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Analysis of the World Oil Crops Market

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Abstract

The world of oilseeds, meals, and oils has been evolving. New issues have emerged for researchers and policymakers. The United States is still the largest player, mainly due to its dominant position in soybeans and soybean meals. Nevertheless, the position of the United States has been challenged by several countries. The growth by Brazil and Argentina in the production of soybeans and soybean meal has especially eroded the market share of the United States in recent years. Malaysia and Indonesia have been aggressively marketing their palm oil, intensifying the competition for U.S. soybean oil exports. Other issues include changing trade policies and demand in major importing countries, trade liberalization, and genetically modified crops.

Key words: oilseeds, soybeans, Brazil, Argentina, trade

HIGHLIGHTS

Annual worldwide soybean production has averaged 175 million metric tons per year from 1998 to 2002, which is significantly greater than annual production averages for other oilseeds: 37 million metric tons for rapeseed, 34 million metric tons for cottonseed, 31 million metric tons for peanuts, 24 million metric tons for sunflowerseed, 7 million metric tons for palm kernel, and 5 million metric tons for copra. Over 80 percent of all oilseeds are crushed for production of meals and oils. Over the last five years, about 30 percent of all soybeans produced were exported, and soybeans accounted for almost 80 percent of all oilseed trade. The next leading oilseed traded is rapeseed, followed by sunflowerseed. Less than 5 percent of the total production of cottonseed, peanuts, palm kernels, and copra was traded. The United States, Brazil, Argentina, and China are the dominant producers of soybeans, accounting for almost 90 percent of world soybean production.

Soybean production in Brazil and Argentina has increased dramatically over the last decade, with production tripling in these two countries since 1990. The growth of Brazil and Argentina in the production of soybeans and soybean meal has eroded the market share of the United States in recent years. China is the biggest and fastest-growing market for soybeans, and the ability of the United States to compete with Brazil in this country is critically important. Projections show that, U.S. soybean production will increase to 83 million metric tons in 2010, while production in Brazil and Argentina will gain some ground on the United States, increasing to 68 and 49 million metric tons, respectively. The likelihood that Brazil will continue to increase soybean production at a significant rate depends largely on the development of their transportation system. China is expected to remain the top producer of rapeseed. Despite greater increases in Russia and Ukraine in acres harvested, Argentina is expected to remain the top sunflowerseed producer due to increases in yield.

Almost 70 percent of the 170 million metric tons of oilseed meal produced annually from 1998 to 2002 consisted of soybean meal. About 43 million metric tons of soybean meal was traded per year, accounting for 36 percent of total soybean meal production. The next most traded oilseed meals were rapeseed meal, palm kernel meal, and sunflowerseed meal. Per capita soybean meal consumption is the highest in the United States and the European Union, and the greatest increases in consumption have been in China and Thailand. While total rapeseed meal consumption is the highest in China, per capita consumption is the highest in Canada, the European Union, and Japan. Per capita sunflowerseed meal consumption is the highest in Hungary.

Eighty-one percent of total oil production from 1998/99 to 2002/03 was composed of four major varieties: soybean oil, palm oil, rapeseed oil, and sunflowerseed oil. International trade of oils has two distinct characteristics. One is the large share of oils traded. In the last five years, the annual average export volume was 35.59 million metric tons, or 40.5 percent of total world production. A large share of palm oil, especially, is traded (72 percent of production). The other characteristic is that trading volumes for different oil varieties do not follow the production pattern. The most traded oil is palm oil (16.50 million metric tons per year), followed by soybean oil (8.64), sunflowerseed oil (3.21), and rapeseed oil (2.73). Malaysia and Indonesia have been aggressively marketing their palm oil, especially in Asia, resulting in intense competition for the soybean oil exported from the United States. The two major exporting countries, Malaysia and Indonesia, rely on the international market for their palm oil industry, so it is expected that the competition will continue.

An Almost Ideal Demand System (AIDS) model is developed to estimate U.S. demand for oilseeds, meals, and oils. Results indicate that soybean consumption is more price elastic than consumption of other oilseeds, and that peanut consumption is the least elastic. The higher expenditure elasticity for rapeseed and sunflowerseed indicate that consumption of these commodities responds more to changes in income. The price elasticities for meals are higher than those for oilseeds or oils, indicating that consumption of meals responds more sensitively to changes in price. This result could be explained by the fact that meals are fed to animals, and animal producers are likely to respond to changes in price by changing the feed ration given to their animals. Consumption of rapeseed meal is found to be the most elastic, with respect to both price and income.

U.S. consumption of oilseeds, meals, and oils is estimated as a function of income. Results indicate that a 1 percent increase in real GDP leads to a 0.5 percent increase in expenditures on oilseeds, a 0.7 percent increase in expenditures on meals, and a 0.8 percent increase in expenditures on oils. Soybean consumption is projected to increase from 47.8 million metric tons to 58.5 million metric tons in 2010. The greatest projected increase in percentage terms is consumption of rapeseed and rapeseed products.

