PALAWIJA NEWS

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Non-edible Applications of Soybean Oil

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Introduction

Historically, mankind has utilized the natural oils to serve its needs. Linseed oil has long been used to preserve wood and as a wax for leather goods. Many plants such as jojoba from Mexico were used by native peoples as soaps and shampoos. Some such as olive and coconut were used for lighting. Others were used aromatically: sandalwood, patchouli and citro[n]ella to mention a *few.* Still others such as castor and curcas gave oils for traditional medicines.

The use of vegetable oils has multiplied dramatically in a comparatively short time period due to new extraction and refining processes. Vegetable oils may now be used as industrial oils, plastics, synthetic lubricants, drying oils for varnishes and enamels, synthetic fabrics, nylon bristles, inks, cosmetics, and for dyeing.

The amount of animal and vegetable fats and oils used outside the food industry is extremely high. In the U.S., it is estimated that 1/3 of fats and oils consumed are utilized for technical applications. These raw materials are renewable, generally biodegradable and widespread, often a by product of other industrial activities. They have serious advantages over products obtained from petroleum.

Soybean oil is still the principal vegetable fat source in the world. (Table 1). It is largely used in lipochemistry, not only because of its availability, but more thanks to its interesting characteristics (presence of linoleic and linolenic acid).

Table 1 (1) Fats and oils world production - 1989/1990	
Soya	**15,810,000 t**
Palm	**10,020,000 t**
Sunflower	**7,730,000 t**
Rapeseed	**7,470,000 t**
Cotton	**3,520,000 t**
Peanut	**3,530,000 t**
Coconuts	**2,840,000 t**
Fish	**1,610,000 t**
Olive	**1,750,000 t**
Palm kernel	**1,370,000 t**
Linseed	**540,000 t**

We would like to comment here on 6 non-edible applications of soybean oil:

1. the use of soybean oils as a raw material in the oleochemical industry,
2. the use of soybean oil as fuel,
3. soybean oil in animal feedstuffs,
4. spraying of soybean oil on grains in order to control dust in storage facilities,
5. replacement of mineral oil by soybean oil in pesticide formulations,
6. the use of soybean oil to manufacture printing inks.

These last three applications are relatively new and utilize either pure, refined, or half-refined oil.

IN THIS ISSUE

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1. The use of soybean oil as a raw material in the oleochemical industry.

Animal and vegetable fats and oils are important raw materials for the chemical industry worldwide. The E.G. chemical industry processes some 3.0 million tonnes of these materials annually. Approximately 1.3 million tonnes are from inedible sources (tallow, linseed, castor, etc) and 1.7 million tonnes from edible sources (palm, coconut, palm kernel, soy, etc), with soybean oil taking an important share.

There are a wide range of chemical reaction processes, the most important being:

- alkyd resin manufacturing and other coating materials (paint industry),
- soaps and detergents,
- lipochemistry (esterification, ethoxylation, hydrogenolysis, polymerisation, nitrogenation, etc).

Other applications are:

- lubricating oil additive industry: emulsifiers, viscosity index improvers, extreme pressure additives, etc.
- pharmaceutical industry: ointment bases, suppository bases, emulsifiers, etc.
- cosmetic industry: cream bases, lipstick bases, foamers for tooth care etc.
- techno-chemical industry: additives used in textile, leather, paper, construction, petroleum and ore flotation industries.

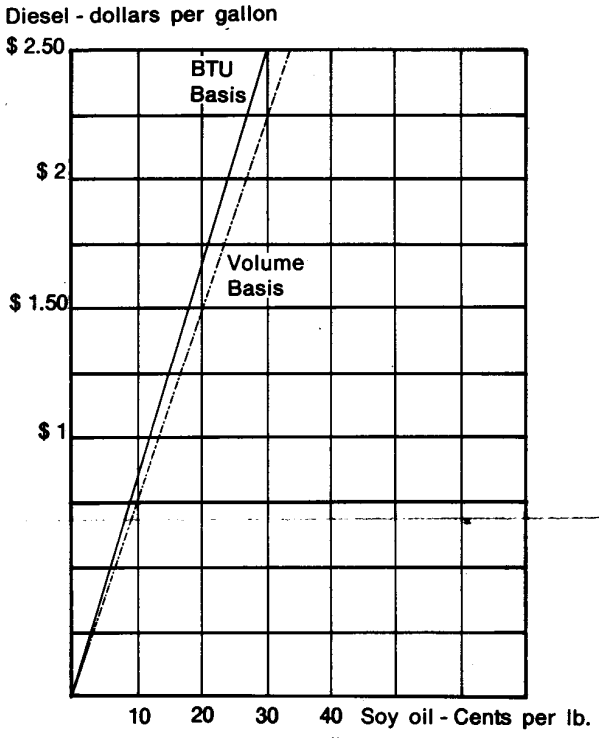
2. The use of soybean oil as fuel

Rudolph Diesel, the inventor of the diesel engine used vegetable oils as a fuel as early as 1900. Because of the ready availability of inexpensive middle distillate petroleum fuels however, little experimentation was done to develop alternative, renewable fuels for diesel engines.

