Availability and Cost Competitiveness of Palm Oil and Palm Kernel Oil in Non-Food Uses

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The two main non-food uses for oils and fats are in the manufacture of oleochemicals and soaps. The principal raw materials which have been generally used for both these industries are coconut oil and tallow. The choice of raw materials is based on three important factors: the properties of the individual oils; availability; and cost competitiveness.

Properties of the Individual Oils

In the Manufacture of Oleochemicals

Oleochemicals are derived mainly from fatty acids. These can be manufactured from any of the oils and fats, but the ones actually used in the oleochemical industry are determined by the market demand for particular types of fatty acids and their derivatives. In 1980 the total amount of oils and fats used for fatty acid manufacture was 1 915 000 tonnes, of which 68% was tallow and 20% was coconut oil (CNO); palm oil (PO) and palm kernel oil (PKO) accounted for less than one per cent *(Table 1)*.

The fatty acid composition of palm kernel oil is very similar to that of coconut oil while the fatty acid compositions of palm oil and palm stearin are similar to that of tallow *(Table 2)*. Technically, therefore, palm kernel oil, palm oil and palm stearin could to a large extent replace coconut oil and tallow in the manufacture of oleochemicals provided availability and cost competitiveness are satisfactory.

In the Manufacture of Soap

All oils and fats can be converted to soap, but the particular oils and fats used will determine the properties of the soap and these properties are generally a function of the fatty acids. For the production of the best soaps no single oil or fat is suitable; a mixture of oils or fats has to be used. Hitherto a blend of coconut oil (15 – 30%) and tallow (70 – 85%) has been generally used as this proved ideal in terms of quality of soap and availability and cost competitiveness of the raw materials.

TABLE 1. ESTIMATED WORLD CONSUMPTION (1980) OF THE PRINCIPAL OILS AND FATS USED IN THE MANUFACTURE OF FATTY ACIDS AND THEIR DERIVATIVES

	Quantity Used ('000 tonnes)	Fatty Acids Produced ('000 tonnes)	Fatty Acids Produced (% of total)
Tallow	1310	1120	68.3
Coconut Oil	385	330	20.0
Soyabean Oil	23	20	1.2
Cottonseed and Groundnut	18	16	1.0
Palm, PKO, Fish and Other	19	15	1.0
Acid Oils	160	140	8.5
Total	**1915**	**1641**	**100.0**

Source: Hewin International Inc., Netherlands (1982)

TABLE 2. PERCENTAGE FATTY ACID COMPOSITIONS OF COCONUT OIL, PALM KERNEL OIL, TALLOW, PALM OIL AND PALM STEARIN

		Coconut Oil	Palm Kernel Oil	Tallow	Palm Oil	Palm Stearin
Caproic	C6	0-0.8	0.1-0.5	–	–	–
Caprylic	C8	3-6	3-6	–	–	–
Capric	C10	6-10	3-5	–	–	–
Lauric	C12	44-52	46-51	0-0.2	0.1-1.0	0.1-0.6
Myristic	C14	13-19	14-17	2-8	1-1.5	1-1.2
Palmitic	C16	8-11	6-9	24-30	42-47	47-74
Palmitoleic	C16:1			2-3	0.1-0.3	0.1-0.2
Stearic	C18	1-3	1-3	14-25	4-5	4-6
Oleic	C18:1	5-8	13-17	40-49	37-41	15-37
Linoleic	C18:2	0-3	2-4	1-5	9-11	3-10
Others		0-1	0-1	0-1	0-1	0-1

Since the fatty acid compositions of palm kernel oil and coconut oil are similar, while the compositions of palm oil and palm stearin are similar to that of tallow, these oils are to a certain extent technically interchangeable, in soap making. Further, RBD oils are more economical as no further pretreatment is needed, whereas with crude tallow the extra cost of bleaching and deodorizing is estimated to be about US$30 – US$ 40 per tonne.

