United States. These data are regarded as very significant because the United States is the largest maize producing and exporting country in the world, as well as being the price leader.

Over the past several years, the production cost per unit area has been rising. The average annual rate in this cost increase in the past five years was just over 14%. In particular, the increases in 1978/79 and 1979/80 were over 20%.

Rises in the cost of land (rent), machinery, fertilizer, fuel, and equipment maintenance have been especially steep.

Production costs comprise the following: variable costs such as seed, fertilizer, etc. (40%); land cost (current value) (about 38%), and machinery costs (14-15%). Fertilizer costs, the highest among the variable costs, account for about 14% of total production cost.

Production costs can differ depending on whether we look at cost per bushel or cost per unit area. For example, production cost per bushel in 1980 compared to that in the previous year rose nearly 50%, because the crop per unit area fell drastically due to the heat wave in the United States and other factors. On the other hand, production costs per bushel in 1978 and 1981 were lower than those of the previous years respectively because of large harvests and only small increases in production cost per acre. As a whole, however, production cost per bushel has tended to rise. The present production cost per bushel is approximately US$3.80 (US$150/t).

In the survey on the U.S. maize production costs cited above, slightly more than 98% of the maize production was covered.

Production costs of maize in the United States are shown in Tables B-4 and B-5. Table B-6 shows the production cost in 1981 constant prices.

II. Policies for Production and Export in Major Maize Producing Countries

In the United States, Argentina, France and Thailand, where maize is produced mainly for export (France exports maize only to the EC countries), measures are taken to maintain a reasonable market price for maize as an export commodity and to ensure a reasonable income for maize farmers. On the other hand, countries such as the USSR and China are aiming to become self-sufficient in grain as quickly as possible, and are taking measures to increase production regardless of production costs.

Table B-4 Production Costs of Maize in the USA (Actual Amounts)

			1977	1978	1979	1980	1981
Variable	Seed	$/planted acre	11.06	11.61	12.41	14.23	16.26
	Fertilizer	"	34.36	33.00	37.55	47.28	52.58
	Lime	"	0.99	1.09	1.18	1.38	1.53
	Chemicals	"	8.95	13.15	13.27	14.24	15.49
	Custom operations	"	5.49	4.15	4.44	4.77	5.52
	Labor	"	11.57	10.54	12.03	12.98	14.92
	Fuel and lubrication	"	7.89	7.62	12.53	17.12	20.26
	Repairs	"	7.07	7.31	8.99	10.25	11.82
	Drying	"	6.10	6.12	6.36	6.62	8.60
	Purchased irrigation water	"	0.11	0.07	0.08	0.09	0.10
	Interest	"	2.82	3.13	4.27	6.28	7.96
	Total	"	96.41	97.79	113.11	135.24	155.04
Machinery ownership		"	27.57	30.83	40.65	48.63	58.08
Farm overhead		"	9.64	7.18	8.62	8.87	9.83
Management		"	13.36	13.58	16.24	19.27	22.29
Total, excluding land		"	147.00	149.38	178.62	212.01	245.24
Land allocation: current value		"	78.41	86.34	107.91	133.73	138.84
Total		"	225.41	235.72	286.53	345.74	384.08
Yield per planted acre		Bushels	90.7	100.5	109.6	90.1	109.4
Dollars per bushel	Variable		1.06	0.97	1.03	1.50	1.42
	Total, excluding land		1.62	1.49	1.63	2.35	2.24
	Total, including land, current value		2.49	2.35	2.65	3.93	3.71
Dollars per MT	Variable		41.73	38.19	40.55	59.05	55.90
	Total, excluding land		63.78	58.66	64.17	92.51	88.18
	Total, including land, current value		98.03	92.52	104.33	154.72	146.06

Note : 1 ton of maize = 39.368 bushels

Source: USDA, Costs of Producing Selected Crops in the U.S.

Table B-5 Production Costs of Maize in the USA (Ratio)

				1977	1978	1979	1980	1981
Variable	Seed	$/planted acre	%	4.9	4.9	4.3	4.1	4.2
	Fertilizer	"	"	15.2	14.0	13.1	13.7	13.7
	Lime	"	"	0.4	0.5	0.4	0.4	0.4
	Chemicals	"	"	4.0	5.6	4.6	4.1	4.0
	Custom operations	"	"	2.4	1.8	1.5	1.4	1.4
	Labor	"	"	5.1	4.5	4.2	3.8	3.9
	Fuel and lubrication	"	"	3.5	3.2	4.4	5.0	5.3
	Repairs	"	"	3.1	3.1	3.1	3.0	3.1
	Drying	"	"	2.7	2.6	2.2	1.9	2.2
	Purchased irrigation water	"	"	0.0	0.0	0.0	0.0	0.0
	Interest	"	"	1.3	1.3	1.5	1.8	2.7
	Total	"	"	42.8	41.5	39.5	39.1	40.4
Machinery ownership		"	"	12.2	13.1	14.2	14.1	15.1
Farm overhead		"	"	4.3	3.0	3.0	2.6	2.6
Management		"	"	5.9	5.8	5.7	5.6	5.8
Total, excluding land		"	"	65.2	63.4	62.3	61.3	63.9
Land allocation: current value		"	"	34.8	36.6	37.7	38.7	36.1
Total		"	"	100.0	100.0	100.0	100.0	100.0
Dollars per bushel	Variable	"		42.6	41.3	38.9	38.2	38.3
	Total, excluding land	"		65.1	63.4	61.5	59.7	60.4
	Total, including land, current value	"		100.0	100.0	100.0	100.0	100.0
Ratio to previous year	Dollars per planted acre	"			+4.6	+21.6	+20.7	+11.1
	Dollars per bushel	"			-5.6	+12.8	+48.3	-5.6

Source: USDA, Costs of Producing Selected Crops in the U.S.

Table B-6 Production Costs of Maize in the USA: 1981 Prices

	1977	1978	1979	1980	1981
Variable ($/planted acre)					
Seed	16.59	15.25	14.89	19.58	16.26
Fertilizer	49.48	47.65	50.05	50.83	52.58
Lime	1.43	1.57	1.57	1.48	1.53
Chemicals	9.93	15.53	15.34	15.49	15.49
Custom operations	7.52	5.31	5.20	5.15	5.52
Labor	15.74	13.40	13.98	13.90	14.92
Fuel and lubrication	16.81	15.46	19.48	19.40	20.26
Repairs	9.47	9.07	10.21	10.73	11.82
Drying	8.36	7.83	7.45	7.14	8.60
Purchased irrigation water	0.15	0.09	0.09	0.10	0.10
Interest	5.50	5.17	5.91	7.29	7.96
Total	137.98	136.33	144.17	155.09	155.04
Machinery ownership ($/planted acre)	41.94	42.98	50.65	54.37	58.08
Farm overhead (")	13.21	9.19	9.63	9.57	9.83
Management (")	20.04	18.69	19.49	20.79	22.29
Total, excluding land (")	213.17	207.19	223.94	239.82	245.24
Land allocation: current value (")	117.62	118.80	129.49	144.29	138.84
Grand total ($/planted acre)	330.79	325.99	353.43	384.11	384.08
Yield per planted acre (bushel)	90.7	100.5	109.6	90.1	109.4
Dollars per bushel					
Variable	1.52	1.36	1.32	1.72	1.42
Total, excluding land	2.35	2.06	2.04	2.66	2.24
Total, including land current value	3.65	3.24	3.22	4.26	3.51
Dollars per MT					
Variable	59.89	53.54	51.79	67.76	55.90
Total, excluding land	92.53	81.10	80.44	104.79	88.18
Total, including land current value	143.58	127.55	126.95	167.83	146.06

Notes: 1) Deflated to 1981 prices using USDA's Farm Prices: Received and Paid.
2) Maize 1MT = 39,368 bushel

Source: USDA, Costs of Producing Selected Crops in the United States

1. The United States

Since the United States is constantly suffering from a surplus of agricultural products, agricultural policy-makers are under great pressure to find markets for the surplus. Maize production policy in the United States, and the measures taken so far to find markets, will now be described.

In the United States, the amount of surplus agricultural products started to increase immediately after the end of the Korean War, and the Agricultural Products Trade Promotion and Assistance Act (PL 480) was enacted in 1954 to deal with this situation. The purpose of the Act was to stabilize supply and demand by reducing the volume of surplus agricultural products, by providing it as aid or selling it cheaply or on a deferred payment basis to developing countries suffering from food shortages. It was also designed to help defence efforts in countries of the free world.

In spite of the above Act, the volume of surplus grain kept increasing. Since the problem of surplus feed grain such as maize became more and more serious, the Feed Grains Act was enacted in 1961. The objectives of the Act were to support farmers in the production of grain for feedstuff to afford reproduction, and to expand consumption by introducing a price support system to maintain a low grain price for stock breeders and exporters. In practice, the artificial support price of grains such as maize was lowered and a direct subsidy was paid for a given volume of crop. In addition, the amount of land under cultivation was reduced to curtail production. Further, producers could apply for a loan if they did not use 20% of their cultivated land, as of the years 1959-60, for soil conservation (The figure of 20% was derived from statistics on cultivated area for the years 1959-60). The actual mechanism for initiating this plan was embodied in an emergency feed grain program.

The above plan was altered in 1963. The loan ceiling was reduced and the domestic market price was lowered nearly to the international market price to promote exports. To compensate for this lowering of the domestic price, the support price was raised, and the differential was subsidized directly.

In the 1966 revision of the plan, the price support system for the 20% cutback in planting was incorporated with support loan and the support payment systems, and attempts were made to reduce the size of the budget covering payment for planting cutbacks by adopting measures for stronger price support.

In all the plans that had been enacted since 1961, the main target was to reduce excessive surpluses and curtail production of maize and other feed grains. In the plan revised in 1967, the main

targets were: a. a rise in farmers' incomes; b. maintenance of the price of livestock products at a level which would satisfy both producers and consumers; c. maintenance of satisfactory levels of stock; d. expansion of exports. In the 1967 plan, payments for cutbacks that went beyond the minimum requirement were discontinued.

The main advocate of the above-mentioned policy of price support for agricultural products is the Commodity Credit Corporation (CCC). The CCC provides farmers with loans by receiving their produce as security. The farmer can have his produce returned to sell in the open market when he pays back the loan and interest to the CCC. When, over a certain period of time, the market price does not rise to the level desired by the farmer, he does not need to pay back the CCC loan, and his produce, previously held in trust by the CCC, then becomes their property.

In other words, the CCC buys the surplus agricultural products from the farmers at the price of their loans.

Cutbacks in planting and price supports in cooperation with the CCC have been the core of the agricultural policy in the United States, and they remain important in the present policy, although the procedures have been altered from time to time.

Table B-7 Plan for Feed Grain (Maize) Planting in the USA in the 1960s

		1965	1966	1967
Support loan (US$/bu)		1.05	1.00	1.05
Support payment (US$/bu)		0.20	0.30	0.30
Reduction in planting system	Minimum	20% of the standard area	Same as previously	Same as previously
	Maximum	50% of the standard area or 25 acres, whichever is larger.	Same as previously	Additional payment discontinued

By the 1970 Agriculture Act, the method of allotting certain areas for particular crops was discontinued. The Act stated that, as long as a certain percentage of cropland was left unplanted and set aside for future agricultural production, the rest of the cropland could be planted in any way the farmers so chose. The objectives of this were to reduce government intervention as far as possible and thereby realize a free market in agricultural products, and also to lighten the Government's financial burden.

In 1973, the grain prices rose steeply due to the poor harvest worldwide in 1972, the large-scale purchase of wheat by the USSR, and the sudden increase in world demand for U.S. agricultural products. To cope with this situation, agricultural regulations were revised to promote production.

The 1973 Agriculture and Consumer Protection Act provided for a system whereby farmers were paid a target price for their produce and if this target price was lower than the market price, they would receive the balance. This was introduced to further promote a free market for agricultural products and to deal flexibly with demand fluctuations. In practice, the target value is set below the market price. In the period 1973-1975, however, the target price system was not needed because grain prices were rising. The system of setting aside a certain portion of land for future cultivation was not used during this period.

In 1975, the world market for food eased. Consequently, the grain market in the United States also became soft, resulting in falling prices and increasing surpluses. In 1976, the target price system was reintroduced due to a fall in the price of agricultural products and a steep rise in surpluses, with the result that agricultural policy was modified to reduce production. To cope with this situation, the Food and Agriculture Act was enacted in 1977, but this caused a sudden increase in the financial burden to the Government, because of the rise in the level of the support price due to the rise in production costs. As a result, a grain stockpiling system was introduced. Under this system, producers were subsidized for storing surplus grain on farm land for a certain period, and releasing it when the market recovered. This can be regarded as a method of indirect grain storage management by the Government. It was hoped that this system would stabilize the market prices of grain within a certain range, and improve the market environment, so that both producers and consumers could benefit.

The system for setting aside land for the future was revived in 1978 (10% was set aside for maize in 1978).

In recent years, the Government's financial burden has risen sharply and political problems have emerged due to the policies of the target price system, setting aside land, and grain storage. Funds for agriculture and foodstuffs were also affected by a reduced budget. The Agriculture and Foodstuffs Act was established in 1981 with the objective of stabilizing grain supply. The Act was implemented to enable the Department of Agriculture to guide the market price of grain to a reasonable level by determining the extent of cultivated area and providing producers with loans and compensation for crop loss due to natural disaster. The Act involves all aspects of agriculture and foodstuffs, and consists of 18 Articles covering

a wide range of topics such as grain storage, export of agricultural products, policies on agricultural research, dissemination and technology, resource conservation, credit, encouragement of farmers and family farms, and publicity to consumers.

Concerning feed maize, target prices were determined for each fiscal year from 1982 to 1985, and the minimum unit value of loans for production was established for the same period. Producers can receive compensation through the target price system when the Secretary of Agriculture declares a state of excess supply, and if they have participated in the program for setting aside land or the acreage reduction program. The Secretary of Agriculture has the responsibility of continuing the acreage reduction program in which subsidy grants are involved. The crop loss compensation subsidy is granted to producers faced with severe economic loss due to natural disaster or other specified causes, and the storage system for wheat and feed grains has been maintained. The Secretary of Agriculture sets the rate for price support loans for a period of three years, and this rate should not be lower than that for standard grain loans at the time the grain storage system is in operation.

The target price is determined by considering the compensation for loss of farm income in relation to the product cost. The loan rate is calculated by taking into account competitiveness with other kinds of grains in the domestic and international markets, production costs, the supply and demand situation, and the movement of prices in the international market.

Table B-8 Price Support of Maize in USA

(US$/bu)

	Fiscal 1977	" 1978	" 1979	" 1980	" (1981)	" (1982)
Target price	2.00	2.10	2.10	2.35	2.40	2.70
Loan rate	2.00	2.00	2.10	2.10	2.40	2.55
Reserve loan rate	-	-	-	-	2.55	2.90

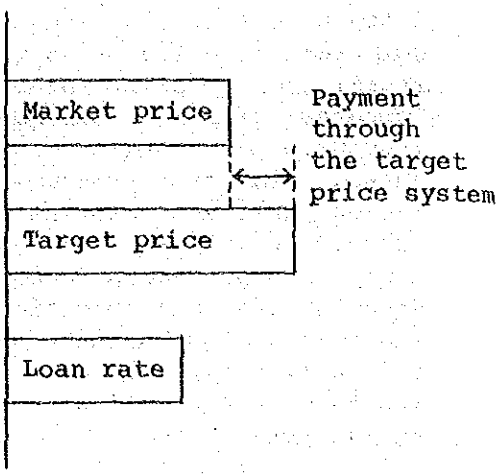
2. EC

In July 1962, the members of the EC decided to adopt a common grain marketing system, in which surplus grain was purchased by the EC and a sliding scale of surcharges imposed on imports and exports to bring the market price into line with the target price in each

Fig. B-5 Maize Price Support Policy in the United States

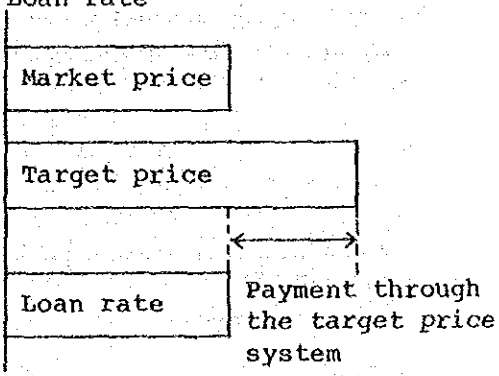
(Case A)
Where: Target price > Market price > Loan rate

a. Producers bring agricultural products to market and receive payments through the target price system.
b. The Government determines the target price by considering the compensation for loss of farmers' income in relation to the product cost.
c. The Government determines the loan rate by taking into account the competitiveness with other kinds of grains in the domestic and international market, production costs, the supply and demand situation, and the movement of prices in the international market.



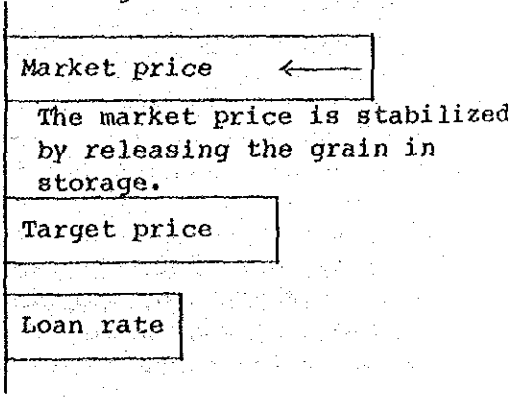
(Case B)
Where: Target price > Market price = Loan rate

a. Producers bring products to market, or choose to receive CCC loans on the security of their produce and wait for recovery of the market.
b. Producers receive payments through the target price system.
c. The loan rate turns out to be the minimum guaranteed price.



(Case C)
Where: Target price < Market price > Loan rage

a. Producers bring agricultural products to market.
b. No payment.
c. When the market price rises above a certain level, paymnt of the storage fee is discontinued and repayment of loans is requested to reduce the quantity of grain in storage, in order to stabilize the market price.



member country. In 1970, the common price system was introduced to realize an integrated grain market.

To remove the difficulties in adjusting the grain prices in each country to the common price, Fonds Européen d'Orientation et de Garantie Agricole (FEOGA), has since its establishment in 1967, distributed export subsidies and compensation payments to those countries in which the grain prices have been lowered through market intervention.

Due to the heavy expenditures incurred by FEOGA, it was decided to impose surcharges on imported agricultural products (90%), and to collect allotment charges from the member countries which represents 10% of the total budget of the EC agricultural products price support policy. As a result, the EC Regulation of the Council on the Common Organization of the Market in Grains was promulgated to maintain the common grain price system. Although there have been various changes in this common agricultural policy, a guaranteed common price (combination of the target price and the intervention price) and the imposition of surcharges on imports and exports are the two basic factors in the policy for grain trading in the EC.

The common market, the priority on trade with EC members and the integrated budget are the three principles of the agricultural policy of the EC. The common market has been created by freeing the circulation of products within the EC. The introduction of systems which obstruct free market competition (e.g., imposition of customs duties or surcharges) is prohibited, and common prices are guaranteed.

Occasionally, however, these principles are difficult to adhere to because of international currency fluctuations. At these times, the price differences are adjusted by changing the "green" rate (the conversion rate of the currency of each country to U.A.; Unit of Account, which is a price unit used in the common market to maintain the common price policy).

While maintaining the priority of trading within the EC, procedures for trading outside the EC have been established to protect EC grain producers. They protect not only producers but also grain consumers, including stockbreeders, from international price fluctuations. In reality, however, the set price is generally higher than the international market price because of the imposition of high surcharge rates.

o Threshold Price

The threshold price functions as a kind of minimum import price. It is determined by subtracting a certain amount from the target price (in the case of grains, subtracting the freight

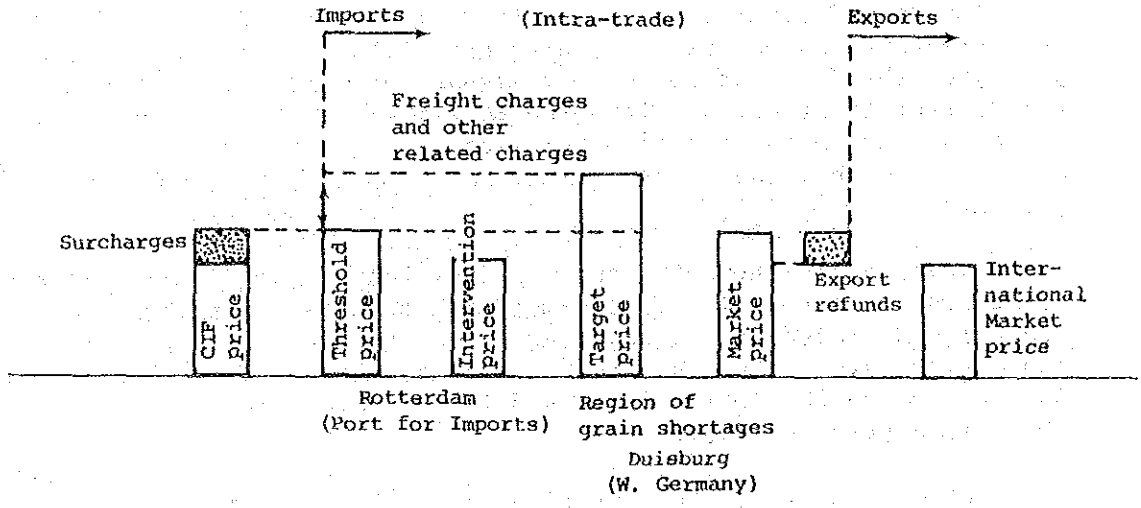
Table B-9 Recent Changes in the Price of Maize in EC

(U.A./MT)

	Fiscal 1976/77	" 1977/78	" 1978/79	" 1980/81	" 1981/82
Target price	137.80	144.97	147.23	194.32	210.00
Intervention price	112.20	118.03	121.57	155.88	165.23

Note: U.A. (Unit of Account) is a price unit used in the common market to maintain the common price policy.

Fig. B-6 Price System in the EC Agricultural Commodities Market



charge to Rotterdam in the Netherlands, the major import port, and other related charges from the target price).

o Target Price

The target price is that price necessary to protect EC producers. It is determined at meetings of agriculture ministers in consideration of production costs, non-agricultural wages and market conditions.

o Intervention Price

The intervention price is the price at which a particular agricultural product is purchased from EC producers of support the producer price of the product. It is determined by the organizations set up by EC members with the sole task of interviewing in the market when the market price is low. This is the minimum guaranteed price for the producers and is set below the target price.

The agricultural policy of the EC as outlined in the Treaty of Rome has the following five purposes: a. improvement in agricultural productivity; b. rise in farmers' income; c. market stabilization; d. stabilization of supply; and e. guarantee of reasonable prices to consumers.

Among these, market stabilization and stabilization of supply can be considered to have been achieved. These two objectives are closely related, because demand for agricultural products does not greatly fluctuate and stability of supply naturally leads to stability of the market.

Actually, supply within the EC is stable, as evidenced by the surplus of production, although this creates problems of its own.

The prices for grain and livestock products are supported by target prices. In the case of shortage, prices are maintained at or below a certain level by promoting imports. Consequently, the prices cannot rise abnormally unless imports are stopped in times of world-wide crop failure. Generally, however, the market is stable.