Because of changes in the international market, many new issues have emerged for researchers and policy makers. First of all, great attention should be paid to the growth of the soybean sector in Brazil and Argentina. Similarly, palm oil production and exports from Malaysia and Indonesia are dominating the vegetable oil market, which is closely related to the development of soybean oil production in the United States. Second, there is a need to better understand the demand and trade policy changes in major importing countries, such as China and India. These factors have affected the international market significantly and will continue to impact soybean and related products in the United States. Third, the progress of free trade negotiations under the framework of the WTO and FTAA is worthy of close observation. These agreements are expected to significantly affect the relative competitiveness between countries. Finally, the development of GMOs is expected to impact the sector from crushing and transportation to final consumption.

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INTRODUCTION

Oilseeds are among the most important agricultural commodities worldwide. Oilseed meal and edible oil can be obtained from the crushing of oilseeds. Although in some Asian countries, as much as 40 percent of soybean consumption is in making soybean related products such as Tofu and milk, most demand for oilseeds still comes from the demand for meal and oil. In turn, demand for meal originates from the protein feed industry.

Oilseed trade is dominated by soybeans. The major types of oilseeds produced throughout the world include soybeans, rapeseed, cottonseed, and peanuts. However, soybeans account for over half of all oilseed production in the world, and about 85 percent of the world's supply of soybeans is crushed to produce soybean meal and soybean oil. Processed soybeans are the largest source of protein feed and vegetable oil in the world. The United States is the leading producer and exporter of soybeans, but production in Brazil and Argentina has been increasing rapidly in recent years. USDA estimates for 2003/04, in fact, show that Brazilian soybean exports will surpass U.S. exports for the first time.

Meal production and exports are dominated by soybean meal, followed by rapeseed meal. The United States is the leading producer and consumer of soybean meal and oil, while Argentina and Brazil are the top exporters. Soybean oil is the leading oil produced and consumed in the world, but it faces major competition from palm oil, which is actually the most traded oil. About 70 percent of all palm oil production is traded, and palm oil exports have been nearly twice as great as soybean oil exports. Palm oil production and exports are dominated by Malaysia and Indonesia, while India and China are the leading importers.

There are numerous factors behind the complexity of the world market. The first reason is that meal and edible oil are essential goods, and demand is closely related to the growth of population. Therefore, many governments have emphasized self-sufficiency of oilseeds. The second reason is that the nature of multiple outputs from oilseeds (including meal and oil) makes analysis of the market more difficult. As policies specific to meal or oil change, they affect the entire complex. Finally, new issues have developed. For example, Brazil and Argentina have emerged as major suppliers in the soybean market. Free trade agreements have been implemented in some regions, and future agreements are being negotiated. These issues bring new challenges for the global market.

The general objective of this study is to analyze the world market for oil crops. Specific objectives are to identify trends in production, consumption, and trade; estimate trends in yields and acreage harvested in the major producing countries and project their future production; estimate demand in the United States; project future U.S. supply, demand, and exports; and identify major issues being faced in the world market.

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The first three sections of this study provide detailed discussion of current and historical information on oilseeds (soybeans, rapeseed, and sunflowerseed), meals (soybean, rapeseed, and sunflower), and oils (soybean, palm, rapeseed, and sunflower). The data presented in these sections, unless otherwise noted, are from the Production, Supply, and Distribution (PS&D) database from the USDA's Foreign Agricultural Service (FAS). Information is included for the major countries that produce, consume, export, and import each of these products. Trends are estimated for yields and area harvested in the major oilseed producing countries, and projections are made for oilseed production in 2010. The next section analyzes U.S. domestic demand for these commodities using an Almost Ideal Demand System (AIDS) model. Projections for U.S. consumption, as well as soybean exports, are also made for 2010. The subsequent section contains a discussion of the major issues and challenges facing the world oil complex. These issues include increased competition that the United States faces from Brazil and Argentina for exports of soybeans and soybean products, changing trade policies and demand in major importing countries, challenges from palm oil trade in the world vegetable oil market, trade liberalization, and genetically modified crops. Conclusions are presented in the final section.

WORLD OILSEED SUPPLY AND DISTRIBUTION

From 1998 to 2002, world oilseed production averaged 312 million metric tons per year. Soybeans are the major oilseed crop produced in the world; their production accounted for 175 million metric tons. This overwhelms annual production averages for other oilseeds: 37 million metric tons for rapeseed, 34 million metric tons for cottonseed, 31 million metric tons for peanuts, 24 million metric tons for sunflowerseed, 7 million metric tons for palm kernel, and 5 million metric tons for copra. Over 80 percent of all oilseeds are crushed for production of meals and oils. Over the last five years, about 30 percent of all soybeans produced were exported, and soybeans accounted for almost 80 percent of all oilseed trade. The next leading oilseed traded is rapeseed, followed by sunflowerseed. Less than 5 percent of the total production of cottonseed, peanuts, palm kernels, and copra was traded.

Soybeans

The United States, Brazil, Argentina, and China are the dominant producers of soybeans (Table 1 and Figure 1). These four countries account for almost 90 percent of world soybean production. The United States has been and continues to be the top producer of soybeans: production in the United States has increased from an annual average of 41 million metric tons in the 1970s, to 52 million metric tons in the 1980s, to 63 million metric tons in the 1990s, and to a high of 79 million metric tons in 2001.

