anum.

Y : National income per inhabitant. As the income per head is already included in the national consumption estimate we may put

$$Y = 1$$

y : growth rate of the income per head in per anum. In this case we have replaced the evolution of the income per head by that of the expenses per head because that figure was available and because the correlation between the global expenses and those for a single product is closer than the correlation between the income and the demand for a product.

e_y : income elasticity of the demand.

$e_y = 0.8$ (cfr. supra).

More generally we can also write :

$$Q_{t'} = Q_t \, (1 + p)^{t'-t} \, . \, (1 + 0.8\, y)^{t'-t}$$

In the case of Ghana the variables become

t : the year 1970
Q : 36.026 tons
p : 0.023 (1)
y : 1st. hypothese : 0 (1)
2nd. hypothese : 0.015 (1)

(1) See point 4.2.1.3.

Annex 4.3/[illegible]

YEARLY AND MONTHLY VARIATIONS OF COPRA PURCHASE IN ESIAMA (Kg)

Month	1962	1963	1964	1965	1966	1967	1968	1969	1970
January	65.824	194.140	277.863	263.508	360.731	-	182.220	85.698	225.903
February	231.648	193.650	355.854	273.304	224.190	-	78.283	182.807	194.565
March	128.880	380.543	387.655	271.170	467.970	91.894	46.634	126.696	214.275
April	450.139	365.811	355.092	315.874	268.427	209.965	76.657	295.433	408.279
May	521.208	538.632	513.436	329.844	315.722	291.846	90.830	315.826	471.435
June	271.831	199.695	57.810	91.897	381.600	163.830	95.860	91.187	139.140
July	64.618	9.195	57.099	17.475	66.091	36.627	19.202	158.901	209.313
August	-	79.654	270.002	12.192	16.491	145.644	19.507	451.967	480.010
September	117.297	375.209	309.543	223.672	210.261	221.894	117.530	295.655	470.611
October	534.860	956.158	306.436	42.977	461.112	527.355	192.684	452.219	399.239
November	290.576	597.902	315.570	269.748	251.366	270.853	200.762	222.034	279.938
December	134.315	243.637	270.815	502.006	-	135.280	191.244	311.252	316.178
Total	2.809.596	4.043.326	3.627.375	2.613.653	2.946.451	2.085.188	1.221.383	3.108.905	3.800.351

Annex 4.7.[illegible]

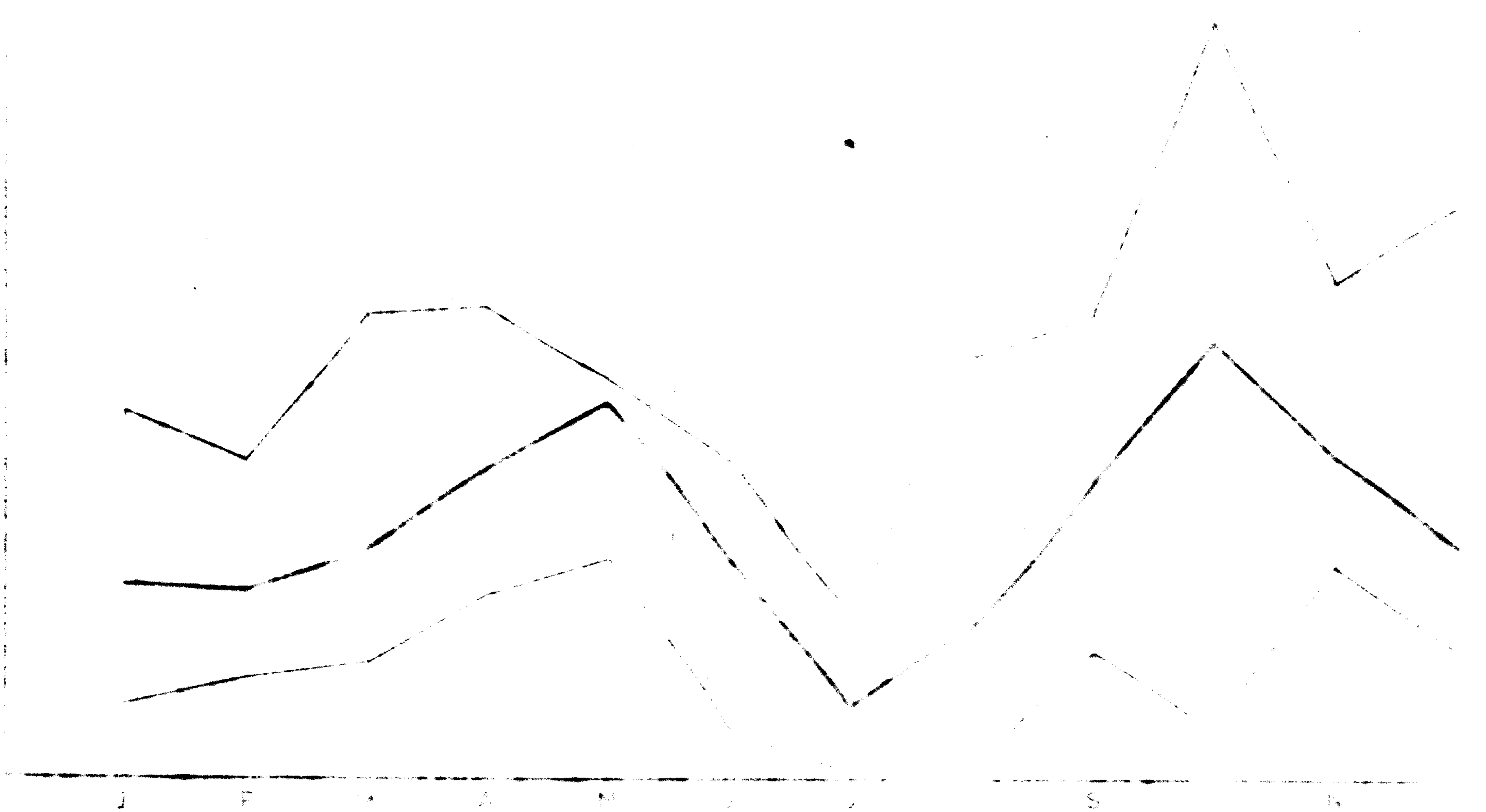
MONTHLY VARIATION OF COPRA PURCHASED IN [illegible]

Month	1962	1963	1964	1965	1966	1967	1968	1969	1970	Σ	Min.	Average	Max.
January	2,31	2,58	7,64	10,08	12,24	-	14,92	2,76	5,94	58,47	2,31	6,50	12,24
February	8,24	4,79	9,81	10,46	7,61	-	6,41	3,28	5,12	55,72	3,28	6,19	10,46
March	4,59	9,41	10,70	10,38	15,87	4,49	3,82	4,08	5,64	68,89	3,82	7,65	15,87
April	16,02	9,05	9,79	12,08	9,11	9,64	6,28	9,50	10,74	92,21	6,28	10,25	16,02
May	18,55	13,32	14,15	12,62	10,72	14,00	7,40	10,16	12,40	113,36	7,40	12,60	18,55
June	9,68	4,94	1,59	3,52	10,24	7,86	7,85	2,93	3,66	52,27	1,59	5,81	10,24
July	2,30	0,23	1,57	0,67	2,24	1,76	1,57	5,11	5,28	20,73	0,23	2,30	5,28
August	-	1,97	7,44	0,47	0,63	6,98	1,60	14,54	12,64	46,27	0,47	5,14	14,54
September	4,17	9,28	10,49	8,56	7,14	10,64	9,62	15,93	12,30	88,21	4,17	9,80	15,93
October	19,02	23,63	10,65	1,64	15,65	25,28	15,77	14,55	10,51	136,70	1,64	15,19	25,28
November	10,34	14,77	8,70	10,32	8,55	12,95	16,43	7,14	7,37	96,57	7,14	10,73	16,43
December	4,78	6,03	7,47	19,20	-	6,49	8,29	10,01	8,32	70,60	4,78	7,84	19,20
Total	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00	900,00	-	100,00	-

production

EVOLUTION OF [illegible]

[illegible]



FACTORY OF ESIAMA - COPRA PURCHASES (Kg)

Locality	Distance in Km	Year 1969											
		J	F	M	A	M	J	J	A	S	O	N	D
Princess Town	54,0	-	-	-	-	4.920	2.409	4.470	5.944	7.925	5.000	2.692	4.…
Factory	-	1.727	7.264	32.614	50.952	30.836	12.192	14.906	30.245	43.506	30.092	16.104	30.3…
Krisin	36,0	4.013	7.874	7.315	19.507	25.451	4.623	4.064	34.180	30.226	30.734	7.925	26.…
Eikwe	37,5	9.398	8.687	11.938	18.593	12.954	4.826	8.200	15.646	18.085	13.157	12.954	18.…
Atuabo	46,8	10.668	15.000	12.090	39.624	23.825	5.131	27.635	50.190	44.145	24.630	17.424	20.…
Beyin	50,5	152	660	2.642	8.230	12.548	5.029	36.271	18.237	17.932	19.253	6.553	10.…
Kangan	56,0	1.372	2.794	3.200	5.029	4.369	1.829	5.385	19.050	10.668	13.106	6.096	7.…
Tikobo II	37,0	2.184	3.302	2.692	0.382	3.708	1.770	2.337	7.569	11.125	12.852	0.230	16.…
Ezinaho	61,0	10.058	8.992	6.706	15.545	29.210	5.639	3.200	22.860	50.064	72.796	30.550	34.…
Bongeri	66,0	11.320	11.786	15.596	30.004	30.320	7.925	30.820	54.661	56.134	65.329	30.049	40.…
Egbwano	72,0	-	-	-	-	-	-	-	-	16.662	10.719	6.198	12.…
Edobo	77,0	4.623	5.000	2.540	8.941	6.553	4.115	4.470	48.768	23.927	23.622	18.719	16.…
Eipa	83,0	2.946	1.626	3.099	6.604	10.516	3.353	3.650	12.954	15.037	8.200	1.571	3.…
Half Assini	85,5	3.099	3.708	2.642	18.871	14.326	3.010	12.344	59.436	37.338	27.076	11.125	13.…
Anlomatuope	90,0	10.008	14.906	12.395	38.405	48.819	9.957	3.404	32.804	34.341	32.512	13.005	27.7…
Mpeasem	96,0	-	-	-	-	-	-	-	-	-	-	10.820	14.…
Efasu	101,0	14.122	10.160	11.227	35.916	57.455	18.491	7.569	42.215	70.460	64.973	24.079	12.…
Total		85.698	102.007	126.696	295.403	315.826	91.187	150.901	451.967	495.655	453.219	[illegible]22.094	311.…

SECTION 1

Annex 4.3/4

FACTORY OF [illegible] - COPRA PURCHASES (Kg)

Distance in Km	J	F	M	A	M	J	J	A	S	O	N	D	Total
	Year 1969												
54,0	-	-	-	-	4.930	2.409	4.470	5.944	7.925	5.000	2.692	4.216	37.744
-	1.727	7.264	32.614	30.952	30.836	12.192	14.906	20.365	43.506	20.092	16.104	30.370	296.976
36,0	4.013	7.874	7.315	19.507	25.451	4.623	4.064	34.100	30.226	30.734	7.925	26.873	303.793
37,5	9.398	8.687	11.938	18.593	12.954	4.826	0.200	15.646	10.085	13.157	12.954	18.745	153.263
46,0	10.668	15.000	12.090	39.624	23.825	5.131	27.635	50.190	44.145	24.638	17.424	20.117	290.575
50,5	152	660	2.642	0.330	12.540	5.029	36.271	10.237	17.932	19.253	6.553	10.109	137.616
56,0	1.372	2.794	3.200	5.829	4.369	1.829	5.305	19.050	10.668	13.106	6.096	7.620	80.518
37,0	2.184	3.302	2.692	0.382	3.700	1.770	2.337	7.569	11.125	12.852	0.230	16.358	80.517
61,0	10.050	8.992	6.706	15.545	29.210	5.639	3.200	22.860	50.064	72.796	20.550	34.130	295.758
66,0	11.320	11.706	15.596	20.004	30.320	7.925	20.826	54.661	56.134	65.329	30.049	40.284	381.052
72,0	-	-	-	-	-	-	-	-	16.662	10.719	6.198	12.751	46.330
77,0	4.623	5.000	2.540	0.941	6.553	4.115	4.470	40.760	23.927	33.622	10.719	16.815	160.173
83,0	2.946	1.626	3.099	6.604	10.516	3.353	3.650	12.954	15.037	8.200	1.571	3.759	73.403
85,5	3.099	3.708	2.642	10.871	14.326	3.010	12.344	59.436	37.330	27.076	11.125	13.818	199.593
90,0	10.008	14.906	12.395	30.405	40.819	9.957	3.004	32.004	34.341	32.512	13.005	27.788	277.624
96,0	-	-	-	-	-	-	-	-	-	-	10.830	14.681	25.501
102,0	14.122	10.160	11.227	35.916	57.655	18.091	7.569	42.215	70.460	64.973	34.079	12.002	369.469
	85.698	102.007	136.696	295.403	315.826	91.107	150.901	451.967	495.655	452.219	222.094	311.252	3.108.905

SECTION 2

FACTORY OF [illegible] - COPRA PURCHASES (Kg)

Locality	Year 1970											
	J	F	M	A	M	J	J	A	S	O	N	D
Princess Town	4.164	1.270	2.235	7.315	8.036	3.642	4.877	10.465	5.994	5.305	2.591	3.
Factory	14.376	19.063	20.143	20.296	39.078	14.630	11.633	18.200	37.440	36.721	27.229	33.
Kisia	17.221	11.001	12.751	25.006	29.972	6.001	7.061	23.360	34.595	23.673	11.938	16.
Kibwe	7.925	6.655	11.532	9.652	12.395	6.200	6.350	10.922	11.930	26.073	15.799	19.
Atuako	13.767	17.932	22.750	57.150	40.530	7.216	20.296	59.007	36.322	29.007	16.764	24.
Boyia	7.569	5.500	7.925	13.665	25.600	0.331	0.700	19.606	22.352	16.713	11.379	10.
Kangan	6.300	4.572	7.874	13.564	16.561	1.422	7.976	21.692	9.957	5.639	3.759	4.
Tikobo II	11.034	7.569	9.449	10.820	10.000	5.103	3.650	0.534	7.112	10.566	10.465	13.
Sinaho	31.750	20.269	14.630	56.497	60.021	11.604	15.443	59.500	57.061	57.709	35.509	41.
Bangeri	24.600	26.975	27.737	60.437	57.700	27.504	32.410	60.565	55.029	49.370	42.062	54.
Dykaago	10.169	7.316	7.417	20.726	26.264	9.550	19.050	41.504	27.330	25.900	23.165	20.
Ndobo	11.379	12.344	10.262	17.002	23.165	6.604	14.275	32.715	20.753	22.060	18.542	20.
Eipo	1.029	-	-	-	-	-	-	-	-	-	-	-
Half Assini	10.644	17.630	19.609	10.106	23.927	3.054	13.564	49.632	39.900	26.313	19.304	17.
Anlonatungo	0.404	7.671	13.767	43.303	41.053	19.761	21.031	50.690	49.012	26.772	27.026	24.
Mpoason	20.900	13.259	6.604	-	-	-	-	-	-	-	-	-
Efasu	15.748	14.275	11.502	34.900	40.100	8.433	6.401	25.166	46.126	45.022	14.376	11.
Total	225.900	194.565	214.275	400.279	471.425	139.140	200.813	400.010	470.611	390.239	279.904	316..

SECTION 1

FACTORY OF ESIAMA - COPRA PURCHASES (Kg)

	Year 1970												
	J	F	M	A	M	J	J	A	S	O	N	D	Total
Town	4.166	1.270	2.235	7.315	8.026	2.642	4.077	10.465	5.994	5.305	2.591	3.912	58.078
	14.376	19.063	20.143	20.296	39.878	14.630	11.633	18.208	37.440	26.721	27.229	33.223	299.720
	17.221	11.481	12.751	25.806	29.972	6.401	7.061	23.368	34.595	23.673	11.930	16.002	228.269
	7.925	6.655	11.532	9.652	12.395	6.240	6.350	10.922	11.930	26.073	15.799	19.710	145.999
	13.767	17.932	22.758	57.150	40.538	7.214	20.296	59.487	36.322	29.007	16.764	24.841	354.076
	7.569	5.588	7.925	13.665	25.400	8.331	0.708	19.406	22.352	16.713	11.379	10.312	157.428
	6.240	4.572	7.874	13.564	16.561	1.422	7.976	21.692	9.957	5.639	3.759	4.115	103.379
x	11.024	7.569	9.449	10.820	10.008	3.182	3.658	0.534	7.112	10.566	10.465	13.868	100.255
	31.750	20.269	14.630	66.497	68.021	11.684	15.443	59.588	57.861	57.709	35.509	41.148	480.109
	24.689	26.975	27.737	60.437	57.709	27.584	32.410	60.565	55.829	49.378	42.062	54.712	480.087
	10.109	7.214	7.417	20.726	26.264	9.550	19.050	41.504	27.330	25.908	23.165	20.726	238.963
	11.379	12.344	10.262	17.882	23.165	6.604	14.275	32.715	20.753	22.860	10.542	20.117	218.898
	1.829	-	-	-	-	-	-	-	-	-	-	-	1.829
ini	18.644	17.620	19.609	18.186	23.927	3.454	13.564	49.632	39.980	26.213	19.304	17.323	267.464
ppo	8.484	7.671	13.767	43.383	41.453	19.761	21.031	50.698	49.022	26.772	27.026	24.790	333.858
	20.980	13.259	6.604	-	-	-	-	-	-	-	-	-	40.843
	15.748	14.275	11.582	34.900	48.188	8.433	6.401	25.146	46.126	45.822	14.376	11.379	282.296
	225.908	194.565	214.275	400.279	471.425	139.140	200.813	480.818	470.611	399.239	279.908	316.178	3.800.351

SECTION 2

An... .

BUYING COST OF COPRA AT [illegible]

	May 69 MF	June 69 MF	Aug. 69 MF	Sept. 69 MF	Janu. 71 MF	Febr. 71 MF	Nr of per M 69	J 69	A 69
Receiving officers	382,00	420,00	991,84	562,18	607,50	566,65	13	15	16
Buying stat lab.	441,50	350,50	660,25	612,27	915,60	805,42	21	21	25
Buying stat watchmen	122,22	127,00	275,70	173,96	257,30	224,00	5	5	6
Field supervisors	100,17	190,17	507,45	284,67	319,29	271,67	5	5	5
Office staff	336,44	312,44	701,62	305,60	165,30	162,99	9	9	8
Carting lab	736,60	777,95	1.213,09	1.230,56	1.200,00	1.120,00	31	31	61
Social security fund	190,25	177,40	360,60	215,11	70,14	72,50	-	-	-
Drivers	-	-	-	-	141,61	134,07	-	-	-
Bonus expenses (1)	1.037,16	435,85	800,40	956,42	676,70	714,00	-	-	-
Depots rents	62,00	70,00	67,00	67,00	100,00	124,50	-	-	-
Stationery & comm.	176,97	96,74	100,30	172,65	11,59	31,20	-	-	-
Travelling & transport	100,00	100,00	-	-	42,20	20,40	-	-	-
Bags & bagging	-	-	17,31	43,96	53,00	27,30	-	-	-
Sundries	-	-	125,32	65,91	69,22	130,00	-	-	-
Bank charges	-	-	-	-	215,05	50,00	-	-	-
Total	4.583,39	3.009,93	5.900,12	4.758,09	4.902,87	4.542,70	-	-	-
Incomes (2)	575,82	766,65	225,50	561,30	867,40	664,50	-	-	-
Net expenses	4.007,57	2.303,20	5.753,62	4.196,79	4.035,47	3.878,20	-	-	-

(1) Bonus to the farmers

(2) Production with V.O.K.D.Labores

SECTION 1

Annex 4.2.c

BUYING COST OF COPRA AT [illegible]

	May 60 MF	June 60 MF	Aug. 60 MF	Sept. 60 MF	Janu. 71 MF	Febr. 71 MF	Nr of personal M 60	J 60	A 60	S 60	J 71	F 71
Receiving officers	382.00	420.00	901.84	563.18	607.50	566.65	13	15	16	17	16	16
Buying stat lab.	641.30	350.50	660.35	612.37	915.60	805.42	31	31	35	30	67	68
Buying stat watchmen	133.32	137.80	275.70	173.96	257.30	234.00	5	5	6	6	8	8
Field supervisors	198.17	198.17	507.65	304.67	319.29	271.67	5	5	5	5	8	7
Office staff	336.64	313.44	701.63	305.60	165.30	162.90	9	9	8	9	4	4
Carting lab	736.60	777.96	1.313.00	1.330.56	1.300.00	1.130.00	31	31	61	56	61	60
Social security fund	180.28	177.60	300.60	315.11	78.16	73.50	-	-	-	-	-	-
Drivers	-	-	-	-	141.61	134.07	-	-	-	-	3	3
Bonus expenses (1)	1.037.16	435.05	800.60	956.42	676.70	714.00	-	-	-	-	-	-
Depots rents	63.00	70.00	67.00	67.00	300.00	134.50	-	-	-	-	-	-
Stationery & comm.	176.07	86.74	100.30	173.65	11.50	31.30	-	-	-	-	-	-
Travelling & transport	300.00	300.00	-	-	42.30	30.60	-	-	-	-	-	-
Bags & bagging	-	-	17.31	43.06	53.60	27.30	-	-	-	-	-	-
Sundries	-	-	135.33	65.94	60.33	130.00	-	-	-	-	-	-
Bank charges	-	-	-	-	315.05	50.00	-	-	-	-	-	-
Total	4.383.30	3.080.93	5.980.13	4.758.00	4.893.07	4.542.70	-	-	-	-	-	-
Incomes (2)	375.83	706.65	226.50	561.30	857.60	664.50	-	-	-	-	-	-
Net expenses	4.007.57	2.383.28	5.753.63	4.196.70	4.035.47	3.878.20	-	-	-	-	-	-