Major disadvantages of the common agricultural market system are as follows: a. conflict of interests of member countries is difficult to reconcile; b. the budget to maintain the system is increasing rapidly; c. since the target prices are set much higher than the international market prices, production is over-encouraged, resulting in excessive production of some agricultural products.

a. The wine war of 1976 between French and Italian farmers is a concrete example of this kind of conflict. Another example is the British complaint about the EC dumping surplus butter in the USSR in 1972. Britain was critical of the dumping of expensive EC agricultural products in the USSR, which used to import cheaper British products. It also claimed that such dumping was aiding a socialist state. This sort of dumping is often criticized by consumers not only in Britain but also in other EC countries.

In 1977, Britain and the Federal Republic of Germany, which are obligated to bear a large proportion of expenses for the maintenance of the system in spite of their small agricultural population, protested strongly against such dumping.

b. The revenue received from tariffs and the import surcharges were insufficient to maintain the budget required to continue the system, so member countries were originally obligated to bear allotted expenses. This allotment system was discontinued in 1978, and a new system was begun in which the member countries pay 1% of revenue from value added tax into an EC fund. There would be no significant problem if the benefits from FEOGA to the member countries were large enough to compensate for the heavy burden imposed on them. In reality, however, they cannot receive sufficient and equitable compensation, resulting in dissatisfaction throughout the EC. Some of the countries have even refused to raise prices of agricultural products which would necessitate an expansion of the fund.

c. Since the agricultural policy of the EC is highly protective, agricultural production in the EC has been increasing due to the high level of prices, which are not affected by international price fluctuations or excessive production of some kinds of products.

This also reduces the farmers' willingness to improve inefficient production methods. The agricultural products with an internal supply rate of over 100% are wheat, rye, barley, butter, cheese and skim milk powder. These surplus agricultural products are exported under export subsidies. In particular, the export of dairy products attracts considerable criticism due to the drain on tax revenues it creates.

There is urgent need to develop general agricultural policies and agricultural financial policies to deal with the present conditions of low economic growth, high unemployment and inflation.

Table B-10 International Market Price of Maize and Import Surcharges in the EC (Fiscal 1976/78)

(U.A./100 kg)

	EC threshold price (1)	International market price (2)	Import surcharge (3) = (1) - (2)	(3)/(2) %
Maize (Reference)	14.28	8.77	5.51	63
Barley	14.28	9.72	4.56	47
Wheat	15.70	7.68	8.02	104
Beef cattle	118.74	61.83	56.91	92

Notes: 1) U.A. (Unit of Account) is a price unit used in the common market to maintain the common price policy.
2) The threshold price is an entry price which should be determined, on the basis of the target price, for a product imported from outside the EC by an organization within the EC.

Table B-11 Border Tax Adjustment in Importing Maize and Domestic Price Adjustment (1979)

	Japan	USA	EC
Border tax adjustment	-	-	Surcharge
Domestic price adjustment	-	Guaranteed price by balance payment	Support price subsidy for production

3. Centrally Planned Economies

In the USSR, agricultural production rose rapidly in 1966-1970 during the eighth Five-Year Plan (a national plan for economic and social development). The value of agricultural production was 43.6 billion roubles in 1965 and rose to 63.1 billion roubles in 1970.

It is said, however, that the growth slowed down in the period 1971-1975 (the ninth Five-Year Plan), due to the economic policy which gave priority to industrialization. It was reported that the production did not grow sufficiently thereafter compared with the increasing amount of investment by the Government and kolkhozes, with agricultural production standing at 61.5 billion roubles and 69 billion roubles in 1975 and 1980 respectively.

As the economy developed, the level of national income rose and demand for meat and dairy products rapidly increased. To cope with this, efforts were concentrated on increasing the supply of feed grain. Consequently, the production of maize, in particular, and other feed grains was accelerated.

In the USSR and East European countries, the increase in consumption of meat is said to represent improvements in living standards. There is a shortage of feed grain for livestock in these countries. Particularly in the USSR, stability of supply and demand for feed, including maize, cannot be expected to be achieved in the eleventh Five-Year Plan ending 1985 or even in the long-term feed plan extending until 1990. Consequently, it is inevitable that the USSR will rely on increasing its imports from the free world to compensate for such shortages.

For the moment, improving outdated agricultural machinery and increasing the supply of fertilizers are important factors in the expansion of production.

In China, agricultural production is growing rapidly because the highest priority, over the development of any other industry, has been given to increasing food production to support the vast population.

China started to actively purchase grain from the free world in 1978. It also initiated broad plans to increase food production.

The Ten-Year Plan for 1976-1985 declared that the average annual growth rate of agricultural production should be 4-5%, that the rate of agricultural mechanization should be lifted to 85% and that 1 mu (6.7 acres) of highly-fertile cropland should be provided to each farmer to ensure a level of 400 million tons in food production by 1985.

Production of maize has shown a rapid increase over the past few years (29.06 million tons in 1970, 32.14 million tons in 1975 and 59.71 million tons in 1980, according to the FAO's Production Yearbook).

Maize is apparently consumed mostly as food in China, and the level of demand for feed maize is not known.

4. Argentina

Maize production in Argentina shows considerable yearly fluctuations due to the occurrence of adverse meteorological circumstances, a common characteristic of grain production in the southern hemisphere.

In the years prior to World War II, Argentina was the top maize exporter in the world, with maize ranking first among this country's grain exports. However, as a result of the post-war policy of industrialization, the level of production substantially fell for some time, although it has been recovering since the early 1960s.

There are many producing areas within the country, mainly in the so-called Pampa region, such as the states of Buenos Aires, Santa Fe, Cordoba and Entre Rios.

Maize is one of major grains along with wheat in terms of production in Argentina, and the area under cultivation and unit yield have increased with the dissemination of hybrids and the mechanization of farming. On the other hand, the harvest fluctuates strongly under such unfavorable conditions as a lack of good irrigation facilities and the extensive cultivation.

Exports of maize from Argentina were traditionally destined for the European market, especially Italy. In recent years, however, the structure of exports whereby the principal destinations were free market economies has changed to include centrally planned economies, as a result of the demand for imported grain from Argentina in the USSR following the restrictions placed by the United States on grain exports to that country.

C. CONSUMPTION

I. Consumption Trends

1. Trends in World Consumption

According to USDA's Foreign Agriculture Circular, total maize consumption increased annually in the 8 years from 1973 to 1980 due to the growth in demand for feed maize corresponding to the growth in demand for livestock, and due to the growth in world population. Total world consumption rose from 317 million tons in 1973 to 407 million tons in 1980, the average annual growth rate being approximately 3.7%.

After the oil crisis in November 1973, demand for maize temporarily dropped due to the recession and the rise in prices. Demand soon recovered, showing an average annual growth rate after 1975 of approximately 4.9%.

As mentioned in the Introduction, maize is consumed principally as a feedstuff in the developed countries and East European countries, and mostly as food in other countries.

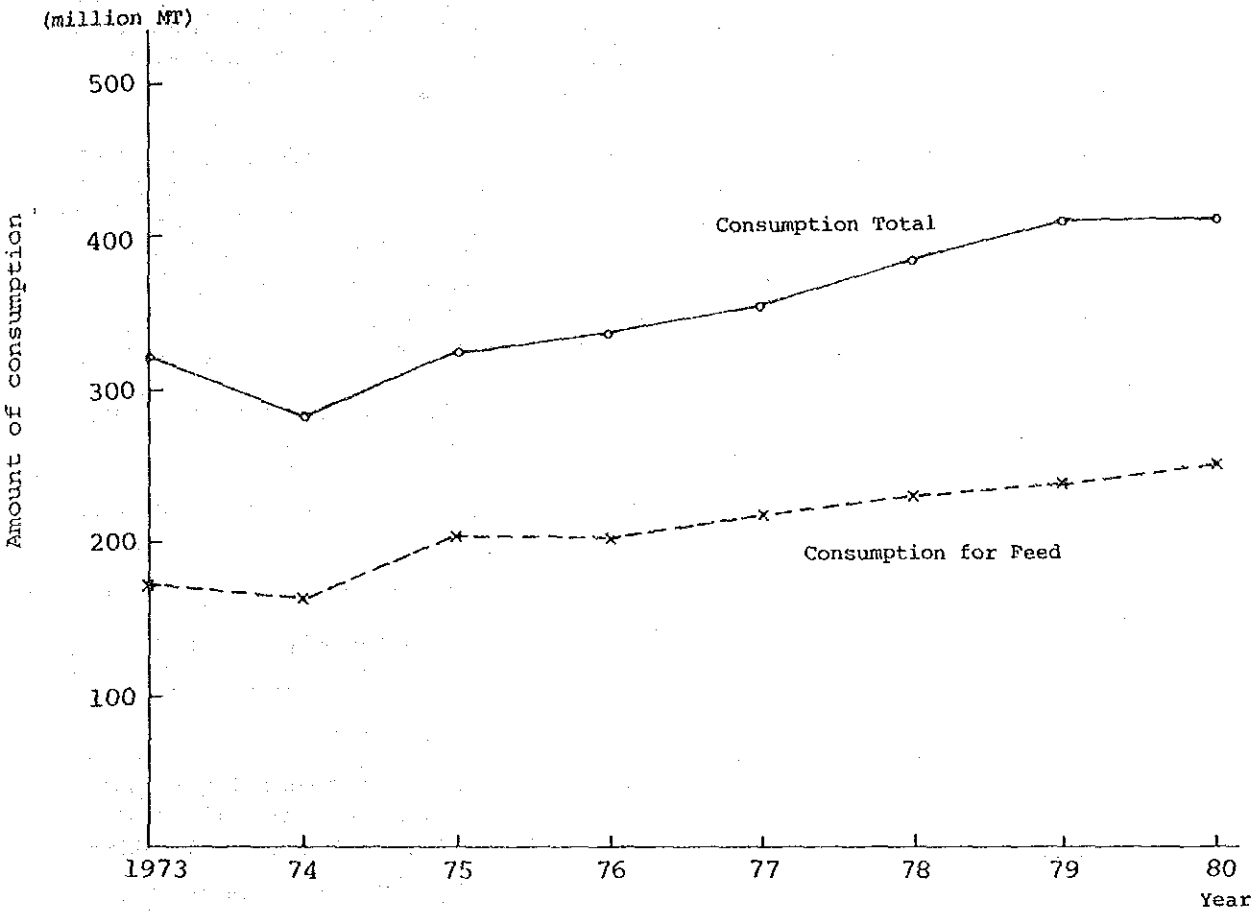
Apart from slight fluctuations, the rate of consumption of maize as a feedstuff in total world consumption is about 60%. Although the rate of maize consumption in China in terms of the total world consumption is fairly large (approximately 14% in 1980), details of consumption have not been reported.

2. Consumption by Countries or Regions

According to USDA's Foreign Agriculture Circular, the United States is the world's largest consumer, with a share of 32% (1980). China is next with 14%, followed by Brazil and the USSR. Next is Japan at 3.4%. For consumption by region, East European countries, excluding the USSR, are collectively the world's third-largest consumer (9%). The EC is fourth with 7%.

With regard to total maize consumption in the 8 years from 1973 to 1980, consumption in the USSR showed heavy fluctuations due to changes in the domestic production and foreign currency conditions.

Fig. C-1 World Maize Consumption



Source: USDA, Foreign Agriculture Circular

The growth rate of consumption is high in Japan, Brazil, East European countries (excluding the USSR) and China. Consumption in Argentina is declining, however. The percentage of maize consumption for feedstuff in the total consumption is higher than 90% in the developed West European countries (excluding the EC countries), and Argentina. The rate of consumption of maize for feed has been increasing rapidly also in East European countries. The proportion of consumption for feedstuff in the total consumption for each country or region can be summarized as follows:

Greater than 90%: West European developed countries excluding EC countries, and Argentina
Less than 90% and greater than 80%: The United States, Japan, Brazil, the USSR, East European countries
Less than 80% and greater than 70%: EC countries
Less than 70% and greater than 60%: World total
Less than 50% and greater than 40%: South Africa

Patterns of consumption growth can be classified as follows:

Table C-1 Classification of Patterns in Maize Consumption Growth

Consumption for feed	Consumption other than for feed	Total consumption	Country or region
Increase	Increase	Increase	USA, Japan
Increase	Same level	Increase	West European developed countries excluding EC countries, Brazil, USSR
Increase	Decrease	Increase	East European countries
Same level	Same level	Same level	EC countries, South Africa
Increase	Decrease	Same level or decrease	Argentina
Not reported	Not reported	Increase	China

3. Self-sufficiency Supply Ratio

Figures were calculated for the period 1973-1980 to show the relationship between domestic production and domestic consumption, with the difference being either exported in times of surplus, or

Table C-2 Consumption of Maize in Major Consuming Countries

(1,000 MT)

Country/Region	Classification	1973	1974	1975	1976	1977	1978	1979	1980
World	Total	317,073	282,115	320,947	336,395	352,815	385,028	409,961	407,449
	For feed	172,034	162,233	203,677	201,807	217,696	233,336	239,485	253,930
USA	Total	118,516	93,652	103,962	104,699	110,109	125,552	132,440	129,549
	For feed	106,808	81,955	91,516	91,669	96,114	110,947	115,930	110,494
EC countries	Total	27,452	26,632	26,152	28,577	27,596	28,494	28,294	28,302
	For feed	21,419	20,586	21,327	22,185	20,918	21,571	21,076	21,067
Other West European developed countries	Total	10,090	10,585	10,485	10,263	11,452	12,391	13,183	13,612
	For feed	9,204	9,811	9,585	9,329	10,918	8,308	12,119	12,425
Japan	Total	7,825	7,415	7,925	8,764	9,674	10,736	11,795	13,800
	For feed	6,400	6,090	6,400	6,856	7,864	8,776	9,421	11,450
South Africa	Total	6,325	6,376	6,438	6,553	6,665	6,702	6,767	6,850
	For feed	2,650	2,740	3,082	2,592	3,061	3,015	3,045	3,100
Brazil	Total	15,273	15,586	16,174	17,038	16,250	17,800	21,000	23,000
	For feed	12,210	11,640	12,674	13,500	13,700	14,900	17,600	19,100
Argentina	Total	4,618	3,897	2,863	3,401	3,533	3,296	3,000	3,400
	For feed	2,954	2,477	2,573	3,101	3,250	3,050	2,750	3,150
USSR	Total	17,648	13,954	19,628	15,138	21,836	18,553	22,950	19,000
	For feed	13,890	10,631	17,062	11,954	18,352	15,698	20,050	15,905
Other East European countries	Total	26,902	27,465	32,153	33,169	32,051	33,092	39,326	36,403
	For feed	7,747	7,635	26,833	26,134	27,128	27,439	33,740	32,480
China	Total	31,853	33,860	35,525	47,950	49,559	58,932	61,966	58,500
	For feed	-	-	-	-	-	-	-	-

Notes : 1) "Total" is the domestic consumption total, and "for feed" is the domestic consumption for feed.
2) the domestic consumption for feed in China has not been reported.

Source: USDA, Foreign Agriculture Circular

Table C-3 Consumption Other than for Feed and the Proportion of Feed Consumption in Major Maize Consuming Countries

Country/Region	1973	1974	1975	1976	1977	1978	1979	1980
Consumption other than for feed (1,000 MT)								
World	145,039	119,882	117,270	134,588	135,119	151,692	170,476	153,519
USA	11,708	11,697	12,446	13,030	13,995	14,605	16,510	19,055
EC countries	6,033	6,046	4,825	6,392	6,678	6,923	7,218	7,235
Other West European developed countries	886	774	900	934	534	4,083	1,174	1,187
Japan	1,425	1,325	1,525	1,908	1,810	1,960	2,374	2,350
South Africa	3,675	3,636	3,356	3,961	3,604	3,687	3,722	3,750
Brazil	3,063	3,946	3,500	3,538	2,550	2,900	3,400	3,900
Argentina	1,664	1,420	290	300	283	246	250	250
USSR	3,758	3,323	2,566	3,184	3,484	2,855	2,900	3,095
Other East European countries	19,155	19,830	5,320	7,035	4,923	5,653	5,586	3,923
Proportion of consumption for feed (%)								
World	54.3	57.5	63.5	60.0	61.7	60.6	58.4	62.3
USA	90.1	87.5	88.0	87.6	87.3	88.4	87.5	85.3
EC countries	78.0	77.3	81.6	77.6	75.8	75.7	74.5	74.4
Other West European developed countries	91.2	92.7	91.4	90.9	95.3	67.0	91.9	91.3
Japan	81.8	82.1	80.8	78.3	81.3	81.7	79.9	83.0
South Africa	41.9	43.0	47.9	39.6	45.9	45.0	45.0	45.3
Brazil	79.9	74.7	78.4	79.2	84.3	83.7	83.8	83.0
Argentina	64.0	63.6	89.9	91.2	92.0	92.5	91.7	92.6
USSR	78.7	76.2	86.9	79.0	84.0	84.6	87.4	83.7
Other East European countries	28.8	27.8	83.5	78.8	84.6	82.9	85.8	89.2

Note : The proportions of consumption for feed were calculated by dividing domestic consumption for feed by the total.

Source: USDA, Foreign Agriculture Circular

Fig. C-2 Consumption of Maize in Major Consuming Countries

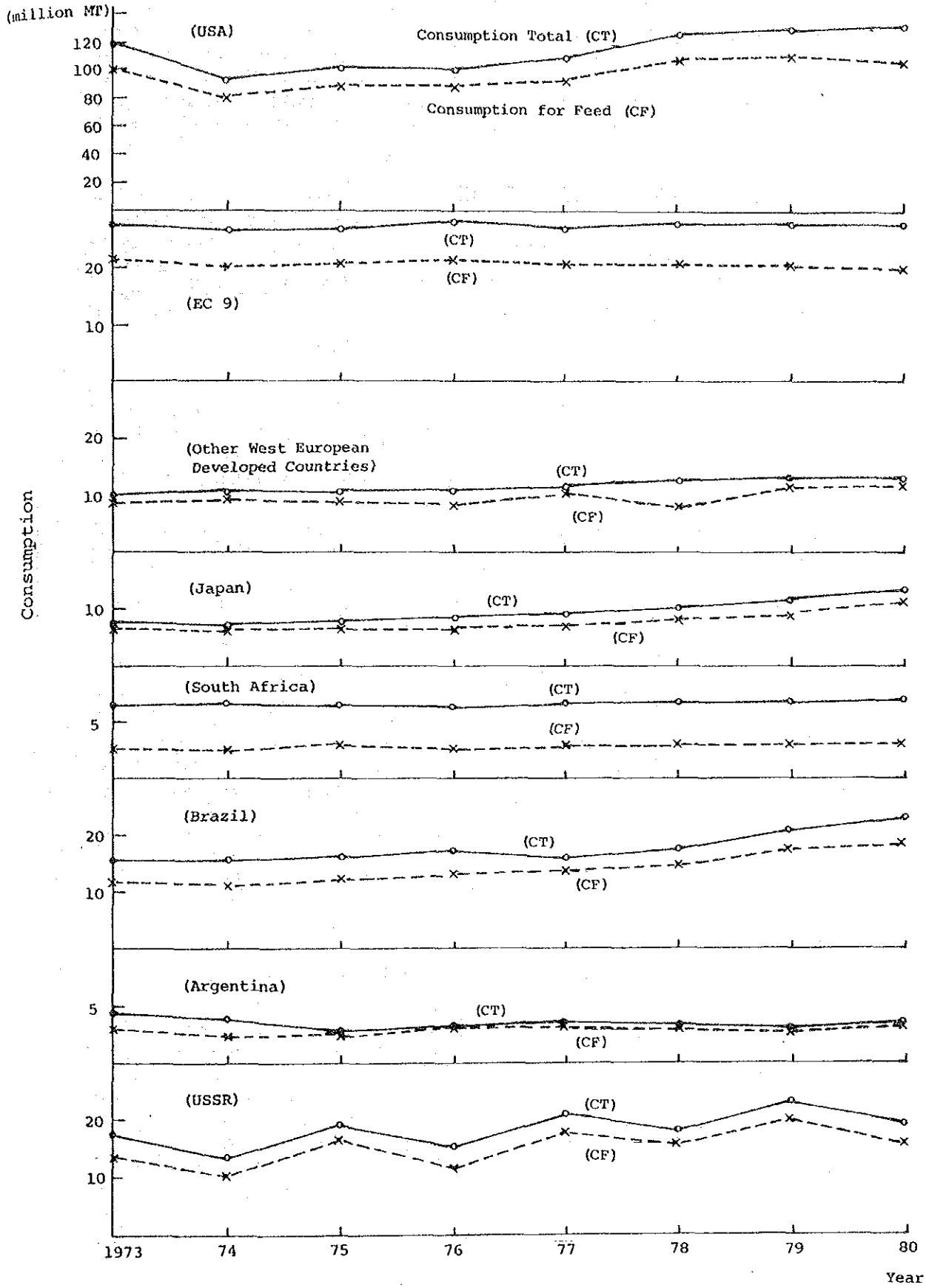
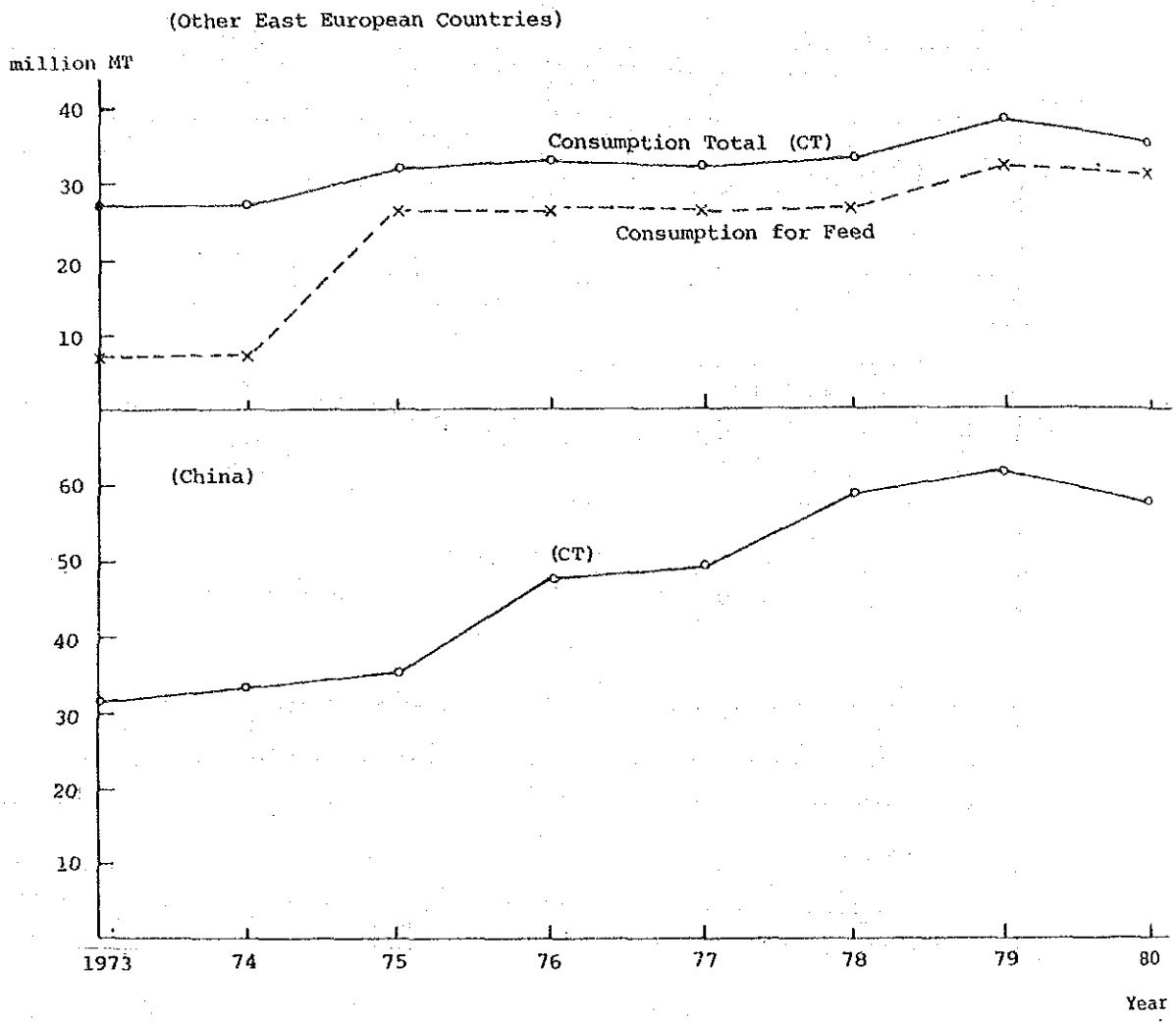


Fig. C-2 (cont'd.)