The increase in production in Brazil and Argentina has been more dramatic over the last decade, with production tripling in these two countries since 1990. Production in Brazil increased to 52 million metric tons in 2002/03 from an annual average of 20 million metric tons in the late 1980s and early 1990s, while production in Argentina has increased from an annual average of about 12 million metric tons in the early-to-mid 1990s to 35 million metric tons in 2002. Estimates for 2003/04 show production in Brazil and Argentina increasing to 60 and 38 million metric tons, respectively. The increase in production in these two countries and the potential for further increases create a major issue for the world soybean market. A recent report by the Foreign Agricultural Service (FAS) of the USDA (January 2003) estimated that between 145 and 170 million hectares of land are potentially available for future field crop expansion in Brazil, and that it is conceivable that the cultivated area under soybeans could increase by 50 to 100 million

hectares. This would represent a dramatic increase in soybean production. Brazil harvested about 18 million hectares of soybeans in 2002/03; by contrast, the United States harvested about 29 million hectares.

Table 1. Supply and Distribution by Country: Soybeans

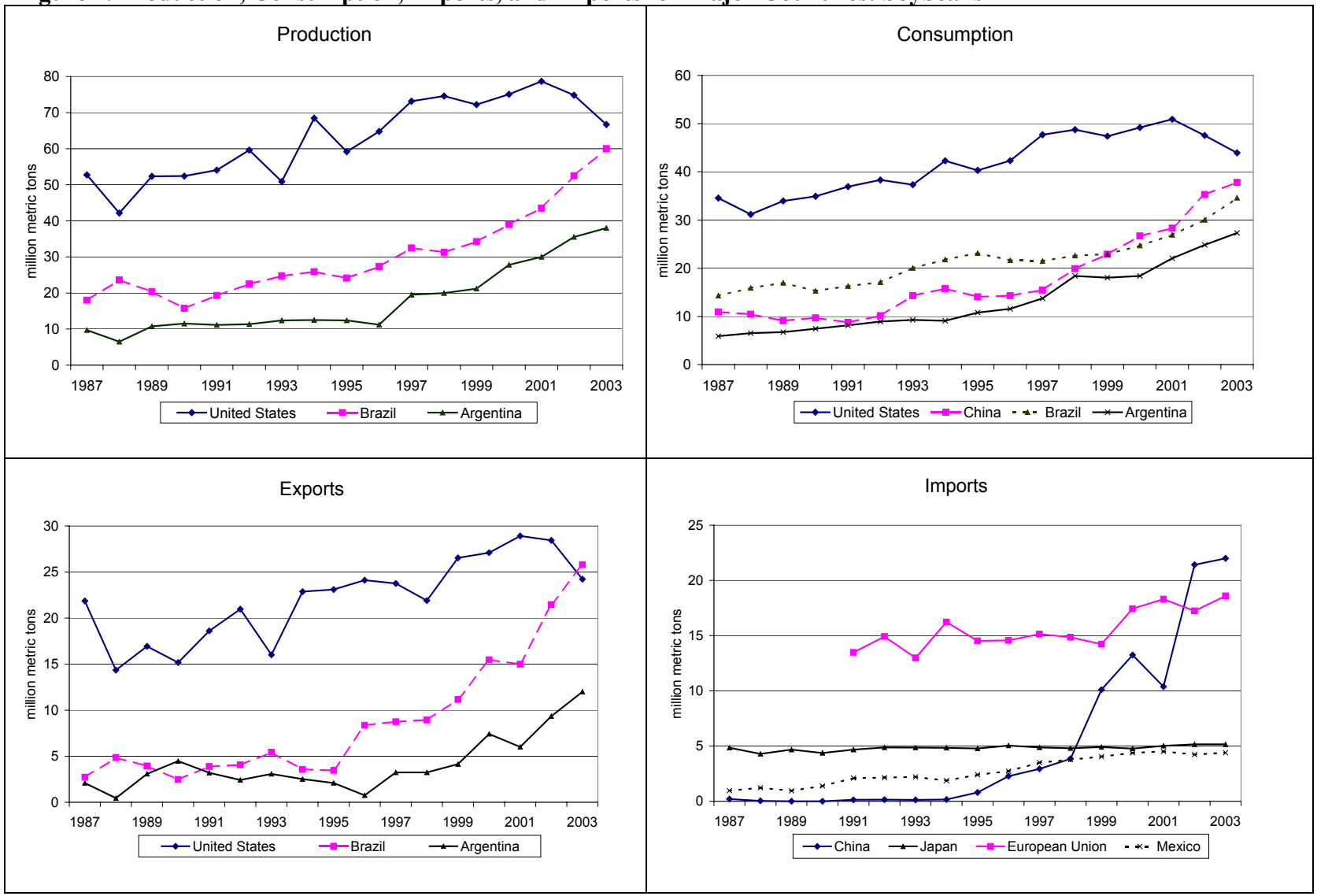
Country	Production	Exports	Imports	Crush	Total Consumption
World Total	174,625	51,818	52,305	148,614	173,958
United States	74,968 (1)	26,117 (1)	82	44,341 (1)	49,152 (1)
Brazil	39,800 (2)	14,272 (2)	900	23,555 (2)	25,592 (3)
Argentina	26,800 (3)	6,097 (3)	417	19,388 (3)	20,481 (4)
China	15,330 (4)	239 (8)	10,716 (1)	18,085 (4)	26,016 (2)
India	5,250 (5)	0	0	4,542 (5)	5,257 (5)
Paraguay	3,294 (6)	2,386 (4)	0	826	908
Canada	2,436 (7)	734 (6)	578	1,686	2,266
Bolivia	1,154 (8)	270 (7)	150	828	1,036
Indonesia	1,075 (9)	0	1,396 (9)	0	2,462
Italy	877 (10)	11	962	1,586	1,840
Russia	337	33 (10)	95	387	401
Thailand	314	0	1,300	1,402	1,600
Japan	226	0	4,911 (3)	3,817 (9)	5,123 (6)
Mexico	123	0	4,289 (5)	4,392 (6)	4,430 (7)
South Korea	120	0	1,469 (8)	1,192	1,587
Spain	8	6	3,138 (6)	2,831 (10)	3,137 (10)
Taiwan	6	0	2,332 (7)	2,055	2,322
Germany	4	14	4,290 (4)	4,260 (7)	4,260 (8)
Netherlands	0	1,364 (5)	5,564 (2)	3,995 (8)	4,179 (9)
Belgium-Luxembourg	0	79 (9)	1,390 (10)	1,134	1,325