Availability of the individual oils

The following are the estimates of consumption of oils and fats by the oleochemical and soap industries in 1985:

a) *Oleochemical Industry*

World fatty acid production = 2.2 million tonnes
Tallow used = 1.4 million tonnes
CNO/PKO = 0.5 million tonnes

b) *Soap Industry*

World soap production = 9.0 million tonnes
Fats consumed (65% TFM) = 5.85 million tonnes
CNO/PKO (at 15% of fat) = 0.88 million tonnes
Other oils and fats = 4.97 million tonnes
Tallow (50% of other oils and fats) = 2.5 million tonnes.

Hence for the oleochemical and soap industries together the tallow consumption is estimated to be about 4.0 million tonnes, which is about 60% of the world production of tallow; the consumption of lauric oils is estimated to be about 1.4 million tonnes, which is about 50% of the world production of coconut oil.

Let us now look at the availability of oils and fats – particularly of tallow, coconut oil, palm oil and palm kernel oil – and at the way this is changing with time.

Since 1979 the production of palm oil and palm kernel oil has risen dramatically, to 6.8 million and one million tonnes respectively in 1985. Tallow and coconut oil production have remained fairly static and were 6.6 million tonnes and 2.7 million tonnes respectively in 1985. An idea of the sharp increase in output of PO and PKO can be seen from *Figure 1*, showing

indices of world production between 1975 and 1985, with the indices for 1975 taken as 100.

The most dramatic increases in the production of palm oil and palm kernel oil still lie ahead. In 1995 palm oil will account for about 16% of total oil and fats production while soyabean oil will continue to hold its present share of about 23 per cent. Malaysia is then expected to be producing about 65% of the world's palm oil and 12% of the world's total oils and fats. This would mean that Malaysia had become the largest single exporter of oils and fats in the world – a position held for many years by the USA. The dramatic increase expected in the world production of palm oil and palm kernel oil in relation to other oils is indicated in *Figure 2*, which shows the indices of world production (5 year averages) taking the indices for 1978 – 82 as 100.

Palm oil and palm kernel oil will thus become available at much faster annual rates of increase than all other oils and fats. Coconut oil and tallow production are expected to increase very slightly, indeed to be virtually static.

Cost Competitiveness

The prices of all oils and fats generally rise and fall in unison. The lauric group of oils, *i.e.* coconut oil and palm kernel oil, generally tend to fetch a higher price than the other oils and fats and the prices of CNO and PKO have generally been about the same. Hence as far as price was concerned either of these oils could have been used; but up to about 1980 the availability of palm kernel oil was very limited.

With the increase in production of palm oil and palm kernel oil there is likely to be downward pressure on their prices. It can be seen from *Figure 3* that the difference in price between coconut oil and palm kernel oil is becoming appreciable and more marked, with PKO discounted. This will be a major incentive for manufacturers of oleochemicals and soaps to substitute palm kernel oil for coconut oil.

Tallow prices are generally below those of other oils and fats, including palm oil. Even with the downward pressure on the palm oil price, it is unlikely to go below that of inedible tallow. Hence palm oil as such might not be able to compete with tallow in the world market as a raw material in the manufacture of oleochemicals and soaps. On the other hand palm stearin appeared in the world market about 1980 – after the start of the refining and fractionation industry in Malaysia – and the price of refined, bleached and deodorized (RBD) palm stearin tends to be below the price of palm oil and to approach that of crude tallow *(Figure 4)*.

During certain periods the price of RBD stearin has been below that of crude tallow and hence would have been a profitable substitute for crude tallow. At times, however, the price of RBD stearin has been much higher than that of tallow as RBD stearin was able to compete with other edible oils. It can be concluded that RBD palm stearin, would be able to compete in price with tallow in certain market situations, particularly since the stearin is refined, bleached and deodorized while the tallow is in the crude form.

It should be noted that the price differentials referred to above are based on CIF Rotterdam and hence strictly speaking are valid only for Rotterdam. Some countries, particularly those closer to Malaysia, would also have an added freight advantage in using palm oil products, resulting in better differentials.

