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UNITED NATIONS INDUSTRIAL
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SUMMARY OF THE DRAFT

WORLD-WIDE STUDY OF THE VEGETABLE-OILS AND-FATS INDUSTRY

Prepared by
International Centre for Industrial Studies

id.77-6624

Explanatory notes

Annual rates of growth or change refer to annual compound rates, unless otherwise stated.

A slash between dates (e.g. 1970/71) indicates a crop year, financial year or academic year.

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

A full stop (.) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

References to "tons" are to metric tons, unless otherwise specified.

The following forms have been used in tables:

Three dots (...) indicates that data are not available or are not separately reported

A dash (-) indicates that the amount is nil or negligible

A blank indicates that the item is not applicable

A minus sign before a figure (-2) denotes a deficit or decrease, except as indicated

Parentheses around a figure indicate a minus amount (in tables only)

n.e.s. indicates that data are not elsewhere specified

Reference to ($) dollars are to United States dollars unless otherwise stated.

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INTRODUCTION

1. The Lima Declaration and Plan of Action on Industrial Development and Co-operation (ID/Conf. 3/31, Chap.IV), which was adopted at the Second General Conference of UNIDO in March 1975, re-asserted that industry was a dynamic instrument essential to the rapid economic and social growth of the developing countries. In the Declaration, the General Conference called for the share of the developing countries in total world industrial production to reach 25 per cent by the year 2000.

2. The Lima Declaration and Plan of Action instructed UNIDO that:

> "in order to give concrete content to the process of industrialization in the developing countries, studies must be undertaken and specific measures formulated in different sectors of industry, special attention being given to priority sectors." (ID/Conf. 3/31, chap.IV, para. 67)

3. One of the priority sectors was the agro-industries sector. From among the agro-industries the oil-seeds and oil-seed-products industry was selected for study as one whose potential for development and extent are generally accepted as essential for the improvement of the agro-industries in developing countries.

4. The oil-seeds and oil-seed-products industry plays an important role in the economy of the developing countries. It makes an essential contribution to the subsistence food sector, to processed food industries, to a wide range of non-food industries, and to animal feedstuff supplies. The influence of the industry is therefore felt throughout the economy.

5. The products of the oil-seed industries account for approximately one sixth of all exports of agricultural products from developing countries and are therefore a major source of export earnings for many of them. Their development potential for developing countries is great because land and labour resources and climatic conditions are especially suitable for oil-seed production.

6. The Draft World-wide Study of the Vegetable Oils and Fats Industry (The Draft Study), of which this paper is a summary, is intended to serve as a basic document for the consultation system specified in the Lima Declaration and Plan of Action, as a policy-making tool for national policy makers, and as a help in developing technical assistance programmes and sectoral development strategies.

7. The Draft Study is an attempt to provide a global overview of the present situation, future trends, and the opportunities for and constraints upon the development of the oil-seed and oil-seed products industry, which is closely linked with such other sectors as agriculture, chemicals, construction, and transportation. Through the study and the consultations that will follow, UNIDO seeks to contribute to an understanding of the issues involved and problems to be solved.

8. In view of the continuous and dynamic developments taking place, it is essential to recognize that the situation presented in the Draft Study may change. The Draft Study will therefore need to be revised and updated regularly to take into account further research and the results of expert meetings and consultations.

I. THE WORLD OIL-SEED ECONOMY TODAY

Production of oil-seed

9. World production of oil-seeds has increased substantially in recent years, showing an increase over the decade 1965-1975 (the latest available 10-year period) of some 43%. The actual increase is from 123.2 million tons in 1965 to 175.9 million tons in 1975. In volume terms, the order of dominance has remained remarkably constant between 1965 and 1975. Soya bean remains the largest crop with 38.9% of global production, over twice the proportion of coconuts the next most important, which accounted for 16.8% of global production in 1975. Cottonseed and groundnuts are also important crops and jointly accounted for 24% of global oil-seeds production in 1975. Oil palm, sunflower seed and rape-seed provided a further 18.7% of total production, with sesame seed and safflower seed accounting for the remainder.

10. There have also been large production increases in certain oil-seeds. In particular, soya bean and oil palm, with increases of 87% and 122% respectively, have far exceeded the average. In the case of soya bean the bulk of the increased production has been from the United States of America and in that of oil palm from Malaysia. Of the less significant oil-seeds, in volume terms, there have been important production increases in rape-seed and safflower seed. Output of the former has expanded 53% since 1965, predominantly in India and Canada, whilst that of safflower seed, the least important of these oil-seeds in volume terms, has shown a 100% increase due mainly to increased production in Mexico and India.

11. All of the remaining oil-seeds have also shown increases in production. Coconut production, until very recently, has remained fairly stable with the major increase coming from the Philippines. Cotton-seed production has expanded slowly by the share of the developing countries has declined. Sunflower seed production rose but 21% with the bulk of this increase (over 80%) coming from the centrally planned economies. Sesame seed production increased by 18% (the bulk of production - over 80% - remaining in the developing countries), and ground-nut production, which is also a predominantly developing country oil-seed, has also undergone a small increase despite production setbacks in recent years.

I2. Production of oil-seeds is geographically comparatively concentrated. Table 1 lists the main producers for each oil-seed. Some 24 countries, of which 16 are developing economies, account for over 80% of world oil-seed production. Thus, although other developing countries may still have a potential for expanding and upgrading their oil-seed processing industries, it is from those listed in table I that an increase must come if any significant change is to be made by the developing countries as a group in their share of the world's oil-seed economy.

Table 1. Principal oil-seed producing countries

Type of oil-seed	World production 1975 (million tons)	Developed economy	Developing Economy	Centrally planned economy
Soya beans	60.4	United States	Brazil	China
Coconuts	29.6	-	India, Indonesia, Philippines, Sri Lanka	
Cotton seed	23.0	United States	Argentina, India, Pakistan, Turkey	China, USSR
Ground-nuts	19.1	United States	India, Nigeria, Senegal	China
Sunflower seed	9.6	-	Argentina, Turkey	Bulgaria, Romania, USSR
Oil palm (fresh fruit bunch)	15.1	-	Indonesia, Ivory Coast, Malaysia, Nigeria, Zaire	-
Palm kernel		-	Brasil, Malaysia, Nigeria, Zaire	
Rape-seed	8.1	Canada, France	India	China, Poland
Sesame seed	2.0	-	Ethiopia, India, Mexico, Sudan	China
Safflower seed	1.0	United States	India, Mexico	

Source: Tropical Products Institute.

Trade in oil-seeds

I3. In I975 some II% of global oil-seed production entered international markets. The predominant feature of oil-seed trading is its dominance by soya beans, which accounted for over 80% of the total volume traded. Although the total volume of oil-seeds traded has risen from I2 million tons in I965 to 2I million tons in I975, the difference is almost entirely due to the growth of soya bean exports. Otherwise, only rape-seed trade has undergone any marked expansion. The volume of other oil-seeds traded has either declined or remained comparatively stable. Trade in ground-nuts, copra, cotton-seed, palm kernels and safflower seed has fallen, whilst trade in sunflower seed and sesame seed, never very substantial, has grown very slowly. Only the trade in rape-seed provides an exception: compared to the trade in soya bean it is still very small but is nevertheless currently the second most important oil-seed traded in seed form.

I4. The relatively stagnant nature of the export trade in most of the major oil-seeds in recent years contrasts with the generally upward trend in production However, any comprehensive assessment of the trade in oil-seed products should also include developments in vegetable oil trading. These are reviewed later.

The production of vegetable oils

I5. Precise figures on the quantity of world oil-seed production that is converted into vegetable oil in any one year are difficult to obtain. Only a few countries keep records of crushing activities, including the use of seed from stock, and of these most are developed economies. The estimates which follow must therefore be regarded as approximations. Estimates made by FAO, the United States Department of Agriculture and commercial sources are in general agreement that the amount of vegetable oil produced in I975 from the seeds at present under review was about 28-29 million tons, distributed approximately as shown in table 2. Soya bean is again dominant, reflecting production patterns, with soya bean oil having increased its share of the total by almost 50% between I965 and I975. The only other oils to increase their share of the total are palm and rape-seed, although ground-nut oil is alone in showing an absolute decline as well as a percentage one.

Table 2. Vegetable oil production in I965 and I975
(in million tons)

Type of vegetable oil	I965		I975	
		Percentage of total		Percentage of total
Soya bean	3.9	20.4	8.5	29.8
Ground-nut	3.4	I7.8	3.2	II.0
Cocoanut	2.I	II.0	2.7	9.6
Cotton-seed	2.7	I4.I	3.2	II.3
Palm	I.3	6.8	2.9	I0.3
Palm kernel	0.4	2.I	0.5	I.8
Sunflower seed	3.I	I6.2	4.0	I4.2
Rape-seed	I.4	7.3	2.6	8.9
Sesame seed	0.6	3.I	0.7	2.5
Safflower seed	0.2	I.0	0.2	0.7
Total	I9.I	I00.0	28.5	I00.0

Source: Tropical Products Institute

I6. It is difficult to obtain information on the present distribution of vegetable oil production between the developed and developing countries. Taking account of scattered evidence concerning individual countries, however, and including all types of extraction methods, it seems likely that the developing countries were responsible for almost 50% of world vegetable oil production in I975. (For figures see table 3.)

Trade in vegetable oils

I7. The volume of vegetable oils traded has expanded steadily with only minor interuptions since I965, at an average annual rate of about 9%, which implies a doubling of supplies in approximately ten years.