There are differences between soy oil and diesel fuel, with diesel fuel being more inert to oxidation and polymerization. The physical characteristics of diesel fuel and soy oil are also quite different: soy oil is more viscous and crystallizes at low temperature. The thermal properties such as flash and fire points and heat of combustion are, however, quite close. A soy oil - diesel fuel mixture reduces or eliminates the indicated problems. Another possibility is to use the methyl esters of the fatty acids obtained by hydrolysis of soy oil.

The problems of using soy oil in diesel engines are certainly not technical but rather economical:

a) first of all, there is the price. In Belgium, diesel fuel is priced over 20 BF per litre whereas refined soybean oil costs more than 30 BF. The price of diesel is, however, heavily taxed: practically 60% goes to excise and V.A.T. Figure 1 gives the ratio of the price of both products on a volume and BTU output basis.



b) the second problem is even more important. The total consumption of diesel fuel in Belgium was over 2.6 million M.T. in 1988. Knowing that the yearly worldwide soy oil production does not reach 16 million tonnes, availability becames the problem. Although sunflower oil, rapeseed oil and palm oil are also available, nevertheless, the problem of supply remains.

c) another factor is the acceptability of the philosophy that it is acceptable to use agricultural products as fuel rather than as food.

3. Soybean oil in animal feedstuffs

Intensive livestock production is an industry and many of the oils and fats used in the animal feed industry are by-products from human food or other operations.

Editorial

Influence of the Feed and Processing Industries on CGPRT Crops

by Seiji Shindo, Director
CGPRT Centre

Recently the Centre received a publication titled "Thailand's Feed and Livestock Industry to the Year 2000". The projection figures regarding. future Thai crop exports, reveal that by the year 2000, Thai maize exports currently amounting to around 3 million tons a year, would drastically decrease. In an extreme case, if per capita income were to reach an annual rate of 6.5%, they would even disappear.

One of the major differences of many CGPRT crops from staple food crops like rice, is their high income elasticity, due to their new and emerging outlets to feed and processing uses. It is widely known that to produce 1 calorie of pork, 4 calories of feed (feed conversion ratio) are required. For poultry meat, the ratio is around 2.0. In terms of weight, the ratios become 1 to 4 (poultry) and 1 to 6 (pork) respectively. This means that around 6 kilograms of grain produce 1 kilogram of pork. Such a fact contributes to boosting the demand for feed grains when consumption of meat, and to a lesser extent, dairy products, rises with income growth.

When domestic production fails to catch up with the increasing demand for secondary crops, imports surge. Such a trend has been revealed in Japan and recently in the Republic of Korea. In Korea cereal imports are now approaching 9 million tons annually, up from 5 to 6 million tons in the early 1980's.

Comparative advantage analysis, which the Centre has been engaged in for the last few years, indicates the degree of competitiveness of these crops. Many other factors intervene, however, apart from simple economic ones. Government policy is one of the important elements, though for CGPRT crops, direct support of prices is seldom found.

The above facts serve to remind us about the importance of considering the economic aspects involved in the development of CGPRT crops.

Fats and oils have always been used for the production of animal feed. Originally, all kinds of cheap by-products were used, such as spent frying fats or oils. Degummed soy oil offers several advantages:

- the quality is known and constant and therefore it is safer to use,
- recent nutritional evidence has shown the needs for a balanced fatty acid supply, this is in addition to the amino-acid balance in the protein fraction of the feed,
- the addition of soy oil to feed reduces dust so that animals suffer less respiratory stress,
- the feed has a better palatability.

The quantities of oils and fats of all origin used in the EEC for the production of animal feeds was estimated for 1988/1989 at 1.4 million metric tons, underlining their importance.

A new trend is to directly use non-extracted, heat-treated soybeans (6). Under certain economic conditions this is more advantageous than a mixture of soybean meal and oil together with other ingredients.

4. Spraying of soybean oil on grains in order to control dust in storage facilities

Dust explosions in grain storage facilities are a troubling reality. 22 explosions took place in 1985 in the United States. In 1980, a specially devastating year, 44 explosions were recorded (Table 2). The problem is also present in Europe, the first dust explosion being recorded in 1785 in Turin, Italy.

The recipe for an explosion is very simple

DUST - OXYGEN - SPARK

and all this in a closed space.

Up to now, the proposed solution consists of installing dust removal systems, aspiration systems ... with filters, cyclones fans etc. It represents a considerable investment, high maintenance costs and an important power consump-

tion. In 1977, the "U.S. Grain Marketing Research Laboratory" in Manhattan, Kansas, began research to determine the possibilities of using soybean oil to reduce dust emissions in storage facilities. They determined the optimum spraying quantity, the necessary spraying equipment, the environmental security and the effects on the quality and final use of the grain. Results clearly indicated that it was a valuable technique and it was even tested in 3 U.S. industrial facilities.