Conclusion

It is important for soap and oleochemical manufacturers to have their products formulated with palm oil, palm stearin, palm kernel oil and palm fatty acids instead of the usual tallow

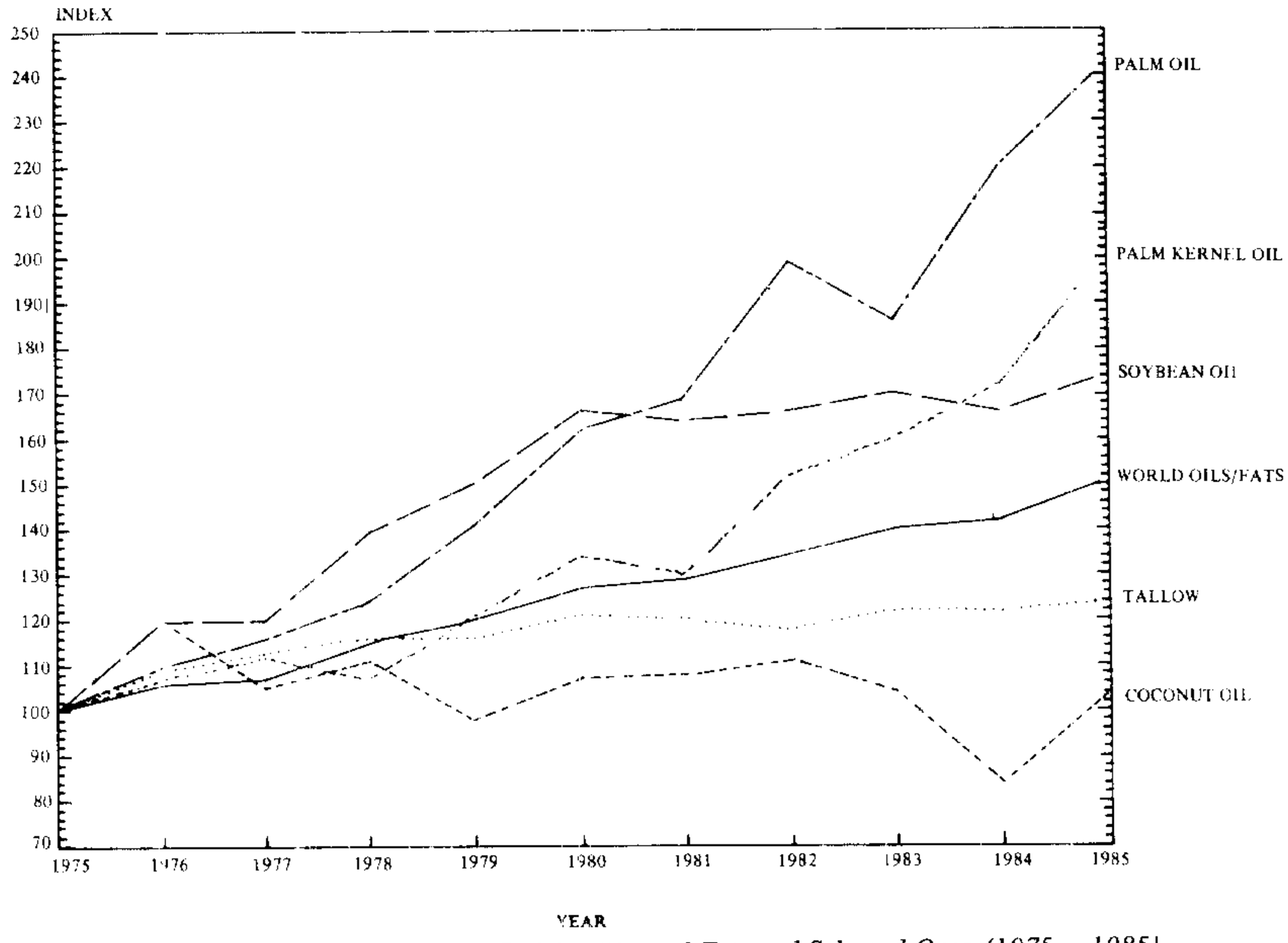

Figure 1. World Production of 17 Major Oils and Fats and Selected Ones (1975 -- 1985)

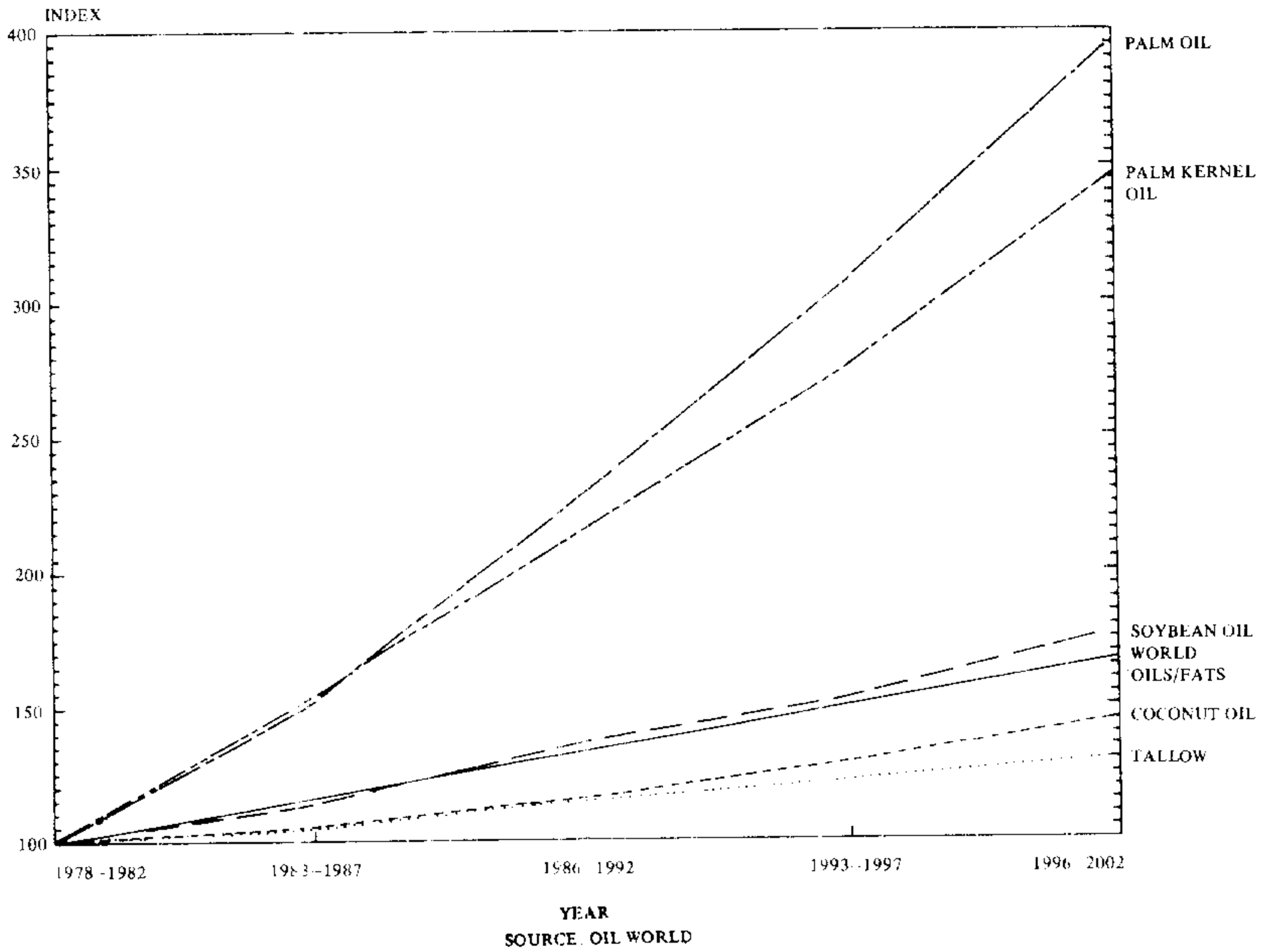

Figure 2. Forecast of World Production of All Oils and Fats and Selected Ones