(1) Bonus to the farmers

(2) Production with [illegible] Labores

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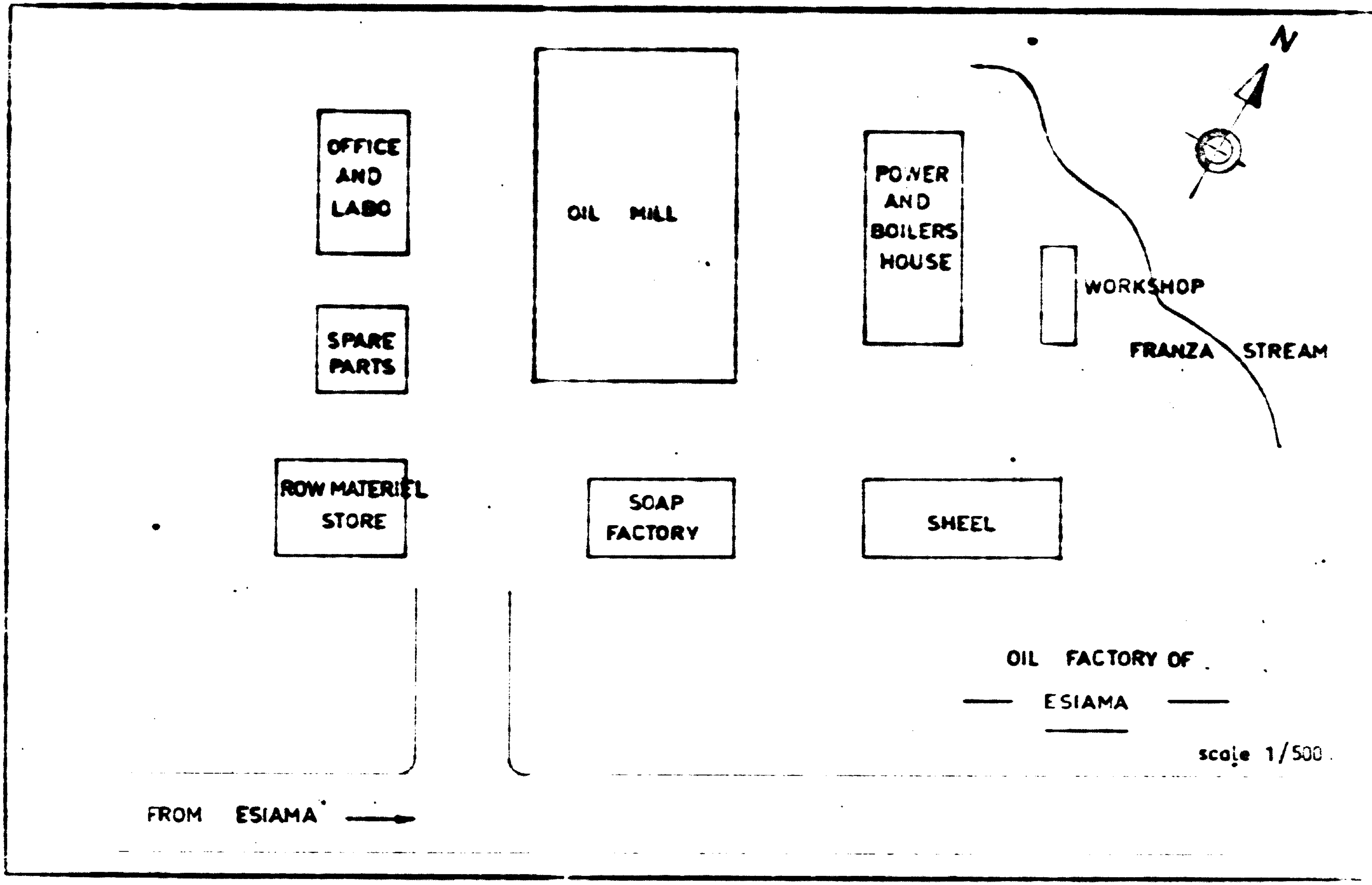
SECTION 2

Annex 4.1/6

	May 69	June 69	Aug. 69	Sept. 69	Jan. 71	Febr. 71	Nr of personnel					
							M 69	J 69	A 69	S 69	J 71	F 71
Depreciation on assets	76.07	76.07	78.23	86.64	112.86	112.86	86	86	121	128	130	133
Purchases in t (material)	220.0	91.4	654.3	604.0	343.4	363.7	-	-	-	-	-	-
Buying cost/t	12.83	26.20	12.67	6.60	11.75	10.60	-	-	-	-	-	-

Annex 4.3/7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OFFICE AND LABO
SPARE PARTS
ROW MATERIEL STORE
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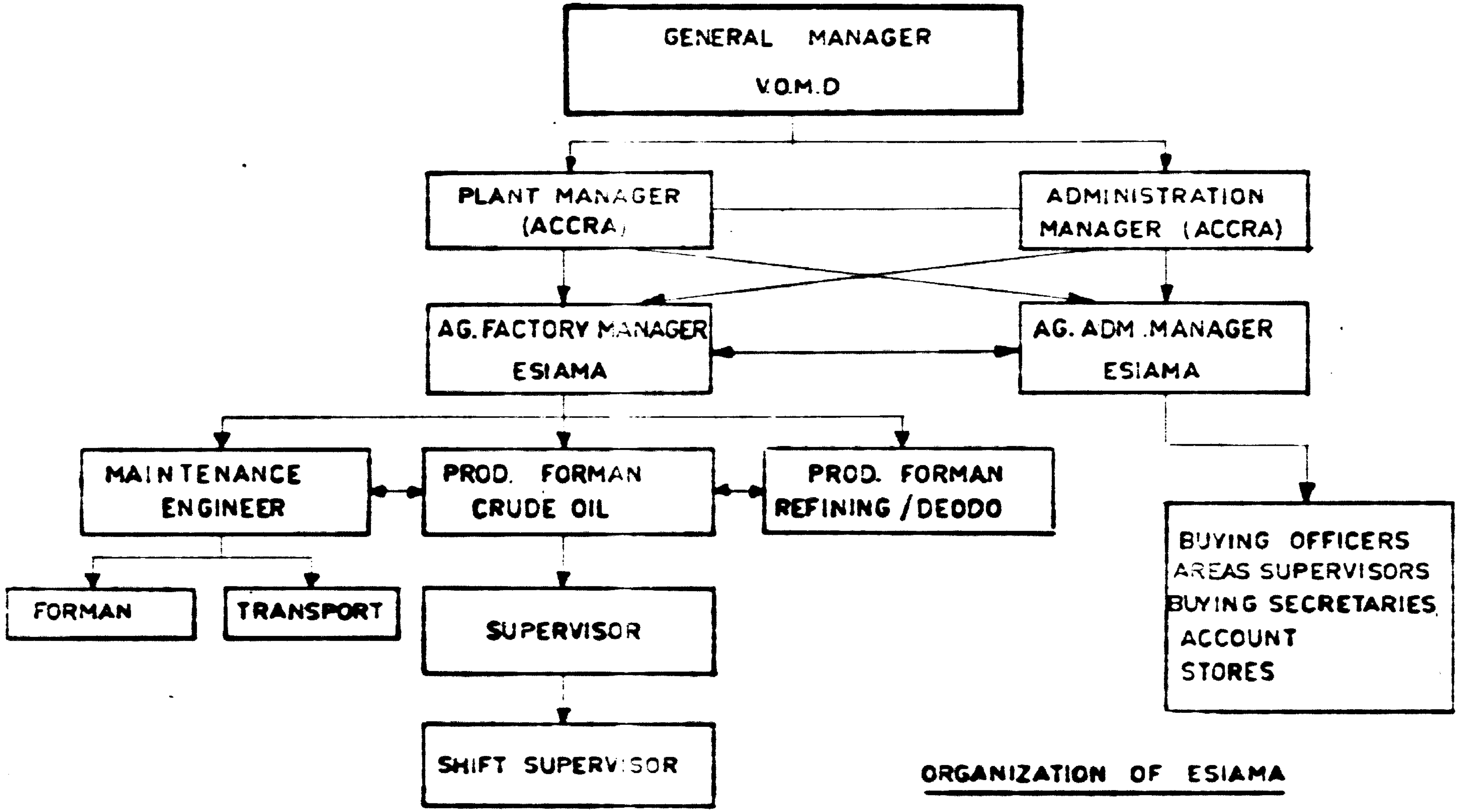
SOAP FACTORY
POWER AND BOILERS HOUSE
SHEEL
WORKSHOP
FRANZA STREAM
FROM ESIAMA
OIL FACTORY OF
ESIAMA
scale 1/500

Annex 4 3/8



ORGANIZATION OF ESIAMA

Annex 4.3/9

FACTORY OF ESIAMA - PRODUCTION AND ANALYSES

Month	Production in t (metric)				Nr. working days	Raw material			Cakes		
	Copra	Oil	Cake	Loss		Oil %	FFA %	Moisture %	Oil %	Moisture %	FFA
1970											
January	159,21	93,20	45,85	Not Available	20	69,54	2,45	5,51	6,48	5,61	2,
February	215,39	124,23	59,14		16	69,92	3,28	4,81	6,21	5,50	2,
March	157,02	92,90	44,70		18	70,36	3,80	4,68	6,99	5,94	3,
April	158,65	93,43	45,68		11	69,45	4,07	4,75	6,94	5,89	3,5
May	346,61	199,99	101,66	16,56	14	70,44	3,39	4,51	7,14	5,51	3,
June	124,92	72,36	34,88	5,59	7	70,09	2,80	4,73	7,25	5,57	3,
July	154,99	89,71	45,85	6,91	18	68,84	2,27	4,87	6,84	5,95	2,
August	194,56	113,43	54,10	10,81	15	68,72	2,80	4,87	6,54	6,10	2,
September	351,64	204,55	98,81	15,24	22	70,23	2,33	4,27	7,54	5,28	2,
October	253,75	153,31	71,31	11,33	20	69,68	2,84	4,19	7,99	4,99	2,
November	542,29	314,81	155,39	24,21	29	69,99	3,14	4,11	7,93	4,94	3,
December	390,83	235,32	119,13	17,78	19	69,78	3,25	4,08	9,15	4,48	3,
1971											
January	503,02	291,94	141,03	22,45	20	69,31	3,40	4,25	7,29	4,19	3,
February	519,23	303,67	148,21	23,16	23	69,31	3,14	4,08	7,07	4,60	3,
March	543,15	331,12	162,31	25,40	23	69,51	2,60	4,38	7,16	5,74	2,
Total	4.623,26	2.714,05	1.327,97	178,64	283	69,60	3,03	4,39	7,30	5,13	2,

SECTION 1

Annex 4.3/9

FACTORY OF ESIAMA - PRODUCTION AND ANALYSES

..th	Production in t (metric)				Nr. working days	Raw material			Cake		Oil	
	Copra	Oil	Cake	Loss		Oil %	FFA %	Moisture %	Oil %	Moisture %	FFA %	Moisture %
70												
	159,21	93,20	45,85	Not Available	20	69,54	2,45	5,51	6,40	5,61	3,41	0,20
..ry	215,39	124,23	59,14		16	69,92	3,20	4,81	6,21	5,50	3,60	0,20
	157,02	92,90	44,70		10	70,36	3,00	4,60	6,99	5,94	3,07	0,20
	158,65	93,43	45,60		11	69,45	4,07	4,75	6,94	5,09	3,53	0,20
	346,61	199,99	101,66	16,56	14	70,44	3,39	4,51	7,14	5,51	3,71	0,20
	124,92	72,36	34,80	5,59	7	70,09	2,80	4,73	7,25	5,57	3,36	0,20
	154,99	89,71	45,85	6,91	10	68,84	2,27	4,07	6,84	5,95	2,18	0,20
	194,56	113,43	54,10	10,81	15	68,72	2,80	4,07	6,54	6,10	2,65	0,20
..ber	351,64	204,55	98,81	15,24	22	70,23	3,33	4,27	7,54	5,20	2,66	0,20
..r	253,75	153,31	71,31	11,33	20	69,68	2,84	4,19	7,90	4,90	2,83	0,20
..er	542,29	314,81	155,39	24,21	29	69,99	3,14	4,11	7,93	4,94	3,17	0,20
..er	390,83	235,32	119,13	17,78	19	69,70	3,25	4,00	9,15	4,40	3,31	0,20
71												
	503,02	291,94	161,03	22,45	20	69,31	3,40	4,25	7,29	4,19	3,43	0,27
..ry	519,23	303,67	168,21	23,16	23	69,31	3,14	4,00	7,07	4,60	3,10	0,20
	543,15	331,12	162,31	25,40	23	69,51	2,68	4,38	7,16	5,74	2,71	0,20
	4.623,26	2.714,05	1.327,97	178,64	283	69,60	3,03	4,39	7,30	5,13	2,90	0,21

SECTION 2

ANNEX 4.3/[illegible]

[illegible] REFINING AND DEODORIZING OF COCO-NUT OIL

	Refining			Deodorizing				
	Crude oil	Refined oil	Efficiency	Crude oil	Deod oil	FFA %	Moisture	Efficiency
1970								
January	5,08 t	4,93 t	97,05	-	-	0,06	0,09	-
February	6,50	6,06	93,23	-	-	0,06	0,09	-
March	-	-	-	-	-	-	-	-
April	-	-	-	-	-	-	-	-
May	34,04	31,48	92,48	-	-	0,06	0,09	-
June	-	-	-	-	-	-	-	-
July	17,98	16,50	91,77	9,35	9,26	0,06	0,09	99,04
August	4,88	4,38	89,75	2,40	2,37	0,03	0,04	98,75
September	5,28	4,87	92,23	3,15	3,09	0,03	0,04	98,10
October	57,20	52,70	92,13	57,86	57,01	0,03	0,04	98,53
November	19,51	17,73	90,88	18,29	18,16	0,03	0,04	99,29
December	55,88	52,76	94,42	50,29	50,09	0,03	0,04	99,60
1971								
January	62,99	57,96	92,01	57,00	56,32	0,03	0,04	98,81
February	29,97	27,88	93,03	31,19	30,86	0,03	0,04	98,94
	299,31 t	277,25 t	92,63	229,53	227,16	-	-	98,97

Since november 1970, Eniama refines also groundnut oil ; the quantitie until februari 1971 were :

Crude oil 45,81 t

Refined oil 41,47 t n = 90,53 %

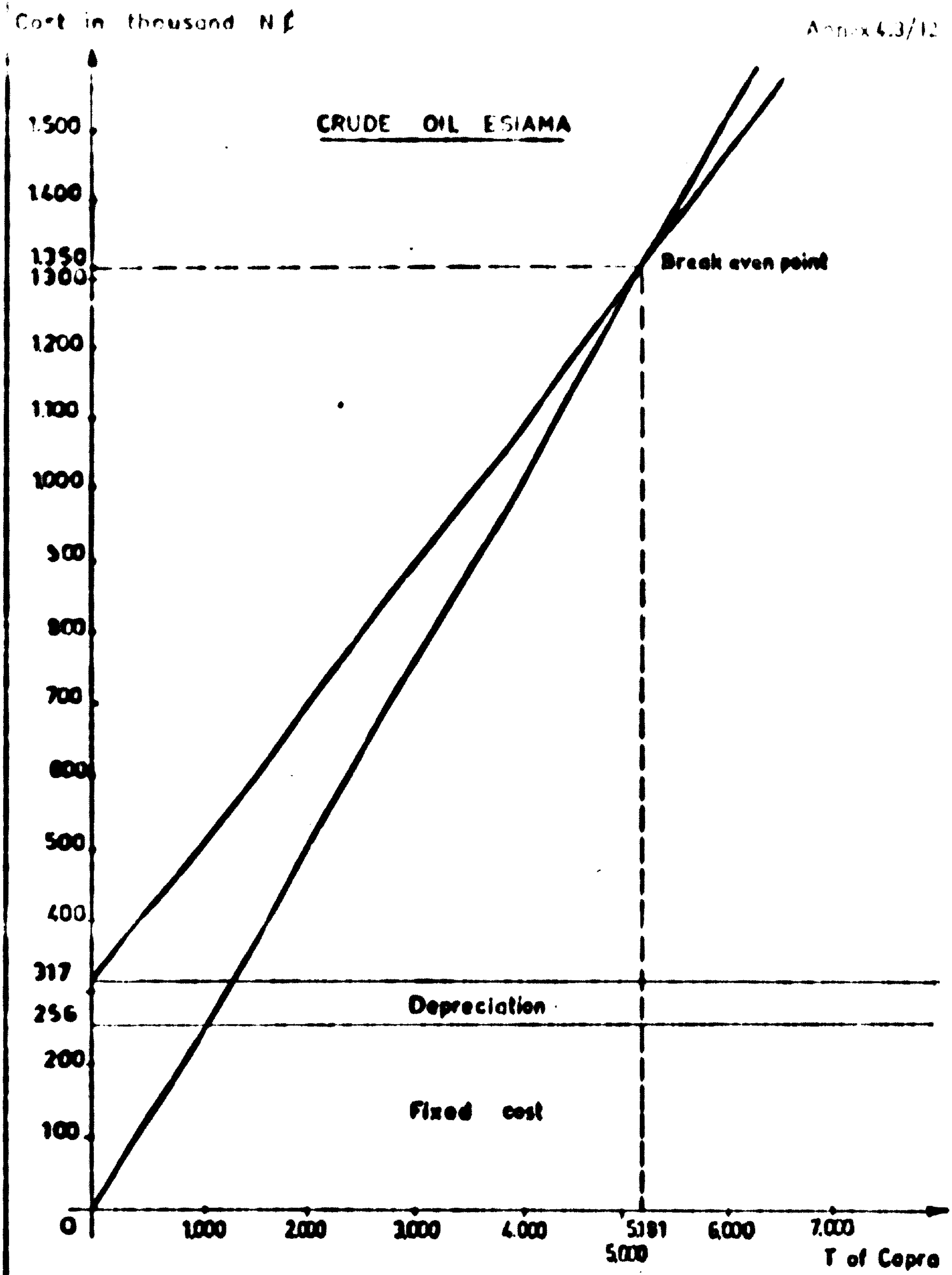
Deodorised oil 36,46 t with 36,94 t of refined oil n = 98,70 %

ESTIMATED OPERATIONAL COST VOMD 1970

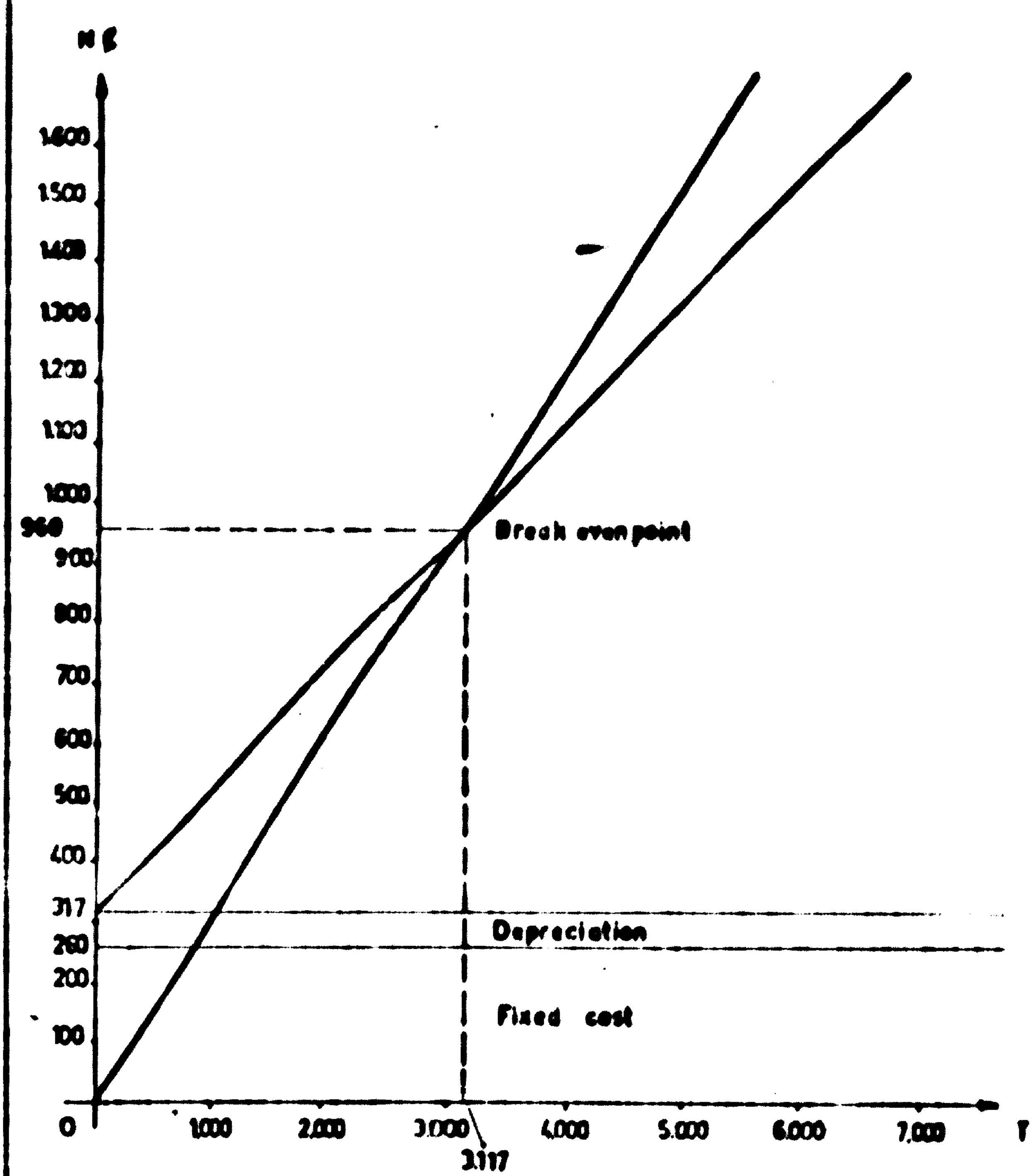
	Esiama	Tamale	Atebubu	Dunu
Factory overhead				
Salaries, wages and S.S.F.	65.000 NC	20.000 NC	14.000 NC	9.000 NC
Plant repairs and renewals	14.000	1.200	1.200	600
Power fuel and water consumed	45.000	7.000	7.000	2.503
Production sundry materials	15.000	2.500	1.500	200
Buildings repair and maintenance	3.000	1.200	1.200	200
Factory licencing and insurance	-	2.000	2.000	2.000
Factory ground rent	600	300	300	300
Chemicals consumed	600	340	340	170
Travelling and transport	3.000	1.500	1.500	1.500
Depreciation	50.000	2.000	1.500	1.500
	196.200	38.040	30.540	17.970
Transport running				
Maintenance staff salaries, wages and S.S.F.	18.000	3.000	3.000	-
Vehicles repairs and maintenance	35.000	5.000	5.000	-
Vehicles fuel and oil consumed	27.000	10.000	10.000	-
Vehicles insurance and licensing	5.000	3.000	3.000	-
Miscellaneous expenses	3.000	1.000	1.000	-

./.