Source: USDA, Foreign Agriculture Circular

imported when domestic demand exceeds domestic supply. This relationship has been called the self-sufficiency supply ratio (hereinafter referred to as the SSS ratio) and is expressed as a percentage. For example, a ratio of 200% indicates that twice as much was domestically supplied as was consumed domestically.

In terms of world production, almost 100% of output has been consumed, reflecting the equilibrium of supply and demand, even allowing for slight variations from year to year. 1976 was a year of abundant harvests, in which production exceeded demand by about 5%. On the other hand, 1980 was a year of poor harvests in which production could not satisfy demand by a similar figure of around 5%. In 1980, the United States experienced a harvest failure caused by a heat wave. The USSR also suffered from poor harvests in 1979 and 1980.

In years other than 1976 and 1980, production levels equaled consumption within a range of 2%.

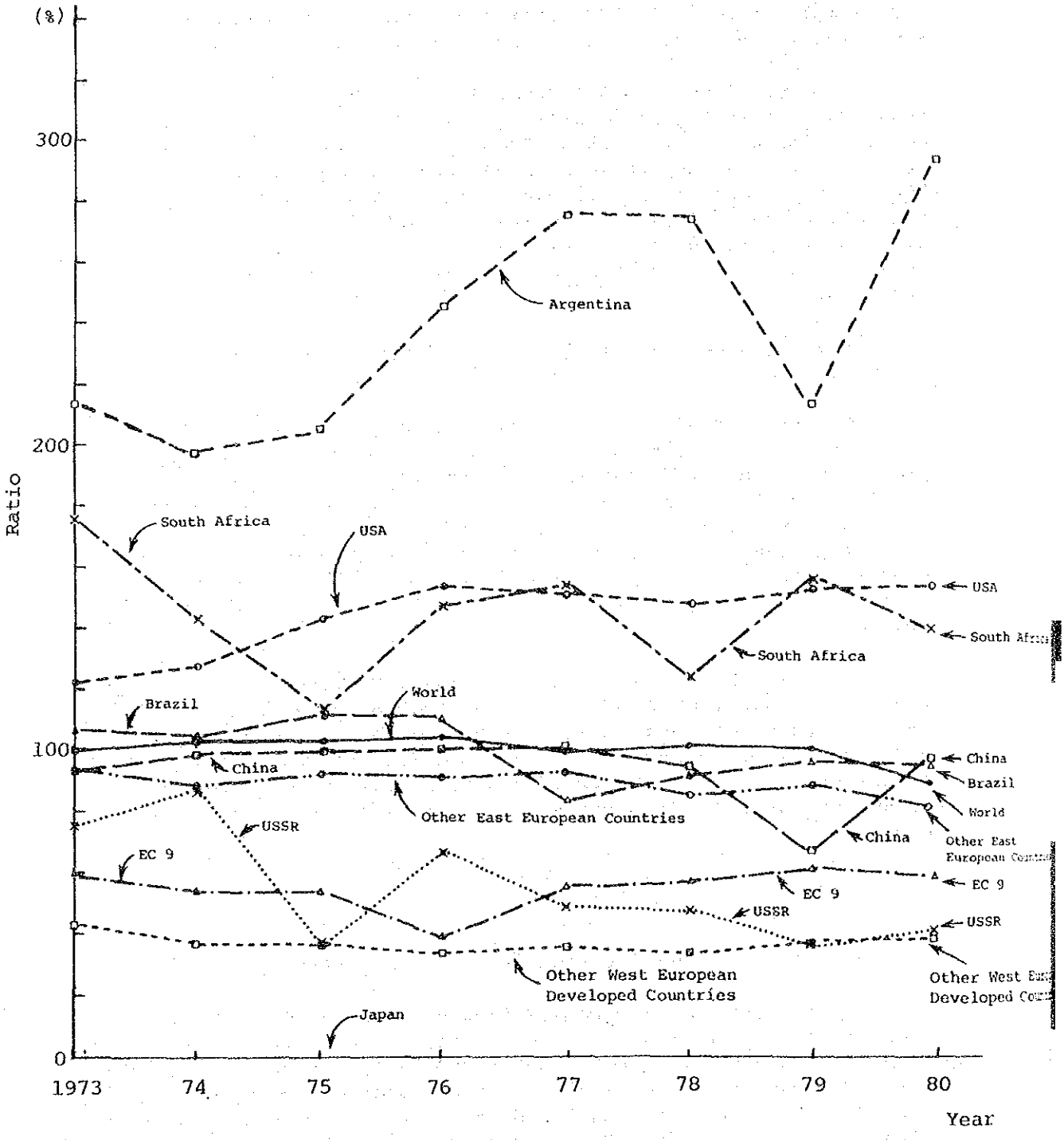
Looking at production by country or region, the United States, Argentina, South Africa and Thailand can export maize when production exceeds domestic consumption. The SSS ratio is high in Thailand and Argentina, and the quantity that can be exported is particularly large in the United States. Brazil had been an exporting country with an SSS ratio of more than 100% until 1977. Domestic consumption rapidly increased in Brazil thereafter, and it became an importing country with a domestic SSS ratio of less than 100%.

The SSS ratio in Japan is the lowest, with nearly 100% of maize requirement being imported. The West European countries (excluding the EC countries) are next with an SSS ratio of around 30%. In the USSR, the ratio fluctuates heavily according to the quantity of crop in any one year. It once rose to nearly 80%, but dropped to a level of 40% recently due to successive poor harvests and increases in demand.

II. Consumption and Distribution in Major Importing Countries

It is natural that the consumption of feed maize in the world is largely influenced by the demand for livestock products. During the period of high economic growth that began in the mid-1960s and ended around 1972 when the so-called food crisis started, maize consumption steeply increased not only in the major maize producing countries such as the United States, Argentina and Brazil but also the major importers such as the EC and Japan where the livestock industry developed rapidly.

Fig. C-3 Self-sufficiency Supply Ratio of Maize in Major Consuming Countries



Source: USDA, Foreign Agriculture Circular

Table C-4 Self-sufficiency Supply Ratio of Maize in Major Consuming Countries

(%)

Country/Region	1973	1974	1975	1976	1977	1978	1979	1980
World	100.1	102.1	102.0	105.4	99.8	101.4	100.3	94.7
USA	121.5	127.5	142.7	152.6	150.1	147.0	152.3	152.8
EC countries	59.6	53.7	53.9	39.6	56.2	57.4	61.5	58.7
Other West European developed countries	42.6	37.8	37.3	34.3	36.1	34.1	37.0	38.6
Japan	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
South Africa	175.6	143.4	113.6	148.4	153.1	123.4	156.6	138.7
Brazil	106.6	104.9	110.6	110.3	83.7	91.6	96.2	93.9
Argentina	214.4	197.6	204.5	244.5	274.6	273.1	213.7	294.1
USSR	74.9	86.7	37.3	67.0	50.3	48.2	36.6	41.1
Other East European countries	93.2	87.8	92.3	90.0	92.7	83.7	87.8	79.9
China	93.7	98.1	100.3	100.1	99.9	94.9	65.2	97.4

SSS ratio = Production/Domestic consumption total x 100

Source: USDA, Foreign Agriculture Circular

Although the USSR was once a large grain producing country supplying the demand of East European countries, it changed into a large grain importing country due to the rapid increase in meat demand as well as in grain consumption in 1972 when there was a poor harvest.

In China, the increase in maize consumption began in the mid-1970s when the internal administration was stabilized and the population showed a high rate of growth.

In 1972, the USSR abruptly imported large quantities of grain, and precipitated a world food crisis. This situation first influenced the consumption of feed maize in West European countries including those in the EC, as well as in the United States, and the consumption growth rate in these countries drastically declined. Sluggish demand in Japan also began to appear.

In 1977, the world market for grains was in equilibrium with prices stabilized, while demand in West European developed countries (excluding the EC), and Japan, began to rise again. In the beginning of the 1980s, however, growth in consumption in Japan and West European countries including the EC showed signs of slackening once again.

On the other hand, consumption in the newly industrializing countries such as the Republic of Korea, Taiwan and Brazil is continuing to grow quickly. Recently, consumption in East European countries has been growing steadily with a pattern different from other big consumers, probably because of a serious food crisis caused by a shortage of meat.

Since most of the feed maize bought in the world is supplied by the United States, feed maize is distributed, in principle, in a free market environment. Contrary to the case of wheat, imports of which are controlled by the government in many countries, maize is bought and sold in a free market, except in the case of exports to centrally planned economies.

Japan in particular does not impose any import duty on maize. Consequently, exports to Japan are quite advantageous in comparison with exports to the EC which imposes surcharges on grain imports.

In Japan, almost the entire supply of feed grain has to be imported, as reflected in the self-sufficiency supply ratio of almost zero, due to poor land resources. In the EC, however, the SSS ratio of feed grains is quite high because a large amount of wheat and coarse grain is produced in France and other countries in the EC. Moreover, substitute feed such as cassava is often used in the EC, because imports of such substitutes are promoted due to the surcharges imposed on grain imports.

In the USSR, consumption of feed grains has been growing in line with increased demand for livestock products. Production of feed grain in the USSR is so susceptible to climatic conditions that imports of feed can fluctuate dramatically. The USSR is the most unstable importing country and often disturbs the international grain market, even though it does play a significant role in the market as a large-scale importing country.

The East European countries, which were previously provided by the USSR with grains sufficient to satisfy demand, are apparently suffering from a serious foreign currency shortage, similar to that of the USSR. As a result, imports are being kept as low as possible. These countries also began to import feed grain from France, the Federal Republic of Germany and other countries in the EC, after supplies from the USSR stopped.

On the whole, the growth rate of world consumption of feed maize is still much higher than that of wheat or other coarse grains. It is thought, however, that steady growth of consumption, as was seen in the times of high economic growth, cannot be expected in the present world recession and that the growth rate will continue to slow down.

D. TRADE

I. Trends in Trade

1. Changes in the Volume of Trade

According to the FAO's Trade Yearbook, the volume of world maize trade grew consistently in the period 1965-1980, although there were fluctutations. Exports were 25 million tons in 1965, and reached a level of 80 million tons by 1980, the average annual growth rate being about 8%. There was, however, a significant change in the volume of trade from 1971. Although the growth rate before 1971 was comparatively low, it subsequently began to rise quickly. The average annual growth rates in the periods 1965-1971 and 1971-1980 were 3.5% and 11%, respectively.

The important reasons for such an increase were the growth in demand for livestock products due to rising income levels, increase in imports due to the harvest failures in the USSR and other East European countries, and the population growth in China.

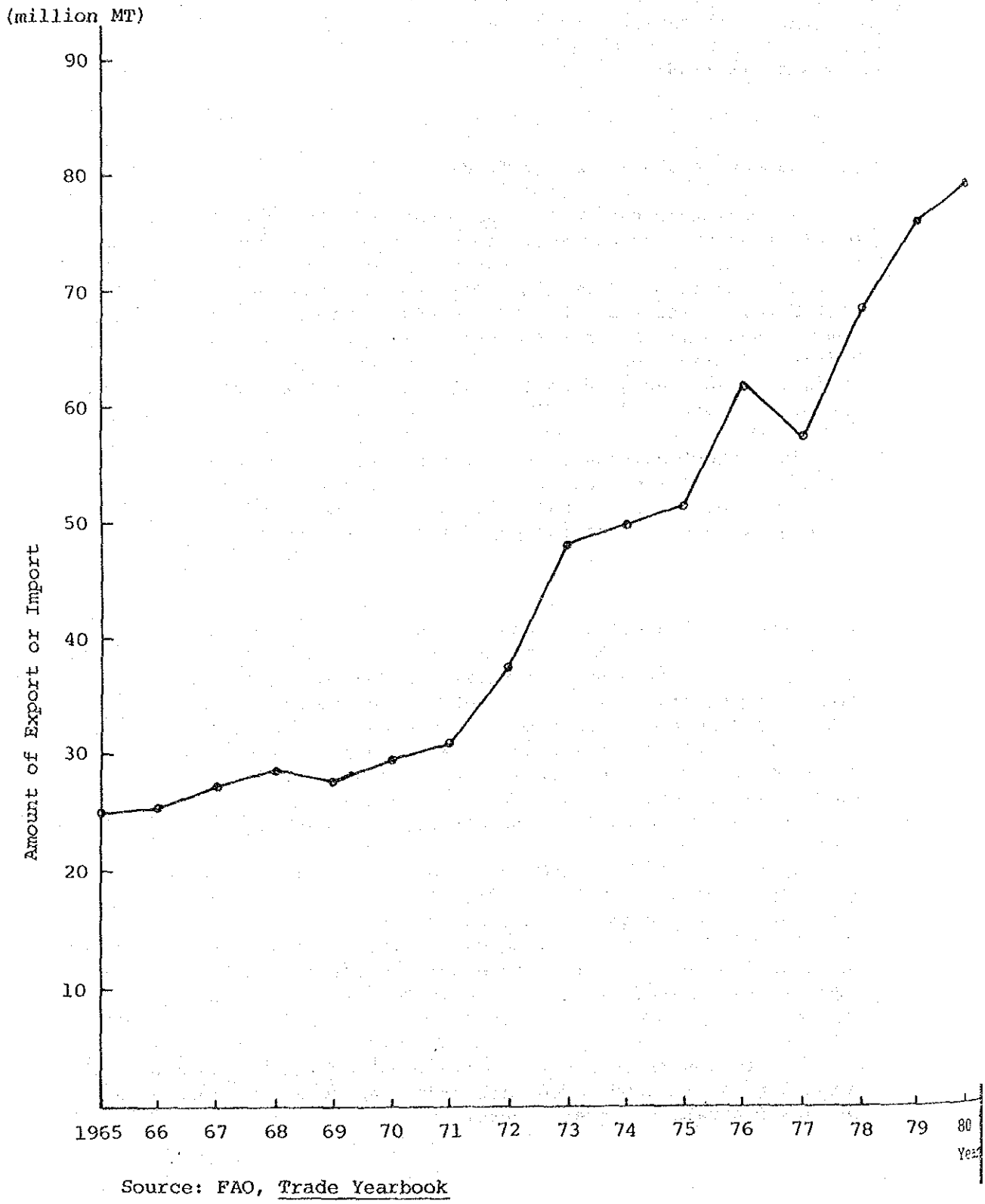
2. Volume of Trade and Share of Each Country or Region

The major maize exporters are the United States, the EC, South Africa, Argentina, Thailand, the USSR and the East European countries. The EC countries and East European countries export maize mainly to countries inside their own geographical region. The volume of exports from Brazil fluctuates a great deal year after year. Brazil, once an exporter, has been an importer since 1978 because domestic demand for feedstuffs increased strongly.

Among exporters, the United States exports an especially large quantity of maize. In terms of world trade, this amounted to 60% in 1965, and it began to increase steadily after 1971, reaching a level of 80% by 1980, which corresponded to the increase in world demand. The volume of exports from any other exporting country is much smaller than that from the United States, and shows no sign of change.

The EC countries imported almost 60% of the total volume of world imports in 1965. The rate decreased to 20% in 1980, due to increased demand of other countries.

Fig. D-1 Volume of World Trade of Maize (Based on Exports)



Source: FAO, Trade Yearbook

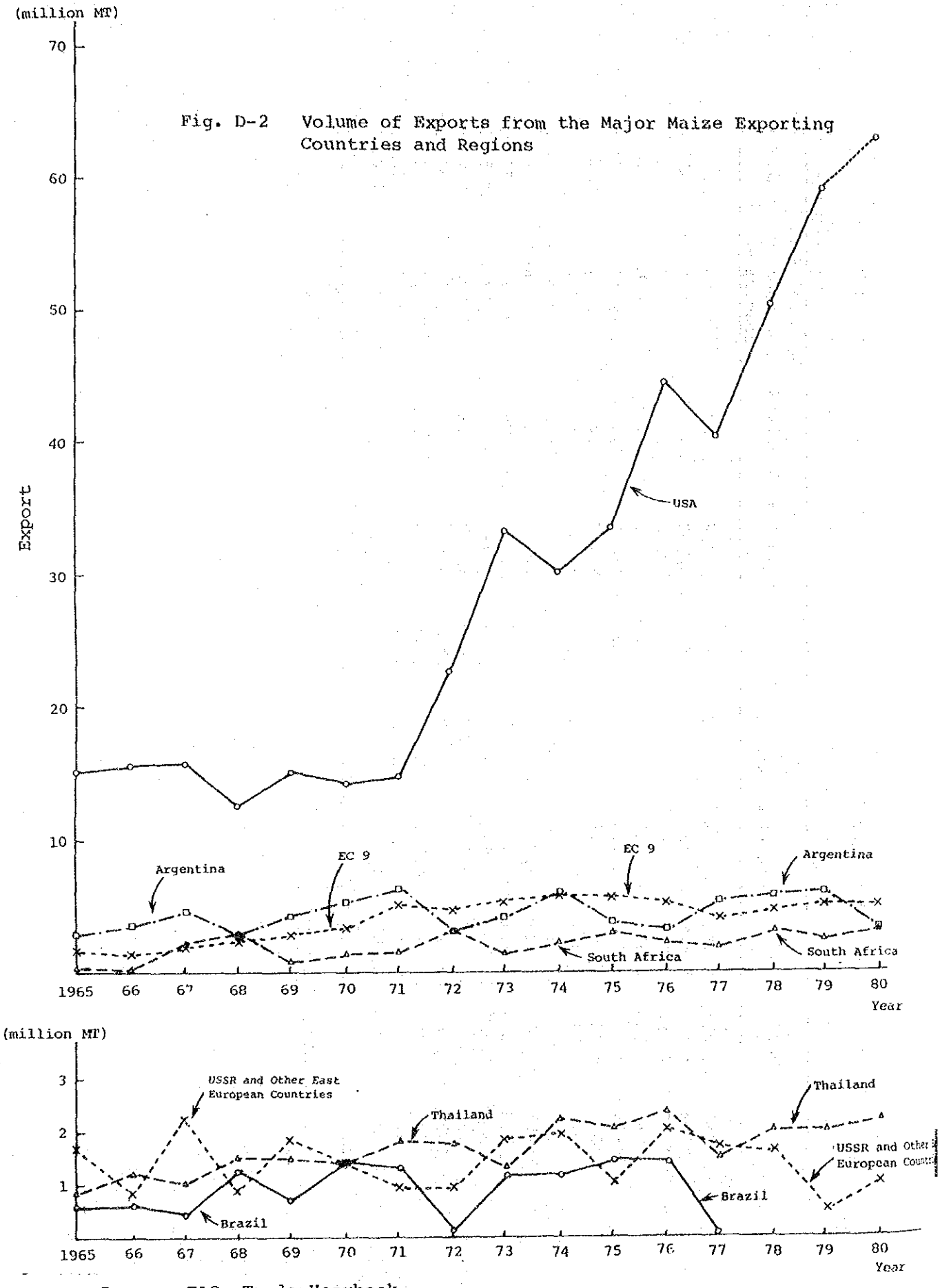
Table D-1 Volume of Exports from the Major Maize Exporting Countries or Regions

(1,000 MT)

	World	USA	EC countries	South Africa	Brazil	Argentina	Thailand	USSR and East European countries	China
1965	25,030	15,159	1,848	327	560	2,804	804	1,782	245
1966	25,440	15,549	1,753	46	627	3,752	1,219	844	146
1967	27,197	12,936	1,993	2,004	430	4,318	1,091	2,204	754
1968	28,526	14,959	2,144	2,953	1,238	2,893	1,481	916	50
1969	27,472	13,954	2,910	761	659	4,024	1,476	1,861	1
1970	29,422	14,401	3,568	1,201	1,471	5,233	1,371	1,414	2
1971	30,854	12,884	5,236	1,468	1,280	6,128	1,806	946	0
1972	37,286	22,386	4,570	3,155	172	3,005	1,758	965	-
1973	48,061	33,196	5,334	1,317	41	4,033	1,306	1,846	-
1974	49,655	29,869	5,717	2,163	1,109	5,525	2,190	1,988	80
1975	51,285	33,503	5,604	3,218	1,148	3,887	2,072	1,035	115
1976	61,993	44,362	5,414	2,228	1,418	3,080	2,388	1,995	130
1977	57,487	40,481	4,122	1,900	1,420	5,431	1,518	1,643	56
1978	68,754	50,142	4,689	2,890	15	5,895	1,955	1,674	30
1979	76,124	59,242	5,024	2,153	10	5,960	1,988	499	40
1980	79,780	63,152	5,198	3,317	6	3,525	2,171	1,078	104

