United States
Department of
Agriculture

ERS

Agricultural
Economic
Report
Number 715

An Economic Research Service Report

Oilseeds

Background for 1995 Farm Legislation

Mark Ash
George Douvelis
Jaime Castaneda
Nancy Morgan

It's Easy To Order Another Copy!

Just dial 1-800-999-6779. Toll free in the United States and Canada. Other areas, please call 1-703-834-0125.

Ask for *Oilseeds: Background for 1995 Farm Legislation* (AER-715).

The cost is $9.00 per copy. For non-U.S. addresses (including Canada), add 25 percent. Charge your purchase to your VISA or MasterCard. Or send a check (made payable to ERS-NASS) to:

ERS-NASS
341 Victory Drive
Herndon, VA 22070.

We'll fill your order by first-class mail.

Other Farm Bill Backgrounders Available!

This report is one of a series of "Background for 1995 Farm Legislation" publications by USDA's Economic Research Service. Other backgrounders available are:

- *Dairy: Background for 1995 Farm Legislation* (AER-705)
- *Cotton: Background for 1995 Farm Legislation* (AER-706)
- *Federal Marketing Orders and Federal Research and Promotion Programs: Background for 1995 Farm Legislation* (AER-707)
- *Honey: Background for 1995 Farm Legislation* (AER-708)
- *Tobacco: Background for 1995 Farm Legislation* (AER-709)
- *Peanuts: Background for 1995 Farm Legislation* (AER-710)
- *Sugar: Background for 1995 Farm Legislation* (AER-711)
- *Wheat: Background for 1995 Farm Legislation* (AER-712)
- *Rice: Background for 1995 Farm Legislation* (AER-713)
- *Feed Grains: Background for 1995 Farm Legislation* (AER-714)
- *Agricultural Export Programs: Background for 1995 Farm Legislation* (AER-716)

Dial 1-800-999-6779 for availability and price information.

Oilseeds: Background for 1995 Farm Legislation. By Mark Ash, George Douvelis, Jaime Castaneda, and Nancy Morgan. Commercial Agriculture Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 715.

Abstract

International trade agreements and greater acreage flexibility have improved the outlook for U.S. oilseed production and trade. Issues for 1995 farm legislation that will affect oilseeds will include: setting marketing loans and loan rates; determining payment acres for program crops; extension of acreage-idling policies; resumption of the Export Enhancement Program for vegetable oils; continued funding for the Conservation Reserve Program and other land use policies; and revenue assurance.

Keywords: Soybeans, soybean meal, soybean oil, sunflowerseed, canola, agricultural policy, agricultural trade, farm characteristics, production costs.

Foreword

Congress will soon consider new farm legislation to replace the expiring Food, Agriculture, Conservation, and Trade Act of 1990. In preparation for these deliberations, the U.S. Department of Agriculture and other groups are studying legislation to see what lessons can be learned that are applicable to the 1990's and beyond. This report updates *Soybeans: Background for 1990 Farm Legislation* (AGES #89-41), by Brad Crowder and Cecil Davison. It is one of a series of updated and new Economic Research Service background papers for farm legislation discussions. These reports summarize the experiences with various farm programs and the key characteristics of the commodities and the industries that produce them. For more information, see Additional Readings at the end of the text.

Washington, DC 20005-4788 May 1995

Contents

Summary iii

Soybeans 1
- Regional Production Differences 1
- Production Practices 1
- Costs of Production 3
- Domestic Uses of Soybeans 6
- Industrial Uses of Vegetable Oils 6
- Trends in World Production and U.S. Share 8
- Trends in World Soybean Consumption 8
- Trends in World Soybean Trade and U.S. Share 8
- World Soybean Meal Exports and Imports 9
- World Soybean Oil Exports and Imports 11
- Issues Affecting U.S. Competitiveness in World Soybean Trade 14

Sunflowerseed 15
- Farm Characteristics 16
- Sunflowerseed and Sunflowerseed Product Demand 16
- Oil-Type Sunflowerseed 16
- Confection Sunflowerseed 17
- Global Market for Sunflowerseed and Products 17
- Foreign Policy Developments 17
- U.S. Export Policies 18
- Trends and Outlook for Sunflowerseed Trade 18
- Trends in Sunflowerseed Oil Trade 18
- U.S. Market Share and the Outlook for U.S. Exports 19

Rapeseed and Canola 19

Flaxseed 20

Trade Agreements 21
- Impact of GATT on the U.S. Oilseed Sector 22
- Impact of NAFTA on the U.S. Oilseed Sector 22

Farm Program for Oilseeds and Issues 23
- Effects of the 1990 Legislation 25
- Issues for 1995 Farm Legislation 27

Glossary 29

Additional Readings 32

Appendix Tables 35

Summary

The 1990's will be remembered as a period of market opening for U.S. oilseeds. That is one important element in the current policy climate as policymakers take a look at all commodity programs. Since the 1980's, the U.S. oilseed industry has been much influenced by government programs and foreign trade policies directed toward other commodities. Acreage-idling policies restrict the ability to plant nonprogram crops such as oilseeds. The Conservation Reserve Program (CRP) has removed millions of acres from production.

In the 1970's, the European Union (EU) began heavily subsidizing oilseed production and vegetable oil exports, restricting major markets for the United States. Competition from South American soybean growers and Asian palm oil producers also increased. A strong dollar further complicated U.S. trade competitiveness in the 1980's. Soybean acreage plunged throughout the southern United States.

The 1990 Farm Act gave U.S. oilseed producers the incentive to plant the crop with the best market return on a portion of their base acres. However, gains in production and export share have been modest. In 1992, U.S. and EU negotiators finally agreed to settle the U.S. trade complaint against the EU's oilseed policy, which had unfairly discouraged soybean imports.

This accord cleared a hurdle for a wider agreement in 1994 for the Uruguay Round reforms of the General Agreement on Tariffs and Trade (GATT). The new GATT agreement will lower import barriers and encourage demand worldwide. The North American Free Trade Agreement (NAFTA) was implemented in 1994, reinforcing Mexico's status as a major U.S. trading partner in oilseeds and products.

One of the most important U.S. farm policy questions affecting oilseeds in 1995 relates to planting flexibility on farmers' program crop acreage bases.

Other questions facing policymakers include:

Can government program payments be scaled back without slashing farm incomes? How can farmers be protected from catastrophic price and yield risks without adding to the Federal budget deficit? Can policy be reoriented from support for farm commodities to conservation of resources and environmental protection?

This year's policy issues that will affect domestic oilseeds include: setting oilseed marketing loans and loan rates, determining target prices and payment acres for program crops, extension of acreage-idling policies, continued funding for the CRP and other land-use programs, resumption of the Export Enhancement Program (EEP) for vegetable oils, export credits, promotion of industrial uses of vegetable oils, agricultural research priorities, soybean quality, and revenue assurance.

Soybeans are by far the leading oilseed and in fact are the second-highest valued U.S. crop, trailing only corn. The farm value of soybean production was $12 billion in 1993/94. U.S. soybean acreage planted fell from 71.4 million acres in 1979 (the peak year) to 61.9 million in 1994. Increasing yields have somewhat offset the loss of acreage, resulting in relatively steady production since the early 1980's. Average U.S. yields rose from 32 bushels per acre in 1979 to a record 41.9 bushels in 1994.

In 1992, about 380,000 U.S. farms (20 percent of the total) grew soybeans. That number was down from 511,000 in 1982. More than half of the U.S. soybean farms and production are in the five Corn Belt States (Illinois, Iowa, Indiana, Ohio, and Missouri).

The soybean production area has been expanding north and west into Wisconsin, Michigan, Minnesota, and the Dakotas. New high-yielding, short-season soybean varieties have displaced acreage from flax, oats, sunflowers, dry beans, and alfalfa.

The leading U.S. minor oilseed, sunflowers, accounted for 3.6 million acres in 1994. Another 750,000 acres was planted to other oilseeds: safflower, flaxseed, canola, rapeseed, and mustard seed.

World soybean exports account for about 25 percent of production. This compares with 18 percent for wheat, 11 percent for corn, and 4 percent for rice. Soybeans make up about 75 percent of world trade in oilseeds.

More than 90 percent of world soybean exports come from the Western Hemisphere, where the United States is the clear leader, with Brazil and Argentina next in line.

Oilseeds

Background for 1995 Farm Legislation

By Mark Ash, George Douvelis, Jaime Castaneda, and Nancy Morgan

Soybeans

Soybeans are the second-highest valued crop in the United States, trailing only corn. The farm value of soybean production was $12 billion in 1993/94. U.S. soybean acreage planted fell from 71.4 million acres in 1979 (the peak year) to 61.9 million in 1994. Increasing yields have somewhat offset the loss of soybean acreage, resulting in relatively steady production since the early 1980's. Average U.S. yields rose from 32 bushels per acre in 1979 to a record 41.9 bushels in 1994. The combination of improved varieties and narrow-row seeding has boosted yields in the last 5 years.

Data from the 1992 Census of Agriculture indicated 381,000 farms in the United States (or 1 in 5 U.S. farms) grew soybeans, down from 511,000 in 1982. The harvested soybean acreage per farm increased to 148 acres in 1992 from 125 acres in 1987 and 114 acres in 1978. Although farms with less than 250 acres of soybeans accounted for 83 percent of the farms growing soybeans (table 1), these farms accounted for only 42 percent of U.S. soybean production in 1992. Twenty percent of these farms had at least half their total farm sales coming from soybeans. About 36 percent of U.S. farms had sales of $100,000 or more, while 13 percent had sales of less than $10,000 (table 2). Individual or family farms accounted for 83 percent of all farms producing soybeans and 72 percent of U.S. soybean production in 1992. Partnerships and small family-held corporations accounted for much of the remainder, while other corporations produced 0.4 percent of the total soybean crop.

Regional Production Differences

Over half of U.S. soybean farms and production are located in the five Corn Belt States (Illinois, Iowa, Indiana, Ohio, and Missouri). Soybean acreage in the North Central region (Corn Belt plus Minnesota and Nebraska) declined only slightly between 1979 and 1994. The soybean production area has begun expanding farther north and west into Wisconsin, Michigan, Minnesota, and the Dakotas. The success in breeding high-yielding, short-season soybean varieties has displaced acreage from flax, oats, sunflowers, dry beans, alfalfa, and land that would normally be fallowed. Incorporating soybeans into a rotation with corn or spring wheat has positive agronomic attributes, also aiding its northwestern expansion.

Nearly all of the decline in soybean acreage since 1979 occurred in the lower-yielding, higher-cost southern regions. Southern farmers who planted more soybean acreage during the rising prices of the 1970's cut back in the weaker market of the 1980's. Delta, Appalachian, and Southeast planted area declined by 49, 40, and 65 percent, respectively, between 1979 and 1994. These three regions accounted for 20 percent of U.S. acreage in 1994, compared with 37 percent in 1979.

Yield growth in the South has consistently trailed midwestern soybean yields as southern soybean acreage increasingly occurred on substandard soils, with the best land devoted to program crops. Double-cropped fields are typically planted later than optimal, which also hurts southern yield potential compared with full-season midwestern production. Greater flexibility and the return of Conservation Reserve acres to cultivation could accentuate the production shift from south to north. The prospects for southern acreage will greatly depend on future world demand for soybean oil and meal and the capability to improve yields and control production costs.

Production Practices

Acceptance of *conservation tillage*[1] systems has surged in recent years to nearly one-half of the soybean area planted. Some producers adopted

[1]Italicized words are defined in the glossary at the end of the report.

conservation tillage to meet *conservation compliance* requirements arising from 1985 and 1990 farm legislation. Conservation tillage includes *no-till*, *ridge-till*, and *mulch-till*. Mulch tillage is the dominant conservation system used in northern areas, although use of the no-till system increased from 3 percent of soybean acreage in 1988 to 14 percent in 1992. Illinois led the northern region in total number of soybean acres under conservation tillage (4.6 million) while Indiana ranked highest in percentage of acres (49). Conservation tillage is practiced less in the South, except for Kentucky and Tennessee. No-till is the primary conservation system used in the South as it is best suited for steeply sloping and less productive soils. No-till use in the South rose from 7 percent of total soybean acres in 1988 to 14 percent in 1992.

The crop rotation pattern has a bearing on the type of tillage system and input use. Double-cropping provides an opportunity for minimum tillage cultivation, as soybeans are planted into the stubble soon after the winter wheat harvest. Soybean double-cropping is declining with the loss of acres in the South. About 16 percent of soybean acreage on southern farms is double-cropped with winter wheat. The number of double-cropped soybean acres is linked to the profitability of wheat relative to other crops and acreage set-aside requirements for wheat. Double-cropped soybeans yield less than single-cropped acres because of later planting and depleted soil moisture and nutrients. But future soybean varieties may soon overcome yield reductions associated with day length.

In areas that receive less than 30 inches of precipitation per year, irrigation may be required for

Table 1—Distribution of soybean farms, by acres of soybeans harvested, 1992

Region	Farms by acres of soybeans harvested					Farms growing soybeans
	1-24	25-99	100-249	250-499	500 or more	
			Percent[1]			*Number*
Corn Belt	16.9	37.8	27.3	13.1	4.9	204,087
Lake States	19.0	40.9	26.1	10.8	3.3	55,713
Northern Plains	15.7	41.6	27.9	10.7	3.9	49,781
Appalachia	32.1	36.1	17.8	8.2	5.8	29,206
Delta	8.7	23.5	23.1	20.9	23.9	16,151
Southeast	22.4	40.5	22.7	9.2	5.2	10,688
Northeast	37.6	37.9	14.6	5.7	4.2	11,402
Southern Plains	10.8	38.4	28.3	15.7	7.0	3,181
United States	18.6	38.1	25.8	12.1	5.3	381,000[2]

[1]Totals may not add to 100 percent due to rounding.
[2]Regional totals do not add to U.S. total because not all farms are reported in each State.
Source: 1992 Census of Agriculture

Table 2—Distribution of soybean farms, by value of sales, 1992

Region	Value of sales					Farms growing soybeans
	$100,000 or more	$40,000-$99,999	$20,000-$39,999	$10,000-$19,999	Less than $10,000	
			Percent[1]			*Number*
Corn Belt	34.6	24.5	16.0	11.9	13.1	204,087
Lake States	35.2	24.4	15.1	11.7	13.6	55,713
Northern Plains	39.7	28.6	15.5	9.3	7.0	49,781
Appalachia	32.5	18.7	15.4	12.9	20.8	29,206
Delta	52.0	16.3	9.8	8.4	13.4	16,151
Southeast	33.0	17.4	13.4	12.4	23.8	10,688
Northeast	37.2	17.1	13.2	13.0	19.5	11,402
Southern Plains	43.0	25.4	13.2	8.7	9.7	3,181
United States	36.1	23.8	15.3	11.5	13.4	381,000[2]

[1]Totals may not add to 100 percent due to rounding.
[2] Regional totals do not add to U.S. total because not all farms are reported in each State.
Source: 1992 Census of Agriculture

successful double-cropping. Under irrigation, double-cropped yields are nearly equal to single-crop yields. U.S. farmers irrigated only 2.5 million acres of soybeans in 1992. Fifty-three percent of the irrigated acres were in Arkansas and Nebraska, which helps explain why about half of the U.S. soybean double-cropped acres are in Arkansas.

A soybeans-after-corn rotation requires more tillage to prepare the seedbed, but less when corn follows soybeans. A soybeans-corn rotation provides a more durable residue, which helps hold the soil in place, than a continuous soybean pattern. A better residue reduces the potential for leaching or runoff of chemicals into water supplies. Crop rotations also help manage soybean pests. The rotation of soybeans following soybeans allows pests to become established, requiring higher pesticide expenses. The most common crop rotation (57 percent of acres) in the major northern soybean-producing States is soybeans-corn-soybeans. In the South, however, the most common pattern (25 percent) is continuous soybean production. Continuous production is more widespread in the South because of fewer program base acres and different soil characteristics there.

The combination of greater pesticide and fertilizer use has made possible the highest soybean yields in the world. For all U.S. field crops, soybeans rank second (behind corn) in pesticide use at 114.3 million pounds (active ingredients) for 1993. Virtually all soybean acreage is treated with herbicides but seldom treated with insecticides or fungicides. USDA's 1993 cropping practices survey of eight major soybean-producing States asked producers about their pest control methods. A key element of *integrated pest management* (IPM) includes scouting, or the monitoring of pest levels to make pesticide decisions, taking into account crop prices, pesticide costs, and other factors. The survey reported 59 percent of soybean acreage had been scouted to determine herbicide application. Other common practices included crop rotation to control weeds (78 percent of soybean acres) and rotating herbicides (55 percent of acres). Adoption of conservation tillage has helped accelerate the trend toward using post-emergence herbicides in soybean production, which has much less residual soil activity than pre-emergence applications. However, farmers continue to use conventional methods because rains can delay exclusively applied post-emergence herbicides, which may result in weeds too large to kill effectively. This increases yield risk over pre-emergence programs. In 1992, 64 percent of soybean planted acres still received pre-plant herbicides (generally broadcast) to get the crop a good start over pests.

Soybeans have the lowest average acre-treatment for fertilizer of all the major field crops. Twenty-seven percent of soybean acres in the northern region were fertilized in 1992, compared with 39 percent in the South. Soybean fields are generally treated only once with fertilizer, usually prior to seeding in the spring. Application rates are highest for potash, followed by phosphorus and nitrogen. Southern regions also had higher per acre application rates of nitrogen and phosphates than the northern regions.

Costs of Production

Cash costs of producing soybeans increased in nominal terms from $56 per acre in 1980 to $73 in 1992 (table 3). But variable costs per bushel had no upward or downward trend from $2.18 per bushel in 1980 because of increasing yields. Real costs (adjusted for inflation) of production were about $20 per acre lower in 1992 than they were in 1981 (although they are higher now than in the 1986-88 period). Real costs per bushel peaked in 1981 and have since trended downward as variable costs have risen more slowly and U.S. average soybean yields more quickly than the general price level (Ali).

Analysis of USDA's Farm Costs and Returns Survey data has found that the nominal average variable cost for producing soybeans in 1990 was $2.11 per bushel (McBride, 1991). The low-cost enterprises accounted for 35 percent of soybean production. Low-cost producers had variable costs of $1.57 per bushel or less; high-cost producers $3.11 or more. Low-cost (high-cost) producers are defined as the 25 percent of U.S. soybean producers with the lowest (highest) per-bushel total variable costs. Low-cost soybean producers planted 54 more soybean acres and operated farms that averaged 85 acres larger than high-cost producers. High-cost producers were more likely to work off the farm and to spend more for hired labor. Returns above variable costs were $200 per acre for the low-cost group compared with only $14 per acre for the high-cost group and $124 for all soybean farms (table 4).

Low-cost producers of soybeans had a 43-percent higher average yield but spent less per acre on fertilizer and pesticides than all other soybean producers in 1990. The expenditure difference could be due both to bulk discounts on farm inputs available to large farms and to lower chemical use rates. About 65 percent of high-cost farms fertilized soybeans, compared with 19 percent of the low-cost farms. Low-cost producers most often planted soybeans after corn while high-cost producers planted continuous soybeans. Residual fertilizer from corn planted prior to soybeans

may have increased yield and reduced fertilizer requirements. Low-cost producers tended to use conservation tillage practices more frequently, as evidenced by lower fuel and labor costs in recent years. Differences in climate for low-cost producers (a proportionately higher representation in northern than in southern production regions) would also affect relative costs. Weed and insect problems are generally more serious on southern farms. The rotation with other crops and the cold winters of the North Central region help to control insects.

