E. INTERNATIONAL PRICES

The price of soybean meal in the United States, the largest supplier and consumer, was at the level of 60 dollars per ton for 44% protein meal until the early 1960s.

From 1963/64 to 1970/71 the price was at the 70 dollars level, and in this period, with the exception of 1965 and 1966, the CCC (Commodity Credit Corporation) maintained a large stock of the bean, and the international supply and demand situation for soybeans was greatly eased, with the price of soybean meal also remaining stable.

With increased production of livestock products, especially meat, the demand for the feed grains and for protein feed continued to increase worldwide. In 1972, the USSR purchased a large amount of wheat and feed grain from the United States, since its grain production had been reduced by adverse meterological conditions. This resulted in an imbalance of the international supply and demand situation, which also affected that of soybeans in July 1973.

The increased overseas demand for protein feed resulted in concentrated purchases on the free market, namely the United States, to such an extent as to deplete the CCC's stock to almost zero, and to encroach on the supplies available to meet domestic demand in the United States, until finally measures banning exports were taken for all of the protein feedstuffs, including soybean meal and alfalfa meal.

This imbalance of supply and demand caused the price of soybean meal to skyrocket to 229 dollars, the highest in history, and 2.5 times the price in the preceding year.

Domestic consumption in the United States in the same year decreased by 10% over the preceding year, because the increased price reduced the profitability of livestock raising.

In 1973/74, the following year, the price decreased by 64% to 146.40 dollars, but it did not return to the price level prior to 1972, and in 1976/77, when production declined by 10% over the level in the preceding year, it approached 200 dollars. In 1980/81, in addition to the reduction of the planted area, soybean production decreased by almost 20% due to the heat wave that year. The level of meal production also decreased by nearly 10%, and consequently the price rose to 218 dollars.

The CIF Rotterdam price for the 44% protein soybean meal produced in the United States was 102 dollars per ton in 1970/71, but in 1972/73 when there was a worldwide shortage in the supply of protein feed as mentioned above, the price increased by 2.5 times the previous year's level, to 324 dollars.

The import price followed a similar price trend in the United States, as mentioned above, and decreased after 1973/74, but since 1976/77 it has been showing a basically upward trend, although there is some fluctuation.

Reference Table E-1 Average Wholesale Price of U.S. Soybean meal
(Soybean meal, 44% protein, Decatur)

-	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81
US$/ton	78.50	90.20	229.00	146.40	130.90	147.80	199.80	164.20	190.00	181.91	218.18
70/71 = 100	100	115	292	186	167	188	255	209	242	232	278

Source: <u>Soybean Digest Blue Book</u>

Reference Table E-2 CIF Rotterdam Price
(Soybean meal, 44% protein)

	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81
US$/ton	102	129	324	218	155	198	230	213	243	259	253
70/71 = 100	100	126	318	214	152	194	225	209	238	254	248

Source: <u>Oil World</u>

F. PROJECTION OF SUPPLY AND DEMAND

I. Projection

1. Data

Soybeans are mainly used for three purposes: (i) for oil, (ii) meal, and (iii) protein food. Soybean meal is produced incidentally as a result of crushing the beans for oil and in proportion to the production of oil. Therefore, it would be inadvisable to make a projection of the former separately from the latter as they are vertically connected. In order to maintain this connection, it was considered proper to use the basic figures of projected soybean oil supply and demand.

With this in mind, the production of soybean meal was calculated by applying the conversion ratio for the production of meal to the volume of beans crushed, which in turn had been derived by applying the bean-oil conversion ratio as calculated on the basis of FAO's Food Balance Sheets to the total volume of oil produced for the years 1980, 1990 and 2000 (Refer to the section on Soybean Oil for the production of soybean oil and the oil-meal conversion ratios).

With regard to the consumption of soybean meal also, the figures for domestic consumption of soybean oil from 1967 to 1979 calculated in the section on Soybean Oil were, as a rule, used to ensure consistency in the data. For the consumption in centrally planned economies, however, the figures in Oil World were used, as they were judged to reflect the actual trends in protein feed consumption better than the figures derived from in the section on Soybean Oil. Because of non-availability of data in Oil World for the period from 1967 to 1969, our estimates of the consumption for this period, based on data for 1970, were used.

2. Classification of Regional Blocs

In order to project the supply and demand, countries were classified into three categories, namely developed countries, developing countries and centrally planned economies, as per the classifications in the FAO Trade Yearbook.

Trends in the production and consumption of soybean meal, as already stated in Section B, Production, and Section C, Consumption, show regional bloc wise features summarized below. The projection for soybean meal supply and demand was also made on the basis of the regional blocs specified, as it was judged proper to reflect these characteristics of each regional bloc in the projection.

a. Developed countries account for a very high proportion of the total world production and consumption of soybean meal, therefore, it can be said to be an developed country-type commodity.

Protein feed is indispensable feed for raising, especially monogastric animals such as hogs and poultry. Intensive livestock raising, which pursues the maintenance and improvement of the productivity of the high-productivity breeds and cost-efficiency, markedly promotes the demand for protein feed. In this sense, soybean meal is a commodity which is in demand in developed countries where such livestock industry is highly developed.

b. Developing countries in which Brazil can be called a typical case when considered in terms of production, showed increasing production and consumption in recent years. The demand for livestock products has expanded as a result of the improvement in national income, especially in those countries which are newly industrializing, and concomitant to this the demand for soybean meal has been rapidly increasing in recent years.

c. In countries with centrally planned economies, on the whole, there occurs a gap between oilseed resources and the number of livestocks raised. For this reason, feedstuffs are generally low-protein, and the re-productivity of livestocks remains at a low level.

Despite efforts to increase the domestic production of oilseed crops, these countries seem to inevitably increase their dependency on imports in order to expand the production of livestock products such as meat.

3. Regression Analysis of Consumption

The consumption data between 1967 and 1979 were regressed on time (year) as follows:

	$\overline{R}^2$	D.W.	S.E.
SSMA = -107,539 + 1,879.3 * YEAR	0.776616,	1.95244,	3,713.87
(-5.11667) (6.53599)			

SSML = -28,783.8 + 437.456 * YEAR 0.909326, 1.6287, 512.944
(-9.91579) (11.0155)

SSMP = -29,377.6 + 469.676 * YEAR 0.959391, 1.56893, 359.667
(-14.4332) (16.867)

Where SSMA is consumption in developed countries
SSML is consumption in developing countries
SSMP is consumption in centrally planned economies and
YEAR is calendar year, e.g. 1967 = 67.

Table F-1 Soybean Meal Consumption by Regional Blocs

(1,000 MT)

	Developed countries	Developing countries	Countries with centrally planned economies
1967	20,664.00	1,104.00	2,687.00
1968	22,595.00	1,268.00	2,709.00
1969	23,507.00	1,386.00	2,872.00
1970	22,482.00	1,733.00	3,320.00
1971	24,246.00	1,923.00	3,514.00
1972	26,956.00	1,784.00	4,257.00
1973	31,037.00	2,679.00	5,335.00
1974	25,674.00	4,381.00	4,942.00
1975	34,727.00	4,092.00	5,580.00
1976	28,048.00	3,959.00	6,360.00
1977	36,291.00	5,171.00	6,839.00
1978	38,784.00	5,028.00	7,051.00
1979	48,343.00	6,448.00	8,348.00

Source: Oil Wrold
(Figures before 1969 are estimated by the Study Team.)

4. Projection Simulation

The consumption figures for soybean meal for the years 1980, 1990 and 2000 were projected by using regression equations estimated in the previous item, and are shown in Table F-2.

Table F-2 Projection of Soybean Meal Production and Consumption by Regional Blocs

(1,000 MT)

	Developed countries	Developing countries	Countries with centrally planned economies	World
Production				
1980	41,316	15,541	7,014	63,871
1990	56,335	19,525	7,300	83,160
2000	69,435	20,929	7,522	97,886
Consumption				
1980	42,805	6,212	8,196	57,213
1990	61,598	10,587	12,893	85,078
2000	80,391	14,961	17,590	112,942

Source: The Study Team

II. Outline of Projections and Some Views

1. Production

The world production of soybean meal in the year 2000 is projected at 97.886 million tons, corresponding to a 1.5-fold increase over the production of 63.871 million tons in 1980.

On a regional basis, it is expected that the developed countries will achieve a 1.68-fold increase with 69.435 million tons; the developing countries, a 1.35-fold increase; and countries with centrally planned economies, a 1.07-fold increase compared with their production in 1980.

Soybean meal production is mainly classified into two types: one is the production in soybean producing countries, and the other in soybean importing countries, as stated in Section B, Production. This explains why the meal production of some of the soybean producing countries is not in proportion to their bean production, and why some countries which hardly produce any soybeans are large meal producing countries.

The scale of soybean meal production is determined by synthesizing such factors as demand for meal as protein feed, oil demand and the scale of crushing.

It may be said that the production of soybean meal in soybean importing countries is determined by oil and meal consumption. This tendency is seen quite markedly in developed countries.

The reason why the production of soybean meal will experience the highest growth rate in developed countries in the year 2000 is because their consumption reflects the trends described below.

The projected 1.35-fold increase in the production of soybean meal clearly shows that the demand for soybean oil is expected to be comparably low in the developing countries.