Source: FAO, Trade Yearbook

Fig. D-2 Volume of Exports from the Major Maize Exporting Countries and Regions



Source: FAO, Trade Yearbook

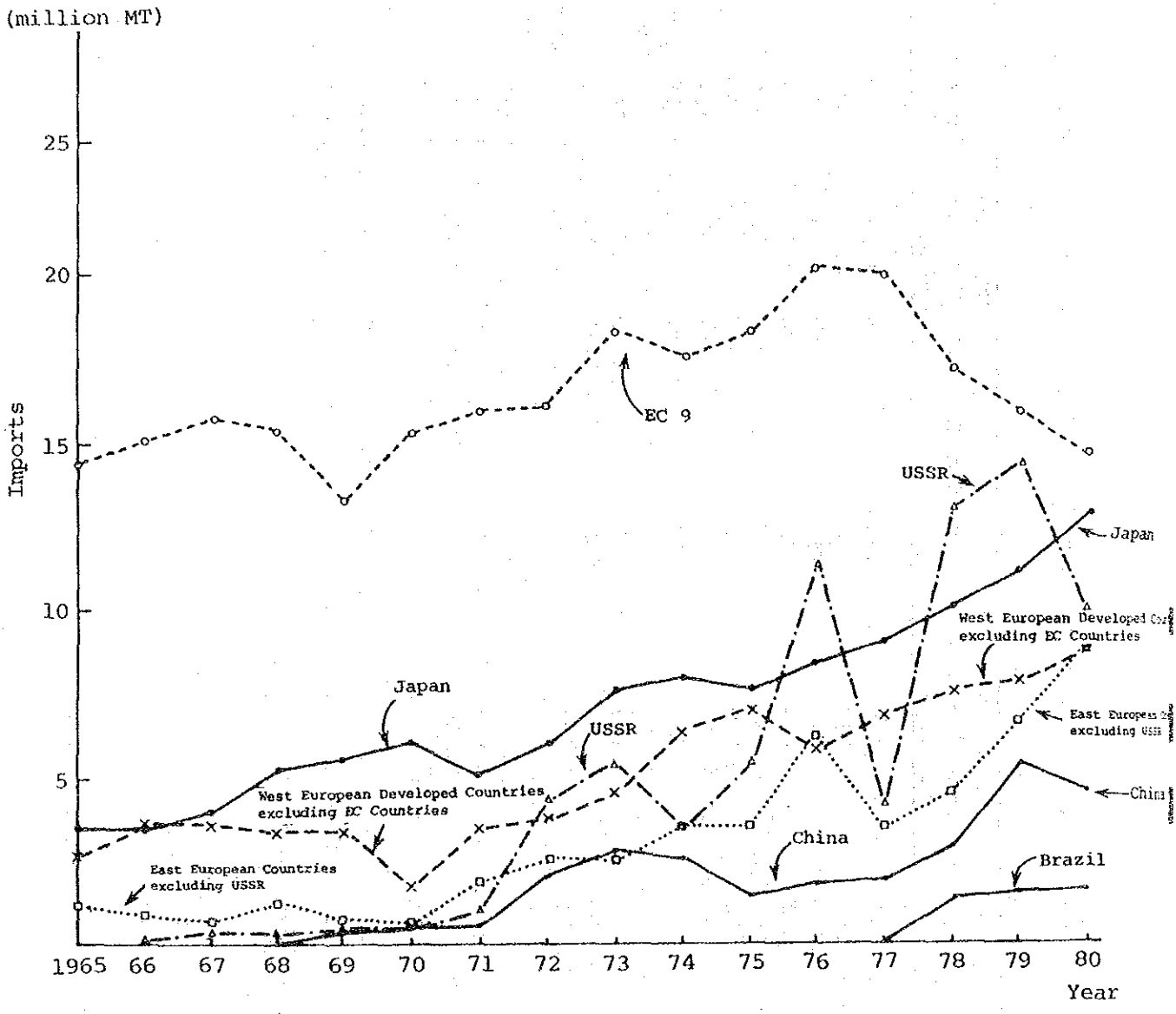
Table D-2 Volume of Imports of Maize to Major Importing Countries and Region

(1,000 MT)

	World	EC countries	Other West European developed countries	Japan	Brazil	USSR	Other East European countries	China	Remarks
1965	23,764	14,288	2,662	3,434	1	-	1,234	72	
1966	25,763	14,954	3,734	3,598	5	164	919	20	
1967	27,009	15,702	3,672	3,960	8	357	734	137	
1968	28,122	15,340	3,405	5,145	5	264	1,086	-	
1969	27,003	13,181	3,437	5,489	1	499	863	408	
1970	29,042	15,222	2,849	6,018	2	304	763	602	
1971	30,938	15,804	3,485	5,007	1	881	1,935	554	
1972	38,020	16,057	3,686	6,052	2	4,100	2,408	1,989	Poor crop in USSR
1973	47,049	18,137	4,463	7,771	4	5,400	2,458	2,762	
1974	48,797	17,410	6,418	7,940	-	3,400	3,551	2,550	
1975	51,621	18,204	7,097	7,470	2	5,548	3,583	1,538	Poor crop in USSR
1976	61,728	20,524	5,917	8,383	2	11,376	6,174	1,861	
1977	55,077	19,905	6,828	9,068	1	4,100	3,393	1,996	
1978	68,065	17,115	7,536	10,534	1,262	13,037	4,878	2,959	
1979	74,794	15,862	7,864	11,408	1,526	14,495	6,774	5,392	Poor crop in USSR
1980	80,432	14,637	8,930	12,830	1,594	10,000	9,049	4,603	"

Source: FAO, Trade Yearbook

Fig. D-3 Volume of Imports of Maize to Major Importing Countries and Regions



Source: FAO, Trade Yearbook

The growth rate of imports is high in Japan, West European developed countries (excluding the EC countries), the USSR, the other East European countries and China. Imports have been increasing at virtually a constant rate in Japan and West European developed countries. Imports to the USSR have fluctuated due to movements in production levels, foreign currency shortages and policy changes.

Brazil, the USSR and China started to heavily import maize in 1978, 1972 and 1972, respectively.

II. International Trade

1. Factors Affecting International Trade

Consumption of feed maize is naturally influenced by changes in the livestock industry. It is also affected by changes in the political and economic climate in both exporting and importing countries.

Table D-3 Volume of Imports of Maize in the Major Importing Countries

(million MT)

	1979	1975	1970	1965
USSR	14.5 (1st)	5.5	0.3	-
Japan	11.4 (2nd)	7.5	6.0	3.4
China	5.0 (3rd)	1.5	0.6	0.0
Spain	4.4 (4th)	4.2	2.0	1.6
Italy	3.4 (5th)	4.5	4.2	5.2
EC countries	15.9	18.2	15.2	14.3
Brazil	1.5	0.0	0.0	0.0
World total	74.8	51.6	29.0	23.8

Source: FAO, Trade Yearbook

Japan, Spain and the other countries which depend largely on imports for feed grains, have been trying to secure a stable supply of maize by increasing their volume of imports from the United

States, which has a great volume of maize for export and a well-controlled market system.

In Japan, in particular, imports from the United States are increasing due to favorable trading conditions. Firstly, the heavy maritime traffic carrying goods from Japan to the United States can be effectively used on the return voyages, and secondly, the volume able to be loaded at West Coast ports has grown with the increase in the production of exportable maize in the Midwest.

Although imports of maize from Argentina and Thailand were once showing a steady increase, they have been playing an auxiliary role recently in the Japanese import scene, with purchases by Japan from these sources mainly being made off-season or during times of shortage in the world supply.

In the past ten years, the world grain trade has been significantly affected by the USSR, which imports grain by fast and efficient means. Moreover, the Government contracts to purchase large amounts of grain secretly and quickly when the market price is very low.

In fiscal years 1978-1980, however, the United States restricted grain exports to the USSR as a reprisal against the military intervention in Afghanistan. This forced the USSR to substantially change its grain import policy. The USSR made up a large part of the sudden deficit by importing from Argentina, Australia, Canada and other countries. Recently, the USSR signed contracts to import grain from Western Europe including the EC countries. The USSR is thus attempting to increase the number of its suppliers to secure a stable supply of grain.

The United States, on the other hand, lost a huge market due to its cutbacks just when it experienced three years of record harvests.

The international market price of maize is determined in the United States, which shares more than half of the world's exports of maize. The price of maize is determined in the Chicago grain market. Similar to the stock market, the grain market is largely affected by movements in supply and demand for maize, crop forecasts, information about possible export contracts, changes in agricultural policies, economic and political climates in the major countries, and also, of course, by speculation.

The local market prices of grain at the unloading ports of Rotterdam and London in Europe are also determined on the basis of the prices in the Chicago Grain Market.

Table D-4 Changes in the Price of Maize in the Chicago Grain Market due to Large-scale Purchases by USSR

Large-scale purchase by the USSR by the fiscal year	Price before sudden purchase (A)		Peak price (B)		Rate of price increase (B-A)/A x 100
	Month	$/bu	Month	$/bu	%
1972/73	July 1972	1.24	Aug. 1973	2.81	166.6
1975/76	June 1975	2.72	Sept. 1975	3.08	13.2
1977/78	Sept. 1977	1.87	April 1978	2.61	39.5
1979/80	June 1979	2.67	July 1979	3.12	16.9

Note: Data taken from the statistical table in the 1980 Agricultural White Paper of the Ministry of Agriculture, Forestry and Fisheries, Government of Japan

2. International Transactions

As can be seen by the strong fluctuations in the international feed grain market during the past ten years, there are many unstable factors which influence the demand and supply and the price of maize.

One measure to cope with this situation is to enter into a long-term bilateral agreement for the supply and purchase of grain. This is a new form of grain transaction which secures a stable export market for the exporting country, and benefits the importing country as well by diversifying and stabilizing supply sources. It also creates favorable conditions for price setting, and increases the potential volume of trade by allowing for favorable conditions for payment.

A bilateral agreement gives priority to the importing country at times of world shortage and, at the same time, provides the exporting country with a guaranteed customer in times of a world glut. In an agreement detailing the price, delivery at the current market price is generally adopted because of fluctuations in the market price for grain.

The record of the bilateral agreements so far made is shown in Table D-5 (from the FAO publication, Long-term Bilateral Agreements and Futures Trading in Grains, the result of a multi-governmental study).

Table D-5 Long-term Bilateral Agreements

Exporting country	Importing country	Term (years)	Volume of annual trade of coarse grains (million MT)
USA	China	4	1.0 - 2.0
"	USSR	5 + 1	3.0 - 4.0
Argentina	Algeria	5	0.03 - 0.06
"	China	4	0.3 - 0.6
"	Mexico	2	0.7
"	USSR	5	4.0
Brazil	USSR	4	0.5
Canada	Mexico	2	0.10
Turkey	Libya	5	0.1

International grain traders operate principally in the United States, and handle more than half of the total amount of maize traded in the world.

Consequently, it often happens that maize produced in Argentina is first sent to the United States to be exported from the U.S. market through spot trading.

The inspection standards for maize, which have been established in the United States in accordance with the Agricultural Products Inspection Standards Act, are generally used in international trade. Maize is usually traded on credit with a certificate issued by the government of the loading country, stating that the goods have passed national inspection at the loading port. (The above-mentioned inspection standards are used to check the moisture, density, percentage of extraneous grain and rate of broken grains.) The term "No.2 Yellow" or "No.3 Yellow" is generally used as a standard for feed maize.

In Argentina, Brazil and Thailand, maize is also traded on credit with a certificate issued after inspection at the loading port. The system is basically similar to that used in the United States except for slight modifications.

Maize is traded in the form of a blanket contract or a partial contract, either FOB (free on board), CIF (cost, insurance and freight), or C & F (cost and freight). Prices of coarse grains are determined in the Chicago market or negotiated at local grain markets around the world. FOB premium prices, on the other hand,

are the prices offered by grain trading companies (market prices). Spot transactions and forward exchange transactions are also utilized.

Transactions in imported grains from the United States are usually made between grain trading companies (or loading companies), and import companies or the users, with import usance of 120 days.

In general, the market price for maize is set in the Chicago grain futures market. Occasionally, however, maize is traded on the basis of the market price in Rotterdam or London.

The Argentine Government tried to manipulate the price and quantity of its maize for export during the early 1970s. This was soon discontinued, however, because it seriously disrupted the international market.

In 1972, the USSR started to increase its purchases of grain from the United States. As a result, in 1973, the U.S. Government introduced a system whereby exporters were obliged to notify the Department of Agriculture within 24 hours after negotiating a contract when exporting more than 100,000 tons of grain. Through this system, the Government sought to maintain the close relationships with longtime trade partners and to stabilize the domestic supply. In the face of the serious food shortage in 1974, this system was revised in October of that year by introducing a regulation that required prior approval for trade in excess of 50,000 tons per day, or 100,000 tons per week. This system was abolished in March 1975 when the grain shortage ended.

3. Trade Organizations

The international markets for all feed grains, except wheat, are virtually controlled by the United States. In particular, maize is traded mostly by the 5 major grain trading companies, the largest of which is Cargill Inc., with its head office in Minneapolis, Minnesota, in the American midwest.

Indeed, in Argentina, which is thought to be comparatively less affected by the policies of the major grain trading companies, 80% of wheat exports, 50% of maize and 70% of milo were reportedly handled in 1973/74 by the major grain traing companies. It is reported that 90% of coarse grain exports from Canada and 90% of exports of wheat and maize from the EC are also handled by these major grain trading companies.

Cargill Inc., a family enterprise with a history that dates back to 1865, has 140 subsidiaries in 38 countries.

The company owns 350 grain elevators throughout the world, 40 of which are important seaboard elevators. The company also controls 12,000 country elevators at inland granaries in the United States and Canada.

It has multilateral operations, not only in the grain trade, but also in soybean processing, feed production, meat processing and in the cotton trade. The yearly turnover of the company reached 14 billion dollars in 1980.

Continental Grain Co., the biggest grain trader after Cargill, handles one fourth of the world's grain exports and approximately 20% of exports from the United States. The company started operations as a grain dealer in Belgium in 1813 and opened a head office in Chicago in 1921. It owns subsidiary companies in Rotterdam, Zurich, Naples, Madrid and other cities in Europe, and its turnover is large, especially for a European grain trader.

Bunge Co., with its head office in Antwerp, is the third-largest grain trader in the world. It also operates mines, canning plants and textile plants, mostly in Argentina. It trades grains mainly in South America.

Louis Dreyfus & Cie, with its head office in Paris, is the fourth-largest trader, doing most of its business in the United States. It is a multinational enterprise, also involved in marine transportation and banking. Andre Co. is the next largest, operating principally in Switzerland. It has grown into a huge grain trader, while also being involved in finance.

Although the volume of transactions handled by Japanese trading companies is far behind that of the 5 major grain trading companies, Mitsui and Co., Ltd., Marubeni Corporation, Mitsubishi Corporation and others have developed rapidly and can be counted as international grain trading companies, on the basis of their grain operations in the United States. The National Federation of Agricultural Cooperative Associations has constructed seaboard elevators on the Mississippi River in New Orleans, and has started to play a leading role in international grain trade.

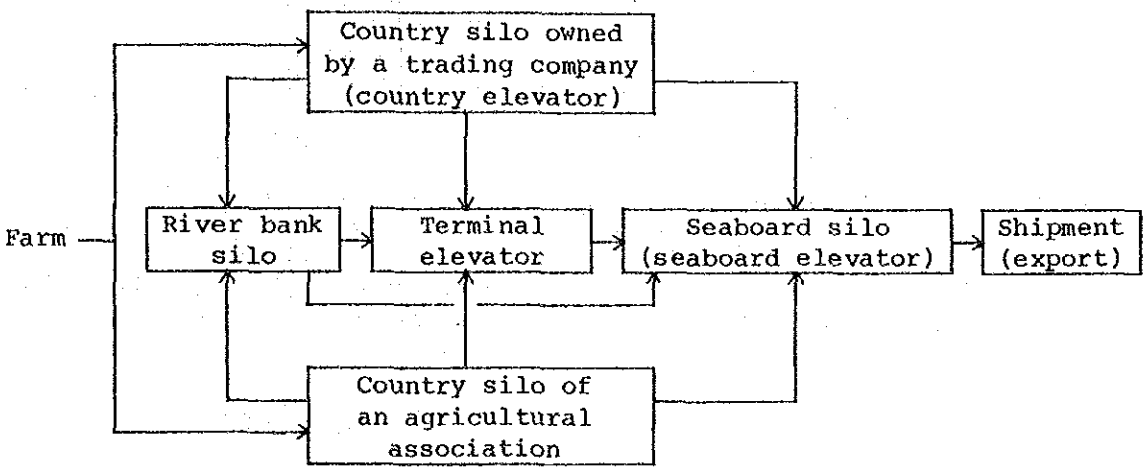
In respect of powerful farmers' organizations (those involved in harvesting and loading operations) in the United States, FARMARCO is the largest. A major agricultural association in the States of Iowa, Kansas and Nebraska with its head office in Omaha, Nebraska, it operates country elevators.

Farmers' Export Company (FEC), based in Kansas, is an active agricultural association for shipping maize for export. The Federation of Agricultural Associations in Illinois and in Iowa are also active organizations in the collection of maize grown in those states.

ACA (Asociación de Cooperativas Argentinas) and FACA (Federación Argentina de Cooperativas Agrícolas) are the well-known and major agricultural associations in Argentina.

The major routes of marketing of maize in the United States, are shown in the following schematic diagram.

Fig. D-4 Schematic Diagram of Export and Marketing Routes of Grain in the United States



4. Marine Transportation

The greater portion of maize exported from the United States, (exports in 1980 were 61.29 million tons) is loaded at ports in the Gulf of Mexico (36.63 million tons in 1980). The balance is loaded at ports on the East Coast, including Norfolk (9.4 million tons), ports in the Five Lakes region (5.97 million tons) and ports on the West Coast, including Long Beach (9.3 million tons).

Marine transportation of grain between Japan and the Gulf of Mexico usually takes about 30 days. Only ships with a displacement of less than 50,000 to 60,000 tons (known as Panamax) can be used in this transportation because ships have to pass through the Panama Canal.

The volume of marine transportation between Japan and the West Coast of North America has recently begun to increase, thereby reducing shipping time to two weeks, although the inland transportation costs are higher.

Table D-6 Ocean Freight Costs for Grain Transportation for the Major Sea Routes

(US$/MT)

		1965 Max. - Min.	1970 Max. - Min.	1972 Max. - Min.	1974 Max. - Min.
West Coast of North America - Japan	A	10.95- 7.00	13.50- 8.75	12.00- 6.25	31.25-18.79
(Required voyage	B	8.25- 7.50		7.90- 3.00	
time: 14-17 days)	C	6.50			
Gulf - Japan	A	13.60- 9.00	16.50-10.00	12.00- 4.85	37.15-25.00
(Required voyage	B	5.65-10.35	16.25- 7.5	10.50- 3.80	34.00-11.25
time: 30-35 days)	C	12.00- 8.50			19.00-15.60
Gulf - West Europe (Rotterdam)	A	8.00- 5.10	11.59- 5.50	12.78- 3.25	20.00-12.50
(Required voyage	B	6.65- 4.50	9.50- 5.25	7.07- 2.15	22.34- 7.00
time: 7-10 days)	C	6.25- 3.75		5.05- 2.50	20.00- 6.75
Argentina - West Europe (River Plate - Rotterdam annual average)		12.23	9.77	12.46	19.64

Note : A: less than 20,000 tons; B: 20,000-50,000 tons; C: more than 50,000 tons

Source: Japan Maritime Research Institute, Report on Development of Overseas Resources Transportation (Food and Feedstuff Section)
Argentina - West Europe -- FAO, Trade Yearbook

Since the port facilities at Rotterdam and other EC ports have been improved, large ships of 100,000-200,000 tons can now be used on the Atlantic route, resulting in a drastic reduction in ocean freight costs.

The ocean freight cost for grain transportation between the Gulf of Mexico and Japan is around $15 per ton.

Since the grain export ports in Argentina and Brazil have insufficient port facilities, large ships cannot be used on the routes and the freight costs are comparatively high.

III. Movements in International Prices

The international price for maize is largely affected by the market price in the United States, the largest maize producer and supplier in the world.

The market price in the United States is largely determined by the Chicago grain futures market. Although the market price for maize always fluctuates according to supply and demand, prospects for the future, weather, individual countries' policies on agricultural products, and so on, the actual prices are determined on the basis of the prices in the Chicago grain market. Table D-7 and Fig. D-5 show price movements in the Chicago grain market which are regarded to be the basis of international prices. Also, F.O.B. prices at the Gulf of Mexico and C.I.F. prices at Rotterdam in the Netherlands are shown in Tables D-8 and D-9, respectively.

In addition, in order to see price trends in the major regional blocs, unit export values (the F.O.B. export value divided by the export volume) and unit import values (C.I.F. import value divided by import volume) are obtained from the FAO's Trade Yearbook. They are shown in Tables D-10 and D-11 as well as Figs. D-6 and D-7.

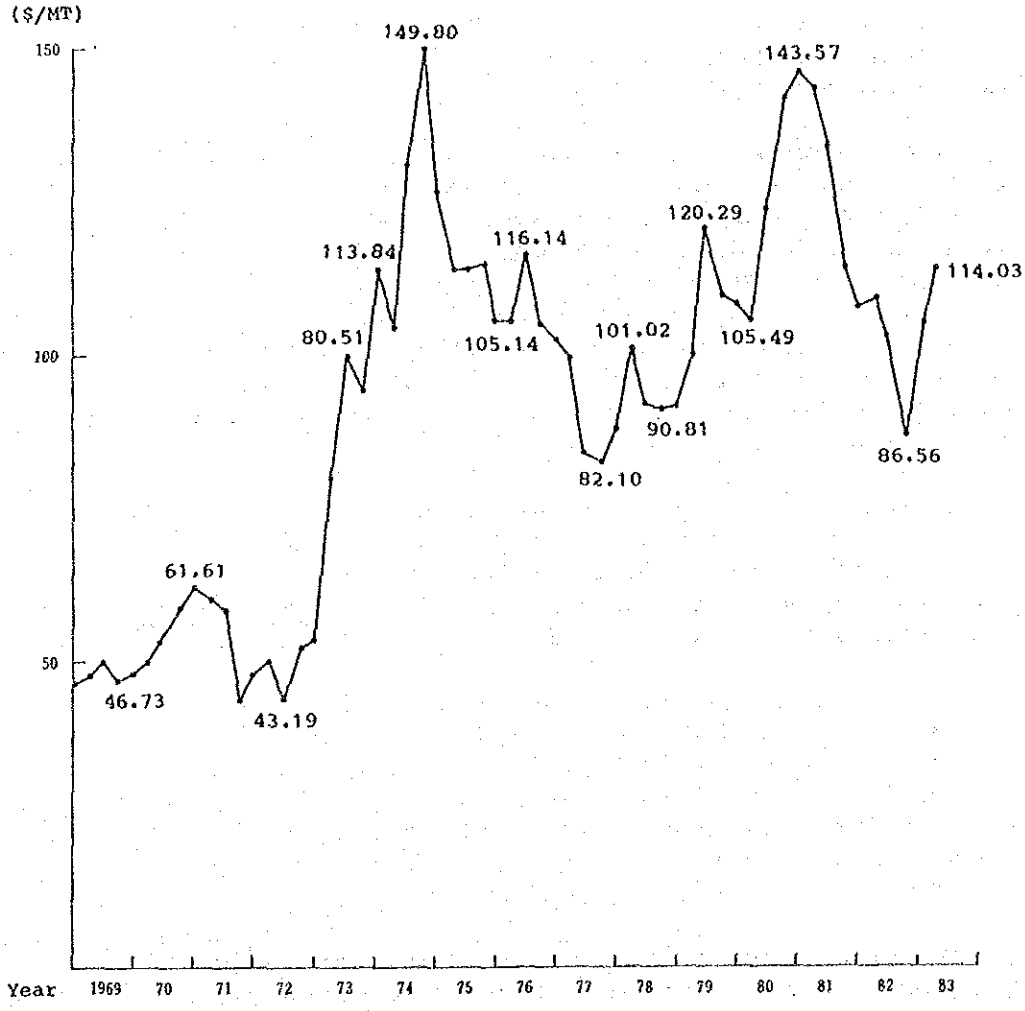
As for the overall movement in unit values, export and import unit values remained virtually on the same level from 1965 to 1972, and then rapidly increased mainly due to the large-scale purchase of grain by the USSR in 1973. The average of world export unit values rose to $136/MT, approximately 2.4 times the average export unit values before the rapid rise (about $60/MT). The poor harvest due to drought in 1974 were also causes of the unit values rise.