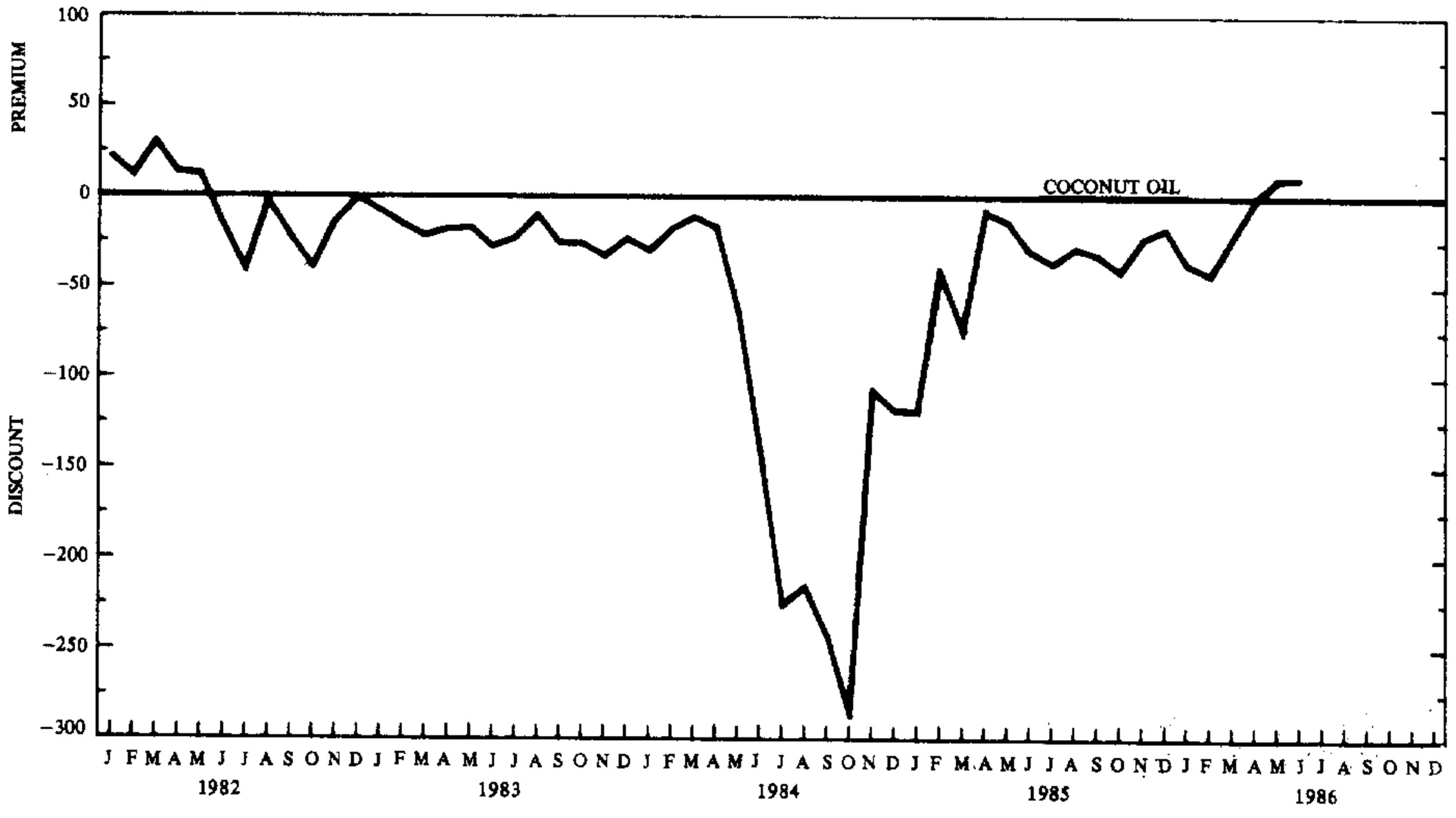

Figure 3. Palm Kernel Oil – Coconut Oil
Premium/Discount (US$/Tonne)