	Esiama	Tamale	Atebubu	Damu
Depreciation	10.000 MF	3.000 MF	3.000 MF	-
Total	98.000	25.000	25.000	-
<u>Administration</u>				
Office salaries and SSF	17.124	13.000	7.000	-
Postages, telegrams and telephones	1.500	2.000	1.000	500
Printing and stationery	1.500	500	200	100
Bank charges	3.000	500	500	100
Office rent	-	-	-	-
Travelling and transport	1.500	1.500	1.000	200
Medical and sanatary	1.200	100	100	50
Miscellaneous	2.500	1.500	300	100
Depreciation	1.000	-	-	-
	29.324	19.100	10.100	1.050

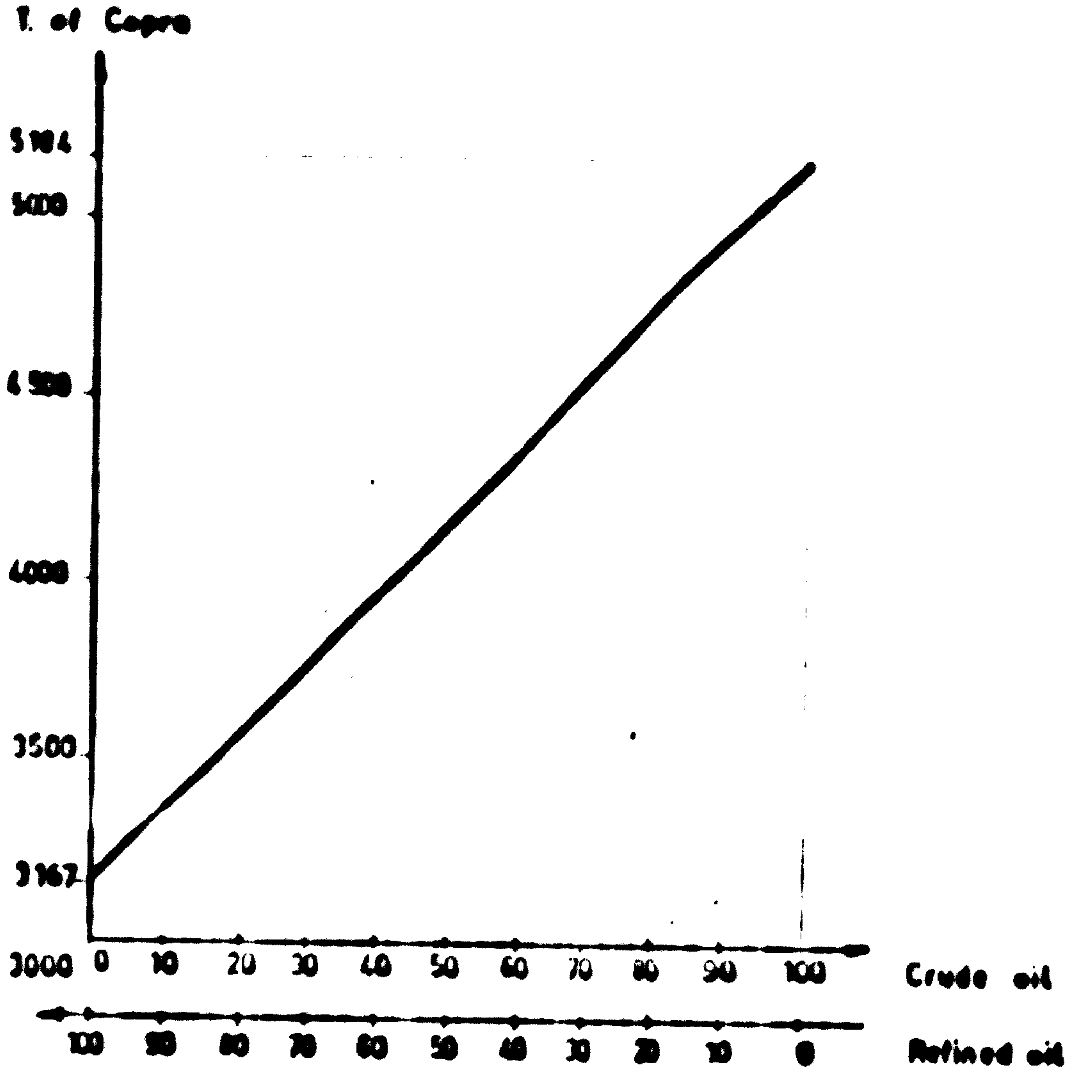

Cost in thousand N¢
CRUDE OIL ESIAMA
1.500
1.400
1.350
1.300
1.200
1.100
1000
900
800
700
600
500
400
317
256
200
100
0
Break even point
Depreciation
Fixed cost
1,000
2,000
3,000
4.000
5.181
5,000
6,000
7,000
T of Copra

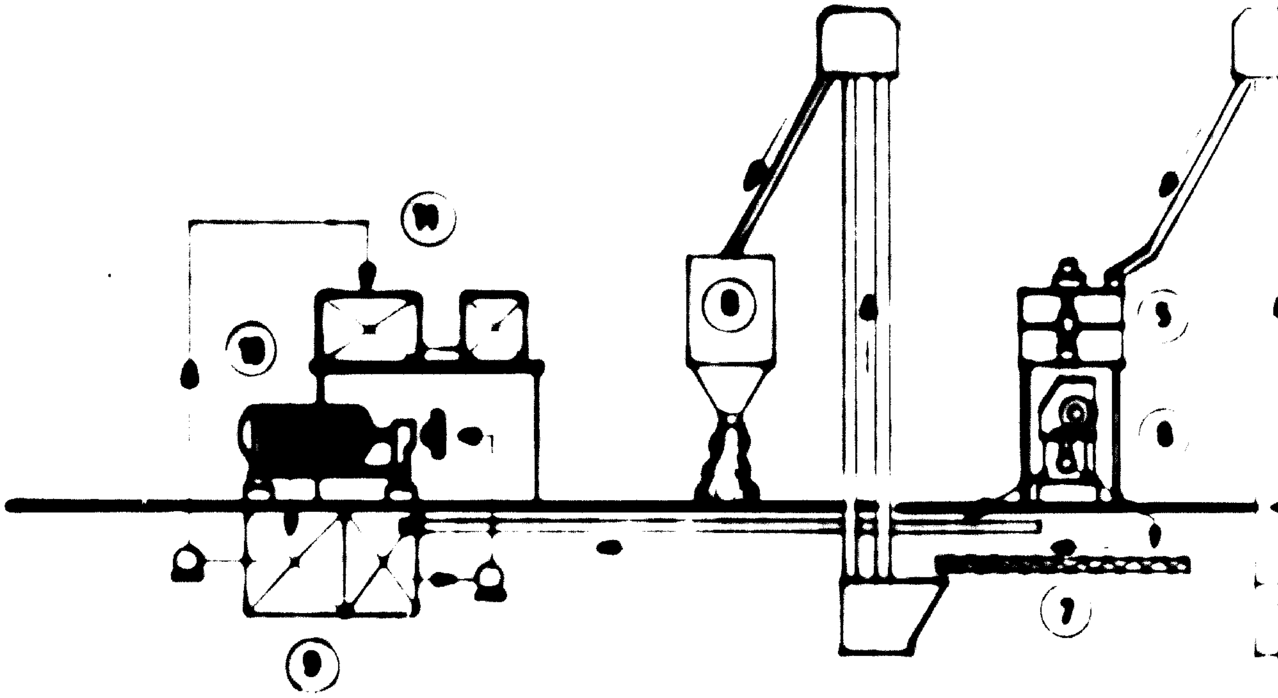
REFINED OIL ESIAMA



ESIAMA

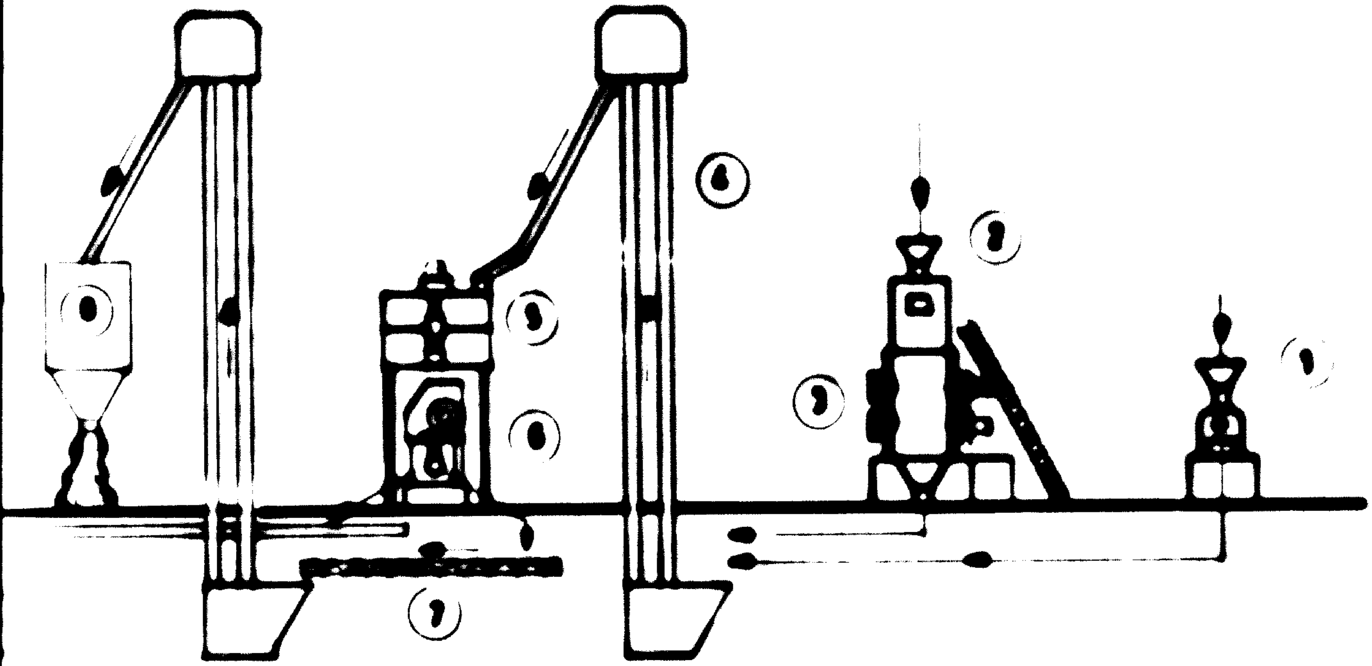
EVOLUTION OF THE VIABILITY THRESHOLED WITH PROPORTION OF REFINED OIL OR CRUDE OIL





1	copra cutter / DDR.veb. Buckau / type 2
2	disc mill / DDR.veb. Buckau / type [illegible]/1962
3	roller mill / DDR.veb. Buckau / Ø 250 . 300
4	elevator / 6 m.
5	heating kettle / DDR baujahr 1958.
6	screw press / DDR EP.
7	screw.
8	cakes silo.
9	oil tank.
10	filter press / [illegible]
11	filter oil tank.

SECTION 1



OIL MILL DIAGRAM OF:

DENU
ATEBUBU
TAMALE
BAWKU

SECTION 2

Enclosure [illegible]

TAMALE - GROUND NUTS PURCHASES (Kg)

Month	Tamale	Bawku	Bolgatanga
1970			
January	365.381	)	-
February	145.326	(28.378	-
March	99.081	) (	-
April	300.720	-	-
May	-	8.140	314
June	-	426	-
July	-	-	-
August	-	-	-
September	-	-	-
October	180.841	-	-
November	444.425	30.740	-
December	180.044	160.370	3.000
1971			
January	163.125	75.030	-
February	51.910	56.913	-
March	15.290	31.530	-

TAMALE - PRODUCTION AND ANALYSES

Month	Production on t (metric)				Working days	Raw material			Cakes		
	Ground nut	Oil	Cake	Loss		Oil %	FFA %	Moisture %	Oil %	Moisture %	FFA
1970											
January	91,71	44,59	56,62	-	18	49,20	-	-	8,70	-	-
Februari	64,53	23,91	37,77	-	15	49,20	-	-	8,20	-	-
March	85,19	39,58	49,23	-	18	48,20	-	-	4,90	-	-
April	91,35	30,56	50,13	-	16	-	-	-	-	-	-
May	72,50	27,87	39,95	-	14	-	-	4,70	-	5,30	4
June	103,71	40,76	53,51	-	19	49,50	-	4,80	9,50	4,70	3
July	110,31	40,81	55,37	2,81	19	49,10	3,06	(?)0,16	8,48	-	-
August	84,19	31,80	41,99	0,86	15	49,25	-	5,43	8,35	-	3
September	105,66	43,11	55,60	0,58	20	48,70	8,45	5,70	7,31	7,02	3
October	98,69	37,31	48,06	6,19	17	48,22	8,91	5,04	7,65	6,01	3
November	98,69	36,41	47,56	7,56	17	48,23	9,05	4,35	7,48	5,32	3
December	91,65	33,86	45,07	7,57	17	48,41	9,02	3,82	7,70	4,12	3
1971											
January	78,16	29,01	38,77	1,18	14	47,53	10,43	6,54	7,85	4,30	3
Februari	98,99	37,72	52,30	-	17	47,35	10,53	5,14	7,90	4,00	3
March	121,92	48,43	63,85	-	21	47,94	7,08	4,85	7,71	5,00	3
Total	139,25	545,73	736,78	26,75	257	48,15	8,15	5,02	7,84	5,12	3

SECTION 1

Enclosure 4.3./17

TAMALE - PRODUCTION AND ANALYSES

	Production en t (metric)				Working days	Raw material			Cakes		Oil	
	Ground nut	Oil	Cake	Loss		Oil %	FFA %	Moisture %	Oil %	Moisture %	FFA	Moisture %
70												
	91,71	44,59	56,62	-	18	49,20	-	-	8,70	-	-	-
ri	64,53	23,91	37,77	-	15	49,20	-	-	8,20	-	-	-
	85,19	39,58	49,23	-	18	48,20	-	-	4,90	-	-	-
	91,35	30,56	50,13	-	16	-	-	-	-	-	-	-
	72,50	27,87	39,95	-	14	-	-	4,70	-	5,30	4,30	0,10
	103,71	40,76	53,51	-	19	49,50	-	4,80	9,50	4,70	3,20	0,10
	110,31	40,81	55,37	2,81	19	49,10	3,06	(?)0,16	8,48	-	-	0,16
	84,19	31,80	41,99	0,86	15	49,25	-	5,43	8,35	-	3,25	0,05
ber	105,66	43,11	55,60	0,58	20	48,70	8,45	5,70	7,31	7,02	3,73	0,17
	98,69	37,31	48,06	6,19	17	48,22	8,91	5,04	7,65	6,01	3,32	0;05
r	98,69	36,41	47,56	7,56	17	48,23	9,05	4,35	7,48	5,32	3,26	0,03
r	91,65	33,86	45,07	7,57	17	48,41	9,02	3,82	7,70	4,12	3,20	0,02
71												
	78,16	29,01	38,77	1,18	14	47,53	10,43	6,54	7,85	4,30	3,50	0,03
ri	98,99	37,72	52,30	-	17	47,35	10,53	5,14	7,90	4,00	3,60	0,04
	121,92	48,43	63,85	_	21	47,94	7,08	4,85	7,71	5,00	3,50	0,03
	139,25	545,73	736,78	26,75	257	48,15	8,15	5,02	7,84	5,12	3,48	0,07

SECTION 2

Enclo.

PRODUCTION OF ATEBUBU (tons)

Month	Raw material	Oil	Cakes	Loss	Working days	Remarks	Raw material	Oil	Cakes	Loss
	1969 Palm kernels			Shortage of raw Materials or containers			1970 Ground nuts			
April	29,15	11,51	20,23	-	10	14	96,35	35,96	46,40	2,56
May	48,43	19,60	26,46	-	9	13	88,45	31,28	39,30	5,51
June	40,67	16,18	22,40	-	8	21	122,45	49,98	72,28	5,03
July	41,25	16,90	22,55	-	10	7	74,39	39,37	58,80	5,91
August	59,81	23,01	33,28	-	14	16	81,13	30,92	40,31	3,83
September	31,90	12,94	14,65	-	8	22	143,62	52,81	68,51	9,24
October	41,76	16,54	16,82	-	9	18	109,29	42,37	53,31	8,51
November	75,91	19,42	27,84	-	18	-	112,48	40,05	55,30	7,34
December	20,30	8,27	10,88	-	6	-	70,47	24,78	34,54	3,60
	1970						1971			
January	68,30	26,97	29,07	-	22	-	103,92	36,27	49,64	8,11
Februari	58,73	22,65	15,59	-	18	-	79,52	31,23	40,50	5,17
March	36,98	18,52	13,99	-	11	-	125,98	50,65	65,46	-
April							33,02	13,89	13,90	-
Total	553,19	212,51	253,76	-	143	-	1.241,07	479,56	638,25	64,81

The analyses are not available (shortage of chemicals)

SECTION 1

Enclosure 4.3/18

PRODUCTION OF ATEBUBU (tons)

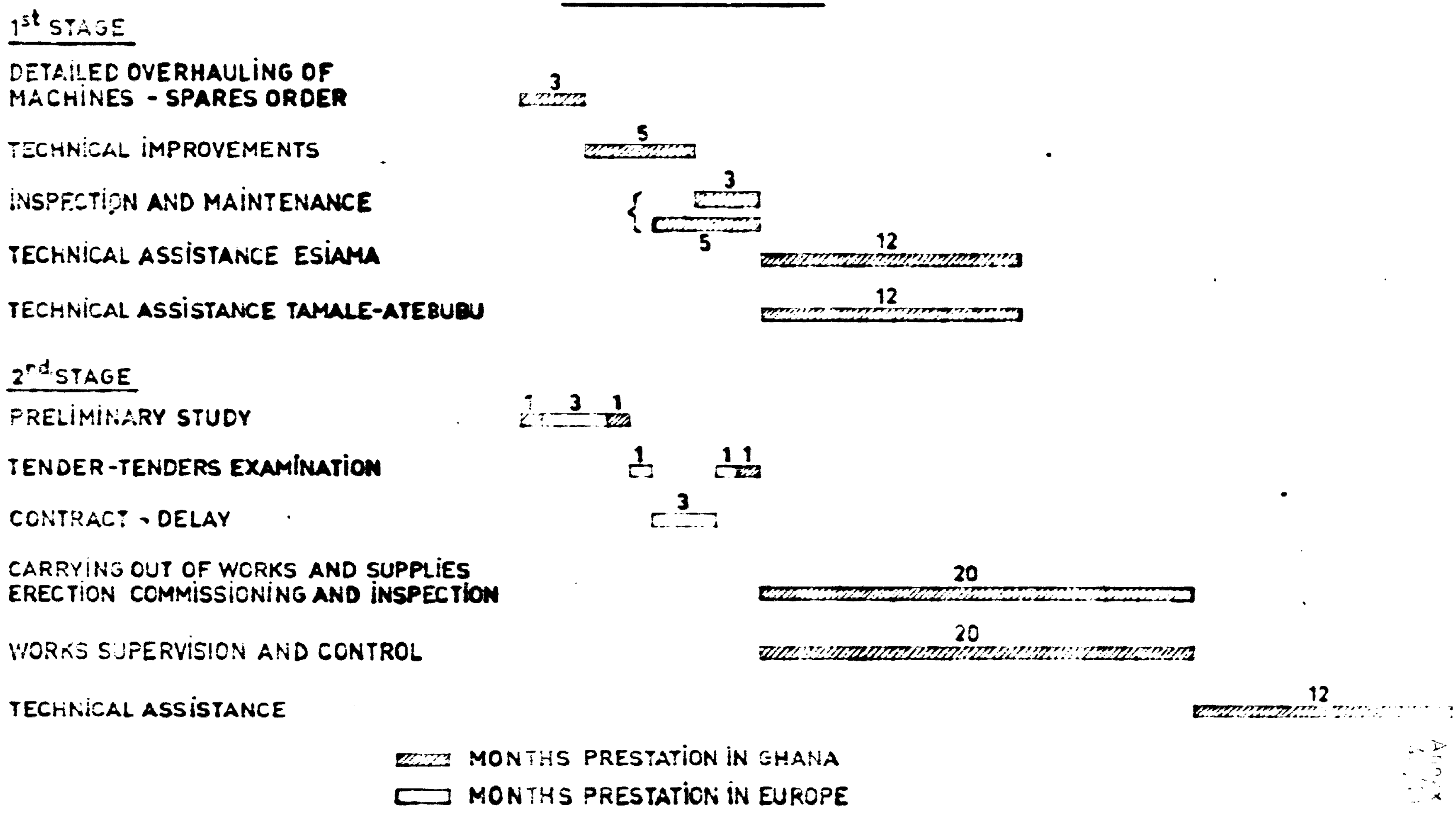
Raw material	Oil	Cakes	Loss	Working days	Remarks	Raw material	Oil	Cakes	Loss	Working days	Remarks
1969 Palm kernels			Shortage of raw Materials or containers			**1970 Ground nuts**					
29,15	11,51	20,23	-	10	14	96,35	35,96	46,40	2,56	17	-
48,43	19,60	26,46	-	9	13	88,45	31,28	39,30	5,51	12	-
40,67	16,18	22,40	-	8	21	122,45	49,98	72,28	5,03	19	-
41,25	16,90	22,55	-	10	7	74,39	39,37	58,80	5,91	18	-
59,81	23,01	33,28	-	14	16	81,13	30,92	40,31	3,83	16	-
31,90	12,94	14,65	-	8	22	143,62	52,81	68,51	9,24	19	-
41,76	16,54	16,82	-	9	18	109,29	42,37	53,31	8,51	16	-
75,91	19,42	27,84	-	18	-	112,48	40,05	55,30	7,34	17	-
20,30	8,27	10,88	-	6	-	70,47	24,78	34,54	3,60	11	-
1970						**1971**					
68,30	26,97	29,07	-	22	-	103,92	36,27	49,64	8,11	14	-
58,73	22,65	15,59	-	18	-	79,52	31,23	40,50	5,17	13	-
36,98	18,52	13,99	-	11	-	125,98	50,65	65,46	-	22	-
						33,02	13,89	13,90	-	6	-
553,19	212,51	253,76	-	143	-	1.241,07	479,56	638,25	64,81	200	-