The production of maize began to increase after 1974 due to expansion of the cultivated area under maize and favorable weather conditions, which caused unit values of maize to drop until 1977, when the average of world export unit values reached a bottom of $111/MT.

The unit values started to rise again, and the average unit values reached almost $150/MT in 1980. Successive harvest failures in the USSR and the poor harvest due to the heat wave in the United States in 1980 were factors in this rise.

As shown in Fig. D-7, the unit import value of the developed countries and that of the developing countries have similar trends, but the unit import value of the countries with centrally planned economies moves slightly differently from those of other regions. This seems to be largely the reflection of USSR contracts, such as forward buying at low prices.

Fig. D-5 Movement in Maize Prices in Chicago Grain Market (Short maturity)



Source: Ministry of Agriculture, Forestry and Fisheries

Table D-7 Movement in Maize Prices in Chicago Grain Market in the U.S.

($/MT)

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Average
1969/70	47.40	50.39	50.39	49.64	48.31	47.28	46.73	46.73	46.77	47.68	47.83	48.07	48.10
1970/71	49.68	50.82	52.24	53.11	57.04	60.31	58.70	57.83	59.52	61.61	59.88	58.86	56.63
1971/72	59.58	61.82	61.94	58.28	51.08	46.02	43.31	42.32	48.06	47.98	47.64	48.29	51.36
1972/73	49.80	50.57	49.20	43.19	51.05	55.11	52.20	53.54	61.74	53.05	63.14	52.26	52.90
1973/74	79.67	79.67	80.51	99.42	113.78	97.67	94.22	99.28	105.41	113.84	122.86	117.99	100.36
1974/75	104.79	104.03	111.57	130.90	140.82	137.04	149.80	143.70	138.91	126.44	116.40	112.28	126.59
1975/76	113.71	108.21	110.25	113.27	122.59	120.21	114.37	105.92	103.20	105.42	105.78	105.46	110.70
1976/77	105.18	111.90	117.40	116.14	109.67	112.20	104.40	95.60	97.07	102.16	100.70	100.33	106.07
1977/78	99.50	95.64	92.32	83.12	74.49	77.10	82.10	87.32	86.63	88.28	89.07	94.95	87.54
1978/79	101.02	101.81	101.02	91.95	86.32	85.09	90.81	90.07	88.71	91.28	93.00	95.41	93.04
1979/80	100.01	103.71	113.21	120.29	111.01	109.35	109.46	105.64	109.09	107.99	107.04	103.51	108.35
1980/81	105.49	107.84	109.83	123.31	134.84	138.87	142.11	150.16	145.74	146.29	142.18	139.53	132.18
1981/82	143.57	137.30	134.32	134.05	122.45	112.04	114.48	109.06	102.31	107.40	105.49	103.45	118.83
1982/83	108.98	107.60	107.41	102.80	91.66	87.90	86.56	91.77	93.41	100.37	107.61	114.03	100.00

Source: Ministry of Agriculture, Forestry and Fisheries, Government of Japan

Table D-8 Change in FOB Gulf Prices of Maize in the U.S.

($/MT)

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Average
1973/74	76.57	86.42	103.41	109.64	122.44	108.17	106.40	106.67	113.72	120.22	130.41	125.78	108.74
1974/75	113.92	113.71	116.63	132.28	145.82	141.43	153.93	145.67	145.27	131.72	120.47	120.07	122.25
1975/76	119.66	114.52	119.29	119.36	129.58	122.34	116.92	110.26	109.15	110.13	113.23	113.06	116.46
1976/77	111.10	118.15	121.80	121.31	116.09	114.96	106.15	98.72	103.49	111.56	110.55	107.89	111.81
1977/78	105.74	100.83	95.94	85.74	76.94	78.48	83.19	93.43	96.01	95.76	101.03	106.14	93.27
1978/79	111.46	112.69	106.55	97.26	92.08	90.99	95.94	100.69	98.89	105.41	107.01	109.52	111.22
1979/80	111.49	112.59	120.34	130.92	118.89	117.96	117.52	118.89	115.32	105.90	113.78	110.08	116.16
1980/81	108.17	111.02	113.94	131.10	143.42	140.79	140.44	146.67	145.44	148.94	148.00	145.00	135.24

Source: USDA, Grain Market News

Table D-9 Change in CIF Rotterdam Prices of Maize in the Netherlands

($/MT)

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	Average
1973/74*	-	-	-	128.35	145.30	121.25	123.20	124.00	132.30	136.20	142.90	146.45	132.90
1974/75	131.90	129.50	133.05	139.75	139.05	152.75	163.40	164.55	159.60	146.70	137.15	134.75	144.35
1975/76	130.35	123.50	129.60	140.90	147.45	138.20	132.35	121.70	118.65	118.45	121.30	122.05	128.71
1976/77	122.25	129.35	133.00	133.80	128.10	132.25	119.95	108.80	111.10	122.50	125.40	117.35	123.65
1977/78	115.45	116.40	102.70	95.75	87.20	87.95	91.20	104.50	108.10	108.70	111.00	116.10	103.75
1978/79	129.25	126.90	119.70	108.25	105.30	104.55	105.04	108.50	113.95	119.40	120.40	124.40	115.47
1979/80	127.40	133.10	139.65	152.35	136.90	137.95	143.95	141.74	139.15	129.65	132.15	132.75	137.23
1980/81	133.55	138.45	139.00	152.75	166.65	164.30	161.70	174.60	172.35	180.55	167.20	165.40	159.71

* 1973/74 —— July - June

Source: USDA, Foreign Agriculture Circular: Grain

Table D-10 Unit Export Value of Major Maize Exporting Countries

(US$/MT)

	World	Developed countries				Developing countries				Centrally planned economies		
		Total	USA	Western Europe	South Africa	Total	Brazil	Argentina	Thailand	Total	USSR	Eastern Europe
1965	57.91	57.83	54.93	81.10	59.92	55.82	49.87	54.82	57.89	65.95	62.06	72.17
1966	58.41	58.96	56.35	81.12	-	55.05	50.71	53.50	59.97	68.55	57.51	71.70
1967	57.38	56.94	54.42	74.72	55.15	53.99	51.23	51.77	59.75	72.02	55.98	73.57
1968	51.83	52.00	49.08	74.60	50.09	49.05	46.05	48.34	50.52	68.05	49.38	73.20
1969	55.48	56.94	52.03	78.57	53.98	51.43	50.62	48.37	54.54	59.30	60.58	59.04
1970	59.99	62.26	57.21	80.74	62.38	54.13	54.80	50.74	64.94	66.54	66.58	66.51
1971	63.45	66.29	57.93	88.76	57.96	57.39	58.94	56.82	58.04	70.63	86.06	67.80
1972	62.76	63.62	55.44	107.73	57.21	57.02	---	58.19	54.17	72.49	67.87	74.24
1973	91.48	91.21	85.46	126.89	83.86	93.03	---	90.58	107.42	92.07	81.82	95.18
1974	127.90	129.65	126.29	143.37	137.18	123.00	125.36	119.21	133.65	118.09	96.35	131.48
1975	136.12	136.30	132.76	161.60	127.53	132.27	131.43	133.21	132.96	152.66	159.08	153.53
1976	123.02	122.67	117.75	159.64	120.64	117.76	119.96	117.74	114.91	151.80	164.56	152.48
1977	110.72	111.43	102.25	192.98	113.02	100.63	95.54	98.39	106.48	151.48	180.40	148.22
1978	116.86	117.07	105.77	235.28	114.54	101.42	---	99.67	106.46	188.14	204.96	187.49
1979	128.04	130.02	118.53	256.21	121.50	112.97	---	101.71	137.14	210.11	210.40	257.57
1980	146.59	149.16	135.72	275.16	162.27	154.75	---	147.47	161.66	232.40	259.54	236.14
1981	153.34	154.85	146.12	240.08	151.82	138.65	---	132.68	147.86	213.19	240.19	215.94

Notes : 1) Unit export value = Exports value ÷ Exports quantity
2) Totals for each area contain values for countries other than those listed.
3) --- indicates the year of very few exports.

Source: FAO, Trade Yearbook

Table D-11 Unit Import Value of Major Maize Importing Countries

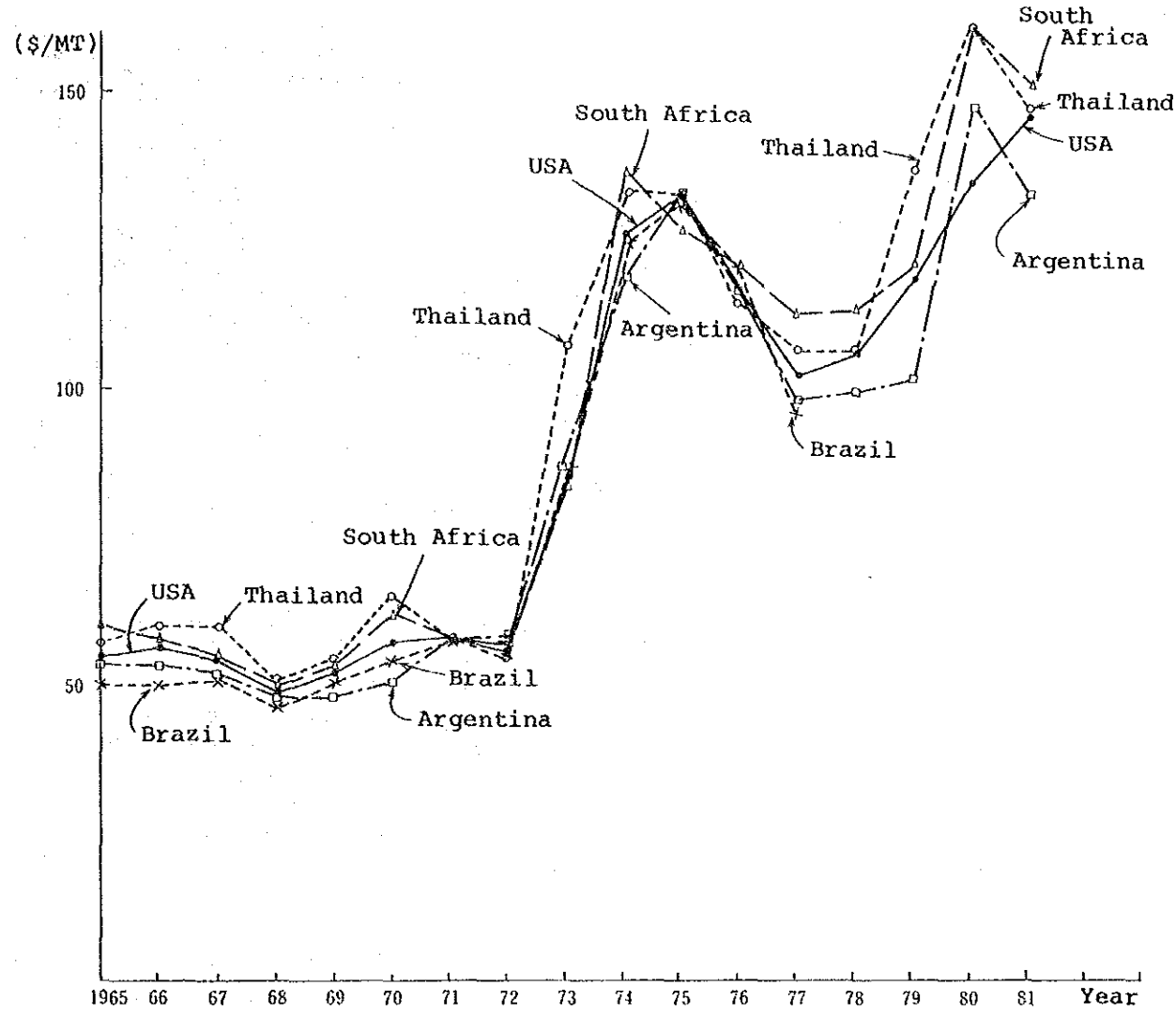
(US$/MT)

	World	Developed countries				Developing countries		Centrally planned economies			
		Total	Western Europe	Japan	Others	Total	Other than Brazil and Argentina	Total	USSR	Eastern Europe	China
1965	66.69	65.81	65.65	67.41	58.68	71.20	71.19	69.46	-	69.49	67.97
1966	66.76	65.54	65.39	67.62	58.72	68.18	68.06	73.52	57.61	74.36	71.29
1967	66.60	66.30	66.33	68.43	54.45	67.86	67.72	67.96	58.46	69.03	70.33
1968	59.03	58.89	59.06	59.80	48.95	62.20	62.05	58.07	49.47	58.79	-
1969	62.30	62.08	63.23	60.36	52.77	67.55	67.47	59.16	50.16	63.33	61.44
1970	69.18	69.00	69.86	67.62	58.05	71.60	71.50	67.43	60.01	68.98	69.23
1971	73.88	74.81	74.99	73.60	69.79	74.55	74.40	65.72	61.48	66.74	69.51
1972	68.51	70.99	73.56	62.65	64.03	69.46	69.38	59.93	53.38	69.71	63.35
1973	97.89	103.77	107.33	94.96	89.58	102.82	102.73	78.55	57.80	96.58	102.08
1974	141.40	145.33	144.62	150.39	127.56	152.62	152.45	121.09	86.70	135.78	145.96
1975	151.65	150.13	149.63	152.32	137.04	158.34	158.20	152.03	154.26	148.47	152.41
1976	131.60	131.79	136.92	116.23	124.16	134.16	134.06	130.42	127.70	134.65	132.82
1977	124.34	124.53	126.83	118.70	114.99	124.40	124.34	123.68	115.35	131.63	119.24
1978	126.06	130.93	136.86	117.80	117.42	136.41	137.55	112.13	102.04	132.73	122.64
1979	142.84	141.56	162.56	131.05	122.73	147.16	146.66	125.23	116.51	137.39	135.74
1980	167.62	163.42	176.67	156.71	152.56	178.14	178.84	155.29	150.83	156.66	162.62
1981	175.51	173.54	181.41	180.37	162.26	181.12	180.82	165.76	162.32	163.74	185.50

Note : Unit import value = Import value ÷ Import quantity.

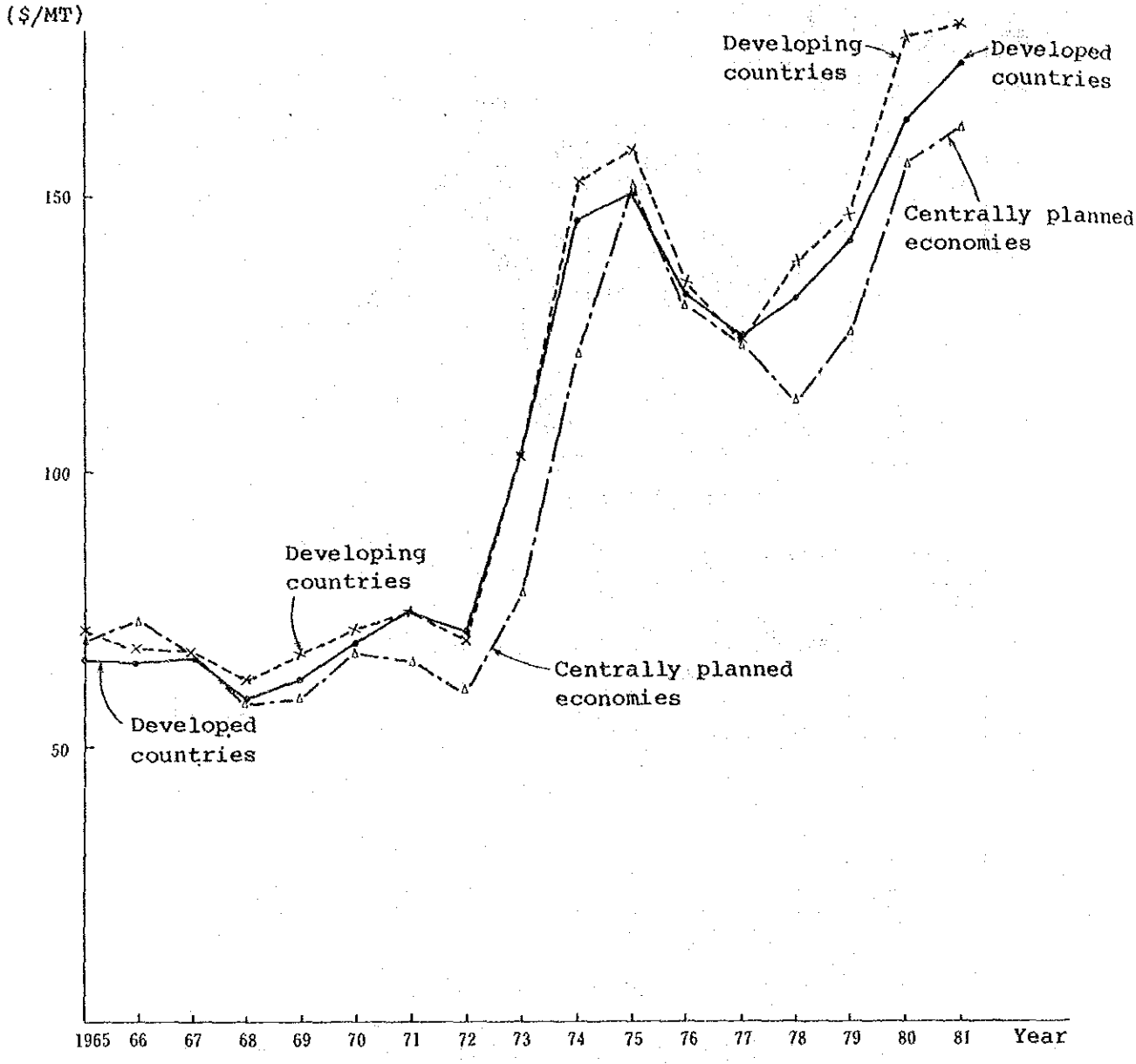
Source: FAO, Trade Yearbook

Fig. D-6 Unit Export Values of Maize in Major Exporting Countries



Source: FAO, Trade Yearbook

Fig. D-7 Unit Import Values of Maize by Major Regions



Source: FAO, Trade Yearbook

E. PROJECTION OF SUPPLY AND DEMAND

I. Projection Model

1. Framework of the Projection Model

1.1 Projection Items

To derive the future demand and supply relationship of maize, projections of future production and consumption volumes were attempted in the following.

1.2 Periods of Projection

A long-term projection for the year 2000 and an intermediate term projection for 1990 were carried out.

1.3 Projection by Country Groupings

Demand and supply figures were projected for the developed countries, the developing countries and countries with centrally planned economies, because the conditions and movements in production and demand are quite different for each group. The three groupings comprise the following countries:

Developed : the United States, EC countries, other West European countries, Japan and South Africa

Developing: 93 countries classified as developing in Africa, Latin America, Middle East and Far East

Centrally planned economies: USSR, Eastern Europe, China

1.4 Data

Data were taken from FAO's Production Yearbook, and Trade Yearbook.

Data for the period from 1965 to 1980 were used. The volume of consumption in each regional bloc was obtained by the following equation:

Volume of Consumption = Volume of Production + Volume of Imports - Volume of Exports

2. Methodology and Features of the Projection Model [1]

The Study Team has attempted to make future projections of regional production and consumption of maize as an individual product by using the projection method developed by Behrman and Adams.[2] This projection model is comparatively simple and suitable for use in projecting the consumption and production conditions of a single kind of agricultural product. The method has been applied to the projection of a variety of individual agricultural products such as cocoa, coffee, tea, sugar, wheat and rice and it has obtained good results.

---

1) In order to make future production and consumption projections of feed crops, a variety of methods can be theoretically considered. One is to consider the number of animals such as beef cattle, pigs and poultry as a demand factor for feed crops and to include feed crops other than maize, as well as other raw materials, as supply factors. However, in reality, there are several limitations in formulating a projection model incorporating these various factors. From the point of view of demand, when the numbers of animals are used as explanatory variables of demand for feed crops, the future projected figures of number of animals such as beef cattle, pigs and poultry are also required in order to make projections on the future demand of feed crops.

Turning to the supply side, when feed crops and bran are incorporated in the projection model, they are usually converted into digestible protein content and nutritions rather than individual products such as maize, grain sorghum or wheat. It is very difficult, therefore, to re-convert the projected amount of digestible protein content and nutritions into the projected demand of individual products, i.e., maize, grain sorghum, and so on.

Further, it is not necessarily our objective in this study to formulate a comprehensive projection model in which the number of such animals as beef cattle, pig and poultry are treated as demand factor, and that coarse grains, other than maize, as well as protein material, are taken into account. Even if such a comprehensive model is theoretically formulated, it cannot be free from the many difficulties that would arise, such as quality and availability of data used and problems in statistical estimation procedures.

2) Behrman and Adams, Econometric Models of World Agricultural Commodity Markets

3. Projection Equations and Variables

The projection equations, which were formulated by the method mentioned above, and the variables used in these equations are as follows:

(Production)

$$CA = \underset{(-2.13209)}{122.138} + \underset{(2.24871)}{0.406149} * CA(-1) + \underset{(2.95079)}{6.24167} * HA \qquad \bar{R}^2 = 0.791515,\ D.W = 2.37176,\ S.E = 13.95$$

$$CL = \underset{(-2.58959)}{-34,7944} + \underset{(7.95937)}{1.43395} * YEAR \qquad \bar{R}^2 = 0.850037,\ D.W = 2.41595,\ S.E = 2.054$$

$$CP = \underset{(-3.97737)}{-23.2214} + \underset{(3.35996)}{0.107409} * PP(-1) + \underset{(12.6317)}{3.58325} * HP \qquad \bar{R}^2 = 0.953532,\ D.W = 1.66282,\ S.E = 3.07577$$

(Consumption)

$$SA = \underset{(-3.28983)}{-600.601} + \underset{(3.95437)}{1.17093} * PPA - \underset{(-1.78035)}{0.360401} * PA \qquad \bar{R}^2 = 0.677241,\ D.W = 2.35138,\ S.E = 12.2751$$

$$SL = \underset{(-5.89508)}{-131,263} + \underset{(9.09713)}{2.71604} * YEAR \qquad \bar{R}^2 = 0.881412,\ D.W = 2.10083,\ S.E = 3.40411$$

$$SP = \underset{(-1.93943)}{-143.484} + \underset{(2.25127)}{0.562427} * SP(-1) + \underset{(2.0043)}{0.145525} * PPP \qquad \bar{R}^2 = 0.865939,\ D.W = 1.98626,\ S.E = 8.14922$$

(Cultivated Area)

$$HA = \underset{(-1.44716)}{-7.04347} + \underset{(8.77763)}{0.588074} * YEAR \qquad \bar{R}^2 = 0.835249,\ D.W = 2.04884,\ S.E = 1.19347$$

$$HP = \underset{(-1.69543)}{-12.9113} + \underset{(3.84688)}{0.823066} * HP(-1) + \underset{(1.70719)}{0.241995} * YEAR \qquad \bar{R}^2 = 0.797098,\ D.W = 1.91418,\ S.E = 1.51723$$

Variables

		Unit
CA	Production in the developed countries	million MT
CL	Production in the developing countries	"
CP	Production in centrally planned economies	"
SA	Consumption in the developed countries	"
SL	Consumption in the developing countries	"
SP	Consumption in centrally planned economies	"

HA	Cultivated area in the developed countries	million ha
HP	Cultivated area in centrally planned economies	"
PA	Import price in the developed countries	$/MT
PP	Import price in centrally planned economies	"
PPA	Population of the developed countries	million persons
PPP	Population of centrally planned economies	"
Year	Fiscal year, example: fiscal 1969=69	
CA(-1)	Production in the developed countries in the previous fiscal year	million MT

4. Examination of Validity of Regression Equations

To test the validity of the above equations, $\overline{R}^2$, D.W. (Durbin & Watson statistics) and S.E. (standard error) were examined, and the actual value and the projected value were compared by means of a graph as shown in Figs. E-1 to E-6.