Table 2 Grain dust explosions in the United States

Year	No. of explosions	No. of dead	No. of wounded	Damage (mil. US $)
1985	22	4	20	6.5
1984	20	9	29	19.8
1983	13	-	14	3.6
1982	14	6	34	15.0
1981	21	13	62	29.0
1980	44	10	47	10.0
1879	19	2	18	8.0
1978	19	8	36	5.0
1977	20	65	84	75.0
1976	22	22	82	60.0

The utilized -equipment is shown 'in Figures 2, and 3.

The cost of such equipment is estimated at about US$ 2,500. Operating costs are naturally reduced. Only the oil quantity has to be taken into account and as only 200 ppm need to be used on a normal grain, this represents 0.2 kg per ton or approximately US$ 15 cents per ton. Moreover, soybean crushers get the oil back, while livestock feed producers have to consider this oil quantity as an addition to the feed energy.

Soybean spraying equipment can reduce the dust in a storage facility to below the danger limit (0.015 g/m^3) and improves security up to a perfect level according to the most strict security standards. Working conditions for employees and the air quality around the facilities have been improved considerably. It has been demonstrated that the performance of dust removal equipment is not influenced, the grain quality remains unchanged for the final utilization and no negative effect on the maintenance equipment has been recorded. Moreover, spraying oil on the grain greatly reduces the losses in quantity as dust is not blown away at each handling. The potential market for such a use is considerable: if only 10% of the European Community's wheat production was treated once with 200 ppm soybean oil, it would represent about 14,000 t.

5. Pesticides Formulation

The use of mineral oil in insecticide and herbicide formulations to protect crops became a necessity when spraying techniques were improved to allow reduction of the applied volumes to 2.3 litres per hectare. It was especially used for spraying pesticides on huge fields with a tractor or even by plane.

Important research was realized in the United States between 1982 and 1985 in order to evaluate the potential to replace mineral oil by soybean oil.

The possibilities were tested under different conditions and the conclusion was that soybean oil represents an excellent alternative to mineral oil, as well as an adjuvant or carrier and diluent. It can be used at the same time in the formulation of herbicides, fungicides and insecticides.

The following remarks can be made:

1. soybean oil can replace mineral oil in pesticide formulations without loss of effectiveness, the price of competing oils, being the decisive factor.
2. research indicates that soybean oil, because of its poly-unsaturated nature, sticks better to the leaves of the plant, even after heavy rainfall, thus increasing the residual lifetime of the active product. As a consequence, it is not necessary to respray the crop, reducing costs considerably. Moreover, the lost quantities of the active product in the environment are considerably reduced.
3. the simple replacement of mineral oil with soybean oil is less damaging to the environment as soybean oil is biodegradable.
4. the crops' tolerance towards the mineral oil or soybean oil are the same. Nevertheless, the effectiveness of some soybean oil formulated herbicides was clearly above those of the same product formulated with mineral oil.

The potential market and the legal situation in Europe were studied in 1985. The use of soybean oil as an adjuvent for herbicides in large foliar crops and for fungicides in cereals seems very promising. The market for oils used as an adjuvant is already well established and it is estimated, in Europe, at 3000 t per year. In the United Kingdom, vegetable oils already have 25% of this market. On the other hand, the use of soybean oil as a carrier will only develop slowly because manufacturers have been authorized to

use their products for a typical formulation. In other words, they would have to resubmit the product to get authorization before being able to put it on the market under a reformulated form. Nevertheless, several products in the United States are already formulated with soybean oil.

6. Printing inks

In 1970, due to the oil embargo, the American Newspaper Publishers Association decided to undertake research to develop a newspaper printing ink based on soy oil. They stopped when mineral oils became available again, but when a law was introduced in the United States describing printing oils as toxical residues, studies started again and led in 1985 to the registration of a copyright of an ANPA patent.

In fact, the use of vegetable oil was not a new innovation, as the Chinese, the inventors of printing, used wood oil. In Europe, Gutenberg used linseed oil as did Pierre Lorilleux in 1820, the first industrial printing ink manufacturer.

In the United States, the most important source of vegetable oil was indeed soybean oil. Nowadays, in Europe, soybean oil or linseed oil are used alternatively, price being the determining factor.

In the United States, ANPA ink can be manufactured under license and at least 22 manufacturers are using it. Its principal use is as a colour ink for rotating presses, but more and more, black ink is also being produced with soybean oil.

The advantages are:

1. soybean oil is of vegetable origin and is widely available and renewable. Its biodegradable qualities make it more ecologically acceptable.

2. rotating presses, turning at high speed, need a stable ink to avoid important paper losses when they start or when paper breaks. The reason being that the change in viscosity by water absorption of the 2 inks is less marked with soybean oil than with mineral oil. Mineral oil has a tendency to create a paste. The presses are also easier to clean when soybean oil is used.

3. readers of a newspaper appreciate the ink stability on the paper as it gives a better resistance to rubbing which means, cleaner hands.