Growers in northern regions had variable costs $10-$20 per acre lower than growers in southern regions (table 5), meaning that many more producers in the North were able to cover variable costs at the prevailing prices than in the South. Nearly 62 percent of North Central producers had variable costs less than $2 per bushel, compared with 11 percent and 14 percent of Southeast and Delta producers, respectively (McBride). Fewer than 15 percent of southern producers were in the low-cost group. More than 70 percent

Table 3—U.S. soybean production costs, selected years, 1980-92

Item	1980	1984	1985	1986	1987	1988	1989	1990	1991	1992
					Dollars per planted acre					
Cash expenses:										
Seed	7.87	10.97	12.92	10.82	11.16	12.01	15.04	12.47	12.89	12.46
Fertilizer, lime, and gypsum	9.36	8.89	6.18	5.35	5.29	6.61	10.66	9.57	9.34	9.39
Chemicals	13.64	19.56	12.41	12.37	12.04	12.24	19.48	20.48	22.51	23.53
Custom operations	2.85	4.03	4.06	4.06	4.05	4.05	3.50	3.56	3.66	3.66
Fuel, lube, and electricity	12.23	8.42	11.62	7.39	8.97	9.12	8.27	9.06	9.49	8.46
Repairs	7.37	6.45	7.04	6.56	6.63	7.30	8.58	8.63	8.92	9.57
Hired labor	3.06	2.37	2.45	2.53	2.62	2.80	5.68	5.88	5.91	6.21
Other variable cash expenses[1]	0.00	0.36	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04
Total variable cash expenses	56.38	61.05	56.68	49.08	50.67	54.13	71.25	69.69	72.76	73.32
General farm overhead	10.30	10.81	6.85	7.87	10.81	12.44	8.95	8.23	9.25	8.78
Taxes and insurance	10.43	11.94	12.85	13.46	13.94	14.39	16.25	15.63	17.14	17.10
Interest	9.76	33.82	20.32	18.16	19.02	19.20	12.08	13.35	15.54	12.76
Total fixed cash expenses	43.48	56.57	40.02	39.49	43.77	46.03	37.28	37.21	41.93	38.64
Total cash expenses	99.86	117.62	96.70	88.57	94.53	100.16	108.53	106.90	114.69	111.96
Economic (full ownership) costs:										
Variable cash expenses	56.38	61.05	56.68	49.08	50.67	54.13	71.25	69.69	72.76	73.32
General farm overhead	10.30	10.81	6.85	7.87	10.81	12.44	8.95	8.23	9.25	8.78
Taxes and insurance	10.43	11.94	12.85	13.46	13.94	14.39	16.25	15.63	17.14	17.10
Capital replacement	19.37	24.17	29.60	31.48	31.84	34.13	17.94	18.59	19.30	20.71
Operating capital	3.00	2.54	1.72	1.08	1.24	1.51	2.86	2.60	1.98	1.31
Other nonland capital	3.91	4.32	4.99	5.07	5.05	6.36	12.27	8.98	10.48	11.79
Land	64.98	52.71	48.16	43.63	45.56	52.22	46.69	49.86	47.32	50.72
Unpaid labor	11.52	8.94	9.22	9.53	9.86	10.54	16.06	16.96	18.40	19.29
Total economic costs	179.89	176.48	170.07	161.20	169.06	185.72	192.26	190.54	196.63	203.02

[1]Includes cost of purchased irrigation water.

Source: *Economic Indicators of the Farm Sector, Costs of Production, Major Field Crops & Livestock and Dairy, 1991*, U.S. Department of Agriculture, Economic Research Service.

Table 4—Soybean variable production costs and returns per acre, by variable cost group, 1990

Item	Low-cost producers	Mid-cost producers	High-cost producers	All FCRS farms
		Dollars		
Costs per bushel:				
Variable costs, actual yield	1.21	2.13	5.08	2.11
Variable costs, normal yield	1.24	1.96	3.28	1.93
Costs and returns per acre:				
Value of production [1]	252.67	195.00	106.53	193.90
Total variable costs	52.32	70.75	92.44	69.86
Seed	11.15	13.39	11.71	12.47
Fertilizer	2.74	9.77	18.78	9.57
Chemicals	18.00	21.52	21.05	20.48
Custom operations	1.75	3.43	5.95	3.45
Fuel, lube, and electricity	7.87	8.60	12.02	9.05
Repairs	8.11	8.83	9.80	8.82
Hired labor	2.56	5.05	13.03	5.88
Purchased irrigation water	0.01	0.06	0.00	0.04
Technical services	0.16	0.10	0.10	0.11
Returns above variable costs	200.32	124.25	14.09	124.03

[1]Value of production determined from the yield reported in the Farm Costs and Returns Survey and State-level soybean harvest-month prices.

Source: William McBride, *Characteristics and Production Costs of U.S. Soybean Farms, 1990*, U.S. Department of Agriculture, Economic Research Service.

Table 5—Soybean variable production costs and returns per acre, by region, 1990

Item	North Central	Southeast	Delta	Northern Plains	All FCRS farms
			Dollars		
Costs per bushel:					
Variable costs, actual yield	1.80	3.91	3.15	2.02	2.11
Variable costs, normal yield	1.71	2.88	2.61	1.85	1.93
Costs and returns per acre:					
Value of production[1]	220.62	128.49	140.79	166.07	193.90
Total variable costs	67.56	85.59	74.18	59.15	69.86
Seed	13.52	9.69	10.48	11.54	12.47
Fertilizer	8.39	23.12	5.45	2.60	9.57
Chemicals	21.51	19.50	19.34	16.47	20.48
Custom operations	3.85	2.25	3.80	2.26	3.45
Fuel, lube, and electricity	7.82	10.22	13.05	11.31	9.05
Repairs	8.25	9.54	10.79	9.52	8.82
Hired labor	4.06	11.24	11.17	5.06	5.88
Purchased irrigation water	0.03	0.00	0.00	0.19	0.04
Technical services	0.12	0.02	0.10	0.21	0.11
Returns above variable costs	153.06	42.90	66.61	106.92	124.03

[1]Value of production determined from the yield reported in the Farm Costs and Returns Survey and State-level soybean harvest-month prices.

Source: William McBride, *Characteristics and Production Costs of U.S. Soybean Farms, 1990*, U.S. Department of Agriculture, Economic Research Service.

of Southeast soybean farmers and more than 50 percent of Delta producers were in the high-cost group.

Southern farms that double-crop are able to lower average production costs for their enterprise by distributing their fixed costs over more production. Land costs and property taxes in the South were about one-third less (because of the lower productivity) than in the Midwest. But the average southern soybean farmer has covered full ownership costs (which include land and capital replacement costs) only once since 1980, when a midwestern drought in 1988 drove up prices nationwide. This explains the exodus of land and capital devoted to soybean production in the South over the last 15 years.

Domestic Uses of Soybeans

Soybean meal is still the most valuable component obtained from processing the soybean, ranging from 50 to 75 percent of the soybean's value. It is by far the world's most important protein feed, accounting for roughly 60 percent of world protein meal. Soybean meal competes with meals produced by crushing cottonseed, sunflowerseed, peanuts, and canola. U.S. exports account for 20-25 percent of total U.S. soybean meal production, resulting in $1.0-$1.5 billion per year in trade.

Over the last decade, edible use of soybean oil in the United States has increased about 3 percent per year. This growth rate matches the consumption growth for all edible oils so that soybean oil has maintained a relatively constant (about 73 percent) proportion of total edible oil use. However, consumption of two vegetable oil substitutes, canola and corn oil, has increased faster than consumption of soybean oil. In 1993/94, salad and cooking oils accounted for 42 percent of edible use of soybean oil, followed by baking and frying fats (40 percent) and margarine (16 percent). The development of no-calorie "fat mimics" and engineered fat substitutes could soon revolutionize the use of edible oils.

Soy flours are made by finely grinding soybean flakes before or after removal of oil. In the United States, soy flours are used primarily for bread and bakery products. Whole soybeans may be used to produce textured soy protein for meat extenders, isolated proteins for dairy substitutes, and oriental foods such as *tofu*, *miso*, *tempeh*, or soy sauce. Domestic demand for these products has expanded slowly outside the vegetarian and Asian-American communities. Consumption of soybeans for food use in the United States was estimated for 1992 at 1.6 million bushels.

The gross processing margin is the difference between the price of soybeans and the value of the soybean products: oil and meal. The margin indicates the cost, including profit, of providing crushing services. A number of factors influence the margin. These include fluctuations in soybean supply and demand, the buying practices of the processor, location and size of the processor, competition for soybean purchases, and product yields per bushel of soybeans. The average gross margin for the last 5 years was 91 cents per bushel, compared with 80 cents for 1984/85-1988/89.

Industrial Uses of Vegetable Oils

Vegetable oil derivatives (or oleochemicals) are used in a wide variety of industrial applications. These include soap, cosmetics, *surfactants*, lubricants, paints and varnishes, solvents, resins and plastics, *stabilizers*, *emulsifiers*, pesticides, and other *fatty acids*. Less than 300 million pounds of domestically produced soybean oil is used for industrial purposes (table 6), which is less than 3 percent of total consumption. Research is accelerating to further expand the applications of these environmentally friendly materials, to products such as nylon, breast implants, and fuel.

Printing inks now commonly use soybean oil as a carrier for pigments and other components. Color inks are readily accepted because a soyoil-based carrier makes more efficient use of pigments, which is the principal cost component of color inks. For U.S. daily newspapers that use color inks, 90 percent now use color soy ink because of its superior visual quality and lower toxicity over conventional petroleum-based inks. Soy inks have one-tenth the emission of volatile organic compounds (VOC), air pollutants that form ground-level ozone. The adoption of soybean oil base for black newsprint inks has been slower, with only 25 percent of the over-300-million-pound market. However, improved, cost-effective formulations are rapidly emerging to tap into a much larger printing market. In 1990, newspapers accounted for only 7 percent of the potential printing ink market of 3.5 million tons, while magazines accounted for 27 percent, commercial printing 19 percent, and books 18 percent. Congress passed a bill in late 1994 to mandate the use of vegetable oil-based inks for all Federal publications (about 2.4 million pounds) whenever technologically feasible. Several State governments have instituted similar regulations for State-contracted print jobs.

The nontoxic and biodegradable features of biodiesel make it an attractive potential fuel source in environmentally delicate areas, such as rivers, bays, parks,

and forests. The Clean Air Act Amendments of 1990 (CAAA) require on-road diesel engines and city buses, beginning in 1995, to reduce emissions of particulate matter, hydrocarbons, carbon monoxide, and nitrogen oxides. Several demonstration projects have begun on a biodiesel blend (80 percent petrodiesel, 20 percent soybean oil) to determine exhaust emission and engine wear levels when used in truck and city bus fleets. This blend can reduce particulate levels by 27 percent and hydrocarbons by 50 percent, and can reduce nitrous oxides provided an engine timing change is made. This biodiesel blend represents a potential market of 50 million gallons (350 million pounds) of soybean oil annually. Biodiesel would require few engine modifications, and maintenance and refueling would be more convenient than with other alternatives (propane, compressed natural gas, methanol). Initial cost estimates of operating bus engines with biodiesel appear to be favorable compared with other alternatives, but its 40-100 percent premium over diesel will relegate it to niche markets where regulatory or environmental issues are a concern. Costs could be reduced through manufacturing improvements and higher-oil-yielding soybeans, although it is unlikely that refined soybean oil would be the first source for biodiesel feedstocks, as tallow, waste restaurant grease, and palm oil are more price-competitive. Interest in biodiesel has also increased in the European Union (EU) since the Common Agricultural Policy (CAP) reform limits oilseed acreage for food, but permits production for industrial uses.

The CAAA also require paint manufacturers to reduce volatile organic compounds in their formulations as surface coatings are the largest single source of VOC's. Epoxidized soybean oil (ESO) derivatives may partially replace petroleum-based chemicals as paint solvents. ESO is also a heavily used plasticizer, for molding plastic resins into bottles, bags, and other products. As ESO use expands into coatings, the market could eventually reach 250-300 million pounds annually, more than double its current size. These materials have a relatively high value (50-75 cents per pound) compared with edible uses.

With further research, there is also a large potential market for soy-based wood adhesives. Wood composite (including particle board, fiberboard, and plywood) manufacturing uses formaldehyde-based adhesives, which emit VOC's.

In early 1994, soybean farmers approved by referendum a nationwide checkoff that funds market development, promotion, consumer education, and research of soybeans. Farmers contribute 50 cents on each $100 of soybean sales. Half of the approximately $50 million to be raised annually will be spent nationally by the United Soybean Board and half will be returned to State organizations. Research into new uses for soybeans (including the National Soy Diesel Board) and ways to lower production costs are key goals of the farmer-funded program.

Table 6—Consumption of soybean oil in inedible products, 1979-93

Year[1]	Total edible	Total inedible[2]	Soap	Paint and varnish	Feed	Resins and plastics	Lubricants	Fatty acids
				Million pounds				
1979/80	8,493.3	205.1	0.0	51.9	0.0	79.8	0.0	21.2
1980/81	8,610.2	202.3	0.0	45.7	0.0	70.9	0.0	22.8
1981/82	9,132.6	202.8	0.0	38.9	0.0	93.7	0.0	21.5
1982/83	9,282.3	204.7	0.0	38.0	D	96.3	D	15.9
1983/84	9,245.4	231.0	D	39.3	D	109.6	D	20.8
1984/85	10,171.6	251.5	10.2	51.7	D	92.9	D	29.1
1985/86	10,003.7	279.5	D	59.5	D	98.7	D	31.5
1986/87	10,212.7	299.5	D	63.2	D	109.2	D	D
1987/88	10,429.1	285.3	2.7	54.1	D	106.1	D	D
1988/89	9,635.8	281.8	1.5	34.9	D	123.7	D	D
1989/90	10,536.7	271.6	D	38.2	D	112.4	D	D
1991	10,966.7	301.0	D	49.2	D	104.7	D	D
1992	11,168.7	302.8	D	43.5	22.3	94.0	5.9	D
1993	12,200.9	294.7	D	38.7	23.7	98.1	5.8	D

[1] Crop year runs from October 1 to September 30. Annual totals reported on a calendar year basis beginning in 1991.
[2] Includes other inedible uses.
D= Data withheld to avoid disclosing figures for individual companies.
Source: *Fats and Oils—Production, Consumption, and Stocks.* Bureau of the Census, Department of Commerce.

An expansion in uses for soybean oil (all other things held constant) would increase the value of oil relative to soybean meal. Soybean breeders would have an incentive to develop high-oil-yield varieties.

Trends in World Production and U.S. Share

World soybean production has been on a sharp upward trend since 1964. Most of the growth in soybean production has come from increases in area rather than higher yields. For example, between 1964 and 1993, soybean production rose at an annual rate of 4.6 percent, with area growing 2.8 percent per year and yields only 1.6 percent. Global soybean production in 1994/95 is expected to rise 15 percent from 1993/94 to 135 million tons.

Five countries account for about 90 percent of the world's soybean production. Despite a continuous decline in production share from 90 percent in 1970, the United States remains the leading soybean producer, with approximately 50 percent of world production. In 1980, the United States had 27 percent of the world's oilseed area but dropped to 21 percent by 1994. Brazil, Argentina, China, and India are the next largest producers of soybeans. Brazil's and Argentina's shares of world soybean production are expected in 1994/95 to be about 20 and 10 percent, respectively, while China and India produce 13 and 4 percent of world soybean output.

In Brazil, production rose from 2 million tons in 1970 to an anticipated 24 million in 1994, representing the largest growth rate during the 1970's. Argentina increased production from a negligible 59,000 tons in 1970 to a projected 12.7 million in 1994. China's and India's soybean production are estimated at 13.3 and 3.3 million tons in 1994/95, respectively. Most of the production expansion in these countries has occurred since 1980. Production has also recently expanded in Indonesia, Canada, and Paraguay.

Trends in World Soybean Consumption

Year-to-year global soybean crush has expanded in 25 of the last 30 years. The annual growth for global crush (5.2 percent) is greater than the rate for total production over the same period. The United States, Brazil, Argentina, China, and the EU account for about 80 percent of total world soybean consumption. Developed countries account for approximately 65 percent of total global soybean crush.

World soybean meal consumption is more widely spread than soybeans through a large number of countries. Although developing countries account for only 25 percent of total world soybean meal consumption, their consumption since 1965 has grown at a faster rate (7 percent) than overall global growth. Slower growth in consumption of soybeans and soybean meal is expected to continue in developed countries, while future growth in soybean meal consumption will be driven mainly by developing countries.

Trends in World Soybean Trade and U.S. Share

World soybean exports account for approximately 25 percent of world soybean production. This compares with 18 percent for wheat, 11 percent for corn, and 4 percent for rice. In addition, soybean exports are approximately 75 percent of international trade in oilseeds.

Most of world soybean exports come from the Western Hemisphere, with the United States exporting about 60-70 percent of world exports and Brazil and Argentina combined 20-25 percent. Other major producers, such as China and India, consume most of their soybean production domestically, which restricts supplies for export.

World soybean exports increased steadily from 6.5 million tons in 1964 to about 29 million tons in 1979 (table 7). However, between 1980 and 1994, world soybean trade remained at approximately the same level. World imports of soybeans are dominated by the EU, Japan, Taiwan, and Mexico (table 8). These countries accounted for approximately 80 percent of world soybean imports. Despite a continuing proportional decline, the EU remains the world's most important import market for soybeans, with a market share of nearly 48 percent.

Several factors have contributed to the lack of growth in soybean trade. Developed countries, especially the EU and Japan, are the primary importers of soybeans. Income growth in developed countries has resulted in declining food expenditures as a percent of income, limiting the demand for soybean products and soybean imports. Also, significant supplies of inexpensive soybean meal from South America led to some shift between soybean and soybean meal imports.

U.S. soybean exports are closely related to U.S. production and consumption. During the 1970's, U.S. production increased faster than consumption, expanding the availability of soybeans for exports. In the 1980's, U.S. soybean production remained nearly constant (primarily because of lower soybean prices and higher support for grains and cotton) but consumption

continued to grow, restricting U.S. soybean export capacity. From the 1969-71 period to 1994/95, the U.S. share of world soybean trade dropped from an average of about 92 percent to 66 percent. Although the United States lost about 10 percent in its share of soybean world trade between 1970 and 1980, U.S. exports increased nearly 9 million tons in the same period. However, during the 1980's, the U.S. share decreased about 20 percent, while U.S. soybean exports dropped by approximately 5 million tons. A stronger dollar and expansion of the domestic livestock sector were key features of this period.

World Soybean Meal Exports and Imports

In contrast to world soybean exports, soybean meal exports have continued to grow since 1964. World soybean meal exports expanded from 2.8 million tons in 1964 to a projected 29.7 million tons in 1994 (table 9). The contrast between meal and soybeans is primarily a result of expanded demand for soybean meal in developing countries relative to stable soybean im-

Table 7—World soybean exports, major exporters and regions, 1964-94

Crop year[1]	World	United States	Argentina	Brazil	China
			1,000 metric tons		
1964/65	6,548	5,774	0	75	577
1965/66	7,592	6,820	0	121	550
1966/67	8,125	7,119	0	305	565
1967/68	7,993	7,255	0	66	571
1968/69	8,675	7,805	0	310	488
1969/70	12,571	11,773	0	290	424
1970/71	12,576	11,806	0	230	460
1971/72	12,906	11,344	0	1,023	370
1972/73	15,441	13,048	0	1,788	310
1973/74	18,086	14,673	0	2,862	340
1974/75	15,580	11,450	0	3,516	330
1975/76	19,229	15,107	111	3,328	178
1976/77	19,137	15,351	623	2,581	115
1977/78	22,339	19,061	1,969	659	90
1978/79	24,658	20,117	2,776	638	274
1979/80	29,063	23,818	2,726	1,533	207
1980/81	24,538	19,712	2,190	1,502	143
1981/82	29,539	25,285	2,151	797	110
1982/83	28,554	24,634	1,338	1,316	320
1983/84	26,372	20,215	3,132	1,580	800
1984/85	24,912	16,279	2,954	3,456	1,080
1985/86	26,101	20,158	2,566	1,192	1,260
1986/87	28,515	20,600	1,292	3,290	1,750
1987/88	30,422	21,870	2,100	3,020	1,482
1988/89	23,850	14,356	516	5,080	1,209
1989/90	28,112	16,952	3,511	4,220	1,107
1990/91	24,204	15,159	4,127	1,645	1,288
1991/92	28,255	18,615	3,050	3,826	1,090
1992/93	29,586	20,944	2,216	4,057	300
1993/94[2]	28,065	16,032	3,054	5,464	1,100
1994/95[3]	32,502	21,500	3,000	4,650	500

[1] Based on aggregate of differing local marketing years.
[2] Preliminary.
[3] Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

ports by developed countries. World soybean meal exports account for nearly 70 percent of total world protein meal trade. The EU is still the largest import market, although Asian buyers are rapidly increasing their demand (table 10).

The U.S. share of world soybean meal exports is about 18 percent. Strong domestic demand for soybean meal and large exports of meat could have partly replaced some meal exports. On the other hand, South America, which became a major competitor for U.S. soybean meal markets during the mid-1970's, increased its share from 25 percent in 1974 to about 58 percent in 1993/94 and is expected to continue growing in the near future. Low costs, fertile and abundant land, increasing soybean supplies, large currency devaluations, and favorable trade policies such as differential export taxes (DET) in Brazil and Argentina made South American soybean producers extremely competitive in world markets, especially for soybean products.