Unit: 1000 metric tons
Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

The United States, China, Brazil, and Argentina are also the major consumers of soybeans. Most soybeans are crushed to produce soybean meal or soybean oil. Consumption in each of these countries has been increasing rather steadily since the mid 1980s. Domestic soybean consumption is currently about 50 million metric tons in the United States, and consumption increased in 2002/03 to 35 million metric tons in China, 30 million metric tons in Brazil, and 25 million metric tons in Argentina. Chinese soybean consumption has tripled over the last decade.

The United States, Brazil, and Argentina dominate the soybean export market, accounting for almost 90 percent of the market. As production in these countries has increased faster than consumption, exports have increased. The increase in exports from Brazil has been especially dramatic (Figure 1). From 1987 to 1995, Brazilian soybean exports averaged 3.9 million metric tons per year. Since 1995, exports have increased each year, reaching 21.5 million metric tons in 2002/03. USDA estimates for 2003/04 show that Brazil's exports will increase to 25.8 million metric tons, surpassing U.S. exports for the first time.

Figure 1. Production, Consumption, Exports, and Imports for Major Countries: Soybeans



Source: PS&D Database, FAS/USDA; accessed December 2003.

There are more importers of soybeans than there are exporters. The top 10 importers account for about 75 percent of all imports. Chinese soybean imports are another important issue in the world soybean market. Since 1999, China has been the number one importer of soybeans. The next largest importers are the Netherlands, Japan, Germany, Mexico, and Spain. While production in China has been gradually increasing, consumption increased rapidly over the last decade. Chinese imports doubled from 10.4 million metric tons in 2001/02 to 21.4 million metric tons in 2002/03.

Rapeseed

China is the leading producer of rapeseed, followed by Canada, India, Germany, and France (Table 2). Chinese rapeseed production has increased throughout the years. Production in other countries had been increasing at lower rates until the late 1990s and has since fallen. Production in Canada dropped from a record 8.8 million metric tons in 1999 to only 3.6 million metric tons in 2002. The United States has been the tenth biggest producer of rapeseed over the last five years, with production averaging 771 thousand metric tons per year.

Table 2. Supply and Distribution by Country: Rapeseed

Country	Production	Exports	Imports	Crush	Total Consumption
World Total	36,808	8,852	8,758	33,719	36,676
China	10,329 (1)	0.4	1,863 (2)	11,181 (1)	12,191 (1)
Canada	6,430 (2)	3,498 (1)	190 (9)	2,658 (4)	3,117 (4)
India	4,407 (3)	0	0	3,854 (3)	4,401 (2)
Germany	3,854 (4)	722 (4)	1,215 (3)	4,313 (2)	4,337 (3)
France	3,593 (5)	1,975 (2)	35	1,325 (7)	1,641 (7)
Australia	1,710 (6)	1,330 (3)	0	372	380
United Kingdom	1,418 (7)	123 (8)	364 (6)	1,475 (6)	1,652 (6)
Poland	1,051 (8)	196 (7)	18	809 (9)	870 (8)
Czech Republic	814 (9)	329 (5)	8	490	492
United States	771 (10)	209 (6)	207 (8)	713 (10)	764 (10)
Pakistan	266	0	340 (7)	539	606
Bangladesh	255	0	189 (10)	445	445
Hungary	197	105 (9)	5	94	97
Ukraine	116	54 (10)	0	59	62
Belgium-Luxembourg	27	43	690 (5)	663	673
Japan	1	0	2,135 (1)	2,151 (5)	2,156 (5)
Mexico	0	0	828 (4)	829 (8)	829 (9)

Unit: 1000 metric tons
Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; April 2003.