The analyses are not available (shortage of chemicals)

SECTION 2

WORKS, SUPPLIES AND TECHNICAL ASSISTANCE

PLANNING



SELLING AND DISTRIBUTION EXPENSES

Staff salaries, wages and S.S.F.	25,000 N¢
Depots and stores rent	6,000 N¢
Advertising and sampling	10,000 N¢
Staff transport and travelling	2,000 N¢
Carriage and distribution expenses	10,000 N¢
Miscellaneous	2,000 N¢
Total/year	55,000 N¢

HEAD OFFICE EXPENSES (VOMD)

Management salaries and S.S.F.	15,000 N¢
Office staff salaries and S.S.F.	10,000 N¢
Postage, telephone and telegramm	3,000 N¢
Printing and stationery	5,000 N¢
Medical and sanitary	300 N¢
Office rent	1,200 N¢
Management and staff transport	6,000 N¢
Housing and entertainment allowances	2,000 N¢
Bank charges	5,000 N¢
Interest on GIHOC Loan (6 % on 525.000)	31,500 N¢
Interest on Barclays Loan (6,5 % on 850.000)	55,250 N¢
Share of GIHOC head quarter expenses, 1 % on turn over	23,000 N¢
Legal and audit charges	4,000 N¢

Miscellaneous	3,000 MF
Total/year	164,250 MF

TRANSPORT (Head office)

Drivers salary	900 MF
Vehicles repairs and maintenance	2,000 MF
Vehicles fuel and oil	2,000 MF
Vehicles licensing and insurance	150 MF
Miscellaneous	200 MF
Depreciation	2,000 MF
Total/year	7,250 MF

Annex 4.3/21

STANDART COST AND MARKET SALE PRICES

1. Coconuts oil

1°) Crude oil		Cost	Sale price
- Ton delivery to Lever			425.00
Production cost	352.27		
Packing in drums	6.00	358.37	
- Drums of 44 gal.			85.00
Prod. cost	62.29		
Packing	1.00		
Excise duty	4.40	67.69	
- Ton delivery to [illegible]			400.00
Prod. cost	352.37		
Packing	6.00		
Excise duty	24.90	383.27	
- Tin filling (4 gall)			9.00
Prod. cost	5.66		
Packing	1.00		
Welding	0.03		
Label	0.01		
Excise duty	0.40	7.10	

2°) Refined oil		Cost	Sale price
- Per ton refined oil			565.65
Crude oil	352.37		
Loss and labour	35.23		
Packing	6.00		
Excise duty	24.90	418.50	
- Drum filling (44 gal.)			100.00
Prod. cost	68.52		
Packing	1.00		
Excise duty	4.40	73.52	
- Tin filling (4 gal.)			11.00
Prod. cost	6.23		
Packing	1.00		
Welding	0.03		
Label	0.01		
Excise duty	0.40	7.67	
- Gallon filling			3.00
Prod. cost	1.56		
Packing and label	0.41		
Excise duty	0.10	2.07	
- Carton filling (15 lbs)			4.00
Prod. cost	2.60		
12 bottles and labels	0.93		
Carton	0.25		
Excise duty	0.17	3.95	

2. Groundnut oil

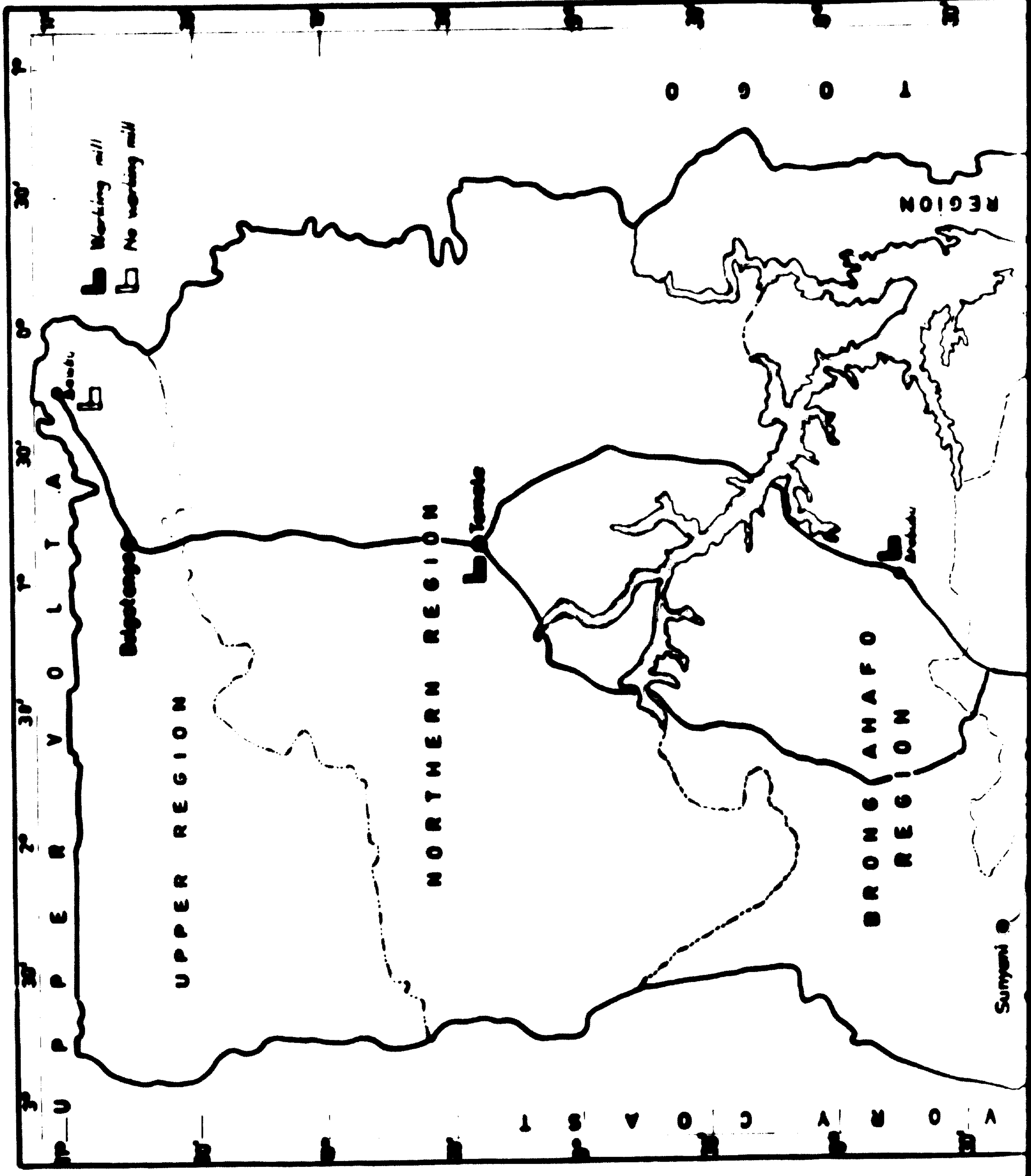
1°) Crude oil

- Per ton			769.06
Prod. cost	563.49		
Packing in drums	6.00		
Excise duty	24.90	594.39	

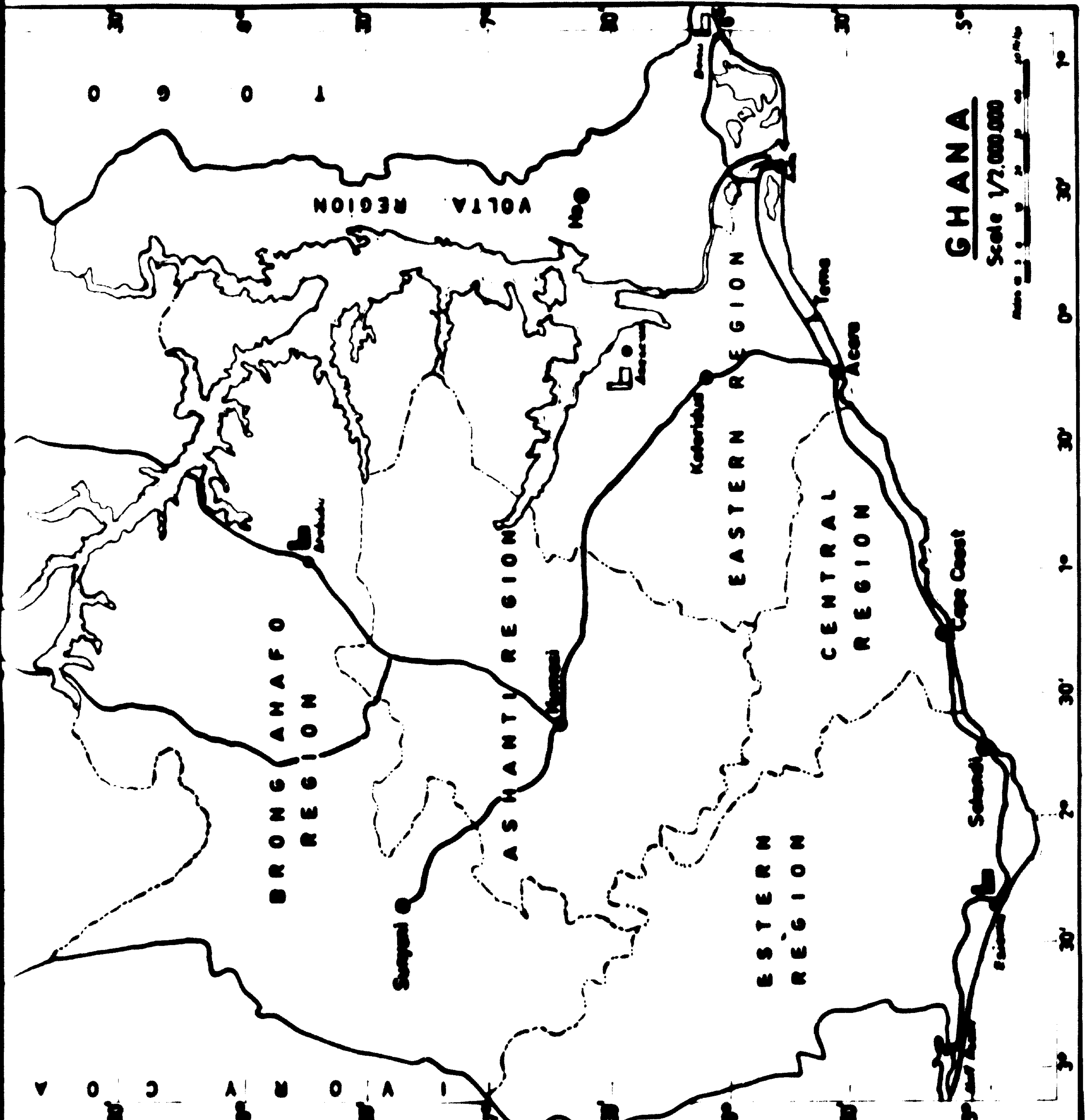
		Cost	Sale price
- Drum filling (44 gal)			135.96
Prod. cost	99.62		
Packing	1.00		
Excise duty	4.40	105.02	
- Tin filling (4 gal)			12.50
Prod. cost	9.06		
Packing welding and label	1.04		
Excise duty	0.40	10.50	

2°) Refined oil

- Per ton refined oil			907.80
Crude oil	568.00		
Loss and labour	81.00		
Packing	6.00		
Excise duty	24.90	679.90	


UPPER VOLTA
TOGO
REGION
IVORY COAST
Working mill
No working mill
UPPER REGION
NORTHERN REGION
BRONG AHAFO REGION
Bolgatanga
Tamale
Sunyani

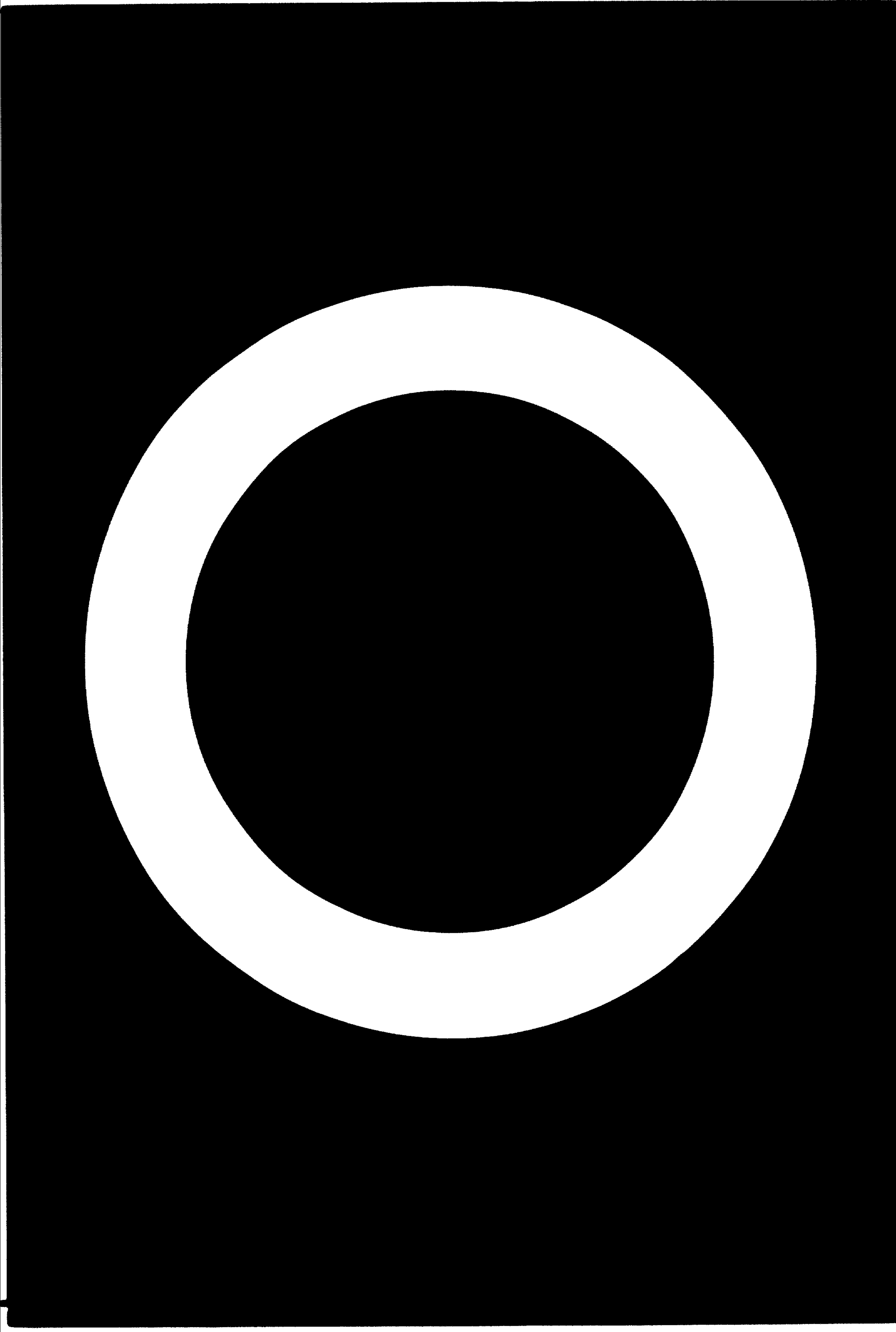
SECTION 1


GHANA
Scale 1/2,000,000
TOGO
VOLTA REGION
EASTERN REGION
CENTRAL REGION
ASHANTI REGION
BRONG AHAFO REGION
ESTERN REGION
Ho
Tema
Accra
Koforidua
Cape Coast
Sekondi
Sunyani

SECTION 2

MAP:
'ESIAMA
OIL MILL PLAN'

NOT
PHOTOGRAPHED.



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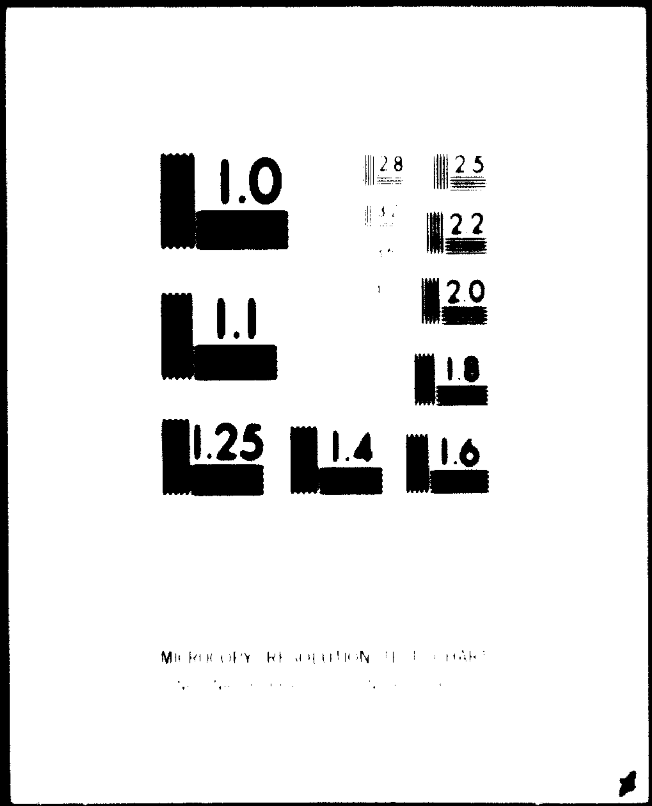
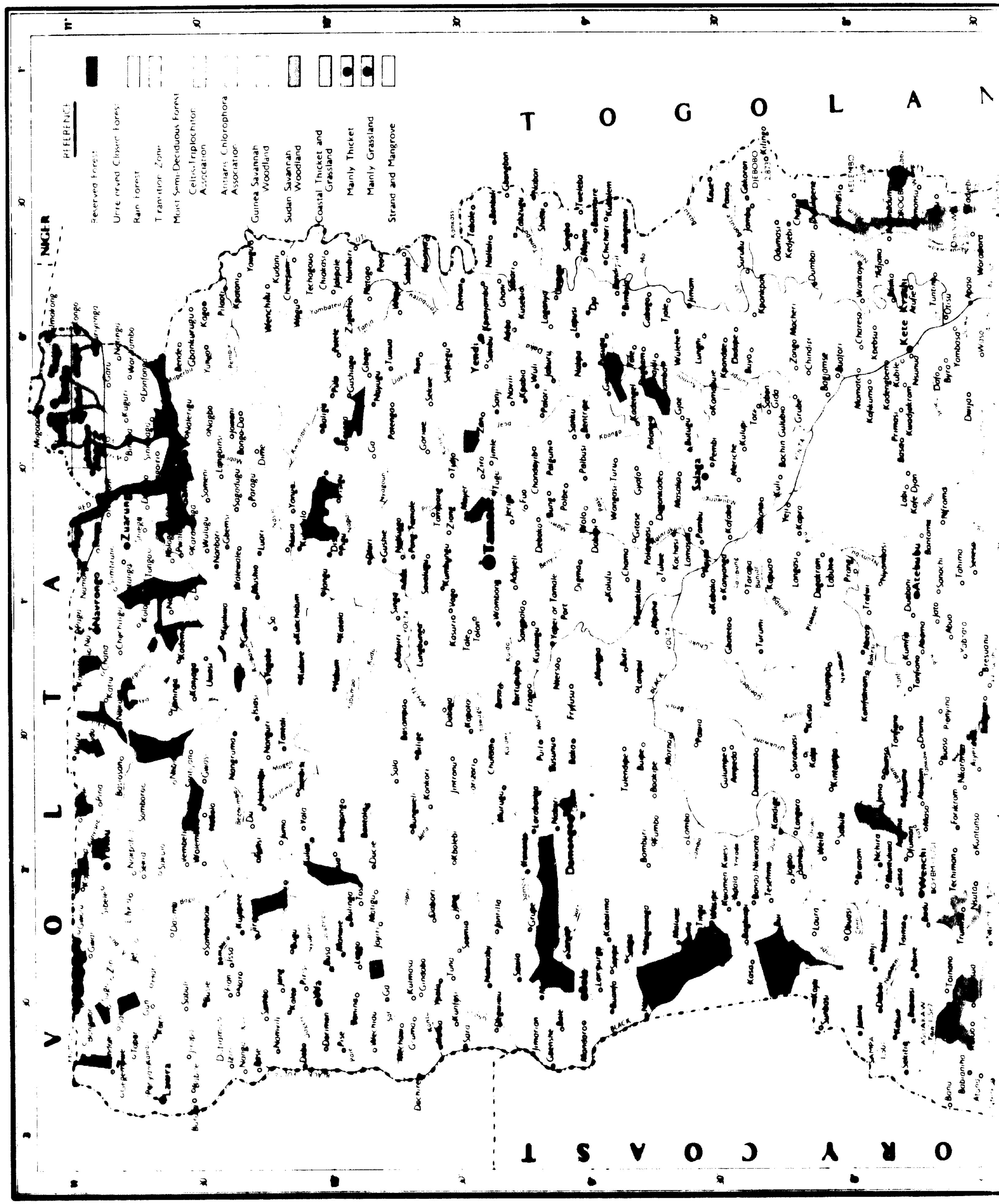
5 OF 5