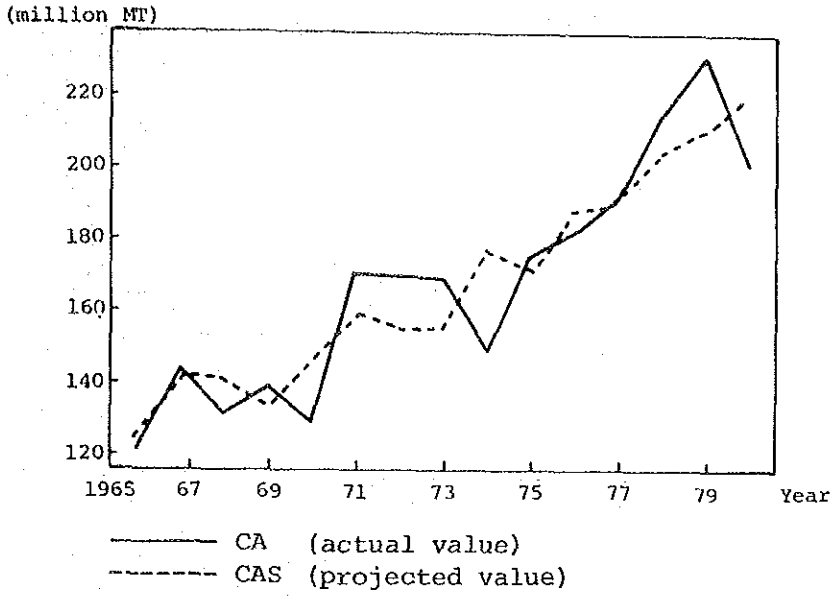
II. Exogenous Variables

The import price used in the regression equations is an exogenous variable. This exogenous variable was estimated from past movements of import prices in the developed countries and the countries with centrally planned economies. Looking at these movements in the period 1965-1980, the trend is very different before and after 1972. Up until 1972, import prices fluctuated relatively little. After 1972, imports rose quickly and quantities fluctuated. As described above, this was the result of a shift in the world maize market brought about by the fluctuating harvests due to abnormal weather conditions from 1972 to 1974.

Since the annual rate of increase in the import price of maize in both the developed countries and centrally planned economies was 3-4% after 1974 (when the harvest fluctuations mentioned above began to stabilize), the annual rate of increase in the import price of maize for the period 1981-2000 was assumed to be 3.5%.

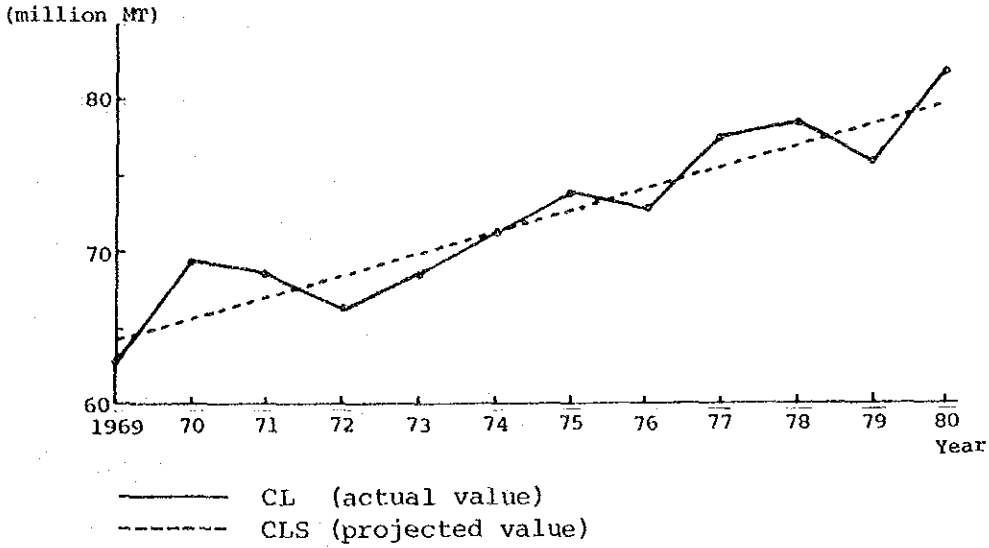
The population growth rate after 1980 was taken as 0.68% in the developed countries and 1.2% in the centrally planned economies.

Fig. E-1 Production in the Developed Countries



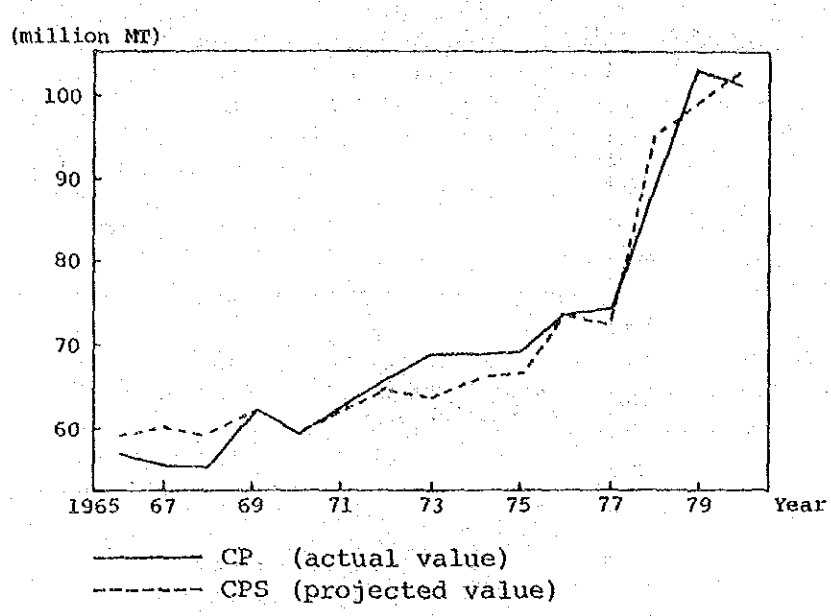
Source: The Study Team

Fig. E-2 Production in the Developing Countries



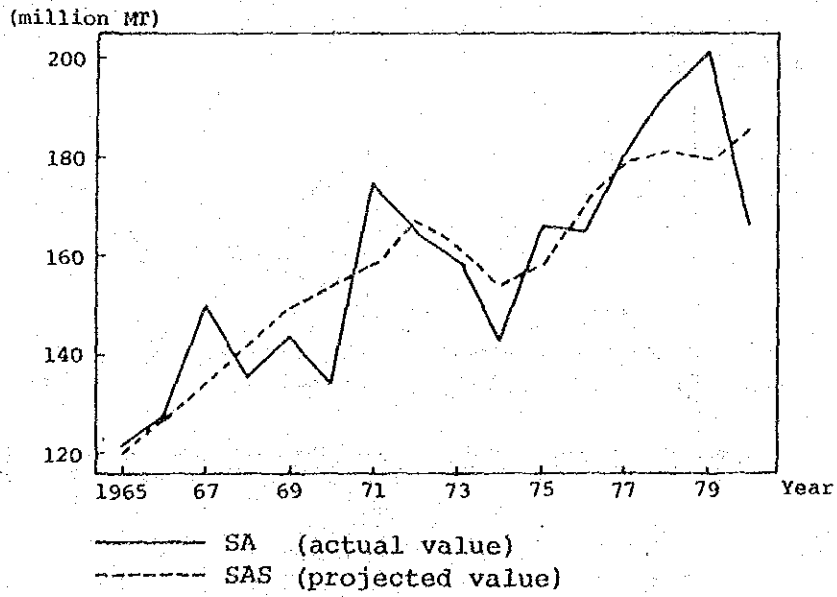
Source: The Study Team

Fig. E-3 Production in Centrally Planned Economies



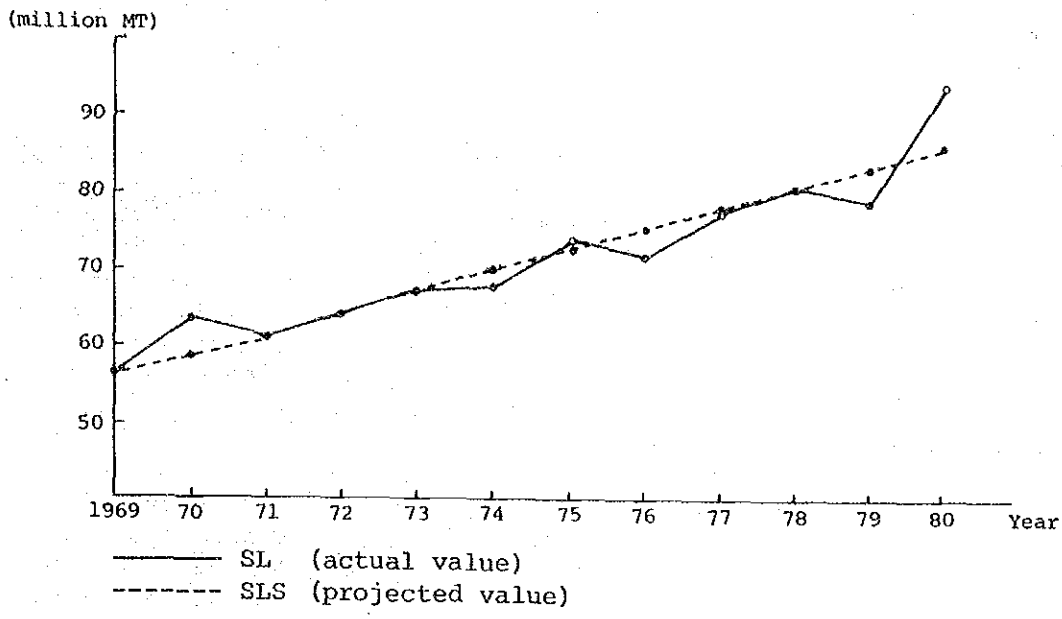
Source: The Study Team

Fig. E-4 Consumption in the Developed Countries



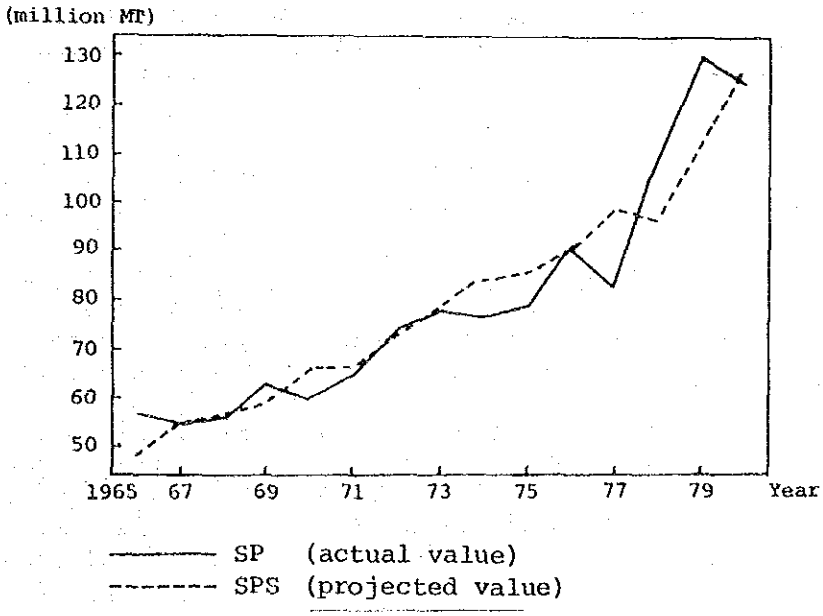
Source: The Study Team

Fig. E-5 Consumption in Developing Countries



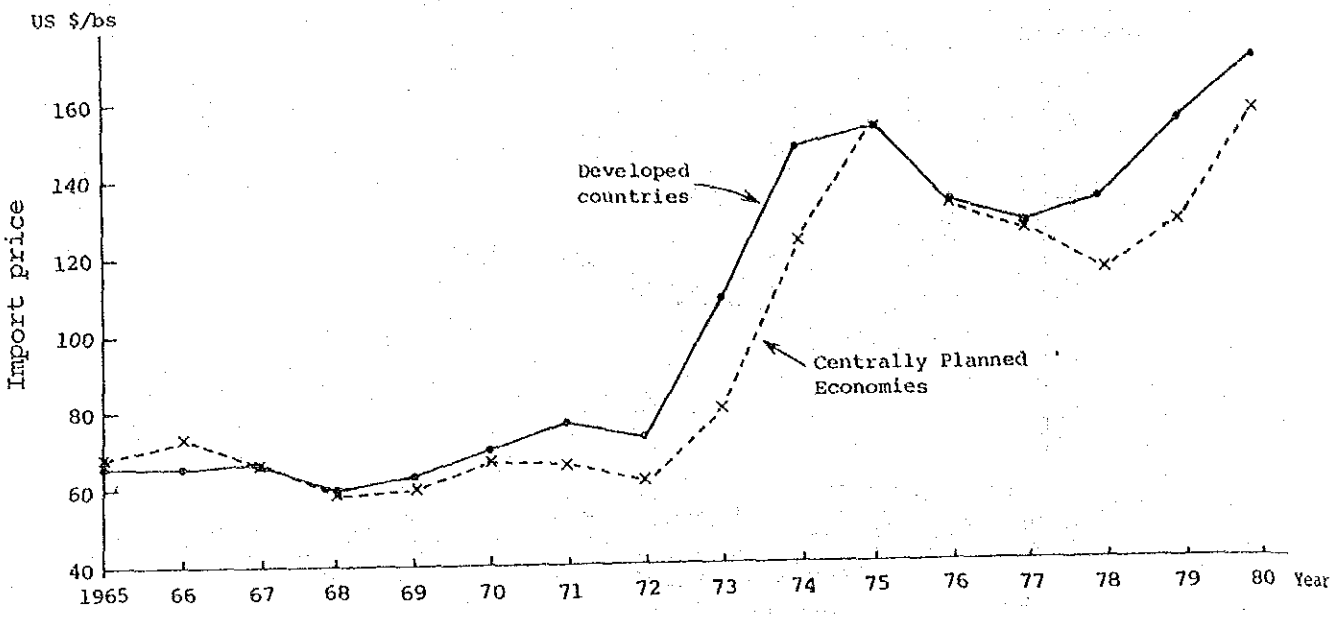
Source: The Study Team

Fig. E-6 Consumption in Centrally Planned Economies



Source: The Study Team

Fig. E-7 Import Price by Country Grouping



Source: The Study Team

III. Projection Results

Using the above equations and exogenous variables, production and consumption levels for maize in 1990 and 2000 were projected (see following Table).

Table E-1 Projected Results

(million MT)

	Production				Consumption			
	Developed countries	Developing countries	Centrally planned economies	Total	Developed countries	Developing countries	Centrally planned economies	Total
1990	272.4	94.3	155.0	521.7	222.2	113.2	173.6	509.0
2000	334.2	108.6	214.4	657.2	252.8	140.3	237.2	630.3

It should be kept in mind that not every country was classified into one of the three groupings. Countries such as Canada, Australia, and New Zealand were not included, and therefore, the totals for the three country groupings do not equal the world total.

IV. Examination of Results

According to the results of the projections as shown in Table E-1, production will continue to exceed demand in the developed countries, thereby creating surpluses. In the developing countries and countries with centrally planned economies, production will not be able to satisfy demand. As for the overall balance of supply and demand in the three groupings, production will exceed consumption by 13 million tons in 1990, and 27 million tons in 2000.

It is felt that the projected values for production and consumption in the developed countries group and and centrally planned economies group shown in Table E-1 should be re-examined.

Although the values for consumption in both groupings appear to be valid in comparison with past data, the projections for production in both of those groupings reflect a growth rate that is possibly unattainable. The average annual growth rates of production until the year 2000 are 2.2% in developed countries and 3.8% in the centrally planned economies.

Among the developed countries, the United States is the largest maize producing and exporting country in the world. The United States has a large surplus of maize and maintains a policy of setting aside 10% of acreage as per the 1982 Agricultural Plan. In the regions where granaries are concentrated, increasing erosion of the surface soil and finite water resources are major problems. Therefore, soil conservation by introducing grass to the setting aside areas or laying land fallow is being encouraged. Although there still are vast areas suitable for cultivation in the southern states, utilization of these lands has been limited due to the low productivity of the land. Taking these circumstances into consideration, it was decided to take the growth rate of production in the developed countries as 2%. Moreover, since over-production causes a drop in price due to market forces, excessive surpluses are unlikely to occur.

The maize cultivation areas in the centrally planned economies have been extended as far north as possible (in terms of climatic conditions) to cope with the rapid growth in demand for livestock products in the East European countries. Consequently, production levels in these countries fluctuate depending on the weather in any one season, as already mentioned above. In China, the rapid population

growth caused an increase in the demand for maize. Accordingly, China increased its imports to compensate for the shortage in domestic production, while at the same time adopting measures to increase domestic production. After taking these factors into consideration, the growth rate of production in the centrally planned economies was set at 3.5%. As a result of this revision, the demand and supply balance in the year 2000 is turned out to be 4.5 million tons of supply surplus as shown in Table E-2.

The projections were compared with the forecast values for supply and demand in the year 2000 produced by other organizations, as shown in the following Table:

Table E-2 Comparison of Projected Values for Supply and Demand of Maize, Coarse Grains and Grinas in 2000

(million MT)

Materials	Product	Developed countries	Developing countries	Centrally planned economies	Total or world total
Production					
Present report	Maize	323.0	108.6	203.2	634.8
Estimates of world supply and demand for food by the Ministry of Agriculture, Forestry and Fisheries	Coarse grains	523.9	269.3	334.0	1,127.1
Global 2000	Grains	739.7-679.1	735.0-740.6	722.0	2,196.7-2,141.7
Toward 2000	Maize		163.0		
Consumption					
Present report	Maize	252.8	140.3	237.2	630.3
Estimates of world supply and demand for food by the Ministry of Agriculture, Forestry and Fisheries	Coarse grains	445.9	284.7	378.8	1,109.3
Global 2000	Grains	648.4-610.8	789.8-772.4	758.5	2,196.7-2,141.7
Toward 2000	Maize		174.6		
Balance of supply and demand					
Present report	Maize	70.2	-31.7	-34.0	4.5
Estimates of world supply and demand for food by the Ministry of Agriculture, Forestry and Fisheries	Coarse grains	78.0	-15.4	-44.8	17.8
Global 2000	Grains	91.3-68.3	-54.8--31.8	-36.5	0
Toward 2000	Maize		-11.6		

Notes:

1) Estimates of world supply and demand for food, produced by the Ministry of Agriculture, Forestry and Fisheries, Government of Japan, assume the following conditions: supply and demand at equilibrium price, normal harvests, no marked fluctuation in the price of fertilizer, continuation in the United States of the policy to set aside land for future use. This case study was taken as the basic model for the present study. Coarse grains examined in this survey include corn, barley, sorghum, oats, rye, millet and mixed grains.
2) Global 2000, in The Global 2000 Report to the President, a special study report by the U.S. Government is also used as a comparative study.
3) Toward 2000, Scenario B (a scenario with an intermediate growth rate —— a comparatively low growth rate to be achieved both in agriculture and the overall economy) from FAO's Agriculture: Toward 2000.
4) The balance of supply and demand is calculated by subtracting consumption from production.

F. SOME COMMENTS ON DEVELOPMENT OF MAIZE PLANTING IN THE CARAJAS REGION OF BRAZIL

As described in the previous Section, the developed countries with sufficient capital and high-level technology are producing more than is required for domestic consumption and are expected to continue supplying other countries, even if production slows down. The United States is the largest supplier of maize to the world, thereby assuming the role of the world's granary. To export maize, the United States has invested heavily in the development of harbor facilities at ports in the Gulf of Mexico, on the East Coast, in the Five Lakes region and on the West Coast.

In the production and collection regions, country and terminal elevators have been constructed to facilitate the shipment of maize. The United States is expected to continue investing in soil conservation, irrigation facilities, and in the development of production technology. Consequently, it is anticipated that production per unit area will further increase alleviating any rises in the cost per unit of production.

In the developing countries and countries with centrally planned economies, it is expected that demand for maize will continue to exceed production due to population growth and increase in demand for livestock products. Deficits will therefore be overcome by importing maize from the developed countries.

Assuming these international conditions, the feasibility of developing the Carajas region in Brazil for maize production is briefly commented on below.

Over the past few years, Brazil has been importing approximately 1.5 - 1.6 million tons of maize annually. From the economic point of view, it would seem appropriate for Brazil to invest, to begin with, in the further development of the existing cultivated maize area in order to raise the production per unit area.

To develop new cultivation areas, a thorough assessment should be made of the requirements for improving the infrastructure (e.g., roads for transporting produce and materials necessary for production, irrigation and drainage facilities) and a produce distribution system should be established. Port, storage, and loading and unloading facilities in production and distribution areas must also be investigated. All these are important considerations in the development of the Carajas region.

References

1. FAO, Production Yearbook

2. FAO, Trade Yearbook

3. USDA, Foreign Agriculture Circular

4. USDA, Cost of Producing Selected Crops in the U.S.

5. Ministry of Agriculture, Forestry and Fisheries, the Government of Japan, Food Demand and Supply Forecast with the World Food Supply and Demand Model (in Japanese), March 1982

6. Special Study Report by the U.S. Government, The Global 2000 Report to the President

7. FAO, Agriculture: Toward 2000

8. Japan External Trade Organization (JETRO), Current Agricultural Policies in the Major Advanced Countries (in Japanese)

9. National Institute for Research Advancement, Agriculture in Japan in the International Age, Materials Section (in Japanese)

10. Mix Feed Supply Stabilization Organization, Feed - Funds and Stockpiles, Nos. 13-15 (in Japanese)

11. Japan FAO Association, Information on Demand and Supply of Major Grains, Nos. 3-4 (in Japanese)

12. Behrman and Adams, Econometric Model of World Agriculture Commodity Markets

13. Japan Feed Trade Association, Study Report on Maize, Milo, Meat, Bone, Meal in Argentina and Brazil (in Japanese)

14. Toshio Sasaki, Food Strategy in Major Advanced Countries (in Japanese), Ienohikari Kyokai

15. The U.S. Government, 1970 Agriculture Act

16. Ibid., 1973 Agriculture and Consumer Protection Act

17. Ibid., 1977 Food and Agriculture Act

18. Ibid., 1981 Agriculture and Food Act

[2-2] SOYBEAN MEAL

A. INTRODUCTION

Soybean meal is very important as a protein feed for livestock, and although various kinds of materials such as vegetable oilseed meals, animal products (animal fats, meat-bone meal, etc.) are used as protein feed, the most prominent one is soybean meal.

Until the early 1960s, oilseed meal was evaluated differently than it is now; i.e., the oil was considered to be the main product and the meal was the byproduct. At that time, the protein feedstuffs mainly consisted of sunflower and peanut. Crushers paid their primary attention to the higher oil content of these crops and used the meal resulting from the oil extraction as a byproduct for protein feed.

From the mid-1960s, the demand for protein feedstuffs from the compound feed producers increased, and thus the production of soybean meal in the United States and fish meal in Peru increased.

The reason for the increased demand for soybean meal was that the hog raising and poultry farming industries, which are the main source of demand for the feed grains and protein feedstuffs, developed improved breeds with higher productivity, and the number of animals increased against a background of increasing demand for livestock products.

The total world production of soybean meal stood at 58.749 million tons in 1981/82, with the soybean producing countries such as the United States, Brazil and China accounting for 60% of this amount and the soybean importing countries such as the EC countries and Japan accounting for 21%. Consequently these few countries share 80% of the worldwide production.

Since the supply sources for the importing countries are mainly the United States, Brazil and Argentina, in geographical terms it follows that North and South America are the principal soybean meal supply sources.

Soybean meal is a commodity whose demand centers on the livestock industries of the developed countries. The scale of demand is increas-

ing in keeping with the increased production of eggs and edible meats such as pork and chicken, and the developed country group including North America, Western Europe and Japan accounted for 65% of world consumption, i.e., 60.19 million tons, in 1981/82.

In the East European countries, especially the USSR, the low consumption level of protein feedstuffs is one of the reasons blocking an increase in meat production. Because there is a limit to the increase of their own protein feed production, the demand for imported soybean meal is increasing in these countries, so that meat production can be increased. In the future, this region has a large potential for increased demand.

Moreover, in Taiwan and Singapore in the Far East and the petroleum producing countries in the Middle and Near East, where intensive livestock production for meat is making progress, consumption shows a high rate of growth accompanying progress in industrialization and improved income levels.

The total quantity of soybean meal exported in 1980 was 17.916 million tons, accounting for 70% (based on actual weight) of the total quantity of vegetable oil meals exported.

The shares of overall exports held by the main exporting countries in the world are 76% for the United States and Brazil, and 18% for the EC countries (the Netherlands and the Federal Republic of Germany account for 82% of total EC exports). These 4 countries hold a combined share of more than 90%; hence the export of soybean meal is dominated by a small number of countries.

Imports of soybean meal stood at 17.752 million tons in 1980, an increase to a little more than 3 times the level of 10 years before.

The shares of the main importing countries of total world imports are 53% for the EC and 26% for Eastern Europe. Europe, as a whole, accounts for 82% of world imports.

In Eastern Europe in particular, the quantity of imports increased by a factor of 8 over this 10-year period, and in Asia, especially in the countries where industrialization is progressing, the level of imports increased to 9 times the previous level.

The price of soybean meal stood at around US$70 (USA wholesale price) until the early 1970s, against a background of the large stock held by the United States. In 1973, however, when there was an international shortage in the supply of protein feed, the price rose to US$229, the highest level ever recorded, and although it later temporarily fell below US$200, the price has since remained high.

Naturally, the import price has followed a similar trend.

B. PRODUCTION

The world production of soybean meal stood at one half the level of vegetable oil meal production in the 1960s, but as the production of soybeans increased, soybean meal gradually rose in importance as a protein feed and now accounts for 70% of total protein feed production including fishmeal (Reference Table B-1).

The total volume of production of soybean meal throughout the world in 1981/82 was 58.749 million tons, double the level of production in 1971/72, which stood at 28.911 million tons (Reference Table B-2).

Soybean meal production can be basically divided into two types; production in the soybean producing countries and that in the soybean importing countries.

The quantities of soybean meal production and the shares held by the main soybean producing countries of world production are 22.365 million tons (38.1%) for the United States, 9.809 million tons (16.7%) for Brazil and 3.336 million tons (5.7%) for China, and these three countries account for 60% of total world production.

The production of soybean meal by the main soybean importing countries is 9.261 million tons (15.8%) for the EC and 2.743 million tons (4.7%) for Japan, and these two regions share 21% of total world production.

If soybean meal production is viewed in terms of economic regions, the developed countries group, including the EC and other West European countries, North America (USA, Canada), Japan and Australia produced 39.241 million tons and accounted for 65% of world production in 1981/82.

The developing countries, including the soybean producing countries such as Brazil and Argentina where soybean production is greatly increasing and the Asian countries where the production of soybean meal is increasing, hold a 25% share of world production, in comparison with 20% in 1976/77.

The planned economy countries such as the USSR, the East European countries and China produced 4.744 million tons in 1981/82, accounting for only 8% of world production (Reference Table B-3).

Hence, the production of soybeans, the material for soybean meal, is limited to a few countries only. Moreover, the production of meal by the crushing of imported beans is concentrated to the developed countries such as the EC and Japan, and therefore the production and utilization of the meal is also limited to particular countries.

The characteristic trends in the producing countries are described below.

1. United States

Protein feed production in the United States consists mainly of the production of soybean meal, which holds a share of more than 90% of the vegetable oil meal produced and more than 70% of the production of protein concentrates, including fish meal and animal products (meat and milk products).

The production of soybean meal in the United States had already reached 5.7 million tons in the early 1950s, and increased to the level of 10 million tons in the early 1960s. Since 1977, it has remained at the level of 20 million tons or a little higher. Although there is some fluctuation from year to year, the United States has a high level of domestic demand, which consumes more than 70% of the amount of soybean meal produced. The United States is the largest producer of soybean in the world, accounting for two-thirds of the total world production (Reference Table B-4 and B-5).

The share held by the United States of total world production of soybean meal was 53% in 1971/72, but this decreased to 38% in 1981/82 because both Brazil, a new producer, and also the EC increased production. While the production increase in the United States itself in these 10 years was only 45%, total world production increased by 103%.

2. Brazil

The production of soybean meal in Brazil stood at only 0.168 million tons in 1965, but reached the 1 million ton level in 1970/71 and steeply increased to 1.493 million tons in 1971/72. At that time its share of world production was only 5%.

However, in 1975/76 production increased to the 5 million ton level and subsequently to the 10 million ton level, an increase of 6.6 times over this 10-year period, and Brazil's share of world production increased to 17%, making it the second-largest producer next to the United States.

This is because Brazil encouraged the production of soybeans through various policies and gave favorable tax treatment to the domestic oil extraction and meal production industries, resulting in soybean production greatly increasing and the production of meal also increasing proportionately.

3. EC

The EC, a region with a large consumption of protein feeds, imports soybeans and produces the meal domestically.

Soybean meal production increased from 4.709 million tons in 1971/72 to a peak of 9.732 million tons in 1979/80, but subsequently production decreased and the peak level has not yet been regained.

The production increase from 1971/72 to 1981/82 showed a steep rate of growth, at 97%.

More than half of the soybean meal production in the 10 countries of the EC is produced by the Federal Republic of Germany and the Netherlands.

The share of production held by the Federal Republic of Germany over the past 6 years (1976/77 - 1981/82) stands at 34%, while that of the Netherlands is 23%, these two countries holding a combined share of 57% of total EC production.

Next in order of rank, Italy holds a share of 13% and Belgium-Luxemburg 10%, and these 4 countries together account for 80% of EC production.

4. Other West European Countries

The production of other West European countries, including Finland, Norway, Portugal, Spain and Switzerland, increased to 234% of the previous level, from 1.389 million tons in 1971/72 to 3.256 million tons in 1981/82, about 80% of which is accounted for by Spain.

5. *Eastern Europe and the USSR*

Soybean meal production in the East European countries doubled, from 0.475 million tons in 1976/77 to 0.962 million tons in 1981/82, and 70% of the production in the 7 East European countries is shared by Romania and Yugoslavia.

Soybean meal production in the USSR fluctuates considerably from year to year. The peak of production in the past was 1.557 million tons in 1976/77, but in 1977/78 it decreased by almost half to 0.844 million tons, and subsequently a level of 1.2 million tons has been maintained.

The vegetable oil meal produced in the USSR consists mainly of two types, i.e., sunflower seed and cottonseed, followed by soybean, linseed, rapeseed, etc.

These domestic materials limit the range of different types of meals that can be supplied, and consequently the production of feedstuffs of low protein content is unavoidable. In addition, when there is crop failure due to meterological disasters, or when policies dictate an increase in the production of livestock products, protein feedstuffs in the form of either finished products or materials must be sought from abroad.

In such a case, soybean is naturally selected from among the various vegetable oil meals because it is most widely traded internationally and has a high meal yield.

Although there are some unstable factors as mentioned above, past production of soybean meal has shown an increasing trend, and it is expected to further increase in the future.

6. Japan

Japan is producing the meal itself, making it the fourth largest soybean meal producer behind the United States, Brazil and the Federal Republic of Germany.

Production increased by 44%, from 1.9 million tons in 1971/72 to 2.743 million tons in 1981/82.

In 1971/72, almost all of the domestic demand for soybean meal was met by the domestic crushing industry, but recently the share of domestic meal production has decreased as a result of increased demand for imported oils and the change in the range of oil products.

7. Asia Region

Soybean meal production in Asia increased a little more than twofold, from 0.649 million tons in 1976/77 to 1.354 million tons in 1981/82.

The meal in this region is produced by the crushing of imported soybean, and most of the production centers on Taiwan, although recently the level of production has increased greatly in the Republic of Korea, India and West Malaysia.

8. China

Although it is difficult to obtain the exact trends of soybean meal production in China, it is known that the level of production has repeatedly fluctuated, between a level of 1.725 million tons in 1971/72 and the level reached in 1981/82 of 3.336 million tons (based on Oil World).

9. Argentina

Soybean meal production in Argentina was only 36,000 tons in 1971/72, but as the production of soybeans showed a sharp growth, the crushing capacity also increased, and the production of meal reached 1.043 million tons in 1981/82.

Reference Table B-1 World Production of Oil Meals

(1,000 MT)

	1965	1966	1967	1968	1969	1970
Oilseed meal	43,015	44,670	45,725	46,445	48,675	54,360
Soybean meal	20,300	22,345	23,715	23,820	25,885	31,440
Other meals	22,715	22,325	22,010	22,625	22,790	22,920
Fish meal	3,750	3,820	4,440	5,275	4,760	4,815
Total	46,765	48,490	50,165	51,720	53,435	59,175

Source: Oil World

Reference Table B-2 World Production of Soybean Meal by Major Countries

(1,000 MT)

	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
EC	4,709	5,469	6,875	6,427	7,028	6,954	8,350	9,015	9,732	8,201	9,261
Other Western Europe	1,389	1,144	1,433	1,763	1,951	1,863	2,163	2,218	2,955	2,838	3,256
USA	15,444	15,158	17,849	15,152	18,828	16,772	20,295	22,094	24,590	22,056	22,365
Brazil	1,493	1,924	2,518	3,919	5,102	5,980	7,655	7,511	8,209	10,688	9,809
Mexico	-	255	788	432	634	589	829	838	1,120	1,216	1,104
Argentina	36	98	157	320	400	389	503	567	553	737	1,043
Japan	1,900	2,141	2,044	1,987	2,090	2,172	2,470	2,600	2,704	2,702	2,743
Taiwan	-	409	410	461	534	517	649	824	750	808	843
USSR	215	781	158	77	1,377	1,557	844	1,214	1,264	1,231	1,357
China	1,725	1,779	2,151	1,822	1,796	1,503	2,031	2,106	2,377	2,472	3,336
Other countries	2,000	1,612	1,658	1,818	2,068	1,835	2,405	2,825	3,696	3,527	3,632
World	28,911	30,770	36,041	34,041	41,808	40,131	48,194	51,812	57,950	56,476	58,749

Source: Oil World

Reference Table B-3 Soybean Meal Production

(1,000 MT)

		1976/77	77/78	78/79	79/80	80/81	81/82
Developed countries	EC	6,954	8,350	9,015	9,732	8,235	9,125
	Other Western Europe	1,863	2,163	2,218	2,967	2,840	3,037
	USA	16,772	20,295	22,094	24,590	22,056	23,573
	Canada	538	576	586	769	677	760
	Japan	2,172	2,470	2,600	2,704	2,563	2,632
	Australia	54	51	70	89	97	114
	Total	28,353	33,905	36,583	40,851	36,468	39,241
Planned economy countries	Eastern Europe	475	720	850	1,165	969	962
	USSR	1,557	844	1,214	1,264	1,271	1,372
	China	1,503	2,031	2,106	2,389	2,400	2,410
	Total	3,535	3,595	4,170	4,818	4,640	4,744
Developing countries	Mexico	604	849	859	1,164	1,378	1,394
	Brazil	5,980	7,655	7,511	8,209	11,298	10,745
	Argentina	389	503	567	535	727	988
	Total	6,973	9,007	8,937	9,908	13,403	13,127
	Asia	1,035	1,219	1,548	1,602	1,749	1,963
Other countries		249	489	589	767	764	840
World		40,145	48,215	51,827	57,946	57,024	59,915

Source: Oil World, Feb. 19, 1982

Reference Table B-4 Production of Protein Concentrates in USA

(1,000 ST)

	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79
Vegetable meal	22,187	21,343	21,695	24,414	21,301	25,100	23,243	27,816	29,495
Soybean meal	18,035	17,024	16,709	19,674	16,702	20,754	18,489	22,371	24,288
Cottonseed meal	1,762	1,842	2,267	2,172	1,851	1,238	1,643	2,083	1,913
Linseed meal	354	405	361	287	232	232	210	242	216
Peanut meal	177	172	181	130	151	311	204	100	108
Copra meal	99	100	100	-	-	-	-	-	-
Gluten feed and meal	1,760	1,800	2,077	2,151	2,365	2,565	2,697	3,020	3,070
Fish meal	351	348	370	375	347	375	345	425	358
Animal products	2,622	2,514	2,412	2,516	2,314	2,339	2,541	2,693	2,714
Total	25,160	24,205	24,477	27,305	23,962	27,814	26,129	30,934	32,667

Source: Soybean Digest Blue Book

Reference Table B-5 Supply and Disappearance of Soybean Meal in USA

(1,000 MT)

Oct./Sept.	Stocks	Production	Total supply	Exports	Domestic disappearance
1950-51	35.2	5,896.8	5,964.8	18.1	5,748.2
1955-56	37.2	6,545.8	6,583.0	400.4	6,071.3
1960-61	82.8	9,451.7	9,534.5	589.7	8,867.4
1961-62	77.5	10,341.9	10,419.4	1,063.7	9,262.1
1965-66	105.7	12,901.0	13,006.7	2,656.1	10,219.1
1970-71	137.0	18,035.2	18,172.2	4,620.6	13,405.6
1971-72	145.8	17,024.2	17,170.0	3,868.2	13,110.0
1972-73	191.7	16,708.8	16,900.5	4,796.8	11,920.5
1973-74	183.2	19,674.4	19,857.6	5,584.0	13,766.3
1974-75	507.3	16,701.5	17,208.8	4,349.2	12,501.3
1975-76	358.3	20,754.2	21,112.5	5,206.0	15,551.6
1976-77	354.9	18,488.1	18,843.0	4,613.9	14,000.8
1977-78	228.3	22,372.6	22,600.9	6,080.0	16,210.6
1978-79	242.9	24,354.1	24,597.0	6,609.8	17,719.8
1979-80	267.4	27,105.1	27,372.5	7,931.9	19,215.0
1980-81	225.6	24,312.1	24,537.7	6,778.2	17,596.8

Source: Soybean Digest Blue Book

C. CONSUMPTION

The vegetable oil meals used as protein feed comprise 9 major types, namely, soybean, cottonseed, peanut, sunflower, rapeseed, sesame, copra, palm kernel and linseed meals.

The world consumption of these vegetable oil meals in 1981/82 was 92.55 million tons, and of this amount, soybean meal accounted for as much as 65% (60.19 million tons).

Next in order of rank is cottonseed meal, at 12% (11.05 million tons), rapeseed meal, at 7.8% (7.20 million tons), sunflower seed meal, at 6.4% (5.91 million tons), and peanut meal, at 4.1% (3.81 million tons) (Reference Table C-1).

Until the middle of the 1960s, the share of consumption held by vegetable oil meals other than soybean meal was 50%. However, among these meals, with the exception of rapeseed meal which shows a significantly increased rate of supply, the rate of growth for both cottonseed meal and sunflower meal has been somewhat slow, and peanut meal is unstable in supply and shows a decreasing trend. Consequently, a considerable change is occurring in the composition of vegetable protein feedstuffs, with soybean meal showing a marked increase in consumption.

The consumption of vegetable oil meals in 1971/72 was 56.90 million tons, with that of soybean meal in the same period standing at 31.42 million tons, a share of 55%.

The consumption of vegetable oil meals reached a level of 92.55 million tons in 1981/82, and during the approximately 10 years prior 1981/82 the consumption of soybean meal almost doubled with an index of 192%, while vegetable oil meal consumption as a whole increased to 163%.

The only other oilseed meal showing the same high growth was rapeseed meal, while the index shown by cottonseed meal, which has the second highest share of consumption after soybean meal, was 125%. The index for sunflower seed meal was 142%, while peanut meal showed a decreased rate of consumption from its level in 1971/72.

Other meals such as sesame seed meal, linseed meal and copra meal showed decreased consumption or remained stagnant at the same level, and although palm kernel showed an increase of 51%, the quantity is small at 0.83 million tons. Its palatability for domestic animal is low, and it is only used as feed for dairy cattle.

The consumption of fish meal showed only a slight increase in this 10-year period. The reason for this is that production was low in Peru,

the main supplier, due to abnormal ocean currents, and this was aggravated by the fact that there are only a limited number of supplying countries.

For the above reasons, soybean meal has the greatest stability of supply as a protein feed, and the scale of consumption is so large that there is little scope for other oil meals to replace it.

Reasons cited for the increase in soybean meal consumption include, in addition to the quantitative factor that the supply of other vegetable oil meals could not meet the increasing demand, a nutritive factor that sunflower seed meal and peanut meal were found to contain an insufficient level of amino acids, resulting in soybean meal gaining a qualitatitive advantage also.

On the other hand, from the latter half of the 1960s onward, the use of maize as a feed increased, and with an oversupply of wheat in Europe making it possible to use it as a feed, the compound feed producers started to use soybean meal in large quantities to be mixed in the high-protein and high-energy feeds produced with these coarse grains as basic ingredients.

In terms of the demand for feed, hog raising and poultry farming, whose rate of increase in production greatly exceeds that of the ruminants (cattle, sheep) which have a greater dependency on roughage, has expanded in scale, resulting in increased demand for the feed grains and protein feedstuffs.

With regard to feed consumption in Europe, the share of roughage and root crops stood at 85% in 1950, against 15% for the concentrates (cereals, oil meal, etc.). However, the share held by the concentrates gradually increased, to 30% in 1960 and 40% in 1970, reaching 45% in 1973 in spite of an international shortage in the supply of feed grains and protein feed. Especially in the EC countries, the trend toward using high-protein feedstuffs is strong.

As the production scale increased in the hog and poultry sectors, high-protein and high-energy feedstuffs were required for raising high-productivity livestock, including the dissemination of hybrid layers and broilers and the breed improvement of hogs to give a shorter fattening period. These qualitative changes in stock raising, i.e., the dissemination of high-productivity breeds, accelerated the changes in the composition of the feed.

On the side of the compound feed producers, the compound feed industry developed and increased production and the modernization of factories were promoted. Computerization was introduced, and the correct nutrient composition and the material price elements were incorporated in mixing the materials. As a result, the mixing process was simplified and the selection of materials advantageous in terms of production cost became eaiser.

In addition, synthetic methionine and lysine were produced on a large scale and became available at a cheap price, and by correcting what had been to date considered a limiting factor in their use as a nutritious feed for poultry farming, the consumption of soybeans was increased. It is thought that two-thirds of the feed consumption in the OECD countries is for meat livestock raising and poultry farming.

The share held by soybean meal as a protein feed in the developed countries shows a much higher rate than that for the world as a whole.

The percentage share of consumption of the various oil meals in the OECD countries in 1977 is shown below.

Soybean meal	75.2%
Cottonseed meal	5.9
Rapeseed meal	2.9
Sunflower seed meal	2.5
Peanut meal	2.1
Copra meal	0.9
Palm kernel meal	0.3
Linseed meal	1.4
Sesame seed meal	0.1
Fish meal	7.5
Other oil meals	1.2
Total	100.0

As for the consumption of protein feeds (vegetable meals and fish meal) by main consuming countries in 1981/1982, the EC accounts for 24% of world consumption at 22.92 million tons, and if the 5.44 million tons consumed by the other West European countries is included, the share comes to about 30% of world consumption.

The United States holds a 20% share, at 19.09 million tons, while Japan's share is 5%, at 4.60 million tons. These developed countries together account for 54% of total world consumption.

The share of consumption of the various planned economy countries is 7% (7.14 million tons) for the East European countries, 7% (6.63 million tons) for the USSR and 9% (9.18 million tons) for China, totaling a combined share of only 24% of overall world consumption (Reference Table C-2).

In the USSR and the East European countries the rate of use of protein feeds is very low, and this impedes improvement of the performance of milk, meat and egg production, and especially constitutes a detrimental factor in increasing meat production. On the other hand, the consumption of protein feeds is increasing in the developed countries in the northern hemisphere.

Among the main soybean meal consuming countries, the United States had the largest consumption in 1981/1982 at 16.474 million tons (27.3% share), followed by the 9 EC countries with 16.107 million tons (26.7%), Japan with 2.893 million tons (4.8%), Brazil with 2.677 million tons (4.4%), the USSR with 2.552 million tons (4.2%) and China with 2.304 million tons (3.8%). These countries hold a combined share of 67% of total world consumption (Reference Table C-3).

The total consumption of the West European countries excluding the EC countries is 3.798 million tons, representing 6.3% of the world total. When added to the figure for the EC countries, the combined consumption reaches 19.906 million tons, accounting for one third of world consumption.

The so-called developed country group, including North America (USA, Canada), the West European countries and Japan, consumes 39.272 million tons, and accounts for 65% of world consumption.

Consumption in the East European countries totals 5.616 million tons (9.3%), and when this is added to the combined consumption of the other planned economy countries including the USSR, China and Cuba, the total becomes 10.617 million tons, which represents 18% of world consumption.

Although consumption in the petroleum producing countries such as Iran, Iraq and Saudi Arabia is expanding, it is still only at a level of 0.373 million tons.

Consumption is also rapidly increasing in the Far East (the Republic of Korea, Taiwan, the Philippines, Indonesia, Singapore and West Malaysia), but the share held by these countries of world consumption is still only 3% (1.970 million tons).

In terms of the rate of increase of soybean meal consumption from 1971/1972 to 1981/1982, the United States, which is the largest consuming country, increased consumption to 138% of the previous level, while both the EC group and the other West European countries group increased consumption to a little more than double over the same 10-year period.

Since the United States is a large producer of soybeans, the percentage held by soybean meal of total vegetable oil meal consumption is high, and already in the middle of the 1960s the share reached 80%, with the balance consisting of cottonseed meal, peanut meal and linseed meal.

