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Staff Paper P89-43 November 1989

TRENDS IN THE MINNESOTA, UNITED STATES, AND WORLD SOYBEAN INDUSTRY

by

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Standard Statistical Conversions for Soybeans

1 bushel of soybeans	=	60.00 pounds
	=	10.70 pounds of crude soy oil (17.83 percent)
	=	47.50 pounds of soybean meal (79.17 percent)
	=	1.80 pounds of manufacturing loss (3.00 percent)
1000 bushels of soybeans	=	23.751 short tons of soymeal
	=	21.542 metric tons of soymeal
1000 metric tons of soymeal	=	46,421.05 bushels of soybeans
1 metric ton of soybeans	=	36.74 bushels
	=	1.10 short tons
1 short ton of soybeans	=	33.33 bushels
	=	.907 metric tons

General Conversions

1 hectare = 2.27 acres
1 acre = .405 hectares
1 metric ton = 1000 kilograms = 2205 pounds

Source: 1988 Soya Bluebook, Soyatech Publications

Marketing year for soybeans is September to August
Marketing year for soybean meal is October to September

Abbreviations

ASA - American Soybean Association
EEC or EC - European Economic Community
ERS - Economic Research Service, branch of USDA
USDA - United States Department of Agriculture

INTRODUCTION

Since World War II, world soybean production has grown fourfold and United States production has increased elevenfold as new products and processing technology have developed. Originally used as livestock fodder, the soybean is currently harvested to be crushed into soymeal and soyoil in the Western world. In China and East Asia, where the soybean was domesticated over 3,000 years ago, tofu (doufu) is made by boiling and crushing the beans, and pressing curds from the soy milk then produced (Hapgood). The meal is predominantly used as a protein supplement in livestock feed and in lecithin. The oil is found in hundreds of food products as vegetable oil, margarine, salad dressing and shortening. A Minnesota firm, Heartland Graphics, has been using soyoil based printing ink for about ten percent of its printing. The ink is supplied by Sinclair & Valentine, an ink producer in West St. Paul.

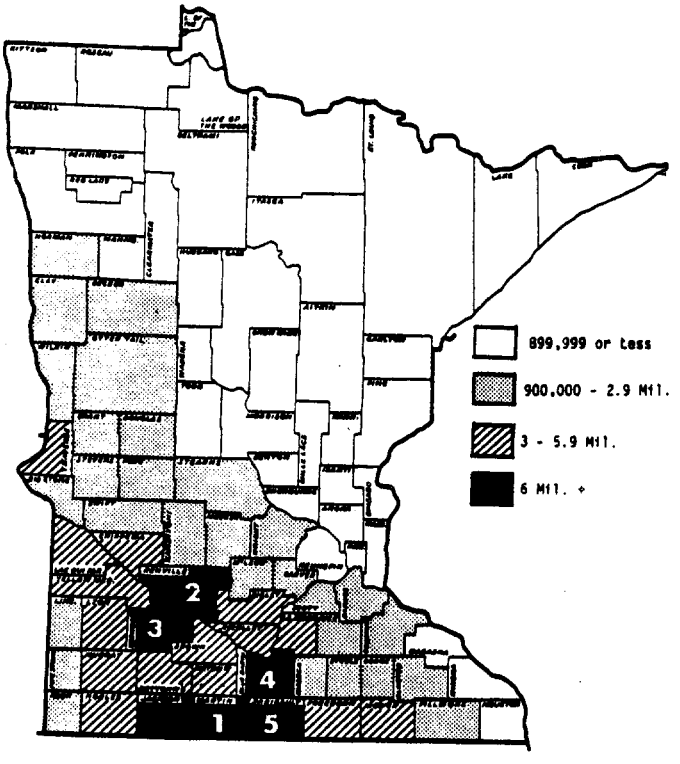
The soybean industries of Minnesota, United States, South America, and the world are summarized in this text. Production, processing, and trade in these geographic areas are covered. Discussion on Soviet soybean imports is also included. The importance of the annual soybean crop can be seen by the vast amount that is produced worldwide--over 51 million hectares (115 million acres) and over 100 million metric tons. This text uses 1986 as a base year, since 1987 data is not yet comprehensive for all areas and as crop year 1988 was influenced by the severe drought.

MINNESOTA SOYBEAN INDUSTRY BACKGROUND

Production

In crop year 1986, Minnesota ranked fourth in total soybean production in the United States behind Illinois, Iowa, and Missouri (USDA Annual Crop Summary). Nine counties in Minnesota each produced over five million bushels--Cottonwood, Faribault, Mower, Renville, Redwood, Martin, Jackson, Yellow Medicine, and Blue Earth; the state's farmers harvested 170 million bushels from 4.750 million acres (Minnesota Ag Statistics). The soybean production had a farm value of $775 million (4.55 dollars per bushel). Only corn with a farm value of $990 million (1.40 dollars per bushel) was greater. Figure 1 illustrates the concentration of soybean production in Minnesota in 1986.

Figure 1. Minnesota Soybean Producing Counties, Harvest 1986

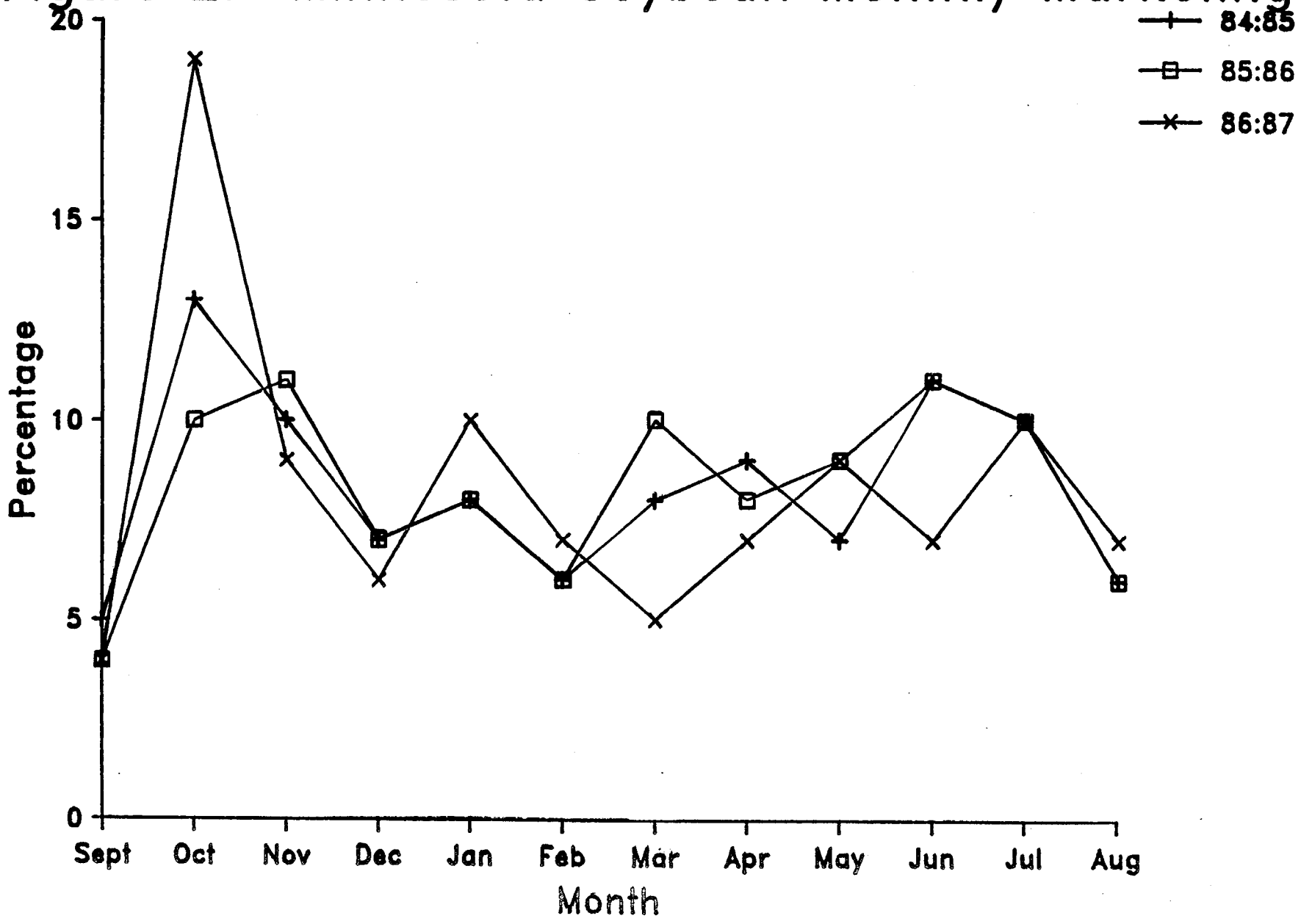


Source: Minnesota Agricultural Statistics 1987

Storage and Transportation

On-farm storage provides farmers with more flexibility in reacting to price fluctuations. Figure 2 demonstrates the seasonal marketing patterns for farmers in Minnesota for crop years 1984, 1985, and 1986. Buyers for the soybeans include elevators, soybean processing plants, and cooperative elevators. For the United States, Schaub et al. found that forty-three percent of the soybean crop was stored on-farm. The report also stated that only three percent was sold directly from the field. The remaining harvest was directly delivered to off-farm locations. The Minnesota harvest was sold in the following percentages: two directly from the field, thirty-nine delivered directly to off-farm locations, and sixty stored on-farm until sold at a later time. Some soybeans are kept by farmers to provide seed for the following year's crop.

Figure 2. Minnesota Soybean Monthly Marketing



Minnesota soybeans are shipped overseas by these routes: by barge down the Mississippi to Gulf ports via Minneapolis/St. Paul, by railroad to Gulf ports and Pacific Northwest ports, and by ship through the St. Lawrence Seaway via Duluth. Buschena, Fruin, and Halbach reported these soybean movements for 1985, when 160 million bushels were harvested:

1. Minneapolis/St. Paul terminal elevators and processors received 63.2 million bushels of soybeans from Greater Minnesota.

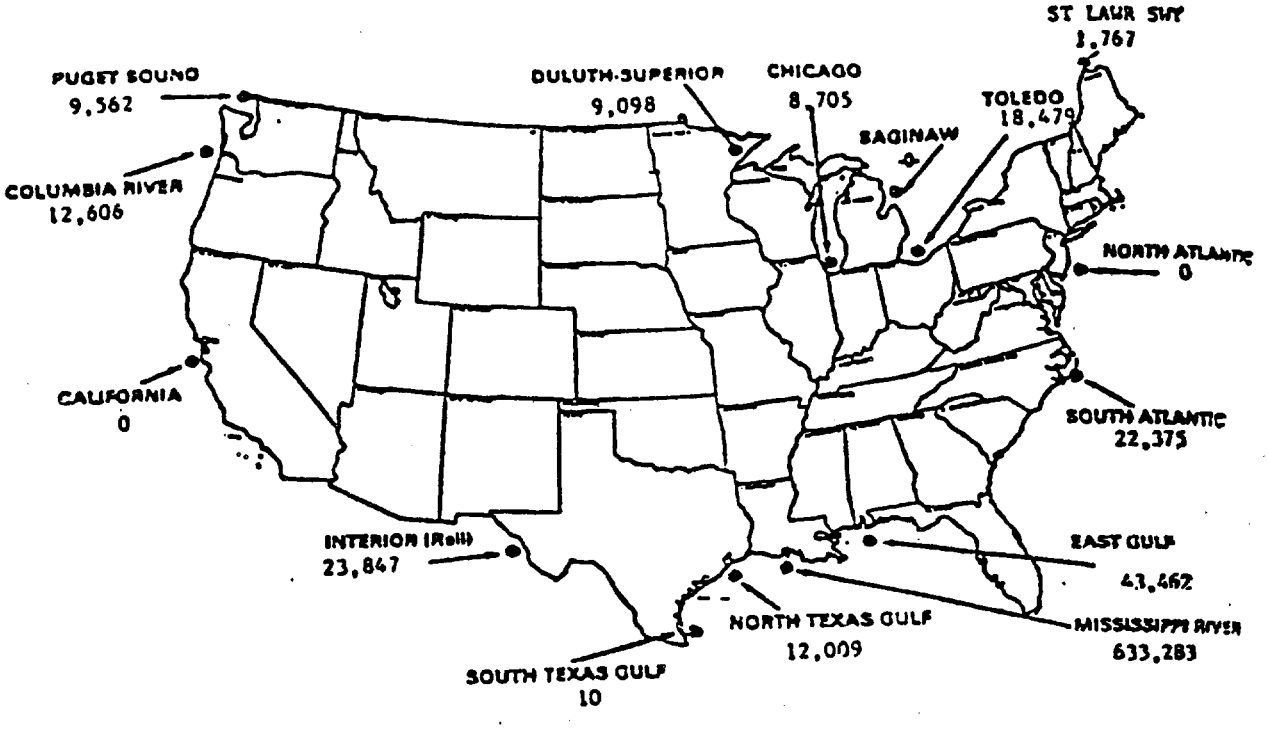
2. Nearly 50 million bushels of soybeans were shipped from the Twin Cities terminal elevators (93% of which went to Gulf ports).