China is also the leading consumer of rapeseed, consuming about one-third of the world supply, and most of their consumption comes from crushing. Chinese consumption levels resemble their production levels since they do not export rapeseed and have not imported rapeseed until recently. Similarly, India is a major producer and consumer of rapeseed, but they do not export or import any of the commodity. (This is also the case for India's soybeans.)

Canada, France, and Australia are responsible for three-fourths of all rapeseed exports, Canada being the top exporter. Japan has been the leading importer of rapeseed for a number of years. China imported significant quantities from 1998 to 2000, reaching a high of 3.7 million metric tons in 1999/00, but their imports dropped in 2002/03 to 350 thousand metric tons. Other importers of rapeseed include Germany, Mexico, and Belgium-Luxembourg.

Sunflowerseed

Sunflowerseed production in Argentina increased in the 1990s to a high of 7.1 million metric tons in 1998/99. Production then dropped to 3.7 million metric tons in 2002/03. Despite this drop in production, Argentina is still the top sunflowerseed producer (Table 3). The Soviet Union was the leading sunflowerseed producer before it was broken up. The former Soviet republics Russia and Ukraine are now the second and third largest producers. U.S. production reached a high of 3.3 million metric tons in 1979. Since then, annual production has ranged from 0.8 to 2.4 million metric tons. U.S. sunflowerseed production equaled 2.4 million metric tons in 1998 but has fallen in each year since to 1.1 million metric tons in 2002.

Table 3. Supply and Distribution by Country: Sunflowerseed

Country	Production	Exports	Imports	Crush	Total Consumption
World Total	24,429	3,250	3,149	21,523	24,412
Argentina	4,710 (1)	381 (4)	0	4,311 (1)	4,356 (1)
Russia	3,473 (2)	545 (2)	13	2,711 (2)	2,935 (2)
Ukraine	2,808 (3)	569 (1)	1	2,102 (3)	2,239 (3)
United States	1,731 (4)	209 (5)	62 (10)	898 (8)	1,587 (5)
China	1,699 (5)	33	10	895 (9)	1,677 (4)
France	1,698 (6)	452 (3)	180 (7)	1,264 (4)	1,412 (6)
India	1,365 (7)	0	0	1,252 (5)	1,365 (8)
Romania	926 (8)	144 (7)	9	749 (10)	792 (10)
Spain	839 (9)	22	536 (2)	1,150 (6)	1,370 (7)
South Africa	782 (10)	47	2	712	741
Hungary	682	171 (6)	16	492	527
Turkey	673	0	351 (3)	1,015 (7)	1,030 (9)
Bulgaria	476	119 (8)	5	352	377
Italy	420	4	201 (6)	612	619
Moldova	265	99 (9)	0	162	167
Canada	122	69 (10)	18	0	71
Germany	67	42	345 (4)	342	371
Austria	58	16	71 (9)	103	112
Portugal	31	3	205 (5)	222	242
Netherlands	0	65	599 (1)	529	534
Belgium-Luxembourg	0	27	169 (8)	135	143

Unit: 1000 metric tons
Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

The leading exporter of sunflowerseeds has changed over time. The United States was the leading exporter in the late 1970s and early 1980s. U.S. exports peaked at 1.8 million metric tons in 1979/80, but as production declined in the mid 1980s, exports dropped even more substantially. From 1998/99 to 2002/03, U.S. exports averaged 209 thousand metric tons, making the United States the fifth largest exporter. At the same time that U.S. exports decreased, exports from France rose dramatically. Sunflowerseed production in France increased significantly in the 1980s, and French exports increased from 14 thousand metric tons in 1977/78 to a height of 1.5 million metric tons in 1987/88. French exports averaged 1.2 million metric tons per year from 1986/87 to 1991/92, but have since declined, averaging 452 thousand metric tons from 1998/99 to 2002/03. Exports from Russia and Ukraine increased considerably in the early 1990s, and throughout much of the mid and late 1990s, these two countries were the leading exporters of sunflowerseed. However, exports dropped in 2001 and 2002. Among the remaining countries, Argentina is also a major exporter. The Netherlands is the leading importer of sunflowerseed, followed by Spain, Turkey, Germany, Portugal, and Italy. Imports by most of these countries have declined somewhat since 1999.