I8. In I965 it was possible to distinguish six principal traded oils, each of which has at least I0% of the market but none more than a quarter of the market. Soya bean oil and palm-oil had the largest shares, with 22% and 20% respectively; ground-nut, cocoanut, cotton-seed and sunflower seed oils were all traded in broadly similar amounts. Thus the trade has a comparatively broad product base. In addition, smaller amounts of palm kernel oil, rape-seed oil and sesame seed oil were also available.

19. The doubling of efforts since 1965 has been accompanied by a marked concentration of the trade in vegetable oils. In 1965, soya bean and palm-oil the two leading products, had an aggregate 42% of the market, but this has now grown to 53%. Faced with a major expansion of supplies in these two oils, producers of the other vegetable oils have had difficulty in retaining their market shares, even though quite often their own supplies have been increased.

20. Furthermore, with the exception of palm-oil, most of the expansion has been in those oil-seeds which are not widely grown in developing countries (rape-seed and soya bean). Even for palm-oil the degree of expansion has been largely due to one country. It is to be hoped that trade in coconut oil will continue to grow and that ground-nut oil will recover some of its lost ground.

21. Table 3 summarizes the effects of international trade in altering the position of the developed and the developing countries with regard to production and availability of oil-seeds. The developing countries produced 62% more oil-seeds than the developed countries in 1975 but only 32% more was available for domestic use. The amount of vegetable oil produced was also slightly greater in the developed countries. However, the slightly higher production of oil in the developed countries had to be shared among a total population less than half that of the developing countries. Without information on the availability of all oils and fats, per capita figures are of limited use, but the final column of the table shows that for the ten major vegetable oils under review, per capita availability in the developed countries is over three times that in the developing ones. The difference cannot be accounted for by other oils and fats.

Table 3. World oil-seed and oil production and availability in 1975
(Based on FAO statistics)

	Oil-seeds[a]		Oil		Per capita availability of oil (kg)
	Production (million tons)	Availability[b] million tons)	Production (million tons)	Availability (million tons)	
World	175.9	175.9	28.5	28.5	7.1
Developed countries	67.2	76.2	14.3	15.8	14.1
Developing countries	109.1	100.3	14.2	12.7	4.4

a/ Includes only the ten major oil-seeds at present under review.

b/ Availability = Production - Exports + Imports, exluding stocks.

Oil-meal production

22. The other prinoipal oil-seed produot is the oil-meal obtained as the residue of oil extraotion. The produot remaining after oil extraotion is oalled vegetable oake or vegetable meal depending on the manufacturing prooess used. Throughout this seotion the term "meal" is applied to all products. Oil-meals are a major souroe of protein, most of whioh is oonsumed at present by the livestock industries of the developed countries.

23. Effeotive demand for vegetable protein in the form of oil-meals has grown muoh faster than the demand for fats and oils. Consequently, this seotor of the market tends to lead the global oil-seed eoonomy. This has led to a ohanged pattern of production for oil-seeds themselves and a growing market preferenoe for oil-seeds with a high meal and low oil content. Soya beans the oil-seed whioh has benefited most from this trend; as a result, the developed oountries, as major produoers of soya bean and especially the United States have expanded their share of production and trade in oil-meals. Table 4 illustrates the relative value in reoent years of the oil and meal oontent of selected oil-seeds.

Table 4. The relative values of the oil and meal content of seleoted oil-seeds

Raw material	Percentage value of oil and meal per ton of oil-seeds prooessed a/	
	Oil	Meal
Oil palm fruit	>95	<5
Copra	85	15
Ground-nuts	80	20
Soya beans	40	60

Source: FAO.

a/ Based on 1975-1976 average prices.

24. Soya bean is today primarily cultivated as a "proteinous seed", although the total volume of seed produoed - and consequently the amount of oil realised - is suoh that soya bean oil has beoome one of the most important single oils in the world.

25. The consequence of this is an important relationship between vegetable oil production and protein demand. One of the incentives of oil-seed producers is likely to remain meal production, and in developing countries this incentive may well become more important if meat production programmes are introduced and feedmills installed.

26. Despite the recent use of soya protein for human foods, there is no doubt that the market for oil-meals as animal feed will continue to be the dominant one.

27. Oil-meals other than soya form a resiaual or marginal market. They are either in short supply (linseed, because of the falling demand for linseed oil, or sesame, because the seed cannot be mechanically harvested) or they possess certain toxic or anti-nutritional elements that reduce demand (rape-seed - erucic acid, cotton-seed - gossypol, and ground-nut - aflatoxin). Copra and palm kernel meal have a fibre content and so are generally used only in cattle fodders.

Trade in oil-meal

28. In 1965 oil-meal exports were 6.6 million tons, of which soya bean, ground-nut and cotton-seed meals accounted for 5.5 million tons, or 83%. By 1975, exports of oil-meals were 12.7 million tons - almost double the 1965 level. The three major oil-meals, soya beans, ground-nut and cotton-seed, have consistently accounted for about 85% of supplies. However, this does not reflect an even performance by the three oil-meals. Soya bean has increased its market share strongly over the decade and now accounts for almost 70% of trade supplies. Trade in ground-nut and cotton-seed, on the other hand underwent an absolute decline, and consequently their combined market share was halved between 1965 and 1975.

29. There has been a rising share of oil-meal exports from developing countries, largely due to increasing supplies of Brazilian soya meal. Both virgin land and former coffee-producing land have been brought under cultivation. Although Brazilian soya meal is as good as that produced in the United States, it tends to be handicapped by the lack of facilities necessary for the smooth handling of the massive quantities available. Brazil does not possess the same network or rail, barge and truck facilities as the United States.

30. The European Economic Community accounts for almost 50% of world imports of oil-meal; other major developed markets are Spain and Japan. Imports into Eastern Europe and the USSR have considerably increased in recent years. Import markets have also grown rapidly in leveloping countries such as Iran, the Republic of Korea, Mexico and Venezuela.

Prices of oil-seeds and oil-seed products

31. The general level of prices in any one year is determined by supply and demand. Supply depends partly on past plantings and price expectation and partly on the weather. Demand depends on price and such factors as population and income growth. In addition, there are speoulative influences and demand for stock cover. After a long period of relative price stability, 1974 was an exceptional year in terms of a decline in supplies, a rapid increase in demand and a high degree of speculation. The consequent rise in prices was followed in 1975 by a price decline that can be seen as a reversal of these factors.

32. During the first half of the 1960's, two distinct price ranges for oil-seeds were discernible. The upper range seeds consisted of copra, palm kernels and ground-nuts, with average prices varying from $164-225 a ton in the period 1960-1965. The lower range seeds, comprising sunflower seed, rape-seed, cotton-seed and soya bean, remained within a comparitively narrow price band of $92-128 a ton over the same period.

33. The situation has undergone considerable changes since then. Between 1965 and 1975 copra and palm kernel prices rose comparitively little while those of soya bean, ground-nut, cotton-seed and rape-seed doubled, and sunflower seed prices almost quadrupled. However, during the latter part of the period, in 1974 and 1975, the demand and supply were somewhat exceptional, and since 1975 the situation has to a certain extent reverted to that prevailing during the earlier period. For the period October 1976 - May 1977, for example, soya bean and rape-seed prices averaged $305-306 a ton, sunflower seed $350 and cotton seed $243, while copra and palm kernel prices averaged $424 and $340 respectively.

34. The trend in relative oil-seed prices is mirrored in the price relationships of the oils themselves. This is evident from table 5 where, if soya bean oil and palm kernel oil prices are taken as an example, the price of soya bean oil was, with one exception, less than the price of palm kernel oil throughout the 1960s, while in much of the period 1972-1976 the situation was reversed. By October 1976 - May 1977, however, soya bean oil prices, at an average of $582, were again less than those of palm kernel oil, which averaged $626.

Table 5. Prices of selected fats and oils a/ c.i.f. Europe, 1960-1976
(In $US a metric ton)

Year	Soya bean	Sunflower	Cotton-seed	Ground-nut	Rape-seed	Olive	Palm	Cooonut	Palm kernel
1960	225	243	235	326	219	585	228	312	317
1961	287	311	305	331	280	561	232	254	263
1962	227	246	266	275	221	631	216	251	255
1963	223	236	243	268	215	871	222	286	287
1964	205	255	250	315	252	586	240	297	299
1965	270	294	278	324	263	663	273	384	353
1966	261	263	333	296	244	661	236	324	271
1967	216	212	378	283	206	690	224	328	249
1968	178	172	305	271	161	681	169	399	367
1969	228	213	291	332	200	666	181	361	306
1970	307	331	354	379	293	699	260	397	429
1971	323	375	392	441	295	727	261	371	335
1972	270	326	324	426	232	916	217	234	244
1973	465	480	500	546	395	1,399	378	513	491
1974	795	983	939	1,077	745	2,174	669	998	1,010
1975	619	739	726	857	551	2,436	433	393	439
1976	376	500	645	675	390	2,350	370	340	360

Source: World Bank.

a/ Descriptions:

Soya bean oil: Crude, United States, c.i.f. Rotterdam
Sunflower oil: Any origin, ex-tank Rotterdam
Cotton-seed oil: United States, PBSY, c.i.f. Rotterdam
Ground-nut oil: Nigerian/Gambian/Any origin, c.i.f. Europe
Rape-seed oil: Netherlands, f.o.b. ex-mill
Olive oil: Spanish, edible, 1% drums
Palm-oil: Malaysian, 5% c.i.f. United Kingdom
Cooonut oil: Philippines/Indonesian, bulk, c.i.f. Rotterdam; for 1973 Netherlands, 5%, ex-mill prior to 1973, White Ceylon, 1% bulk, ex-tank Rotterdam.
Palm kernel oil: West African, c.i.f. United Kingdom

35. Owing to different end uses and particularly the varying oil content of oil-seeds, it seems very difficult to draw specific conclusions from these relative changes in oil-seed prices. It should be noted, however, that throughout the period 1960 to the present, ground-nut oil prices remained relatively high. In view of the importance of ground-nuts in a number of developing countries, a narrowing of the price differential between ground-nuts and other oil-seeds would benefit the developing countries in any effort to gain a greater share of world markets for oil-seed products. In the case of oil palm, specific developing countries are already in a position to take increased advantage of the price competitiveness of the product.

36. In the case of oil-meals the price mechanism in the trade is a complex one; so the demand for and prices of other oil-seed products has to be taken into account by the producers of oil-meals. Prices of oil-meals have not been subject to general fluctuation, but strong upward and downward trends may be established in any one season, depending on the level of supply in the markets.

37. Short-term demand is relatively price inelastic, since at the beginning of every year there is a given livestock population to rear and feed, and if farmers are faced with high protein prices, their response in reducing livestock populations takes place over a relatively long period.

38. The trend in oil-meal prices is illustrated by table 6. Over the period 1965-1973 prices of oil-meals moved steadily upwards, but in 1972/73 there was a sharp rise in price. The factors generally regarded as responsible for this were on the supply side: the small increase in production in the 1972/73 season, caused primarily by a shortfall in fishmeal supplies and ground-nut meal (and also by a reduction in supplies of sunflower seed, rape-seed and linseed meals); and the very low level of stocks. Coupled with this, demand was particularly strong that year, with a much higher livestock population in the major meal-using countries and the entry of the Soviet Union into the market as a major meal importer. After 1972/73 oil-meal prices were reduced but have stayed at a higher level than before 1972/73.

Table 6. Selected oilcake/meal prices
($US a ton)

Type of cake/meal	1966-1968 average	1969-1972 average	1973	1974	1975
Soya bean meal, United States, 44% c.i.f. Rotterdam	89	107	302	184	155
Cotton seed expeller, 45/46% c.i.f. Hamburg	-	98	225	179	153
Ground-nut meal, 50%, any origin, c.i.f. Hamburg	95	107	266	174	140
Ground-nut expeller, Nigeria, 56% c.i.f. U.K.	-	121	305	223	186
Sun pellets, 38%, Argentina/Uruguay, c.i.f. Rotterdam	78	87	217	150	135
Rape-meal, 34%, f.o.b. ex-mill Hamburg	70	78	178	143	128
Cocoanut pellets, 23/24% Philippines, c.i.f. Hamburg	-	88	153	118	145
Fish meal, Peru, 65% c.i.f. Hamburg	-	194	542	372	245

Source: Oil World Semi-Annual, Hamburg.

II. DEMAND FOR VEGETABLE OILS AND OIL-MEALS

Vegetable oils and fats

39. The difference between the demand for oils and fats in the developed countries and that in the developing countries can be indicated by comparing current consumption figures. Table 3 showed that per capita availability of the 10 major oil-seeds in the developed countries in 1975 was more than three times as great as in the developing countries. When other sources of vegetable oil are included the difference is greater, and when animal fats are included it is greater still. Even in the major vegetable-oil producing developing countries per capita consumption is generally less than half that of developed countries, although in some of former, such as Argentina, Brazil, Malaysia and the Philippines, Sudan and Zaire, where the oil-crushing industries are well developed, consumption has risen considerably. It is also notable that vegetable oils provide a much higher proportion of the oils and fats consumed in certain developing countries. Asian and African countries in particular show a reliance on vegetable oils as the main source of fat in the diet.

40. Different levels of per capita consumption of vegetable oils reflect different patterns of usage and hence of demand in the developed and developing countries. The figure summarizes the end uses of oil-seeds and oil-seed products; it is evident that a variety of consumption patterns is possible. In the developed countries the principal end uses are as margarine or shortenings, which account for about 45% of total vegetable oil use. Substantial amounts are also used as cooking or salad oils, especially in the United States, where about 43% is used in this way, Japan, and the Mediterranean countries (olive oil). In developing countries, on the other hand, a much higher proportion is used as cooking oil, while the margarine and shortening industries are less well developed. In India, for example, only about 20% of the edible oil consumed is used as fat (in the form of vanaspati); the rest is used as crude oil, except for about 1% used in the form of refined oil. In aggregate the developing countries produced about 1.0-1.5 million tons of margarine and other prepared fats in 1974, compared with a world total of 8.2 million tons.

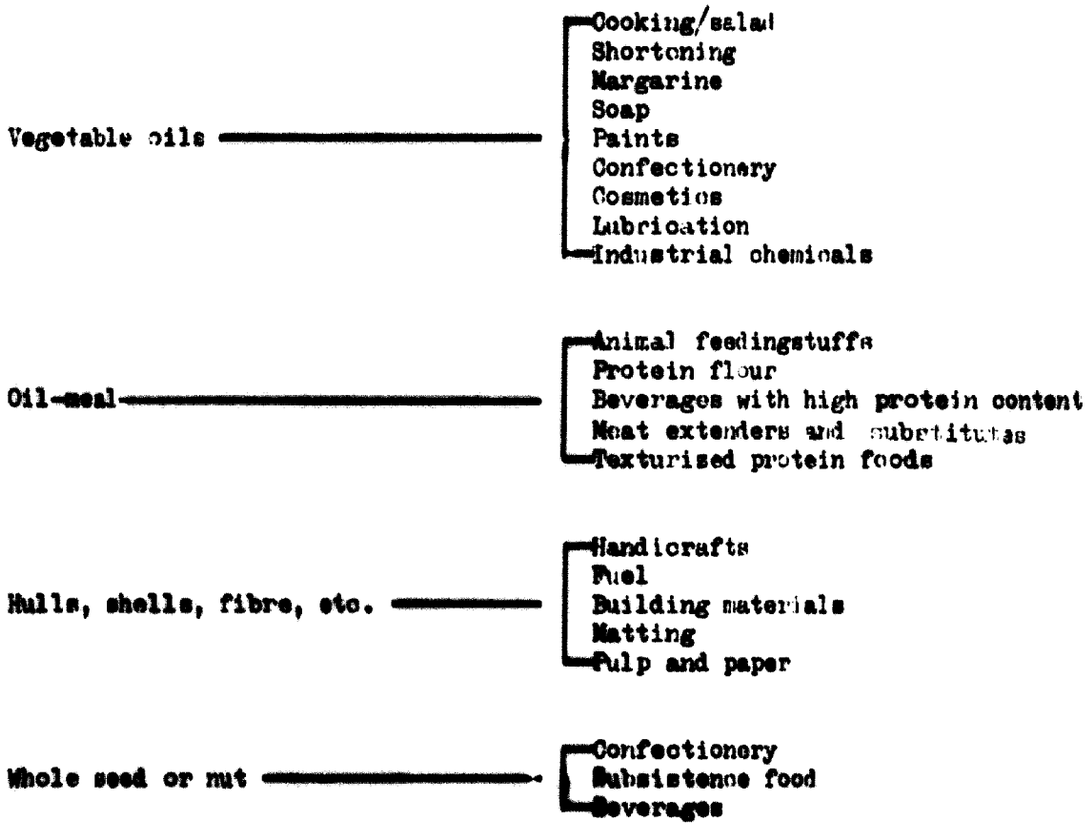

Figure: The end uses of oil-seeds

41. A similar situation is evident in the case of non-edible vegetable-oil products, particularly soap, washing powders and detergents. Out of a world soap production of 6.1 million tons and a washing powder and detergent production of 10.6 million tons, the developing countries produced only about 2 million tons and 1.6 million tons respectively in 1974. The developing countries, with two thirds of the world population, produced only one fifth of the world output of margarine, soap, washing powders and detergents; in terms of oil content, this accounted for about 3 million tons of oil from a total availability in the developing countries of 12.7 million tons. In the developed countries the vegetable-oil content of the margarine, soap, washing powder and detergents produced amounted to approximately 12 million tons, compared with an availability of 15.8 million tons of the ten major vegetable oils under study.

42. Very few developing countries process vegetable oils beyond the stages already mentioned. A major exception is Malaysia where processing capacity is expanding rapidly. Of a total production of 1.6 million tons of palm oil, nearly half is now being exported as processed oil, in the form of refined, bleached, deodorized or fractionated oil.

43. Given the main patterns of usage of vegetable oils, the three most important factors that affect future demand significantly are:

(a) The per capita consumption of fats and oils has virtually stagnated in many developed countries at between 20-30 kg, reflecting market saturation, and could even decline as the result of a fall in living standards and changes in food consumption patterns due to greater health consciousness. Greater health consciousness, however, has led to growing demand for soft oils (oils that are liquid at room temperature). This is partly due to growing availability, particularly of soya oil, and partly also to the qualitative changes in consumer patterns taking place in many developed countries, where consumers either believe or are being led to believe in that there are links between saturated fats and certain health problems;

(b) The level of effective demand for fats and oils in many developing countries is rising faster than that of domestic supplies. This is because of rising incomes (for example, in the mineral-oil exporting countries such as Iran and Iraq,) or because the Governments of certain countries (India and Pakistan, for example) have become committed to national food policies in which fats and oils have been classified as essential commodities. Such countries are therefore committed to importing fats and oils in order to make up shortfalls in domestic production;

(c) Increased mutual substitution is occurring as a result of developments in processing technology (fractionation, transesterification, refining, deodorizing, and hydrogenation). The demand for a particular oil depends very much on the extent to which other fats and oils are mutually substitutable. If an oil has few substitutes, its price may be independent of the prices of other fats and oils. If it has many substitutes, then its price is likely to follow the overall price level fairly closely. The increasing substitutability

of oils is reflected in the tendency of their prices to be similar, particularly in periods of rising prices, although less in times of falling prices. A more elaborate explanation of the importance of substitutability will be found at the end of this chapter.

Oil-meals

44. Oil-meals are a major source of protein, most of which is presently consumed by the livestock industries of the developed countries. The growing use of oilcakes in these countries is the result of the growth of livestock industries, generally in response to increased demand for meat and the development of more intensive feeding methods for most types of livestock.

45. Protein is essential in livestock feeding. Although grains are usually the main source of protein in fodders produced in developed countries, oil-meals are used to supplement them. Demand for oil-meals is greatest in the developed countries and, to a lesser extent, the centrally planned economies.

46. In developing countries grains are primarily used directly for human consumption, and oil-meals are often the principal source of protein for animal fodders. At subsistence level, oilcakes for animal feed are also a source of energy because of their high residual oil content, while in many cases the whole seed is used.

47. A further use of vegetable protein is for human consumption: it has long been recognized that consumption of vegetable protein from oil-meals need not be limited to animal feeding. Because of the escalation of meat prices throughout the world (mainly caused by the increased cost of the compound feed on which animals are reared), the use of vegetable protein for human consumption has recently become as economic proposition in developed countries. Soya protein leads the market and at present is sold in a number of forms but particularly as texturized vegetable protein. Soya protein is used mainly as a meat extender, but its nutritional value should eventually encourage its use as an alternative food source in its own right.

48. Some soya protein products, such as soya flour, grits, concentrates and isolates, have been marketed for up to forty years, but only recently were extrusion and spinning processes applied to the defated flakes to form textured vegetable protein. The United States is the largest market for soya protein for human consumption, and it is estimated that 900 million pounds (408,000 tons) are used annually for all applications, including exports.

49. Protein made from oil-seeds is not yet important quantitatively in developing countries although it has already been used successfully to enrich protein-deficient foods.

50. Despite the recent use of soya protein for human foods, the dominant market will continue to be the market for vegetable oil-meals as animal feed for some time to come. Research and development are becoming increasingly important, however, for the use of vegetable proteins for human consumption in the future. New products already include drinks and meat extenders.

Substitutability of oils and fats

51. At present, the food and non-food industries use vegetable oils and fats mainly in a relatively limited number of products: cooking and salad oils; margarine; shortening; and soaps, paints and other non-edible products.

52. It is likely that most vegetable oils and fats will continue to be used in these products in the future, but the increasing substitutability of individual oils may affect the quantities of each oil used. Modern technology has enabled manufacturers to substitute one oil for another. The extent to which this is possible is primarily a technical problem, but once the technical constraint is overcome, the availability and relative prices of the oils and fats concerned will very much influence decisions regarding the choice of raw material.

53. Oils and fats that are composed mainly of saturated fatty acids are more stable and resistant to chemical deterioration than those containing a large proportion of unsaturated fatty acids. The most widely used method of modifying oils so that they can be readily used as substitutes is hydrogenation: the addition of hydrogen to unsaturated oils renders them more saturated and thus more stable. Theoretically, it is possible to hydrogenate most unsaturated oils and by doing so make them into substitute oils for the natural saturated oils, but in practice there are limits to the degree of substitutability. The manufacturer may therefore be restricted in his choice of oils and fats as raw materials for modification.

54. Other factors, such as viscosity at different temperatures; solidification point; and the odour, taste and colour required in the final product must also be considered.

55. Another important factor affecting substitutability is the availability of an oil or fat in the highly competitive world market. An oil or fat of which a surplus becomes available on its traditional markets is likely to be used as a raw material by manufacturers in both the food and non-food processing industries. An example would be the widespread use of soya bean oil by manufacturers because it has tended to be readily available and supplies have been generally predictable in the short term. Palm oil is being increasingly used because end-users are able to assess that future supplies are reasonably assured owing to the already substantial planting of oil palms in Malaysia and the prospect of an increase in supplies from new plantings in Indonesia. The result of intensive competition between soya bean and palm oil will probably be that each oil will find uses in an increasing number of new end-products.

56. With the aid of modern technology, nearly all vegetable oils are substitutable to varying degrees, both for each other and for animal fats, marine oils and synthetic products. The manufacturer of food and non-food products based on vegetable oils has a wide choice when deciding on a suitable substitute oil for his particular end-product. Generally, he will select the cheapest and most readily available oil.

57. The degree of substitution among vegetable oils is a function of economic and technical considerations. The relationship between price and supply is demonstrated by the fact that the proportion of the most competitive oils, palm oil and soya bean oil, in total world vegetable-oil production increased from 35% in 1965 to 44% in 1975, a figure that it is predicted will increase even further. The change in price differentials over the last ten years has also been considerable. In 1965 the price differential between the cheapest and most expensive vegetable oils was of the order of $60 a ton, but by 1973 this had risen to $150 a ton and in 1974 had reached an unprecedented $580 a ton. Differentials of this size for what are essentially similar commodities cannot be maintained without major changes taking place in the pattern of use. It is inevitable that processors should seek to take advantage of the cheaper oil by extending its uses. The development of blended food products, such as salad oils, margarine and cooking fats, has increased the competiveness and substitutability of a large number of vegetable oils. In the case of salad oils, almost all the liquid edible oils can be substituted for one another, while in the case of margarine and compound cooking fat it is possible to substitute most vegetable oils that have been

hydrogenated or are in the natural, unhydrogenated condition.

58. In addition, competition from synthetic materials must not be overlooked. So far, this has mainly affected the non-food products utilizing lauric oils. The main reason is that for many years the lauric oils were relatively highly priced. Furthermore, synthetic substitutes are now available and are well placed to take advantage of any instability or inadequacy of supply shown by the natural oils. As the developing countries become involved in setting up petrochemical industries, competition from this source will tend to become increasingly possible.

59. In view of the substitutability between oils in many uses, the demand for a particular oil could be affected, since it is inevitable that manufacturers will select the cheapest and most readily available oil for using in blended products. This is a particular problem for many of the developing countries because of the concentration of a single product on which the oil-seed economy is based and the limitation of their stock and storage capacities to keep reserves against rapid changes in the prices of various oils.

III. SUPPLY OF VEGETABLE OILS - EXTRACTION AND REFINING EFFICIENCY AND COST

60. Although the levels of technical and economic efficiency may differ, the method of extraction of oil from oil-seeds is principally the same whether the process is carried out at the village level or industrially. Before oil extraction can start the oil bearing material is usually dried, broken into small particles, and heated or "cooked". In village production palm fruit is treated differently: it is either allowed to "ferment" so as to facilitate the removal of the individual fruits from the bunch, or boiled in water to facilitate the removal of the fruits and to inactivate the lipolytic enzymes. The oil is usually extracted from the pre-treated seeds by pressure, applied either manually, in village production, or mechanically in factory extraction. In the more advanced industrial environments oils is also extracted with solvents, a process that combines high technical efficiency with a product of high quality.

61. A number of salient features of village oil-seed processing may be noted. Firstly, such processing is widespread and is applied to most of the major oil-seeds grown in developing countries. Sesame seed, rape-seed, safflower seed plus coconut and oil palm are all extensively processed at this level. Secondly, absolute output levels are very limited. Thirdly, the oil extraction rates obtained using village methods are limited. A further factor is the quality of oil produced, although with care the quality of village-extracted oil can be good and, since the oil is mostly used quickly, the free fatty acid content is not usually excessive. In many areas village processing still plays a useful role and will continue to do so in the near future: it provides employment, helps rural development, and contributes valuable nutrients to the food supply of the inhabitants.

62. As a consequence, there is a need for simple and cheap improvements in village processing methods. Although village processing may be technically inefficient in terms of oil extraction, this does not mean that it is uneconomic.

63. The limitations of village processing nevertheless make it advisable to consider introducing factory-scale extraction when planning the extension of the oil-seed industry in developing countries.

64. In a factory, oil-seed is crushed by some form of powered machinery. Crushing may be an end in itself or a prelude to further chemical processing. However, the scale and variety of technologies vary greatly, and so does the structure of the oil-seed and oil-seed products industry. In many developed countries, pre-pressed solvent extraction is the most common technique, but in many developing countries the screw press, often 20 or more years old, is the principal form of powered crushing unit. In some developing countries, however, solvent extraction units have been established. These units are commonly, but not necessarily, associated with mechanical pre-pressing facilities. Solvent extraction methods are also used with a wide range of oil-seeds.

65. Solvent extraction is the most efficient method of recovering oil from oil-bearing material, particularly for oil-seeds or other materials with a low oil content. Since minimum heat treatment is involved, the oil produced by solvent extraction is of the best quality, and the proteins in the meal suffer minimum heat damage. Solvent extraction equipment is relatively expensive, however, compared with other extraction systems, and safety problems arise when inflammable solvents are used. Some recent types of solvent extraction plants have provision for directly handling high-oil content seeds. New technologies based on water extraction are under intensive study.

Refining of crude oil

66. Substances detrimental to the use of fats and oils for food purposes are usually removed in four operations: degumming, deacidification, bleaching and deodorizing. Degumming and deacidification are often combined in one operation, but modern plants employ continous systems. Other refining systems employing steam refining and miscella refining are also sometimes used.

67. A high proportion of the vegetable oils produced in developing countries is used in crude form. This applies both to village processed oil and to some of the oil extracted in larger processing facilities. Consequently, refining facilities are comparatively limited, except where oil is being exported or where a large indigenous urban market is available.

Distribution of capacity

68. The distribution of oil-seed processing in the developing world between the technologies mentioned is broadly as follows:

Technology	Percentage of all processing
Village	8-10
Small expellers	45-55
Medium to large expellers	25-30
Solvent extraction	12-18

69. Many developing countries have oil-seed processing facilities that often are little more than half used and in some cases are not used at all. The list of developing countries which appear to have excess capacity of one kind or another is long, but the most important ones are Indonesia, Nigeria, Pakistan, Philippines, Senegal and Sri Lanka. There are many reasons for apparent excess capacity but the main one seems to be an imbalance between supply and demand. A lack of raw materials is the principal reason for excess processing capacity in several of the countries listed.

70. If certain developing countries are to realize their planned production targets over the next five to ten years, they will need to expand their processing facilities. Countries in this category include Argentina, Brazil, Ivory Coast and Malaysia, and possibly India. The technology required in any given case depends on the oil-seed concerned but seems likely to rage from conventional expellers to solvent extraction, refining or even fractionation facilities. A number of developing countries are also becoming major importers of crude oil and seem likely to have to expand their refining facilities.

71. It is impossible to generalize about the cost of investing in the oil-seed industry. Not only do local conditions (land, labour, potential market size, and other factors) differ; different oil-seeds often require different types of industrial arrangement. Palm-oil, for example, generally has to be extracted within hours of harvesting the fruit bunches so as to minimize the formation of free fatty acids, which are detrimental to the final quality of the oil. However, by taking examples it is possible to give some idea of current investment requirements. In the case of palm-oil, the oil extraction plant is usually integrated with an oil-palm estate; the cost of the crushing facilities accounts for about 30% of total estate costs, which could be themselves $40-50 million for a 10,000 ha estate. This means $12-15 million for plant

and equipment. For cocconut oil the capital requirements for a crushing plant having the capacity to produce 38,000 tons of oil a year are some $7 million, while for a ground-nut oil factory that has solvent extraction and refining equipment and a capacity of 28,000 tons of oil a year (250 tons of groundnuts a day), the cost is about $11 million. In Brazil the capital requirement for a 300,000 tons a year soya bean processing plant, including land, storage, solvent extraction, was about $10 million. The estimated average capital expenditure for a pre-press solvent crushing plant to process 600 tons a day of rape-seed in 1977 was $16.2 millions.

72. It is evident from these examples that the expansion of the oil-seed industry in developing countries represents a substantial call on the capital resources of these countries and that great care has therefore to be taken in appraising individual projects and in arriving at suitable financing arrangements.

IV. MAIN VARIABLES IN THE OIL-SEED AND OIL-SEED PRODUCTS INDUSTRY

73. In the preceding chapters world production and trade in oil-seeds and oil-seed products have been surveyed and their present utilization and processing patterns examined. It is possible, as a result, to identify the essential features of the oil-seed sector. While many variables affect the world oil-seed and related markets, some are more important than others and can provide the foundation for a detailed analysis and detailed forecasts of the oil-seed sector.

74. Since even the main variables in the oil-seed and oil-seed products sector are extremely diverse and complex, it is useful to divide the sector into three sub-sectors: oil-seed production, the extraction and refining of oil, and further processing in connection with oil-based derivative industries.

Oil-seed production

75. On the supply side, the production of oil-seeds is influenced by the amount and type of land available, the variety of seed used, the skills and knowledge of the farmer, and the infrastructure. Government policies and price incentives also play a very important role, and the institutional infrastructure is therefore important as a channel for them. Energy availability and cost, chemical inputs (fertilizers, for instance), and storage facilities must be considered. The availability and cost of investment capital arelikely to depend not only on market considerations but also on institutional arrangements for the provision and distribution of capital.

76. On the demand side, the development of internal and external markets is of prime importance. Where oil-seeds are to be crushed for oil and meal, demand will depend largely upon income levels, relative prices, and the strength of consumer preferences. This applies in both domestic and export markets, although the relative importance of each factor is likely to vary widely. Forward linkage with the oil-seed-processing industry is particularly important: fully integration guarantees simultaneously a market for the producer and raw material supplies for the processor.

77. The future use of oil-seed protein for human consuption could have a positive influence on production because of the stimulus of higher prices.

78. Market forces operate within an institutional environment, and attempts have been made to influence them in different ways. Policies range from special promotional activities sponsored by individual firms to official attempts at regulating competitive pressures.

The extraction and refining of oil

79. Similar variables to those mentioned above affect the oil-seed processing sector, but the emphasis is somewhat different. Land is seldom a constraint, but access to and the cost of capital are important in both the market and the institutional settings. The availability and cost of raw materials is important for the efficient operation of an oil-seed crushing mill. Supplies are often irregular in many developing countries and this leads to over-capacity and high unit costs, while the prices paid for seed have at times made the crushing operation unprofitable. The physical infrastructure is also important as irregular supplies of power have often affected capacity utilization in the past.

80. Other factors that are important for an analysis of the oil-seed processing industry are the technical skills of personnel, access to technological innovation, employment effects, pollution, safety, the degree of commercialization of the industry, and the institutional infrastructure. Managerial skills and the improvement thereof are of decisive importance as is the development of internal and external markets for vegetable oil and oil-meal. The complex inter-relationships between the markets for meat, oil cake, dairy products and vegetable oils have to be considered. Tariffs that discriminate particularly against semi- or fully-manufactured products are a powerful variable. Tariffs that escalate with the degree of processing are a serious problem for developing countries.

Derivative industries

81. The variables to be taken into account for the derivative industries based on vegetable oil are similar to those mentioned in connection with the oil-seed-processing industries. In view of the greater technological complexity involved, however, their relative importance is different. Where vegetable oils are used as ingredients in soaps, soap powders and margarines, for example, a high degree of technology is required, with consequent demands for trained manpower, while consumer incomes take on a greater significance in determining the size of the market. As far as the fractionating and splitting of oils is concerned, a fairly sophisticated market is required, with its own standards.

82. The foregoing delimitation of the oil-seed sector and identification of the main variables serves as a foundation for future analysis and predictions about the oil-seed economy. Many decisions have already been taken that will determine the supply and use of vegetable oils in the short to medium term, but the more distant prospects depend on many variables. In the following chapter the world oil-seed situation in 1985 is discussed. The picture that emerges is in broad agreement with similar predictions made by other national and international observes. On the longer-term outlook, however, opinions may differ, and the main variables identified in this sector can serve not only as framework for predictive analysis but also as a means of identifying strategies for the achievement of given aims, such as those of the Lima Declaration.

V. MEDIUM-TERM PROSPECTS - THE SITUATION IN 1985

83. The information given in the preceding chapters may be used for forecasting the medium and long-term prospects. It is convenient for this purpose to consider first the medium-term, up to 1985, which then becomes an additional source of information for looking at longer-term prospects. For the purposes of this summary the analysis is simplified by considering only the major trends in demand and supply, which are brought out in the following paragraphs.

84. In developed countries, the demand for vegetable oils is expected to reach saturation point by the early 1980s: in the developing countries consumption is still low, although in most of them vegetable oils are becoming an increasingly important component in the diet. It is predicted that the gap will be narrowed somewhat during the remainder of this century. FAO agriculture projections to 1980 indicated an increase in total demand for food fats and oils of about 2.7% a year. The fastest rate of total consumption increase (average 4% annually), was projected for developing countries. Developed countries' consumption is expected to rise by only 1.6% a year. Broadly speaking, these rates of growth are confirmed by USDA projections.

85. A recent up-dating of the FAO projections, carried out by UNIDO and extending the period to 1985, has indicated little change in these figures. On a low growth rate assumption the rate of growth of demand for fats and oils in developing countries is estimated to be 3.7% a year, while that of the developed countries should follow the earlier FAO forecasts. Assumptions of higher growth rates raise the average developing country rate of growth of demand for these products to 4.5% a year and that of the developed countries to 1.8% a year.

86. The implications of these demand projections for the developing countries' oil-seed economies are highly significant. Table 3 showed the developing countries are now exporting a considerably greater quantity of vegetable oils than they are importing. The likely pattern of future demands indicates, however, that the developing countries could become the most important market for vegetable oils and fats.

87. With overall demand likely to stabilize in the developed economies, it is expected that consumers will also become more discerning in their use of vegetable oils. The oils most likely to benefit will probably be those with particular characteristics, such as a high or medium polyunsaturated fat content,

for example, sunflower and soya bean, and also also the lauric oils, coconut and palm kernel. However, overriding many if not all of these specific characteristics will be the continuity of supplies and the relative prices of the oils. Since vegetable oils are becoming increasingly substitutable, the really important factor will be whether a given price differential is sufficient to justify the cost of modifying an oil for use in a role not previously considered.

88. Table 7 shows the production situation in 1975 and suggests that the vegetable oils most likely to be in abudant supply by 1985 are soya bean oil and palm oil, with sunflower seed oil a close third; this is in accordance with the trend in recent years. If demand is concentrated upon these oils, in volume terms the developing countries as a whole will see little improvement in the volume of oil they can sell, although the major palm oil producers will benefit. In view of the importance of soya bean as a source of protein, and the likelihood of continued government support for growers, soya bean oil production is likely to remain concentrated in Brazil and the United States. It is estimated that by 1985 production in the United States will reach about 6 million tons and in Brazil 2.8 million tons (oil equivalent). This would be 66% of the world total shown in table 7. World palm oil production is expected to increase by about 11% a year between 1975 and 1985. Some 40% of the palm oil consumed in 1975 was used in developed countries. It is estimated that by 1985 around 2.5 million tons, or 45% of a total consumption of 5.6 million tons, will be consumed in the European Community, Japanese and United States markets, with the European Communities and the United States taking more than 1 million tons each. This increase can be achieved only at the expense of other oils.

Table 7. Vegetable oils: production in 1975 and projections to 1985

Type of vegetable oil	1975		1985	
	Million tons	Percentage of total	Million tons	Percentage of total
Soya bean	8.5	29.8	13.4	33.1
Ground-nut	3.2	11.0	4.3	10.6
Coconut	2.7	9.6	3.3	8.1
Cotton seed	3.2	11.3	4.0	9.9
Palm	2.9	10.3	5.6	13.8
Palm kernel	0.5	1.8	0.8	2.0
Sunflower seed	4.0	14.2	5.0	12.3
Rape-seed	2.6	8.9	3.0	7.4
Sesame seed	0.7	2.5	0.7	1.7
Safflower seed	0.2	0.7	0.4	1.0
Total	28.5	100.0	40.5	100.0

89. The real growth, however, is expected to take place in the palm oil producers' domestic markets and exports to other developing countries. Two developing countries whose consumption of palm oil is expected to increase substantially are Iran, where consumption is expected to expand to 200,000 tons by 1985, and India, where expansion from 53,000 tons to 125,000 tons between 1974 and 1985 has been predicted. The penetration of palm oil into these markets will undoubtedly boost the developing countries' share of the total world market, but the trend will benefit a very small number of developing countries and add considerably to the imports bills of many more.

90. Using the estimated rates of increase in demand previously mentioned and the estimates of production shown in table 7, a projection for 1985 suggests that the developing countries will be consuming between 18.3 and 19.7 million tons of oil but may be producing as much as 20.9 million tons. In contrast, the developed countries are expected to be consuming between 18.2 and 18.5 million tons of vegetable oil by 1985 but producing about 19.6 million tons. Consequently, the estimated total demand in 1985 of between 36.5 and 38.2 million tons seems more than likely to be met by the projected supplies of 40.5 million tons. It is highly unlikely that a physical surplus will be produced, but the gap between potential supply and demand implies pressure on price levels and increased competition for the available market.

91. In summary, as income levels increase in the developing countries an increasing proportion of the supply of vegetable oils will go towards meeting demand there, although towards the end of the century the rate of growth of demand may fall off in some countries as basic needs are satisfied. In the developed countries, demand is not expected to grow much faster than population, and the potential from supplies in these countries could cause problems for the developing countries if domestic processing industries are faced with increasing competition from highly competitive imported oils.

VI. THE LONG TERM - THE SITUATION IN 2000

92. The development of the world oil-seed economy after 1985 is best considered in the conceptual framework of chapter IV. Of the three sub-sectors discussed there, oil extraction alone has direct links with each of the others. Statements about the situation in 2000 are therefore made in terms of vegetable oils, although assumptions have been made about variables in all three sub-sectors.

93. It is not possible set out here all the assumptions that have been made, but the conclusions can be summarized as follows: on a simple growth trend based on the figures given in the previous chapter, with oil production from the ten major seeds at 28.5 million tons in 1975 and about 40.5 million tons in 1985, the extrapolated production level for the year 2000 would be 68.6 million tons. This would consist of 37.2 million tons from the developing countries (20.9 million tons estimated for 1985) and 31.4 million tons from the developed countries (19.6 million tons in 1985). Production, however, accounts for only the supply side of the market for vegetable oils. The ultimate situation in 2000 will be the result of a complicated interplay between demand and supply considerations. Since a workable model is still to be developed, it is convenient to begin with demand and work gradually towards an opinion concerning the overall market situation.

Trends in demand for vegetable oils

94. The demand for vegetable oils is largely a function of income levels, prices of competing products, and tastes. In the developed countries, the trend towards increased consumption of polyunsaturated fatty acids noted in the forecast for 1985 is likely to slow down in the latter part of this century, although the trend towards increased substitutability between oils in various end-uses could continue. The incentive for investigating substitutability depends, however, upon the relative prices of different oils in their present uses. Because the consumption of oils and fats has already reached a relatively high level in the developed countries, future demand for edible and non-edible uses is expected to increase in the long term at a rate not much higher than that of population growth, although some additional shift of interest from animal fats to vegetable fats is possible. The latest United Nations estimate of annual population growth in the developed countries up to 2000 is 0.6%. on this basis the demand for vegetable oils would be about 19.9 million tons in the developed countries, assuming (as in chapter V) that consumption in 1985 would be approximately 18.2 million tons.

95. In the developing countries, demand for fats and oils is expected to continue to rise in proportion to anticipated rises in per capita income; so income and population growth rates are regarded as the most crucial variables affecting demand in those countries. The most recent United Nations estimates of population growth rates in developing countries between 1980 and 2000 imply an average annual increase of 2.1% over the twenty-year period. No readily available estimate exists for the expected growth rate of gross domestic product (GDP) or GDP per capita for the developing countries as a whole over the same period. In UNIDO's recent updating of the FAO projections to 1985, however, a series was established of upper and lower projected growth rates of GDP by country for some 70 developing countries. If the lower unit of this range is taken as a conservative assumption for 2000, a representative sample of the largest of these countries indicates an average annual rate of growth of GDP of 5.1%. If this figure can be accepted as being of a reasonable order of magnitude, and if it is further assumed that the income elasticity of demand for fats and oils in developing countries is about 0.8, which is typical of the values calculated in the earlier FAO study, an annual rate of growth of demand for fats and oils of about 4.4% is implied. The level of demand in the developing countries would then be some 34.9 million tons by 2000. Taking the developed countries into account, total demand by 2000 is therefore expected to be about 54.8 million tons. On a somewhat lower rate of growth of GDP in developing countries of 4% a year, which would represent a rate of growth of per capita GDP of just under 2% a year, the total would fall to 51 million tons.

96. The figure of 54.8 million tons would mean that a per capita consumption of 4.4 kg in the developing countries in 1975 will have risen to only 7.1 kg in 2000 - still under half the figure for the developed countries.

97. It has been assumed in this discussion of demand that real relative prices for vegetable oils will remain at their present levels throughout the period considered, and there are some grounds for believing this will happen.

Trends in supply

98. It may be assumed that there will be gradual improvement throughout the oil-seed economy, aimed at satisfying demand and meeting requirements for more and better products. On the agricultural side, extended research will lead to improved varieties and productivity. On the processing side, the adaptation of existing and new technologies will ensure that they continue to be applied increasingly in developing countries.

99. Current research will also contribute to product development and the establishment of production capacities for high-value-added products in the developing countries.

100. The demand for protein for animal feed is likely to increase steadily in developed countries at about the same as population growth; although year-to-year fluctuations will continue in response to changes in the corn/soya price ratio, there will be a corresponding increase in the demand for oil-meal in those countries. If, however, there is a substantial increase in the supply of protein from bacterial sources, using such raw materials as hydrocarbons and agricultural and industrial wastes, the demand for oil-meal could be significantly affected. Although it does not seem that protein from fermentation processes will be a threat to oil-meal in the near future, it should be taken into account when future development is planned.

101. In the developing countries, the demand for oilcake will tend to increase as incomes rise and livestock programmes expand, but the outlook of the developing countries as producers of oil-seed is likely to be one of confidence. Oil-seed production in the developing countries is dominated by 16 main producing countries. Each region has some countries whose prospects for future production are stronger than others, but all have been expanding and are likely to continue to expand their total oil-seed production. The countries which are best placed to do so are Argentina, Brazil, India, Ivory Coast, Malaysia, Philippines, Senegal and Sudan, which together account for almost 70% of the oil-seeds produced by the 16 major producing countries. Although the remaining eight countries have somewhat lower expected rates of growth, they still appear to have the potential to raise output in excess of that currently planned, through improved yields and cultivation practices, if financial and manpower resources are made available. Other developing countries could produce more oil-seed, because they have land, suitable climates, labour and other inputs.

102. The overall production picture is therefore reasonably encouraging, with a number of the major producers likely to achieve growth rates of oil-seed production of 5% a year or more. If fully realized, such growth in the countries discussed would result in a considerable increase in their share of global production. At present, the 16 countries reviewed account for 35% of world oil-seed production. Even by 1985 this figure would rise to 47% if their current plans are realized and all other producers continue to expand at past rates. It is therefore likely that the world supply of oil-seeds will

be ample to meet the expected global demand for oil, given previous assumptions about the production efficiency and technology of oil extraction.

Implications

103. Given a reasonable assumption about demand and supply variables, it seems that the market for vegetable oils in 2000 could well be in balance. What is important from the point of view of the Lima Declaration, however, is the proportion of world oil-seed production that is processed into oil and meal in the developing countries. The target of 25% of world industrial production by 2000 in developing countries must be interpreted for the vegetable oils and fats sector: since this percentage has already been attained, the notion from the Lima Declaration of "maximum possible" production is proposed instead, with the concrete meaning to be determined by the further strategies related to the development of the oil-seed and oil-seed products industries. The question is whether a continuation of present trends in the oil-seed industry in developing countries represents the "maximum possible".

104. Two points made so far are particularly relevant to this question: the main increase in demand for vegetable oils and related products is widely expected in the coming years to originate from within the developing countries, and the developing countries as a group appear to have unexploited potential for a substantial increase in the production of oil-seeds. The link is provided by the oil-seed and vegetable oil processing industries, and the opportunity exists, or will exist, for development of these industries within the developing countries themselves.

105. Although demand for oil-seed products in the developed countries is expected to grow much more slowly than in the developing countries, the absolute level of demand is currently greater than that of all the developing countries taken together and therefore still represents a market that has considerable potential and contains a number of substantial importers of oil-seeds and oil-seed products. For the developing countries to increase their share of this market, however, it is of prime importance that their industries be geared to optimum levels of operation.

106. Taking such considerations together, it would therefore appear that the continuation of present trends with regard to the proportion of the world oil-seed industry found in the developing countries represents a comparatively modest rate of change. However, although the potential may exist for increasing the developing countries' share of the world oil-seed industry, a number of

constraints have to be overcome before the potential can be realized. The main constraints on the future development of the oil-seed based industries in the developing countries are examined in the following section, which also offers direction on the evolution of strategies for their elimination.

VII. CONSTRAINTS, OPPORTUNITIES AND STRATEGIES

107. The major constraints on the development of the oil-seed industry may be classified as technical and economic. In the developed countries the major economic constraint is often expansion of the market for oil-seed and oil-seed products in their domestic and overseas markets. In the developing countries, however, the situation is much more complex and involves a wide variety of factors at all levels from the production of oil-seeds, through the different stages of processing, to the final market. The technical constraints in developed economies are those largely associated with new product development and new processing techniques. Many of the developing countries, in contrast, face technical constraints in the implementation of comparatively well-tried processing methods.

Production and storage constraints

108. Production constraints in developing economies arise mainly from inadequacies in the supply of services and factors of production - land, particular forms of labour, and capital, for example. The effect of a lack of the capital necessary for acquiring and clearing land, installing infrastructure, promoting research and education, and acquiring equipment and supplies to aid oil-seed production should not be under-estimated. This constraint applies to both the individual farmer and government. Developing countries (except the oil-rich States), generally have very limited capital resources to undertake such investments, and international loans, even at favourable interest rates, often only add to a growing debt burden.

109. The commercial initiatives of many multinational companies are sometimes politically unacceptable, and many developing countries are exercising restraint even in entering into joint ventures to overcome a shortage of capital. Capital shortage therefore remains a major constraint on the expansion of oil-seed production in most developing countries.

110. Technical constrains include the need for higher-yielding, disease-resistant, varieties that are adaptable to arid conditions. Improved storage facilities, extension services and government priority for the sector are also important.

Processing constraints

111. Processing constraints are many, involving matters of regularity and quality of supplies of seeds for crushing, efficiency and availability of service infrastructure, skills and entrepreneurial ability of manpower, managerial skills, and, on a technical level, the adaptability of machinery to different types of seed.

112. Only when the processing constraints are satisfactorily overcome can a processing factory expect to produce high quality products at minimum cost, and the manufacturer to compete effectively in domestic and world markets. Although the market depends upon the quality and price of the product, there are additional constraints that can affect the functioning of the marketing system and can therefore reduce the effectiveness of any improvements made at the manufacturing level. Because of their complexity and widespread implications, marketing constraints are dealt with below at somewhat greater length.

Marketing constraints

113. Market constraints occur at both the domestic and international level. At the domestic level, demand for the product, the price to the producer and the marketing mechanism are all vital to the level of production. With the notable exception of the premium liquid oils (safflower and olive oils, for example), most fats and oils can be regarded as raw materials for the fats and oils processing industry that will be transformed into margarines, shortening, cooking oil and, in developing countries such as Iraq and Pakistan, vanaspati. The marketing problem is therefore basically how to satisfy the requirements of the developing countries for margarine, shortening and cooking oil. This can be done by ensuring the delivery of a good (low free fatty acid content) product in regular quantities. Supply management schemes aimed at preventing undue price fluctuations of vegetable oils are now under consideration by UNCTAD and other bodies. The schemes will involve investment in bulk-storage, loading and transport facilities.

114. The consumption of oil-seed products is very largely determined by the level of income, which, in the majority of developing countries, undoubtedly adversely affects overall demand for these products. Consequently, a rapid expansion of domestic markets for oil-seed products cannot be expected without a real increase in incomes and growth in the economy generally. It would be unrealistic to propose a significant expansion of oil-seed processing for

the domestic market without a corresponding underlying growth trend in the economy as a whole. The easing of constraints at the processing level, however, will help to ensure that costs and hence prices are kept at a level that allows maximum advantage to be taken from growth in domestic purchasing power.

115. At the producer level, there must be adequate economic incentives in the form of remunerative commodity prices paid to the farmer. In some countries producer prices have been allowed to stagnate because of concern to hold down the general cost of living. This can cause producers to turn to other crops, with the result that inadequate supplies are available to the processing industry. Alternatively, producers may confine themselves to providing for their own immediate family needs and show little, if any, interest in providing a surplus for urban consumption.

116. Allied to the problem of remunerative prices is the need for an effective marketing mechanism capable of distributing products from production areas to consumption areas. This can be done either by private traders or through an institutional framework such as a marketing board or co-operative, or a combination of both.

117. At the international level, a favourable pattern of trade can serve as a powerful incentive to expand the production of a commodity. With the development of oil-seed production in the developed countries, the growth of processing capacities in the developing countries and the formation of the EEC as a major world economic block, considerable changes have taken place in trade relations between the developed and developing world in recent years. There has been a progressive dismantling of trade preferences and a simultaneous erection of trade barriers in different forms. Members of the EEC who formerly gave special concessions to certain developing countries have had to abandon all their individual preferential treatment arrangements and operate the Common External Tariff on oil-seeds and vegetable oils. Certain types of oil-seeds and oils from Associated States only are allowed to enter duty-free. Moreover, EEC gave subsidies for the production for oil-seeds within the community, and EEC regulations allow for the imposition of a compensatory levy if a country exporting to the EEC grants an export subsidy of any kind or situations arise that prejudice the production of oils and oil-seeds in the EEC. There is continuing concern amongst developing countries about the EEC's future policies on these matters, and particularly on the discriminative

tariffs applied to highly processed products. There have been some improvements, however, such as the removal of the duty on coconut oil.

118. Above all, the expansion of the oil-seed sector or any part of it requires a commitment on the part of government to encourage such development. Government policy in the form of a clear strategy with specific targets is a prerequisite for most industrial development in developing countries.

Opportunities for further processing

119. It has already been pointed out that the main source of future demand for oils and fats should come from the developing countries rather than from the developed ones; so there is substantial potential to be realized in the manufacture of these products in developing countries. This applies not only the basic extraction of vegetable oil but also to its refining and further industrial processing in both food and non-food uses. However, development of these markets will be gradual, and it is important in the medium term to look also at the potential for increasing sales of these products in the markets of the developed countries. Although potential exists throughout the world, a great number of factors are involved. For example, there are considerable problems in the handling, storage and transportation of oils over long distances. If the quality of a fully-refined oil deteriorates during transport, the oil must be re-refined in the consuming country, and large-scale production of fully-refined fractionated oils for the export market could be rendered uneconomic. Although semi-refined oils have a lower added value, the production of semi-refined oils is not subject to this constraint to the same extent and could become more common in developing countries, particularly in view of the growing pollution-control regulations that are increasing the refining costs in many developing countries (especially Japan, the west coast of the United States and also some developing countries). More research is needed to overcome these problems and will benefit developing countries. A further problem affecting the ability of developing countries to capture an increased share of the market for vegetable oils in the developed countries is the ability of the developed countries to produce their own supplies using their existing factories. So long as alternative supplies of raw materials can be obtained economically, notably United States soya beans, these industries will continue to compete with sources of vegetable oil from outside their geographical area.

120. A possible exoeption to the general situation is palm-oil, beoause of the massive inorease in palm-oil supplies, partioularly from Malaysia. Since palm-oil is neoessarily produoed in the growing oountry, for quality reasons, the only possibility for future development of the industry lies in further prooessing. This involves investment in:

(a) Storage, loading and transport faoilities, partioularly tankers in various sizes;

(b) Faoilities for further prooessing, inoluding fraotionating and refining.

121. Many diffioulties remain, however. For example, the partioular strength of palm-oil is its oheapness, but although refined bleaohed palm-oil is an important ingredient for the food and soap industries of the developed oountries, palm-oil fraotions (stearin and palm olein) oannot yet be produoed to sell at prioes below thòse of oompeting produots (prinoipally tallow). The developing oountries themselves do not have an industry fully oapable of using the stearin fraotion domestioally. Fraotionated palm-oil requires more oareful handling than orude palm-oil, and there is little experience in handling and transporting fraotions.

122. The main trend in further industrialization of the laurio oil industry in the produoing oountries is in orushing palm kernels and oopra looally. This too involves investments in storage and transport faoilities, both to guarantee supplies and avoid prioe distortion due to uncertain supplies, and to avoid quality deterioration during transport. Crushing oopra to produoe oooonut oil in the country of origin may also be regarded as a means of maintaining quality standards. In the developed oountries, oopra orushing is not vital to the fats and oils orushing industry.

123. The orushing industry in developed oountries is beooming inoreasingly geared to orushing soya beans and, to a lesser extent, looally grown rape-seed. This industry oan be oonsidered to be a vital one in view of the heavy dependenoe on soya meal to meet the protein requirements of the livestook industry. As long as the United States exports soya bean, the viability of the European orushing industry is largely ensured. This, as already mentioned, plaoes fats and oils exported from other souroes at a disadvantage, and will oontinue to do so if market struotures remain unaltered.

124. It is unlikely that there will be any signifioant new entrants in the world soya bean market. Although there is oonsiderable interest in soya bean oultivation around the world, additional volume will remain generally small. Domestioally grown soya beans (from tropioal oountries other than Brazil,

for example)' will be extracted mainly to satisfy the growing local demand for oil and protein. Production costs would often not be competitive with those on the world market. In addition, it has to be remembered that soya meal dominates the world market for oil-meal. Like fish-meal, which in recent years has been in uncertain supply, soya bean meal is rich in lysene and so is virtually essential for feeds for monogastric animals, particularly in feed-deficient countries such as Japan and countries in Western Europe. The structure of the oil-seed industry in the above areas is geared to soya bean extraction; soya beans are available in large quantities, and this permits bulk handling and processing.

125. There is a possibility, however, of initiating adequate joint ventures in vegetable oil processing in developing countries that have emerged as net importers of fats and oils. The Brazilian soya bean co-operative COTRIJUI, for example, is planning to crush some 300,000 tons in Iran. Palm-oil exporting countries could set up storage and refining facilities in India, Iraq and Pakistan.

126. The establishment of a viable export-oriented chemical derivates industry in the developing countries, given the present structure of world markets, is uncertain. Although such products are relatively easy to manufacture, their marketing is difficult because there is often no domestic commercial market. For this reason the opening of markets in the developed countries could improve the situation. The only possible exception could be methyl esthers, which are stable, and easy to transport and convert, but there is no ready commercial market for them; so an agreement would first have to be concluded to ensure that these products will be used in the manufacture of oleo-chemical derivates.

Strategies

127. The final problem is strategies for the reduction of constraints so as to improve the trend performance of the developing countries. The choice of strategy depends in the degree of influence exercised by each interest group in the oil-seed industry over the variables and constraints in the sector. As a first approximation, it is convenient to divide the interest groups into: developed economy exporters of oils and oil-seeds, developed economy importers of these products, developing economy exporters, and developing economy importers.

128. The developing economies have a greater degree of control over their own internal industries and markets; an obvious strategy for them is to encourage the development of these industries and markets. Since the developed countries' markets for vegetable oil are expected to expand only slowly, it will be difficult for producers from developing countries to increase their share of these markets, and producers of vegetable oils in developed countries will themselves be looking more towards the developing countries for their markets. The developing countries have the difficult task of ensuring the long-term protection of their own developing industries while simultaneously seeking the elimination of protection in the developed countries. For the latter to be achieved, agreement should be sought for the developed countries to not simply allow their industries to be exposed to world competition, but take positive action on the gradual restructuring of their economies in accordance with changing international comparative advantage. The situation should be seen as one not of conflict but of globally efficient allocation of resources.

129. If protection is to be eliminated and resources allocated efficiently, however, agreement is also needed among the developing countries themselves; with such a wide variety of highly-substitutable products spread over a large number of producers, agreement must be sustained, especially if there is any tendency for supply to exceed demand.

130. It is within a general framework of this nature that policies and strategies that will enable the developing countries to realize their maximum industrial potential in oil-seeds and oil-seed products up to 2000 in accordance with the Lima Declaration have to be evolved. It has been shown in the last two sections where the greatest potential for the developing countries lies from now until 2000, and what major constraints are likely, if they are not tackled, to prevent the realization of this potential. The strategies should therefore focus attention on the elimination of constraints.

131. Measures and strategies to eliminate constraints could include:

(a) Measures to expand the capacity of the oil-seed and oil-seed products industry in the developing countries;

(b) Efforts to control marketing problems associated with the increasing degree of substitution between oil-seed products from the developing countries;

(c) The establishment and support of price stabilization schemes for the mutual benefit of developed and developing countries, with particular attention given to the problems faced by developing countries;

(d) Agreement on the removal of trade barriers that affect the importation of oil-seeds and oil-seed products in to developed countries;

(e) The unconditional use of bilateral and multilateral aid for developing the oil-seed industry in developing countries;

(f) The commitment by the developed countries to seek means of controlling the expansion of their own oil-seeds and oil-seed products industries;

(g) The provision of improved market information services to developing country producers of oil-seed products;

(h) Improvement of the flow of information on technological trends and innovations in the oil-seed and oil-seed products industry;

(i) Agreement among developing countries on the best way to co-ordinate the interests of developing countries whose oil-seed industries are comparatively well advanced with those that are still at an early stage of development and those that have an oil-seed deficit;

(j) The establishment of means for increasing international co-operation in the promotion of the oil-seed and oil-seed products industry;

(k) The development of means for monitoring national plans to expand the production of oil-seeds and oil-seed products so that over-supplying of international markets may be avoided or anticipated sufficiently well in advance for remedial action to be agreed on.

132. It is also important that strategies should form part of a co-ordinated effort to improve the position of the developing countries and that their combined effect should be an integrated attack on the major constraints. This requires agreement on the implementation of the strategies not only between the developed and the developing countries, but also between the developed countries themselves and the developing countries themselves.

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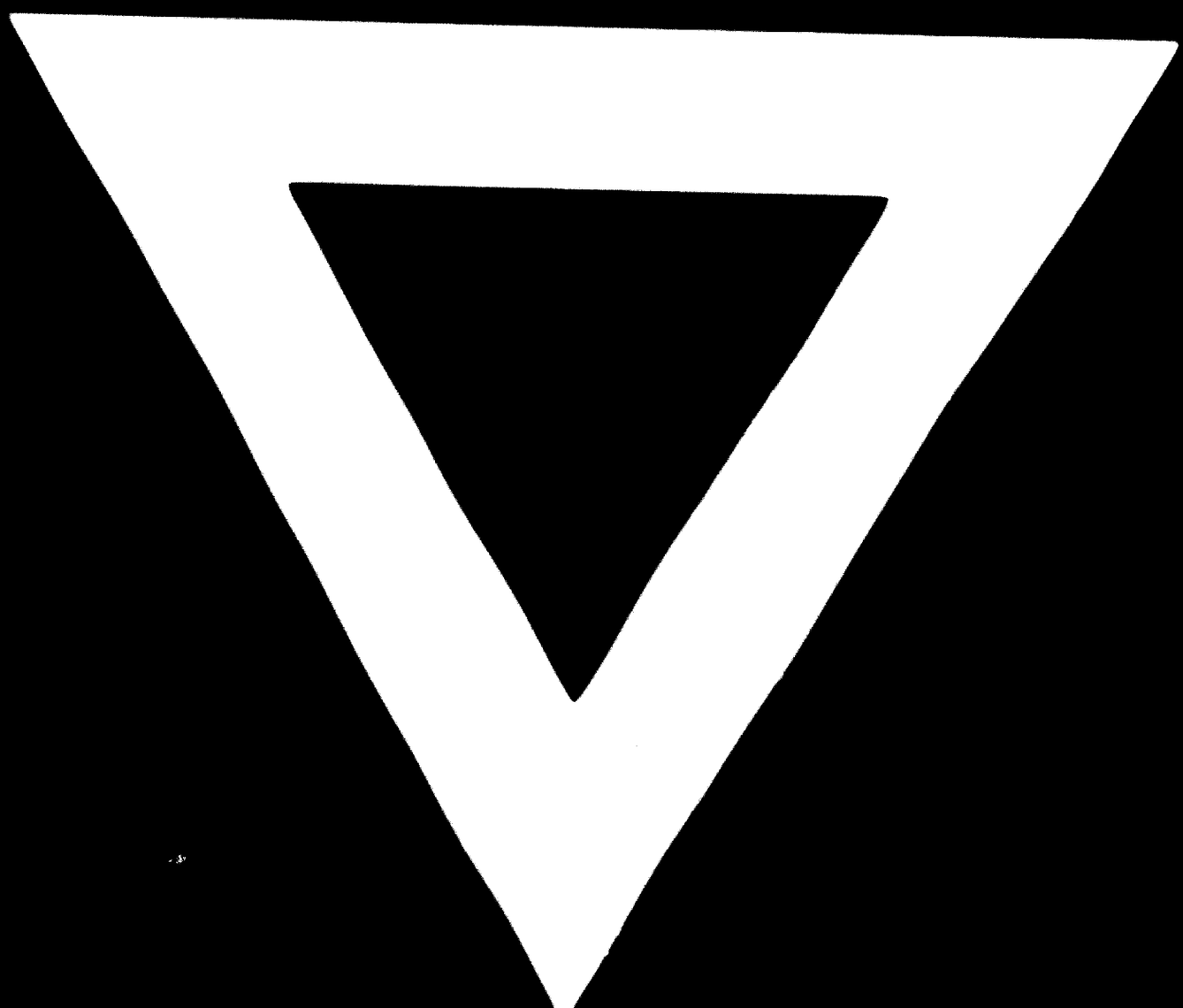

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