Recently, India has dramatically expanded production of oilseeds, including soybeans, to meet rising demand for domestic edible oil. But demand for soybean meal within India is low, so its large surplus of meal has been exported, primarily to other Asian countries. This has hampered growth of U.S. exports

Table 8—World soybean imports, major importers and regions, 1964-94

Crop year[1]	World	EU[2]	Japan	All Asia	East Europe	Mexico	Latin America
			1,000 metric tons				
1964/65	6,666	3,417	1,864	2,112	115	3	49
1965/66	7,670	4,173	2,178	2,415	79	5	67
1966/67	8,249	4,537	2,183	2,615	107	7	64
1967/68	8,384	4,556	2,435	2,877	70	8	77
1968/69	9,327	5,058	2,604	3,148	175	22	93
1969/70	12,343	7,013	3,257	4,012	119	133	223
1970/71	12,647	7,170	3,226	3,898	184	62	179
1971/72	13,935	8,048	3,396	4,253	114	18	145
1972/73	14,880	7,971	3,635	4,720	176	50	198
1973/74	17,290	10,765	3,244	4,524	236	271	418
1974/75	16,365	10,074	3,334	4,349	128	118	230
1975/76	19,883	11,438	3,554	4,811	316	135	277
1976/77	19,716	11,277	3,602	4,897	189	498	642
1977/78	23,115	13,608	4,260	5,916	603	551	834
1978/79	25,857	14,654	4,132	6,241	699	589	1,032
1979/80	28,289	16,233	4,165	6,669	925	711	1,394
1980/81	26,214	13,219	4,213	6,961	515	1,370	2,613
1981/82	29,233	15,947	4,486	7,367	477	566	2,440
1982/83	28,428	15,557	4,871	7,628	783	1,070	1,738
1983/84	25,724	12,891	4,728	7,319	829	1,805	2,405
1984/85	25,533	12,901	4,611	7,458	572	1,472	2,330
1985/86	27,516	13,228	4,796	8,442	784	877	1,568
1986/87	29,367	14,442	4,866	8,851	753	1,092	2,455
1987/88	28,697	13,583	4,847	9,481	727	956	2,061
1988/89	24,303	11,153	4,286	8,388	422	1,220	2,368
1989/90	26,925	13,265	4,667	9,148	778	945	1,659
1990/91	25,945	12,797	4,375	8,783	494	1,376	2,296
1991/92	29,274	13,775	4,672	9,829	276	2,100	3,259
1992/93	29,989	14,809	4,866	9,926	300	2,136	2,887
1993/94[3]	28,434	13,049	4,855	10,120	258	2,150	3,883
1994/95[4]	32,152	14,868	4,800	10,702	433	2,250	3,208

[1]Based on aggregate of differing local marketing years.
[2]Includes intra-EU trade.
[3]Preliminary.
[4]Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

Table 9—World soybean meal exports, major exporters and regions, 1964-94

Marketing year[1]	World	United States	Argentina	Brazil	EU[2]	China	India
			1,000 metric tons				
1964/65	2,826	1,847	0	105	606	0	0
1965/66	3,534	2,360	0	185	749	0	0
1966/67	3,498	2,410	0	125	759	0	0
1967/68	3,869	2,630	0	235	798	0	0
1968/69	4,274	2,762	0	310	991	0	0
1969/70	5,728	3,661	0	580	1231	0	0
1970/71	6,719	4,136	0	990	1364	0	0
1971/72	6,888	3,452	0	1,506	1,670	23	0
1972/73	8,157	4,304	14	1,373	2,167	0	0
1973/74	10,068	5,033	12	2,396	2,263	21	0
1974/75	9,648	3,900	158	3,450	1,740	25	0
1975/76	11,182	4,667	251	4,078	1,909	16	0
1976/77	11,910	4,136	325	5,329	1,818	17	0
1977/78	14,453	5,516	370	5,368	2,789	30	40
1978/79	14,969	5,997	260	5,038	3,116	31	50
1979/80	18,852	7,196	277	6,936	3,767	66	60
1980/81	19,880	6,154	591	8,562	3,904	185	107
1981/82	20,773	6,266	1,209	7,822	4,547	289	200
1982/83	23,324	6,449	1,765	7,994	5,861	586	225
1983/84	21,962	4,862	2,663	7,690	5,396	694	250
1984/85	22,112	4,426	2,521	8,628	5,160	650	350
1985/86	22,807	5,476	3,248	6,961	5,081	1,116	450
1986/87	25,742	6,617	3,600	8,030	5,081	1,542	450
1987/88	26,998	6,191	5,350	8,477	3,827	2,343	360
1988/89	25,429	4,937	4,350	9,577	3,541	1,600	890
1989/90	25,680	4,825	4,860	8,994	3,824	1,600	950
1990/91	26,806	4,962	6,294	7,414	3,732	2,250	1,420
1991/92	28,127	6,301	6,330	8,151	3,968	1,400	1,180
1992/93	27,376	5,653	6,538	7,987	3,964	400	2,005
1993/94[3]	29,336	4,859	6,939	10,050	3,660	700	2,020
1994/95[4]	29,660	5,284	6,971	9,815	3,979	500	2,020

[1]Based on aggregate of differing local marketing years.
[2]Includes intra-EU trade.
[3]Preliminary.
[4]Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

of soybeans and soybean meal, as Asian consumers have replaced declining Chinese soybean and meal exports with lower priced meal from India.

World Soybean Oil Exports and Imports

Soybean oil is the most common edible oil produced and consumed in the world, accounting for about 25 percent of the production and consumption of the nine major edible oils[2] in the world market. Soybean oil is second only to palm oil in world trade, with 20 percent of international trade. Soybean oil trade accounts for 25 percent of world production. Exports from the United States, Argentina, the EU (including intra-EU trade), and Brazil represent more than 90 percent of world soybean oil exports. Unlike exporters, there are a large number of soybean oil importers, with Asia, Latin America, and the Middle East as the most important regions. These are countries that have greater deficits of edible oils than they have for livestock feeds.

Between the early 1960's and the early 1980's, world soybean oil trade increased from an average of 600,000 tons to about 4 million tons (table 11). But from the mid-1980's to 1992, world soybean oil trade stabilized at about the 1983 level. Soybean oil trade increased substantially during 1993/94 and is expected to rise even more in 1994/95. Low supplies of palm

[2]The major edible oils include soybean, rapeseed, sunflowerseed, peanut, cottonseed, palm, coconut, olive, and fish.

oil, combined with high demand in developing countries (especially China), have pushed soybean oil trade to nearly 5 million tons. Vegetable oil imports are dominated by low-income importers that are highly price-sensitive (China, India, Pakistan, Bangladesh, Egypt, and Latin America) (table 12). India's oil imports have dropped dramatically in the last 10 years because of higher domestic production.

U.S. soybean oil exports account for less than 10 percent of domestic soybean oil production. Moreover, U.S. market share of world soybean oil exports dropped from 75 percent in 1964 to 17 percent in 1994, while its production was growing ever larger. The decline in U.S. trade market share is associated with increasing domestic consumption of soybean oil, exports from South America, and production of other oilseeds in the EU. In the 1980's, EU oilseed producers benefited from support regimes which had the effect of reducing dependence on imported oilseeds and particularly foreign sources of protein. In addition, during the last 10 years, trade of palm oil more than doubled, flooding the world's edible oil market and hindering U.S. exports of soybean oil.

Recently, U.S. soybean oil exports have become dependent on government-assisted programs, such as credit guarantees, the *Export Enhancement Program (EEP)*, and food aid (PL-480). Enacted in 1986, the focus of the EEP program is to counter competitors'

Table 10—World soybean meal imports, major importers and regions, 1964-94

Marketing year[1]	World	Mexico	EU[2]	FSU	Japan	All Asia
			1,000 metric tons			
1964/65	2,882	27	2,138	0	46	57
1965/66	3,532	18	2,743	0	7	18
1966/67	3,703	14	2,760	0	2	35
1967/68	3,919	2	2,995	0	15	61
1968/69	4,521	1	3,472	0	27	87
1969/70	5,662	3	4,092	0	72	166
1970/71	6,648	105	4,853	0	39	135
1971/72	7,652	58	5,373	0	52	163
1972/73	8,568	13	5,593	0	277	331
1973/74	9,213	36	5,832	0	132	241
1974/75	8,951	25	5,836	0	18	226
1975/76	10,951	7	7,068	0	193	491
1976/77	11,759	190	7,125	0	314	748
1977/78	14,576	95	9,307	0	340	898
1978/79	15,665	91	9,820	52	283	975
1979/80	17,932	169	10,919	345	262	1,019
1980/81	18,759	150	10,556	966	290	1,113
1981/82	21,038	41	13,181	1,103	103	1,214
1982/83	23,094	180	13,430	2,812	177	1,465
1983/84	22,408	0	13,752	827	181	1,591
1984/85	22,869	106	14,308	550	94	1,167
1985/86	23,973	81	14,896	478	234	1,651
1986/87	26,631	102	14,636	2,900	204	1,838
1987/88	25,252	184	12,555	1,768	552	2,223
1988/89	26,395	317	12,210	2,456	377	2,285
1989/90	25,619	328	13,587	1,503	597	2,325
1990/91	27,151	260	13,908	1,816	839	3,143
1991/92	28,293	365	13,955	2,100	907	3,704
1992/93	27,001	395	14,195	1,050	871	4,297
1993/94[3]	28,710	370	14,450	1,016	875	4,657
1994/95[4]	29,418	425	14,750	1,070	850	4,590

[1]Based on aggregate of differing local marketing years.
[2]Includes intra-EU trade.
[3]Preliminary.
[4]Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

unfair subsidies and trade practices in targeted markets. Wheat and wheat flour sales have dominated the EEP expenditures since the inception of the program. Vegetable oils, as of 1987, were included in the EEP initiatives, with soybean oil accounting for a majority of the EEP vegetable oil sales.

Nevertheless, these programs have not curbed the constant decline of U.S. world soybean oil exports. U.S. vegetable oil exports are a small component in the U.S. supply and demand balance, accounting for only 14 percent of total vegetable oil production. Soybean oil outranks other edible oils in production, consumption, and exports in the United States, with approximately 75 percent of the vegetable oil market.

During 1991-93, the United States exported an average of 1.2 million metric tons of vegetable oils per year, accounting for only 5 percent of global vegetable oil trade. Over the same period, the U.S. produced nearly 38 percent of the world's soybean oil, and exported roughly 14 percent of world trade.

The United States also supports vegetable oils through a variety of import duties. The general import duty for soybean oil (22.5 percent ad valorem) is higher than for other vegetable oils, such as canola oil and

Table 11—World soybean oil exports, major exporters and regions, 1964-94

Marketing year[1]	World	United States	Argentina	Brazil	EU[2]
			1,000 metric tons		
1964/65	779	608	0	0	115
1965/66	579	419	0	0	112
1966/67	676	488	0	0	148
1967/68	629	437	0	0	151
1968/69	684	395	0	0	240
1969/70	1,107	644	0	3	395
1970/71	1,365	790	0	7	461
1971/72	1,211	634	0	38	454
1972/73	1,137	484	22	82	490
1973/74	1,464	651	33	16	718
1974/75	1,545	466	20	320	721
1975/76	1,708	443	67	430	749
1976/77	2,161	702	64	560	814
1977/78	2,691	933	59	522	1,154
1978/79	2,912	1,059	102	459	1,253
1979/80	3,531	1,220	88	809	1,323
1980/81	3,434	740	84	1,212	1,299
1981/82	3,635	942	220	873	1,489
1982/83	3,769	918	298	947	1,472
1983/84	3,945	827	504	920	1,574
1984/85	3,617	753	544	935	1,307
1985/86	3,118	570	649	413	1,389
1986/87	3,918	538	800	975	1,367
1987/88	4,010	850	1,030	661	1,157
1988/89	3,750	754	868	864	1,016
1989/90	3,943	614	1,006	887	1,136
1990/91	3,516	354	1,266	410	1,172
1991/92	4,506	747	1,295	710	1,424
1992/93	4,240	644	1,451	689	1,099
1993/94[3]	4,959	694	1,500	1,336	1,047
1994/95[4]	4,942	885	1,451	1,000	1,186

[1]Based on aggregate of differing local marketing years.
[2]Includes intra-EU trade.
[3]Preliminary.
[4]Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

palm oil, which are duty free. Import duties prevent significant imports of soybean oil but enable imports of substitute oils.

Issues Affecting U.S. Competitiveness in World Soybean Trade

International factors affecting U.S. competitiveness include foreign and domestic trade policies in key importing/exporting countries, relative prices and yields, transportation and infrastructure costs, and exchange rates.

Relative to other commodities, nearly all soybean exporters offer little or no explicit support for soybean and product exports. Virtually all major non-U.S. soybean and soybean meal exporters are developing countries with limited funds to subsidize exports or production. The transportation and marketing systems in Brazil and Argentina are less efficient than those in the United States, which adds to the costs of exporting. Soybean exports in both countries are implicitly taxed through a system of differential export taxes (DET), which lower domestic prices for soybeans. However, this system has supported the production of value-added oilseed products (meal and oil) since the early 1980's. This policy resulted in these countries becoming the two largest exporters of soybean meal and soybean oil in the world.

Historically, Brazil has provided direct support to the agricultural sector through negative interest rates,

Table 12—World soybean oil imports, major importers and regions, 1964-94

Marketing year[1]	World	EU	North Africa	China	Latin America
			1,000 metric tons		
1964/65	718	218	74	0	56
1965/66	550	127	54	0	67
1966/67	534	113	85	0	70
1967/68	503	108	89	0	81
1968/69	691	154	111	0	74
1969/70	995	260	106	0	112
1970/71	1,274	289	165	0	111
1971/72	1,070	249	107	10	97
1972/73	1,016	236	79	58	148
1973/74	1,483	428	147	0	260
1974/75	1,496	392	152	11	265
1975/76	1,587	352	130	13	239
1976/77	2,150	426	188	85	265
1977/78	2,667	509	189	184	347
1978/79	2,918	521	254	125	428
1979/80	3,101	574	264	100	373
1980/81	3,353	525	229	73	470
1981/82	3,502	596	281	31	563
1982/83	3,725	611	250	20	621
1983/84	4,033	640	261	0	765
1984/85	3,449	581	222	21	621
1985/86	3,130	564	123	210	584
1986/87	3,765	577	183	450	443
1987/88	3,562	497	164	220	473
1988/89	3,448	496	199	385	398
1989/90	3,960	473	207	520	498
1990/91	3,671	595	138	459	557
1991/92	3,879	581	326	218	723
1992/93	4,040	464	414	100	749
1993/94[2]	4,852	457	522	980	894
1994/95[3]	4,801	438	540	900	796

[1]Based on aggregate of differing local marketing years.
[2]Preliminary.
[3]Forecast.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division: Production, supply, and distribution database, December 1994.

minimum price support, and input subsidies. However, since 1990, government policies have been eliminated or significantly reduced. The rural credit system, once a major support policy, was significantly affected when the government reduced the level of subsidies. Since interest rates are now positive for farmers, a new credit-swap system has been developed among farmers, cooperatives, crushers, and exporters. Other programs also eradicated included the minimum price system and an export registration system that controlled soybean exports to maintain an adequate domestic supply for crushing. Overall support programs that have not been eliminated are expected to be maintained at a minimum level.

Brazil has State and Federal taxes that provide an incentive to export soybean products rather than soybeans. In addition, a "drawback" system allows processors to import soybeans free of duty if they export the corresponding products. Brazil frequently imports U.S. soybeans to sustain near-capacity crush rates.

In Argentina, agricultural policy for soybean and soybean meal exports is not expected to change significantly in the next decade. Under the Uruguay Round agreement, Argentina will likely maintain its DET, and continue favoring exports of meal and oil over soybeans. The current Argentine Government has embarked on a series of new macro-economic policies with the objectives of privatizing national entities, lowering inflation, and fixing the exchange rate.

Argentine farmers have received little assistance from their government. Over the years, export taxes, combined with marketing deficiencies and poor infrastructure, resulted in significant misallocation of Argentine resources. However, with the privatization of economic sectors, the slowdown of inflation, and the reduction of export taxes, the Government of Argentina has improved the competitive status of Argentine farmers. Argentina also eliminated most artificial financial incentives to export, such as an undervalued exchange rate. Argentina maintains an export tax of 3.5 percent on oilseeds (but none on oilseed products) that promotes the export of processed products, instead of soybeans. In addition, there is an export tax rebate of 2.5 percent which is provided on exports of oilseed products.

Formerly the world's largest soybean oil importer, India's oilseed production expanded dramatically in response to self-sufficiency policies adopted in 1987. The drain on foreign exchange, combined with a goal of increasing farm income, led India to restrict imports of oilseeds and products. Despite the introduction of more open trade policies, India remains one of the largest restricted oilseed markets in the world, affecting world oilseed marketing and trade. India's agricultural policy will continue to promote oilseed production to supply oil for the domestic market. This policy will result in a significant increase in India's soybean meal exports, especially to Asia, because of its small internal market.

The changing pattern of trade in soybeans and soybean meal with the former Soviet Union (FSU) also has contributed to a lower U.S. market share in the 1980's and 1990's. In 1987/88, following 8 years without bilateral soybean and soybean meal trade, the United States regained 44 percent of the FSU soybean meal market. Since then, the FSU has been a major market for U.S. soybean meal exports, accounting for an average of about 28 percent of total U.S. soybean meal exports annually from October 1987 through September 1992.

Nevertheless, in November 1992, the FSU defaulted on a series of GSM-102 loans, forcing the United States to halt additional credits. Imports of soybeans by the republics of the former Soviet Union will be critically dependent on credit availability or other barter arrangements. Credit defaults by the FSU in 1993 served as an indicator of the volatility introduced into global commodity markets as a result of the FSU republics' inability to import without credit.

Average annual growth in the FSU for both soybean and soybean meal imports is expected to remain slow in the near future. However, as economic reforms result in increasing incomes and more economic and political stability, some growth in soybean meal consumption is expected to resume.

Sunflowerseed

U.S. sunflower production is geographically concentrated and, while very important to regional economies, does not command a large share of national cropland. The 1992 Census of Agriculture indicated that 95 percent of sunflower acreage was concentrated in five States: North Dakota, South Dakota, Minnesota, Kansas, and Colorado (app. table 7).

Sunflowers were touted as "one of the most promising growth crops" as the 1970's drew to a close, and U.S. acreage projections of 10 million were not uncommon (Kleingartner, 1988). These projections were based on several advantages that sunflower cultivation offered (particularly to producers in the Northern

Plains): a short growing season, drought tolerance, a developing crushing industry to absorb the product, and its use as a profitable alternative crop in a rotation with small grains.

Sunflower acreage failed to expand as expected in the 1980's, despite the optimistic projections. Acreage significantly dropped in 1980 and ranged between 3.1 and 4.8 million acres through 1985. In 1986, acreage fell sharply and by 1987 was below 2 million acres, where it remained until 1990. The substantial decline in acreage in the 1980's was due in part to the reversal of the very factors that had led to the earlier expansion:

1) Sunflower prices leveled off and then declined as world oilseed and product competition intensified, especially in the European Community;

2) The returns of wheat and barley in the United States increased because of rising Government income supports, making sunflowers a less attractive crop alternative; and

3) The increased yields associated with the new cultivars came with increased production costs, while the continued concentration of sunflower production and lack of rotation increased susceptibility to pest and disease attacks.

Starting in 1991, sunflower acreage again reversed its trend, expanding to 2.7 million acres and by 1994 had reached 3.6 million. The reversal was partially driven by the changes in the 1990 farm legislation that allowed farmers to respond more promptly to market conditions. These acreage increases were also influenced by low wheat returns in the five principal sunflower-producing States during that period.

The outlook for sunflower acreage for the rest of the 1990's is uncertain. The changes in farm policy should continue to allow farmers flexibility to respond to market conditions as in 1994. But the rate of growth of domestic and foreign markets for sunflowerseed and products will be crucial. Reduced competition from foreign producers through reduced EU supplies and robust world consumption of vegetable oils should support some expansion in U.S. sunflower acreage. Whether U.S. export subsidies for sunflower oil are continued will also make a difference.

Farm Characteristics

The 1992 Census of Agriculture recorded 9,914 farms growing sunflowers, with a harvest of roughly 2 million acres. This acreage produced 2.2 billion pounds of seed for a total farm value of $208.8 million. Although 33 States reported sunflower production, five States—North Dakota, South Dakota, Minnesota, Kansas and Colorado—accounted for 93 percent of national production. North Dakota alone accounted for 56 percent of sunflower production.

Cash grains, primarily wheat, barley, corn, and soybeans, dominated crop production in these States. Eighty-four percent of the farms growing sunflowers were classified as cash grain farms in 1992. The 1992 Census of Agriculture surveyed sunflowers as a principal crop in only North Dakota, South Dakota, and Minnesota. Few farms specialize in growing solely sunflowers because of the limited market for sunflower products and agronomic constraints. Rather, sunflowers are rotated with grains and other specialty crops adapted to the region.

Thirty-nine percent of U.S. farms with sunflower acreage harvested fewer than 100 acres, 36 percent harvested between 100 and 249 acres, and 25 percent harvested 250 acres or more (app. table 9). In the two leading States, North and South Dakota, operations tended to be larger, with 26-29 percent harvesting more than 250 acres.

Sunflowerseed and Sunflowerseed Product Demand

The demand for oil-type sunflowerseed is primarily derived from the demand for various end products. The market for seed is complicated by the two distinct seed classes: oil-type and confection. While the two types are substitutable to a certain extent, each holds a comparative advantage in a different end market. The demand for sunflowerseed and its end products is also sensitive to macroeconomic factors, including changes in income levels and interest rates that affect consumer demand and operating costs, as well as Government policies and exchange rates that affect domestic production and trade patterns.

Oil-Type Sunflowerseed

Sunflowerseed demand includes domestic processing for oil and meal production as well as demand for exported seed to be crushed abroad. The price paid for seed and the prices received for oil and meal determine the profitability of crushing operations. The profitability of processing (margin) changes as the demands for sunflowerseed oil and meal expand or contract.

Meal and hulls represent larger weight components of oilseed than of confectionery sunflowers. However,

because of the higher prices, oil dominates in terms of overall seed value. For example, between 1978 and 1993, oil content ranged between 37 and 42 percent of the seed crushed, while meal content ranged between 50 and 59 percent. During this same period, oil accounted for an average 79 percent of the value of the products.

Sunflowerseed oil and meal markets are complex, and the resulting prices necessary to clear these markets are closely tied to vegetable oil and animal feeds markets. This market similarity stems from the high degree of substitutability found among the various oils and meals. Foreign trade patterns and public policy choices that influence domestic markets also affect sunflowerseed oil, meal, and resulting seed demand.

For the 1994/95 marketing year, USDA estimates total supply of oil-type sunflowerseed at 4.3 billion pounds, up 92 percent from 1993/94. Exports are expected to reach 300 million pounds, up 280 million from 1993/94. Crush is expected to climb to a new record of 2.3 billion pounds, up 59 percent from the previous year. However, carryover stocks are forecast at a record 920 million pounds.

The expected record crush will result in a 426,000-metric-ton production of sunflowerseed oil in 1994/95, up 62 percent from 1993/94. Domestic demand is expected to increase to 91,000 metric tons (up 54 percent), while exports of sunflowerseed oil are expected to total 320,000 metric tons, more than 57 percent higher than last season (app. table 12).

Confection Sunflowerseed

Confection sunflowerseed differs from oil-type sunflowerseed not only in its genetic characteristics, but also in the markets that drive seed demand. The larger seed size and a loose hull of the confection sunflowerseed facilitate cracking and make it well suited to the direct food uses market. Confection sunflowerseeds have also made significant inroads into the breads and baked goods markets, both domestically and abroad. In these markets, confection sunflowerseeds compete with other nut crops such as peanuts, almonds, walnuts, cashews, and grains used in the production of multi-grain breads. Confections also compete for discretionary consumer income with other snack foods including potato and corn chips, dried fruits, cheese products, and candies.

Data pertaining to the demand for confection sunflowerseed are limited. USDA estimates total demand for confection sunflowerseed (export and domestic uses including use for bird food and seed) in the 1994/95 marketing year at about 579 million pounds, up from an estimated 452 million in 1993/94.

Global Market for Sunflowerseed and Products

World sunflowerseed production grew more than 4 percent annually since 1972 and averaged 10 percent of global oilseed production between 1988 and 1993. Sunflowerseed production ranks fifth in world oilseed production, behind soybeans, cottonseed, peanuts, and rapeseed.

Most of the growth of sunflowerseed production since 1972 was concentrated in the major producing areas of the FSU, the EU, and Argentina. These three regions accounted for 62 percent of world sunflowerseed production over the 1985-93 period. Other major producers include the United States, China, Turkey, Hungary, and Romania. The U.S. share of world sunflowerseed production peaked in 1979 at 20 percent. Over the past two decades, rising production in other producing countries has reduced this share to an average of 5 percent. Growth in global output of sunflowerseed is expected to slow through the year 2000 to 3 percent per year. Changing policies in major producing countries and the relative prices of competing commodities are expected to constrain growth.

International factors affecting the competitiveness of U.S. exports of sunflowerseed and products include the production and trade policies of foreign competitors and importers, availabilities of other oils and their relative prices, and international trade agreements.

The export market has historically been very important for the U.S. sunflowerseed industry, with exports constituting almost 70 percent of production in the 1978-82 period. This ratio dropped precipitously after the early 1980's and has averaged 10 percent since 1988. Approximately two-thirds of U.S. sunflowerseed exports are destined to the EU, particularly Spain and Germany. However, changing policies in the EU have reduced demand for imported sunflowerseed. Increasing supplies from Argentina in the 1980's have caused significant decreases in U.S. exports since the mid-1980's.

Foreign Policy Developments

Currently there is very little support, either through domestic policies or export subsidies, for competitor exports of sunflowerseed or sunflowerseed oil. The EU's surge in sunflowerseed production over the

1980's was stimulated through support programs aimed at increasing farm incomes and reducing dependence on imported oilseeds.

EU policy reforms have resulted in a decline in EU sunflowerseed and sunflowerseed oil production since 1990. In 1993, for the first year since 1985, the EU resumed its status as a net importer of sunflowerseed oil. This steady decline in production is likely to be institutionalized through provisions of the U.S.-EU oilseed agreement that limit oilseeds area payments to a mandated level. The base area for rapeseed, sunflowerseed, and soybeans is set at 5.128 million hectares for the EU-12 beginning in 1995/96. Consequently, EU import demand for sunflowerseed is likely to increase from the low levels of the 1980's.

The major exporter of sunflowerseed, Argentina, has historically taxed its agricultural exports. However, a system of differential export taxes has supported the production of value-added oilseed products (meal and oil) since the early 1980's and is likely to continue. The agricultural sector, apart from the benefits passed on to the crushing industry through the differential taxes, received no support from the government. Argentine sunflowerseed production has experienced little growth over the 1990's, and the outlook for significant expansion in sunflowerseed production is likely to be constrained by increased wheat area over the next decade.

U.S. Export Policies

U.S. sunflowerseed and product exports have become increasingly dependent on government-assisted programs, such as credit guarantees, export subsidies, and food aid. Export programs that directly affect the sunflowerseed industry include the *Export Credit Guarantee Program* (GSM-102/103) and the *Sunflowerseed Oil Assistance Program (SOAP).*

Exports of sunflowerseed and its products have been promoted through the use of short-term credit (up to 3 years, GSM-102) and its longer term counterpart GSM-103 (3-10 years). In 1985, GSM sales of sunflowerseed and oil reached a peak, with 68 percent of sunflowerseed exports and 75 percent of oil exports facilitated under the program.

Since the inception of the SOAP program in 1988, exports of subsidized sunflowerseed oil shifted from EEP to SOAP, with isolated EEP sales of sunflowerseed oil registered in 1991 and 1992. SOAP is specifically designed to allow U.S. exporters of sunflowerseed to match world export prices for sunflowerseed oil in targeted markets. In fiscal 1992 and 1993, over 80 percent of U.S. sunflowerseed oil exports were assisted by SOAP, with average bonuses ranging from $87 per metric ton in FY 1992 to $127 in FY 1993. The major recipients of SOAP sales in FY 1993 were Algeria, Mexico, and Egypt while the major commercial markets were Japan and the EU.

Trends and Outlook for Sunflowerseed Trade

World trade in sunflowerseed accounts for only a small portion of world sunflowerseed production, averaging only 9 percent since 1988. Trade in sunflowerseed has been increasingly dominated by the EU and the FSU as trade between these two regions boosted their combined global market share from 15 percent to 65 percent between 1975 and 1985. A reversal of the strong EU production growth experienced in the 1980's is likely to cut the EU's share of world exports in half from the peak of 75 percent in 1988.

Exports from Argentina, the other major foreign exporter, accounted for about 13 percent of world trade in recent years. This share has grown from the 1975-85 average of 6 percent. The United States accounted for about 9 percent of world sunflowerseed trade over the past decade.

The EU remains the major import market for sunflowerseed, accounting for nearly 80 percent of total trade in sunflowerseed. A slowdown in EU domestic production through the year 2000 offers opportunities for expansion in sunflowerseed imports. Mexico, despite a smaller share of world imports from the 1975-85 period, continues to be a major importer, accounting for 11 percent of global imports between 1985 and 1993. The implementation of NAFTA is expected to increase Mexican imports.

Trends in Sunflowerseed Oil Trade

Sunflowerseed oil is the fourth largest edible oil produced and consumed in the world, accounting for about 12 percent of total vegetable oil production and consumption since 1990. Sunflowerseed oil trade has averaged about one-third of total production since the mid-1980's. Buoyed by strong production growth over the 1980's, exports of sunflowerseed oil grew by 9 percent over the decade. Adverse weather conditions in major producing countries in the early 1990's and policy reforms in the EU and the FSU led to a 10-percent drop in exports.

Argentina dominates the export market for sunflowerseed oil, accounting for approximately 39 percent of world exports. Domestic policies in the EU contrib-

uted to the doubling of EU sunflowerseed production over the 1980's, turning the EU into a net exporter of sunflowerseed oil and expanding its share of the export market from 22 to 26 percent. In Eastern Europe, however, increased domestic consumption of sunflowerseed oil eroded its market share.

U.S. Market Share and the Outlook for U.S. Exports

A contraction in U.S. sunflowerseed production over the 1980's and strong export supplies from competitors such as Argentina have led to a significant decline in the U.S. share of world sunflowerseed trade. U.S. market share, which averaged near 70 percent in the 1970's, dropped precipitously to average 6 percent since 1990. A projected slowdown in production growth in the EU, however, has the potential to reverse this declining trend. U.S. exports of sunflowerseed oil are important to the domestic industry, constituting about 72 percent of total oil production since 1985. U.S. exports, however, have averaged 9 percent of world trade in sunflowerseed oil since 1985. The major markets for U.S. sunflowerseed oil include Mexico, Algeria, the EU, and Egypt, together accounting for about three-quarters of U.S. exports over 1988-93.

Income growth in many of these markets and a slowdown in production growth in the EU are likely to increase import demand for sunflowerseed oil through this decade. U.S. sunflowerseed oil exports and market share are expected to increase as growth in competitor export supplies slows over the next 10 years.

Rapeseed and Canola

Canola is the name given to the seed, oil, and meal derived from rapeseed cultivars that are low in erucic acid and glucosinolates. These compounds present potential health risks to humans and reduce the palatability and nutritional value as a feed. While many parts of the world continue to produce high-erucic-acid varieties for human consumption, the so-called "double low" varieties now dominate production in Canada and throughout western Europe. Worldwide production of all rapeseed has risen rapidly over the past two decades and rapeseed now ranks third behind soybeans and cottonseed.

A member of the mustard family, rapeseed cultivation is suitable to colder climates in North America, northern Europe, the former Soviet Union, and parts of Asia. Prior to 1985, all U.S. production went toward specialized industrial uses. Accordingly, acreage remained small and was concentrated in areas of the Northern Plains, Northwest, and parts of the southern Corn Belt. In 1982, only 65 farms reported harvested acreage of rapeseed, totaling 6,382 acres. Roughly 95 percent of the production acreage was located in just three States: North Dakota, Montana, and Kentucky.

In January of 1985, the Food and Drug Administration granted GRAS (Generally Recognized As Safe) status for low-erucic-acid rapeseed (LEAR) products. Since that time, interest in canola has grown rapidly in the United States. Interest has been fueled further by implied health benefits associated with the lowest saturated fat content among all major vegetable oils. Since 1985, U.S. rapeseed area and production have significantly expanded. The 1992 Census of Agriculture indicated that 1,181 farms reported harvesting 89,777 acres of rapeseed (82,098 acres were canola). North Dakota, Idaho, Washington, and Minnesota accounted for 58 percent of the total acreage, while the remainder was distributed among 26 States.

Rapeseed has also made substantial inroads into the world oilseed and products trade. It ranks second in terms of world oilseed trade, with Canada and France accounting for most of the exports. Rapeseed plays a less dominant role in oilseed products trade. Palm and soybean oil continue to dominate world oil trade, while soybean meal still commands the largest share of the protein meal market.

However, competitively priced rapeseed products continue to gain market share. Favorable oilseed policies in the EU and, more recently, Canada have allowed rapeseed oil to capture 10 percent of world vegetable oil trade, more than double its share of the late 1970's. Rapeseed meal trade has also expanded, accounting for roughly 7 percent of world meal trade in 1993. Canola in the United States, however, remains a minor crop, dwarfed by traditional crops such as corn, wheat, and its principal competitor, soybeans.

Despite growing interest, there is no solid consensus on how the role of canola and its principal byproduct, canola oil, will evolve in the United States. Views range from a role as a niche crop for the specialty oils market to the next big cash crop for U.S. farmers, able to compete head-to-head in the U.S. vegetable oil and protein meal complex with soybeans. The ability of canola and its products to capture a larger share of U.S. oilseeds markets and farm resources will depend on a number of factors. First, does a market for the products exist, and, if so, what are the factors driving the demand for these products and products that compete with canola for market share? Second, if the

demand exists, can the crop be produced profitably enough to attract resources away from other crops and land uses? One obstacle to greater U.S. production is that few pesticides have been registered with EPA to permit their use on canola.

The demand for canola seed is derived mainly from its use as an input in canola oil production and secondarily as an input in meal production. Canola meal is a less valuable livestock feed than soybean meal, because it is lower in protein and has a higher roughage content.

USDA estimates total supply of canola seed for the 1994/95 marketing year at 1.5 billion pounds, up 48 percent from last season. Despite the 77-percent year-to-year increase in domestic production, from 252 million pounds to 447 million, imports of Canadian canola seed still represent 65 percent of total U.S. supplies (app. table 14).

The demand for canola seed in 1994/95 is expected to reach 1.4 billion pounds, 51 percent higher than in 1993/94. Crush, the most important component of the demand, is expected to set a new record at around 1.3 billion pounds. Exports in 1994/95 are forecast at 110 million pounds.

The record crush is expected to produce 481 million pounds of canola oil, a level far below the 1994/95 total demand of 1.4 billion pounds, resulting in 963 million pounds of canola oil being imported, mostly from Canada (app. table 15). Greater canola oil imports have largely satisfied the accelerating demand for the last 5 years, as consumption has outpaced domestic production.

Flaxseed

Flaxseed, the raw material from which linseed oil is obtained, is the seed of the flax plant. The early colonists brought flaxseed into this country to make flax fiber, which was to be spun and woven into linen cloth. Thus, flax was originally grown in the United States as a fiber crop. The invention of the cotton gin in 1793 caused the demand for flax fiber to decline and more flax was grown for flaxseed, instead. Flaxseed is classified in the United States as an oilseed crop along with cottonseed, peanuts, and soybeans. While oils from these other oilseeds are classified as "non-drying" oils, linseed oil is classified as a "drying oil." The "drying property" of a vegetable oil is its ability to absorb oxygen when exposed to the air. This attribute made linseed oil the principal vehicle for protective coatings and other allied manufactured products, resulting in the cultivation of several million acres of flaxseed in the early 20th century.

After World War I, new chemicals, new materials, and new techniques were developed in the protective coating industry that began replacing linseed oil as the only input. The largest losses of linseed oil markets occurred as a result of the development of vinyl floor coverings to replace linoleum and latex interior paints as a direct replacement for linseed oil-based paints. The dramatic decline in linseed oil demand resulted in a huge decline in planted acreage of flaxseed (table 13).

Today, U.S. flaxseed production is centered in Minnesota, South Dakota, and North Dakota. USDA

Table 13—Flaxseed acreage planted, harvested, yield, and production, 1965-94

Year	Planted	Harvested	Yield	Production
	- -1,000 acres - -		*Bu./ acre*	*1,000 bushels*
1965	2,868	2,775	12.8	35,402
1966	2,679	2,576	9.1	23,390
1967	2,061	1,976	10.1	20,036
1968	2,177	2,092	12.9	26,983
1969	2,661	2,605	13.4	34,929
1970	2,950	2,836	10.4	29,416
1971	1,627	1,545	11.8	18,198
1972	1,189	1,149	12.1	13,883
1973	1,749	1,700	9.7	16,408
1974	1,742	1,659	8.5	14,083
1975	1,621	1,511	10.3	15,553
1976	1,045	955	7.9	7,580
1977	1,330	1,239	11.5	14,280
1978	710	687	12.5	8,614
1979	922	878	13.7	12,014
1980	759	663	11.7	7,728
1981	605	577	12.6	7,289
1982	780	735	14.0	10,278
1983	605	580	11.9	6,903
1984	555	538	13.1	7,022
1985	620	584	14.2	8,293
1986	720	683	16.9	11,538
1987	470	463	16.1	7,444
1988	275	226	7.1	1,615
1989	195	163	7.5	1,215
1990	260	253	15.1	3,812
1991	356	342	18.1	6,200
1992	171	165	19.9	3,288
1993	206	191	18.2	3,480
1994	178	171	17.1	2,922

Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Crop Production, annual and monthly issues, 1962-95.

estimated that farmers planted 178,000 acres of flax in the 1994/95 marketing year. The availability of inexpensive imported flaxseed from Canada has exacerbated the decline in planted acres.

USDA estimated total demand for flaxseed at 9.2 million bushels for the 1994/95 marketing year, up slightly from 1993/94. Most of the demand will be met through imports, which in 1994/95 are expected to reach 6.3 million bushels (app. table 18), up 24 percent from 1993/94. Crush, the main component of the demand, is expected to climb to 8.8 million bushels, 100,000 bushels above the 1993/94 level.

The demand for linseed oil in 1994/95 is expected to mirror the demand for seed by increasing slightly to 178 million pounds, up 13 million pounds from 1993/94. Total supplies are expected to reach 238 million pounds in 1994/95, resulting in ending stocks of 60 million pounds. The same trend is expected for linseed meal, for which total supplies and total demand are expected to reach 169,000 and 164,000 short tons, respectively, in 1994/95.

"Linola," an edible flaxseed, has recently been developed in Canada. Canadian production is small but it works well in a rotation with canola. Its oil is similar to sunflower oil in taste and fatty acid content. As with canola, it will take years before the Food and Drug Administration approves the use of linola in the United States.

Trade Agreements

The GATT round of 1962 secured duty-free status for soybeans and soybean meal imported into the EU. This meant that protein feeds and other energy supplements were traded at or close to world prices, while the Common Agricultural Policy kept internal grain prices substantially higher than world prices. High internal grain prices created a price structure that favored the consumption of protein meals over grains, occasionally even as a source of energy. By the late 1970's, the EU had instituted lucrative subsidies to EU oilseed processors, allowing them to pay EU producers support prices far above world prices and to discriminate against foreign suppliers. EU oilseed acreage and production (particularly of sunflowerseed and rapeseed) soared, which helped the EU reduce budget expenditures by providing producers with an alternative to producing grains, which were in chronic surplus. This created surpluses of oil that were exported below world market prices. Export subsidies were also available for oilseeds but were little used because most oilseeds were purchased by domestic buyers. EU overproduction and increased competition from South America have cut U.S. exports and market share to the EU from the level of the late 1970's. In the late 1980's, the EU introduced production ceilings in an attempt to rein in expenditures on oilseed support. Although these ceilings were ineffective in limiting output, the rapid expansion in oilseed production of the early- to mid-1980's was slowed.

The U.S. Government, on behalf of soybean producers, filed a *Section 301* trade complaint in 1989 against the EU's oilseed policy. A GATT panel, formed to resolve the dispute, found that the EU oilseed subsidy regimes violated articles of the existing GATT agreement. The EU agreed to submit a reform proposal, which was implemented beginning in 1992. Producer price support was replaced with a direct payment based on acreage planted to oilseeds. But the regime did not require producers to set aside land and maintained high payments that encouraged continued high levels of oilseed production. The GATT panel reconvened to evaluate the EU's policy revisions and again ruled that the EU had not satisfied the original U.S. objections. The EU subsequently proposed a "rebalancing" scheme that would have lowered protection on cereals in exchange for increased tariffs on soybeans and corn gluten feed. U.S. trade negotiators opposed this plan.

Keeping intact many features of the 1992 oilseed regime, the EU adopted in May 1992 a major reform of the expensive CAP, which was implemented in 1993. To control supplies, EU grain price supports and oilseed area payments were reduced. Producers were also required to set aside a percentage of the land planted to grains and oilseeds to remain eligible for payments. Production of oilseeds on the set-aside area was allowed for industrial uses.

With impending trade sanctions on EU products at stake, U.S. and EU negotiators finally settled the lengthy dispute at a Washington, DC, meeting in late 1992. This so-called Blair House agreement establishes a separate base area for oilseeds, which limits the area on which payments are made without penalty. Full oilseed payments may be made on the base area minus a 10-percent minimum set-aside. Penalties for exceeding the oilseed area limits were outlined. The base area for rapeseed, sunflowerseed, and soybeans was set at 5.128 million hectares (12.7 million acres) for the EU-12 beginning in 1995/96. Oilseed meal production on set-aside land was also capped.

The new GATT agreement also requires substantial cuts in the value of subsidized exports and a 21-percent reduction in the quantity of subsidized exports. Tariffs, such as the duties levied by Japan, South Korea, and the United States on imported soybean oil, are slated for reductions.

Impact of GATT on the U.S. Oilseed Sector

By itself, the Blair House oilseed agreement will lead to slower growth in EU oilseed production and rising oilseed imports. In the absence of CAP reform, growing meal consumption, lower EU oilseed production, and continued high grain intervention prices would have provided incentives for increasing soybean and soybean meal imports. However, the oilseed agreement was implemented almost simultaneously with the broad CAP reform that included major reductions in internal grain prices. These price cuts are significantly affecting the European feed markets as the proportion of grains in feed rations rises. However, lower feed prices could stimulate greater consumption of meat and poultry in the EU, resulting in an expansion in total protein demand. The ultimate effect on EU oilseed production and import demand of these policy changes is unclear and will vary from farmers to feed compounders and from country to country.

Total EU meal consumption is expected to show a modest decline, primarily as a result of the changing price structure (lower feed grain prices under CAP reform and area restrictions from Blair House). This reduction could come from reducing imports from either South America or the United States. Lower EU seed production, combined with some drop in soybean imports, will contribute to sharp declines in annual EU vegetable oil exports from the record 4.6 million tons in 1991/92.

Under the Uruguay Round agreement (UR), higher world incomes will increase soybean meal and oil demand, although much of this growth will appear after the year 2000. In several markets, the UR will increase trade in livestock products rather than soybeans and soybean meal, meaning higher domestic soybean meal use. World demand for soybean meal-equivalent imports is projected to increase by an added 2 percent by 2005. This is 1.3 million tons of soybean meal-equivalent above baseline projections that exclude the agreement. The United States could capture the largest share of UR trade opportunities in soybeans and meal, increasing soybean exports by almost 1 million tons in 2005, about 4 percent above baseline projections. Soybean prices could rise 5-9 percent above baseline levels by 2005, and planted area could increase by about 2 million acres to meet increased demand. It is important to emphasize that these outcomes depend upon how the United States implements domestic acreage programs such as the *Conservation Reserve Program* (CRP). These results assumed no extension of CRP contracts.

Additional uncertainty for the outlook for EU protein meal demand is introduced by implementation of the U.S. Clean Air Act Amendments, which will likely result in increased U.S. ethanol production. Corn gluten feed, a major byproduct of ethanol production, will likely follow historical trends and be exported to the EU as a non-grain feed ingredient. This has additional potential to displace some protein meal in feed rations, but it is unclear how extensive this substitution will be.

The UR mandates reductions in export price subsidies for U.S. agricultural commodities but will not require reductions in U.S. loan rates. In fiscal year 1992, subsidies for EEP, SOAP, and COAP sales accounted for about 57 percent of U.S. vegetable oil exports. The UR requires subsidized exports of U.S. vegetable oils to progressively drop by 21 percent from a 1986-90 base. Programmed exports would fall from the 1991-92 level of 676,000 metric tons to 141,299 by the decade's end. As a result, the outlook for U.S. vegetable oil in the next several years is for higher domestic supplies that may reduce prices and crush margins and imports of competing oils. However, increased world demand for vegetable oils, particularly from developing countries, and higher world prices will more than offset export subsidy reductions in 2000 and beyond.

Impact of NAFTA on the U.S. Oilseed Sector

The North American Free Trade Agreement (NAFTA) was passed by Congress in November 1993 and signed by the Canadian, Mexican, and U.S. governments shortly after. Mexico had a seasonal tariff on soybeans of 15 percent. Under NAFTA, Mexico immediately reduced this tariff to 10 percent and reduced the dutiable season. Mexico also had a 15-percent tariff on soybean meal, a 10-percent tariff on crude soybean oil, and a 20-percent duty on refined soybean oil. All these duties will be phased out over 10 years, greatly expanding the opportunities for trade with the United States.

Mexico's soybean imports vary depending on domestic production, domestic coarse grain consumption, and the availability and price of protein and oil substitutes. The average annual level of Mexico's soybean imports was about 1.1 million tons in the 1980's. Soybean imports have ranged from 877,000 tons in

1985 to 2.2 million tons in 1991. Mexican imports of soybean meal recently have been about 400,000 tons, with soybean oil imports about 80,000 tons. The United States traditionally supplied about three-fourths of Mexico's soybean and soybean meal imports, annually totaling about $400 million.

Under NAFTA, U.S. soybean exports to Mexico are expected to be about 4.5 million metric tons by the end of the 10-year transition period. This is about 20 percent above what would be expected without NAFTA. Mexico has enough crush capacity to encourage imports of soybeans for crushing. Additionally, increases in protein feed demand will encourage a modest increase in soybean meal imports to 700,000 tons, or 12 percent above what would have occurred without NAFTA. By the end of the transition period, U.S. farm prices are expected to be about 2 percent higher than without NAFTA, and industry revenues are expected to be up by $400-$500 million (Office of Economics-ERS). In 1994, the first year of the accord, U.S. exports of soybeans and soybean meal to Mexico were up 18 percent and 96 percent, respectively, from 1993. Because of its increase in soybean imports, Mexican imports of U.S. soybean oil in 1994 are 31 percent less than the 1993 level. Trade in 1995 will be dampened by the substantial devaluation of the peso.

Even without NAFTA, U.S. oilseed and product exports to Mexico likely would have increased because of the expanding urban population and higher incomes, which lead to greater per-capita meat demand. Mexico is also modernizing its transportation infrastructure and has scaled back its own price subsidies to farmers for oilseeds, which should expedite imports and reduce Mexican production. However, lower tariffs will be the key to fulfilling Mexico's full trade potential. The export share of the United States should increase as imports from non-NAFTA countries will still be subject to the seasonal tariffs.

Implementation of NAFTA is projected to stimulate economic growth in Mexico, strengthening vegetable oil demand and imports. Mexico's 10-percent duty on crude sunflowerseed oil will be phased out over 10 years, reducing import prices, and strengthening the competitiveness of U.S. sunflowerseed oil exports to Mexico. Mexico is projected to continue to be a major market for U.S. sunflowerseed oil in the future and the total elimination of the 10-percent tariff should allow the United States to compete more effectively against competition from low-priced Argentine sunflowerseed oil.

Farm Program for Oilseeds and Issues

The 1991-95 crops of soybeans and minor oilseeds are affected by legislation passed in the 1990 Food, Agriculture, Conservation, and Trade Act (FACTA) and the Omnibus Budget Reconciliation Act (OBRA). The 1990 legislation extended many features of previous legislation pertaining to oilseeds including: the Export Enhancement Program (EEP), Export Credit Guarantee Program (GSM-102), *Intermediate Export Credit Guarantee Program* (GSM-103), the *0-92 program*, and the Conservation Reserve Program (CRP).

Unlike the conditions facing legislators in 1981 and 1985, the 1990 farm bill debate was set in an environment of a strengthening agricultural sector, rising farm income, declining debt, and gradually improving exports. Based on these successes, the overall structure of commodity programs built on past policies, and many of the underlying provisions remained largely intact.

However, the 1981 and 1985 acts did not fully address the competitiveness of the U.S. oilseed sector. One particular concern had been the continued decline in the U.S. share of world oilseed and oilseed-products trade and the associated drop in U.S. oilseed acreage. For example, between 1979 and 1990, U.S. acreage planted to oilseeds declined by roughly 18 million acres. This included a 19-percent decline in soybean acreage, a 65-percent decline in sunflower acreage, and a 73-percent decline in flaxseed acreage.

The decline, however, came during a period of steady growth in world demand for oilseeds, meal, and oil. With rising world demand and falling U.S. production, U.S. market share of world oilseed and oilseed-products trade declined from 51 percent in 1979 to roughly 32 percent in 1993. The final oilseed provisions in the 1990 farm act, combined with the 1990 Budget Reconciliation Act are, in part, a policy response to this issue.

To arrest the declining U.S. share of world trade in soybeans and products in the 1980's, something needed to be done to prevent U.S. soybean acreage from falling while foreign soybean acreage rose to record levels. While loan rates for soybeans in 1986-90 had been declining (to $4.50 per bushel by 1990), planted acreage also fell because farmers were effectively locked into planting corn and other program crops. The lower *loan rates* of the 1985 Act made higher export demand possible again, but a higher soybean supply was not forthcoming.

The 1985 Act changed the treatment of oilseeds so that they were no longer able to be planted on underplanted program *crop acreage base*. Farmers would not increase planted soybean area even when soybean prices were comparatively attractive. Planting an alternative crop on base acres resulted in an acre-for-acre loss of support payments and possibly a reduction in base starting the following year (McCormick, 1992). The 1988 Disaster Assistance Act attempted to increase production of soybeans by allowing producers in 1989 and 1990 to plant soybeans and sunflowers on 10-25 percent of their permitted acres. However, the provision was only marginally successful in increasing oilseed acreage as farmers gave up deficiency payments (but maintained base acres) for each oilseed acre planted. This loss required soybean prices to reach $7-8 per bushel to compete against corn and over $13 against cotton.

The 1990 OBRA broadened the flexibility provisions of the Disaster Assistance Act. In an effort to reduce budget outlays (an important theme in the 1990 legislation), flexibility provisions were modified to eliminate deficiency payments on 15 percent of program base acres (*normal flex acres* or NFA), regardless of whether the program crop or another crop was planted on such acres. Producers desiring more flexibility may plant alternative crops on up to an additional 10 percent of the program crop base (*optional flex acres* or OFA). The producer's base is protected, but deficiency payments are forgone. Planting an alternative crop on NFA will not directly affect program benefit levels. By removing the influence of program crop target prices on NFA acreage, planting decisions are more responsive to market price signals. On the additional 10 percent, the producer will still consider deficiency payments in making planting decisions.

All oilseeds planted on flex acres are eligible for *nonrecourse loans*. However, USDA has discretion to exclude any crop from flex acres. If USDA determines that the soybean price will be less than $5.27 (105 percent of the loan rate), USDA must prohibit soybeans on the optional flex acres. The act removed sunflower, safflower, flaxseed, and mustard seed as accepted *conserving use* crops. The law also permits USDA to allow designated crops to be planted (with an acre-for-acre reduction in payment acres) on up to 50 percent of the *reduced acres*; USDA has never exercised this authority, however.

Under the FACTA, *marketing loan* provisions are made mandatory for soybeans and minor oilseeds (sunflowers, canola, rapeseed, safflowerseed, flaxseed, and mustard seed) with minimum basic loan rates set at $5.02 per bushel for soybeans and $8.90 per hundredweight for other oilseeds. Producers may repay price support loans at the lesser of the loan rate plus interest or the announced loan repayment rate (LRR). For each oilseed, the actual LRR is equal to the lesser of the applicable county loan rate or the announced loan repayment rate. Producers who are eligible to obtain a price support loan for a crop of oilseeds, but who agree to forgo the loan, may obtain a loan deficiency payment (LDP). The LDP rate is equal to the amount by which the applicable county loan rate exceeds the announced county LRR for a given oilseed.

The 1990 OBRA created a loan origination fee for each oilseed for which price support loans or loan deficiency payments are made. This provision recouped government revenues on loans made for oilseeds. The fee was 2 percent of the value of the loan, making the effective loan rate $4.92 per bushel for soybeans and $8.72 per hundredweight for minor oilseeds for 1991-93 crops.

The 1990 FACTA continued the prohibition on any production adjustment program for oilseeds as a condition for price support loans or loan deficiency payments. Oilseeds are not eligible for any commodity reserve storage program and producers cannnot receive payments to cover oilseed storage costs. The annual payment limitation for loan deficiency payments and marketing loan gains was reduced from $200,000 to $75,000 per person. The limit is $250,000 when combined with deficiency and diversion payments from other program crops and CRP payments.

When an acreage reduction program is in effect, the 0-92 program allows producers to underplant *permitted acres* from their wheat and feed grain crop acreage base and receive 92 percent of the projected deficiency payment rate. Eight percent must go into conserving uses or other allowed crops. This optional program does not affect the producer's base acreage or program yield. By not requiring production of a crop to obtain deficiency payments, this program gives producers added flexibility and promotes soil and water quality through less intensive use. This program protected farm incomes in 1993 when many Midwestern fields were flooded or too wet to be planted to any crop.

Producers may shift to any combination of minor oilseeds while maintaining 92 percent of their wheat or feed grain deficiency payments. However, producers who opt for the 0-92 payments on such acres are not eligible for oilseed loan support for that minor oilseed planted anywhere on the farm. The producer may re-

linquish the 0-92 deficiency payments to be eligible for marketing loans on acres planted to minor oilseeds. The decision to shift to a minor oilseed under the 0-92 option will depend on the expected market returns for competing crops, experience and capital required to establish the crop, relative yields, and price risks.

The 1990 Act broadened the mission of the former Targeted Export Assistance program by replacing it with the Market Promotion Program (MPP). The redefined $90-million program assists trade organizations to develop, maintain, and expand export markets for U.S. agricultural products. The CCC shares promotion costs with eligible organizations (producer cooperatives, trade groups, State agricultural agencies, and private companies) that implement a foreign market development program. Program tools include technical assistance to food processors, trade servicing, nutritional information, supermarket promotions, and advertising. For fiscal year 1994, MPP funded the American Soybean Association with $1.72 million to promote soybean oil in foreign markets.

While the *Federal Crop Insurance Corporation (FCIC)* subsidized up to 30 percent of crop insurance *premiums*, enrollment in the program had never exceeded 35 percent of soybean acres planted, even after widespread crop failures. Most farmers still found premiums to be too high to justify the coverage of their loss expectations. The low participation had been limited to producers who knew that their potential *indemnities* would likely exceed their premiums. Consequently, total premium payments were too small to fully cover the total indemnities paid. Losses in excess of premiums for soybeans (totaling over $591 million) accounted for 29 percent of all FCIC excess losses from 1981 through 1989. *Loss ratios* were highest in the South; Arkansas, Georgia, Louisiana, and Mississippi combined accounted for 72 percent of FCIC soybean program losses. Also, benefits were not equitably distributed. Insured farmers with catastrophic losses who also received ad hoc disaster payments often obtained an income larger than if they had experienced a normal crop or only a one-third crop loss. This means that farmers with insurance would use production practices that would not minimize yield losses but increase their chances of receiving an indemnity, leading to even larger financial costs to FCIC. Between 1983 and 1990, 40 percent of the excess losses were on only 1.4 percent of the soybean policies.

The 1990 legislation omitted major revisions to *Federal crop insurance* except to require FCIC to adopt rates and coverage that will improve its actuarial soundness. In response, FCIC raised premium rates in high-loss regions and improved monitoring for abnormal loss histories of individual policyholders. In 1992, FCIC also approved a pilot program for soybeans that based crop insurance on area-yields in 13 States where individual-yield coverage has had a poor actuarial record.

Congress passed in 1994 a reform of Federal crop insurance that provides catastrophic yield protection for losses of 50 percent (based on actual farm production history). Participating farmers will receive 60 percent of the expected market price. To be eligible for farm programs, producers will be required to pay a $50 registration fee per crop per county for catastrophic coverage. Farmers also will be able to purchase higher coverage levels if desired. Participation in the program will improve as the government eliminates ad hoc disaster payments.

Effects of the 1990 Legislation

Two aspects of the 1990 legislation, planting flexibility and oilseed marketing loan provisions, had immediate implications for the oilseed industry. These programs applied to producers of soybeans, sunflower seed (oil and nonoil types), canola, rapeseed, flaxseed, safflower, mustard seed, and such other oilseeds as the Secretary of Agriculture may determine.

Because the programs were aimed primarily at producers, most of the impacts were driven by changes in supply. Reducing the percentage of payment acres lessens the pressure on USDA to reduce program costs by idling acreage through ARP's. Subsequently, potentially more acres can be flexed to soybeans and other oilseeds. The new flexibility provisions also reduce the effective return of program crops that compete with oilseeds on the NFA. This encourages farmers to consider the market value and loan support levels of soybeans and special oilseeds. While the current loan levels alone are not likely to encourage large shifts toward oilseeds, they do offer producers a degree of insurance. In effect, the loan establishes a price floor for producers by protecting against downside price risk. Tying repayment rates to market conditions is more likely to keep the seed in the marketing channel than a conventional nonrecourse loan and prevents a buildup of government stocks. Larger supplies at reasonable prices have bolstered the U.S. position in the world market.

By raising borrowing costs to farmers, OBRA's loan origination fee reduced participation in the marketing loan program by about one-half from 1990. Thus, the

loan origination fee prevented producers from taking advantage of the marketing advantages of the program. The fee was eliminated in 1994, and starting with the 1994 crop, the new loan rates are $4.92 for soybeans and $8.72 per cwt. for the minor oilseeds. In 1994, a provision was also added that farmers are required to pay back the loan within the fiscal year that it is taken out.

Program forfeitures and related costs to date for oilseed marketing loans have been minimal because of their low levels compared with market prices. Direct outlays incurred from marketing loan provisions have ranged from $2 million for the 1993 crop to $30 million for the 1991 crop. Virtually all of the direct outlays have been made to minor oilseed producers; soybean prices above loan rates have precluded payments to soybean producers. Among the minor oilseeds, most of the outlays have been made for oil-type sunflower. However, flaxseed has received relatively more support, with almost 70 percent of the crop receiving payments over the 3-year period compared with 35 percent for oil-type sunflower. About 15 percent of the canola, rapeseed, and confection sunflower have received payments. Mustard seed and safflower prices have exceeded loan rates over the period, so few program payments have been made for these crops. The largest public expenditures for oilseeds have been for disaster assistance, most recently in 1993.

The impact of the 1990 flexibility legislation can also be found in the USDA compliance reports of annual program signup. In 1994, U.S. farmers planted 5.914 million acres of soybeans on flex acres. Of that total, 4.118 million oilseed acres were flexed from corn base and 1.344 million from wheat base. Acreage flexing in 1994 was similar to 1991 and 1992 levels. The potential normal flex acreage was 26.2 million acres and optional flex acreage was 17.5 million. This means that only 16 percent of potential flex acres were shifted from the original program crop.

The low use of flexing was due to a comparatively lower soybean-to-corn price ratio since 1991 (2.5) versus the 1986-90 period (2.8) covered by preceding farm legislation. But farmers are now better able to respond quickly to future commodity market shocks than before 1991.

The 1991 signup also indicated that farmers flexed 295,000 acres to minor oilseeds, with most of that acreage derived from wheat and barley base acreage. In 1992, the compliance report showed that 226,000 acres were flexed to minor oilseeds, while in 1993 and 1994 farmers flexed 428,000 and 459,000 acres, respectively.

The USDA compliance reports also indicate that producers have used the 0-92 option to plant additional minor oilseeds. Roughly 532,000 acres of minor oilseeds were planted on program base, distributed about equally between wheat (268,535) and feed grains (263,009). Farmers in the tri-State region (North Dakota, South Dakota, and Minnesota) utilized the 0-92 minor oilseed option to the fullest, accounting for nearly 75 percent of national base shifted to minor oilseeds. Many of the producers in these States have experience in growing minor oilseeds and have access to established markets. The same kind of response was observed in the following years, when farmers used the 0-92 option to plant 367,000 acres of oilseeds in 1992, 811,000 acres in 1993, and 1,584,000 acres in 1994.

Average U.S. soybean acres planted in 1991-94 were only slightly above the previous 5 years' plantings, although many acres went unseeded in 1993 due to major flooding and wet soil conditions. While planted acreage has increased since 1990 in the eastern and western Corn Belt, soybean acres in the Delta and Southeast have continued their descent. During the FACTA years, 1991-94, annual soybean acreage averaged 60.1 million acres, compared with 59.2 million during 1986-90.

Table 14—Minor oilseeds: U.S. planted and harvested acres, 1991-94

Oilseed	Area planted				Area harvested			
	1991	1992	1993	1994	1991	1992	1993	1994
				1,000 acres				
Sunflower	2,746	2,187	2,757	3,567	2,673	2,043	2,486	3,430
Safflower	223	341	404	240	209	307	293	228
Flaxseed	356	171	206	178	342	165	191	171
Canola	155	140	199	354	147	112	187	340
Mustard seed	19.4	15.3	18.1	13.6	18.1	14.8	16.4	13.4
Rapeseed	18.2	12.0	7.2	7.4	15.6	9.8	6.1	6.7

U.S. farmers planted 3.57 million acres of sunflowers in 1994, up 87 percent from 1990 (table 14). Farmers also planted 354,000 acres of canola, 240,000 acres of safflower, and 178,000 acres of flaxseed. These acreage levels represent a 30-percent decrease for flaxseed compared with 1990, and increases of 8 percent and 128 percent for safflower and canola, respectively, compared with 1991, the first year that acreage statistics were compiled for minor oilseeds.

One notable change in the final program implementation rules was the division of sunflower seed into two separate categories: "oil" and "other" types, the latter including confection varieties and varieties grown specifically for bird seed. This was an important shift for confection and bird seed growers. Based solely on oil content, these seeds are severely discounted relative to oil-type sunflowers.

With implementation of the 1990 farm legislation, the financial attractiveness of minor oilseeds has increased relative to crops that traditionally dominate land use. Since 1991, farmers have responded to these changes by expanding minor oilseed acreage. Helped by promising growing conditions in the areas where minor oilseeds are traditionally grown, the total area of sunflower seed and other minor oilseeds has increased.

Issues for 1995 Farm Legislation

Given the relatively healthy finances of the farm sector, it is probable that Federal deficits will encourage Congress to find ways to shrink the $10-$12 billion spent annually on farm programs. Spending reductions for the export programs are required by the new GATT accord. Appropriations for FY1995 for EEP, MPP, and PL-480 already have been reduced somewhat from FY1994. However, the administration has indicated that it would redirect spending toward measures such as conservation, alternative uses, export credit, market promotion, crop insurance, and research/extension programs, that is, measures that do not distort trade.

Federal programs still favor planting wheat, feed grains, and cotton and discourage domestic production of oilseeds. One proposal would reduce target prices for program crops. Flexibility could be further increased by allowing alternative crops to be planted on a larger portion of a farmer's base or on conserving use acreage with no loss in payments or payment acres. There may be a proposal to maintain program crop bases but reduce payment acres from the current 85 percent to reduce outlays and provide more planting flexibility. Alternatively, soybeans and possibly minor oilseeds could be included in a whole-farm acreage base, with one commodity substituting for another without loss of base or payments. The 0-92 program could then be phased out. Each proposal has widespread implications for farm program participation and costs, farm prices and incomes, and land values.

The number of acres involved with a continuation of the CRP has ramifications for all field crops, including oilseeds. The first CRP contracts would have expired beginning September 1995, with contracts lapsing on about 16 million acres by January 1997. The reserve currently totals 36.5 million acres with a legislated target of 38 million. But in late 1994, the Secretary of Agriculture announced several discretionary changes in the program. Farmers who obtained 1-year extensions for 1995 (2.2 million acres) have the option to extend for another 9 years. In 1995, farmers may also terminate the contracts or modify them to reduce the acreage covered. In 1996, farmers with current CRP contracts will have the option to modify and extend contracts at maturity (10-year extension for contracts signed before November 28, 1990, and a 5-year extension for later contracts). Rental rates on extended contracts will be reevaluated. USDA will also consider bids for new 10-year contracts subject to more stringent environmental and conservation criteria. Long-term easements, through the Wetlands Reserve Program, will also be offered on environmentally sensitive lands, such as lowlands bordering rivers.

How much acreage remains in the CRP will depend on market returns, modifications in eligibility criteria, and funding constraints. USDA estimates that the CRP would gradually decline to 32.1 million acres by 2005, of which 3.9 million are allocated from soybeans. However, given current budget rules and priorities, it is unlikely that the government will continue to appropriate nearly $2 billion annually on the CRP in addition to deficiency payments. A survey indicated that only 13 percent of enrolled acres would remain in CRP if landowners were offered half their current rental rate.

Stewardship payments may be explored as a means to target the most environmentally sensitive land (based on its erodibility, leachability, and presence of wetlands or endangered species). These incentive payments would not be intended to support farm income directly but be made in exchange for environmental services. Another proposal is to grant tax credits on farm equipment purchased for the purpose of satisfying conservation compliance requirements.

The prospect of large domestic supplies of vegetable oils has prompted the oilseed industry to propose a plan to advance commercialization of industrial vegetable oil uses. The plan would require USDA to operate EEP to its maximum level allowed by the new GATT accord. The plan would create a fund from export program savings from 1991-92 levels to be distributed to firms that use vegetable oils in industrial uses. The value of soybean oil exports under government-assisted programs totaled $116.7 million in fiscal year 1991, compared with $192 million in total exports. The biodiesel industry also seeks a blending tax credit similar to those granted to alcohol fuels.

On the other hand, some of the public have called for elimination of the EEP, which could reduce soybean oil exports to North Africa and the Middle East. U.S. soybean oil prices would fall relative to world prices, which would reduce competing oil imports and help regain export competitiveness.

Continued support for export credit programs will be important for sustaining import growth by the former Soviet Union and other developing countries. However, without changes in criteria for determining creditworthiness and a reduction of its external debt, it is unlikely that the FSU would be able to use the credits.

Public funding of oilseeds research grants and cost-sharing agreements that benefit producers and consumers alike will continue to be a critical issue. Research into commercializing new industrial uses, pest and disease control, natural resources management, and development of varieties with higher oilseed quality will determine the future productivity growth of the U.S. oilseeds sector. Finding commercially viable new uses for oilseeds will lessen farmers' dependence on Federal support programs. Recent breakthroughs include a bioengineered soybean variety approved by USDA that is tolerant to an environmentally safer herbicide. It will soon be available to farmers, pending EPA approval of that herbicide's use for soybeans. Such varieties could increase yields and lower production costs for producers. Research on new IPM methods could help reduce the use of chemical pesticides. Scientists are seeking to increase shelf life of soybean oil and lower its saturated fat levels. Breeding soybean varieties with reduced linolenic acid content could eliminate flavor problems in the oil and also make it better suited for soy ink and biodiesel use. Consumers may also benefit from research defining the health aspects of trans-fatty acids, a type of fat produced in the hydrogenation process for vegetable oils. A bioengineered canola variety is near introduction where the oil has a higher melt point, which eliminates hydrogenation and the production of trans-fatty acids in margarine.

Soybean quality has been a trade competitiveness issue. South American soybeans have been superior to U.S. exports in their oil and protein content. Currently, the farm price of soybeans does not reflect its potential value of oil and meal products but is based on test weight, foreign material, and damage levels. Farmers plant soybean varieties with the maximum potential yield and have little or no incentive to plant high-oil, high-protein varieties. Component pricing (which incorporates oil and protein content in the Federal grading of soybeans) has been proposed as a solution to this problem. However, resistance to this proposal has been due to farmers' and processors' uncertainty of their returns under this system. Merchandisers assert that the costs of segregating soybeans of varying oil and protein levels would be prohibitive to them. Yet, Japanese and Taiwanese buyers already request oil and protein information in their contracts and many other importing countries are following suit. A research program to improve oil yields of soybean varieties without sacrificing field yields would give farmers more tools to compete in the quality arena.

There likely will be proposals to deal with yield and price risk. One proposal that has received a lot of attention is the "revenue assurance" plan put forth by a group of Iowa producers. This plan would combine separate programs dealing with yield and price risk into a single plan that would stabilize annual revenue at 70 percent of 5-year average market revenue.

Another proposal would privatize yield risk with an *area yield options contract*. Farmers would insure a crop by buying a yield *put option* for the expected yield in the region where they produce. The value of the put option would be the difference between the coverage level selected by the farmer and the actual yield. The premium and indemnity are determined by the area's yield rather than an individual producer's yield. The Commodity Futures Trading Commission recently approved a Chicago Board of Trade application to begin trading yield insurance options for several commodities. The options will be used by crop insurance companies to hedge against volatile changes in crop conditions. Continuing to educate farmers on the use of risk management instruments, such as the Options Pilot Program, would complement these other initiatives.

Glossary

Area yield options contract—A contract entitling the holder to receive a payment when the area yield is below (above) the put (call) options strike yield. The strike yield is the yield at which the holder of an option contract can exercise the option.

Commodity Credit Corporation (CCC)—A federally owned and operated corporation within the U.S. Department of Agriculture created to stabilize, support, and protect farm income and prices through loans, purchases, payment, and other operations. All money transactions for agricultural price and income support and related programs are handled through the CCC; the CCC also helps maintain balanced, adequate supplies of agricultural commodities and helps in their orderly distribution. The CCC does not have any operating personnel or facilities.

Conservation compliance—A provision that requires farmers with highly erodible cropland to implement an approved conservation plan. The plan must be completed by 1995 for the farm operation to remain eligible for specified Federal program benefits.

Conservation Reserve Program (CRP)—A major provision of the Food Security Act of 1985 designed to reduce erosion on 40-45 million acres of farmland. Under the program, producers who sign contracts agree to convert highly erodible cropland to approved conservation uses for 10 years. In exchange, participating producers receive annual rental payments and cash or in-kind payments to share up to 50 percent of the cost of establishing permanent vegetative cover.

Conservation tillage—Any tillage and planting system that maintains at least 30 percent of the soil surface covered by residue after planting to reduce soil erosion by water; or where soil erosion by wind is the primary concern, maintains at least 1,000 pounds (per acre) of flat, small grain residue equivalent on the surface during the critical wind erosion period. Two key factors influencing crop residue are (1) the previous crop, which establishes the initial residue amount and determines its fragility, and (2) the type of tillage operations prior to and including planting.

Conserving use—Land idled from production and planted in a soil-conserving crop, such as annual, biennial, or perennial grasses, or other soil-conserving crop.

Crop acreage base—A farm's 5-year average acreage planted to wheat and feed grains, plus land not planted because of acreage reduction or diversion programs during a period specified by law. Crop acreage bases are reduced by the portion of land placed in the Conservation Reserve Program (CRP) for the duration of the 10-year contract.

Crop year—September 1 to August 31 for soybeans, sunflowerseed, safflower, and mustard seed. June 1-May 31 for canola, rapeseed, and flaxseed.

Emulsifier—A substance that enables the mixing of normally unmixable liquids. Lecithin, a byproduct of soybean oil extraction, is a common agent to prevent separation of water and oil in liquids that contain both, e.g. mayonnaise, ice cream.

Export Credit Guarantee Program (GSM-102)—The largest U.S. agricultural export promotion program, functioning since 1982. It guarantees repayment of private, short-term credit for up to 3 years.

Export Enhancement Program (EEP)—A program initiated in May 1985 under a Commodity Credit Corporation (CCC) charter to help U.S. exporters meet competitors' prices in subsidized markets. The program was formally authorized by the Food Security Act of 1985. Under the EEP, exporters are awarded cash bonuses enabling them to sell vegetable oils to specified countries at prices below those of the U.S. market.

Farmer-Owned Reserve (FOR)—A program for wheat and feed grain producers under which they may place eligible grain in storage after maturity of their regular price support loans. FOR loans are for 27 months with one 6-month extension at the Secretary's discretion. The loans are nonrecourse in that farmers can forfeit the commodity held as collateral to the Government in full settlement of the loan without penalty and without paying accumulated interest. Under certain market conditions, storage programs are made by the Commodity Credit Corporation and no interest accrues on the loan.

Fatty acids—A type of organic fat compound produced when glycerine is split off from the triglycerides in vegetable oils. The most commonly occurring fatty acids in vegetable oils are: unsaturated and polyunsaturated (linoleic, oleic, linolenic); and saturated (palmitic and stearic). Oleic, linoleic, and linolenic acids are used in industrial cleaners.

Federal crop insurance—A subsidized insurance program that provides farmers with a means for risk management and financial stability against crop pro-

duction loss. The insurance is available for 50 different crops, varying by county. Participation in the program is often required for a farmer to qualify for Federal emergency loans.

Federal Crop Insurance Corporation (FCIC)—A Federal corporation within USDA that administers the Federal Crop Insurance Program.

Indemnity—The amount that a farmer receives as settlement on a loss claim. It is calculated by multiplying the price election by the number of bushels of loss below the yield guarantee.

Integrated pest management—The control of pests or diseases by using an array of crop production strategies, combined with careful monitoring of insect pests or weed populations and other methods. Some approaches include selection of resistant varieties, timing of cultivation, biological control methods, and minimal use of chemical pesticides so that natural enemies of pests are not destroyed. These approaches are used to anticipate and prevent pests and diseases from reaching economically damaging levels.

Intermediate Export Credit Guarantee Program (GSM-103)—A program established by the Food Security Act of 1985 which complements the Export Credit Guarantee Program (GSM-102) but guarantees repayment of private credit for 3-10 years.

Loan deficiency payment—Producers who are eligible to obtain a price support loan for a crop of oilseeds, but who agree to forgo the loan, may obtain a loan deficiency payment. The loan deficiency payment is equal to the loan repayment rate times the quantity of an oilseed that is eligible to be put under loan. The loan deficiency payment rate is equal to the amount by which the applicable county loan rate exceeds the announced county loan repayment rate for a given oilseed.

Loan rate—The price per bushel at which the Commodity Credit Corporation will provide loans to farmers enabling them to hold their crops for later sale. USDA was required to announce 1992-95 loan rates by November 15 prior to the calendar year in which the crop was harvested.

Loan repayment rate—Producers may repay price support loans at the lesser of the loan rate plus interest (or the prevailing world market price) or the announced loan repayment rate.

Loss ratio—Total indemnities paid out divided by total premiums collected (including the premium subsidy) by the Federal Crop Insurance Corporation (FCIC).

Marketing loans—This program allows producers to repay nonrecourse price support loans at less than the announced loan rates whevever the world price for the commodity is less than the loan rate.

Miso—Made from soaked, steam-heated soybeans that are inoculated with mold cultures grown on rice. The mixture is then allowed to ferment and age for months until a solid paste forms. Used as a soup base and condiment.

Mulch-till—The soil is disturbed prior to planting. Tillage tools such as chisels, field cultivators, disks, sweeps, or blades are used. Weed control is accomplished with herbicides and/or cultivation. More common on the flatter slopes of northern production areas.

No-till—The soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels, or roto-tillers. Weed control is accomplished primarily with herbicides. Cultivation may be used for emergency weed control. Best suited for sloping lands that are highly erodible.

Nonrecourse loans—The major price support instrument used by CCC. Farmers who agree to comply with all commodity program provisions may pledge a quantity of a commodity as collateral and obtain a loan from the CCC. The borrower may elect either to repay the loan with interest at any time prior to maturity and regain control of the collateral commodity or default on the loan. The loan matures on the last day of the ninth month following the month the agreement is approved by CCC. In case of a default, the borrower forfeits without penalty the collateral commodity to the CCC. Stocks may be stored on the farm in approved structures or off the farm in approved commercial warehouses. Oilseeds forfeited to the CCC may not be sold at less than the lower of 105 percent of the loan rate (adjusted for location, grade, and quality) or 115 percent of the loan repayment rate.

Normal flex acreage—This provision of the Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508) requires a mandatory 15-percent reduction in payment acreage. Under this provision, producers are ineligi-

ble to receive deficiency payments on 15 percent of their crop acreage base (not including any acreage removed from production under any production adjustment program). Producers, however, are allowed to plant any crop on this acreage, except fruits and vegetables.

Optional flex acreage—Under the planting flexibility provision of the 1990 Act, producers can choose to plant up to 25 percent of the crop acreage base to other Commodity Credity Corporation-specified crops (except fruits and vegetables) without a reduction in crop acreage bases on the farm, but receiving no deficiency payments on this acreage. The Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508) made a 15-percent reduction in payment acreage mandatory. The remaining 10 percent is the optional flex acreage.

Permitted acreage—The maximum acreage of a crop that may be planted for harvest within a program. The permitted acreage is computed by subtracting the acreage reduction program requirement from the crop acreage base minus the diversion acreage (if applicable). For example, if a farm has a crop acreage base of 100 acres and 10-percent acreage reduction is required, the permitted acreage is 90 acres.

Premium—The amount that a producer is charged for the purchase of crop insurance. A farmer's premium depends on that farmer's production history and selection of coverage. Total premium is subsidized at up to 30 percent by FCIC.

Put option—The right, without obligation, to sell a futures contract at a specified price during a specified time period.

Reduced acres—Producers participating in the annual acreage reduction program (ARP) must devote the ARP percentage times the crop acreage base into the Acreage Conservation Reserve, or reduced acres. This land must be put into an approved conserving use that protects it from weeds, and from wind and water erosion. Also known as Acreage Conservation Reserve (ACR).

Ridge-till—The soil is left undisturbed from harvest to planting except for nutrient injection. Planting is completed in a seedbed prepared on ridges with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with herbicides and/or cultivation. Ridges are rebuilt during cultivation.

Section 301—A provision of the U.S. Trade Act of 1974 that allows the President to take appropriate action to get a foreign government to remove any act, policy, or practice that violates an international agreement. The provision also applies to practices of a foreign government which are unjustified, unreasonable, or discriminatory, and which burden or restrict U.S. commerce.

Stabilizer—A substance that helps other substances resist chemical change.

Sunflowerseed Oil Assistance Program (SOAP)—Authorized under the Rural Development, Agriculture and Related Agencies Appropriations Act of 1988. The CCC awards bonuses in the physical commodity (sunflowerseed oil) or cash to exporters to facilitate exports in targeted markets.

Surfactant—A substance that reduces the surface tension of liquids. Commonly used in detergents.

Tempeh—A soy food product developed in Indonesia in which soybeans are soaked overnight and then cooked for a short time; the cooked soybeans are inoculated with a fungus and allowed to stand for 18-48 hours. The product is roasted, cooked in soup, or fried in oil; may also be sliced and dried.

Tofu—A cheese-like product made from coagulated soy milk.

World price—The cost, insurance, and freight (c.i.f.) price of an imported oilseed at a principal port (e.g., Rotterdam).

0-92 program—A program provision that allows wheat and feed grain producers to devote all or a portion of their permitted acreage to conserving uses or to a minor oilseed crop and receive deficiency payments on that acreage. The program makes deficiency payments for a maximum of 92 percent of a farm's maximum payment acreage. Under other types of acreage diversion programs, such as acreage reduction programs, producers cannot receive deficiency payments unless permitted acres are devoted to producing a crop.

Additional Readings

Ackerman, Karen Z., and Mark E. Smith. *Agricultural Export Programs: Background for 1990 Farm Legislation.* Economic Research Service, U.S. Dept. Agr., May 1990.

Ali, Mir. "Trends in Costs of Production for Corn, Soybeans, and Wheat, 1975-1991. *Agricultural Income and Finance Situation and Outlook Report,* Economic Research Service, U.S. Dept. Agr., AFO-50, Sept. 1993, pp. 41-43.

_____ and William McBride. *Soybeans: State-Level Production Costs, Characteristics, and Input Use, 1990.* SB-873. Economic Research Service, U.S. Dept. Agr., Feb. 1994.

Ash, Mark. *Animal Feeds Compendium.* AER-656. U.S. Dept. Agr., Economic Research Service, May 1992.

Bickerton, Thomas W. *USSR Oilseed Production, Processing, and Trade.* AER-232. Economic Research Service, U.S. Dept. Agr., Sept. 1987.

Bull, Len, Herman Delvo, Carmen Sandretto, and Bill Lindamood. "Analysis of Pesticide Use by Tillage System in 1990, 1991, and 1992 Corn and Soybeans," *Agricultural Resources: Inputs Situation and Outlook Report,* AR-32. Economic Research Service, U.S. Dept. Agr., Oct. 1993, pp. 41-54.

Carter, Jack F. "Shine On, Sunflower," *Science of Food and Agriculture.* Vol. 5, No. 1. Ames, IA: Council for Agricultural Science and Technology, Jan. 1987, pp. 2-7.

Castaneda, Jaime, and Mary Anne Normile. "U.S.-EU Oilseed Agreement and CAP Reform: The Impact on U.S. Oilseed Exports," *Oil Crops Situation and Outlook Report.* OCS-40. Economic Research Service, U.S. Dept. Agr., Jan. 1994, pp. 18-22.

Collins, Keith J., and Larry Salathe. *The Basic Mechanisms of U.S. Farm Policy: How They Work, with Examples and Illustrations.* MP-1479. Economic Research Service, U.S. Dept. Agr., Jan. 1990.

Crowder, Brad and Cecil W. Davison. *Soybeans: Background for 1990 Farm Legislation,* AIB-592, Economic Research Service, U.S. Dept. Agr., Mar. 1990.

Dinosson, W.E., R.L. Harold, and J.N. Johnson. "Sunflowerseed Oil Meal in Rations for Growing and Finishing Swine," *Journal of Animal Science,* 53 (Supplement 1): 1981, p. 95.

Erickson, David R., Everett H. Pryde, Ordean L. Brekke, Timothy L. Mounts, and Richard A. Falb, Eds. *Handbook of Soy Oil Processing and Utilization.* St. Louis: American Soybean Association and American Oil Chemists' Society, 1980.

Fryer, E., and R. Hoskin. "U.S. Vegetable Oil Price Relationships," *Oil Crops: Situation and Outlook Report.* OCS-9. Economic Research Service, U.S. Dept. Agr., Dec. 1985.

Glaser, Lewrene, Irshad Ahmed, Donald Van Dyne, and Mary Anne Normile. "Fats and Oils," *Industrial Uses of Agricultural Materials Situation and Outlook Report,* IUS-1. Economic Research Service, U.S. Dept. Agr., June 1993, pp. 15-22.

Glauber, Joseph W., Joy L. Harwood, and Jerry R. Skees. *An Alternative for Reducing Federal Crop Insurance Losses.* AER-668. Economic Research Service, U.S. Dept. Agr., May 1993.

Helgeson, Delmer L., David W. Cobia, Randall C. Coon, Wallace C. Hardie, LeRoy W. Schaffner, and Donald F. Scott. *The Economic Feasibility of Establishing Oil Sunflower Processing Plants in North Dakota.* Bulletin 503. Agricultural Experiment Station, North Dakota State University, Apr. 1977.

Kleingartner, Larry. "Sunflower Markets: A Function of Government Production Policy and Oil Export Programs," *Proceedings from the 65th Agricultural Outlook Conference,* Washington, DC, Nov. 1988, pp. 417-419.

Knowles, P.F. "Morphology and Anatomy," *Sunflower Science and Technology.* Ed. Jack F. Carter. American Society of Agronomy, Number 19. Madison, WI, 1978, pp. 55-84.

Lilleboe, Don. "Flowers Complement Rotation of National Soybean Leader," *Sunflower.* National Sunflower Institute, April/May 1990a, pp. 9-11.

_____. "More Red River Valley Acres in '90?" *Sunflower.* National Sunflower Institute, Jan. 1990b, pp. 13-15.

Marx, George. "Feeding Whole Sunflowerseeds to Dairy Cattle," *The Sunflower*, Vol. 17, No. 4, Apr./May 1991.

McBride, William D. *Characteristics and Production Costs of U.S. Soybean Farms, 1986*. AIB-623. Economic Research Service, U.S. Dept. Agr., Apr. 1991.

_____. *Characteristics and Production Costs of U.S. Soybean Farms, 1990*. AIB-658. Economic Research Service, U.S. Dept. Agr., Oct. 1992.

_____. "Conventional and Conservation Tillage Systems in Soybean Production, 1990," *Oil Crops Situation and Outlook Report*. OCS-33. Economic Research Service, U.S. Dept. Agr., Apr. 1992.

_____. "The Farm Operator Account: An Alternative Measurement of Farm Enterprise Costs and Returns," *Agriculture Income and Finance Situation and Outlook Report*. AIS-53. Economic Research Service, U.S. Dept. Agr., June 1994.

McCormick, Ian, and Bengt Hyberg. "Sunflower Acreage Response to Increased Commodity Program Flexibility," *Oil Crops: Situation and Outlook Report*. OCS-28. Economic Research Service, U.S. Dept. Agr., Jan. 1991.

McCormick, Ian, Cecil Davinson, and Roger Hoskin. *The U.S. Sunflower Industry*. AER-663. Economic Research Service, U.S. Dept. Agr., Oct. 1992.

McElroy, Robert, Mir Ali, Robert Dismukes, and Annette Clauson. *Costs of Production for Major U.S. Crops, 1975-1987*. Staff Report AGES 89-22. Economic Research Service, U.S. Dept. Agr., May 1989.

McKinnell, Cathy, and Nydia R. Suarez. "Export Programs for Vegetable Oils," *Oil Crops: Situation and Outlook Report*. OCS-27. Economic Research Service, U.S. Dept. Agr., Oct. 1990.

McMullen, Marcia P. (ed.). *Sunflower Production and Pest Management*. Extension Bulletin 25 (rev.). North Dakota State University, Dec. 1985.

The Miller Publishing Co. "Ingredient Analysis Table, 1991 edition," *Feedstuffs*. Vol. 63, No. 29, July 18, 1991, pp. 28-30.

Morgan, Nancy. "U.S. Vegetable Oil Export Price Subsidies—What Now?" *Oil Crops: Situation and Outlook Report*. OCS-40. Economic Research Service, U.S. Dept. Agr., Jan. 1994, pp. 16-17.

National Sunflower Association. "Boost Your Cash Flow with Sunflower Power," *Sunflower*. Feb. 1990.

_____. *1990 U.S. Sunflower Crop Quality Report*. Bismark, ND, 1991.

_____. *Sunflower Oil Processing*. Bismark, ND, 1985.

Normile, Mary Anne. "Oilseeds," *Western Europe Agriculture and Trade Report*. RS-89-2 and RS-90-4. Economic Research Service, U.S. Dept. Agr., July 1989 and Nov. 1990.

Olson, Barry M., and Daniel L. Zink. *North Dakota Grain and Oilseed Transportation Statistics*. UGPTI Pub. No. 83, Upper Great Plains Transportation Institute, Fargo, ND, Dec. 1990.

Putt, Eric D. "History and Present World Status," *Sunflower Science and Technology*. Number 19. Ed. Jack F. Carter. Madison, WI: American Society of Agronomy, 1978, pp. 1-25.

Reeves, J.B., and J.L. Weihrauch. *Composition of Foods*. AH-8-4. U.S. Department of Agriculture, 1979.

Robbinson, R.G. "Production and Culture," *Sunflower Science and Technology*. Number 19. Ed. Jack F. Carter. Madison, WI: American Society of Agronomy, 1978, pp. 89-144.

Schaub, James, W.C. McArthur, Duane Hacklander, Joseph Glauber, Mack Leath, and Harry Doty. *The U.S. Soybean Industry*. AER-598. Economic Research Service, U.S. Dept. Agr., May 1988.

Scheithauer, R., and K. Dripchak. *Economics of Vegetable Oil Processing*, Oak Ridge, TN: Oak Ridge National Laboratory, 1985.

Schingoethe, O.J. "Sunflowers Dairy Application," *Feed Management*, Vol. 32(G) 1984, p. 18.

_____. "Sunflower Products in Cattle Rations," *The Sunflower*, Vol. 10, No. 5, June/July 1984.

Simpson, Beryl Brintall, and Molly Conner Ogorzaly. *Economic Botany: Plants in Our World*. New York: McGraw-Hill, 1986, pp. 309-11.

United Nations. "Commodity Trade Statistics," Dept. of International Economic and Social Affairs, Statistical Office, Statistical Papers, Series D, 1962-89.

U.S. Department of Agriculture. *Agricultural Statistics*. Various issues.

U.S. Department of Agriculture, Economic Research Service. *Costs of Production: Major Field Crops, 1988*. ECIFS 8-4. Apr. 1990.

_____. *Costs of Production: Major Field Crops, 1989*. ECIFS 9-5. Apr. 1991.

_____. *Oil Crops: Situation and Outlook Report*. Quarterly issues, 1977-93.

_____. *Provisions of the Food, Agriculture, Conservation, and Trade Act of 1990*. AIB-624. Economic Research Service, U.S. Dept. Agr., June 1991.

U.S. Department of Agriculture, Foreign Agricultural Service, Oilseeds and Products Division. Production, Supply, and Distribution Database, July 1991.

_____. *World Oilseed Situation and Outlook*. Various issues, 1979-91.

U.S. Department of Agriculture. *Crop Production*. National Agricultural Statistics Service. Annual and monthly issues, 1962-92.

U.S. Department of Agriculture. *Effects of the Uruguay Round Agreement on U.S. Agricultural Commodities*, Office of Economics, GATT-1, March 1994.

U.S. Department of Agriculture. *Long-term Agricultural Baseline Projections, 1995-2005*, World Agricultural Outlook Board. Staff Report No. WAOB-95-1, Feb. 1995.

U.S. Department of Commerce, Bureau of the Census. *1992 Census of Agriculture*. Geographic Area Series, Vol. 1, Nov. 1994.

U.S. Department of Commerce, Bureau of the Census. *1987 Census of Agriculture*. Geographic Area Series, Vol. 1, Nov. 1989.

U.S. Department of the Interior, Fish and Wildlife Service. *1985 National Survey of Fishing, Hunting, and Wildlife Associated Recreation*. Nov. 1988.

U.S. International Trade Commission. *Harmonized Tariff Schedule of the United States (1992)*. USITC Pub. 2449. U.S. GPO, Washington, DC, Nov. 1, 1991.

Weber, J. Alan. "The Feasibility of Producing Biodiesel in the United States Using a Community-Based Facility," *Industrial Uses of Agricultural Materials Situation and Outlook Report*, IUS-2, Dec. 1993, pp. 30-34.

Weiss, Theodore J. *Food Oils and Their Uses*. 2nd ed. Westport, CT: AVI Publishing Co., 1983.

Appendix table 1--Soybeans: Acreage planted, harvested, yield, production, and value, 1965-94

Year	Planted	Harvested	Yield	Production	Value
	--- 1,000 acres ---		Bushels per acre	1,000 bushels	1,000 dollars
1965	35,227	34,449	24.5	845,608	2,151,305
1966	37,294	36,546	25.4	928,481	2,553,612
1967	40,819	39,805	24.5	976,439	2,433,519
1968	42,265	41,391	26.7	1,106,958	2,688,571
1969	42,534	41,337	27.4	1,133,120	2,664,204
1970	43,082	42,249	26.7	1,127,100	3,214,710
1971	43,476	42,705	27.5	1,176,101	3,559,708
1972	46,866	45,683	27.8	1,270,608	5,550,459
1973	56,549	55,667	27.8	1,547,543	8,786,680
1974	52,479	51,341	23.7	1,216,287	8,069,585
1975	54,590	53,617	28.9	1,548,344	7,617,984
1976	50,269	49,401	26.1	1,288,608	8,768,979
1977	58,978	57,830	30.6	1,767,267	9,362,997
1978	64,708	63,663	29.4	1,868,754	12,449,679
1979	71,411	70,343	32.1	2,260,665	14,203,660
1980	69,930	67,813	26.5	1,797,543	13,601,112
1981	67,543	66,163	30.1	2,000,145	12,004,638
1982	70,884	69,442	31.5	2,190,297	12,462,779
1983	63,779	62,525	26.2	1,635,772	12,774,974
1984	67,755	66,113	28.1	1,860,863	10,748,050
1985	63,145	61,599	34.1	2,099,056	10,571,324
1986	60,405	58,312	33.3	1,942,558	9,262,746
1987	58,180	57,172	33.9	1,937,722	11,391,000
1988	58,840	57,373	27.0	1,548,841	11,487,742
1989	60,820	59,538	32.3	1,923,666	10,916,145
1990	57,795	56,512	34.1	1,925,947	11,042,010
1991	59,180	58,011	34.2	1,986,539	11,091,996
1992	59,180	58,233	37.6	2,190,354	12,167,564
1993	60,135	57,347	32.6	1,870,958	11,949,633
1994	61,940	61,129	41.9	2,558,317	13,785,353

Appendix table 2--Soybeans: Supply, disappearance, and price, 1965-94

Year beginning September 1	Supply: Beginning stocks	Supply: Production	Supply: Total[1]	Disappearance: Crush	Disappearance: Exports	Disappearance: Seed, feed, and residual	Disappearance: Total	Ending stocks	Average price received by farmers
	Million bushels								Dollars per bushel
1965	30	846	876	537	251	52	840	36	2.54
1966	36	928	964	559	262	53	874	90	2.75
1967	90	976	1,066	576	267	57	900	166	2.49
1968	166	1,107	1,273	606	287	53	946	327	2.43
1969	327	1,131	1,458	737	433	58	1,228	230	2.35
1970	230	1,127	1,357	760	434	64	1,258	99	2.85
1971	99	1,176	1,275	721	417	65	1,203	72	3.03
1972	72	1,201	1,273	722	479	12	1,213	60	4.37
1973	60	1,548	1,608	821	539	77	1,437	171	5.68
1974	171	1,216	1,387	701	421	77	1,199	188	6.64
1975	188	1,549	1,736	865	555	71	1,491	245	4.92
1976	245	1,289	1,534	790	564	77	1,431	103	6.81
1977	103	1,767	1,870	927	700	82	1,709	161	5.88
1978	161	1,869	2,030	1,018	739	97	1,854	176	6.66
1979	176	2,261	2,437	1,123	875	81	2,079	358	6.28
1980	358	1,798	2,156	1,020	724	99	1,843	313	7.57
1981	313	1,989	2,302	1,030	929	89	2,048	254	6.04
1982	254	2,190	2,444	1,108	905	86	2,099	345	5.67
1983	345	1,636	1,981	983	743	79	1,805	176	7.83
1984	176	1,861	2,037	1,030	598	93	1,721	316	5.84
1985	316	2,099	2,415	1,053	740	86	1,879	536	5.05
1986	536	1,940	2,479	1,179	757	106	2,042	436	4.78
1987	436	1,938	2,375	1,174	802	97	2,073	302	5.88
1988	302	1,549	1,855	1,058	527	88	1,673	182	7.42
1989	182	1,924	2,109	1,146	623	101	1,870	239	5.69
1990	239	1,926	2,168	1,187	557	95	1,839	329	5.74
1991	329	1,987	2,319	1,254	684	103	2,041	278	5.58
1992	278	2,190	2,471	1,279	770	130	2,179	292	5.56
1993	292	1,871	2,170	1,272	589	100	1,961	209	6.40
1994[2]	209	2,558	2,775	1,360	790	115	2,265	510	5.20-5.50

[1] Includes imports.
[2] Preliminary.

Appendix table 3--Soybean meal: Supply, disappearance, and price, 1965-90

Year beginning October 1	Supply: Beginning stocks[1]	Supply: Production	Supply: Total[2]	Disappearance: Exports	Disappearance: Domestic	Disappearance: Total	Ending stocks 1/	Price of 48-percent protein, Decatur (solvent)
	1,000 short tons							Dollars per ton
1965	106	12,901	13,007	2,601	10,274	12,875	132	81.46
1966	132	13,483	13,615	2,657	10,820	13,477	138	78.83
1967	138	13,660	13,798	2,900	10,753	13,653	145	76.93
1968	145	14,581	14,726	3,044	11,525	14,569	157	74.12
1969	157	17,597	17,754	4,036	13,581	17,617	137	78.45
1970	137	18,035	18,172	4,559	13,467	18,026	146	78.51
1971	146	17,024	17,170	3,085	13,173	16,978	192	90.20
1972	192	16,709	16,901	4,558	12,160	16,718	183	228.99
1973	183	19,674	19,857	5,558	13,792	19,350	507	146.35
1974	507	16,702	17,209	4,299	12,552	16,851	358	130.86
1975	358	20,754	21,112	5,145	15,612	20,757	355	157.68
1976	355	18,488	18,843	4,559	14,056	18,615	228	218.73
1977	228	22,371	22,599	6,080	16,276	22,356	243	179.45
1978	243	24,354	24,597	6,610	17,720	24,330	267	206.18
1979	267	27,105	27,372	7,932	19,214	27,146	226	197.05
1980	226	24,312	24,538	6,784	17,591	24,375	163	235.13
1981	163	24,634	24,797	6,908	17,714	24,622	175	196.62
1982	175	26,714	26,889	7,109	19,306	26,415	474	200.94
1983	474	22,756	23,230	5,360	17,615	22,975	255	203.21
1984	255	24,529	24,784	4,917	19,480	24,397	387	136.40
1985	387	24,951	25,338	6,036	19,090	25,126	212	166.20
1986	212	27,758	27,970	7,343	20,387	27,730	240	177.31
1987	240	28,060	28,300	6,824	21,323	28,147	153	239.35
1988	153	24,943	25,100	5,442	19,498	24,940	173	252.40
1989	173	27,719	27,928	5,319	22,291	27,610	318	186.48
1990	318	28,325	28,688	5,469	22,934	28,403	285	181.40
1991	285	29,831	30,183	6,945	23,008	29,953	230	189.20
1992	230	30,364	30,687	6,232	24,251	30,483	204	193.75
1993	204	30,417	30,691	5,356	25,185	30,541	150	193.00
1994[3]	150	32,265	32,475	5,825	26,350	32,175	300	165.00

[1] Includes millfeed (hull meal).
[2] Includes imports.
[3] Preliminary.

Appendix table 4--Major oilseeds: World supply and use, 1990-93

Item	1990/91	1991/92	1992/93	1993/94[1]
		Million metric tons		
Production:				
Soybean	104.14	107.38	117.11	116.60
Cottonseed	33.42	36.62	31.61	29.49
Peanut	22.12	22.24	23.05	23.97
Sunflowerseed	22.84	21.84	21.32	20.98
Rapeseed	25.11	28.27	25.33	26.79
Copra	4.76	4.73	4.84	4.82
Palm kernel	3.32	3.41	4.00	4.26
Total	215.71	224.49	227.26	226.92
Exports:				
Soybean	25.38	28.46	29.59	28.07
Cottonseed	0.34	0.45	0.57	0.49
Peanut	1.34	1.37	1.34	1.34
Sunflowerseed	1.98	2.21	1.91	1.98
Rapeseed	4.00	4.80	4.00	4.96
Copra	0.28	0.24	0.23	0.22
Palm kernel	0.06	0.06	0.06	0.07
Total	33.37	37.59	37.69	37.13
Imports:				
Soybean	25.72	29.12	29.99	28.50
Cottonseed	0.37	0.51	0.67	0.55
Peanut	1.39	1.38	1.31	1.34
Sunflowerseed	1.90	2.44	1.94	2.02
Rapeseed	4.55	4.69	4.03	4.91
Copra	0.26	0.22	0.22	0.22
Palm kernel	0.06	0.05	0.06	0.06
Total	34.26	38.41	38.22	37.60
Crush:				
Soybean	87.33	92.25	96.16	99.71
Cottonseed	25.89	28.64	24.85	22.77
Peanut	11.81	11.78	12.52	12.74
Sunflowerseed	19.87	19.03	18.49	17.78
Rapeseed	23.66	25.50	22.86	24.69
Copra	4.77	4.61	4.82	4.80
Palm kernel	3.28	3.37	3.87	4.28
Total	176.61	185.19	183.56	186.86

Note: Trade and crush are aggregated using individual marketing years, except Argentina and Brazil, which are adjusted to and Oct.-Sept. year.

[1] Preliminary.

Source: U.S. Department of Agriculture, Foreign Agriculture Service, Oilseeds: World Markets and Trade, FOP 12-94, December 1994.

Appendix table 5--Major protein meals: World supply and use, 1990-93

Item	1990/91	1991/92	1992/93	1993/94[1]
		Million metric tons		
Production:				
Soybean	69.50	73.08	75.78	78.88
Cottonseed	12.23	13.32	11.46	10.63
Rapeseed	14.40	15.62	14.05	15.14
Sunflowerseed	8.88	8.63	8.28	8.01
Fish	5.98	6.28	5.91	6.24
Peanut	4.81	4.79	5.10	5.17
Copra	1.66	1.57	1.61	1.62
Palm kernel	1.72	1.75	2.04	2.25
Total	119.16	125.03	124.24	127.94
Exports:				
Soybean	26.89	28.67	27.38	29.33
Cottonseed	2.46	2.30	2.40	2.07
Rapeseed	2.57	3.36	3.27	3.00
Sunflowerseed	2.34	2.29	1.80	1.97
Fish	3.19	3.46	3.33	3.90
Peanut	0.72	0.71	0.65	0.85
Copra	1.20	0.91	1.03	0.98
Palm kernel	1.33	1.47	1.79	1.80
Total	40.69	43.18	41.65	43.90
Imports:				
Soybean	27.17	28.31	27.00	28.65
Cottonseed	2.46	2.50	2.30	2.28
Rapeseed	2.57	3.49	3.41	3.24
Sunflowerseed	2.22	2.36	2.16	1.95
Fish	3.46	3.45	3.87	3.72
Peanut	0.77	0.74	0.72	0.70
Copra	1.22	0.91	0.89	0.86
Palm kernel	1.44	1.48	1.67	1.70
Total	41.31	43.23	42.02	43.10
Consumption:				
Soybean	70.09	73.26	74.75	78.68
Cottonseed	12.27	13.54	11.40	10.83
Rapeseed	14.50	15.65	14.18	15.37
Sunflowerseed	8.73	8.72	8.62	7.98
Fish	6.30	6.30	6.17	6.05
Peanut	4.85	4.81	5.17	5.03
Copra	1.75	1.53	1.48	1.47
Palm kernel	1.74	1.81	2.01	2.11
Total	120.22	125.62	123.78	127.52

[1] Preliminary. Note: Trade and consumption are aggregated using individual marketing years, except Argentina and Brazil, which are adjusted to an Oct.-Sept. year. Source: U.S. Department of Agriculture, Foreign Agriculture Service, Oilseeds: World Markets and Trade, FOP 12-94, December 1994.

Appendix table 6--Major vegetable and marine oils: World supply and use, 1990-93

Item	1990/91	1991/92	1992/93	1993/94[1]
		Million metric tons		
Production:				
Soybean	15.93	16.89	17.10	17.94
Palm	11.09	11.50	13.01	13.41
Sunflowerseed	7.89	7.69	7.37	7.16
Rapeseed	8.65	9.32	8.41	9.17
Cottonseed	3.79	4.18	3.59	3.35
Peanut	3.38	3.38	3.60	3.60
Coconut	2.99	2.92	3.04	3.02
Olive	1.50	2.14	1.78	1.61
Fish	1.39	1.11	1.19	1.22
Palm kernel	1.47	1.49	1.74	1.89
Total	58.06	60.60	60.82	62.38
Exports:				
Soybean	3.63	4.29	4.24	4.97
Palm	7.70	7.68	8.42	9.21
Sunflowerseed	2.53	2.68	2.20	2.05
Rapeseed	1.90	2.09	1.65	1.79
Cottonseed	0.55	0.49	0.35	0.39
Peanut	0.30	0.32	0.23	0.32
Coconut	1.58	1.47	1.69	1.42
Olive	0.72	0.56	0.57	0.63
Fish	0.75	0.62	0.70	0.69
Palm kernel	0.88	0.88	0.92	0.89
Total	20.54	21.07	20.98	22.36
Imports:				
Soybean	3.67	3.86	4.04	4.85
Palm	7.70	7.67	8.09	9.21
Sunflowerseed	2.69	2.69	2.29	2.28
Rapeseed	1.84	2.16	1.71	1.81
Cottonseed	0.55	0.53	0.44	0.42
Peanut	0.32	0.30	0.31	0.29
Coconut	1.45	1.32	1.41	1.34
Olive	0.80	0.67	0.70	0.71
Fish	0.69	0.59	0.60	0.58
Palm kernel	0.81	0.82	0.73	0.75
Total	20.52	20.61	20.32	22.23
Consumption:				
Soybean	15.83	16.00	17.24	18.34
Palm	11.39	11.44	12.40	13.66
Sunflowerseed	7.98	7.77	7.59	7.41
Rapeseed	8.74	9.35	8.55	9.20
Cottonseed	3.78	4.24	3.69	3.37
Peanut	3.39	3.35	3.69	3.60
Coconut	2.98	2.84	2.83	2.90
Olive	1.80	1.86	1.94	1.96
Fish	1.31	1.11	1.11	1.14
Palm kernel	1.40	1.45	1.56	1.80
Total	58.60	59.40	60.60	63.38

Note: Trade and consumption are aggregated using individual marketing years, except Argentina and Brazil, which are adjusted to an Oct.-Sept. year.