3. Other Minnesota processors purchased 49.7 million bushels of soybeans, primarily from Southwestern Minnesota farmers.

4. Minnesota country elevators sent 5.8 million bushels to the Pacific Northwest, 2.8 million bushels to Mobile, Alabama (a Gulf port), and 4.2 million bushels to Iowa processors and river terminals out of a total of 14.1 million bushels that they shipped out-of-state.

Although no soybeans were shipped from Duluth in 1985, the USDA Office of Transportation reported 9.098 million bushels of soybeans were exported from the Duluth-Superior port in 1987 (Grain Transportation Situation). Toledo shipped 18.479 million bushels of soybeans in 1987 to lead the Great Lakes ports in soybean exports. The total bushels exported from the Great Lakes--St. Lawrence Seaway ports in 1987 was 38 million bushels. Soybean shipments from Gulf ports in 1987 totaled 688.283 million bushels. Figure 3 denotes the soybean shipments from United States ports in 1987.

Figure 3 U.S. Soybean Exports by Port Areas--Calendar Year 1987
(Thousand Bushels)



Source: USDA Grain Transportation Situation

The following table shows the mileage between Mankato, Minnesota and the ports of Rotterdam in the Netherlands, Odessa on the Black Sea, and Leningrad on the Baltic Sea in the Soviet Union. Shipping through the port of Duluth is shorter for soybeans (and other products) from Minnesota than shipping down the Mississippi River to New Orleans by either barge or by railroads.

Table 1. Travel Distances, in Miles, of Soybeans Shipped from Mankato Minnesota by Mode of Transport

Modes	Mankato/Rotterdam Gulf Port (Barge)	(New Orleans) (Rail)	Duluth
Rail	85	1358	236
Barge	1847	-	-
Ocean	5622	5622	5030
Total	7554	6980	5266

Modes	Mankato/Odessa Gulf Port (Barge)	(New Orleans) (Rail)	Duluth
Rail	85	1358	236
Barge	1847	-	-
Ocean	5835	5835	5650
Total	7767	7193	5886

Modes	Mankato/Leningrad Gulf Port (Barge)	(New Orleans) (Rail)	Duluth
Rail	85	1358	236
Barge	1847	-	-
Ocean	5791	5791	5345
Total	7723	7149	5581

Sources: Lloyd's Maritime Atlas and Mississippi River Atlas.

Processing

For the 1986-87 production year, Minnesota soybean processors produced 1.877 million metric tons of meal, which required 86.5 million bushels of soybeans (Department of Commerce). Figure 4 tracks the monthly Minnesota production of soymeal in thousands of metric tons. Table 2 shows the monthly soybean meal production in Minnesota from October 1985 to September 1989.

Figure 4. Minnesota Soymeal Production
1986 : 87

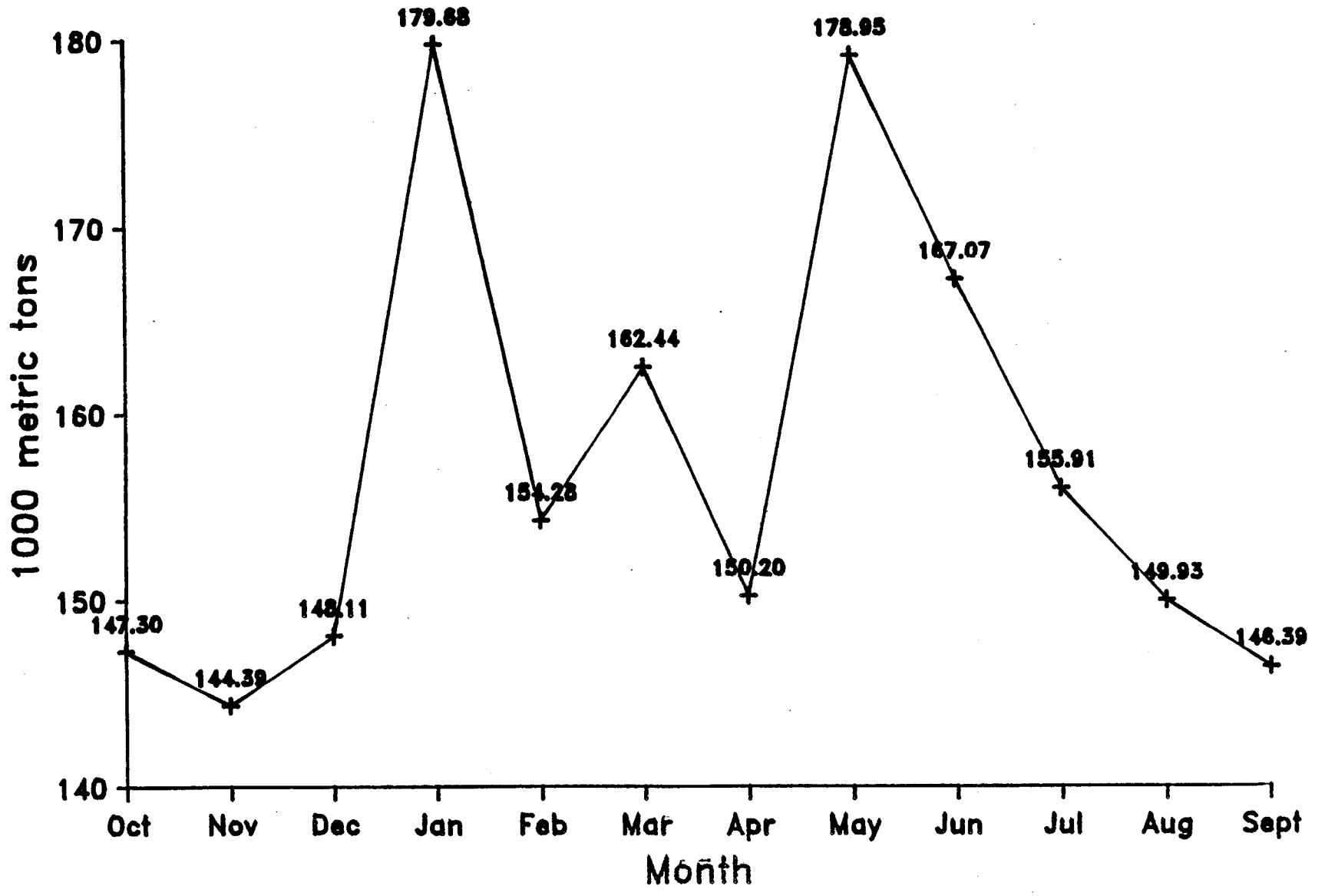


Table 2. Minnesota Monthly Soymeal Production in Short Tons

Month	Marketing Year			
	1985/86	1986/87	1987/88	1988/89
October	151.6	162.4	171.1	146.7
November	154.9	159.2	163.2	164.1
December	160.0	163.3	173.7	155.9
January	145.9	189.1	176.3	153.0
February	139.5	170.1	154.1	142.1
March	148.6	179.1	171.1	163.9
April	131.6	165.6	151.3	132.9
May	144.7	197.3	169.1	159.5
June	142.3	185.2	160.2	163.2
July	140.5	171.9	161.4	161.7
August	151.8	165.3	159.5	NA
September	147.1	161.4	154.2	NA

NA: Data not available yet.
Source: U.S. Department of Commerce, Bureau of Census, Current Industrial Reports: Fats & Oils - Oilseeds Crushings. Various issues.

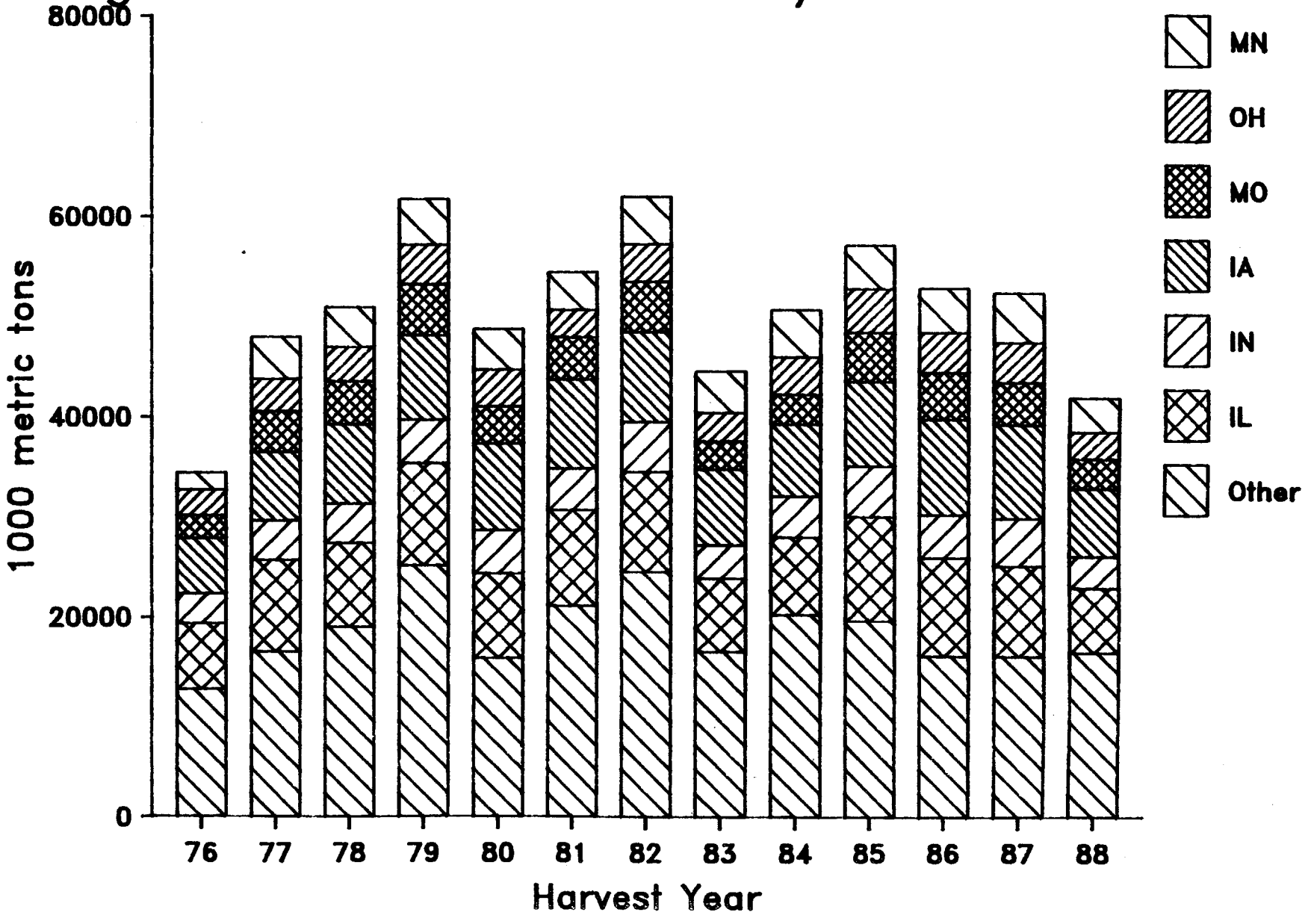
The Department of Commerce reported four soybean oil mills operating in Minnesota in 1986. (There are currently three mills operating in Minnesota.) These mills employed 237 workers and the annual payroll for that year was nearly five million dollars. These statistics do not include any auxiliary or indirect effects, such as storage, transportation, feed processing or farm production. Two mills employed under 50 workers, one hired 50-99 people, and one processor retained between 100-249 employees.

UNITED STATES SOYBEAN INDUSTRY

Production

Over 58 million acres of soybeans were harvested in 1986 in the United States to produce 1.940 billion bushels or 52.801 million metric tons. Illinois was the largest producer with slightly over 360 million bushels. Figure 5 shows soybean production in the United States in metric tons for 1976-1988. The value of the 1986 crop was estimated at 9.262 billion dollars by the National Agricultural Statistics Service-USDA. This was the lowest annual value since 1976. Thirty-two million metric tons were crushed to provide oil for the food industry and protein meal for the

Figure 5. United States Soybean Production



livestock feed industry. Over 2.5 million metric tons was kept for seed or feed. Slightly over 20 million metric tons of raw soybeans were exported.

Processing

The primary products of soybeans--oil and meal--provide basic food stuffs for people and livestock. One bushel of soybeans provides 10.7 pounds (17.8 percent of a bushel) of crude soy oil, and 47.5 pounds of soybean meal (79.2 percent). Typically 1.8 pounds is lost in manufacturing. In 1986 the dollar value of the oil was $ 1.65 and for meal was $ 3.80 per bushel (ASA). Figure 6 illustrates 1986 crushings by state.

The Department of Commerce reports that the total amount of soybeans crushed in the 1986 marketing year for the United States was 32 million metric tons. Illinois was the largest soymeal producing state in 1986, crushing 6.39 million metric tons of soybeans, followed by Iowa, Minnesota, Indiana, and Ohio. Figure 7 shows the location of soybean oil mills in the United States (ASA).