4. colour inks give a better colour stability and the picture is cleaner.

If all the U.S. newspapers were to use soybean oil ink, the potential market for soybean oil would be around 135.000 t per year. About 1200 important newspapers have started using soybean oil and tests are also underway to develop an ink for sheet presses and for glazed paper. Soybean oil inks are also available on the market in Europe. The use of soybean oil for printing listing paper for computers is a brand new application.

Note:

All these examples offer non-traditional uses for soybean oil. Other vegetable oils could probably also be used.

Conclusion

With the current global concern over industrial pollution and the need for sustainable raw material sources, vegetable oils, especially soybean oils, are becoming increasingly attractive. Their non-polluting and renewable characteristics suggest that their future role will be vital for the welfare of mankind.

Price Forecasting of *Palawija* Crops

Ir. Effendi Salam*

Introduction

The Directorate of Food Crops Economics and Post-harvest Processing of the Ministry of Agriculture, Indonesia, started with market and marketing related activities as far back as 1978. The Directorate in that year, set up a market information system on vegetables. Initially production centres in 11 provinces were, covered, later expanding to 14 provinces.

There were good reasons for starting a vegetable price information system. Vegetables were grown in a relatively large number of production centres primarily located in highland areas. Because of the relative isolation of the highland vegetable production centres, there was little market communication between the production areas. Prices fluctuated substantially, caused in part by seasonal production patterns but also by price expectations, which influenced planting behaviour. Because market signals did not reach the various production centres in the same manner and because there were substantial

price disparities between the various consumer centres, the resulting production pattern did not always meet the quantitative and qualitative market requirements.

Assisted by the Deutsche Gessellschaft fr Zusammenarbeit (GTZ), the Directorate therefore designed a programme to contribute to price and market integration. This programme took place in a period when substantial investment in infrastructure was occuring. Roads were improved and in many consumer centres – primarily the big cities-central wholesale market facilities were made. Thus, the price information programme of the Directorate was clearly part of a wider development programme.

The Directorate's staff at the provincial level, collects price information on vegetables. This information is relayed to Jakarta and matched with information on the other provincial wholesale markets for vegetables. After price checks, the resulting daily producer and wholesale prices are broadcast on the Government Radio Station (RRI). There is no doubt that in conjunction with the infrastructural improvement the vegetable trade and production has benefitted substantially from the information services. Market integration has noticeably improved in the last decade while inter-regional trade in perishable vegetables has expanded substantially. This has dampened local production fluctuation and ensured more quality conscious production.

Establishment of *Palawija* Programme

In 1981, the Directorate embarked on a similar programme for *Palawija* crops: soybean, maize, groundnut and mungbean. Initially, only the main producing provinces were covered regarding producers prices: Central Java, East Java, Lampung, South Sulawesi, and DI Yogyakarta. In 1989, West Sumatra and the NTT provinces were included in the programme. Because of the more seasonal production structure of *Palawija* crops, there is no need for daily prices, so at this point, producers prices are being collected once a week. It is envisaged however, that in the 1990 harvesting season, producers prices will be collected and broadcast three times a week. As well, West Java and North Sumatra will be added to the list of provinces covered by the *Palawija* price forecasting system in 1990.

With regard to the prices, a little elaboration may be useful for the reader because there is often confusion about the actual meaning of producers prices and wholesale prices. A sharp and clear definition of commodity prices has become more important with the developing differentiation in the market. *Palawija* crops are used for animal feed, snack foods produced by factories and cottage industries, and for direct human consumption. Each specific utilization requires its own quality and also quantity of product.

The Directorate has long been aware of the utmost importance of linking commodity prices to market specific commodities. As well, while producers prices remain very important for monitoring rural farm incomes, market specific wholesale prices have become more important lately. This is because the availability of wholesale market information stimulates the inter-provincial trade in *Palawija* produce with the overall effect of improved price stability. It is evident that prices of *Palawija* produce should therefore be collected with great care and evaluated properly, so as to have a firm and useful relationship with the trade. Producers prices are simply defined as the prices the area trader/collector pays to either the farmer, contract harvester or commissioner. Producers prices are therefore more meaningful as an indication of the first step in price formation, rather than an indication of farmgate prices. Wholesale price is defined as the price for a quality specified _commodity, in the major wholesale markets of Indonesia, primarily in the big cities and industrial centres. Prices are collected in direct and open collaboration with private sector companies in the wholesale market and with traders and commissioners in the producer area.