[1] Preliminary.

Source: U.S. Department of Agriculture, Foreign Agriculture Service, Oilseeds: World Markets and Trade, FOP 12-94, December 1994.

Appendix table 7--Sunflowerseed: Number of farms and acres harvested, by State 1987 and 1992

	1987		1992	
	No. Farms	Harvested acres	No. Farms	Harvested acres
Alabama	3	D/	4	6
Arkansas	N.A	N.A	7	851
California	97	19,319	85	12,991
Colorado	172	28,893	251	45,652
Georgia	11	596	19	985
Illinois	39	1,304	65	3,451
Indiana	12	567	11	258
Iowa	4	D/	8	52
Kansas	1,196	113,449	657	81,499
Kentucky	6	D/	4	11
Louisiana	9	1,044	6	3,855
Maryland	10	150	6	27
Michigan	67	3,041	36	2,367
Minnesota	683	82,278	1,131	202,025
Missouri	9	298	26	1,117
Montana	24	6,172	9	3,328
Nebraska	282	28,194	312	32,766
New Jersey	3	D/	9	19
New Mexico	3	D/	4	508
New York	25	1,360	28	462
North Carolina	13	622	8	137
North Dakota	7,043	1,407,115	5,287	1,130,593
Ohio	39	1,742	34	1,351
Oklahoma	18	1,942	14	1,316
Oregon	N.A	N.A	9	10
Pennsylvania	40	1,651	16	252
South Carolina	15	803	11	718
South Dakota	1,659	262,847	1,571	349,668
Tennessee	4	15		88
Texas	105	12,185	180	23,812
Virginia	8	17	6	9
Wisconsin	116	4,012	71	2,933
Wyoming	10	1,917	12	1,644
Other	N.A	N.A	12	327
United States	11,741	1,982,357	9,914	1,905,088

D/ Witheld to avoid disclosing data for individual farms. N.A = Not available.
Source: U.S. Department of Commerce, 1992 Census of Agriculture, Geographic Area Series, Vol. 1, November 1994.

Appendix table 8--Sunflowerseed acreage planted, harvested, yield, and production, 1962-94

Year	Planted	Harvested	Yield	Production
	---1,000 acres---		*Lbs/acre*	*1,000 lbs*
1962	13	13	980	12,250
1963	31	30	970	29,100
1964	42	40	644	25,760
1965	50	46	827	38,050
1966	76	73	894	65,240
1967	221	216	1,037	233,960
1968	156	151	1,031	155,670
1969	195	185	927	171,430
1970	219	207	902	186,670
1971	405	392	1,050	411,680
1972	719	692	916	633,560
1973	678	666	1,080	719,070
1974	572	548	957	524,750
1975	787	709	1,109	786,010
1976	834	810	1,058	857,100
1977	2,321	2,205	1,252	2,760,470
1978	2,840	2,798	1,365	3,817,920
1979	5,555	5,410	1,349	7,296,110
1980	3,910	3,683	1,016	3,741,640
1981	3,865	3,811	1,177	4,487,410
1982	4,815	4,724	1,129	5,332,820
1983	3,110	3,063	1,044	3,198,500
1984	3,754	3,692	1,014	3,744,530
1985	3,055	2,844	1,109	3,153,020
1986	2,025	1,955	1,369	2,675,750
1987	1,805	1,775	1,469	2,608,150
1988	2,038	1,921	933	1,792,090
1989	1,840	1,786	985	1,759,760
1990	1,905	1,851	1,229	2,274,405
1991	2,746	2,673	1,352	3,613,030
1992	2,187	2,043	1,255	2,564,985
1993	2,757	2,486	1,035	2,572,063
1994	3,567	3,430	1,410	4,836,185

Source: U.S. Department of Agriculture, National Agricultural Statistics Service. *Crop Production.* Annual and monthly issues, 1962-1995.

Appendix table 9--Distribution of farms growing sunflowers, by acres harvested, 1992

State	Acres of sunflowers harvested							Farms
	1-24	25-49	50-99	100-249	250-499	500-999	1,000 or more	
	Percent							*Number*
North Dakota	3	8	20	39	22	7	1	5,287
South Dakota	5	10	24	35	17	7	2	1,571
Minnesota	7	13	20	38	16	5	1	1,131
U.S. total	7	11	21	36	18	6	1	9,914

Source: U.S. Department of Commerce, Bureau of the Census. *1992 Census of Agriculture*. Geographic Area Series, Vol. 1, Nov. 1994.

Appendix table 10--Distribution of farms growing sunflowers, by sales class, 1992

State	Less than $20,000	$20,000 to $39,999	$40,000 to $49,999	$50,000 to $99,999	$100,000 or more	Farms
	Percent					*Number*
North Dakota	5	9	4	25	57	5,287
South Dakota	6	9	5	25	55	1,571
Minnesota	8	7	4	18	63	1,131

Source: U.S. Department of Commerce, Bureau of the Census. *1992 Census of Agriculture*. Geographic Area Series, Vol. 1, Nov. 1994.

Appendix table 11--U.S. sunflowerseed: Supply, disappearance, and price, 1977-94

Year beginning September 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Supply: Total use	Disappearance: Crush	Disappearance: Non-oil + seed	Disappearance: Exports	Disappearance: Total	Ending stocks	Price: Average received by farmers
	1,000 metric tons									$/mt
1977	23	1,330	3	1,356	219	118	942	1,279	77	224
1978	77	1,823	7	1,907	292	159	1,366	1,817	90	236
1979	90	3,310	10	3,410	547	147	1,820	2,514	896	200
1980	896	1,697	28	2,621	780	154	1,505	2,439	182	245
1981	182	2,035	32	2,249	374	177	1,555	2,106	143	238
1982	143	2,419	40	2,602	766	191	1,348	2,305	297	199
1983	297	1,451	31	1,779	590	113	1,044	1,747	32	287
1984	32	1,698	26	1,757	567	128	991	1,686	71	249
1985	71	1,430	26	1,527	674	276	365	1,315	212	175
1986	212	1,214	8	1,434	635	242	304	1,181	253	152
1987	253	1,183	10	1,446	900	79	270	1,249	197	184
1988	197	813	25	1,035	575	294	87	956	79	267
1989	79	798	20	897	546	230	96	872	25	234
1990	25	1,031	40	1,096	569	275	168	1,013	85	240
1991	85	1,639	75	1,800	952	422	163	1,537	262	192
1992	262	1,163	47	1,473	923	363	118	1,404	69	215
1993	69	1,167	25	1,261	661	429	99	1,190	71	284
1994[2]	71	2,194	9	2,274	1,048	558	250	1,857	417	217-229

Appendix table 12--U.S. sunflowerseed oil: Supply, disappearance, and price, 1977-94

Year beginning October 1	Supply: Beginning stocks	Supply: Production	Supply: Total[1]	Disappearance: Domestic	Disappearance: Exports	Disappearance: Total	Ending stocks	Price: Average, crude, Minneapolis
	1,000 metric tons							$/mt
1977	N.A.	86	86	49	34	83	3	N.A.
1978	3	115	118	70	41	111	7	728
1979	7	224	231	72	86	158	73	575
1980	73	298	371	29	301	330	41	594
1981	41	137	178	63	103	166	12	550
1982	12	303	315	43	229	272	43	495
1983	43	204	247	53	188	241	6	741
1984	6	219	225	65	130	195	30	661
1985	30	265	295	65	205	270	25	421
1986	25	266	291	84	156	240	51	353
1987	51	377	430	40	319	359	71	520
1988	71	235	306	57	212	269	37	500
1989	37	215	254	78	159	237	17	538
1990	17	234	266	82	163	244	22	520
1991	21	413	438	179	214	393	45	476
1992	45	331	376	85	266	351	25	558
1993	25	263	292	59	204	263	29	683
1994[2]	29	426	456	91	320	411	45	585-605

N.A. = Not available.
[1] Total supply includes imports.
[2] Estimate.
Source: U.S. Department of Agriculture, Economic Research Service. Oil Crops: Situation and Outlook Report. OCS-41, July 1994 and monthly updates.

Appendix table 13--U.S. sunflowerseed meal: Supply, disappearance, and price, 1977-94

Year beginning October 1	Supply			Disappearance				Price
	Beginning stocks	Production	Total[1]	Domestic	Exports	Total	Ending stocks	Average, 28-percent protein
	1,000 metric tons							$/mt
1977	N.A.	131	131	127	N.A.	127	4	N.A.
1978	4	180	184	180	N.A.	180	4	102
1979	4	359	363	359	N.A.	359	4	106
1980	4	439	443	440	N.A.	440	3	122
1981	3	201	204	200	N.A.	200	4	117
1982	4	434	438	433	N.A.	433	5	112
1983	5	265	270	240	25	265	5	123
1984	5	321	326	307	14	321	5	58
1985	5	357	362	313	44	357	5	76
1986	5	305	310	269	36	305	5	84
1987	5	426	431	381	46	427	4	109
1988	4	298	315	306	6	312	3	135
1989	3	262	277	269	3	272	5	111
1990	5	281	304	294	5	299	5	97
1991	5	498	510	451	53	503	6	85
1992	6	440	451	401	48	449	2	98
1993	2	327	332	291	37	328	5	104
1994[2]	5	535	544	494	45	540	5	55-71

N.A. = Not available.
[1] Total supply includes imports.
[2] Estimate.
Source: U.S. Department of Agriculture, Economic Research Service. *Oil Crops: Situation and Outlook Report*, OCS-41, July 1994 and monthly updates.

Appendix table 14--U.S. canola seed: Supply and disappearance, 1987-94

Year beginning June 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Supply: Total[1]	Disappearance: Crush	Disappearance: Exports	Disappearance: Total	Ending stocks
	Million pounds							
1987	3	27	2	32	30	0	30	2
1988	2	39	37	78	71	4	75	3
1989	3	95	231	329	298	10	308	21
1990	21	97	141	259	195	32	227	32
1991	32	191	2	225	109	97	212	13
1992	13	144	27	184	59	104	174	10
1993	10	252	773	1,035	850	78	940	95
1994[2]	95	447	992	1,535	1,290	110	1,418	117

[1] Includes planting seed and residual. [2] Estimate.

Appendix table 15--U.S. canola oil: Supply and disappearance, 1987-94

Year beginning October 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Supply: Total	Disappearance: Domestic	Disappearance: Exports	Disappearance: Total	Ending stocks
	Million pounds							
1987	4	14	273	291	263	0	263	29
1988	29	54	430	513	486	8	494	19
1989	20	130	391	541	510	6	516	24
1990	24	18	583	625	577	7	584	41
1991	41	32	815	888	801	15	816	71
1992	71	49	861	981	898	16	914	67
1993	67	406	902	1,375	1,228	76	1,304	71
1994[1]	71	481	963	1,515	1,355	85	1,440	75

[1] Estimate.

Source: U.S. Department of Agriculture, Economic Research Service. *Oil Crops: Situation and Outlook Report*. OCS-41, July 1994 and monthly updates.

Appendix table 16--U.S. canola meal: Supply and disappearance, 1987-94

Year beginning October 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Supply: Total	Disappearance: Domestic	Disappearance: Exports	Disappearance: Total	Ending stocks
	1,000 tons							
1987	2	11	227	240	228	0	228	12
1988	12	42	308	362	327	1	328	34
1989	3	101	251	355	340	9	349	6
1990	6	14	375	395	389	0	389	6
1991	6	25	621	652	646	0	646	6
1992	6	39	603	648	642	0	642	6
1993	6	322	780	1,108	1,102	0	1,102	6
1994[1]	6	376	829	1,211	1,205	0	1,205	6

1/ Estimate.
Source: U.S. Department of Agriculture, Economic Research Service. *Oil Crops: Situation and Outlook Report.* OCS-41, July 1994 and monthly updates.

Appendix table 17--U.S. flaxseed: Supply, disappearance, and price, 1984-94

Year beginning June 1	Supply: Beginning stocks	Supply: Production	Supply: Imports	Supply: Total	Disappearance: Crush	Disappearance: Exports	Disappearance: Total use	Price: Average received by farmers
	1,000 bushels							$/bu
1984	1,716	7,022	3,796	12,534	9,935	238	10,885	6.09
1985	1,649	8,293	2,927	12,869	10,313	250	11,240	5.05
1986	1,629	11,538	2,224	15,391	10,000	1,448	12,090	3.47
1987	3,301	7,444	2,925	13,671	10,800	156	11,346	3.39
1988	2,325	1,615	6,730	10,670	8,500	764	9,363	7.56
1989	1,307	1,215	7,260	9,782	8,250	1,054	9,538	7.20
1990	244	3,812	6,715	10,771	8,800	549	9,800	5.27
1991	971	6,200	4,371	11,542	9,050	541	9,986	3.52
1992	1,556	3,288	6,035	10,879	8,600	230	9,334	4.12
1993	1,545	3,480	5,110	10,135	8,650	126	8,980	4.20
1994[1]	1,155	2,922	6,345	10,422	8,750	150	9,172	4.40-4.60

[1] Estimate.

Source: U.S. Department of Agriculture, Economic Research Service. *Oil Crops: Situation and Outlook Report*. OCS-41, July 1994 and monthly updates.

Appendix table 18--U.S. linseed oil: Supply, disappearance, and price, 1984-94

Year beginning June 1	Supply: Beginning stocks	Supply: Pro-duction	Supply: Total[1]	Disappearance: Domestic	Disappearance: Exports	Disappearance: Total	Ending stocks	Price: Average, crude, Minneapolis
	Million pounds							Cents/Lb.
1984	48	194	242	194	15	209	33	32.0
1985	33	205	238	184	15	199	39	30.8
1986	39	201	240	183	6	189	51	26.4
1987	51	217	268	219	8	227	41	24.7
1988	41	170	211	151	12	163	48	39.5
1989	48	165	213	164	12	176	37	40.2
1990	37	176	213	167	6	173	40	38.0
1991	40	182	222	170	12	182	40	32.1
1992	40	172	212	150	8	158	54	31.0
1993	54	174	228	158	7	165	63	32.5
1994 2/	63	175	238	170	8	178	60	3.10-3.60

Appendix table 19--U.S. linseed meal: Supply, disappearance, and price, 1984-94

Year beginning June 1	Supply: Beginning stocks	Supply: Pro-duction	Supply: Total[1]	Disappearance: Domestic	Disappearance: Exports	Disappearance: Total	Ending stocks	Price: Minneapolis 34-pct. protein
	1,000 short tons							$/ton
1984	3	179	183	120	60	180	3	99.00
1985	3	184	190	110	75	185	5	102.00
1986	5	185	192	127	63	190	2	112.00
1987	2	198	202	140	59	199	3	130.25
1988	3	156	170	102	63	165	5	178.45
1989	5	153	167	139	23	162	5	139.30
1990	5	162	170	124	41	165	5	130.10
1991	5	167	172	127	40	167	5	125.25
1992	5	159	166	106	55	161	5	133.60
1993	5	160	167	113	49	162	5	139.55
1994[2]	5	162	169	120	44	164	5	100-115

[1] Includes imports. [2] Estimate. Source: U.S. Department of Agriculture, Economic Research Service. *Oil Crops: Situation and Outlook Report*. OCS-41, July 1994 and monthly updates.

U.S. Department of Agriculture
Economic Research Service

SUMMARY OF REPORT #AER-711

The 1995 Farm Bill

Sugar Quota System, Price Supports Among Key Issues in Policy Debate

April 1995

Contact: Ron Lord, (202) 219-1287

The sugar portion of the 1995 farm bill debate will likely focus on the level and type of support to the industry, as well as the effectiveness of the sugar provisions in the 1990 omnibus farm legislation (entitled the Food, Agriculture, Conservation, and Trade Act). Those issues and others are outlined in ***Sugar: Background for 1995 Farm Legislation***, a new report from USDA's Economic Research Service.

U.S. Sugar Policy

The current U.S. sugar price support program has its origins in 1981 legislation. The foundations of the program are tariff-rate import quotas, domestic marketing allotments, and price supports. They restrict overall supply to help maintain price. The current U.S. minimum price support level, unchanged since the 1985 crop, is based on a raw cane sugar loan rate of 18 cents a pound, raw value. Import quotas have meant that the U.S. sugar price has been largely unaffected by movements in the lower world price.

The 1990 farm legislation added a minimum sugar import requirement of 1.25 million short tons (1 short ton = 2,000 pounds), standby domestic sugar marketing allotments (domestic supply controls), and a marketing assessment of 1 percent of the loan rate, later increased to 1.1 percent. USDA assesses whether or not to implement the standby allotments at the beginning of each quarter of the fiscal year. If imposed, allotments apply to the entire fiscal year, and have been imposed for fiscal years 1993 and 1995.

Several options exist for the U.S. sugar program. Preserving the basic structure of the nonrecourse loan program provides one set of options. To continue price support, a mechanism for domestic supply control is necessary. At the other extreme, the domestic program could be eliminated.

Another factor in this year's debate will be the General Agreement on Trade and Tariffs (GATT). Under GATT, the U.S. is committed to maintain a minimum access level for imports of 1.256 million tons. This commitment precludes domestic sugar legislation from increasing the protection afforded domestic sugar producers from foreign sugar, even if surpluses arise.

The U.S. Sugar Industry

The domestic sugar and sweetener industry is the largest in the world, with total annual consumption of caloric sweeteners approaching 20 million tons a year. The United States is among the top five countries in the world in production, consumption, and imports of sugar. About 83 percent of the sugar consumed in the United States during 1992-94 was produced domestically, with 45 percent from sugarcane and 38 percent from sugar beets.

To Order This Report...

The information presented here is excerpted from ***Sugar: Background for 1995 Farm Legislation,*** AER-711, by Ron Lord. The cost is $12.00.

To order, dial **1-800-999-6779** (toll free in the United States and Canada) and ask for the report by title.

Please add 25 percent to foreign addresses (including Canada). Charge to VISA or MasterCard. Or send a check (made payable to ERS-NASS) to:

ERS-NASS
341 Victory Drive
Herndon, VA 22070

U.S. Department of Agriculture
Economic Research Service

SUMMARY OF REPORT #AER-713

The 1995 Farm Bill

Rice Program Being Analyzed in Climate Of Increased Government Dependence

April 1995

Contact: Randall D. Schnepf, (202) 501-8513

The increasing importance of government program payments to U.S. rice producers is one issue policymakers will have to consider in this year's farm bill debate, according to ***Rice: Background for 1995 Farm Legislation***, a new report from USDA's Economic Research Service.

Currently, a typical U.S. rice farm is likely to benefit from two types of government program outlays: target price deficiency payments and marketing loan gains. Since the inception of the marketing loan program for rice in the 1985/86 marketing year, government outlays for the rice program have averaged $733 million per year, or 42 percent of all returns from rice farming .

Some rice farmers have been operating at a loss, because of inflation in production costs since the early 1980's, coupled with frozen government payments, reduced target prices, and continued reductions in farm program benefits because of budgetary pressures. Additional costs are being placed on rice farms by increasing environmental regulations, including restrictions on the registration and use of pesticides, wetland regulations, and concern for the quality of both groundwater and surface water. Gulf coast and California rice producers are particularly vulnerable to cost increases.

Any reductions in current rice program support levels would probably accelerate the trends of a declining number of U.S. rice farms, increasing farm size, and a shift of rice growing from the high-cost production regions along the gulf coast to the upper Delta States, while reducing both the participation rate and dependency on government program revenue.

The U.S. Rice Industry. Domestic rice acreage, production, and income have increased in recent years. Since 1990, rice plantings have averaged slightly more than 3 million acres per year, up from an average of 2.8 million in the 1980's. Most of the increase has been in the areas where production costs are lower—along the Mississippi River and in the nondelta areas of Arkansas. Domestic rice production has averaged 160 million cwt (hundredweight) since 1990, up from 140 million cwt during the 1980's. Total returns to the rice industry have averaged $1.9 billion since 1990, up from approximately $1.6 billion during the 1980's.

The U.S. domestic rice market has been growing at more than 4 percent a year for the past 25 years and has now overtaken the international market as the principal outlet for U.S. rice. Direct food use is the largest domestic use. However, with numerous new products and effective marketing, use of rice in processed foods is the fastest growing area of the domestic market. Despite its small area and value relative to other field crops, U.S. rice production plays a major role in those States in which it is grown.

To Order This Report...

The information presented here is excerpted from ***Rice: Background for 1995 Farm Legislation,*** AER-713, by Randall D. Schnepf and Bryan Just. The cost is $12.00.

To order, dial **1-800-999-6779** (toll free in the United States and Canada) and ask for the report by title.

Please add 25 percent to foreign addresses (including Canada). Charge to VISA or MasterCard. Or send a check (made payable to ERS-NASS) to:

ERS-NASS
341 Victory Drive
Herndon, VA 22070

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD).

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, DC 20250, or call (202) 720-7327 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

U.S. Department of Agriculture
Economic Research Service
1301 New York Avenue, NW.
Washington, DC 20005-4788