The production in countries with centrally planned economies is, on the whole, projected to level off, though a very slight increase may be experienced in the year 2000. In the case of these countries, however, there are so many uncertain factors that it is not clearly known whether the projection will remain accurate or whether the supply of soybean meal produced within each country will expand with the aid of increased soybean imports following the increase in meal demand.

2. Consumption

The world consumption of soybean meal in the year 2000 is projected at 112.942 million tons, corresponding to a 1.97-fold increase over the consumption of 57.213 million tons in 1980.

On the basis of economic regions, it is expected that the developed countries will show a 1.88-fold increase at 80.391 million tons; the developing countries, a 2.4-fold increase at 14.961 million tons; and countries with centrally planned economies, a 2.15-fold increase at 17.590 million tons compared with their consumption in 1980.

The reason for the lowest projection, a 1.88-fold increase, being projected for the developed countries is that the type of feed consumed has already been switched to the high-protein feeds under intensive livestock raising management in the current developed countries, therefore it is difficult to expect a substantial increase in the consumption of protein feed per animal, and it would be appropriate to expect the increase in protein feed consumption to be proportionate to the number of livestock.

Although, with the advance in technology, the use of leaf protein, urea and single cell protein as substitute feedstuffs is conceivable, substitutive relationships were omitted from our projection based on the argument that such substitutes will not be used on such a scale as to affect the pattern of protein feed consumption.

Among the developing countries, an increase in protein feed consumption is being experienced in Brazil, the newly industrializing Far Eastern countries, and in petroleum producing countries.

It is also a well-known fact that in countries with centrally planned economies one of the obstacles to expansion of livestock industry is the low level of protein contents of the domestic supply of feedstuff.

Both developing countries and those with centrally planned economies seem to inevitably experience an increase in demand for protein feed in order to expand livestock products, especially meat production.

3. Supply and Demand Balance

According to these projections, by the year 2000 a shortage of 15 million tons of soybean meal will occur throughout the world.

On the economic category basis, too, considerable shortages will be experienced, with the developing countries being the only region having surplus, at 5.968 million tons (29% of the output) in the year 2000.

Developed countries are expected to domestically produce only 86% of their consumption, and will experience a shortage of 10.956 million tons in the year 2000.

It is also projected that the countries with centrally planned economies can meet only 43% of their consumption from domestic production, and will depend on imports from other regions, amounting to about 10 million tons in the year 2000. It cannot be easily appraised, however, whether they will import only the meal or import soybeans to obtain both the oil and the meal.

However, as analyzed in the chapter on soybean, the projected production of soybean in this Study is somewhat below the projection made by the World Bank. On the other hand, the consumption of soybean meal has rapidly grown in each region since 1967 and this high growth rate in soybean consumption is inevitably reflected in the projected consumption figures in this Study.

If the soybean meal suppliers place more weight on crushing of soybeans in consideration of both the oil and meal aspects, especially as the meal gained from soybeans is superior among those from the nine kinds of vegetable oils, the supply of soybean meal will necessarily expand.

In any case, as far as it can be judged from the present situation of soybean production in developing countries, the rank of Brazil and Argentina in the international market for soybean meal is expected to rise, because they are the countries which have been able to significantly increase their scale of soybean production.

APPENDIX: STANDARD SPECIFICATIONS FOR SOYBEAN PRODUCTS

These have been adopted for certain soy products as follows by the National Soybean Processors Association (NSPA), AAFCO, and the IFN specifications, and made a part of their Trading Rules governing purchase and sale of soybean meal in the United States:

Soybean Cake, Soybean Chips, Expeller Soybean Meal — The product after the extraction of part of the oil by pressure or solvents from soybeans. A name descriptive of the process of manufacture, such as expeller, hydraulic or solvent extracted shall be used as part of the brand name. It shall be designated and sold according to its protein content.

Protein	Minimum	41.0%
Fat	Minimum	3.5%
Fiber	Maximum	6.5%
Moisture	Maximum	12.0%

Urease Activity-Range (as increase in pH) 1)	0.05 - 0.20 2)
Bulk Density Range	36 to 40 pounds/cubic foot
Screen Analysis	95-100% through U.S. Screen #10 40-60% through U.S. Screen #20 Maximum 6.0% through U.S. Screen #80

Performance Criteria	Minimum	Maximum
P.D.I. and/or N.S.I. 3)	15.0%	30.0%
P.E.R. (Protein Efficiency Ratio) 4)	2.3	-
Chick Weights — 4 weeks: in grams 5)	500.0	-

1) Urease Activity, AOCS Tentative Method Ba 9-58.
2) If the soybean meal is to be used in a mixture containing a significant level of soy, (20% or more) 5% or more of urea and 20% or more of molasses, or if a similar soya-urea mixture is to be exposed to hot, humid storage conditions, then it is advisable that the urease activity of the soybean meal does not exceed 0.12 increase in pH.
3) P.D.I. — Protein Dispersibility Index, AOCS Tentative Method Ba 10-65, or N.S.I. — Nitrogen Solubility Index, AOCS Tentative Method Ba 11-65.
4) P.E.R. — Protein Efficiency Ratio: Biological Evaluation of Protein Quality Official Methods, AOAC 11th Edition.
5) Using a medium energy "Carrick" type of corn-soy diet.

Soybean Flakes, 44% Protein Soybean Meal — 44% Soybean Meal is produced by cracking, heating and flaking soybeans and reducing the oil content of the conditioned product by the use of hexane or homologous hydrocarbon solvents to 1% or less on a commercial basis. The extracted flakes are cooked and ground into meal. The meal will not contain viable weed seeds. The meal may contain a nontoxic conditioning agent to reduce caking and improve flowability in an amount not to exceed that necessary to accomplish its intended effect and in no case exceed 0.5%. The name of the conditioning agent must be shown as an added ingredient on the label.

Protein	Minimum	44.0%
Fat	Minimum	0.5%
Fiber	Maximum	7.0%
Moisture	Maximum	12.0%

Urease Activity-Range (as increase in pH) 1) 0.05 - 0.20 2)

Bulk Density Range 35 to 38 pounds/cubic foot

Screen Analysis
95-100% through U.S. Screen #10
40-60% through U.S. Screen #20
Maximum 6.0% through U.S. Screen #80

Performance Criteria	Minimum	Maximum
P.D.I. and/or N.S.I.3)	15.0%	30.0%
P.E.R. (Protein Efficiency Ratio) 4)	2.3	-
Chick Weights — 4 weeks: in grams 5)	500.0	-

Dehulled Soybean Meal — Dehulled Soybean Meal is produced by cracking, heating and flaking soybeans and reducing the oil content of the conditioned product by the use of hexane or homologous hydrocarbon solvents to 1% or less on a commercial basis. The extracted flakes are cooked and ground into meal. The meal will not contain viable weed seeds. The meal may contain a nontoxic conditioning agent to reduce caking and improve flowability in an amount not to exceed that necessary to accomplish its intended effect and in no case exceed 0.5%. The name of the conditioning agent must by shown as an added ingredient on the label.

Protein	Minimum	48-50%
Fat	Minimum	0.5%
Fiber	Maximum	3.0-3.5%
Moisture	Maximum	12.0%

Urease Activity-Range (as increase in pH) 1) 0.05 - 0.20 2)

Bulk Density Range 41 to 42 pounds/cubic foot

Screen Analysis	95-100% through U.S. Screen #10 40-60% through U.S. Screen #20 Maximum 6.0% through U.S. Screen #80

Performance Criteria	Mininum	Maximum
P.D.I. and/or N.S.I.[3]	15.0%	30.0%
P.E.R. (Protein Efficiency Ratio)[4]	2.4	-
Chick Weights — 4 weeks; in grams[5]	600.0	-

References

1. OECD, The Instability of Agricultural Commodity Markets, 1980
2. Commodity Review and Outlook, 1980-1981
3. Oil World
4. World Soybean Research Conference, 1979
5. Soybean Digest Blue Book

[2-3] CASSAVA PELLETS

A. INTRODUCTION

Cassava is a tropical plant and a shrubby root crop, and its cultivation requires sandy soil and a tropical climate.

The optimum growing temperature is 27 to 28°C. It is not suited to low temperatures and growth stops at 15°C, and it is said that it requires a frost-free season of more than 9 months.

The optimum rainfall is 700 to 1,000 mm, but once it takes root after planting, it can withstand dry conditions.

A some yield can be achieved even in acidic and low-fertility soils. These crop characteristics are attractive for small farmers because they can obtain food on land not suitable for other crops, with a minimum of crop supervision and without the need of fertilizer.

On the other hand, it has shortcomings such as low yield and deterioration of land because of its exhausting of soil productivity.

The components of cassava are shown in the following table. Cassava consists mainly of starch and has a low content of protein and amino acids, and in addition, it has only a very small amount of the essential amino acids.

Therefore, it is not adequate as a food or animal feed when used alone, and it is necessary to be supplemented by additional protein, vitamin and minerals.