Data Collection System

This feature of the' data collection system is most exceptional and shows the increased willingness of private sector companies to participate in the government programme for the public benefit. The data collection system consists of data intakes from the provinces, evaluation activities covering larger areas, transmission of the data to the centre's processing unit in Jakarta, and finally, distribution of the forecasts from Jakarta. Price forecasts are made in the area evaluation unit as well as in Jakarta, ensuring double checks as well as the proper use of area specific factors (see Figure 1). The process of data analysis is depicted in Figure 2. It is interesting to note that a general clipping and information service is part of the whole evaluation procedure, which strengthens the institutional memory of the system. As well, the Directorate makes the data available in its 3-monthly bulletin to government offices, the private sector, newspapers and international

agencies such as the FAO and the CGPRT Centre. In Table 1, a list of quality specific *Palawija* commodities is given. It can be seen that commodities reflect the location specific characteristics, and common references in their denomination. Because some of the specificities are difficult to translate in English the original Indonesian is presented as well. Finally, a sample is given of price development and forecast for maize prices in Jakarta, based on quarterly price analysis (See Figure 3). For quick and easy reference, the international FOB prices from the US are given as well.

Conclusion

The Directorate of Food Crops Economics and Post-harvest Processing of the Ministry of Agriculture, Indonesia, has undertaken a very useful study in a very professional manner and deserves respect for its initiative. It is hoped that the efforts taken so far, will be continued in the years to come, and that in due course they will be expanded in accordance with the needs of producers, traders and consumers, thus contributing to the users efficiency of the market system in Indonesia as a whole. For further information the readers are invited to direct inquiries to:

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Appendix

Table 1 The list of commodities for price estimation collection and estimation

West Sumatera	DKI Jakarta	Lampung
Soybean (local) *	Tapioca	Local Soybean (1)*
Groundnut 6-7 mm*	Mungbean Nylon*	Ungraded soybean
Groundnut 7-8 mm	Mungbean	Imported soybean
Imported groundnut	Groundnut 7 mm	Maize (1)*
Mungbean (small)*	Groundnut 8 mm*	Ungraded maize
Mungbean Nylon/large	Imported groundnut	Dried cassava (1)*
Yellow maize*	Imported yellow soybean*	Ungraded gaplek
	Local yellow soybean*	Cassava*
	Maize**	Cassava Racun
		Tapioca

East Java	Central Java	South Sulawesi
Yellow Maize*	Yellow Maize*	Yellow maize*
White maize	Imported yellow soybean*	Yellow soybean*
Imported yellow soybean*	Local yellow soybean*	Mungbean Nylon*
Local yellow soybean*	Groundnut 8 mm*	Dried cassava
Groundnut 8 mm*	Groundnut 7 mm	Cassava
Groundnut 7 mm	Imported groundnut	Mixed groundnut
Fresh shelled groundnut	Mungbean Butek	
Mungbean Butek*	Mungbean Nylon*	
Mungbean Nylon	Fresh cassava	
Cassava	Sweet potato	
Sweet potato	Dried cassava*	
Dried cassava*	Tapioca	

NTB	NTT
Yellow maize*	Yellow maize*
White maize	Local yellow soybean*
Local yellow soybean*	Imported soybean*
Mixed soybean	Mungbean small/Butek
Groundnut 8 mm	
Groundnut 7 mm	
Mungbean medium/Nylon*	
Mungbean small/Butek	

Note: * The data are collected and estimated
** The data are estimated

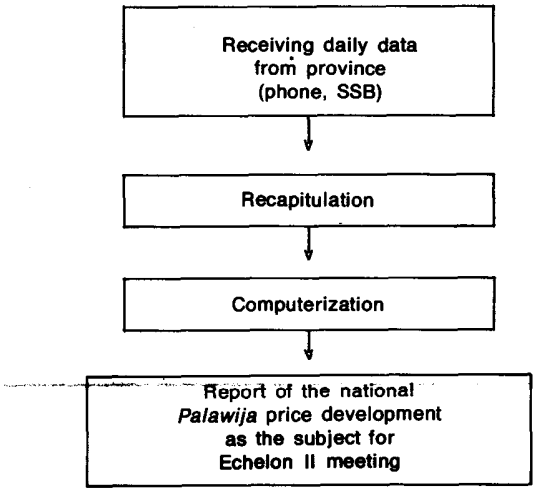

Figure 1 The flowchart of the sub-directorate for marketing information activities

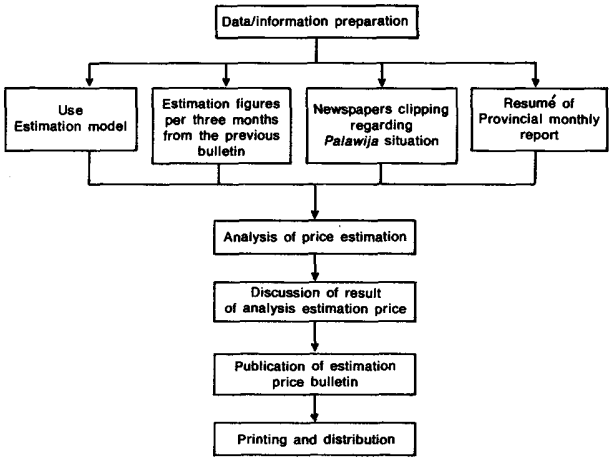

Figure 2 The flowchart of the sub-directorate for marketing information in publishing the bulletin with *Palawija* price estimation