Yield and Production Changes in Major Producing Countries

U.S. soybean area harvested increased 26 percent from 57.5 million acres in the early 1990s to 72.5 million acres at the beginning of this decade (Table 4). During this same 10-year period, soybean harvest acreage increased by 62 percent in Brazil and 138 percent in Argentina. Brazil's soybean area harvested increased from 24.8 million acres in the early 1990s to an average of 40.1 million acres from 2000 to 2002, while the harvest area increased in Argentina from 11.9 million acres to 28.3 million acres. Soybean yields have also increased over the last decade. Yields in the United States increased from 35.3 bu/acre in the early 1990s to 38.5 bu/acre, while yields in Brazil and Argentina have increased more substantially. During the same period, soybean yields increased from 28.5 bu/acre to 41.2 bu/acre in Brazil and from 35.0 bu/acre to 40.3 bu/acre in Argentina. With the combined increase in area harvested and yield, soybean production has increased over the last decade by 174 percent in Argentina and 135 percent in Brazil, compared to 37 percent in the United States. Figure 2 shows soybean acres harvested over time in the United States, Brazil, and Argentina, and Figure 3 shows changes in yields in these countries. The data in these figures are from FAOSTAT, and they differ slightly from the PS&D data. The USDA estimates that the soybean area harvested in 2003/04 will total 49 million acres in Brazil and 73 million acres in the United States.

Table 4. Area Harvested, Yield, and Production in Major Oilseed Producing Countries

	1990-92 Average			*2000-02 Average*			*Change (%)*		
Country	Area Harvested (1000 acres)	Yield (bu/acre)	Production (1000 MT)	Area Harvested (1000 acres)	Yield (bu/acre)	Production (1000 MT)	Area Harvested	Yield	Production
Soybeans									
United States	57,585	35.3	55,364	72,513	38.5	76,006	26	9	37
Brazil	24,772	28.5	19,183	40,099	41.2	45,000	62	45	135
Argentina	11,902	35.0	11,333	28,334	40.3	31,100	138	15	174
China	17,974	21.1	10,337	22,651	25.6	15,773	26	21	53
India	7,723	13.0	2,733	14,389	12.5	4,883	86	-4	79
Paraguay	2,282	23.4	1,450	3,476	37.1	3,507	52	59	142
Canada	1,404	36.4	1,392	2,580	31.7	2,224	84	-13	60
Bolivia	517	28.7	404	1,581	29.5	1,270	206	3	214
European Union	1,354	44.3	1,632	806	48.5	1,064	-40	9	-35
Indonesia	3,542	16.8	1,617	1,689	19.4	890	-52	15	-45
Rapeseed									
China	14,507	18.6	7,349	17,900	22.8	11,088	23	22	51
European Union	6,316	41.1	7,072	7,488	44.5	9,074	19	8	28
India	15,353	12.7	5,321	12,413	11.7	3,942	-19	-8	-26
Canada	7,178	19.4	3,787	9,424	20.4	5,237	31	5	38
Poland	1,142	32.3	1,002	1,084	34.1	1,006	-5	6	0
Czechoslovakia	371	39.6	400	1,081	35.8	1,053	191	-10	163
United States	120	22.4	73	1,413	21.9	841	1075	-2	1047
Australia	273	20.1	149	3,390	15.6	1,441	1140	-22	865
Bangladesh	861	9.8	229	813	11.3	249	-6	15	9
Pakistan	776	10.9	230	716	12.8	250	-8	18	9
Sunflowerseed									
Argentina	6,095	60.8	3,700	5,149	68.7	3,531	-16	13	-5
Russia	6,466	48.5	3,132	9,528	36.0	3,423	47	-26	9
Ukraine	4,018	61.9	2,483	6,555	45.8	2,993	63	-26	21
European Union	6,338	65.6	4,148	4,446	68.1	3,022	-30	4	-27
China	1,902	74.3	1,410	2,814	62.8	1,764	48	-15	25
India	4,810	22.6	1,084	6,013	24.0	1,442	25	6	33
United States	2,189	58.5	1,278	2,469	58.1	1,431	13	-1	12
Romania	1,179	50.6	595	2,053	38.3	784	74	-24	32
Turkey	1,606	51.8	830	1,293	49.5	638	-19	-4	-23
Hungary	957	77.7	742	918	70.2	643	-4	-10	-13