Table of Cassava Components

	Calorific value	Protein (%)	Fat (%)	Carbohydrates (%)	Ash (%)	Water (%)	Fiber (%)	Vitamins A (IU/100g)	Vitamins B (IU/100g)	Vitamins C (mg/100g)
Cassava roots	127	0.8-1.0	0.2-0.5	32	0.3-0.5	65	0.8	-	-	-
Cassava chips	355	1.5	1.0	85	0.8	15	-	-	10	-
Potato	89	2.1	0.1	20	1.0	77	0.7	40	30-80	13-15

Amino Acid Content (per 100g)

	Water (g)	Nitrogen (g)	Protein (g)	Lysine (mg)	Methionine (mg)	Threonine (mg)	Tryptophan (mg)	Essential amino acids (mg)	Total amino acid content (mg)
Cassava meal	13.1	0.26	1.6	67	22	43	19	404	1,184
Wheat	12.0	2.09	12.2	374	196	382	142	4,280	12,607
Maize	12.0	1.52	9.5	245	182	342	67	3,820	9,262

A problem which arises when cassava is used for food or feed is that it contains toxic hydrocyanic acid.

Cassava is divided into the sweet type and the bitter type, depending on the content of hydrocyanic acid.

The sweet type has a higher content of hydrocyanic acid in the root skin and a lower content in the root pulp, while the bitter type contains hydrocyanic acid equally in the root skin and the pulp. Since the content of hydrocyanic acid differs even within one and the same variety depending on the soil moisture and fertilizing conditions, these classifications are not absolute.

Since the hydrocyanic acid contained in cassava is readily dissolved in water and tends to volatilize, a considerable amount of it can be removed by soaking in water or by heating.

The occurrence of harm or problems to people who habitually eat cassava, or to animals and poultry to which it is given as a feed in the EC countries has never been reported. The reason may be that the toxic components are removed in the course of cooking or processing, or that it poses no problem as long as it is used within a certain limited amount.

However, due consideration is required in increasing the rate of use in such countries where strict control is imposed on foods and feedstuffs to ensure hygienic safety.

The total world production of cassave root is 127 million tons (1981) and it is one of the six major crops, the others being rice, wheat, maize, potato and sweet potato.

The largest area of production is in Africa (47.8 million tons in 1981), followed by Asia (47.6 million tons) and Latin America (31 million tons).

The main producing countries include Brazil (19.7% share of total world production in 1981), Thailand (14.1%), Indonesia (10.8%), Zaire (10.2%), Nigeria (8.6%), India (4.6%), Tanzania (3.7%), China (2.6%), Mozambique (2.2%), Colombia (1.7%) and Angola (1.5%) (Reference Table A-1).

Since cassava is typically a subsistence product which is consumed in the producing countries, worldwide consumption statistics are not available, although it is estimated that two-thirds of the production is consumed domestically as food, and about 30% is used as feed for animals in the producing countries themselves and also for exports. In addition, 4% of the total production is used for manufacturing starch and less than 1% is used as an alcohol material, mainly in Brazil.

Cassava root is a starch food with a low content of protein (0.8-1.0%) and a high carbohydrate content (32%), and is a kind of subsistence product used as food for the low-income brackets in the developing countries, in the tropics and subtropics, except in the case of Thailand.

Therefore, the share held by exports of production is very small, only 0.2% for Africa and 0.1% for Latin America. In Asia, which includes Thailand where production for export has sharply increased, the export share is very high (33%), and Asia accounts for 99% of total world exports.

Since the cassava root contains a large amount of water (as much as 61%) and rotting and autodigestion start soon after harvesting, it is processed as a commodity into such forms as chips, pellets or flour.

Chips and pellets are utilized for feed purposes and the flour is used as material for food, paper and plywood industries.

Total world imports of cassava products reached a peak in 1978 at 16.9 million tons (root equivalent), which however decreased to 15.3 million tons in 1980. The imported cassava is used mainly as feed for livestock (See Reference Table A-2). The demand for cassava products as feed means that they are used as a substitute for compound feed grains such as maize, barley, etc., and their imports are limited to the EC countries. About 6 million tons (on a product base) are traded annually.

The export and import of cassava for use as feed is characterised by the trade being mainly concentrated on Thailand as an exporter and the EC as an importer.

The history of cassava pellets as an export commodity only dates back some 10 years, since it was only in 1970 that cassava was produced in sufficient quantities for export, with transportion costs being reduced through volume compression and pelletization preventing dust inclusion during cargo handling.

Reference Table A-1   Cassava Production in 1981

	Harvested acreage (1,000 ha)	Yield (kg/ha)	Production (1,000 MT)	Share of production (%)
Africa	7,433	6,433	47,818	37.6
Angola	130	14,615	1,900	1.5
Ghana	230	8,043	1,850	1.4
Mozanbique	600	4,750	2,850	2.2
Nigeria	1,200	9,167	11,000	8.6
Tanzania	950	4,895	4,650	3.7
Zaire	1,853	7,017	13,000	10.2
North and Central America	157	6,091	954	0.7
South America	2,577	11,905	30,677	24.1
Brazil	2,093	11,968	25,050	19.7
Colombia	207	10,386	2,150	1.7
Paraguay	135	14,815	2,000	1.5
Asia	3,866	12,307	47,584	37.4
China	251	13,061	3,276	2.6
India	346	16,803	5,817	4.6
Indonesia	1,412	9,718	13,726	10.8
Thailand	1,050	13,414	17,900	14.1
World total	14,054	9,055	127,261	100

Source: FAO, Production Yearbook

Reference Table A-2 Imports of Cassava Products (Root equivalent)

(1,000 MT)

	1975-77 average	1978	1979 (prelim.)	1980 (estim.)
World total	9,469	16,910	14,955	15,347
Developing countries	447	274	218	223
Latin America	4	1	2	2
Africa	1	1	1	1
Far East	442	272	215	220
Korea, Rep.	100	44	40	40
Singapore	62	62	50	50
Developed countries	9,022	16,636	14,737	15,124
North America	210	184	171	164
USA	198	175	164	155
Western Europe	8,422	15,989	14,092	13,630
EC	8,385	15,958	14,064	13,600
Other Western Europe	37	31	28	30
USSR & Eastern Europe	-	20	60	900
Japan	390	443	414	430

Source: FAO, Commodity Review and Outlook, 1980/81

Reference Table A-3 Exports of Cassava Products
(Root equivalent)

(1,000 MT)

	1975-77 average	1978	1979 (prelim.)	1980 (estim.)
Latin America	38	26	22	42
Brazil	27	9	9	30
Africa	72	178	224	110
Angola	21	27	31	35
Malawi	6	6	6	6
Mozambique	5	4	4	4
Tanzania	1	140	182	60
Togo	25	1	1	1
Zaire	1	-	-	-
Far East	9,679	17,505	13,540	14,010
India	12	102	-	40
Indonesia	560	650	2,020	1,700
Malaysia	99	63	67	70
Thailand	8,992	16,693	11,450	12,200
Asia CPE	...	125	250	1,400
China		125	250	1,400
World total	9,790	17,834	14,036	15,562

Note : Cassava products: pellets, chips, flour

Source: FAO, Commodity Review and Outlook, 1980/81

B. PRODUCTION

In order for cassava to be internationally traded as a feedstuff, it is necessary for it to be formed at least into chips, and preferably into pellets.

Presently, of the three countries exporting cassava products; i.e., Thailand, Indonesia and China, which are exporting their products to the EC, the main market; only Thailand is exporting in pellets while the other two countries are exporting in the form of chips.

As mentioned above, Thailand is the biggest exporter of cassava products for animal feed and the sole producer of cassava pellets. Therefore, the following discussion will mainly concentrate on Thailand.

I. Thailand

1. Increased Production and its Background

The production of cassava roots in Thailand increased by 2.5 times during the past 10 years, from 1.222 million tons in the early 1960s to 3.114 million tons in the early 1970s.

However, in 1981/82 it grew still more sharply to 17.744 million tons, an increase of 4.5 times (Reference Table B-1).

The reasons for such a large increase in production are as follows:

a. The compound feed producers in the EC are compelled to use feed grains whose prices are higher than the international prices, because the Common Agricultural Policy maintains grain prices at a high level.

For this reason they are highly interested in any cheap material to replace these grains, and their attention has been drawn to cassava products as an attractive commodity. The demand for it from such a large and stable market has been met by the producing side increasing its level of production sharply.

b. The production of cassava does not require much labor, nor much fertilizers or agricultural chemicals.

c. Cassava is attractive as a profitable crop to farmers who lack a cash crop.

d. It can be grown on land which is not suitable for other crops.

e. Since cassava roots must be processed shortly after harvesting because they tend to rot quickly, they require processing at the production site.

Since the middleman collecting the agricultural products can have the benefits of processing in the village in addition to the profits realized from material buying, the processing facilities have been established in the localities of production.

f. For the above reasons, in the upland field farming regions in the eastern and northeastern parts of Thailand where there usually is a lack of commercial crops, the area under cultivation of cassava has been greatly increased.

Cassava pellet production in Thailand is a good example showing how well and how rapidly conditions for exports were met in terms of crop production, processing facilities, improvement of quality, export organization and the improvement of shipping facilities, for the purpose of exporting to the EC countries.

2. Production of Cassava Pellets

Since Thailand produces cassava products solely for the purpose of exporting, the form of the product has changed greatly, reflecting the demand situation on the importing side.