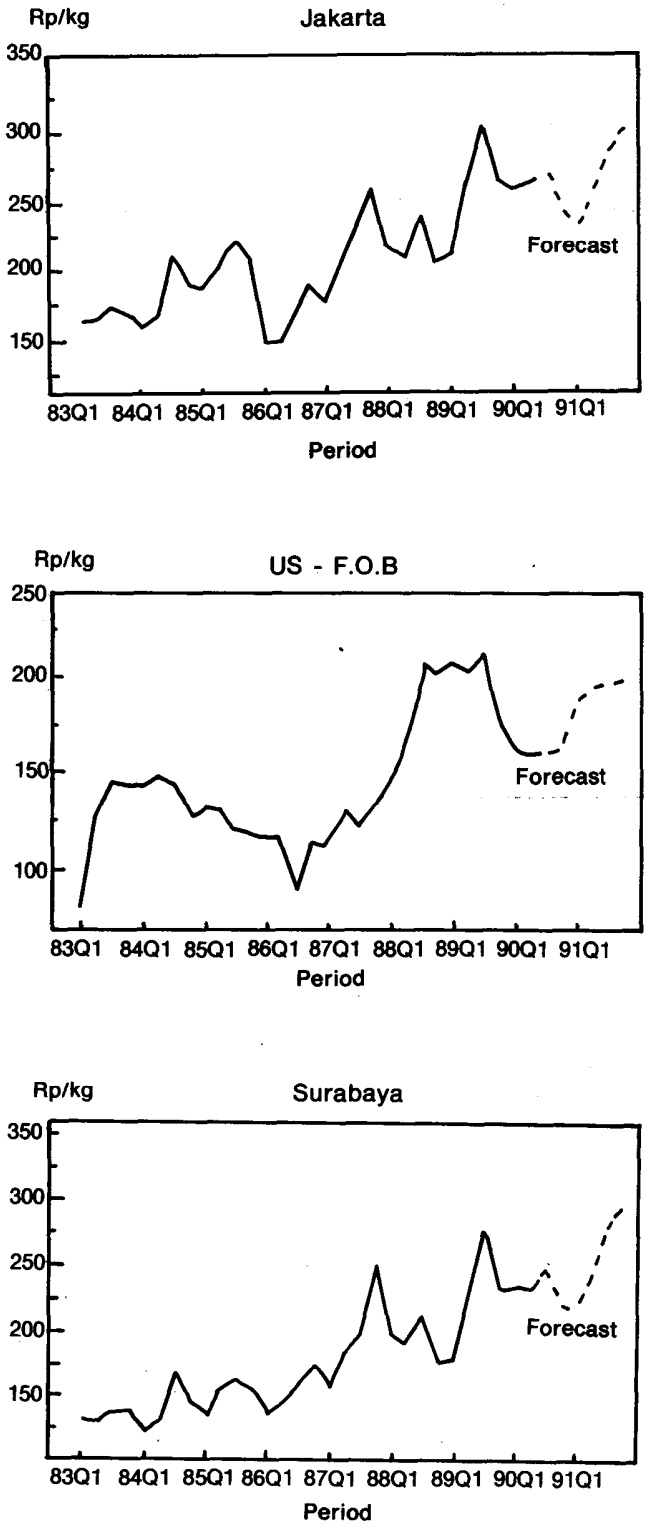

Figure 3 The development of maize wholesale prices

Thailand Vegetable Oil Situation and Prospects*

Prakarn Virakul**

Background

Oilcrop production in Thailand has increased substantially over the past decade (1977/1978-1988/ 1989), from 2.15 million tons to 4.32 million tons. The annual growth rate averaged 6.85 percent. These oilcrops include soybean, groundnut, coconut, oilpalm, kapokseed, cottonseed, and rice bran (Table 1). The remarkable growth has been contributed mainly by oilpalm and soybean.

The government has initiated several oilcrop development projects to reduce dependency on imports, to conserve foreign exchange and to increase farm income via productivity improvement. Crops that received priorities for promotion were soybean and oilpalm. The achievement of self-sufficiency in vegetable oils and oilseed meals was the ultimate goal.

Oilcrops Production in 1989/1990

The larger 1989/1990 crop is meeting strong domestic demand for both soybean meal and oils. The total oilcrop production is forecast at 4.77 million tons, about 10 percent above last year. The 1989/1990 soybean crops were estimated at 0.617 million ton, 20 percent above 1988/1989.