In the United States, 127 soybean oil mills employed 7,262 people in 1986, according to the Department of Commerce. The payroll for these employees was over 173 million dollars. The breakdown by size of the plants is illustrated in the following table:

Table 3. Oil Mill Plant Size

Size	Number of Plants	Employees
1-4	23	42
5-9	11	79
10-19	13	191
20-49	23	896
50-99	37	2594
100-249	15	1985
250-499	5	1475
+500	0	0

Source: Department of Commerce, Bureau of the Census.

In another report (Survey of Plant Capacity), the Department of Commerce found that preferred plant capacity utilization rates from 1980 to

Figure 6. United States 1986/87 Soymeal Prod

1000 metric tons

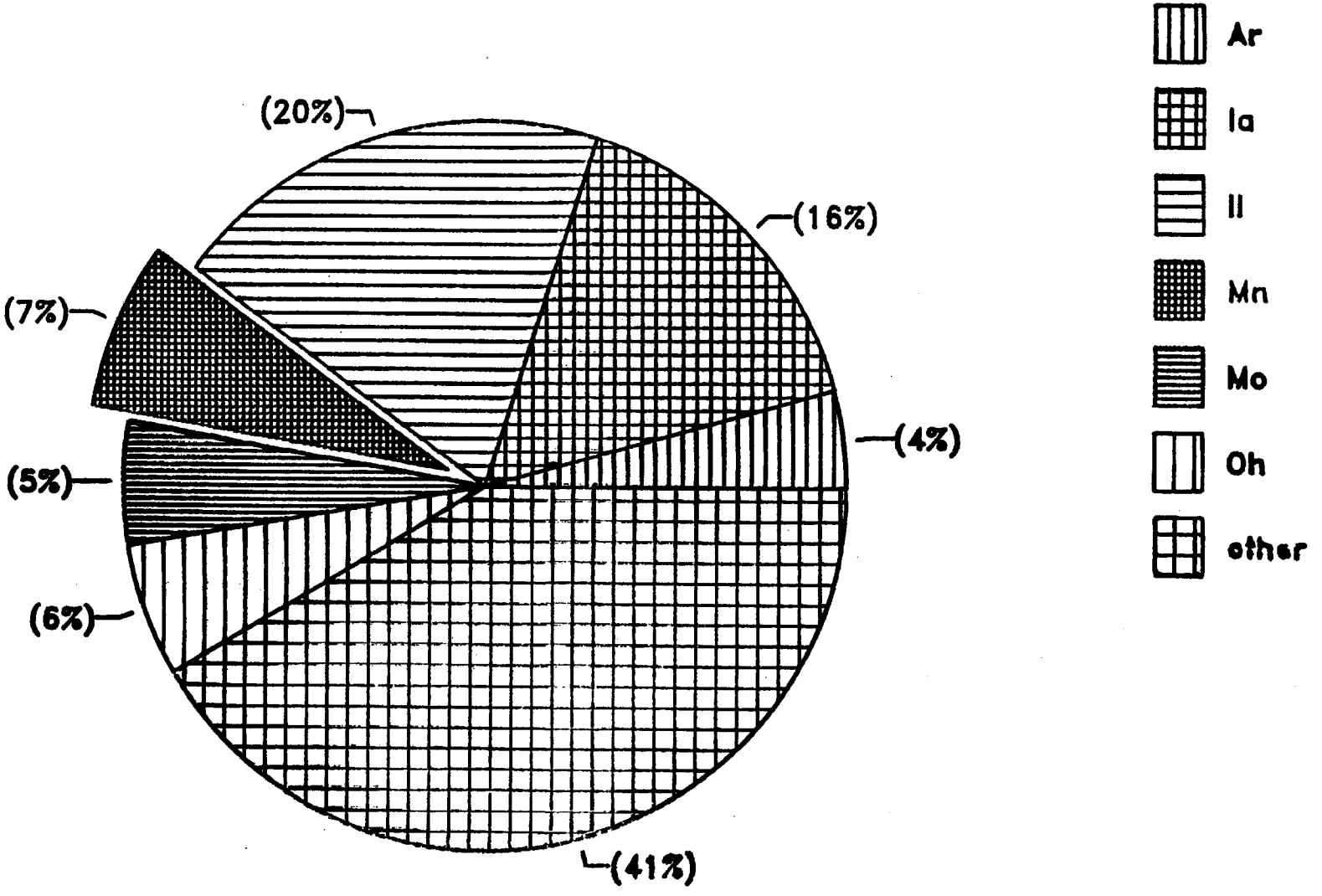
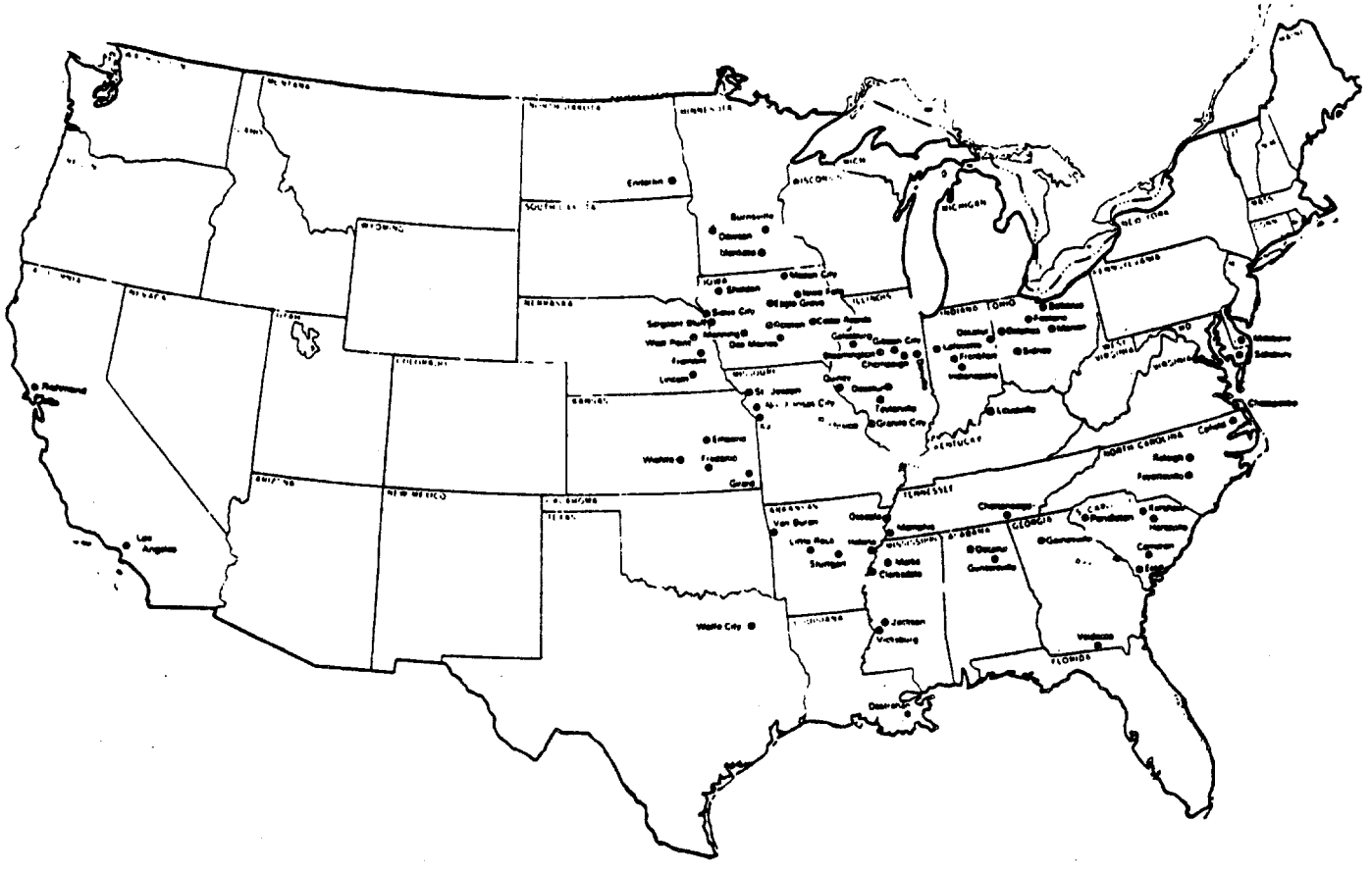


Figure 7. Locations of Soybean Processing Plants in the United States



1986 in the fourth quarter ranged between 78 to 92 percent with an average of 85 percent. Preferred plant capacity is represents the ratio of actual operations to preferred level of operations. Managers reported preferred operations as the level plants would not exceed due to costs or other considerations. This is implicitly considered the level where marginal costs are equal to marginal revenue and where profits are maximized. Assumptions by the managers in determining this level include: typical product mix, sufficient inputs to operate equipment and machinery, no repairs or expansion of facilities, normal maintenance, and no increased use of subcontracting. Practical plant capacity utilization rates were also listed in the survey with an average of 82.9 percent and a range from 77 to 91 percent in the fourth quarter in 1980 to 1986. Practical capacity is defined as the ratio of actual operations to the practical capacity level. Practical capacity is the maximum level the factories are expected to attain using a realistic work schedule. The preferred level may equal, but may not exceed practical capacity.

INTERNATIONAL SOYBEAN TRADE

Soybeans - Exporters

The United States from the 1950s to the 1970s produced over two-thirds of the world's soybean supply. In the mid 1970s, the United States began to lose its dominance in the soybean market as Brazilian, and later Argentine, farmers expanded production. The United States produced a record 61.5 million tons in 1979 (2.05 billion bushels). By 1980 world production had soared to 81.172 million tons (2.706 billion bushels) from 44.225 million tons (1.474 billion bushels) in 1970. As a result of the production increases in South America, United States' share of world production has fallen to about fifty percent. In 1988 an all-time high production of 102.786 million tons (3.462 billion bushels) was recorded.

Comparative Production Costs

Trapido and Krajewski compared costs of production for soybean producing regions in the United States, Argentina, and Brazil. Their study found that many Argentine producers had lower average variable costs than the United States' farmers, and that some Brazilian growers had cash

Table 4. Costs of Production for Growing Soybeans by Region for Argentina, Brazil, and the United States

Country and region	Total variable cost	Yield	Average variable cost	Area planted	Percent of area planted	
					By region	Cumulative
	$/ha	Tons/ha	$/ton	1,000 ha	Percent of country	
United States:						
Corn Belt-Lake States	123.33	2.168	57	15,078	60	60
Northern Plains	101.59	1.721	59	2,103	8	68
Delta	132.06	1.564	84	3,822	15	83
Southeast	167.69	1.484	113	4,250	17	100
Brazil:						
Sao Paulo	193.74	1.895	102	484	5	5
Parana	193.74	1.810	107	2,025	21	26
Mato Grosso do Sul	193.74	1.753	111	1,229	13	39
Mato Grosso	264.11	2.051	129	747	8	47
Rio Grande do Sul	193.74	1.359	143	3,496	37	84
Minas Gerais	264.11	1.831	144	400	4	88
Brazilia	264.11	1.831	144	41	0	88
Santa Catarina	193.74	1.322	147	413	4	92
Goias	264.11	1.702	155	647	7	99
Maranhao	264.11	1.560	169	7	0	99
Bahia	264.11	1.302	203	63	1	100
Argentina:						
Santa Fe, Northwest	95.04	2.162	44	273	10	10
Cordoba	95.04	1.952	49	427	16	26
Buenos Aires, West	95.04	1.619	59	101	4	30
Buenos Aires, North	160.08	2.334	69	1,241	46	76
Santa Fe, South	160.08	2.244	71	612	23	99
Buenos Aires, Center	160.08	1.831	87	51	2	2/ 101
Combined:					Percent of combined area	
Santa Fe, Northwest	95.04	2.162	44	273	1	1
Cordoba	95.04	1.952	49	427	1	2
Corn Belt-Lake States (U.S.)	123.33	2.168	57	15,078	40	42
Northern Plains (U.S.)	101.59	1.721	59	2,103	6	48
Buenos Aires, West	95.04	1.619	59	101	0	48
Buenos Aires, North	160.08	2.334	69	1,241	3	51
Santa Fe, South	160.08	2.244	71	612	2	53
Delta (U.S.)	132.06	1.564	84	3,822	10	63
Buenos Aires, Center	160.08	1.831	87	51	0	63
Sao Paulo	193.74	1.895	102	484	1	64
Parana	193.74	1.810	107	2,025	6	70
Mato Grosso do Sul	193.74	1.753	111	1,229	3	73
Southeast (U.S.)	167.69	1.484	113	4,250	11	84
Mato Grosso	264.11	2.051	129	747	2	86
Rio Grande do Sul	193.74	1.359	143	3,496	9	95
Minas Gerais	264.11	1.831	144	400	1	96
Brazilia	264.11	1.831	144	41	0	96
Santa Catarina	193.74	1.322	147	413	1	97
Goias	264.11	1.702	155	647	1	98
Maranhao	264.11	1.560	169	7	0	98
Bahia	264.11	1.302	203	63	0	2/ 98

1/ Crop year. 2/ Rounding error.

Sources: United States: (7); Brazil: (1) and (2); Argentina: (1).

production costs double that of Corn Belt farmers. Table 4 shows the specific results found by Trapido et al. USDA estimates of production costs in Minnesota by cash expense were added to Table 5 for comparison with a similar table completed by Trapido et al.

Table 5. Farm Costs of Production for Soybeans: Minnesota, Corn-Belt States, United States, Argentina, and Brazil (dollars per hectare)

Cash Expenses:	MN	Cornbelt	U.S.	Arg	Bra
Seed	18.11	22	19.39	19	40
Fertilizer	7.49	14	14.55	0	39
Lime & Gypsum	NA	2	2.43	0	13
Chemicals	45.99	46	42.97	31	46
Custom Operations	2.81	8	8.56	28	50
Fuel, Lube, & Elec.	9.40	12	10.90	1/	1/
Repairs	14.48	15	14.80	1/	2
Hired Labor	3.54	4	3.45	1/	1/
Miscellaneous	NA	1	.75	17	1/
Tech Services	NA	.4	.34	2/	3
Variable Cash Expense	101.82	12	118.13	95	194
Gen Farm Overhead	35.25	30	23.74	61	53
Taxes & Insurance	26.67	39	29.19	2/	3
Interest	113.64	90	64.83	5	67
Fixed Cash Expenses	175.54	159	117.77	65	123
Total Cash Expenses	277.36	282	235.88	160	317

	MN	Cornbelt	US	Arg	Bra
Harvest period price ($ per ton)	161	166	168	186	224
Yield (tons/ha)	2.16	2.56	2.02	1.70	1.62
Ave. Total Cost ($/ton)	128	111	117	94	195
Ave. Variable Cost ($/t)	47	48	58	59	119

Notes: All US data are 1986/87 crop year.
Sources: MN--Davenport, Cornbelt--Leath et al., Brazil & Argentina--Trapido et al. Totals may not add due to rounding. 1/ These items included in custom operations. 2/ These items included under general farm overhead.

Total cash expenses for Minnesota farmers were slightly less than for the Corn Belt states producers, due to lower variable cash expenses such as fertilizer and custom operations. However, the United States' total

growers' costs were below both the Corn Belt states and Minnesota farmers. The reason for the difference is interest paid, a fixed cash expense. Disregarding fixed cash expenses, Minnesota soybean producers are second (as the low cost producers) only to two regions farmed in Argentina. The report warns against using one region in any country as a typical region for the basis of comparison.

These producing countries, along with mainland China, constitute the major exporters of soybeans in the world marketplace. Figure 8 displays the world soybean export by countries for 1981-88. The United States exported seven times the amount of soybeans that Brazil did in 1987 and three times the amount of the rest of the world (in other words, the U.S. still retains nearly 75 percent of the export market share) of unprocessed soybeans.

Soybeans - Importers

The soybean import market also is dominated by a small number of countries. Five-sixths of the soybean imports are to developed countries. The major importers are highlighted in Figure 9; most use the soybeans as a protein feed additive for livestock. The Asian countries also use soybeans in the form of tofu as food for people. The European Economic Community receives nearly half the soybean imports, 14.75 million tons in 1987. The major EEC importers are the Netherlands, West Germany, and Spain, as illustrated in Figure 10. The Netherlands also processes soybeans and then exports soymeal and soyoil to other European countries (Western and Eastern).

Brazil Soybean Expansion/Export Policies

Nearly 25 years ago, the Brazilian government decided to pursue export promoting policies for soybeans (Thompson 1979). Licensing requirements were abolished and the exchange rate was devalued in small amounts during the next year. Brazil established domestic and export policies to achieve the following objectives: larger domestic crushings, adequately supplied domestic soyoil market, and changing its role from that of an importer to an exporter of soyoil and soymeal. Policies during the seventies consisted of subsidized credit for machinery and current inputs, high

Figure 8. Major Soybean Exporters

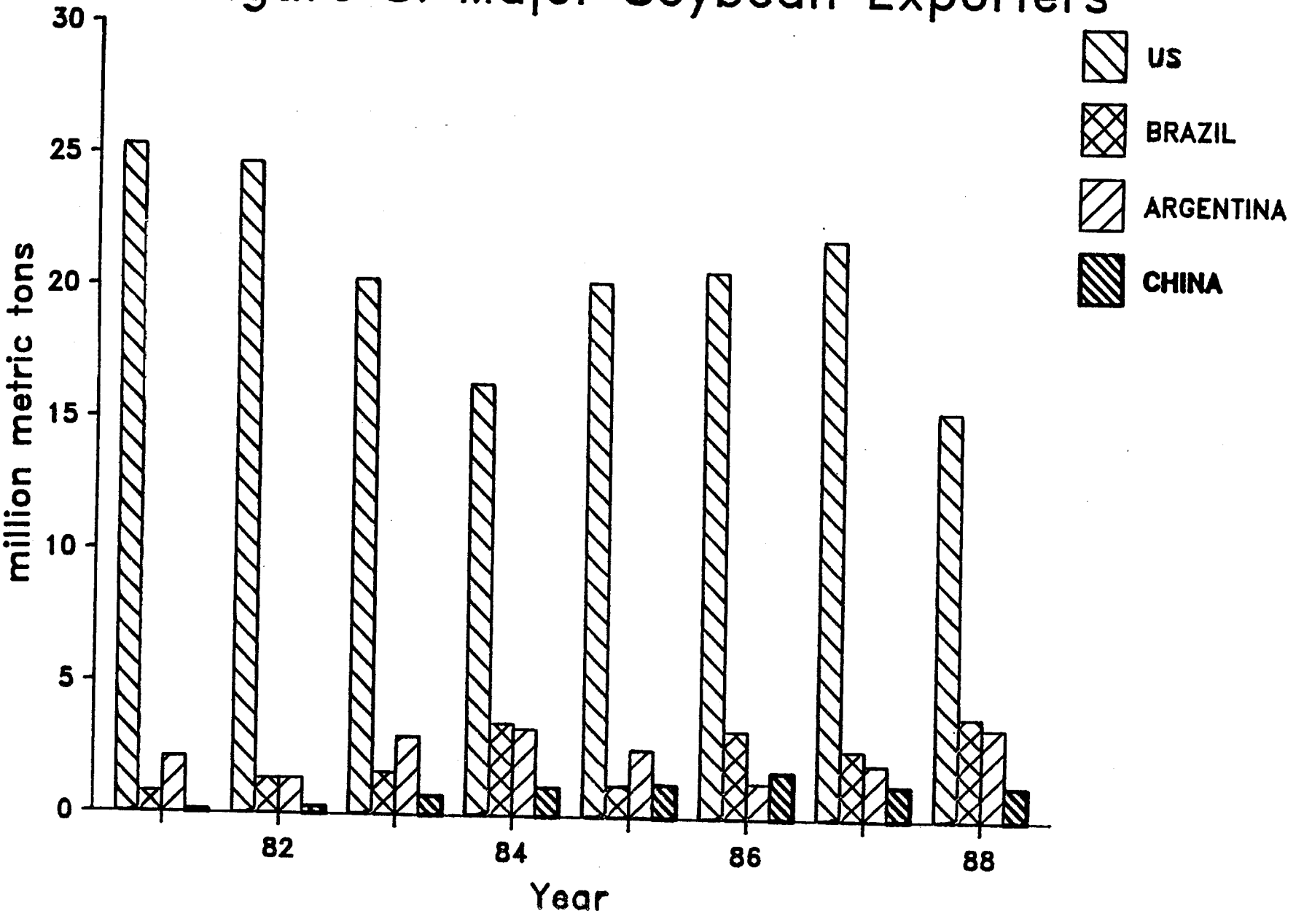


Figure 9. Major Soybean Importers

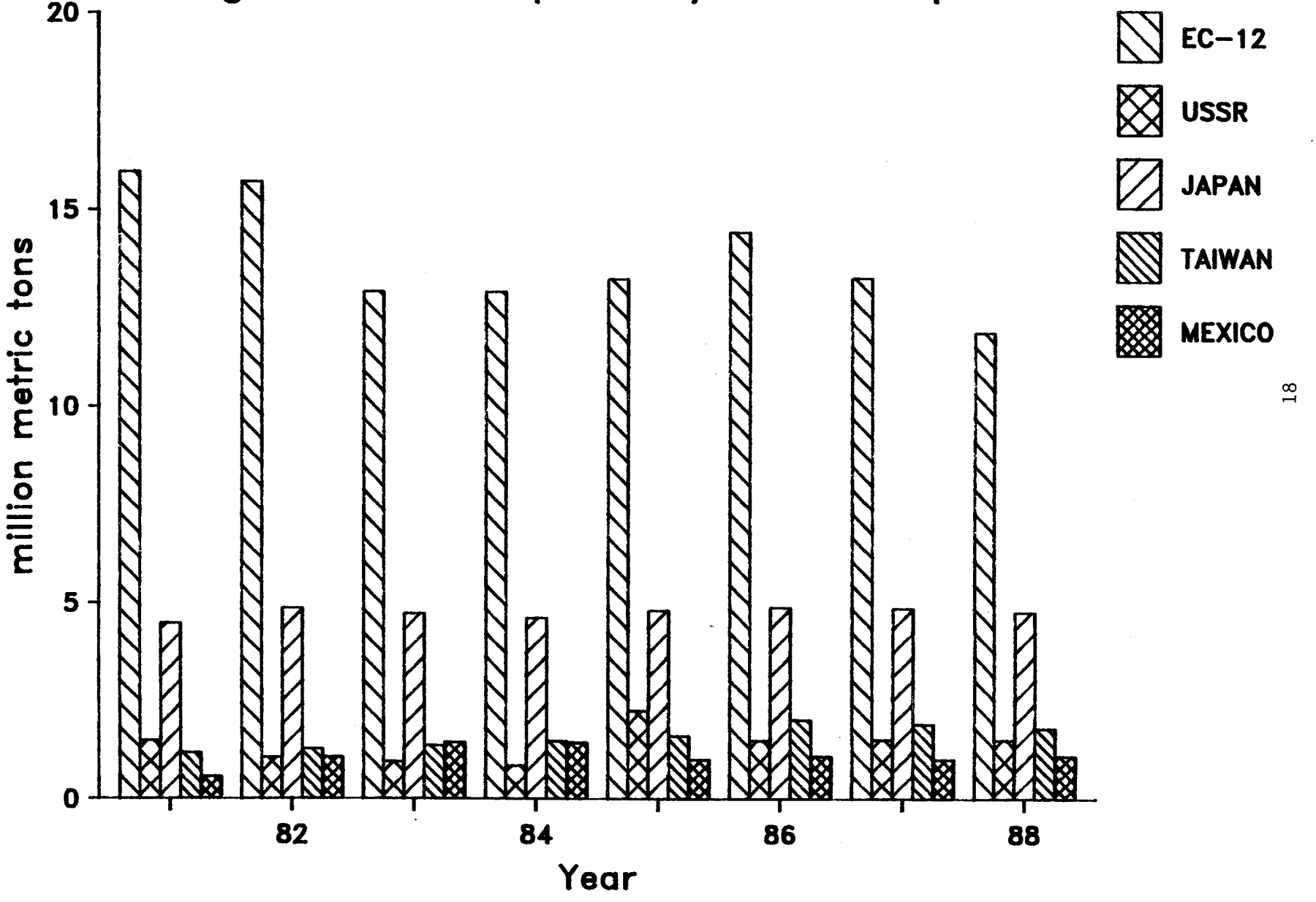
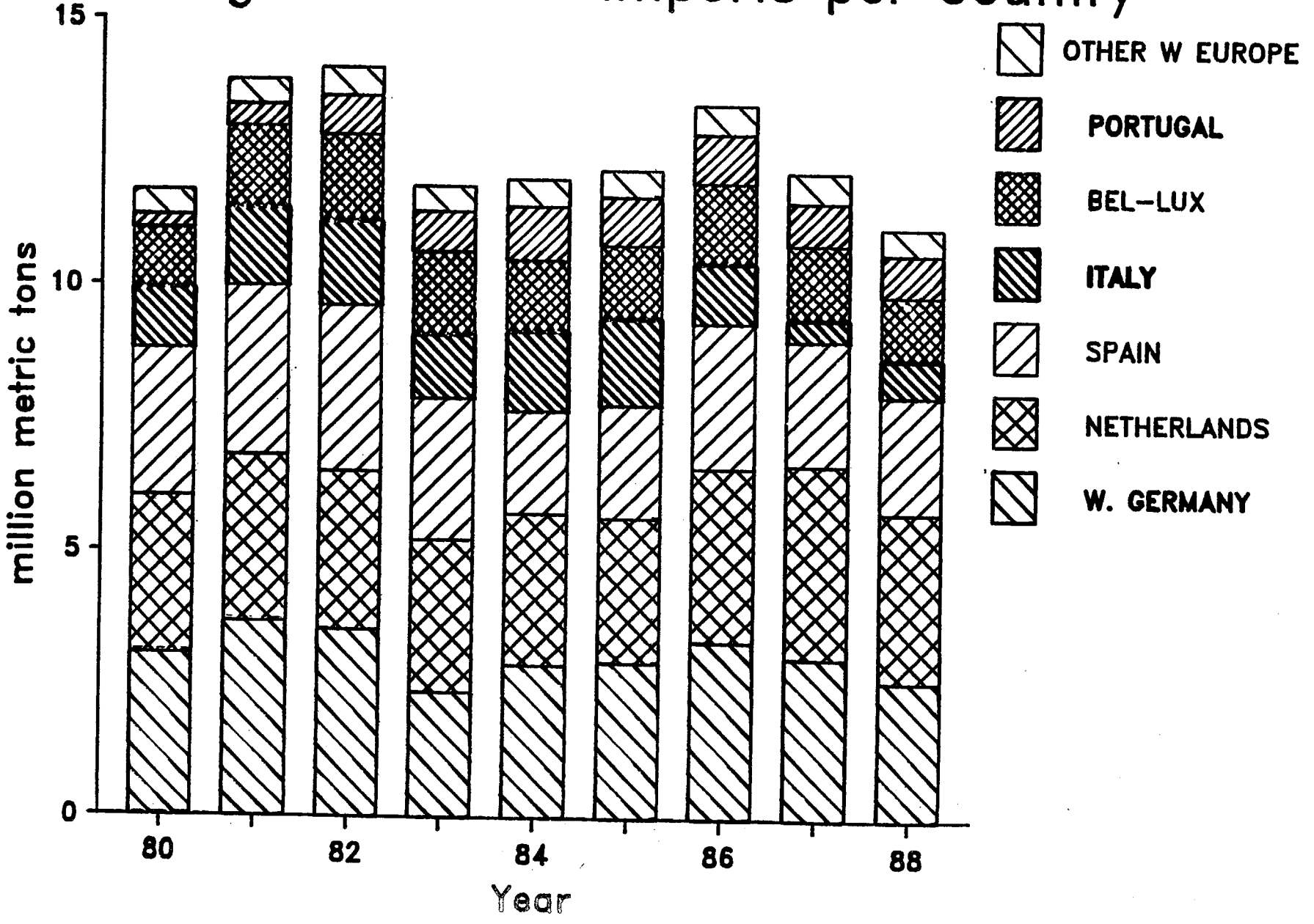


Figure 10. EEC Imports per Country



support prices for wheat (leading to double-cropping with soybeans to use the land and machinery), encouraging the planting of soybeans on land previously used for coffee trees, export tax credits for meal and oil, and exempting processors from a 30 percent corporate tax.

Soymeal - Exporters

Soybean meal is one product of crushing. Its primary use is as a livestock feed for its protein content. Soymeal contains higher amounts of protein than other oilseeds, as shown by the following table:

Table 6. Protein Content in Selected Oilseed Meals

Soybean meal	40-48%
Corn gluten meal	42%
Linseed meal	35%
Cottonseed meal	43%

Source: Perry

Leading exporters of soymeal are Brazil, Argentina, U.S., European Community, and China. Figure 11 shows the world production of soybean meal from 1980-1988. Total production volume has ranged from 50 to 60 million metric tons and total export volume has ranged from 20-25 million metric tons.

Before 1976, the United States dominated the soybean meal export market. During the late seventies, Brazil became the leading exporter (Figure 12). In 1987, Argentine soybean meal exports overtook those of the United States. Thompson and Williams state that European buyers prefer Brazilian over American meal due to the higher protein content in Brazilian meal (48 versus 44 percent). They point out that some American meal may have a protein content of 40 percent if hulls have been blended into the meal after crushing. Figure 13 shows the pattern of prices in the marketing year 1987/88 for soybean meal. On a per protein basis, the Brazilian and Argentine meals are cheaper than the United States' meal. Brazilian and Argentine meals are also pelletized, which facilitates handling during transportation and storage, since "bridging" or "setting

Figure 11. Major World Soybean Meal Producers

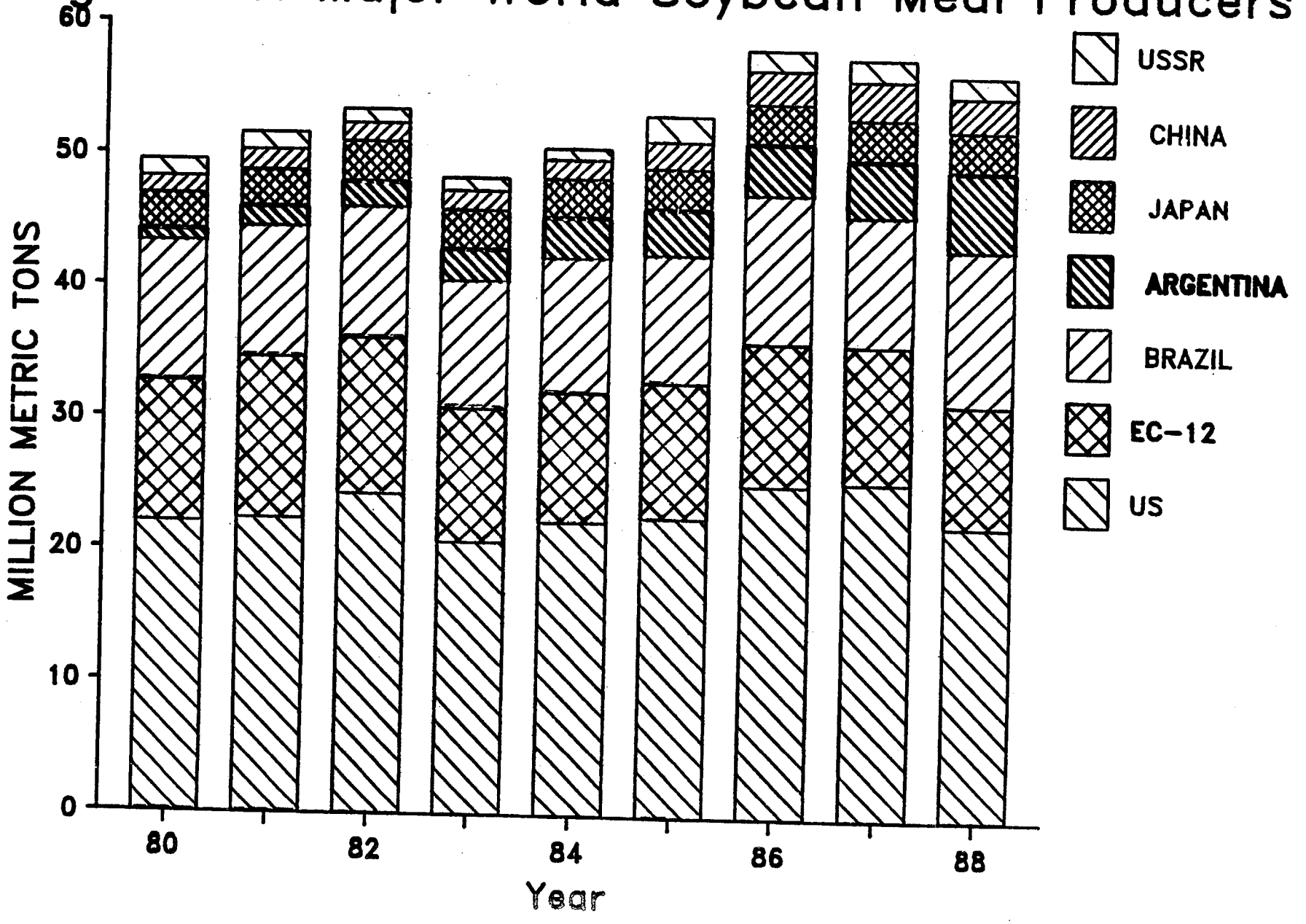


Figure 12. U.S., Brazil and Argentina Soymeal

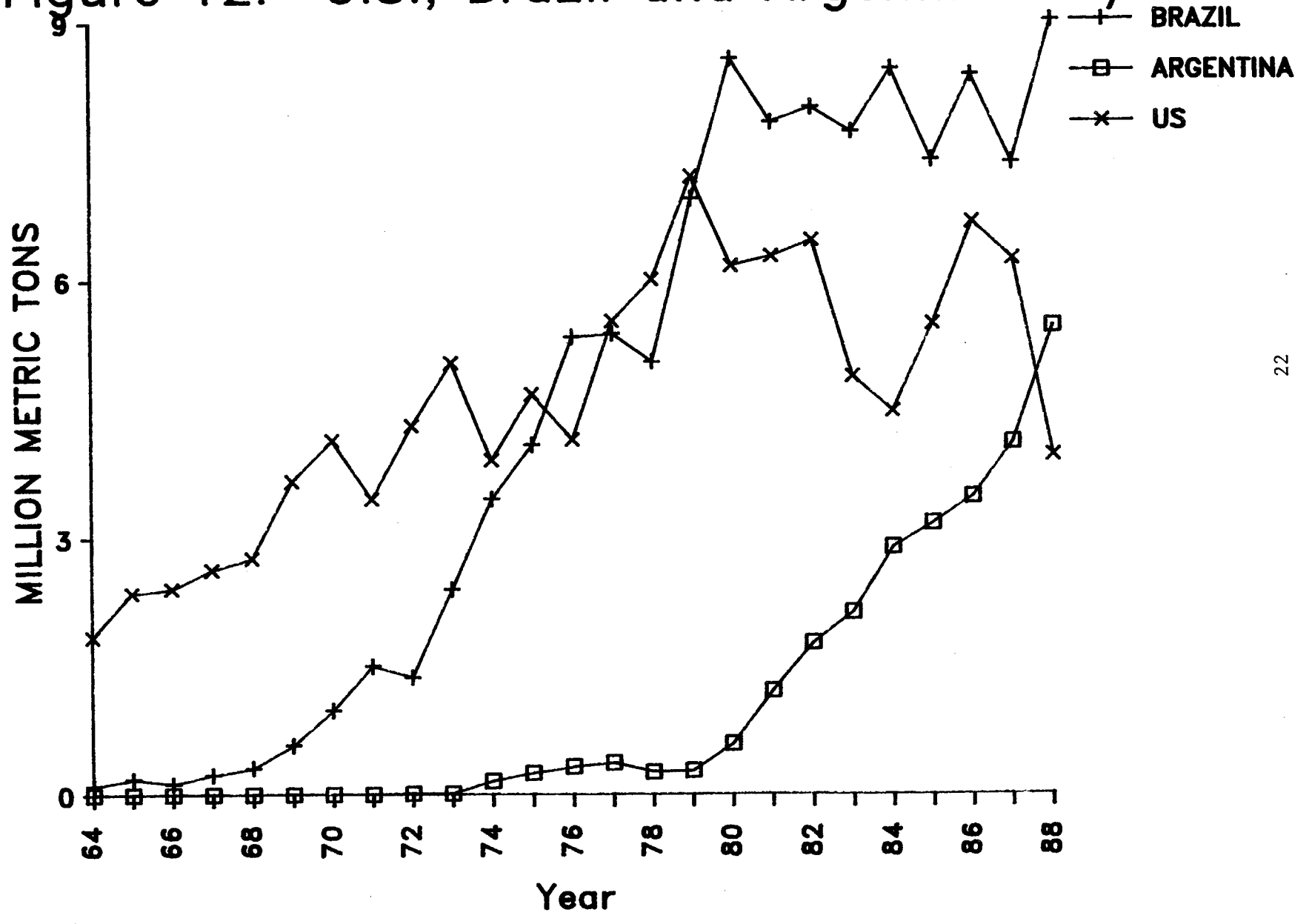
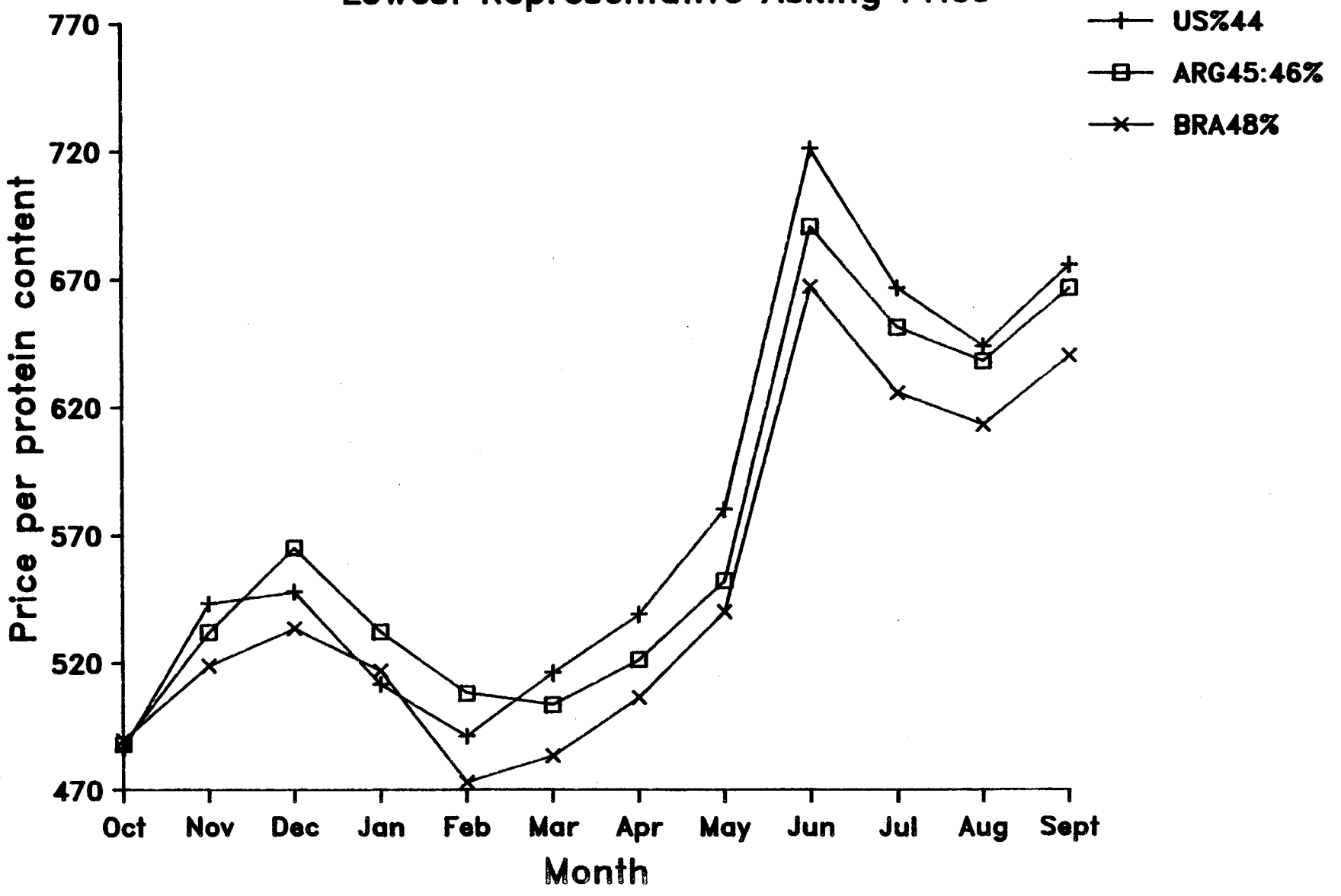


Figure 13. Prices for Soybean Meal, 1987/88



up" is prevented.

The advantage for Southern Hemisphere countries lies in the seasonal price cycle of the world market. Brazilian soybeans and products are marketed near the end of the United States' marketing year, when world prices are higher. Disadvantages in purchasing Brazilian soybeans are a higher free fatty acid content which increases refining costs and red dust which increases bleaching costs. In a 1987 Farm Journal article, a East European livestock farmer complained that pelletizing was used to hide mold in the meal.

Soymeal - Importers

Approximately half the world's soybean meal imports are by the European Community. As with soybean importers, the countries that import meal are predominantly developed and the soymeal is used for livestock protein supplements. The Soviet Union has begun to import soybean meal to supplement its livestock feeding program. In a USDA oilseed summary, the lack of foreign exchange and limitations on port facilities and internal transportation were specified as major constraints for Soviet soymeal imports (Smith). Figure 14 shows total European and Soviet imports of soybean meal from 1980-1988. The USSR and Eastern Europe combined import far less soybean meal than the European Community. Other meal importers include Canada, Indonesia, Mexico, Venezuela, and Pakistan.

THE SOVIET UNION AS WORLD MARKET PLAYER

USSR Oilseed Sector: Production and Livestock Rations

Remaining deficient in both quality and quantity, livestock feed rations in the Soviet Union have never reached the level specified by any five-year plan (Severin 1988). Severin also emphasizes that quantities of energy available remain approximately twenty percent below announced standards. If all imported grain was used for feed during 1979-82, nearly one-quarter of total concentrates consumed by livestock would have been from foreign sources.

The Soviet Union did produce a five-year average oilseed crop of 10.8 million tons during 1981-85 and planted over 9 million hectares (Bickerton). The following maps show the production regions of the Soviet Union for cotton, sunflower, and soybeans.

Figure 14. E. Europe, Soviet and EC-12 Meal I

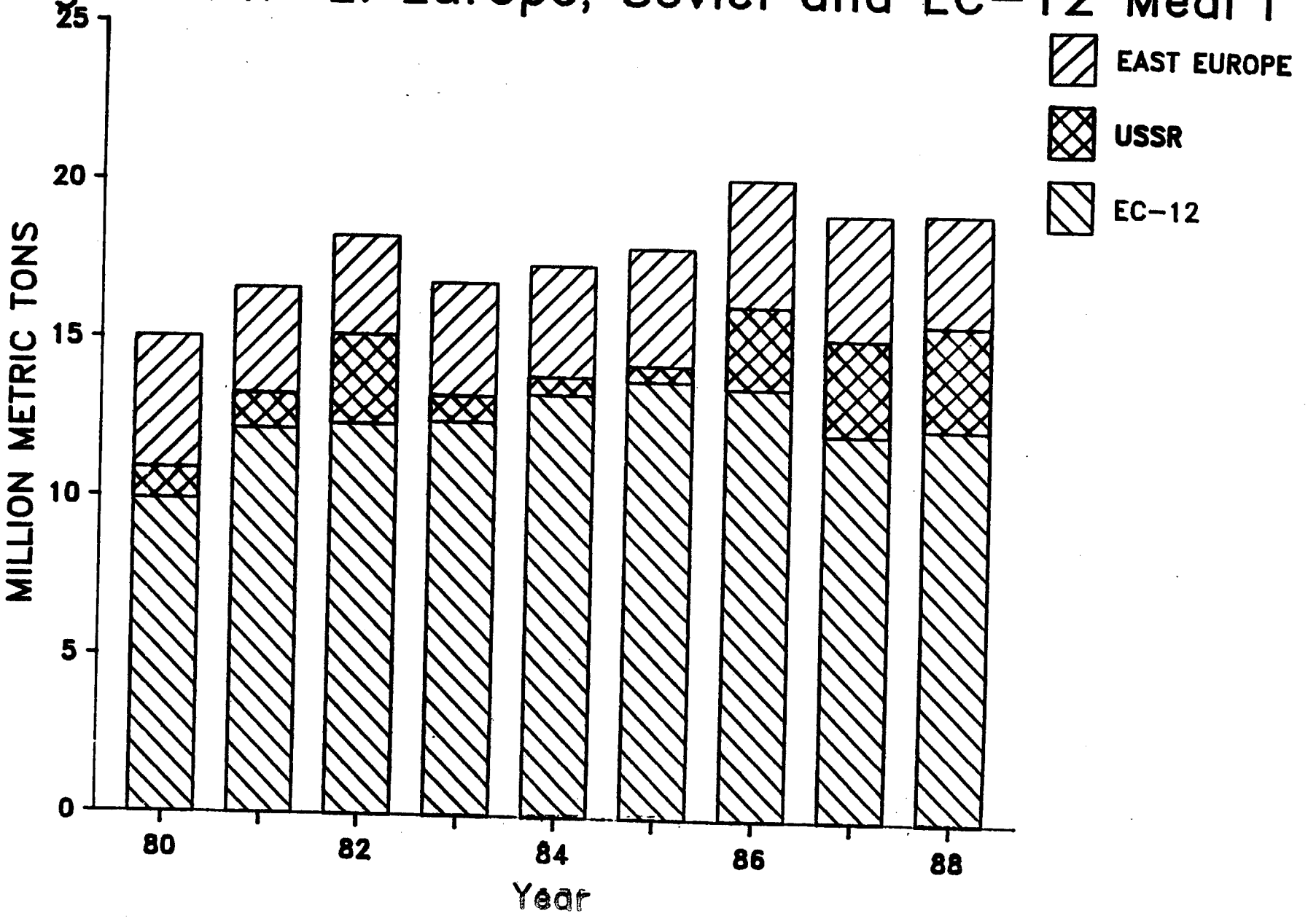


Figure 15. Flax and Cotton production:

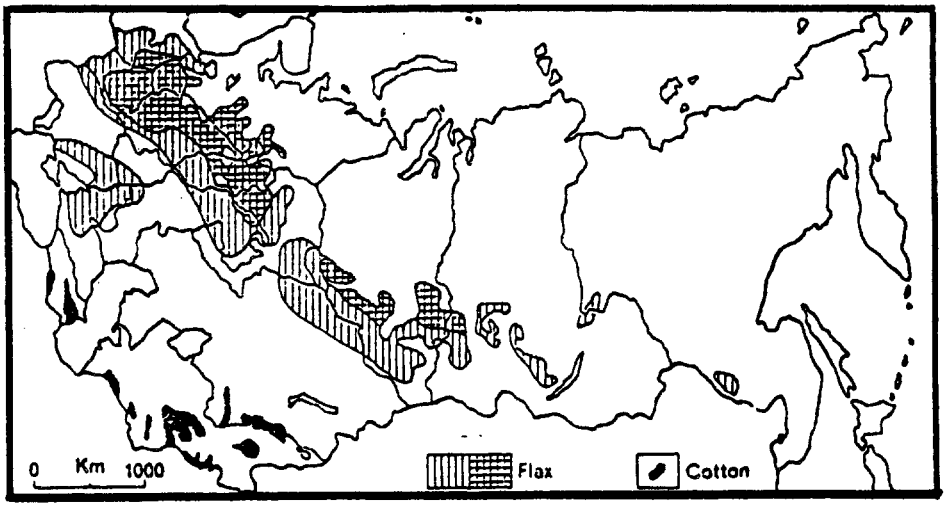


Figure 16. Sunflower production

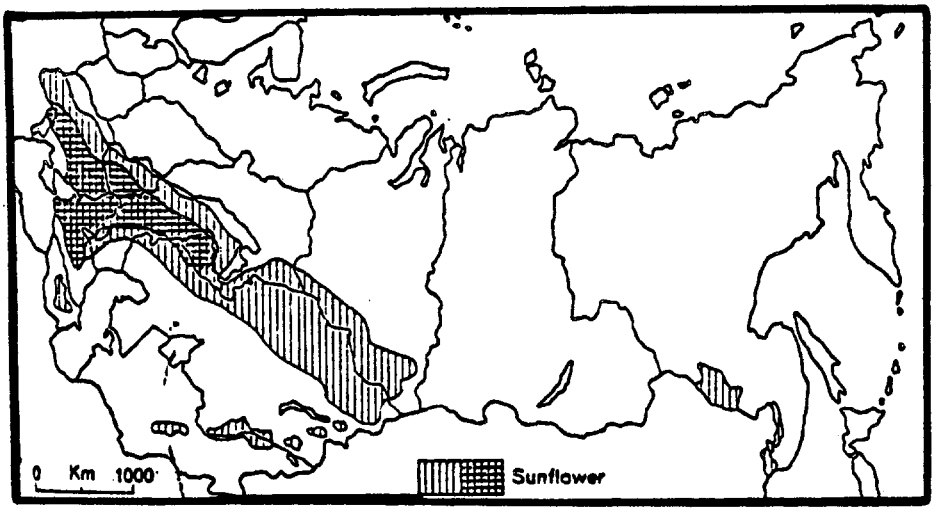
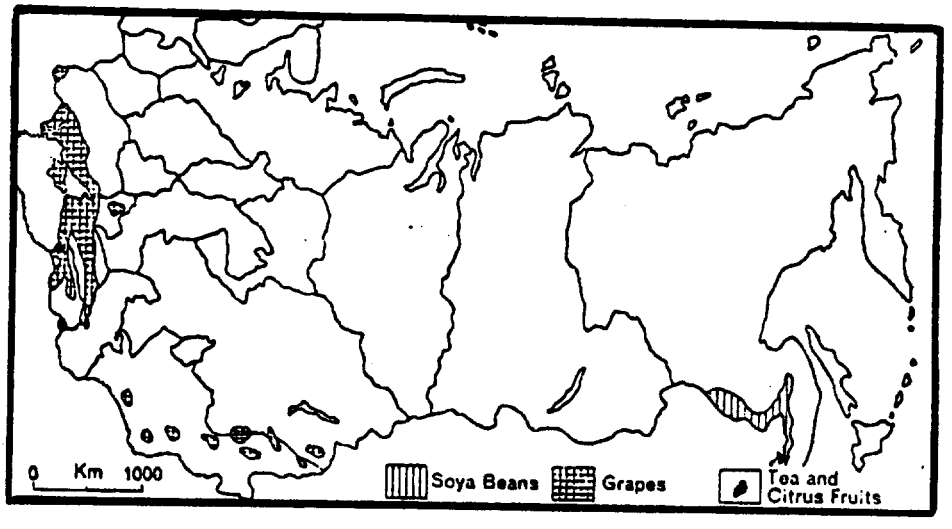


Figure 17. Soybean production



Source (Figures 15 - 17): John C. Dewdney.

Oilseed meal from cottonseed and sunflower seed has provided a substantial portion of the protein supplement in livestock rations in the past. Figure 18 demonstrates the available raw protein by meal in the Soviet Union. From the graph on raw protein, the role of imported soymeal in livestock rations is apparent. (Domestic production includes crushing of imported soybeans.) However, even with the imported oilseed meals and domestic production, the Soviet Union is nearly thirty percent behind the European Community and United States in major oilmeal usage in livestock rations (Figure 19). Regions where cattle are raised are depicted on the map (Figure 20). Swine are predominantly produced in the same region as horned cattle.

Bickerton (1988) notes several reasons that the Soviet have stated for preferring South American and EC soybean meal:

1. Easier handling and storage of South American pelletized meal-less dust, which saves about 10-15 percent of transportation costs.
2. Higher protein content (48 percent) of Brazilian meal.
3. Proximity of EC suppliers for the delivery of meal.

The recent change may have also been linked to the value of the dollar;

Figure 18. USSR Raw Protein Available

Domestic Oilmeals and Imported Soymeal

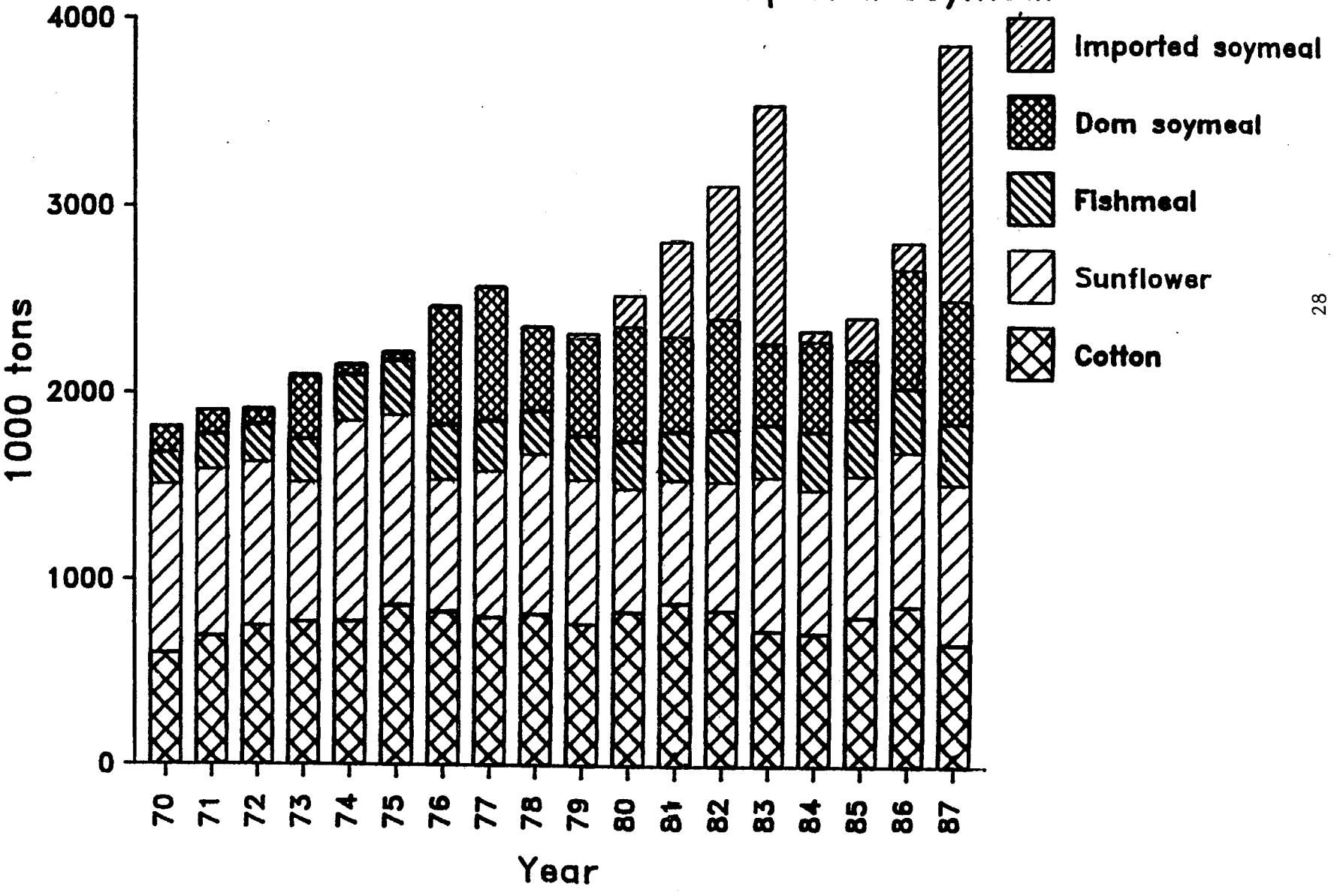


Figure 19. Major Oilmeal Usage

Soybean meal equivalent, per ton of livestock

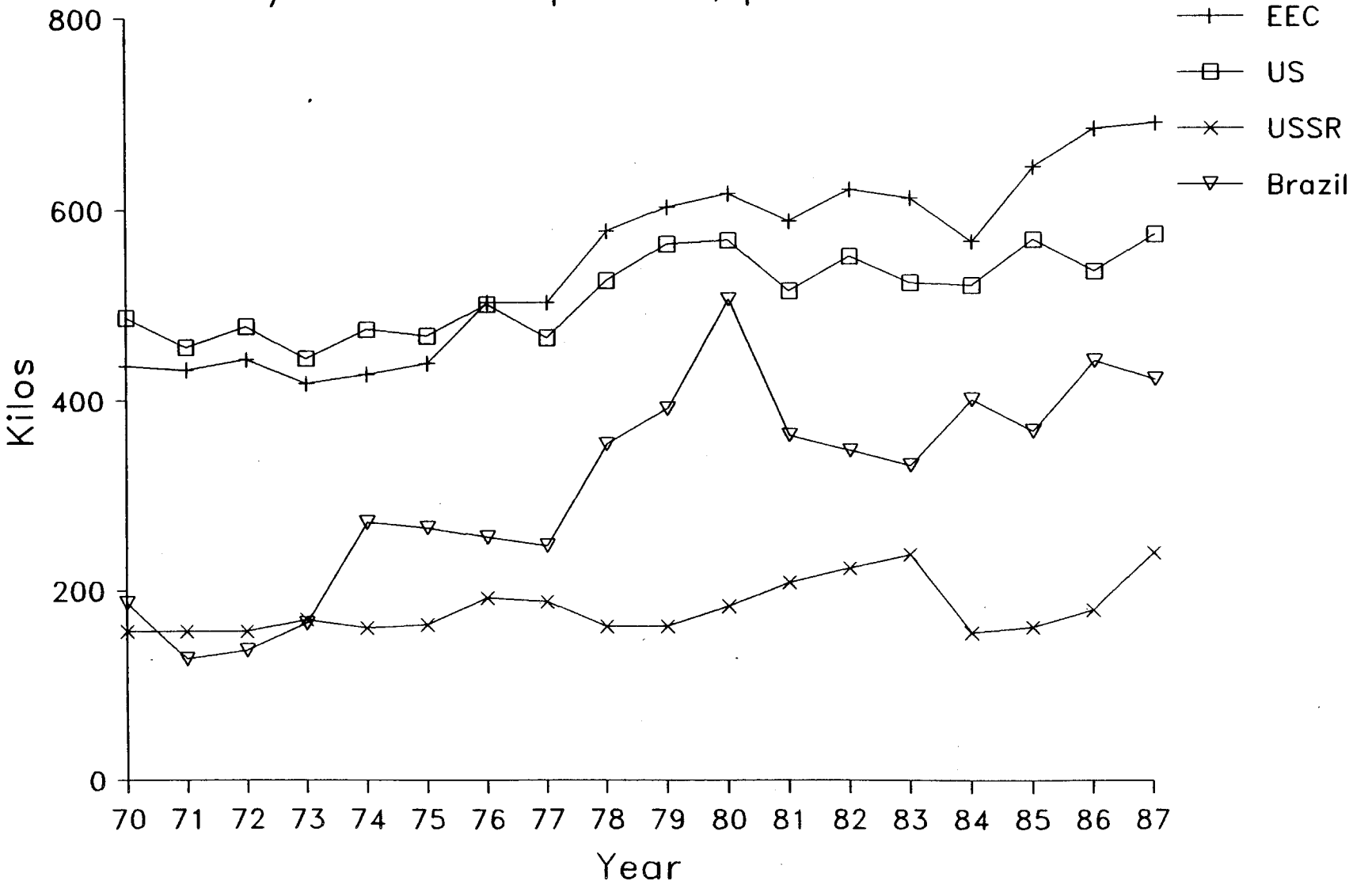
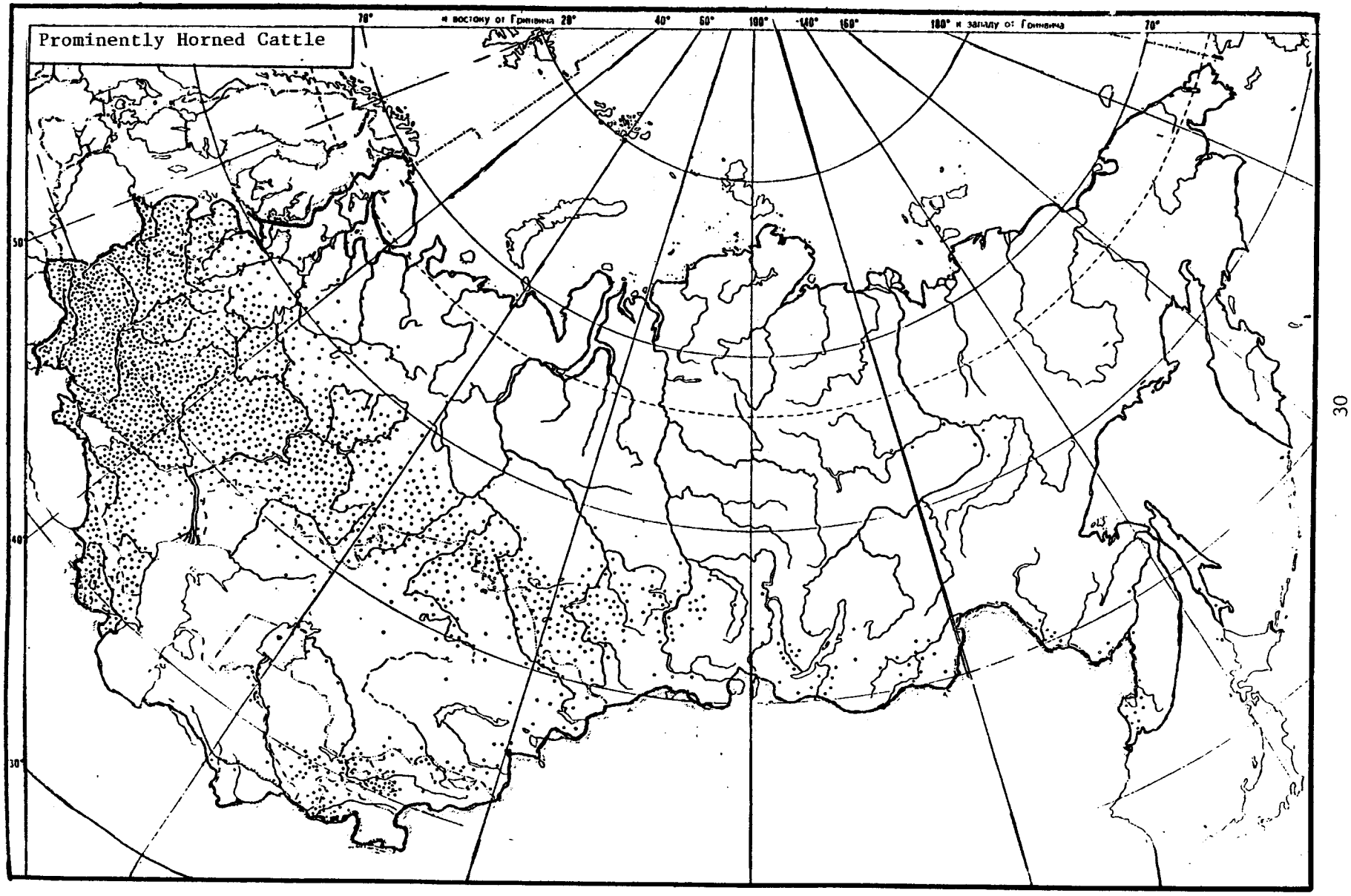


Figure 20. Regions Where Cattle Are Raised in the Soviet Union



1 dot = 25,000 head of cattle.