The volume presently traded by forms is 4.8 million tons for pellets, 0.51 million tons for flour and 0.27 million tons in chip form, with pellets holding the dominant share.

In terms of the percentage share of production by form, 80% of the cassava roots are for the production of pellets.

Since cassava roots tend to rot and proceed with autodigestion within a short time after harvesting, the chip-producing factories are located in the places of production. It is estimated that there are about 1,500 factories operating throughout the country.

The chip-producing factory is a simple facility, equipped with a chipping machine (slicer or shredder) and concrete-lined place for sun drying. Usually a 3-day sun drying produces chips with a moisture content of 14 to 16%.

Therefore, the processing capacity of the chip factory depends on the size of the sun drying area.

Cassava pellets are divided into "brand pellets" and "native pellets".

Brand pellets are the products with good shape retention conforming to the "hard pellets" standard established by the Thai Industrial Standards Institute in February 1980, and are formed by means of imported pelletizers. As of 1981, seven factories have a total production capacity of 2,100 tons per day.

In the production process, the chips delivered to the factory are sieved to remove sand, milled by means of a hammer, and mixed with molasses and vegetable oil. The starch is then dextrinized by means of steaming, formed by the pelletizer, and then cooled to become the final product.

Native pellets are produced using domestically-manufactured pelletizers, and have low shape-retention characteristics.

Nearly 90% of the pellet production is of native pellets, and according to an investigation made in 1979, 385 factories have a total production capacity of 11,800 tons per day.

Since Thailand has no demand for cassava pellets for feed purposes within the country, all of the production can be considered to be for export.

Thailand, which is also an exporting country of rice and maize, is basically different from other cassava producing countries, most of which are producing it as a food. In contrast, cassava is considered poor as a food in Thailand. Moreover, the production of maize for feed purposes exceeds domestic demand, and consequently cassava is not generally used as a feed.

Because cassava has no domestic demand and depends entirely on export, the difficulty being felt in coping with the reduced volume of exports, which will be described later, is consequently all the more serious.

The past peak of production of cassava pellets was 5.709 million tons in 1978, while in 1979, the following year, production decreased because of a serious drought. In 1980, the amount of production was controlled at a level of 4.759 million tons due to voluntary restrictions on exports to the EC.

The production of pellets in 1978 increased to about 6 times the 1971 level of 0.953 million tons, but production subsequently decreased due to import restraints in the EC, the main market for the product.

II. Indonesia

The scale of production of cassava roots in Indonesia has been generally maintained at 1.4 million ha, with an annual production of 11 to 12 million tons over the past 10 years, although in 1981 this figure increased to 13.7 million tons (Reference Table B-1).

Although some large-scale production zones exist (Lumpung, Sumatra), most of the production is performed by smallholders, and there is no large-scale intensive producing area as seen in Thailand, with production in Indonesia being widely distributed throughout the country.

Cassava is one of the main food crops, next to rice in importance, and is domestically consumed as food mostly by people in the low income brackets. It is said that 45 kg per capita is consumed annually.

Since it is typically a subsistence crop, the yield is very low (9.7 tons per ha) in comparison with that in Thailand (13 to 14 tons per ha.).

Because it is one of the important foods in the country, the export situation largely depends on the domestic supply and demand conditions for food.

If the supply and demand situation of food in the country is eased by the increased production of rice, etc., and the price of cassava products becomes lower and a surplus occurs, then cassava is exported; in other words, it is a so-called surplus export commodity.

The export market is chiefly the EC, and the peak volume of exports in the past was 856,000 tons in 1977.

The export commodity for feed purposes is entirely in the form of chips, and the production of pellets is not carried out.

There are some rumors that pellets are produced in Lumpung, Sumatra, but in actual fact it appears that it is chips that are being produced.

As for the outlook of this product as an export commodity, it seems that the government is not considering an increase in exports or the promotion of pellet production because the domestic demand for cassava as feed for animals is expected to increase.

Reference Table B-1 Cassava Root Production

(harvested acreage: 1,000 ha; yield: kg/ha; production: 1,000 MT)

	World			Thailand			Indonesia		
	Harvested acreage	Yield	Production	Harvested acreage	Yield	Production	Harvested acreage	Yield	Production
1965	8,977	8,500	76,503	102	14,460	1,475	1,554	7,300	11,274
1966	9,298	8,500	79,136	130	14,554	1,892	1,565	7,700	12,100
1967	9,344	8,500	81,728	141	14,184	2,000	1,519	7,400	11,291
1968	9,794	8,700	85,625	171	15,275	2,612	1,503	7,582	11,396
1969				190	16,205	3,079	1,467	7,442	10,917
1970	10,731	9,403	100,904	225	15,249	3,431	1,398	7,495	10,478
1971	10,836	9,436	102,248	222	14,027	3,114	1,406	7,603	10,690
1972	11,055	9,350	103,366	331	12,000	3,974	1,468	7,074	10,385
1973	11,342	8,871	100,611	436	13,000	5,668	1,429	7,828	11,186
1974	11,878	8,831	104,891	480	13,000	6,240	1,509	8,636	13,031
1975	11,952	8,641	103,284	594	13,636	8,100	1,410	8,898	12,546
1976	12,158	8,785	106,807	700	14,483	10,138	1,353	9,010	12,191
1977	12,575	8,761	110,167	960	12,888	12,372	1,364	9,155	12,488
1978	13,783	8,909	122,801	1,012	14,870	15,048	1,383	9,329	12,902
1979	13,573	8,657	117,505	1,061	10,630	11,278	1,439	9,556	13,751
1980	13,926	8,770	122,134	1,158	14,283	16,540	1,421	9,523	13,532
1981	14,054	9,055	127,261	1,270	13,972	17,744	1,412	9,718	13,726

Source: World - FAO, Production Yearbook
Thailand, Indonesia - National statistics

C. EXPORTS FROM THAILAND

I. Progress of Exports

Since there is no domestic demand for cassava pellets in Thailand, all of the production is considered to be for export.

The previous peak volume of exports was 5.796 million tons in 1978, 6 times the volume in 1971 (0.964 million tons).

Almost the entire amount was exported to the EC, with the largest export volume to other countries registering only 100,000 tons per annum. However, in 1981 when the EC restrained imports, 310,000 tons were exported to the USSR, a new market.

Of the EC countries, the Netherlands is the largest buyer, holding a share of about 90% of the total exports to the EC until 1977. From 1978 to 1980, exports to Belgium, the Federal Republic of Germany, France and Italy increased, and the share held by the Netherlands decreased to a little over 70%, although in 1981 the share of this country again increased (Reference Table C-1).

Since 1978, when exports to the EC reached a peak, France and other grain producing countries have moved to restrain imports due to competition of cassava products with barley produced within the EC.

For this reason, the EC and the Government of Thailand made an agreement to reduce the level of exports, in two-year stages during the 6 years from 1981 to 1986.

1981 Agreement:

Period	Export quota target quantity	Import duties
1st stage, 1981-1982	5.0 million tons (Allowance within 10%)	Within target qty: 6%
2nd stage, 1983-1984	4.5 million tons (Allowance within 10%)	Over quota: 30%
3rd stage, 1985-1986	To be discussed in consideration of the results of the above two periods, the domestic production conditions and trade balance situation.	

In addition, the following Agreement was made in 1982 between the EC and Thailand:

Period	Export quota target quantity	Import duties
1st stage, 1983-1984	5.0 million tons (Allowance within 10%)	Within target qty: 6%
2nd stage, 1985-1986	4.5 million tons (Allowance within 10%)	Over quota: MFN treatment applied.

As a result of the above measures, Thailand, which could previously increase its export of cassava pellets without limits, is now compelled to reduce its level of exports to the EC, and it is important for this country to develop new export markets and new uses for cassava products, as well as to reduce the area under cassava by conversion to other crops such as rubber trees.

II. Export Policy

Since cassava pellets are an export commodity not having any domestic demand, the Thai Government has been promoting exports through policies as explained below.

1. Quality Improvement Policy

Measures to cope with the following complaints have constituted an important factor in promoting export of cassava.

a. Complaints from the compound feed producers concerning the inclusion of earth and sand,

b. Complaints from cargo handling personnel and residents in the vicinity against the dust produced from the powdered pellets when they are unloaded at the destination port and compound feed factory.

For this reason, the Thai Government established the Exporter Registration System and Export Quality Standards for the control of quality. The Exporter Registration System, the purpose of which is to check the non-law-abiding traders and guide ordinary traders, is requiring all the traders to register with the Export Promotion Division of the Foreign Trade Department, Ministry of Commerce since 1962.

To qualify for the registration, an exporter must be a member of the Thai Tapioca Trade Association, and as of 1980, 89 exporters have been registered. Exports require the attachment of an Export Approval Certificate issued by the Office of Commodity Standards of the Foreign Trade Department, Ministry of Commerce (OCS) or by a private inspection company.

In order to regulate the quality and standards, all cassava products except flour were designated as a Standard Commodity in 1962, thereby falling under the purview of the Exports Standardization Act.

As a reference, the Standard Commodities comprise 10 items, such as maize, kenaf, kapok, salt, teak, etc.

The following Table shows the respective quality standards, and it can be seen that the EC standards specify a higher starch content.