Table 1 Major Oilcrop Production in Thailand **unit 1000 tons**

Oilcrop	1977/1978	1982/1983	1987/1988	1988/1988[1]	Growth rate %	1989/1990[2]
Soybean (beans)	96	113	338	517	15.8	617
Groundnut (in shell)	108	145	162	170	4.4	177
Coconut (fruit)	927	1,076	1,310	1,378	5.6	1,437
Oilpalm (FFB)	46	254	728	885	33.3	1,098
Kapokseed	46	41	41	40	1.0	41
Cottonseed	60	81	50	55	-4.4	62
Rice bran	866	1,058	1,135	1,278	2.5	1,334
Total	2,149	2,768	3,764	4,323	6.8	4,766

[1] Preliminary
[2] Estimates

In response to the recognition of cholesterol as a health hazard as well as the establishment of a modern feed industry due to the strong demand for meat in the foreign markets, i.e. Japan, several oil extraction plants have undergone substantial expansion and modification to meet the demand for vegetable oils and oilseed meals. However, the total amount of oilseed meals and vegetable oils produced domestically could not keep pace with the faster growth rate of consumption, for cooking oil and oils and meals used in the food processing and feed industry. Imports of soybean oil, palm oil and various oilseed meals were made and increased continuously.

Oilpalm production in 1989/1990 is likely to rise 24 percent above last year in line with the expected increase in consumption of oil for cooking, food and industrial use.

Vegetable Oils Production

Production of various vegetable oils is presented in Table 2. Palm oil and palm kernel oil have increased their role since 1977/1978, from 24 percent of the production total, to 56 percent in 1989/1990, followed by soybean. Coconut oil has decreased its importance and been substituted for by palm oil. The production share of coconut oil dropped from 25 to 13 percent in 1977/1978 and remained there in 1989/1990, in terms of total vegetable oil production.

The minor vegetable oils including groundnut, kapok, cotton and sesame, are produced from crops which are grown for other industrial purposes. Crushing is made from the surplus to

* Paper presented at the ESCAP Expert Group Meeting on the Promotion or Intraregional Trade in Vegetable Oil. Bangkok, Thailand 17-20 April 1990.

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increase value added. These oils, except sesame, are sometimes blended with soybean oil before marketing, for a cheaper priced and lower quality product. They are considered to play an insignificant role in the oil sector.

exported in this period (Table 3). Thailand is considered to be a net ecporter of oil crops, except for three consecutive years in 1980/1981-1982/1983 when Thailand imported more coconut and copra and offset the exports, and again in

Table 2 Vegetable Oil Production: Thailand **unit 1000 tons**

	1977/1978		1982/1983		1987/1988		1988/1989		1989/1990	
	Q	%	Q	%	Q	%	Q	%	Q	%
Soybean	10	11	12	8	39	16	57	19	66	20
Groundnut	10	11	12	8	9	4	9	3	8	2
Coconut	23	25	33	23	46	18	45	15	44	13
Oilpalm	20	22	54	38	123	49	149	50	171	52
Palm kernel	2	2	4	3	9	4	11	4	12	4
Kapokseed	5	5	6	4	7	3	6	2	6	2
Cottonseed	6	7	8	6	4	2	15	2	6	2
Rice bran	16	17	13	9	13	5	16	5	16	5
Total	92	100	142	100	250	100	298	100	329	100

It is interesting to note that the rice bran production has an annual growth rate of 2.5 percent, with rice bran oil production remaining constant at 16,000 tons per year due to the fact that most of the fresh rice bran is directly utilized as animal feed. At present, the logistical problems of coll[e]ction and delivery of rice bran from rice mills to oil extraction plants within 24 hours, to maintain freshness of the raw material, are the time constraint. This constraint needs to be solved in order to prolong the shelf-life of the bran oil.

Imports and Exports

Over the past 11 years (1977/1978-1987/1988), all the oilcrops were consumed locally. Not more than 3 percent of total oilcrops production was

1978/1988, when soybean imports were made to compensate for the shortfall of beans in the country. On the other hand, cottonseed, groundnut and kapokseed were contributing to the country's net exports.

Thailand is an oilseed meals deficit country. Although aggregate oilseed meal imports rose in line with supply, increasing from 142 thousand tons in 1977/1978 to 371 thousand tons in 1987/1988, soybean crush also rose higher, from 69 thousand tons to 251 thousand tons. Self-sufficiency in soybean oil will be obtained in 1990. However, with the rapidly increasing demand for soybean meal, it is projected that it would take another decade to fulfill the sufficiency prospects of protein meal consumption.

The gradual decrease in vegetable oil imports is driven by an overall 6.8 percent increase in

Table 3 Imports and Exports of Oilcrops and Their Products

	Oilseeds			Meal			Vegetable Oil		
	Imports	Exports	Net Exports	Imports	Exports	Net Exports	Imports	Exports	Net Exports
1977/1978	25.39	51.36	25.97	142.51	19.34	123.17	16.81	0.65	(16.16)
1978/1979	17.29	59.84	42.55	47.26	21.64	25.62	10.01	2.83	(8.08)
1979/1980	10.11	66.31	56.20	144.60	28.88	115.72	28.72	0.29	(28.43)
1980/1981	83.07	58.57	(24.50)	144.10	32.95	111.15	88.96	0.59	(88.37)
1981/1982	123.39	86.08	(37.31)	193.44	27.23	166.21	56.89	0.62	(56.27)
1982/1983	6428	56.84	(7.44)	202.75	18.02	184.73	34.36	0.58	(33.78)
1983/1984	0.16	25.62	25.46	251.70	34.04	217.66	70.87	4.06	(66.71)
1984/1985	0.16	42.29	42.13	233.05	20.46	212.59	34.91	9.71	(25.20)
1985/1986	0.09	29.14	29.05	242.46	16.31	226.15	8.16	27.06	18.90
1986/1987	0.26	30.18	29.92	293.64	43.69	249.95	2.86	8.36	5.50
1987/1988	33.83	26.97	(6.86)	371.36	11.15	360.21	5.58	2.84	(2.74)