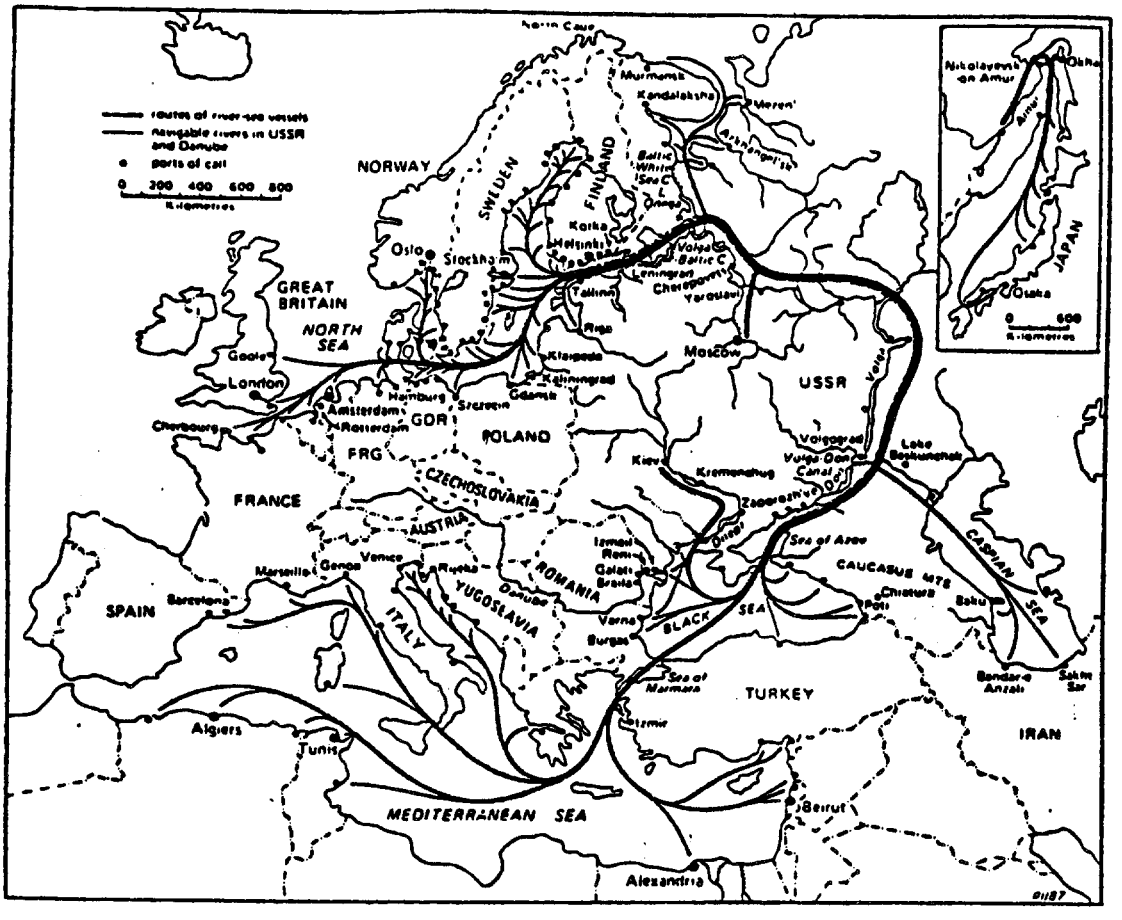
however, Bickerton says that the dollar's decline was offset by a rise in the cost of U.S. soymeal prices. The Soviet mixed feed industry was supplied with 2.8 million tons of protein concentrates in 1980 (Cook). Even with that amount, only nineteen percent of state mixed feeds met the standards for protein content. Bickerton estimates that the Soviets face a protein deficiency of 9-13 million metric tons in soybean meal equivalent. Soviet crushing capacity has stagnated at 12 million tons, so imports of oilseed meals are expected to remain strong in the future.

North states that river-sea vessels present opportunities for transportation in the Soviet Union. Figure 21 illustrates the routes of Soviet river-sea vessels. Port congestion and handling problems (labor shortages, damage, and theft) complicate transhipping cargo off of ocean vessels. The unique railroad gauge limits international traffic competition and railroads are under severe strain as a predominant mode of transportation (Figure 22). The underdevelopment of roads, only seven percent paved, is another constraint on transportation (Figure 23). Waterways, railroads, and roads are primarily located in the Western section of the Soviet Union. East of the Ural mountains, the population is located in industrial centers, such as Novosibirsk, Irkutsk,and Vladivostok.

Soviet Union and United States Trade

Major constraints to the United States and Soviet Union becoming trading partners exist. The current (1989) reforms are slowly changing the rules and methods of trading that the Soviets have practiced in the recent past, but some barriers to trade are still present, other than the transportation and storage problems mentioned above. Gregory and Stuart underscore several: central planning and internal price distortions, ruble inconvertibility, and hard currency shortages. Soviet state and collective farms still have to meet central planners' demands, given resources and inputs provided to the farms by the planners. Internal price distortions encourage hoarding of supplies, and with the lack of storage facilities, feed rations can spoil and become unusable. The lack of storage sites also increases Soviet harvesting losses, as well as poor transportation and handling. Ruble inconvertibility causes commodity

Figure 21. Routes of Soviet River-Sea Vessels



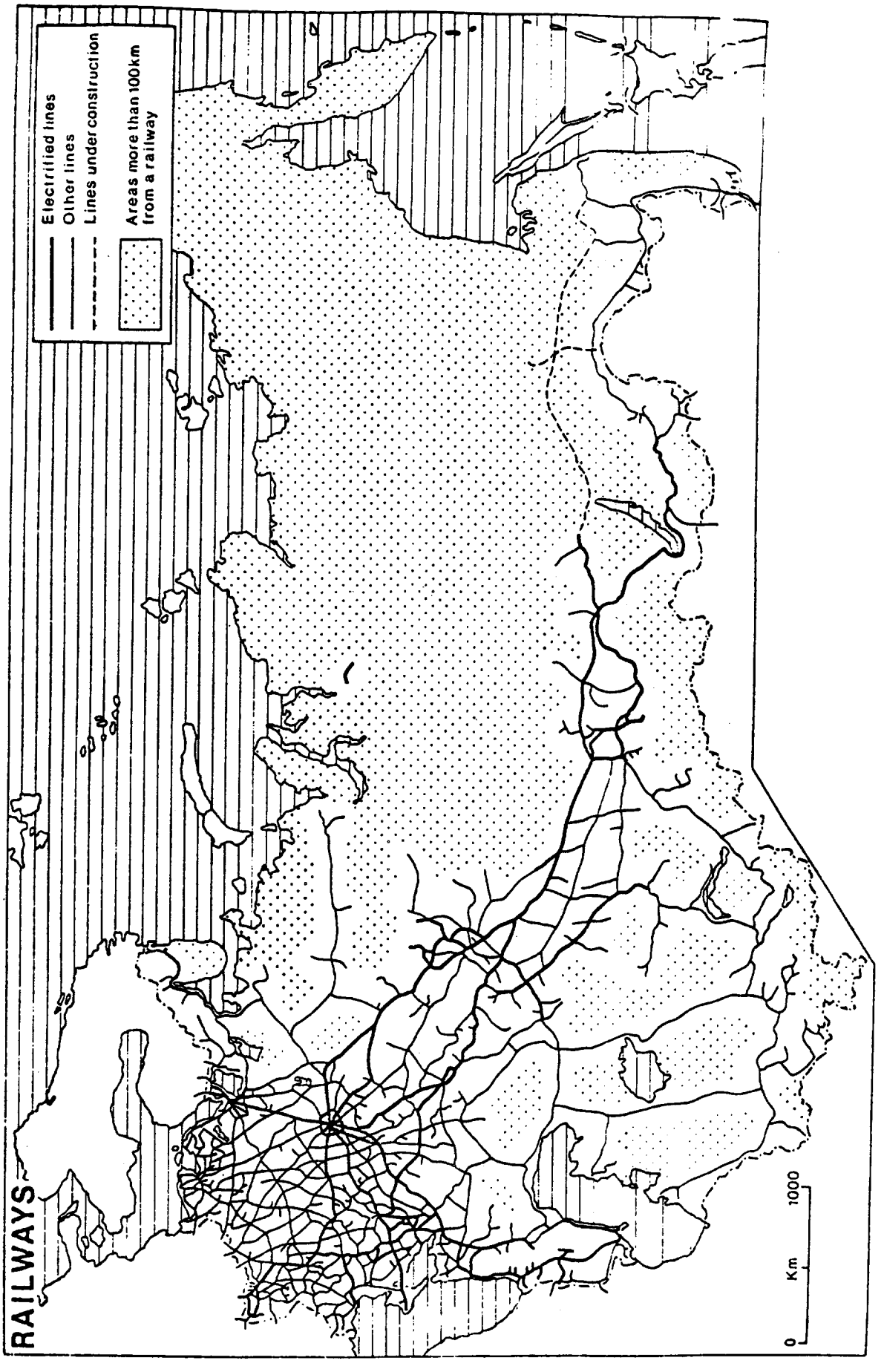
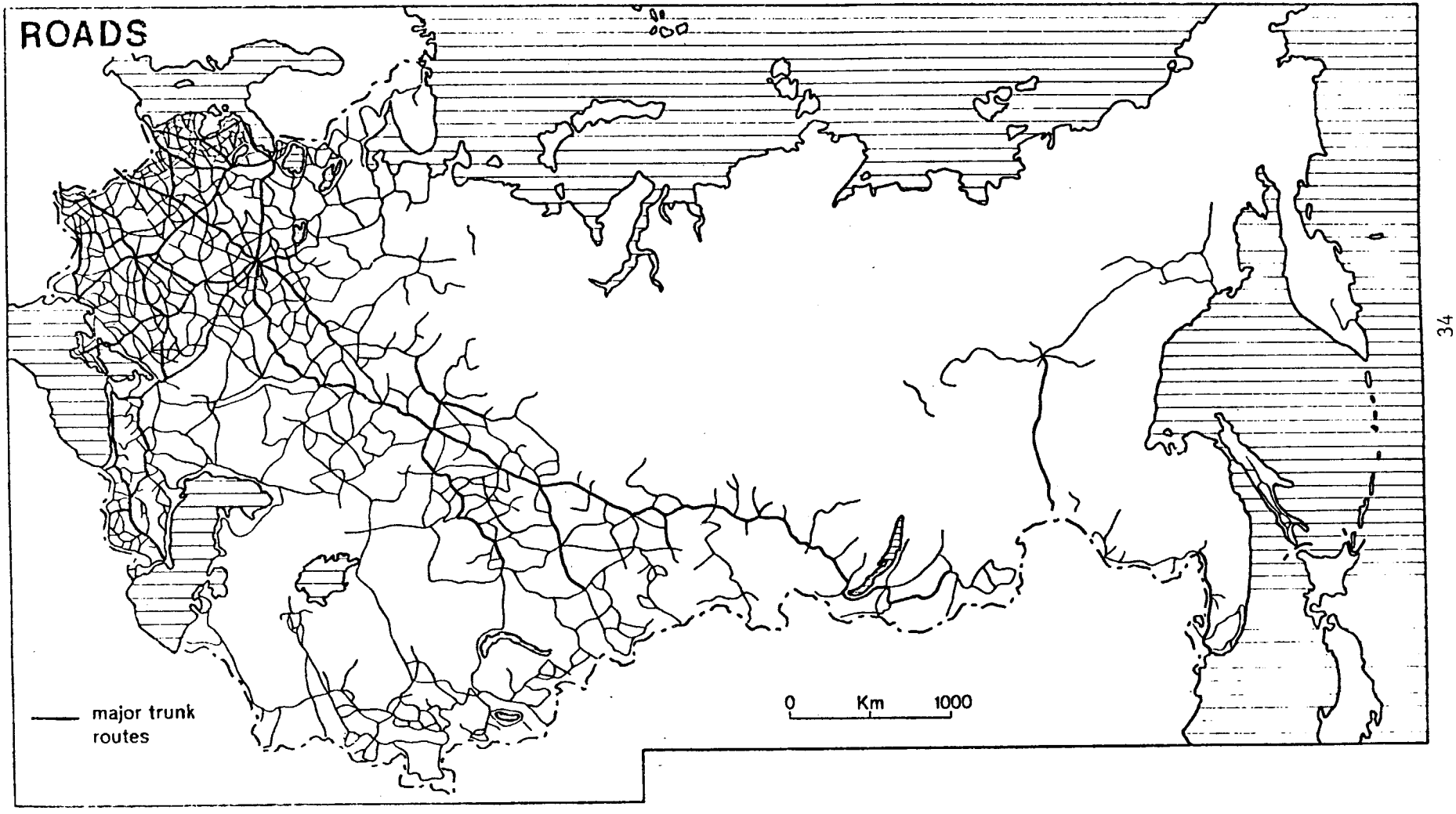


Figure 22. Soviet Railways

Figure 23. Soviet Roadways



exchanges to occur, and if this fails, "commodity inconvertibility" results. In other words, unlike the United States and other world trading countries, the Soviet Union cannot run trade deficits or surpluses with its trading partners. The hard currency shortages follow from this problem, and the Soviets must purchase and sell goods and services for Western convertible currencies. Since most Soviet manufactured goods are perceived as being poor quality, the Soviets have a flow of raw materials and minerals out of their country. These inherent problems have not prevented Soviet trade but complicated the process. The United States can provide the Soviet Union with several goods, including soybean products, as these barriers disappear.

SUMMARY

Soybeans continue to be a vital link in the food system for people worldwide, whether directly (tofu) or indirectly from livestock sources. Minnesota production and processing continue to be important to the state economy, both in people employed and livestock fed. The United States still provides nearly half the world's soybeans and a quarter of the meal exports. The markets for soybean exports are primarily to more developed countries and the centrally planned economies of Eastern Europe.

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