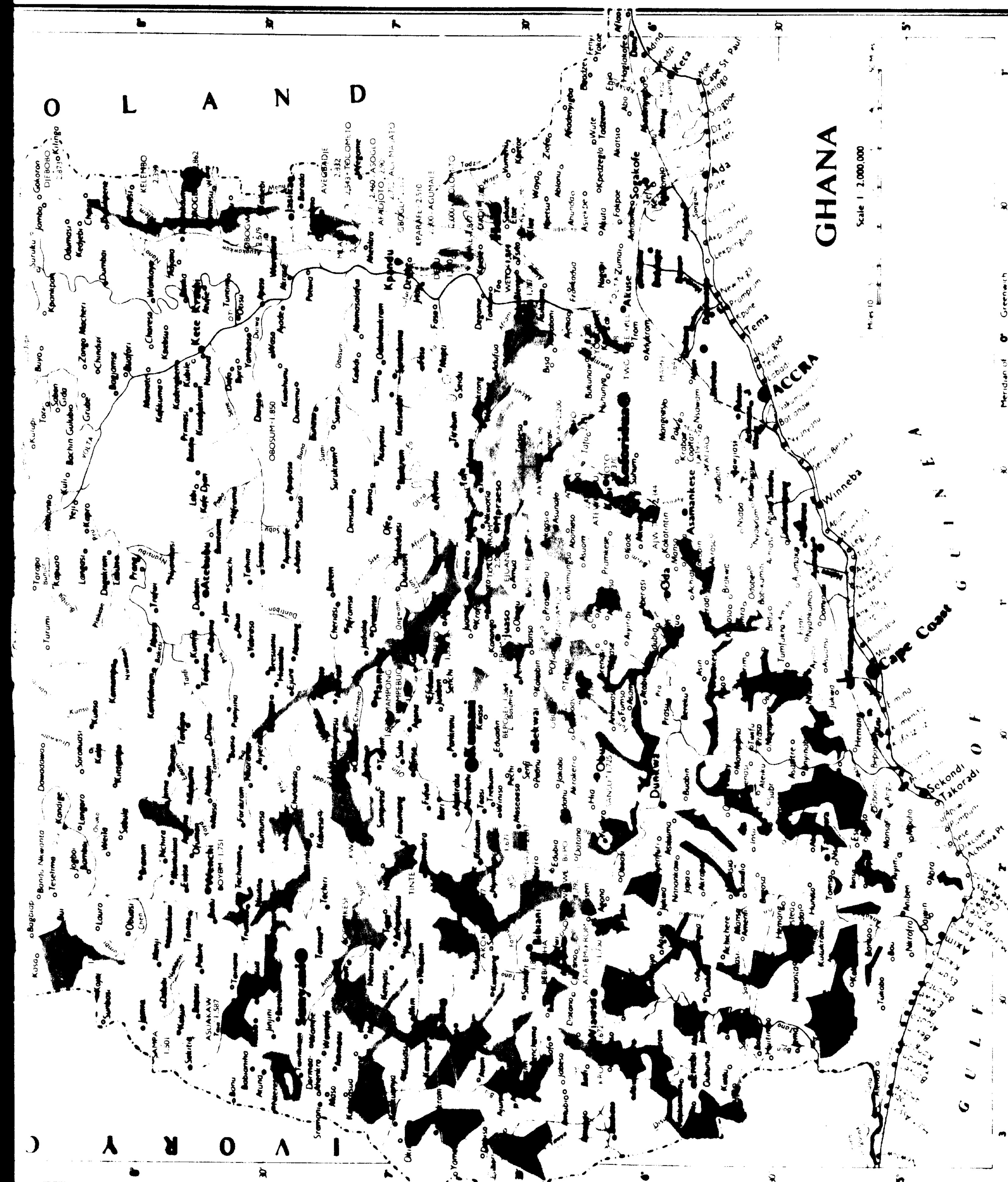


24x
E

VEGETATION ZONES

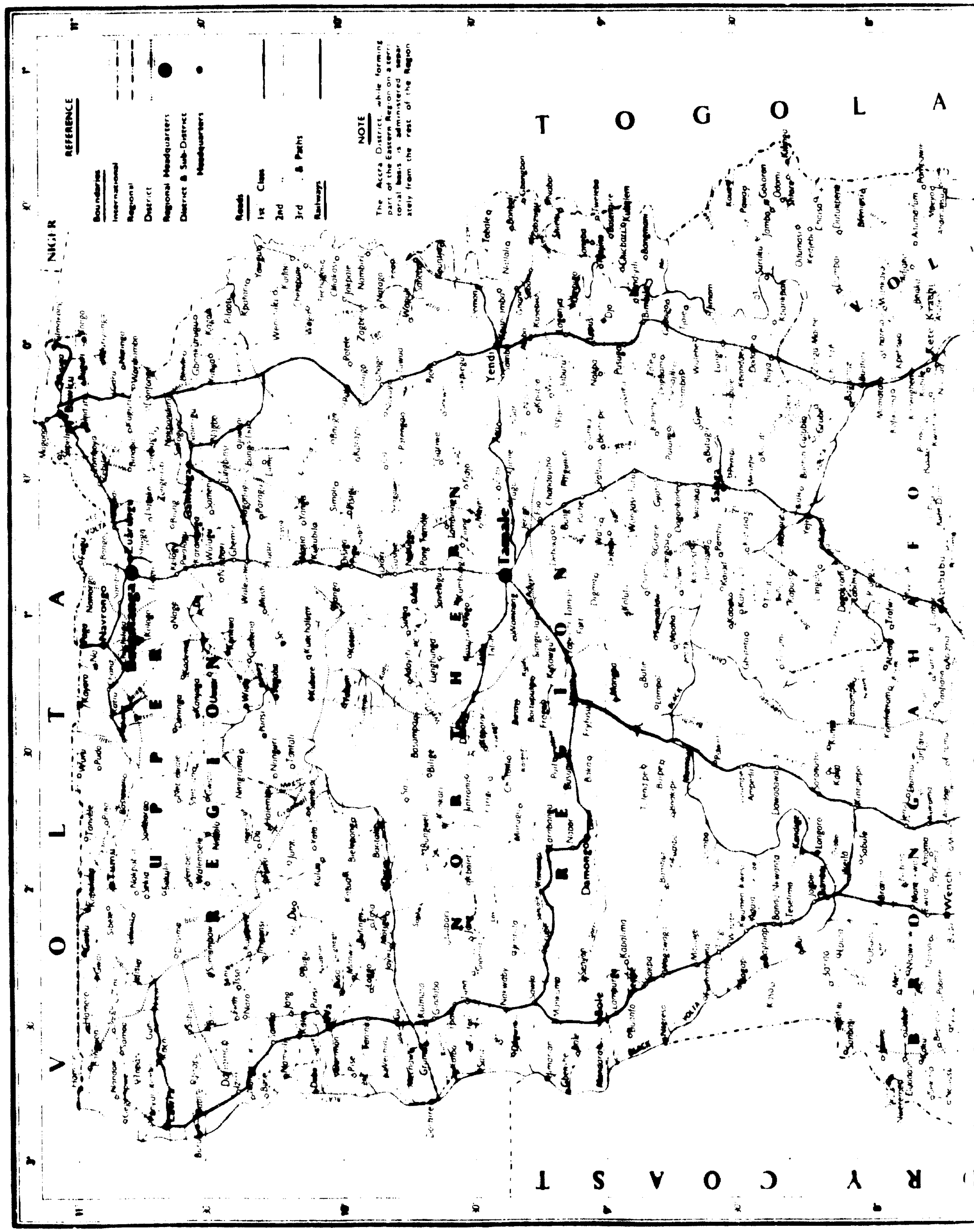


SECTION 1

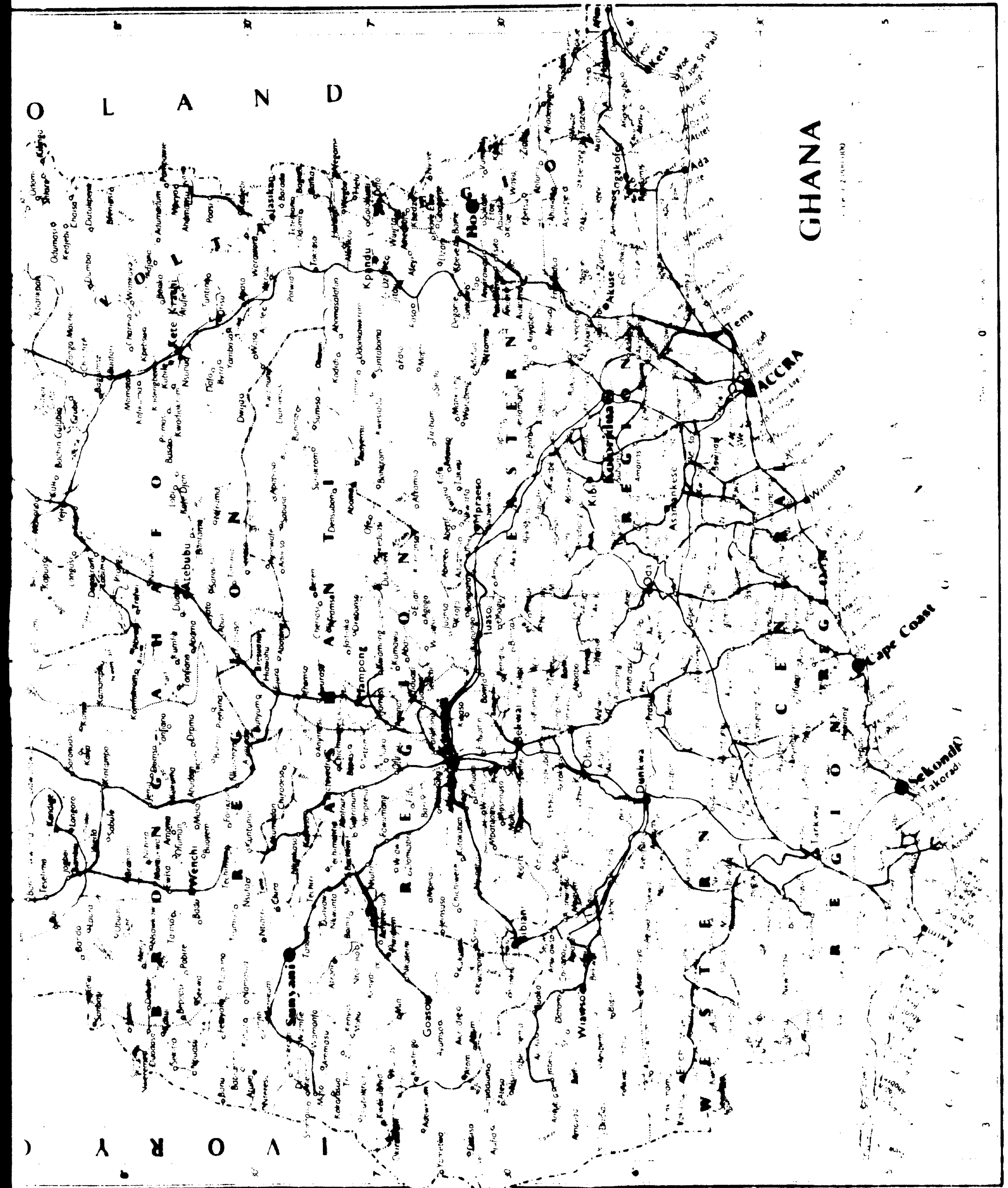


SECTION 2

ADMINISTRATIVE



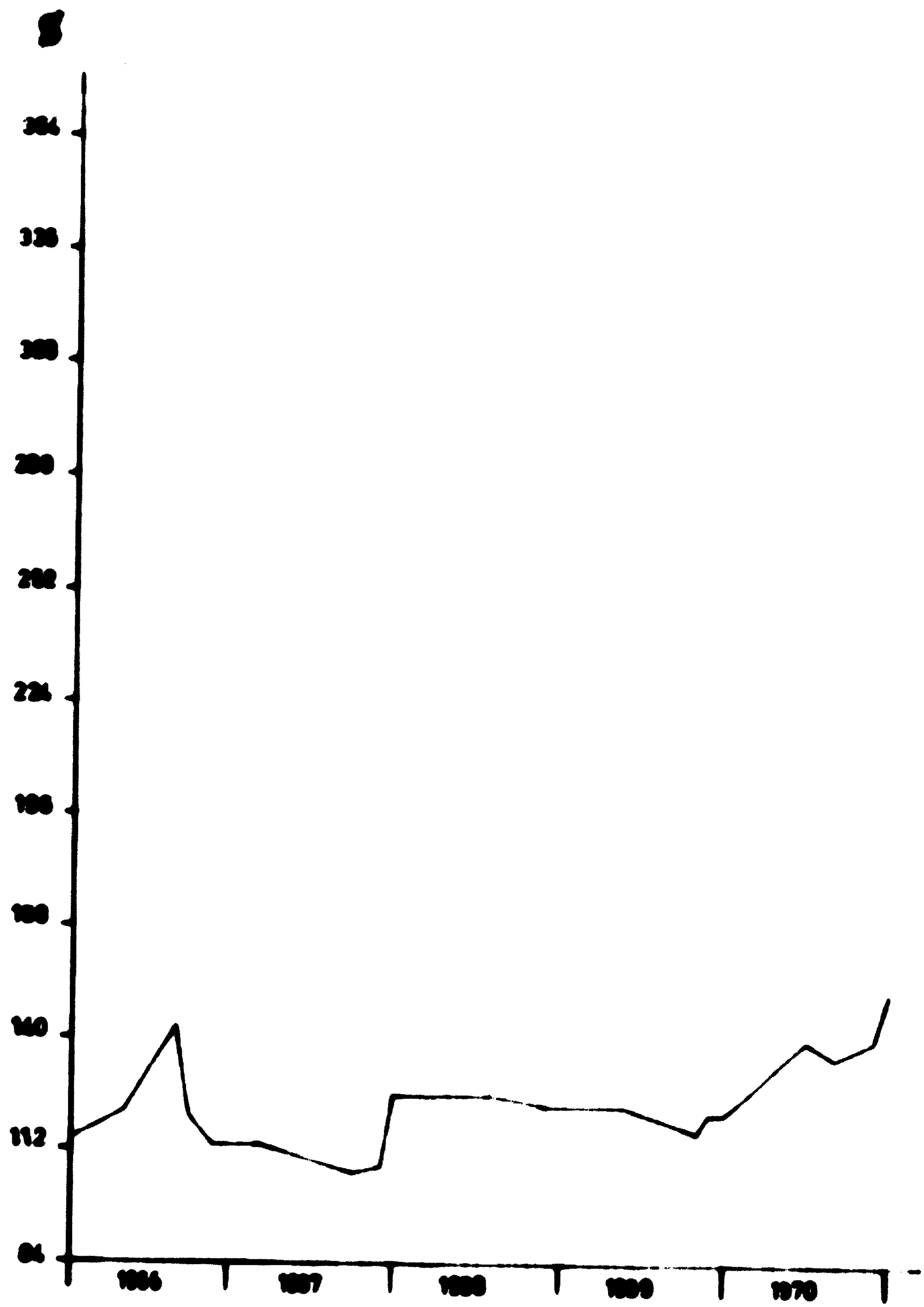
SECTION 1



SECTION 2

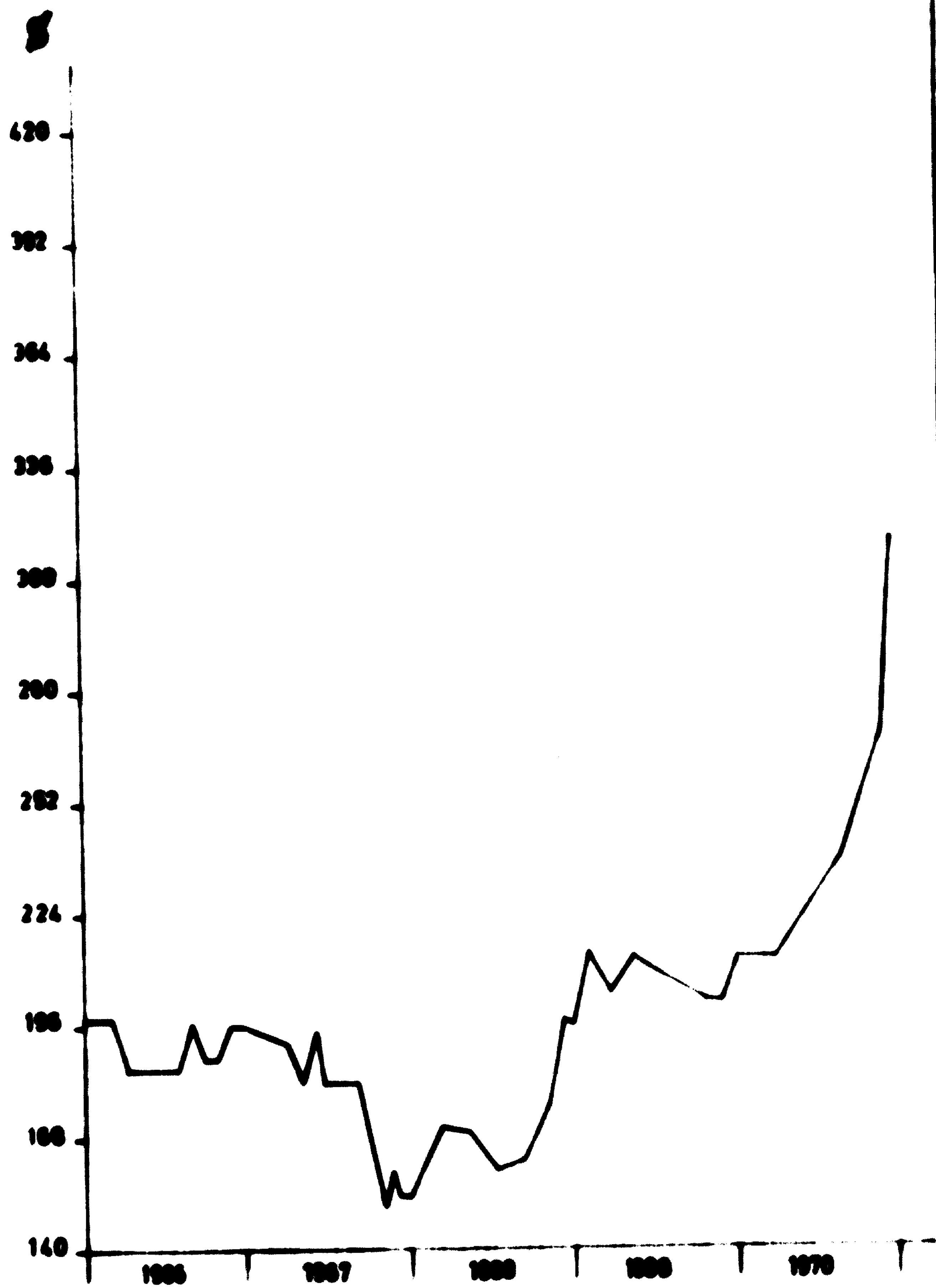
GRAPH. 1

EVOLUTION OF SOJA BEANS MARKET PRICES



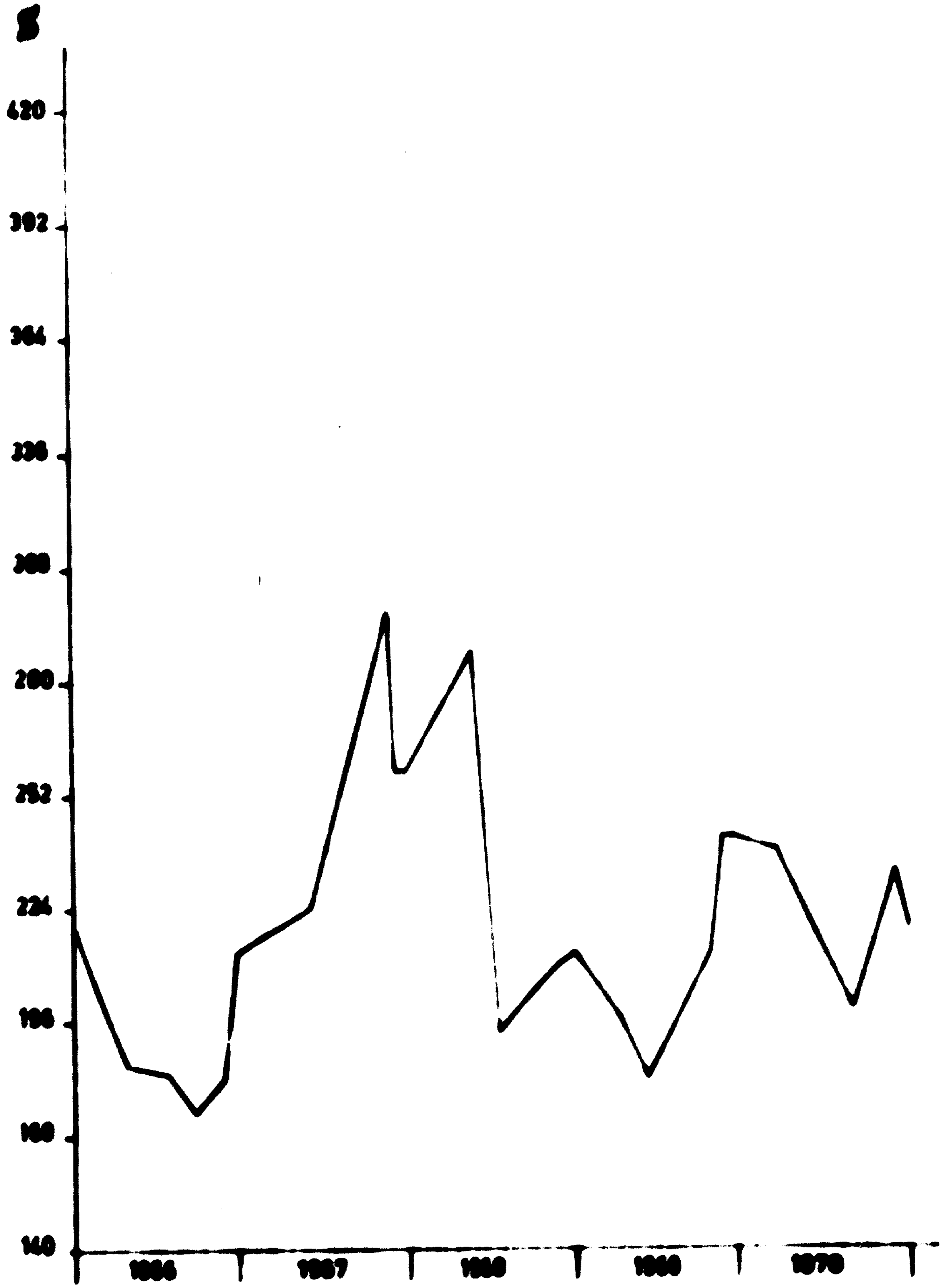
GRAPH. 2

EVOLUTION OF GROUNDNUTS MARKET PRICES



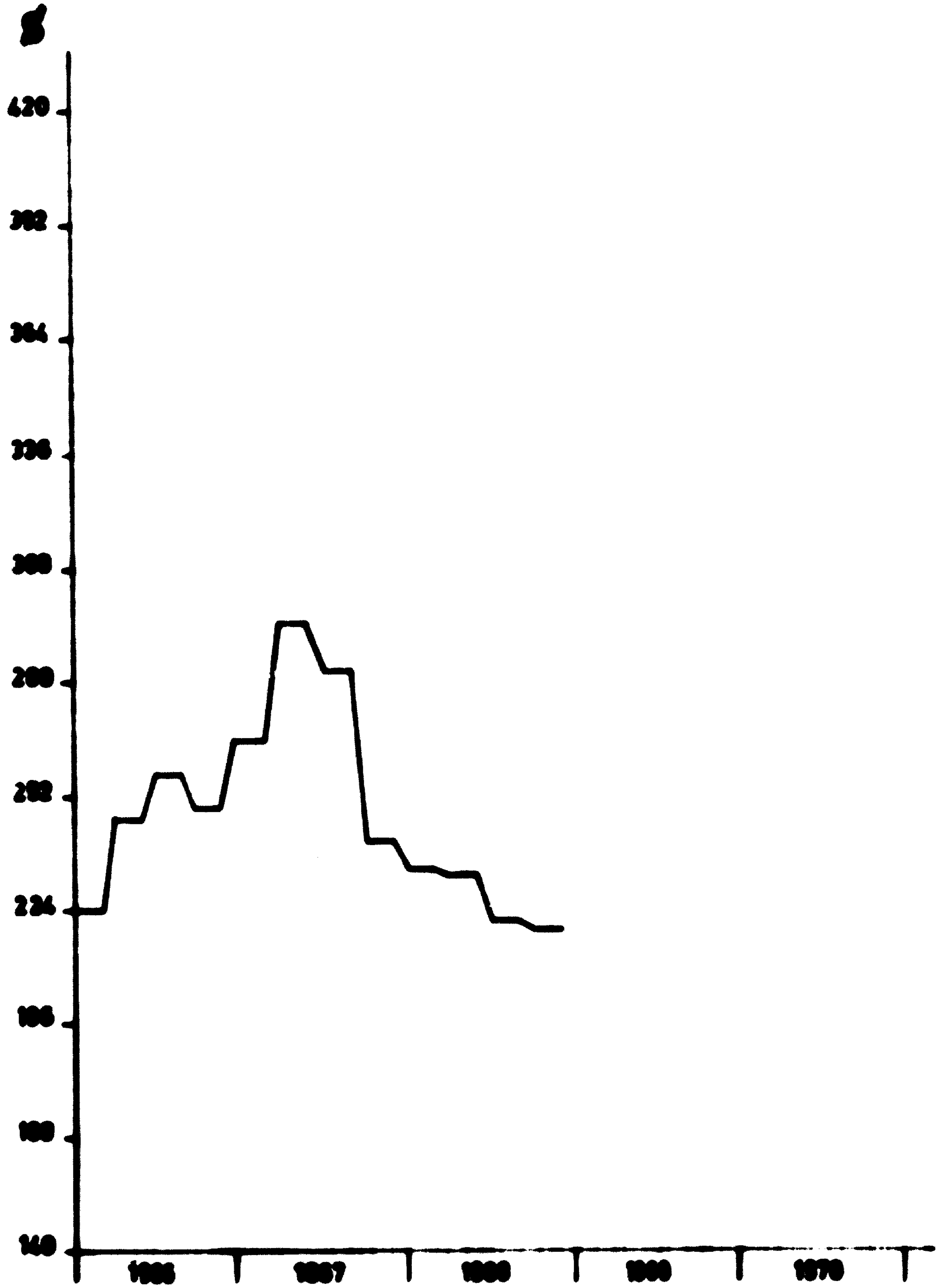
GRAPH. 3

EVOLUTION OF COPRA MARKET PRICES



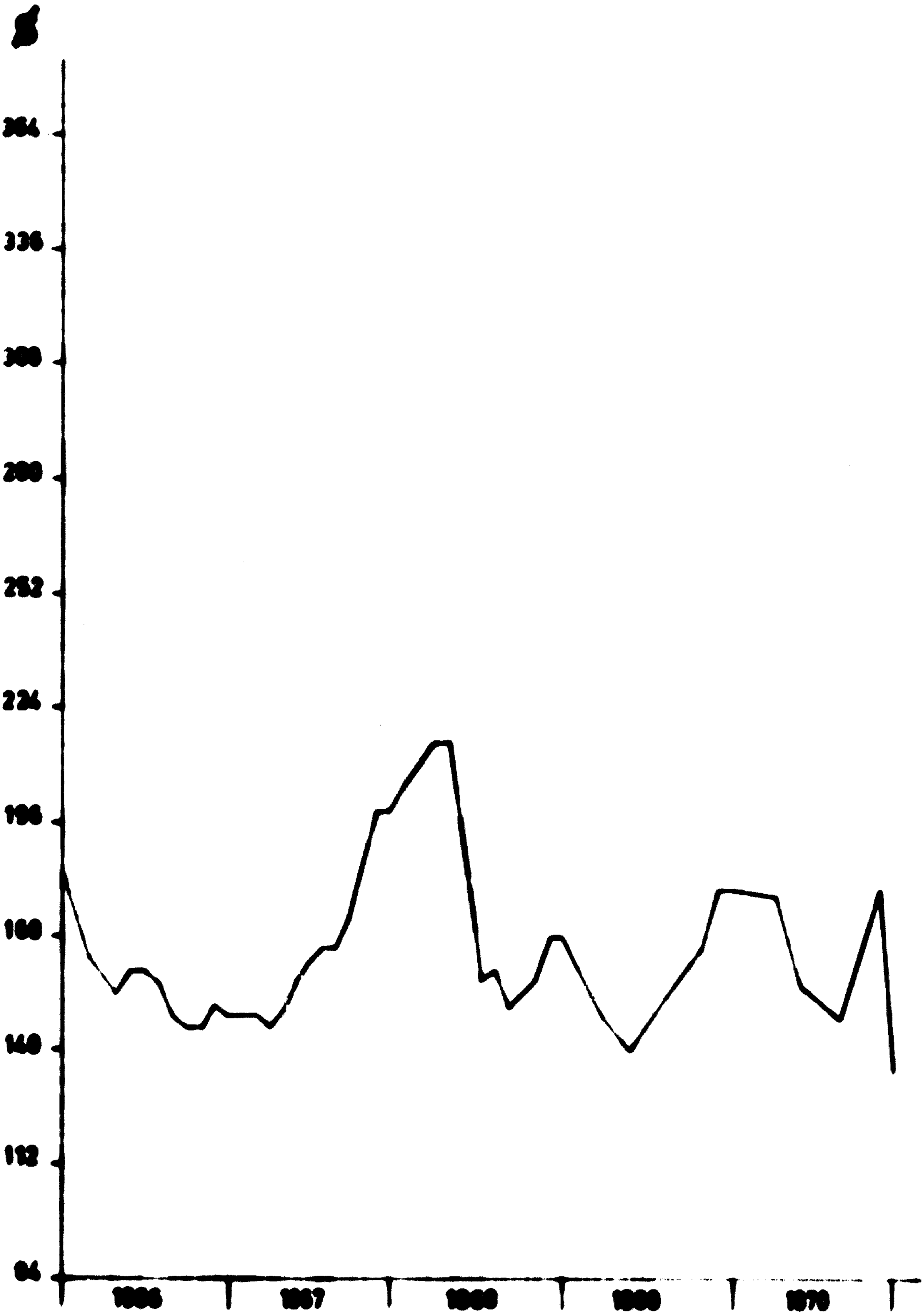
GRAPH. 6

EVOLUTION OF SESAME SEEDS MARKET PRICES



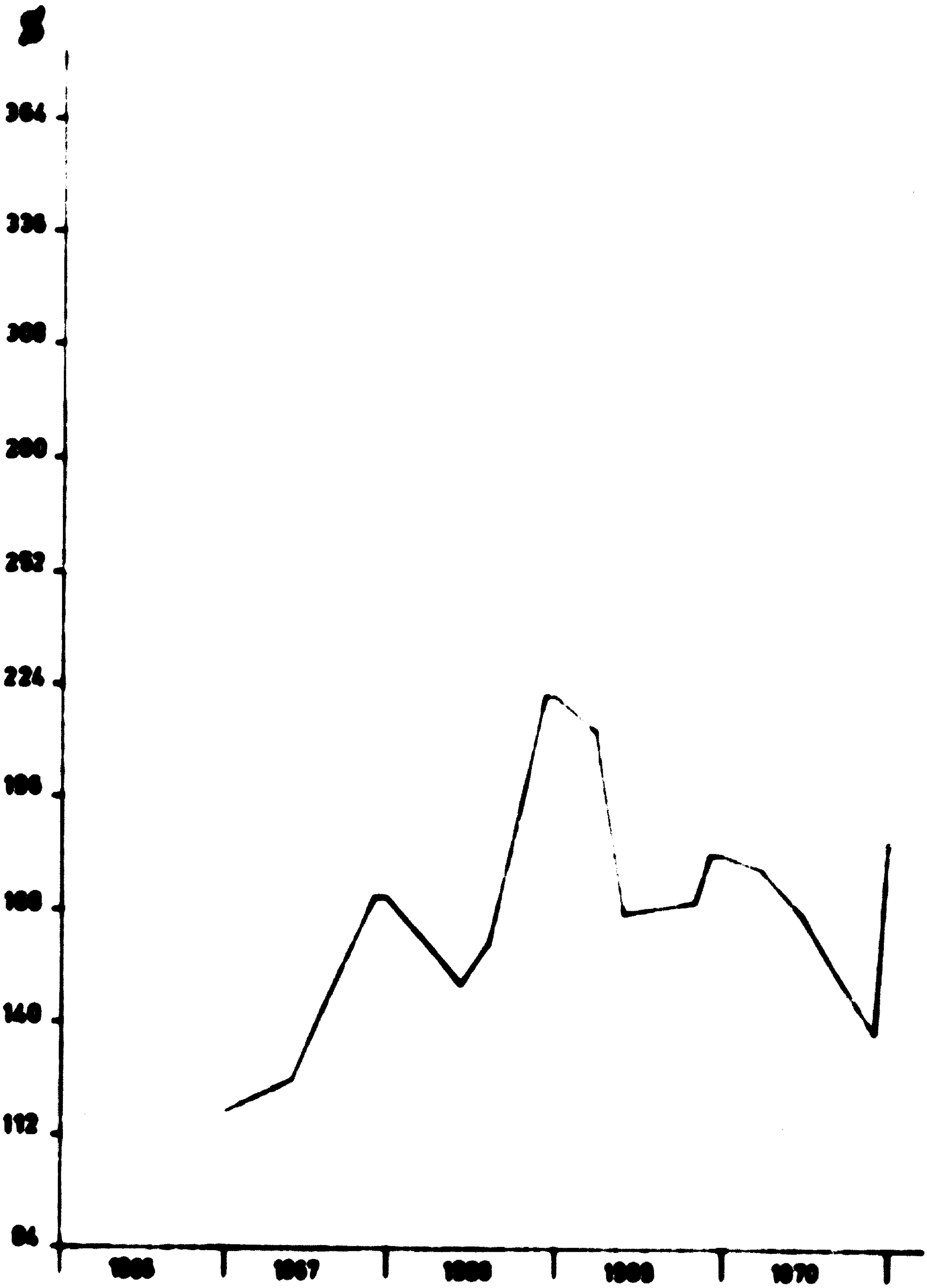
GRAPH. 5

EVOLUTION OF PALM KERNELS MARKET PRICES



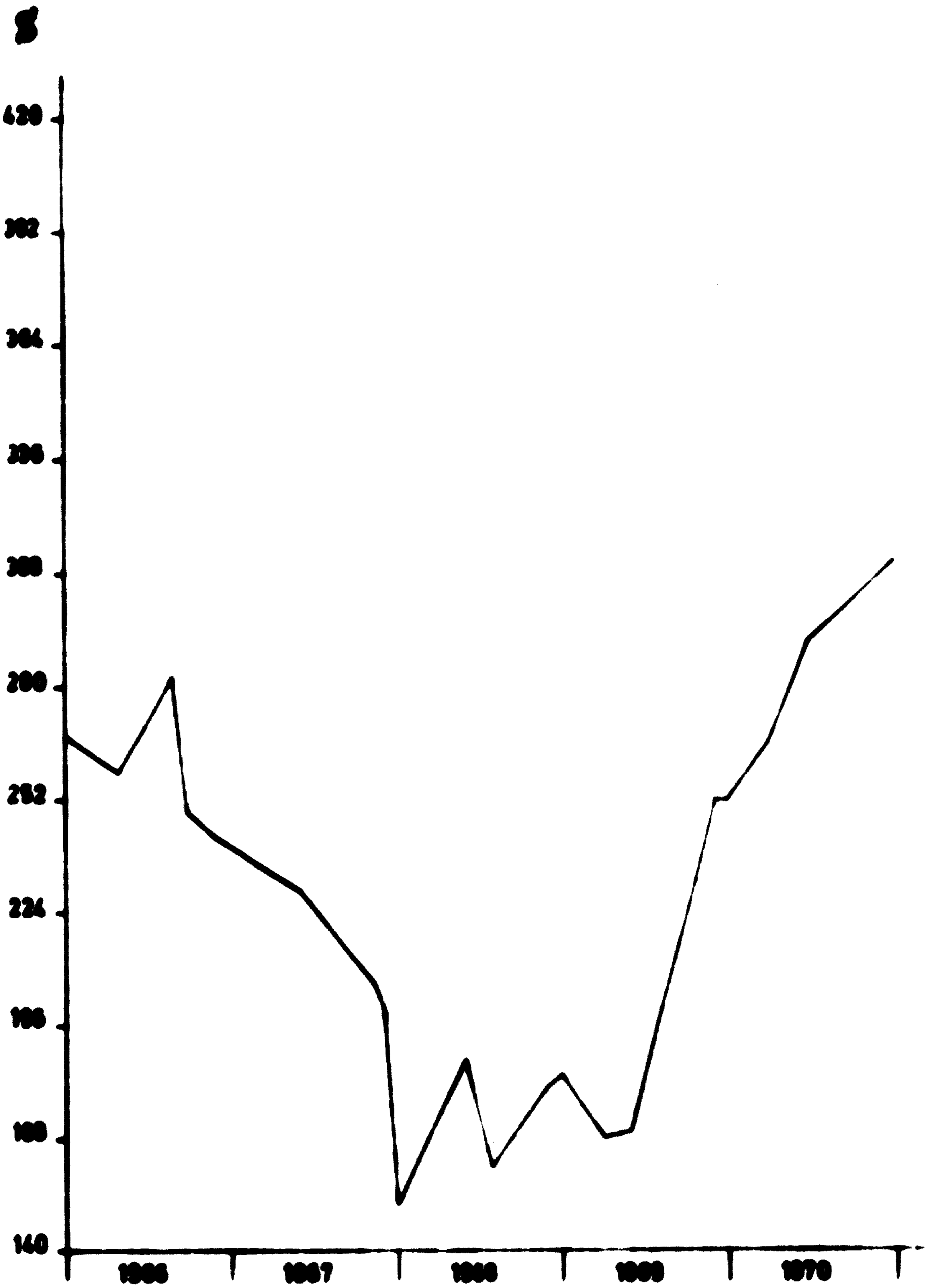
GRAPH. 6

<u>EVOLUTION OF SHEANUTS MARKET PRICES</u>



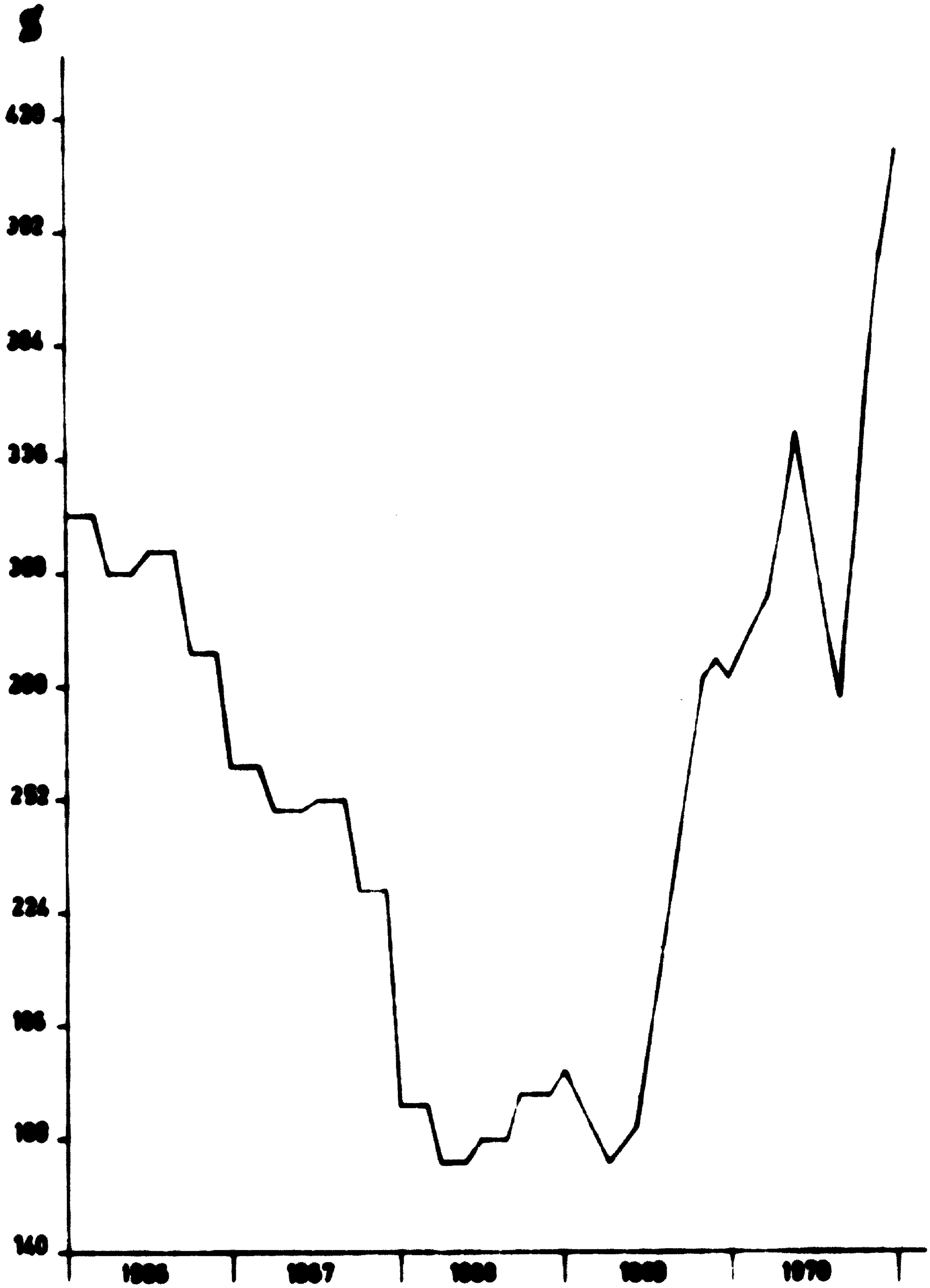
GRAPH. 7

EVOLUTION OF SOJA OIL MARKET PRICES



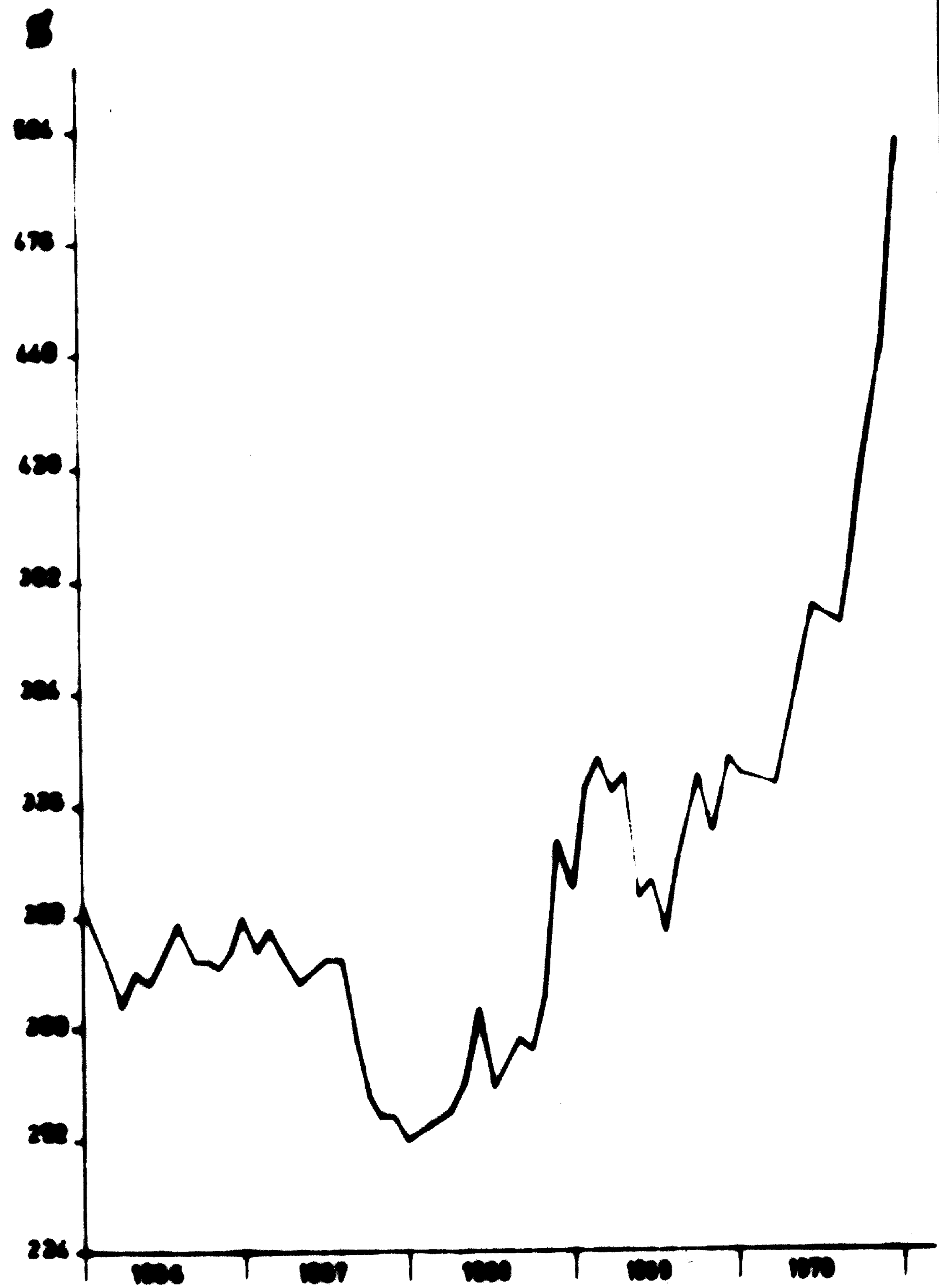
GRAPH. 8

EVOLUTION OF SUNFLOWER OIL MARKET PRICES



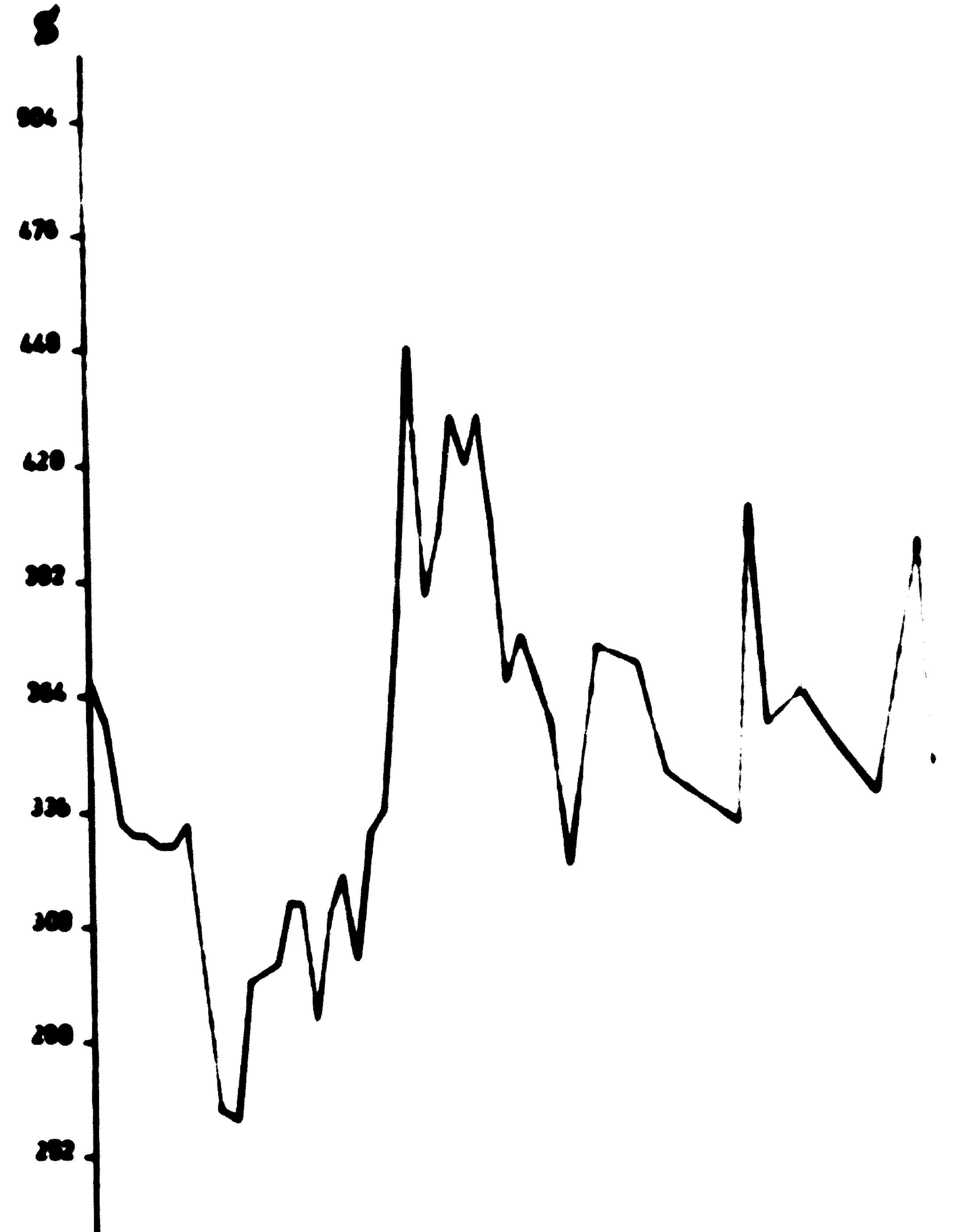
GRAPH. 9

EVOLUTION OF GROUNDNUT OIL MARKET PRICES

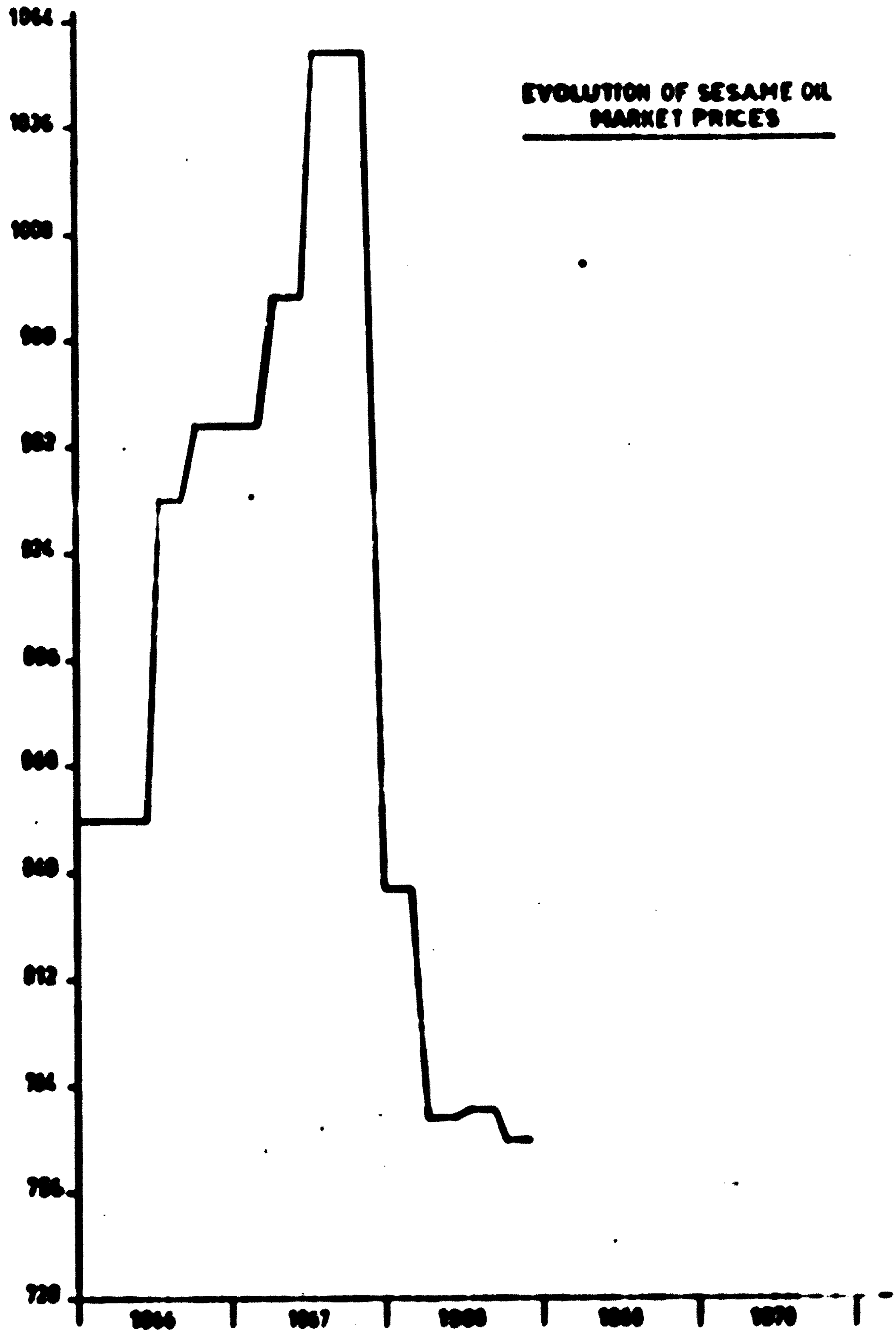


GRAPH. 10

EVOLUTION OF COCONUT OIL MARKET PRICES

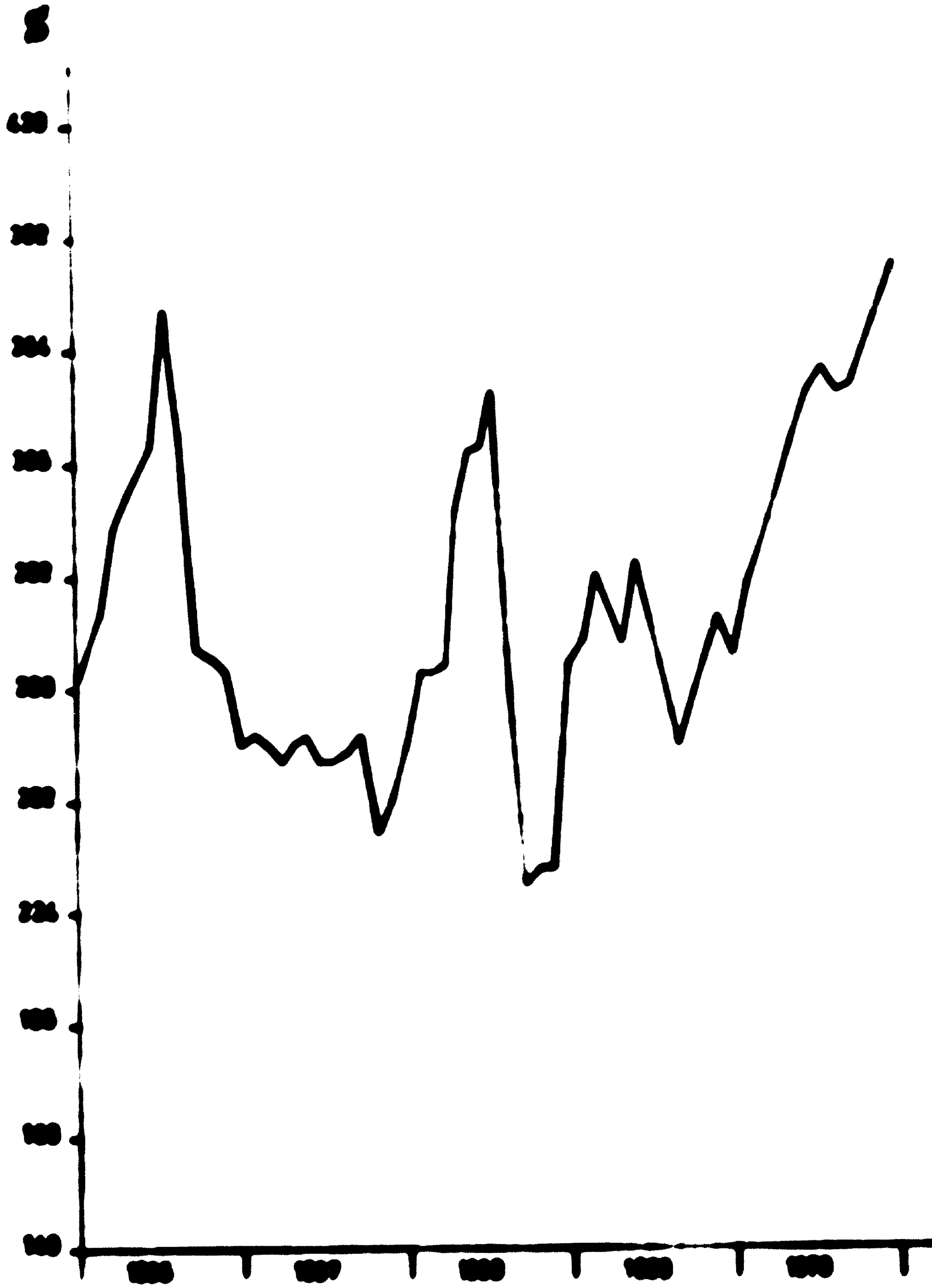


GRAPH. 11



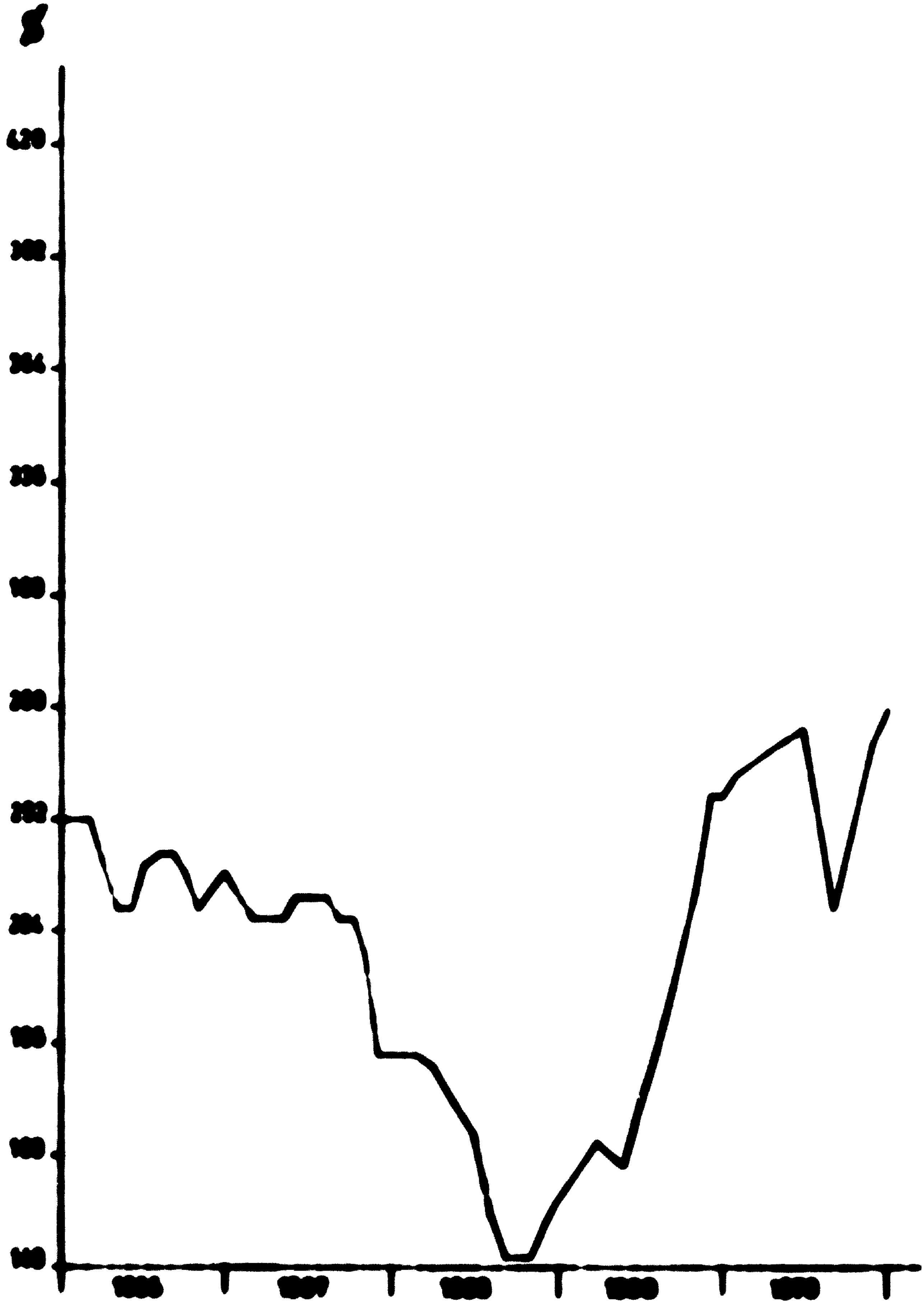
GRAPH. 12

EVOLUTION OF COTON OIL MARKET PRICES



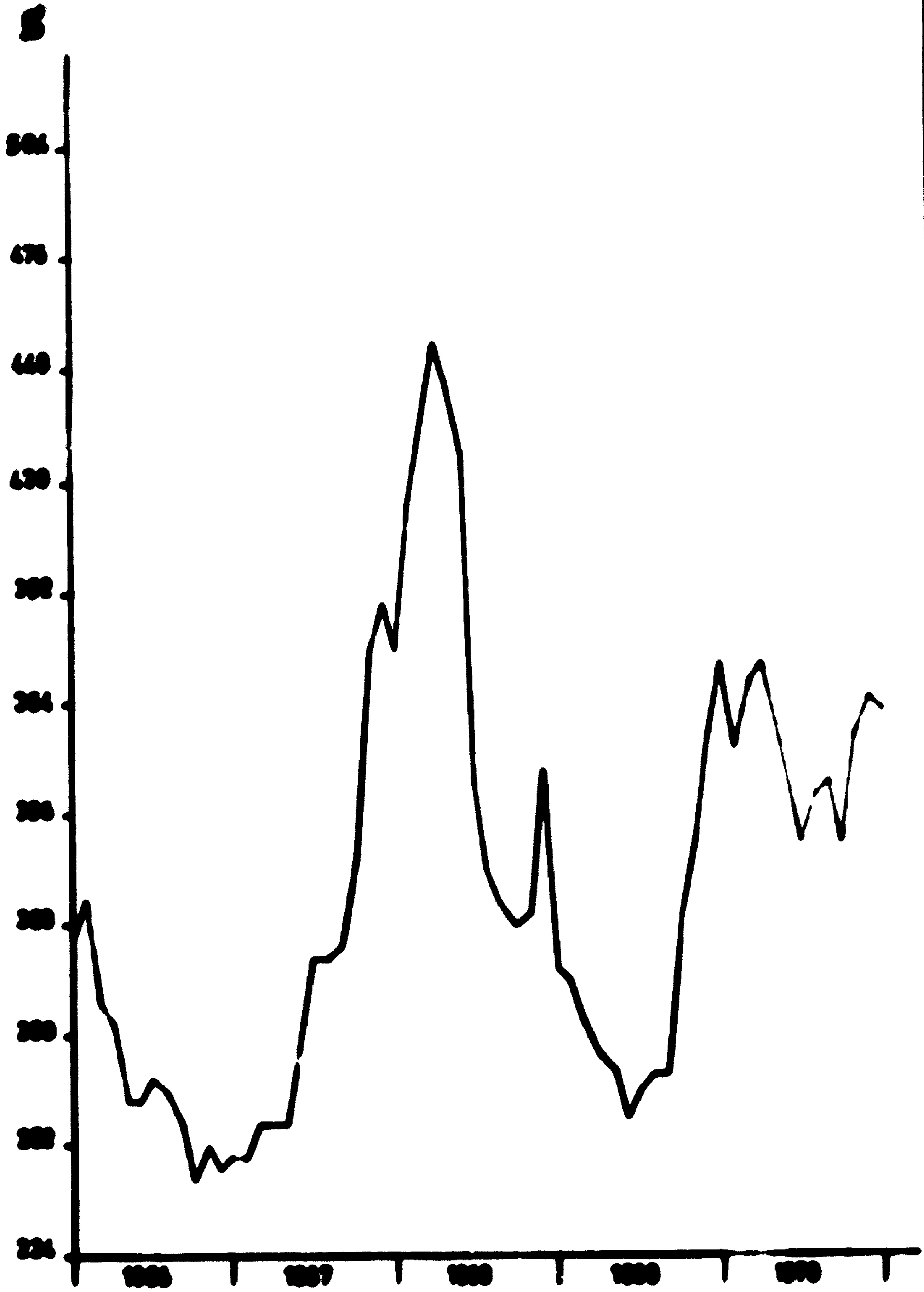
GRAPH. 13

EVOLUTION OF PALM OIL MARKET PRICES



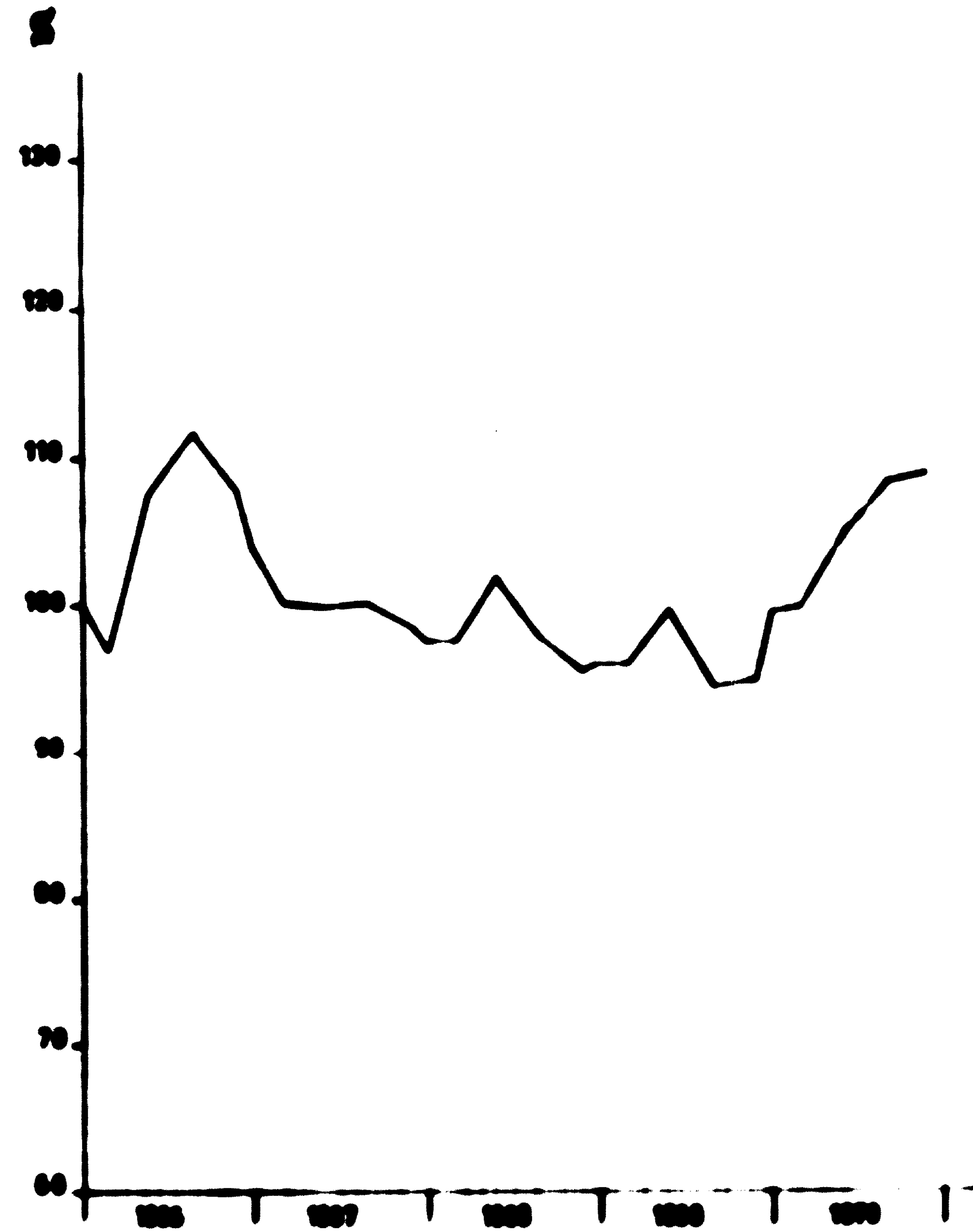
GRAPH. 14

EVOLUTION OF PALM KERNELS OIL MARKET PRICES

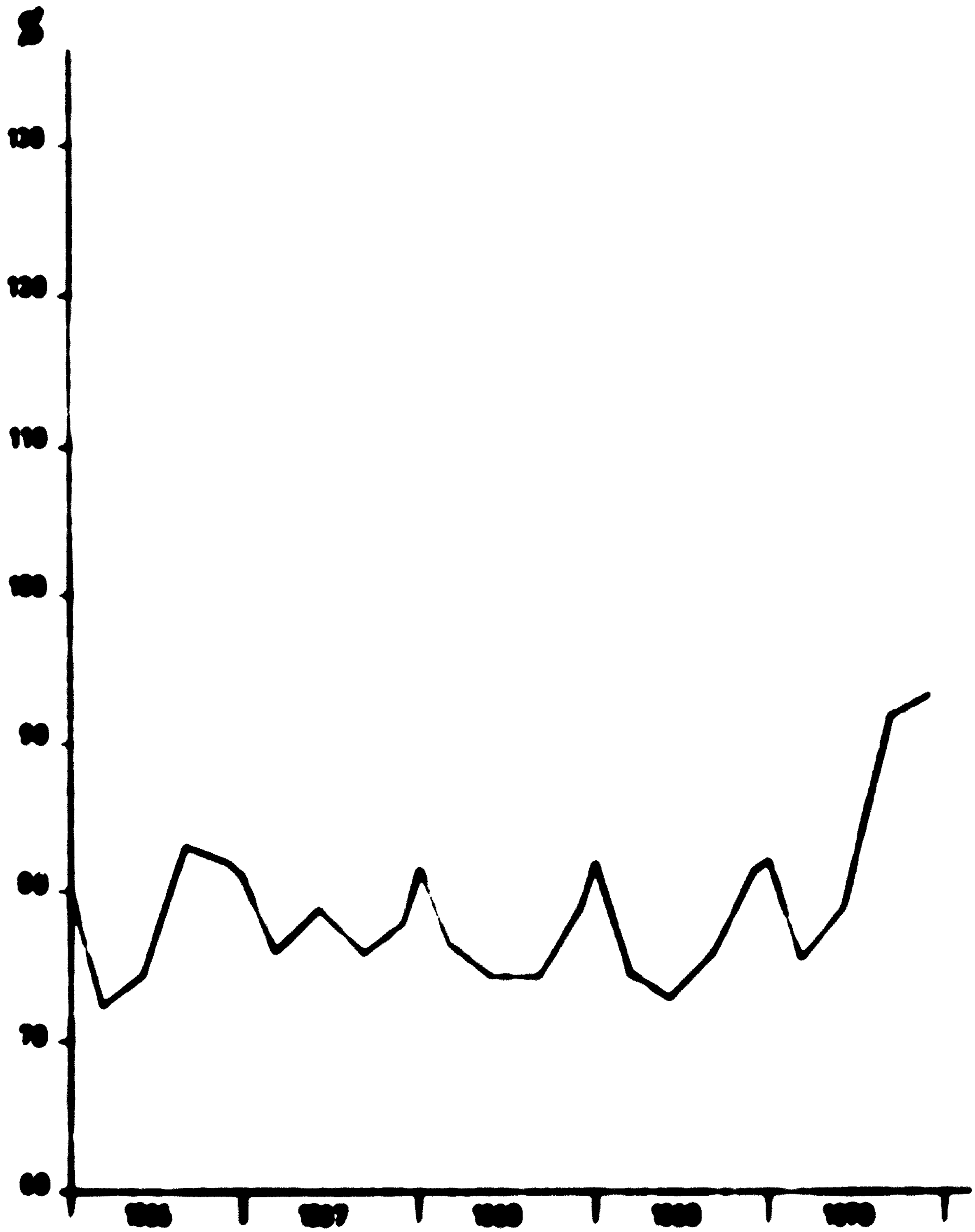


GRAPH.15