Since the consumption of the latter three products has tended to decrease, the increased demand for protein feed has been covered by soybean meal, and its share of the total consumption of vegetable oil meals increased greatly, to 85% in the early 1970s and 90% in the early 1980s (Reference Table C-4).

Thus it can be said that vegetable oil meal consumption in the United States depends heavily on soybean meal.

As mentioned above, the changes in the percentage shares of consumption held by the various products are significant, although the total consumption of all the vegetable oil meals increased by only 31% over the period from 1971/72 to 1981/82.

The consumption of feed grains in the United States in the same period remained virtually unchanged, from 132.1 million tons in 1971/72 to 134.9 million tons in 1981/1982. The United States is a large producer of feed grains, and the price movements of feed grains there are quite different from those in the EC (The price situation of the feed grains in the EC will be discussed later).

The consumption of feed grains in the United States during this 10-year period fluctuated between the peak of 147.8 million tons in 1972/73 and the lowest level of 106.5 million tons in 1974/75. If this is viewed in terms of the relationship between the cereals and protein feeds, the United States also seems to be increasingly dependent on protein feedstuffs for the increase of its livestock production (Reference Table C-6).

Ratio of Soybean Meal Consumption to Livestock Production

$$\left(\frac{\text{Soybean meal consumption}}{\text{Pork/broiler production}} \right)$$

1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1.00	1.03	0.98	1.07	1.10	1.25	1.09	1.23	1.21	1.19	1.15

Source: USDA, 1981 Agricultural Outlook

Since one third of the protein feed demand in the United States is for hog raising and 40% is for poultry farming, increases or decreases in protein feed consumption are closely connected with periods of expansion or decline in these two sectors.

Since the EC sets price levels and levies an import surcharge on imported cereals to protect grain production within the EC, the price of imported cereals is maintained at a higher level than the international price.

On the other hand, no import duties are imposed on soybeans and soybean meal since they do not compete with the products which the EC itself produces.

For this reason, the compound feed producers place great importance on material composition, so that they can quote a reasonable price which will be acceptable to the stock raisers who are very sensitive to the market price of the feed. Hence, the ratio of use of the feed grains, the basic feed for livestock, is reduced while the use ratio of substitute materials such as tapioca products and corn gluten, with low import duties, and of soybean meal, is increasing.

The average annual consumption in the EC of the coarse grains for feed over the 8-year period beginning from 1973/74 was 76 million tons, with the peak level of consumption reaching 2% above that amount in 1978/79 and the lowest level of consumption registering 2% below that amount in 1976/77 (Reference Table C-7).

The grain import system in the EC brought about significant changes in the material composition of the compound feeds, resulting in a large consumption of the protein feeds, mainly consisting of soybean meal as well as tapioca products (6 million tons imported in 1981) and corn gluten (2.8 million tons imported in 1981).

As a result of such price situation for the feed materials, the production of compound feed increased and high-protein feeds were supplied (Reference Table C-8).

In Brazil, the consumption increased by 10 times over the 10-year period. The reason for this was that soybean production greatly increased, and domestic meal production also increased because the domestic crushing industry was given favorable tax treatment. The production of broilers and pork, which requires the supply of protein feedstuffs, increased by 6 times and 1.7 times the previous levels respectively.

In Japan, livestock production started very late in comparison with crop production, and because the agricultural land area is small, the area of land available for livestock raising is limited. For this reason, domestic meat production is largely based on pork and chicken, whose production has significantly increased to reach a share of about 70%, while cattle raising, which depends on roughage as a feedstuff, shows a decreasing share.

Shell egg production in Japan has now reached the level of complete self sufficiency.

Therefore, the type of livestock raising which is carried out in Japan requires a large amount of feed grain and protein feed, and with the exception of fish meal, Japan depends on imports for most of its requirement of concentrates.

Although the demand for feed has increased in keeping with the rapid increase in consumption of livestock products, measures are

currently in effect for the restraint of production of eggs, pork and broilers so to stabilize the prices. This is partly because the national level of nutrition has reached a high point and partly because the economic recession has slowed down the increase in demand for livestock products.

Consequently, the increase in demand for feed has slackened, and with future growth in the consumption of livestock products also expected to be moderate, it is considered that the tempo of increase in consumption of soybean meal will also slow down accordingly.

The consumption of oilseed meals in the USSR was 6.8 million tons in 1981, 45% up from the level of 4.7 million tons in 1971, although this increase is lower than the world rate of increase at 56% over the same period.

The domestic production of oilseeds, mainly consisting of sunflower and cottonseed, is 11 to 12 million tons, although some fluctuation occurs from year to year. The production of all types of meals stands at a level of between 4.5 million tons and 4.9 million tons.

On the other hand, the consumption of soybean meal was only 0.215 million tons in 1971/72, but this increased remarkably to 1.377 million tons in 1975/76 and 2.522 million tons in 1981/82.

Since an increase in meal production using domestic materials cannot be expected to any great extent, the scale of consumption will depend on the scale of imports, including imported soybean. Furthermore, since the feed consumed in the USSR mainly consists of low-protein feedstuffs, it is considered that there is a large potential for an increase in consumption of soybean meal, although this may depend on the national economic conditions.

Reference Table C-1 World Disappearance by Types of Meal

(million MT)

	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
Soybean	31.42	33.11	37.47	37.73	44.61	43.72	51.04	54.40	56.50	56.44	60.19
Cottonseed	8.85	9.60	9.73	9.79	8.46	9.08	10.11	9.89	10.30	10.27	11.05
Peanut	4.11	3.49	3.54	3.60	4.44	3.84	3.67	4.00	4.07	3.14	3.81
Sunflower seed	4.15	3.98	4.72	4.41	3.94	4.02	5.10	5.34	5.95	5.85	5.91
Rapeseed	3.74	3.99	3.88	3.89	4.16	4.46	4.32	5.39	5.80	6.59	7.20
Sesame seed	0.82	0.77	0.80	0.77	0.72	0.72	0.78	0.82	0.82	0.55	0.63
Copra	1.57	1.48	1.21	1.46	1.81	1.60	1.66	1.51	1.67	1.68	1.65
Palm kernel	0.55	0.48	0.51	0.55	0.59	0.63	0.58	0.68	0.74	0.75	0.83
Linseed	1.71	1.49	1.29	1.17	1.25	1.37	1.46	1.47	1.50	1.43	1.28
Subtotal	56.90	58.40	63.15	63.37	69.97	69.44	78.72	83.50	87.35	86.70	92.55
Fish meal	5.47	4.10	3.82	4.61	4.58	4.22	4.22	4.62	4.65	4.34	4.65
Total	62.37	62.50	66.97	67.98	74.55	73.66	82.94	88.12	92.00	91.04	97.20

Source: Oil World

Reference Table C-2 World Disappearance of the Ten Major Oil Meals by Major Countries

(million MT)

	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
EC	13.95	14.27	13.56	14.27	16.60	17.16	19.00	21.30	22.30	21.06	22.92
Other Western Europe	3.40	3.33	3.54	3.56	4.03	4.25	4.68	4.66	4.80	5.04	5.44
Eastern Europe	4.78	5.13	5.95	5.91	6.31	6.36	7.03	7.10	7.30	8.37	7.14
USSR	4.76	5.04	5.30	5.45	5.76	5.98	5.63	5.78	6.05	6.20	6.63
USA	14.85	13.91	14.60	13.95	16.14	15.09	17.34	18.37	19.10	18.26	19.09
Brazil	0.72	0.80	1.15	1.34	1.36	1.67	1.99	2.39	2.75	2.55	2.47
China	6.69	6.62	7.58	7.32	7.54	7.57	7.82	8.57	9.08	7.21	9.18
India	3.25	2.58	3.19	3.55	3.29	2.77	3.71	3.95	4.10	3.48	4.19
Japan	3.45	3.95	3.69	3.42	3.64	3.94	4.31	4.44	4.45	4.49	4.60
Other countries	6.52	6.87	8.41	9.22	9.86	8.88	11.44	11.57	12.07	14.38	15.54
World	62.37	62.50	66.97	67.98	74.55	73.66	82.94	88.12	92.00	91.04	97.20

Source: Oil World

Reference Table C-3 World Disappearance of Soybean Meal by Major Countries

(1,000 MT)

	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
EC	7,251	7,939	8,914	9,395	10,616	11,002	12,981	14,471	15,281	14,244	16,107
Other Western Europe	1,865	2,059	2,383	2,459	2,847	2,939	3,212	3,336	3,645	3,709	3,798
USA	11,950	10,903	12,137	11,657	14,074	12,770	14,744	16,076	17,452	15,973	16,474
Brazil	265	322	678	831	873	1,116	1,501	1,813	2,276	2,592	2,677
Japan	1,944	2,341	2,181	2,014	2,222	2,478	2,815	2,865	2,972	2,786	2,893
USSR	215	738	158	77	1,377	1,559	847	1,266	1,544	2,303	2,522
China	1,707	1,764	2,137	1,807	1,785	1,498	2,023	2,096	2,375	2,298	2,304
Other countries	3,610	4,540	6,066	6,689	7,914	7,530	8,949	9,859	12,261	13,016	13,631
World	28,807	30,606	34,654	34,929	41,708	40,892	47,072	51,782	57,806	56,921	60,406

Reference Table C-4 USA Consumption of Vegetable Oil Meals

(1,000 MT)

	70/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
Soybean	13,406	13,110	11,920	13,766	12,502	15,552	14,001	16,209	17,673	19,153	17,540	18,100
Cottonseed	1,680	1,858	2,198	2,078	1,808	1,238	1,524	1,920	1,747	1,863	1,597	1,865
Linseed	258	263	212	194	94	84	127	83	125	134	120	76
Peanut	173	175	181	129	152	313	203	100	105	125	84	133
Copra	99	100	-	-	-	-	-	-	-	-	-	-
Total	15,616	15,506	14,511	16,167	14,556	17,187	15,885	18,312	19,650	21,275	19,341	20,329

Source: Soybean Digest Blue Book

Reference Table C-5 Usage of Protein Concentrates in USA

(1,000 ST)

	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79
Vegetable meals	15,689	15,596	14,689	16,264	14,643	17,279	15,925	18,427	19,246
Soybean meal	13,467	13,173	11,972	13,854	12,552	15,613	14,000	16,277	17,400
Gluten meal	1,236	1,067	1,262	1,361	1,340	1,490	1,300	1,223	1,102
Fish meal	605	752	462	350	444	508	425	405	402
Animal products	2,629	2,529	2,419	2,519	2,317	2,355	2,525	2,711	2,739
Total	20,159	19,944	18,832	20,494	18,744	21,632	20,175	22,766	23,489

Note : Animal products —— Tankage and meat scraps, milk products

Source: Soybean Digest Blue Book

Reference Table C-6 Feed Usage in USA

(million MT)

	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81	81/82
Coarse grains	126.9	136.0	142.3	139.5	105.4	115.6	113.3	119.2	137.3	138.8	123.2	131.0
	100	107.2	112.1	110.0	83.1	91.1	89.3	93.9	108.2	109.4	97.1	103.2
Coarse grains + wheat	132.1	143.1	147.8	143.0	106.5	116.7	115.3	124.5	141.7	141.2	124.6	134.9
	100	108.3	111.9	108.3	80.6	88.3	87.2	94.2	107.3	106.9	94.3	102.1

Note : Index - 1970/71 = 100

Source: USDA, Foreign Agriculture Circular

Reference Table C-7 Usage of Coarse Grains for Feed

(million MT)

	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78	78/79	79/80	80/81
Western Europe	91.3	96.5	99.1	105.0	104.8	105.0	104.8	106.6	111.3	111.3	112.4
EC	69.3	72.1	73.8	77.2	75.5	75.4	73.9	74.9	77.5	76.4	76.8
Other Western Europe	22.0	24.4	25.3	27.8	29.3	29.6	30.9	31.7	33.8	34.9	35.6

Index (1970/71 = 100)

Western Europe	100	105.7	108.5	115.0	114.8	115.0	114.8	116.8	121.9	121.9	123.1
EC	100	104.0	106.5	111.4	108.9	108.8	106.6	108.1	111.8	110.2	110.8
Other Western Europe	100	110.9	115.0	126.4	133.2	134.5	140.5	144.1	153.6	158.6	161.8

Source: USDA, Foreign Agriculture Circular

Reference Table C-8 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	22,605	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	65,230	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	12,100	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	47,658	49,013	52,836	58,482	57,790	58,120	65,330	67,770	71,414	77,926	79,520	79,734

Source: Oil World

D. INTERNATIONAL TRADE

I. Exports

The volume of exports of vegetable oil meals (based on actual weight) was 25.697 million tons in 1980, and soybean meal, with a share of 70% (17.916 million tons) is the main product among the various vegetable oil meals.

The vegetable oil meal supplying countries are few in number, and include Senegal and Sudan (peanut meal) in Africa; the United States (cottonseed meal, linseed meal and soybean meal) and Canada (rapeseed meal) in North America; Argentina (peanut meal, cottonseed meal, linseed meal, sunflower seed meal and soybean meal) and Brazil (soybean meal and peanut meal) in Latin America; and India (peanut meal and cottonseed meal), Indonesia and the Philippines (copra meal) and Malaysia (palm kernel meal) in Asia.

The export volumes of the individual oil meals other than soybean meal are: peanut meal, 1.050 million tons (4.1%); copra meal, 1.056 million tons (4.1%); sunflower seed meal, 0.930 million tons (3.1%); cottonseed meal, 0.792 million tons (3.1%); linseed meal, 0.718 million tons (2.8%); rapeseed meal, 0.632 million tons (2.5%); and palm kernel, 0.538 million tons (2.1%) (Reference Table D-1).

The share held by soybean meal of total world oil meal exports has increased every year, and has reached 80% on the basis of protein content.

The export of oil meals (including fish meal) by economic regions stands at 65% for the developed countries and 35% for the developing countries; i.e. more than half is supplied by the developed countries.

In the developed country group, North America holds a share of 94%, while in the developing country group Latin America has an 80% share, and North and South America together account for a little less than 90% of total world oil meal exports.

World exports of soybean meal reached 17.916 million tons in 1980, an increase of 290% over the 1971 figure of 6.185 million tons.

The main exporting countries are the United States, at 7.024 million tons (39.2% share) and Brazil, at 6.582 million tons (36.7%), and these two countries supply 76% of total world exports.

If the EC's 3.172 million tons (17.7%) is included, the share reaches 94% of total exports, and it can be said that the export of soybean meal is limited to a small number of countries.

Within the EC, the Netherlands exports 1.739 million tons (54.8% of EC exports) and the Federal Republic of Germany 0.859 million tons (27.1%), giving a combined share of 82% of total EC exports. The four countries comprising the United States, Brazil, the Netherlands and the Federal Republic of Germany together hold a 90% share of world exports.

The growth of exports in the major countries during the period 1971 to 1980 was 730% for Brazil, 330% for the EC and 172% for the United States, with Brazil and the EC showing remarkable increases.

The United States is the largest producer, consumer and exporter of soybeans in the world, and in addition to meeting its large domestic consumption, it exports a significant quantity of bean and meal (Reference Table B-5).

The United States and Brazil, which together account for 76% of world exports, are considerably different from each other in their approach to exporting.

The United States consumed 72% of its soybean meal production domestically in 1980/1981 and exported the balance (a little less than 30%), whereas Brazil has a policy of exporting the product in the form of the oil and meal which have a higher added value than the bean. In the case of Brazil, as the production of soybeans increases, the production of domestically-crushed meal also increases, thereby greatly increasing the export market share of soybean meal.

The bean produced in the United States is mainly exported to the Netherlands and the Federal Republic of Germany, and the meal produced by the crushers in both of these countries is exported to countries within and outside the EC.

Therefore, it can be seen that the United States and Brazil are quite different from each other in terms of the form of the export product, with the export ratio of the bean (meal equivalent) to the meal standing at 71:29 for the United States and 15:85 for Brazil.

Although there is a large difference in soybean production between the two countries, the United States mainly exports the bean and also exports a relatively large quantity of meal while Brazil places emphasis mainly on the export of the meal.

Reflecting this background, the level of soybean meal exports from Brazil in 1977 exceeded the level of exports from the United States by as much as 1.1 million tons, to place Brazil at the top rank in the world, while the amount exported from the United States declined about 20% over the level in the previous year.

The share held by Brazil of combined exports of soybean meal from

the United States and Brazil was 13% in 1970, and this figure increased to 48% in 1980.

However, although Brazil's share of exports of soybeans, for the reasons mentioned above, increased to a one-time peak of 21% in 1975 from 2% in 1970, it subsequently declined to a level of 7% in 1980.

The United States, the largest exporter of soybean meal, was shipping 70% of its exports to the EC market in the early 1970s when Brazil was not yet participating in the export market, but its export share to the EC decreased as Brazil increased its exports, falling to 54% in 1980. The United States is currently increasing its export share to Eastern Europe and the Asian countries, where the level of imports is increasing (Reference Table D-3).

The EC has a lage consumption, which is met by imported meal and by meal produced from imported bean, and is consequently not only an importing region but also an exporting region.

II. Export Commodity Standards

In the United States, a major exporter of soybeans and soybean meal, the National Soybean Processors' Association established the "Trading Rules for the Purchase and Sale of Soybean Meal" in 1933, prescribing matters such as the sales contract, quality, quantity, shipment, etc.

The quality standards are as follows:

	44%-protein soybean meal	49%-protein soybean meal
Protein (when loaded by seller)	Min. 44.0%	Min. 49.0%
Fat	" 0.5%	" 0.5%
Fiber (when loaded by seller)	Max. 7.0%	Max. 3.3%
Moisture (")	" 12.0%	" 12.0%

III. Imports

World imports of soybean meal stood at 17.752 million tons in 1980, an increase of 326% over the 1971 figure of 5.453 million tons (Reference Table D-4).

The quantities imported by the main importing countries and their share of world imports are the EC with 9.417 million tones (53%), followed by the East European countries with 4.597 million tons (26%),

and if the quantity imported by the West European countries outside the EC is also included, Eastern and Western Europe accounts for a combined share of 82% of world imports.

Eastern Europe is a region which has been increasing its level of imports remarkably since 1971, with an eightfold increase over the period from 1970 to 1980.

Asia has also been increasing its imports (by a factor of 9.4%), while Japan has maintained an import level of 0.3 million tons per year since 1977. In addition, Singapore and West Malaysia, where industrialization is making progress, are also increasing their level of imports.

Reference Table D-1 Exports and Imports of Vegetable Oil Meals in 1980

(1,000 MT)

	Oilseed meal		Peanut		Cottonseed		Sunflower		Rapeseed		Linseed		Copra		Palm kernel	
	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.
Africa	272	1,278	21	341	8.5	128	0.2	0.6	-	33.6	-	8.4	-	15	-	141
North and Central America	1,013	8,074	15	-	52	205	14	58.5	-	207	2.7	132	1	1.5	-	-
USA	29	7,714	-	-	2.7	142	-	58.5	-	-	2.7	123.7	-	-	-	-
South America	365	9,081	-	205	-	197	-	687	-	44.5	-	508.5	-	-	-	61
Argentina	0	1,816	-	-	-	118	-	684	-	4.5	-	469	-	-	-	-
Brazil	0	6,999	-	-	-	44	-	-	-	24	-	3.5	-	-	-	55
Asia	1,815	2,994	45	471	27.8	198	0.2	4.8	13	34.5	-	19	11.2	967	35	326
India	2.7	1,205	-	459	0.2	160	-	4.8	-	3	-	18	-	-	-	-
Europe	21,929	4,249	998	33	703.5	63.4	902	179	687	312.5	719.5	48.8	976.5	52	435.6	10.7
EC	16,002	3,984	770	33	633	63.2	708	170	569	309.5	650.8	48.8	918.8	48	432.7	10.7
Other Western Europe	822	252	57	-	24	0	21	3.4	112	3	59.7	-	56.7	4	2.9	-
Eastern Europe	5,105	13	171	-	46.6	-	173	5.7	6	-	9.0	-	1	-	-	-
USSR	355	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-
Oceania	13	21	-	-	-	0	-	-	-	-	-	-	-	20	-	-
World	25,762	25,697	1,079	1,050	801	792	916	930	700	632	722	717	989	1,056	471	538

Source: FAO, Trade Yearbook

Reference Table D-2 Exports of Soybean Meal

(1,000 MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
North and Central America	3,811	4,207	3,709	4,528	4,933	3,842	4,925	4,252	6,009	6,109	7,103
USA	3,660	4,086	3,619	4,415	4,817	3,783	4,862	4,207	5,961	6,087	7,024
South America	549	904	1,422	1,622	2,061	3,307	4,591	5,679	5,794	5,578	7,131
Brazil	525	901	1,405	1,581	2,031	3,134	4,374	5,329	5,419	5,177	6,582
EC	912	957	1,300	1,793	2,020	1,522	1,687	1,671	2,455	2,839	3,172
Netherlands	365	423	585	568	583	559	637	593	1,145	1,535	1,740
Germany, FR	265	250	395	899	991	569	559	570	656	733	859
Other countries	99	116	112	173	237	269	145	248	309	419	510
World	5,371	6,184	6,547	8,116	9,251	8,940	11,348	11,850	14,569	14,946	17,916

Source: FAO, Trade Yearbook

Reference Table D-3 *Exports of* Soybean Meal from USA

(1,000 MT)

	1970	1971	1972	1979	1980
North America	242.1	204.5	199.2	684.3	687.3
South America	-	-	-	284.7	375.8
Western Europe	3,336.7	2,794.9	3,138.3	3,586.3	4,124.8
EC	3,236.7	2,668.5	2,815.3	2,681.6	3,780.2
Other Western Europe	99.8	126.4	323.0	904.7	344.6
Eastern Europe	587.4	448.3	956.5	1,297.7	1,391.5
USSR	-	-	-	26.9	-
Asia	152.2	153.7	332.7	564.8	426.5
Japan	22.0	24.5	287.0	205.0	245.5
Oceania	33.0	17.6	8.6	4.4	18.7
Africa	12.5	7.5	8.5	8.5	22.6
Total	4,559.3	3,805.4	4,744.8	6,087.7	7,023.7

Source: Soybean Digest Blue Book

Reference Table D-4 Imports of Soybean Meal

(1,000 MT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
EC	3,566	4,205	4,498	4,337	4,734	4,757	5,630	5,637	7,825	8,424	9,417
Other Western Europe	190	206	282	912	548	636	956	880	938	799	515
Eastern Europe	565	627	1,086	1,617	1,934	2,963	3,279	3,515	3,718	3,929	4,597
USSR	-	-	-	-	-	-	-	-	-	52	346
North and Central America	316	281	317	268	418	408	474	489	664	757	877
Canada	243	208	222	191	277	294	349	351	413	465	404
South America	-	12	23	5	100	43	166	228	232	200	365
Asia	156	126	153	324	248	213	478	703	1,206	1,275	1,467
Japan	72	39	52	277	131	18	193	317	340	283	326
Africa	7	5	7	8	8	14	21	22	133	117	157
Oceania	29	30	24	11	25	11	1	5	28	7	11
World	4,829	5,492	6,390	7,481	8,015	9,044	11,005	11,480	14,744	15,560	17,752

Source: FAO, Trade Yearbook