Source: PS&D Database, FAS/USDA

Figure 2. Soybean Area Harvested in the United States, Brazil, and Argentina

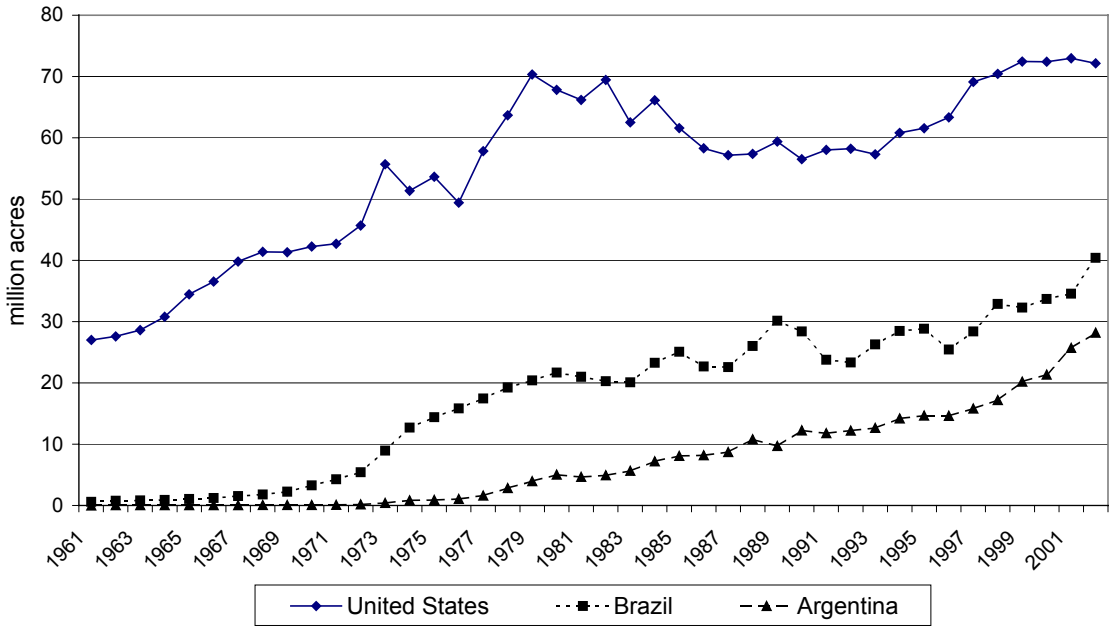
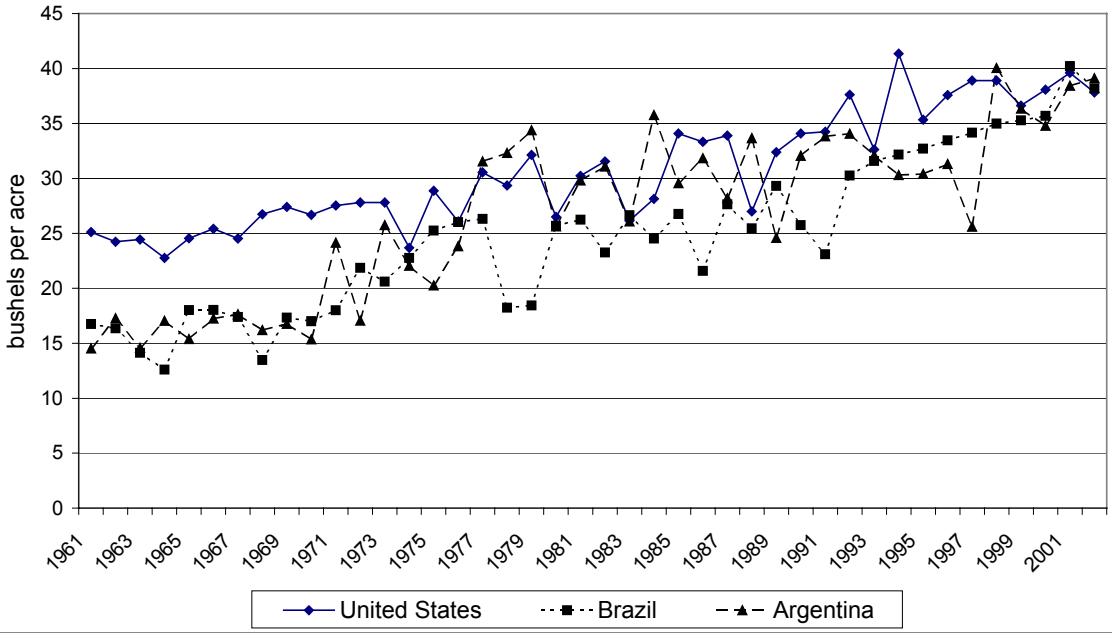


Figure 3. Soybean Yields in the United States, Brazil, and Argentina



Rapeseed area harvested and total production have increased the most, in percentage terms, in the United States and Australia, while yield increased the most in China. Rapeseed yield is the highest in the EU, by a significant margin. Sunflowerseed area has declined in Argentina and the EU, while increasing the most significantly in Ukraine, Russia, China, and Romania; yields have declined in a number of countries, including Ukraine and Russia, while increasing the most in Argentina.

To examine trends in area harvested and yield in the major oilseed producing countries, a simple econometric model is estimated. Acres harvested in the top producing countries is regressed against a trend variable as follows:

$$A_{it} = \alpha_0 + \alpha_1 TR_t + \varepsilon_{it} , \quad (1)$$

where A_{it} is acres harvested in country i in year t, and TR_t is a trend variable that equals 1 the first year and increases by 1 each successive year. A similar equation is estimated for yields:

$$Y_{it} = \beta_0 + \beta_1 TR_t + e_{it} , \quad (2)$$

where Y_{it} is yield in country i in year t. These equations are estimated for the top five producers of soybeans, rapeseed, and sunflowerseed. The estimated results of Equations 1 and 2 are shown in Table 5. The data used in the estimation are annual data. Soybean data are from 1961 to 2002, while rapeseed and sunflowerseed are from 1962 to 2002, with a few exceptions. In the soybean area equation, the data for China start in 1977; the data for India start in 1972 in the soybean yield model, and the data for Russia and the Ukraine begin in 1992. The FAOSTAT data are used in the analysis.