production of major vegetable oils, mainly soybean oil and palm oil. But the nearly 33 percent rise in oilpalm production to 183 thousand tons of palm oil, and another 16 percent rise in soybean production to 66 thousand tons of soybean oil, have had the largest impact, changing Thailand's status from a net vegetable oil importer to a net exporter. However, even with overall self-sufficiency, certain types of vegetable oils such as sunflower oil and corn oil, which are not available at present, are met by imports.

Vegetable Oil Consumption

It is generally accepted that consumption of vegetable oils is influenced by the increase in population and per capita income. Annual per capita consumption of vegetable oils has increased from 2.17 kg in 1977/1978 to 5.96 kg in 1988/1989, during the same period the total annual consumption has increased from 94 thousand tons to 255 thousand tons. The factors contributing to this increase in consumption are as follows:

- a population growth rate of 2 percent per annum.
- higher family incomes leading to a better standard of living, plus increased awareness of the risk of cholesterol.
- decreased availability of animal fat for cooking oil resulting in a higher demand for vegetable oils.
- some smuggling across the borders due to a price differential.

The analysis on income elasticity of demand was derived from the time series per capita vegetable oil consumption (food and non-food industries), and income data showed that a high income elasticity of 1.3221 was observed (Table 4).

Table 4 Relationship Between Income and Consumption Levels of Vegetable Oils

Year	Per Capita	Per capita consumption (kg per annum)		
	income (baht)	Actual	Estimates*	Difference
1977	9,234	2.17	1.49	0.68
1978	10,853	2.03	1.84	0.19
1979	12,098	2.47	2.13	0.34
1980	13,890	4.25	2.58	1.67
1981	15,673	3.29	3.00	0.29
1982	16,559	3.29	3.22	0.07
1983	18,164	3.88	3.64	0.24
1984	18,968	3.54	3.86	-0.32
1985	19,287	3.59	3.94	-0.35
1986	20,456	4.28	4.26	0.02
1987	22,374	4.76	4.80	-0.04
1988	23,613	5.96	5.15	0.81
1989	24,924	6.00	5.53	0.47

Note: * Ln (PC) = - 11.6736 + 1.3221 Ln (P1)
where:
PC = Per capita consumption per annum
PI = Per capita income per annum

Projection of Vegetable Oil Demand

The projection of vegetable oil demand is made under the assumption that the population will grow at a rate of 1.5 percent p.a. and the per capita income at about 5.5 percent, with the demand for vegetable oils likely to grow in line with production. The projected domestic demand for vegetable oils is between 307 to 555 thousand tons between 1989-1996. The per capita consumption will reach 9.05 kg in the year 1996, almost double that of 1989. The production target for vegetable oils is also estimated for the Seventh Plan (1992-1996). The excess supply of vegetable oils found over this period, ranged from the lowest in 1989 with 27 thousand tons, to the highest in 1992 with 81 thousand tons. The trend seems to drop thereafter due to some of the oilpalm plantations reaching the age for replanting (Table 5).

Table 5 Vegetable Oil Production and Consumption Projection 1989/1990-1996/1997

			Per Capita	Vegetable Oil	Total Availability (1.000 tons)		Difference (1.000 tons)
Year	Population (1000 heads)	Per Capita Income (baht)	Production	Consumption	Production	Consumption	
1989	55,448	24,924	6.00	5.53	333.24	306.63	26.61
1990	56,340	26,307	6.70	5.94	378.30	334.66	43.37
1991	57,196	27,783	7.82	6.39	435.86	365.48	70.38
1992	58,040	29,283	8.25	6.85	478.86	397.57	81.29
1993	58,874	30,876	8.61	7.34	507.05	432.14	74.91
1994	50,005	32,550	9.03	7.88	538.98	470.40	68.58
1995	60,506	34.314	9.54	8.44	577.34	510.67	66.67
1996	61,312	36,174	10.02	9.05	614.12	554.87	59.24

CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

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In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

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In pursuit of its objectives, the Centre has three programmes which are mutually supportive:

1. Research, which entails the preparation and implementation of studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific;
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Contributors are invited to submit concise summaries of significant social research related to CGPRT crops for publication. Submissions should be limited to two to four double-spaced typewritten text. Two figures (graphs or tables) may accompany the article. Include only references cited. All articles are subject to editing to meet space limitations.

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