Quality Standards for Tapioca Products

	Thai standards	EC standards
Starch content	60% min.	65% (63.0% for June 1 - Sept. 30)
Raw fiber	5.0% max.	5.0% max.
Sand	3.0% max.	3.0% max.
Moisture	14.0% max. (14.3% for June 1 - Sept. 30)	14.0% max. (14.3% for June 1 - Sept. 30)

The inspection of conformity to export standards is carried out by the OCS, or by private inspection companies registered with the OCS.

2. Market Development

In order to develop the market, the Foreign Trade Department of the Ministry of Commerce, the Tapioca Products Committee, the Standing Committee of the privately-operated Board of Trade of Thailand (BOT) and The Thai Tapioca Trade Association are in action.

Because of the Agreement between the EC and Thailand on export restraints, it is important for Thailand to expand the market for cassava as feedstuffs and as material for substitute energy in countries other than the EC.

3. Setting of Minimum Export Prices

In order to prevent export prices from falling due to overcompetition, minimum export prices for cassava pellets and chips were fixed in May 1980, and exporters are required to quote prices not lower than these price levels.

Any exporter who fails to comply with this rule is liable to prosecution.

The minimum export prices are shown in Reference Table C-3. The price of cassava pellets (native pellets) for prompt shipment was US$130/MT for the shipment period as of January 31, 1981, but was gradually modified downward to US$100/MT for the November shipment in the same year (Reference Table C-2 and C-3).

This is considered to be a reflection of the actual supply and demand situation, caused by the reduction of the export volume to the EC.

For brand pellets, the price of native pellets plus US$11 to US$12.50/MT is fixed as the minimum price.

III. Export Price

Movements in the price of cassava pellets from Thailand are shown in Reference Table C-4. An increase in the price from US$51.10/MT in 1971 to a level of US$90/MT from 1975 is shown, although in 1978, when the peak volume of exports was recorded, it temporarily declined to US$84/MT. In 1979, the large drop in production caused by the drought pushed the price up to US$120/MT, but in 1981 the price again declined due to the restraints on exports to the EC.

IV. Improvement of Export Conditions

1. Road Network

The southeastern part of the Thai central plain, the main cassava production area, is relatively close to the loading port (within 100 km), whereas the new production area in the northeastern region is far more distant (about 560 km, measured from the remotest area).

However, the road network has been improved and paved, and consequently all of the transportation from the production area to the loading port is handled by large trucks.

The 1981 freight charges from the remotest production place to Bang Pakong, where the largest warehouse facilities are located, were US$13.04/MT, while those from the nearest production area were US$2.61/MT.

2. Port Warehousing and Loading Facilities

The storage capacity of the warehouses (including silos) for tapioca products for export is 1.65 million tons, comprising 27 warehouses, and since there are also some ordinary warehouses which are used for storing the pellets, the total capacity comes to 1.7 million tons.

The methods of loading are largely divided into a) direct loading, b) bulk loading using floating pontoons and c) bulk loading using the vessel cranes or crane trucks.

An example of the direct loading method is the Mah Boon Krong Silo, which is exclusively used for tapioca and was completed at Sira-Cha port in February 1977. This is used by two companies, Tradax Ltd. and Peter Creamer Ltd. Pellets stocked both in bulk bins with a total capacity of 25,000 tons and in a flat godown with a capacity of 75,000 tons are carried by a conveyor running on a jetty of 3 km in length projecting into the sea, and 600 tons per hour are loaded by three loaders located at the end of the jetty.

The bulk loading system using floating pontoons was installed in 1978 by a joint venture among Alfred C. Toepfer Ltd., Krohn & Co., Ltd., and an elevator manufacturer in the Netherlands, to compete with the direct loading system described above.

The pellets are loaded in bulk into a lighter and are discharged into the hopper by the loading jib of a floating pontoon moored alongside the vessel, and 600 tons per hour are loaded through the basket conveyor - loader - spout into the hatch of the vessel.

Buyers who cannot utilize the above two loading facilities use the vessel cranes or crane trucks for vessels not fitted with a crane, and the pellets are loaded in bulk from the lighter. This method has the merit of being able to be used for large vessels of more than 100,000 tons since there is no draft limit involved.

3. Loading Ports

There are four ports, Bangkok, Koh Sichang, Siracha and Sattahip, used for exporting tapioca products.

Bangkok port, a river port, has limitations on the total length and draft of entering vessels, and a large vessel cannot come in. Therefore, its main role is to act as a lighter-shipping port for the main loading port, Koh Sichang.

Koh Sichang port was previously used for additional loading as an outport for Bangkok port, but as tapioca-carrying vessels became larger in size, it became an important loading port together with Siracha port.

Siracha port is equipped with direct loading facilities and about 25% of the exports are shipped from this port. However, because of its shoaling beach, vessels are limited to 60,000 tons, and larger ships must travel to Koh Sichang port for additional loading.

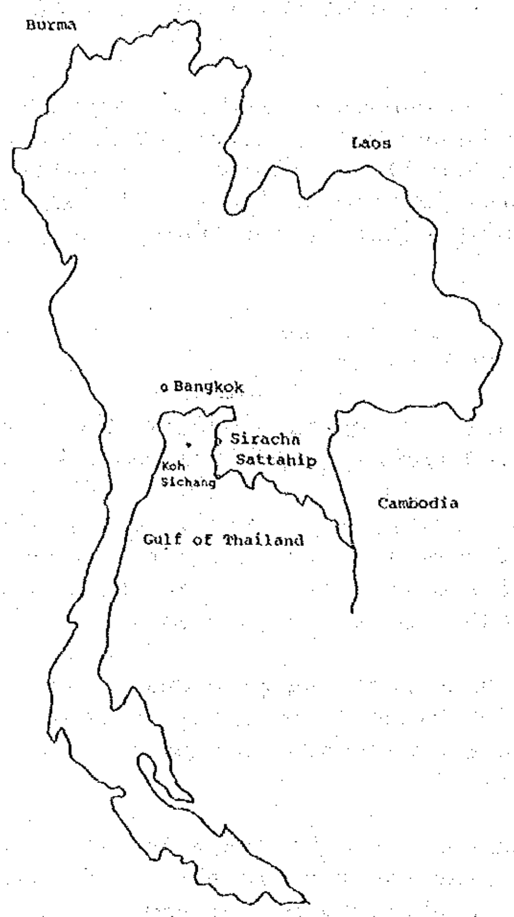
Sattahip port is a naval port, part of which is used as a mercantile port, although recently its use for mercantile purpose has been low because it has no large warehouse and large vessels must travel to Koh Sichang for additional loading.

V. International Transactions

Tapioca products are exported by two types of companies, suppliers and shippers.

A supplier is an exporter who collects the products from the factories and possesses an export quota obtained from the government.

Cassava Pellet Export Ports in Thailand



Suppliers also conduct the domestic procedures such as export inspection and the obtaining of the export certificate.

A shipper is an exporter who buys the products from the supplier, assigns ships and negotiates with the importer. There are four shippers, including three West German companies (Krohn & Co., Alfred C. Toepfer, Peter Creamer) and one American company (Cargill) who have formed an oligopoly, handling 99% of total exports in 1980.

There are 55 companies which are suppliers of cassava pellets, and the largest 10 companies had a share of 50% of the trade in 1980.

Foreign firms have established their dominant position in trade through tie-ups or joint ventures with the large suppliers, their activities extending from the construction of the brand pellet processing facilities in the production area to the buying up of large amounts of native pellets and the chartering of ships, for sales to the countries within the EC zone.

The Thai exporters, resisting this strong foreign dominance, established the Eurasian Corp. in 1980 and started direct sales to the end users in the EC. However, the operation is confronted with many difficulties.

There are four industrial associations, comprising a) the Thai Tapioca Trade Association (TTTA), b) the Thai Tapioca Products Factories Association (TTPFA), c) the Thai Tapioca Flour Industries Trade Association (TTFITA) and d) the Tapioca Pelletizing and Chipping Factories Association (TPCFA).

Of the above four Associations, the most influential and powerful is the TTTA.

TTTA was established in 1963 as a licensing association based on the Trade Association Act, and in 1981 consisted of 105 companies as regular members, who are actively engaged in exporting pellets and chips.

Its main work is to promote the export of tapioca products, to guide and give technical assistance to the cassava farmers, processing industry and trading industry, and to study the cassava planting acreage and yield.

The membership of TTPFA consists mainly of the owners of tapioca production factories and also includes some suppliers. Its main work is to improve the quality of the product, to seek better mutual understanding among the members and to coordinate the members' points of view for the purpose of promoting exports.

The membership of TPCFA consists of 130 manufacturing companies who produce pellets and chips, and its main work is to promote the production of pellets and chips and to give guidance and advice to the cassava growers.

Reference Table C-1 Exports of Cassava Pellets from Thailand

(1,000 MT)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Pellets											
EC	953	1,176	1,595	1,934	2,110	3,412	3,671	5,709	3,661	4,759	5,268
Netherlands	812	1,067	1,353	1,719	1,966	3,143	3,252	4,059	2,646	3,574	4,922
Germany, FR	124	75	114	112	97	89	186	431	211	324	92
France	13	33	115	88	45	128	135	430	227	120	81
Belgium	4	–	9	15	2	38	86	564	409	668	90
UK	1	2	3	–	1	2	5	19	2	–	–
Italy	1	–	–	–	0	12	8	206	166	74	83
Other countries	11	1	44	98	59	29	16	87	34	52	318
Subtotal	964	1,177	1,639	2,032	2,169	3,441	3,687	5,796	3,695	4,811	5,586
Chips	2.5	2.4	19.0	105.0	70.6	42.5	65.6	255.6	142.0	159.0	413.0
Total	966.5	1,179.4	1,658.0	2,137.0	2,239.6	3,483.5	3,752.6	6,051.6	3,837.0	4,970.0	5,999.0

Source: Thai Tapioca Trade Association

Reference Table C-2 Exports from Thailand of Cassava Products for Feed Use

(1,000 MT)

	1965		1966		1967		1968		1969		1970		1971		1972		1973	
	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
EC	78	404	68	369	181	343	384	317	26	55	1,154	0	953	0	1,176	0	1,595	0
Netherlands	16	207	16	161	82	173	281	128	14	14	843	-	812	-	1,067	-	1,353	-
Germany, FR	60	183	50	190	95	153	97	166	9	24	308	-	124	-	75	-	114	-
France	-	-	-	-	-	-	1	-	-	-	1	-	13	-	33	-	115	-
Belgium	1	14	-	15	3	5	4	23	-	2	1	1	4	-	-	-	9	-
UK	-	-	-	-	-	-	1	-	-	-	3	1	1	-	2	-	3	-
Italy	1	-	1	-	1	-	-	-	3	15	-	-	1	-	-	-	-	-
Other countries	2	4	1	3	0	12	5	6	2	1	14	8	11	2.5	1	2.4	44	19.2
Total	80	408	68	369	181	343	389	323	28	56	1,168	8	964	2.5	1,177	2.4	1,639	19.2

	1974		1975		1976		1977		1978		1979		1980		1981	
	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C
EC	1,934	3	2,110	6.6	3,412	34.4	3,671	49.0	5,709	239.7	3,661	142.0	4,759	159.0	5,268	328
Netherlands	1,719	-	1,966	2.0	3,143	31.8	3,252	45.3	4,059	147.2	2,646	35.0	3,574	90.5	4,922	257
Germany, FR	112	3	97	4.6	89	2.6	186	-	431	3.7	211	12.5	324	14.5	92	-
France	88	-	45	-	128	-	135	1.7	430	38.9	227	37.2	120	3.0	81	16
Belgium	15	-	2	-	38	-	86	2.0	564	46.7	409	57.3	668	51.0	90	55
UK	-	-	1	-	2	-	5	-	19	-	2	-	-	-	-	-
Italy	-	-	-	-	12	-	8	-	206	3.2	166	-	74	-	83	-
Other countries	98	102	59	64.0	29	8.1	16	16.6	87	15.9	34	-	52	-	318	85
Total	2,032	105	2,169	70.6	3,441	42.5	3,687	65.6	5,796	255.6	3,695	142.0	4,811	159.0	5,586	413

Note: P: pellets; C: chips

Source: Thai Tapioca Trade Association

Reference Table C-3 Export Floor Prices in 1981

(US$/MT)

Announcement		1. Tapioca pellets				2. H.T.P.
		Prompt shipment		Advance shipment		Price in category
No.	Date	Date	Price	Date	Price	1.+ at least
1/1981	Dec. 30,'80	Jan.1-31,'81	130	Feb.-Apr.	130	11
2/1981	Jan. 27,'81	Jan.28-Feb.28	120	Mar.-Apr.	120	11
				Mar.-Jul.	124	
3/1981	Feb. 16,'81	Feb.17-Feb.28	118	Mar.-Apr.	118	11
				May -Jul.	126	
4/1981	Feb. 27,'81	Mar.2-31	118	Apr.	118	11
				May -Jul.	126	
5/1981	Mar. 11,'81	Mar.12-31	118	Apr.	118	11
				May -Jul.	120	
6/1981	Mar. 31,'81	Apr.1-30	118	May -Jul.	120	12.5
7/1981	Apr. 30,'81	May 1-31	118	June-Aug.	118	12.5
8/1981	May 21,'81	May 22-31	100	June-Nov.	100	12.5
9/1981	July 14,'81	July 15-31	100	Aug.-Apr. '82	100	12.5
10/1981	July 31,'81	Aug.	100	Sept.-Apr.'82	100	12.5
11/1981	Aug. 31,'81	Sept.	100	Oct.-June '82	100	12.5
12/1981	Sept.30,'81	Oct.	100	Nov.-June '82	100	12.5
13/1981	Oct. 30,'81	Nov.	100	Dec.-June '82	100	12.5

Announcement		3. Tapioca Chips				Exchange rate:
		Prompt shipment		Advance shipment		
No.	Date	Date	Price	Date	Price	Baht/US$
1/1981	Dec. 30,'80	-	-	-	-	20.52
2/1981	Jan. 27,'81	Jan.28-Feb.28	116	Mar.-Apr.	116	20.58
				Mar.-July	120	
3/1981	Feb. 16,'81	Feb.17-Feb 26	114	Mar.-Apr.	114	20.58
				May -July	122	
4/1981	Feb. 27,'81	Mar.2-31	114	Apr.	114	20.58
				May -July	122	
5/1981	Mar. 11,'81	Mar.12-31	114	Apr.	114	20.58
				May -July	116	
6/1981	Mar. 31,'81	Apr.1-30	114	May -July	116	20.60
7/1981	Apr. 30,'81	May 1-31	114	May -July	114	20.68
8/1981	May 21,'81	May 22-31	96	June-Nov.	96	20.90
9/1981	July 14,'81	July 15-31	96	Aug.-Apr. '82	96	20.90
10/1981	July 31,'81	Aug.	96	Sept.-Apr.'82	96	20.90
11/1981	Aug. 31,'81	Sept.	96	Oct.-June '82	96	22.90
12/1981	Sept.30,'81	Oct.	96	Nov.-June '82	96	22.90
13/1981	Oct. 30,'81	Nov.	96	Dec.-June '82	96	22.90

Notes: 1. The above prices are FOB unstowed at Thailand ports without sacks.
2. H.T.P. = Hard Tapioca Pellets

Source: Foreign Trade Dept.

Reference Table C-4 Prices in Thailand

Year	Cassava roots Farm gate price	Bangkok wholesale price for pellets	Export price		
			Year	Chips	Pellets
	BHT/kg	cents/kg		US$/ton	US$/ton
1970/71	0.47	4.05			
71/72	0.52	4.20	1971	49	51
72/73	0.47	5.25	72	45	56
73/74	0.34	5.40	73	65	64
74/75	0.30	7.65	74	68	72
75/76	0.41	8.30	75	85	93
76/77	0.46	8.09	76	94	95
77/78	0.47	6.66	77	88	93
78/79	0.36	7.22	78	79	84
79/80	0.74	12.44	79	120	119
80/81	0.75	12.55	80	125	134
81/82	0.54	9.35	81		-

Source: Thai Tapioca Trade Association

D. IMPORT AND CONSUMPTION

I. Requirements of EC Market for Substitute Material for Grain

Most of the cassava pellets and chips used as animal feed are imported by the EC countries, and more than 90% of the supply is accounted for by Thailand. This means that cassava products constitute an export commodity which is traded among only a few specific countries.

In the EC the price of feed grains is kept at a higher level than the international price because the Grain Price Support System has been adopted in accordance with the Common Agricultural Policy. In order to protect the grains produced within the region, import duties are levied on imported competitive grains so that their price will be at the same level as the price of the indigenous products of the region.

For this reason, the compound feed manufacturers, who want to maintain and expand their operations, are highly interested in obtaining cheaper feed to replace the feed grains used as a material for compound feed.

As a result, a reduced rate of use of the basic feed grains, and an increased rate of use of substitute feed materials can be seen for the compound feed produced in the EC.

The use rate of feed grains is very low, at 39% in 1978, compared with 60% in Japan.

The use of substitute feeds such as cassava pellets, molasses, corn gluten and sugar beet reached 22 million tons (grain equivalent) in 1980, an increase of 10 million tons over 5 years (Reference Table D-1).

Cassava pellets were a new commodity, brought about in a sense by the EC's import system for agricultural products, and drew much attention as a cheap material for compound feed, thus boosting the consumption rate.

The rate of increase of cassava pellet imports in the period from early 1970s to the present has greatly exceeded the growth of compound feed production. This indicates the change in the material composition of compound feed; i.e., attention was drawn to cassava pellets as a cheap substitute material and the rate of consumption increased (Reference Table D-2).

Another new commodity created by the EC's import system for agricultural products is the corn gluten being imported from the USA. While the cassava pellet is a starchy feed, the corn gluten is a proteinic feed, and its consumption is reaching a level of almost 3 million tons.

The annual average level of imports into the EC of cassava products for feed purposes from 1978/79 to 1980/81 was 6.02 million tons, and since part of this was exported, the average annual consumption in the EC during this period was 5.23 million tons.

II. Import and Consumption Trends

The largest importer in the EC is the Netherlands, which accounted for imports totaling 2.7 million tons per annum, 45% of the average annual imports of the EC, during the above period. A part of this amount is exported but most of it is consumed within the country.

The Netherlands depends greatly on imported feed because grain production is small in this country, and in addition, its production of compound feed is the largest next to the Federal Repubic of Germany, since pig and poultry farming are highly developed.

Furthermore, per animal consumption of compound feed is the highest among the European countries, and the mixing ratio of cassava products in compound feed reaches 16%.

The second largest consumer of cassava products is the Federal Republic of Germany, which imported an average of 1.49 million tons per annum, 25% of the total amount imported by the EC, during the corresponding period. The ratio of cassava products used in compound feed is 9%.

The combined imports of the Netherlands and the Federal Republic of Germany reach almost 70% of total EC imports, with the balance being imported by Belgium, Luxemburg, France and Italy, and a small amount being imported by Denmark and the UK.

Cassava pellets are consumed in the form of compound feed for hogs, poultry and cattle, and the mixing ratio is the largest for hog feed at 30%, while the ratio for poultry is limited to 15% from the nutritional point of view.

In addition to the EC countries, the USSR imports cassava pellets as a substitute when it faces difficulty in importing feed grains.

From 1981, the EC, the major cassava pellet importing region, placed restraints on the import of cassava pellets and chips, setting the upper limit at 6 million tons. This was because increased imports of substitute feedstuffs threatened the grain produced within the region.

In 1982 the import quotas were set at 5 million tons for Thailand with an allowance of 10% (0.5 million tons), 0.5 million tons for Indonesia and 0.37 million tons for China. The quota for Thailand was further reduced to 4.5 million tons starting from 1983, making it difficult to expect an increase in the level of imports by EC countries at least for the time being.

By the same token, the import of corn gluten from the USA is set at 3 million tons as the upper limit.

III. Import Price

Cassava products for feed are mostly traded between Thailand and the EC, but it is a minor trade commodity from the international point of view.

For this reason, it is difficult to obtain statistics of the import prices in time series from published data. However, movements of the export price in Thailand are shown in Reference Table C-4, with which the import prices are assumed to have been in parallel.

The recent import prices (CIF Hamburg, April 1982) are DM295/MT afloat for the pellets (delivered quality) produced in Thailand, DM30 higher for the hard pellets, DM310 for the pellets produced in Indonesia and DM330 for the chips produced in China. In comparison with the pellets produced in Thailand, the products from Indonesia and China are higher in price, but the reason for this is unclear; i.e., whether it is because of a difference in quality due to the fact that the latter countries produce the chips from skinned cassava roots, or whether it is due to cheaper freight for cassava products from Thailand as she uses larger vessels.

Feed grains are chiefly imported by the developed countries in the northern hemisphere, but the possibility of cassava pellets being imported as a substitute for maize, etc., by the feed grain importing countries is considered to be low, except when they are imported as an emergency measure when there is a shortage in the international supply of feed grains, or when it becomes economically advantageous to use cassava pellets to supplement protein feed due to price increases of the feed grains.

For example, in Japan, which is a steady importer of a large amount of feed grains, cassava pellets have been used on a trial basis, but there is little possibility that they will be used in the future unless the price is considerably lowered.

The USSR decided to import 1 million tons from Thailand during the three years starting from 1981, and imported about 0.3 million tons in 1981, but it is doubtful whether this country will import cassava pellets continuously and steadily because it is protein feed which is lacking in the USSR.

Reference Table D-1 EC Estimates of Use of Cereal Substitutes

(1,000 MT)

	1975	Present	Sources and Comments
Manioc			
Use in compound feeds	2,340	5,320(?)	FEFAC, Feed and Food (the present figure was adjusted to take account of recent market trends)
Substitution formula	1 kg of manioc + 250 grams of soya cake replace 1.25 kg of maize.		
Quantity of cereals replaced by cassava + oilcake	2,925	6,375(?)	Increase from 1975 to the present + 3,950(?)
Molasses			
Use in compound feeds only	1,548	2,665 in 1979	FEFAC, Feed and Food
Imports from third countries	1,731	2,706 in 1980	Eurostat
Total use in animal feeds	2,068	3,000(?)	Eurostat, Feed balance
Substitution formula	750 grams of molasses + 150 grams of soya cake + 100 grams of tallow replaces 1 kg of maize.		
Quantity of cereals replaced by oilcake + tallow	2,757	4,000(?)	Increase from 1975 to the present + 1,243(?)
Corn gluten feed			
Imports	930	2,596 in 1980	Eurostat
Substitution formula	1 kg of corn gluten feed replaces 450 grams of maize + 425 grams of soya cake + 225 grams of bran.		
Quantity of cereals replaced by corn gluten feed	418	1,168 in 1980	Increase from 1975 to the present + 750

Reference Table D-1 (cont'd.)

(1,000 MT)

	1975	Present	Sources and Comments
Dried sugar beet pulp			
Total use in animal feeds	3,030	4,000(?)	Eurostat, Feed balance
Substitution formula	1 kg of maize is replaced by 630 grams of dried pulp + 200 grams of bran and 120 grams of fats + 50 grams of soya cake.		
Quantity of cereals replaced by the pulp + bran + tallow + oilcake	4,810	6,349(?)	Increase from 1975 to the present + 1,539
Dried citrus pulp			
Imports	536	1,727	Eurostat
Substitution formula	Ditto - sugar beet pulp		
Quantity of cereals replaced by mixture containing citrus pulp	850	2,741	Increase from 1975 to the present + 1,891
Fats			
Total used in compound feeds	695	985 in 1979	FEFAC, Feed and Food
Amount which constitutes feed for pigs and poultry alone	200(?)	500(?)	
Substitution formula	1 kg of fat provides as much energy as 2 kg of cereals.		
Quantity of cereals replaced by fats	400(?)	1,000	+ 600(?)
Total			
Quantity of cereals replaced	12,160	22,133	+ 10,000

Source: OECD

Reference Table D-2 Mixed Feed Production in EC

(1,000 MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Poultry	15,841	15,915	16,435	18,246	17,740	17,160	18,250	18,251	18,925	19,989	20,676	21,279
Pigs	16,664	18,024	19,152	21,357	22,085	21,250	22,600	23,548	24,983	26,580	27,019	26,759
Cattle	12,227	11,949	13,722	16,859	16,040	17,460	22,030	22,876	24,502	28,014	27,981	28,302
Others	2,926	3,125	3,527	2,020	1,925	2,250	2,450	2,766	3,004	3,343	3,344	3,394
Total	47,658	49,013	52,836	58,482	57,790	58,120	65,330	67,441	71,414	77,926	79,020	79,734
Belgium/ Luxemburg	4,282	4,279	4,660	5,023	5,000	4,700	5,100	5,000	5,019	4,995	4,905	4,778
Denmark	2,574	2,548	2,740	2,707	2,700	2,900	3,400	3,700	4,217	4,750	4,842	4,753
France	7,581	8,357	9,606	10,981	11,100	11,100	12,300	12,500	13,296	14,007	14,695	15,156
Ireland	988	1,057	1,180	1,225	1,090	1,020	1,230	1,370	1,560	2,063	1,766	1,860
Italy	3,632	3,710	4,023	6,201	6,400	6,000	7,400	8,100	8,780	9,982	10,478	10,457
Netherlands	7,851	8,596	9,116	10,078	10,500	10,700	11,400	12,300	12,726	14,051	14,456	14,570
UK	11,023	10,603	10,848	11,228	10,300	10,200	11,400	10,800	10,964	11,640	11,082	11,007
Germany, FR	9,728	9,863	10,663	11,039	10,700	11,500	13,100	14,000	14,852	16,438	16,796	17,153
EC Total	47,658	49,013	52,836	58,482	57,790	58,120	65,330	67,770	71,414	77,926	79,020	79,734

Reference Table D-3 Net Imports of Grain substitutes by EC (Jan./Dec. basis)

(1,000 MT)

	1977	1978	1979	1980	1981
Corn gluten	1,465	1,639	1,959	2,501	2,779
Cassava	3,675	5,646	5,047	4,663	6,160
Total	5,140	7,285	7,006	7,164	8,939

Source: Oil World, April 8, 1982

Reference Table D-4 Imports and Exports of Cassava Products

(1,000 MT)

EC	1978/79			1979/80			1980/81		
	Imports	Exports	Net imports	Imports	Exports	Net imports	Imports	Exports	Net imports
Belgium/Luxemburg	1,121.6	275.1	846.5	767.7	183.8	583.9	990.3	214.6	775.7
Denmark	105.8	-	105.8	56.4	-	56.4	74.1	-	74.1
France	774.5	2.7	771.8	309.8	0.2	309.6	491.7	0.1	491.6
Italy	231.3	-	231.3	98.5	-	98.5	216.8	-	216.8
Netherlands	2,687.6	454.4	2,233.2	2,198.3	349.4	1,848.9	3,218.6	790.2	2,428.4
UK	33.6	-	33.6	25.4	-	25.4	203.8	-	203.8
Germany, FR	1,642.0	55.2	1,586.8	1,323.3	14.0	1,309.3	1,494.6	45.1	1,449.5
Total	6,596.4	787.4	5,809.0	4,779.4	547.4	4,232.0	6,689.9	1,050.0	5,639.9

Source: Oil World, April 16, 1982

E. FACTORS TO BE CONSIDERED REGARDING EXPORTS OF CASSAVA PELLETS

I. Limitations of Export Market and Unlikelihood that Imports will Increase

From the viewpoint of nutrition, cassava pellets are a starchy feed, and they are unlikely to gain widespread use as a substitute for maize, grain sorghum, etc., which are customarily used as basic feedstuffs in the feed grain importing countries.