EVOLUTION OF SOJA CAKE MARKET PRICES

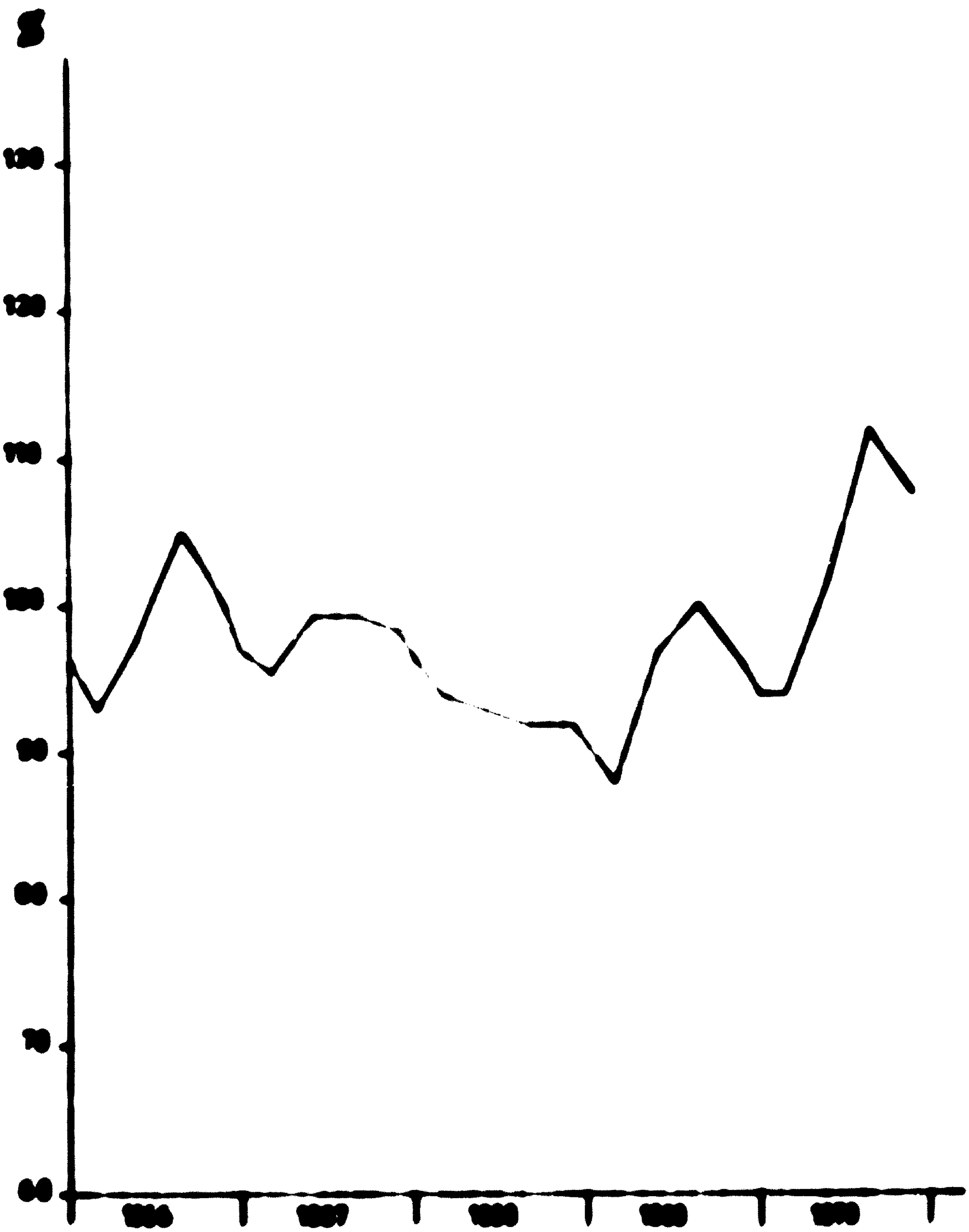


EVOLUTION OF SUNFLOWER CAKE MARKET PRICES



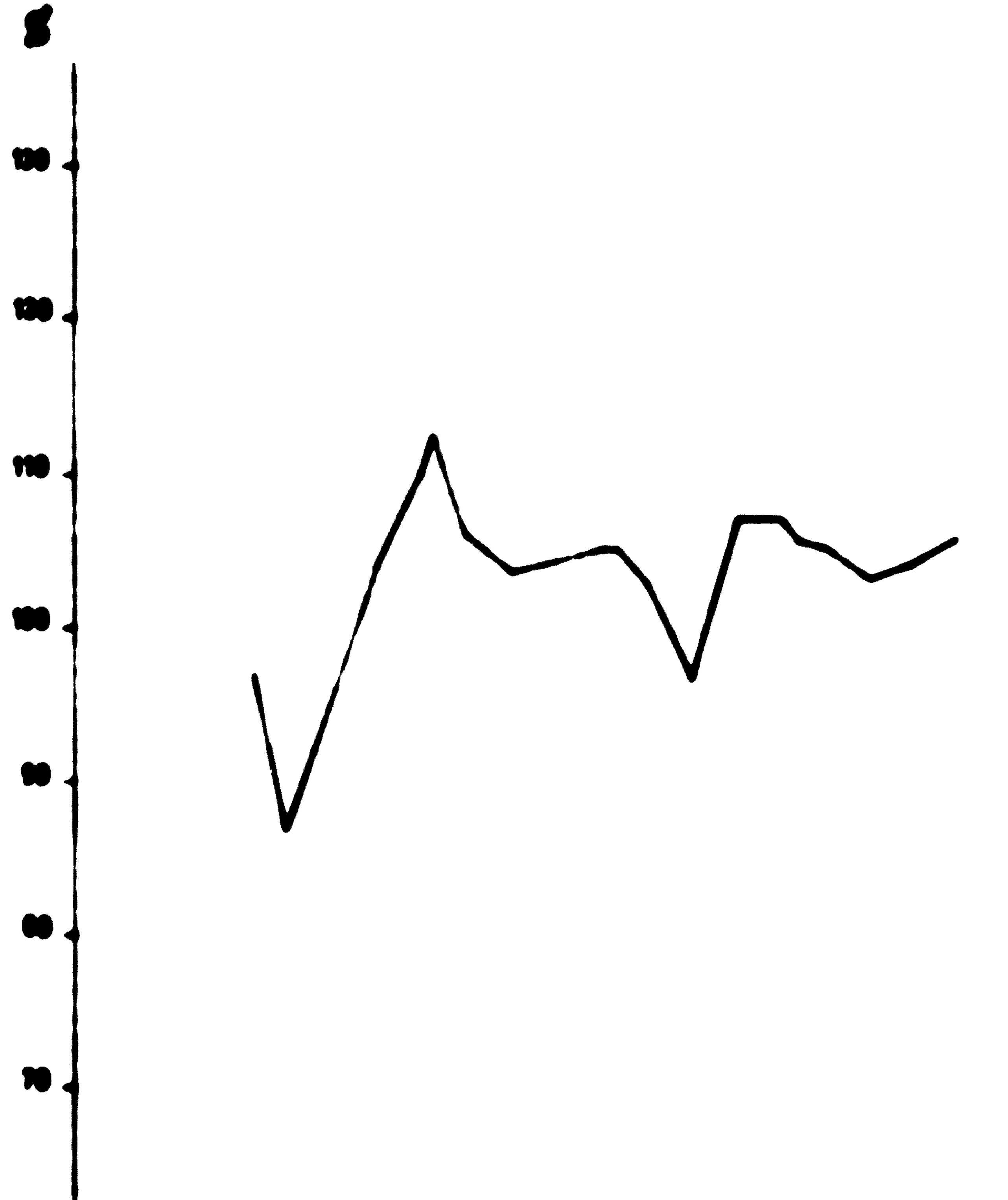
GRAPH 17

EVOLUTION OF GROUNDNUT CAKE MARKET PRICES



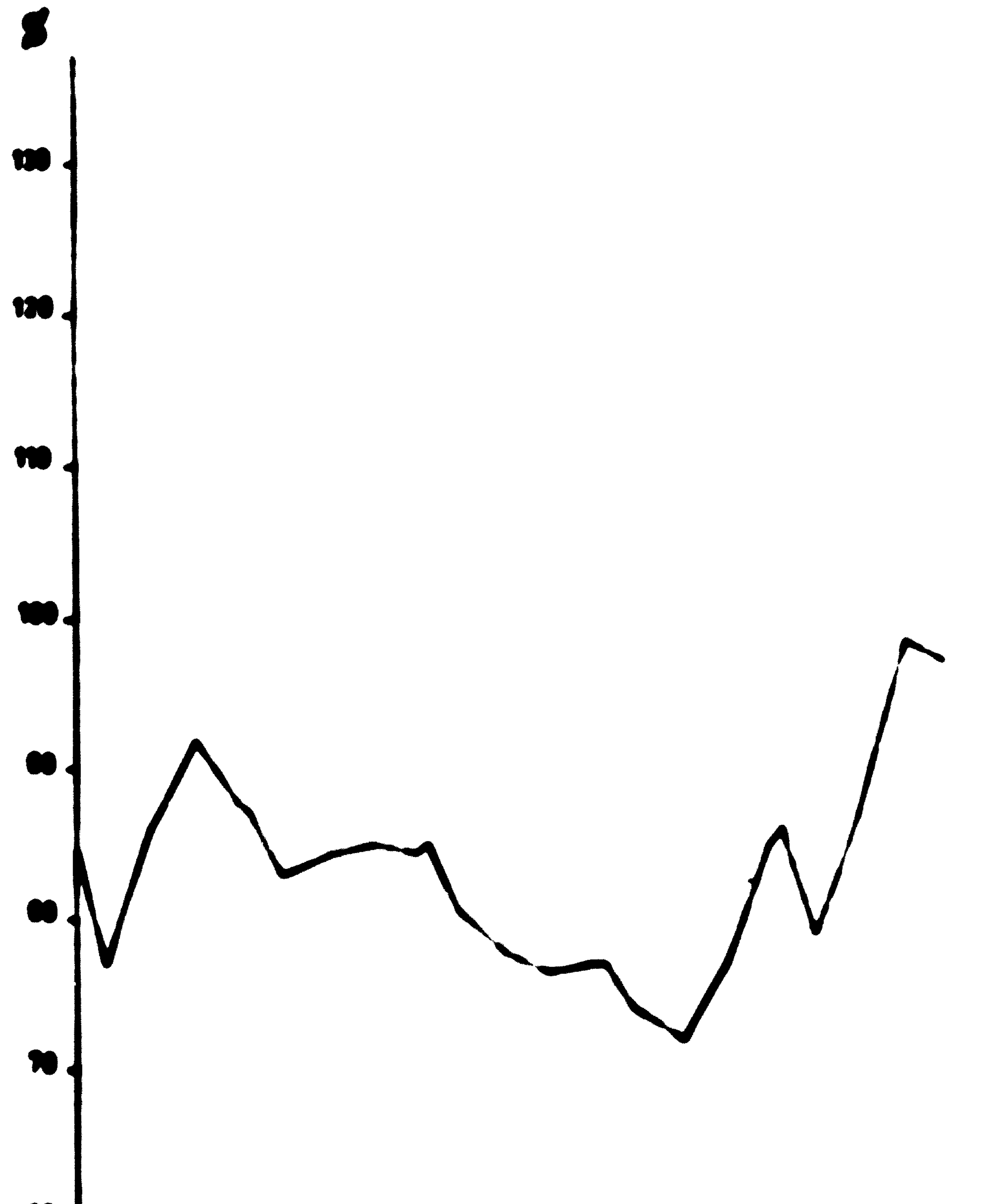
GRAPH 18

EVOLUTION OF COPRA CAKE MARKET PRICES



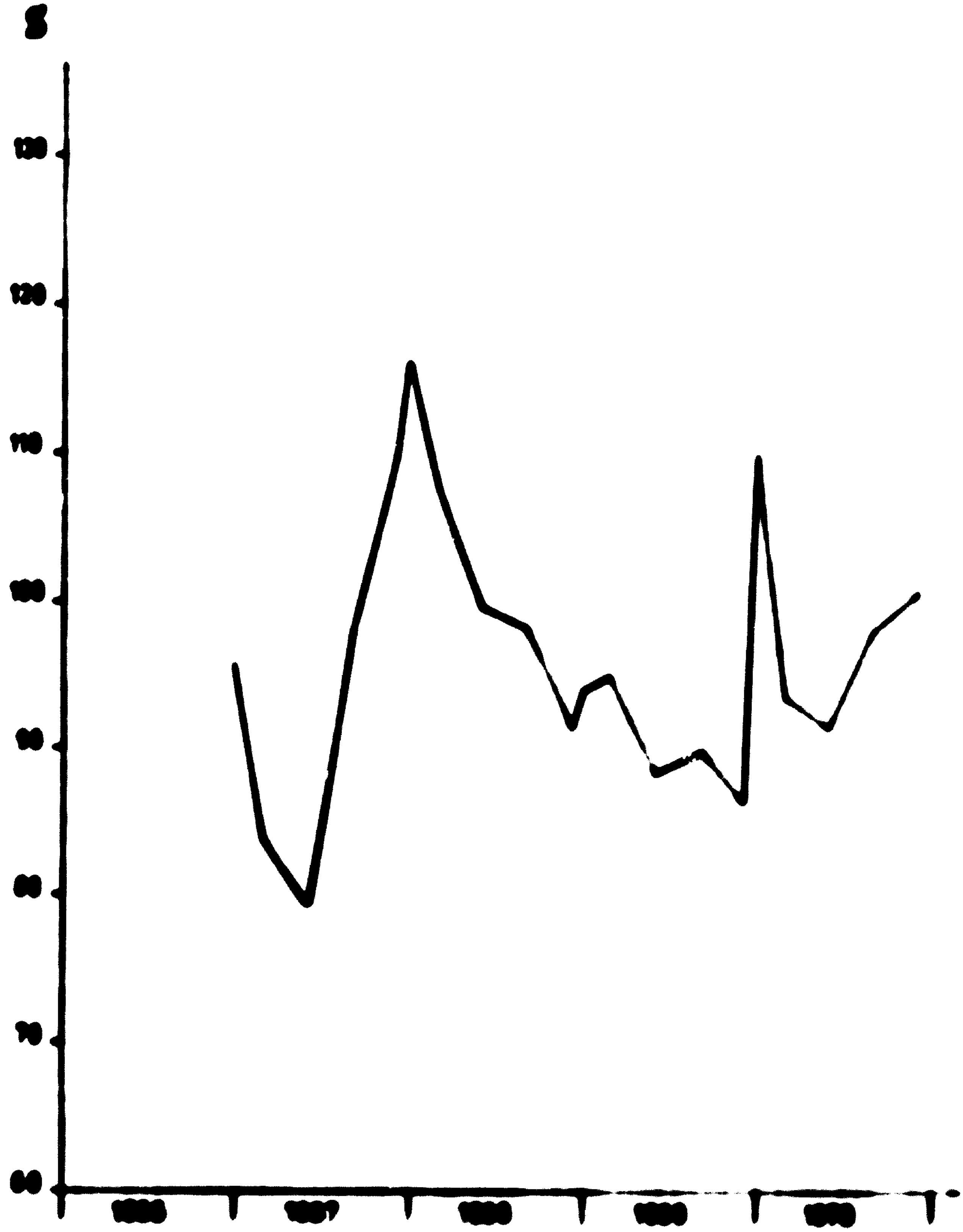
GRAPH. 19

EVOLUTION OF COTON CAKE MARKET PRICES



GRAPH. 20

EVOLUTION OF PALM KERNELS CAKE MARKET PRICES



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