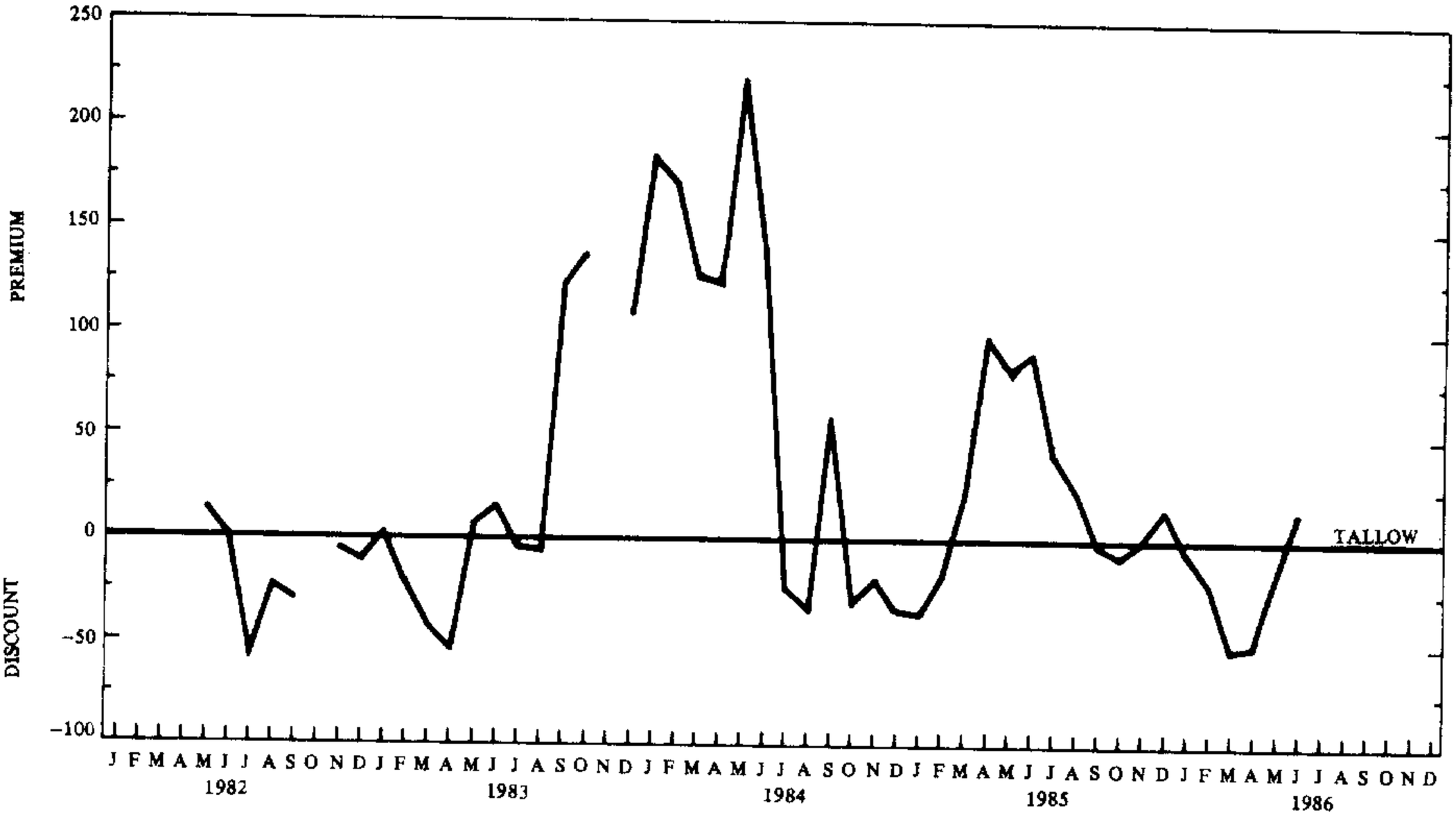

Figure 4. RBD Palm Stearin – Tallow
Premium/Discount (US$/Tonne)

and coconut oil, in order to benefit from the techno-economic advantages.

This trend of substitution is observable in that since 1980, the soap industry has started using these palm oil products in varying percentages. Some of the countries concerned are Japan, China, Kenya, India, Papua New Guinea, Sri Lanka, Malaysia, Indonesia and South Korea.

The trend has begun in the oleochemical industry as well. Whereas in 1980 the contribution of palm oil and palm kernel oil to world oleochemical manufacture was less than 1%, it is estimated to have risen to approximately 10% in 1985. Malaysia alone produced about 120 000 tonnes of fatty acids in 1984.