Table 5. Estimated Trends for Area Harvested and Yield in Major Oilseed Producing Countries

	Acres Harvested					Yield (bu/acre)		
Country	Intercept	Trend	D[3]	D*Trend[3]	R^2	Intercept	Trend	R^2
Soybeans								
United States	23,032,721	2,117,867	30,264,996	-1,773,856	0.88	22.45	0.39	0.81
	(0.001)[1]	(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	
Brazil	-1,997,512	926,059			0.93	13.19	0.54	0.85
	(0.048)	(0.001)				(0.001)	(0.001)	
Argentina	-9364588	681,532	-69,220,160	1,849,817	0.99	15.15	0.54	0.74
	(0.001)	(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	
China	14,923,859	169,529			0.40	9.89	0.40	0.92
	(0.001)	(0.001)				(0.001)	(0.001)	
India[2]	4.243	0.084	3.482	-0.097	0.98	10.17	0.10	0.11
	(0.001)	(0.001)	(0.210)	(0.157)		(0.001)	(0.040)	
Rapeseed								
China	955241	414950			0.94	5.66	0.59	0.89
	(0.022)	(0.001)				(0.001)	(0.001)	
Canada	47547	288175			0.79	13.34	0.19	0.64
	(0.933)	(0.001)				(0.001)	(0.001)	
India	5807395	232286			0.75	4.94	0.23	0.81
	(0.001)	(0.001)				(0.001)	(0.001)	
Germany[2]	5.433	0.026			0.95	26.70	0.56	0.74
	(0.001)	(0.001)				(0.001)	(0.001)	
France	-14436	62622			0.85	23.68	0.63	0.70
	(0.888)	(0.001)				(0.001)	(0.001)	
Sunflowerseed								
Argentina	1683531	142583			0.70	20.67	1.32	0.84
	(0.001)	(0.001)				(0.001)	(0.001)	
Russia	-564323	268022			0.23	53.82	-0.50	0.06
	(0.908)	(0.072)				(0.005)	(0.239)	
Ukraine	-5759532	311021			0.81	70.85	-0.70	0.01
	(0.009)	(0.001)				(0.016)	(0.322)	
United States	300596	79931			0.43	40.74	0.51	0.45
	(0.386)	(0.001)				(0.001)	(0.001)	

[1]p-values in parentheses

[2]The soybean area model for India and the rapeseed area model for Germany are semi-log models; all others are linear.

[3]The dummy variable is for the period after 1979 in the U.S. soybean area model, the period after 1996 in the Argentina area model, and the period after 1998 in the India rapeseed area model. The Argentina model also has a dummy variable for the period before 1974, but the results are not reported here.

As shown in Figure 2, U.S. soybean acreage increased significantly until 1979, before dropping off in the 1980s and then increasing again in the 1990s. To account for the change in trend around 1980, slope and intercept dummy variables are added for the period after 1979 in the U.S. equation. The results show that prior to 1980, U.S. soybean acreage had an upward trend of 2.1 million acres per year. Adding the trend variable with the slope dummy shows that soybean acreage has been increasing at a trend of 344 thousand acres per year since 1980.

Brazil's soybean acreage, over the entire period, has been moving upward at a trend of 926 thousand acres per year. In the Argentina model, slope and intercept dummy variables are included for the period before 1974 and the period after 1996. Argentina's soybean production prior to the mid-1970s was minimal. Acreage began increasing at a fairly constant rate in the mid-1970s until the mid-1990s. Since 1997, soybean acreage has been increasing at a faster rate. Results show that Argentina's soybean acreage was moving upward at a trend of 682 thousand acres per year between 1974 and 1996 and at a trend of 2.53 million acres per year since 1997.

The equation for India is estimated with a semi-log function, where area harvested is in the log form, since the trend for this country is exponential rather than linear. Results show that the trend in India has been an increase in harvest acreage by 8.4 percent per year. Slope and intercept dummy variables are also included in the India equation to account for change in trend occurring around 1999, though neither of these variables are found to be significant.

The greatest upward trend in rapeseed acreage has been in China, with production increasing at a rate of 415 thousand acres per year, and the biggest upward trends in sunflowerseed acreage have been in Ukraine and Russia.

Soybean yields have been increasing the fastest in Brazil and Argentina, at about 0.54 bushels per acre each year, while U.S. yields have been moving upward over time at a trend of 0.39 bushels per acre. Soybean yields in India vary widely each year depending on the weather, resulting in a low R^2, and there has been little significant upward trend in the country. Rapeseed yields have grown the fastest in France, China, and Germany, while the strongest upward trend in sunflowerseed yields has been in Argentina. Sunflowerseed yields in Russia and Ukraine have not exhibited any significant trends during the 1992-2002 period.

Results from these models are used to project future production. Table 6 shows 2002 data from FAOSTAT and the projected area harvested, yield, and production in 2010 that would result if the currents trends continue. According to this estimate, U.S. soybean production will increase to 83 million metric tons in 2010. Production in Brazil and Argentina will gain some ground on the United States, increasing to 68 and 49 million metric tons, respectively. China is expected to remain the top producer of rapeseed. Despite greater increases in Russia and Ukraine in acres harvested, Argentina is expected to remain the top sunflowerseed producer due to increases in yield.

Table 6. