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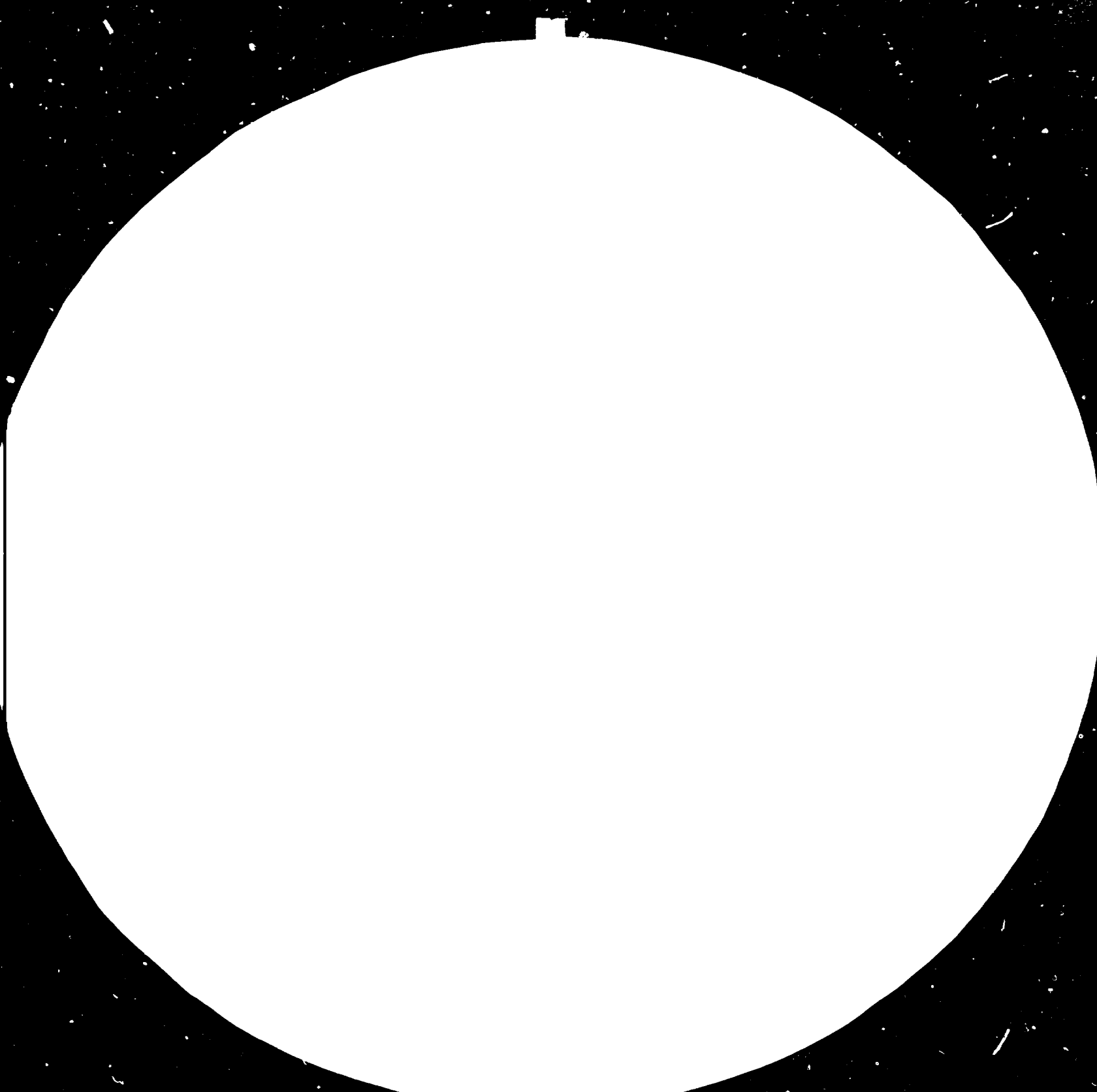

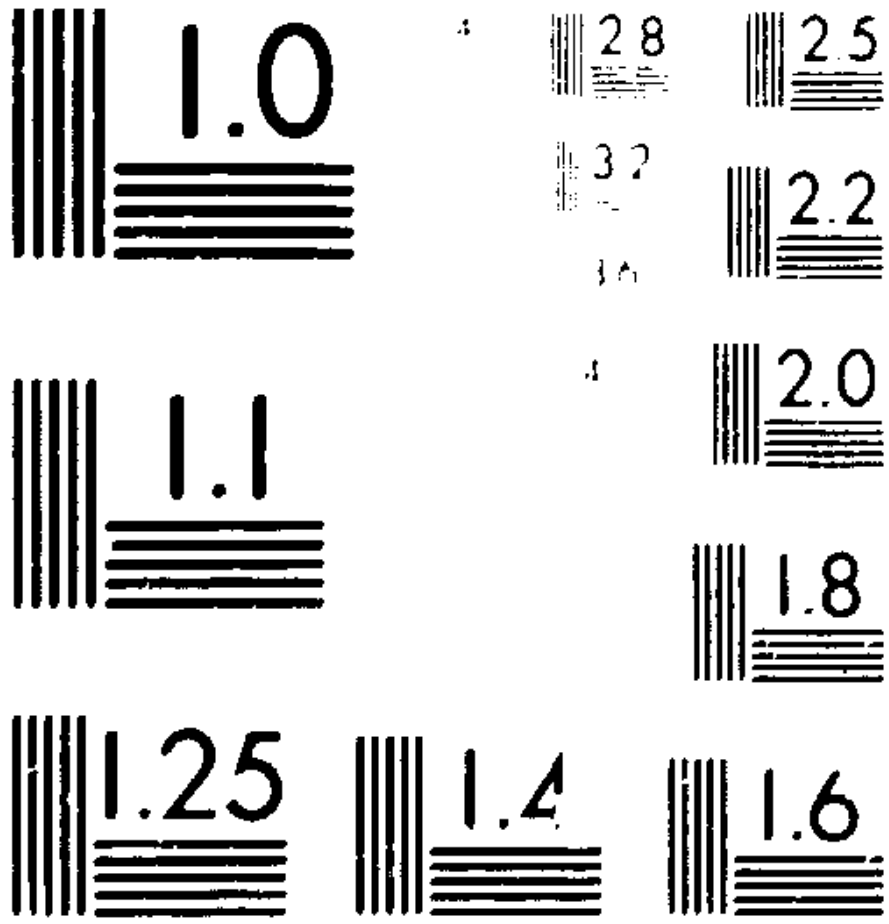

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VEGETABLE OILS AND FATS INDUSTRIES IN DEVELOPING AFRICAN COUNTRIES: CONSTRAINTS AND PROMOTION OF INTEGRATED DEVELOPMENT *

by

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This document is supplementary to the detailed document ID/WG.404/1 entitled: Integrated Food-Processing Industry Development in Africa: Constraints and Promotional Measures, by the same author.

1.0 INTRODUCTION

Oil seeds and nuts are important crops in African developing and least developed countries. They form a regular part of the diet as sources of oil or flavour or they are eaten as snacks. Nutritionally they are important sources of energy, proteins, vitamins and minerals, so their higher production and wider use could contribute substantially to the solution of the prevalent malnutrition problems which occur in these countries.

Oil seeds and nuts are suitable for household and village level processing, right up to large industrial level, since the technology exists at all these levels. The major end products, such as vegetable oils and fats are in high demand and should supply for human consumption. Crude oils are useful in soup manufacture and related industries. The most important byproduct is the seed cake which can be refined into human grade products, protein isolates or processed for incorporation into weaning foods. The cake as such is also widely used in formulating livestock feeds. It is therefore apparent that oil seeds are ideally suited for integrated food-processing industry development since they have such wide variety of uses. This communication deals with the major oil seeds, their recent production and trade. Processing is treated briefly and a model of integrated food industry development is presented for ground nuts and cotton seed which are the most important oil seeds in Africa.

2.0 PRODUCTION OF MAJOR OIL SEEDS

The major oil seeds produced in developing market economy countries of Africa are summarized in Table 1. It is worth noting that there are many smaller oil seed sources whose potentials are yet to be developed, for example olive kapok, hemp, cocoa and shea nut to mention but a few. On the other hand, the major cereal staples such as maize, sorghum and rice, when milled, yield byproducts which are fairly good sources of vegetables oil.

From Table 1 it is evident that ground nuts (in shell) are the most important with an average of 3,940 thousand metric tons between 1969 and 1981. West African countries, especially Niger, Nigeria and Senegal were the major producers. The crop, however, declined from 4,383 thousand tons in 1969-71 to 3,980 thousand tons in 1981.

Cotton seed is second in magnitude and averaged 928.5 thousand tons between 1969-71 and 1981, but there was a decline from 1,040 thousand tons to 886 thousand tons over the period. Egypt and Sudan were the most important producers but

practically in almost all the African countries under consideration grew some cotton.

Taking the 1969-71 period as a base (100), by 1981, the total for the major oil seeds declined to (88) with 7,085 thousand tons and 6,223 thousand tons respectively. Sesame, and coconuts also declined in production. The only increases were in the production of soybeans, sunflower rape seed and palm kernel which was mainly grown in the Equatoral African group of countries.

Table 1: Production of Major Oil Seeds in Developing Economy African Countries

(thousand metric tons)

	1969-71 (base)		1979	1980	1981	1981 % change from 1969-71 as base
Soybeans	75	(100)	166	203	178	(137)
Groundnuts in shell	4,883	(100)	3,568	3,328	3,980	(82)
Sunflower seed	50	(100)	149	148	143	(186)
Rape seed	20	(100)	21	22	22	(110)
Sesame seed	247	(100)	243	241	243	(98)
Safflower seed	37	(100)	30	31	31	(98)
Cotton seed	1,040	(100)	882	906	886	(85)
Conocnuts	2	(100)	1	1	1	(50)
Palm kernel	731	(100)	717	734	739	(101)
Total	7,085	(100)	5,777	5,614	6,223	(88)

Source: FAO Production Yearbook 1981
Volume 35, Tables - 28, 29, 31, 33, 35, 37, 38 and 39

( ) calculated from the data

3.0 PRODUCTION OF MAJOR VEGETABLE OILS AND FATS

3.1 Africa and the world

Statistics for the world and Africa for 1971 and developing African countries (1980 only) are given in Table 2.

Table 2: World and Developing African Production of Major Vegetable Oils and Fats (thousand metric tons)

Product	ISIC	World production*		Developing African countries production		Share of developing African production in world production %	
		1971	1980	1971	1980	1971	1980
Margarine, imitation lard and other prepared fats	311501	7,616.2	9,829.5	91.4 *	237.9 *	1.2	2.4
Oil, soya bean, refined	311513	3,480.0	5,592.0	40.0 *	54.0 *	1.1	1.0
Oil, cottonseed, crude	311516	2,526.0	2,957.0	198.0	218.0 *	7.8	7.4
Oil, cottonseed, refined	311519	916.0	1,068.0	198.0 *	304.0 *	21.6	28.5
Oil, groundnut, crude	311522	3,100.0	2,439.0	423.0	262.0	13.6	10.7
Oil, groundnut, refined	311525	349.0	309.0	99.0 *	187.0 *	28.4	60.5
Oil, olive, crude	311528	1,629.0	2,133.0	203.0	148.0	12.5	6.9
Oil, olive, refined	311531	130.0	157.0	9.0	7.0 *	6.9	4.4
Oil, other, of vegetable origin, crude	311534	7,789.0	12,430.0	1,016.0 *	1,413.0 *	14.2	11.4
Oil, other, of vegetable origin, refined	311537	4,636.0	5,418.0	122.0 *	68.0 *	2.6	1.2

* Provisional or estimated figure

Source: Yearbook of Industrial Statistics, 1980, Edition: Volume II

Table 2 shows that margarine imitation lard and other prepared fats, in world production, were the highest by quantity in 1971 and 1980, however the developing African countries had only 2.4% of this volume in 1980. Africa had the highest share in world production for refined groundnut oil (60.5 % in 1980 for developing and least developed countries) followed by refined cotton seed oil (28.5 %).

In general world production between 1971 and 1980 seems to have varied from crop to crop. Only modest increases occurred in margarine, imitation lard and other prepared fats, soybean oil and cotton seed oil. Groundnut oil decreased. It could be extrapolated that the developing African countries had a production pattern not differing very much from the world trend as this was also evident in the production of raw oil seeds (Table 1).

3.2 Developing and least developed countries

Table 3 presents details of vegetable oils and fats production in developing and least developed African countries by 1980 (Note: some of the data is based on information available in the 70s, so, observations made are only indicative). Like in world production by 1980, on individual commodity basis cotton seed oil(crude and refined) was highest at 522 thousand metric tons. The main producers were Egypt and the Sudan. Groundnut oil (crude and refined) was second with 499 thousand metric tons and the major producers were Sudan, Senegal, Niger and Mali.

Table 3: Production by Developing African Countries in 1980 (According to ISIC Classification)

Thousand metric tons - ISIC 1980 - Vegetable Oils and Fats

	311501 Margarine/ Other Fats	311513 Oil/Soya-bean Refined	311516 Oil/Cotton-seed Crude	311519 Oil/Cotton-seed Refined	311522 Oil/Ground-nut Crude	311525 Oil/Ground-nut Refined	311528 Oil/Olive Crude	311534 Oil Other of Vege-table origin/Crude	311537 Oil Other of Vege-table origin/Refined
Algeria	13.4	-	-	-	-	-	19 *	-	20 (79)
Angola	0.4(76)	-	-	4 (73)	-	5 (73)	-	40 *	5 (73)
Benin	-	-	-	-	-	-	-	26	-
Botswana	-	-	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-	1 *	-
Cape Verde	-	-	-	-	-	-	-	-	-
Central African Rep.	-	-	-	-	-	-	-	2 *	-
Chad	-	-	-	-	-	-	-	-	-
Comoros	-	-	-	-	-	-	-	-	-
Congo	-	-	-	-	1 (76)	1 (76)	-	7 *	-
Djibouti	-	-	-	-	-	-	-	-	-
Egypt	160.1(79)	5 (79)	170 *	168 (79)	-	-	-	6 (74)	2 (79)
Equatorial Guinea	-	-	-	-	-	-	-	5 *	-
Ethiopia	-	-	-	-	-	-	-	-	-
Gabon	-	-	-	-	-	-	-	1 *	-
Gambia	-	-	-	-	-	-	-	3 *	-
Ghana	0.9	-	-	-	-	-	-	21 *	-
Guinea	-	-	-	-	-	-	-	42 *	-
Guinea-Bissau	-	-	-	-	-	-	-	5 *	-
Ivory Coast	22.0	-	12	-	-	-	-	191	49
Kenya	10.6	-	-	-	-	-	-	3 (77)	8 (77)
Lesotho	-	-	-	-	-	-	-	-	-
Liberia	-	-	-	-	-	-	-	27 *	-
Libyan Arab Jamahiriya	-	-	-	-	-	-	16 *	-	-
Madagascar	-	-	-	-	-	4	-	2 *	-
Malawi	-	-	-	-	-	-	-	-	-
Mali	-	-	-	-	7	1	-	8	-
Mauritania	-	-	-	-	-	-	-	-	-
Mauritius	-	-	-	-	-	-	-	-	-
Morocco	2.5(74)	-	-	-	-	-	28 *	-	-
Mozambique	1.5	-	8 (72)	9 (74)	-	7 (74)	-	29 (74)	2 (74)
Namibia	-	-	-	-	-	-	-	-	-
Niger	-	-	-	-	3 *	-	-	-	-
Nigeria	5.1(75)	-	-	-	3 *	-	-	675 *	-
Reunion	-	-	-	-	-	-	-	-	-
Rwanda	-	-	-	-	-	-	-	-	-
Sao Tome and Principe	-	-	-	-	-	-	-	1 *	-
Senegal	0.2	-	-	-	90	35	-	6 *	-
Seychelles	-	-	-	-	-	-	-	1	-
Sierra Leone	-	-	-	-	-	-	-	48 *	-
Somalia	-	-	-	-	-	-	-	-	-
Sudan	-	-	44*(77)	65 (75)	162 *	62 (75)	-	-	-
Swaziland	-	-	-	-	-	-	-	-	-
Togo	-	-	-	-	-	-	-	20 *	1 (79)
Tunisia	0.5	37 (71)	-	-	-	-	85	-	1 (79)
Uganda	-	-	-	38	-	-	-	-	-
United Rep. of Cameroon	-	-	-	-	-	-	-	69	-
United Rep. of Tanzania	-	-	-	-	-	-	-	3 *	-
Upper Volta	-	-	3 (79)	3 (79)	1 (78)	1 (75)	-	1	-
Zaire	3.0(76)	-	1*(78)	-	-	-	-	180 *	-
Zambia	3.5(72)	14	-	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	-	-	-	-
Total Africa	237,9 *	54 *	218 *	304 *	262	197 *	148	1,413 *	68 *

*Provisional or estimated figure

Source: Yearbook of Industrial Statistics, 1980 Edition, Volume II.

4.0 EXPORTS OF OIL SEEDS FROM DEVELOPING AFRICAN COUNTRIES

Recent exports of oil seeds by developing African countries is presented in Table 4.

Table 4: Exports of Oils Seeds from Developing African Countries

	Quantity thousand metric tons		Value million US $	
	1979	1981	1979	1981
Groundnuts (total shelled)	87.2	42.9	57.1	32.9
Soybeans	0.7	0.7	0.3	0.3
Cotton seed	542.8	503.0	6.5	4.9
Sunflower seed	7.8	6.2	2.7	2.6
Sesame seed	22.5	11.3	12.7	5.9
Copra	37.2	18.4	17.5	7.4
Palm nuts and kernel	130.5	106.2	42.3	26.8
Total	728.7	595.0	139.1	80.8

Source: FAO Trade Yearbook Vol.35 (1981).

From Table 4 exports for the major oil seeds for 1979 and 1981 averaged 661.9 thousand metric tons valued at US $ 110.0 million. Cotton seed and groundnuts contributed most of the quantities. There was a drop in both quantity and value from 1979 to 1981.

It is worth noting that while the undernourished African countries exported valuable oil seeds at low value, the paradox is that they in turn imported processed oil and magarine at high prices using foreign exchange as shown in the following Table 5.

5.0 IMPORTS OF VEGETABLE OILS

Table 5: Imports of Vegetable Oil by Developing African Countries

Type of oil	Quantity thousand tons		Value million US $	
	1979	1981	1979	1981
Soybean	334.2	331.2	233.7	210.1
Cotton seed	13.8	3.2	13.0	3.0
Ground nut	12.5	8.2	18.8	10.0
Sunflower	64.8	144.7	48.5	93.6
Palm	95.4	185.9	74.4	105.4
Coconut	9.2	15.8	10.5	14.9
Palm kernel	8.5	11.1	8.1	8.1
Total	538.4	700.1	407.0	445.1

Source: FAO Trade Yearbook, Volume 35, 1981

As indicated in Table 5, total imports by developing African countries averaged 619.3 thousand metric tons at a cost of US $ 426.1 million. Soybean oil provided the largest import of 334.2 thousand metric tons at a cost of US $ 233.1 million in 1979. Overall during 1979 and 1981, imports increased both in quantity and value and this trend might continue unless the countries concerned utilize their local oil seed resources more gainfully by developing national processing industries, instead of exporting the raw materials.

6.0 VEGETABLE OILS AND FATS PROCESSING

Processing techniques for vegetable oils and fats are well documented.*/ Consequently only a brief mention is made of the main methods as related to suitability for integrated food industry development.

*/ See: Draft World-Wide Study on the Vegetable Oils and Fats Industry 1975-2000, UNIDO/ICIS.46, 16 September 1977.

6.1 Farm/Village processing methods

Small and large scale methods are essentially the same in principle. The process involves size reduction of the oil bearing material but in fruits fermentation may also be carried out as is the case in palm oil. Drying may be carried out as in copra. Extraction of oil from pretreated oil seeds is done under pressure often using a weighted wooden mortar and pestle driven by various power sources. Hydraulic presses are also used but in the household coconut oil is easily obtained by grating, boiling and floatation of the coconut meat. The oil separates as the top layer did, it is then easily separated.

6.2 Commercial processing methods

Large scale processing requires regorous post-harvest handling, careful storage and preparation. This involves cleaning by a variety of methods, proper storage conditions of temperature to avoid rancidity, decortication, size reduction and at times prehealing.

Oil extraction is carried out in large screw presses or expellers under pressure which may be on a batch basis or continuous. Solvent extraction can further be carried out on pressed cake to recover more oil or done directly on the pretreated oil bearing material using a variety of solvents. Often light paraffinic petroleum fractions and the hexane fraction are used. Refining is done by boiling with alkali and charcoal. Further processing by hydrogeration and other processes produce margarine and shortenings.

It is worth noting that in small scale and industrial processing, precious byproducts such as oil seed cake and bagase or "bran" are produced for further processing or for use in related integrated food industry establishments.

7.0 MODELS FOR INTEGRATED FOOD PROCESSING INDUSTRY DEVELOPMENT - THE CASE OF GROUNDNUTS AND COTTON SEED

Groundnuts and cotton seed are the largest oil seed sources in African countries and they offer a unique example with much potential since the continent is environmentally suitable for the growing conditions of these two crops.

Since integration involves many linkages, models are best described diagramatically so as to bring out the main aspects as indicated in the following figures since a prose presentation may be long and tedious to follow:

Figure 1: Integrated groundnut processing industry model

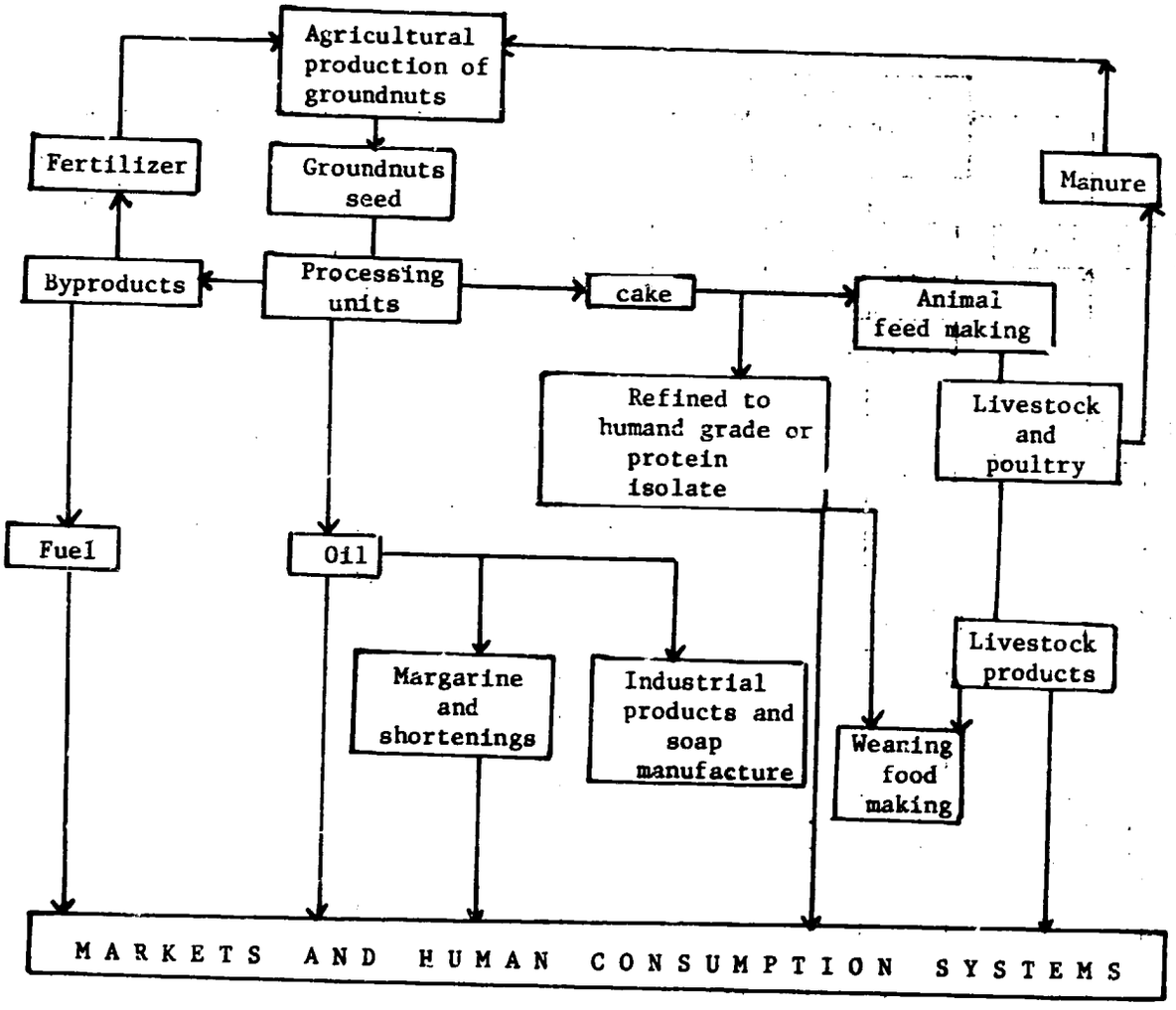
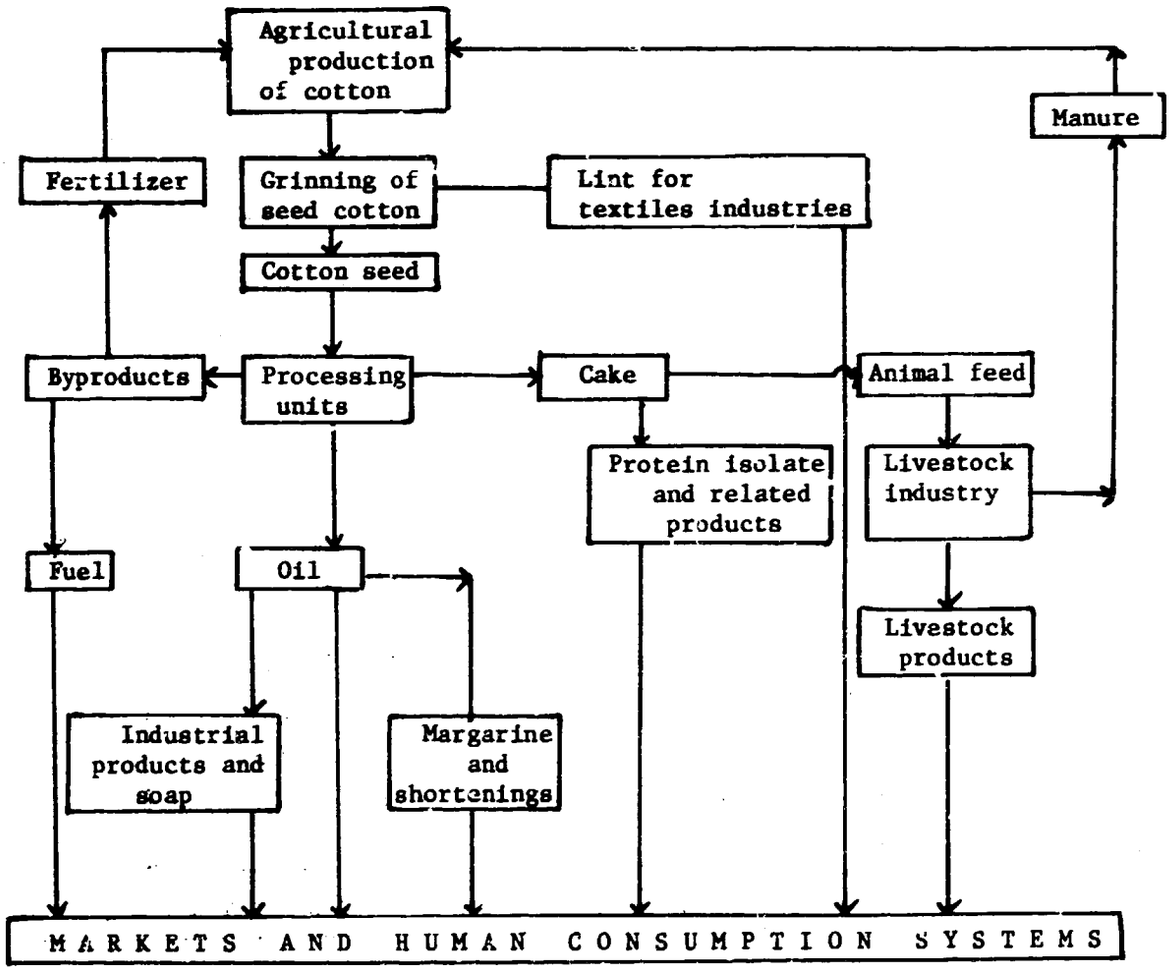


Figure II: Integrated model for cotton seed processing industry



As evident in Figures I and II, integration is best developed at three main levels, namely agricultural production of new materials which could be organized to cater for the second level of processing. The third level - marketing and consumption is the alternate serving the needs of the population, nutritionally and materially. The manpower so served, then recycle their efforts in agricultural production and processing, so the whole system is repeated and starts all over again.

Both crops give byproducts which are valuable and give rise to oil seed cakes which in turn provide the establishment of related industries such as animal feeds and baby food manufacture in the case of groundnuts. Cotton lint, however, is an industry in itself for textiles and oil could be regarded as a byproduct. Wastes from both oil seeds can be used as fuel or recycled back to the land as fertilizer.

However, the figures are self explanatory and it is possible to add more linkages as local situations may demand.

8.0 CONSTRAINTS AND PROBLEMS RELATED TO OIL SEEDS WITH REFERENCE TO GROUNDNUTS AND COTTON SEED

Constraints and probable solutions in integrated food industry development in Africa have been dealt with in detail in the major document. */

The problems and promotional measures related to agricultural production, postharvest storage and handling, processing product quality and marketing, as described in the document, all apply equally well on the oil seeds industry. Only specific problems akin to oil seeds are dealt with here.

Groundnuts varieties grown in Africa today are largely low yielding, so increased production requires use of higher yielding types developed through intensive research and development (R + D). Use of better crop husbandry and expansion of area cultivated will serve the same process.

Oil seeds are prone to rancidity, so careful harvesting with minimum physical damage, careful drying and good storage conditions are essential. Groundnuts in particular, under high moisture conditions, easily grow moulds, especially the Aspergillus species which produce the mycotox - Afflatoxin. This mycotox is dangerous to human beings and animals since it also easily develops in the seed cake.

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*/ Integrated Food-Processing Industry Development in Africa: Constraints and Promotional measures, by A.C. Mosha (1983)

Cotton seed usually contains the chemical gossypol and its content in the seed cake is high and affects nutrient utilization by animals and poses a health hazard to human beings as well. The use of cotton seed protein concentrates or isolates in the formulation of weaning foods for young children, may be much limited.

Solutions include chemical solvent extraction of the gossypol on the other hand, the use of glandless varieties of cotton which usually are low in gossypol, may be more practicable under African conditions.

9.0 CONCLUSIONS

In retrospect, oil seed production in the developing African countries is low and there is need to increase production in order to supply the existing big demand for direct consumption or processing. The same observation is valid for vegetable oils and fats whereby groundnuts and cotton seed are the most important. Local processing of oil seeds should take precedence over exports, for oilsand byproducts.

Constraints that exist have possible and practicable solutions. It is therefore possible to develop integrated vegetable oils and fats industry on the model proposed: matching agricultural production, processing and marketing stages, while developing related industries from byproducts and wastes.