The reason for cassava pellets being used in the EC as a substitute feed is that the EC levies a high rate of tariff on imported feed grains, and thus cassava pellets drew attention as a cheap material to replace the high-priced feed materials.

The EC, the main import market, has already made agreements with the exporting countries for import restraints, due to the steep increase in imports of substitute feedstuffs. An agreement has also been made with Thailand, the main exporting country, for economic and technical cooperation for the realization of production curtailment.

As for the demand in the USSR and other planned economy countries in the East European bloc, in the oil producing countries in the Middle East, and in the Asian countries where industrialization has made progress, it is very difficult to predict a steady increase of imports in the future.

Unless cassava pellets can be used at a price level lower than that of the feed grains on a nutritive value basis, an increase in their consumption as an imported feed is unlikely.

Also, since cassava pellets are a starchy feed, it is necessary to add to them a protein feed such as oilseed meal, and it is important that the overall price including the price for the added protein feed can compete with the price of the feed grains.

II. Improvement of Export Conditions

The production of cassava in Thailand developed within a relatively short period of time, exclusively for the purpose of exporting the product.

1. Establishment of Labor-Saving Cultivation Techniques

Cassava cultivation attracted smallholders in the upland farming region who lacked profitable cash crops, as the only cash crop available to them. In the area cassava thus rapidly increased, and the traditional middlemen, who had already established themselves as buying and collecting agents for rice and maize, in cooperation with other agencies constructed chip factories in the production areas and further pelletized the product to enhance the added value of the export commodity.

It can be said that cheap and abundant labor enabled the realization of low-cost pellet production.

In the other main producing countries of the world also, cassava is characterised as a food for self-consumption for the smallholders, and technical research on breeding and growing is greatly lagging in comparison with that for other crops, with cultivation using modern agricultural methods not yet having been established.

In Thailand as well, the use of the tractor is limited to ploughing when planting, and other work for the control of cultivation is all carried out manually.

For a large area to be cultivated by a limited labor force, it will be necessary to establish low-cost mechanization.

2. Maintenance of Production Levels

Although cassava can withstand an extensive cultivation, a decrease in soil productivity and yield is feared because of the wide-spread non-fertilized cultivation and continuous cropping of the plant.

In Thailand, only one traditional variety, Ryon No. 1, is grown. As one of the measures to cope with the import restraints on the part of the EC, Thailand is studying the selection of appropriate varieties to enable the introduction of rotation of crops, by shortening the growing period to prevent soil productivity from decreasing, and the conversion from a single variety to multiple varieties in order to prevent damage by disease as well as to enable the selection of varieties with a high fertilizing effect.

In creating new production areas, it will be necessary to carry out these kinds of technical investigations and to take advance measures to avoid deterioration of soil productivity.

3. Requirement of Export Commodities for Maintenance of Quality and Intensive Standards Inspection

In Thailand, cassava products constitute one of the important agricultural products for export, together with rice and sugar. The exportation of these agricultural products requires registration of exporters, setting of the quality and standards of the products and export inspection. Since cassava pellets were designated as such a product, the improvement of quality was effected within a short time span.

In trying to establish a new export commodity, these systems and their operations seem to deserve to be given due consideration.

4. Improvement of Transportation Conditions

Transportation to the loading port and silos, warehouses and loading facilities at the shipping port must be improved.

Thailand has improved the roads to the shipping ports and all of the transportation to the shipping ports is done by trucks.

The port facilities such as silos and loading facilities have been installed through joint ventures with European firms and by domestic capital, and large vessels can be used.

These improvements have enabled the reduction of both cargo handling costs and ocean freight charges through the use of large vessels.

III. Future Market Forecast

The EC, which constitutes the present market for cassava pellets, is already restraining imports, and it must be said that the possibility of developing a new market outside EC will be difficult.

The main feed importing countries which depend on external sources of feed materials for their planned increase in production of livestock products are principally the developed countries in the northern hemisphere.

The main demand for imported feedstuffs comes from the meat and egg industries in these countries, but future demand for feedstuffs is not expected to increase at such a high rate as realized in the past because the nutrition of the peoples has already reached a considerably high level.

Furthermore, one of the most important factors in forecasting the consumption of substitute feeds is the future developments of the grain price policy of the EC.

If the level of the grain support prices is considerably lowered to approach the international price level, the use of the grains as feed stuffs will increase, while that of the substitute materials will decrease.

It is expected that the agricultural policy of the EC, which is the main market for both protein and substitute feedstuffs, will have a significant effect on the future demand for these products.

Moreover, in the Far Eastern countries and the petroleum producing countries in the Middle and Near East, where industrialization has recently been making progress and the import of feeds has been increasing, it is unlikely that the consumption of cassava pellets will increase, either in competition with the feed grains such as maize or as a supplementary feed, as long as the present relative price levels are maintained and the grains and the substitute feedstuffs are placed under the same import system.

In addition, it should be remembered that in countries with religious constraints on eating pork products it is impossible to expect any demand from the pork industry, which is a sector normally using a relatively large amount of cassava pellets.

The above demand forecast is based on the present price level of cassava pellets. However, if productivity improvements such as a considerable improvement in yield and a shortening of the growing period are disseminated, as demonstrated at the CIAT (Centro Internacional de Agricultura Tropical) which is studying cassava as one of its major subjects of research, the price of cassava products may be considerably lowered from the present level.

Considerable efforts will be required to modernize production so as to develop a competitive international trade commodity, moving away from the traditional way of production dominated by small-scale subsistence farmers. However, if such modernization is realized, cassava products are considered to have the potential to coexist with the feed grains as a commodity.

There is a danger for the production of agricultural products aiming mainly at exports with little domestic demand to be directly affected by changes in the international trade situation. In order to maintain a stable production system, measures should be considered to secure a certain amount of domestic demand as a buffer.

If Brazil selects cassava products as an export commodity, it is advisable to investigate the possibility of and needed measures for using these products to help meet domestic feed demand, in keeping with the livestock promotion targets within the country.

(Appendix)

Some Comments on Possibility of New Applications for Cassava

Because cassava has the strong characteristic of being a subsistence food in the developing countries, its trade in the international market is generally limited.

As the only exception to this rule, the cassava products produced in Thailand are exported as a feedstuff to the international market in the amount of 6 million tons per year.

For this reason, cassava products have not yet reached the stage where systematic research is carried out on the development of new applications other than for food and feed.

As one of the measures to cope with the import restraints of the EC, a research and development project of new applications other than for feedstuff is being considered in the main exporting country, Thailand.

It is reported that the EC will provide assistance to this project.

Since cassava is a product of the developing countries, the producing countries are not yet in a position to develop new applications. Therefore the manner in which the importing developed countries will proceed with the technical development of the uses of starch, the principal component of cassava, will be one of the important factors increasing the possibility of developing new applications.

The industrial products now using cassava flour as a material include: a) fibers, paper, and corrugated fiberboard as industrial products; b) monosodium glutamate and beer in the food industry; and c) amino acids and glutamic acid in the drug industry. In addition, d) hyfractose sugar will draw attention as a new application.

For the production of monosodium glutamate, 2,000 tons monthly or 30,000 tons annually are being produced on a commercial basis in the cassava production area in Thailand, by means of the technology of a Japanese food producer.

Furthermore, as a substitute energy source in the future, alcohol production is drawing attention, but the problem of cost still remains.

In investigating new applications, not only the technical feasibility but also the marketability from the viewpoint of competitiveness is a very important factor.

Other starch materials include sweet potato, potato and corn starch.

When the users select a material, they naturally compare its price and stability of supply with that of other starch materials.

With the present price level and supply situation based on the present yield and starch content, there is little possibility for cassava to be able to compete with and replace corn starch.

The means of achieving cost reduction by improving the yield and starch content and by shortening the growing period (period required for thickening of the cassava roots) will be the key to the development of new applications.

Also, apart from development of new ways of utilization, if the quality of cassava products, which are currently evaluated as a low-protein high-starch feedstuff, can be enhanced in terms of their composition as a feed, especially toward higher protein content, through applying the results of technological research, their range of use as a feedstuff will expand.

Researchers have been showing considerable interest in the development of technologies for the improvement of the protein content of cassava products, employing useful bacteria and using starch as a material, and have been making various attempts over a number of years.

Among such endeavors were efforts made by companies using domestic materials in Japan, although these were suspended for economic and other reasons, with the result that an expansion of production was not realized.

In recent years, a method of feed production has been developed for raising the protein content by means of solid phase culture using Aspergillus sp., with its high starch decomposition capability and high protein content, at IRCHA (Institut de Recherche en Chimie Appliquée).

The establishment and diffusion of techniques in the future for the securing of easy and stable production will bring self-sufficiency in feedstuffs to cassava producing countries which currently are suffering from a shortage in protein feeds.

Furthermore, it can be anticipated that the establishment of profitable commercialization of production will significantly boost the position of cassava as a feed source.

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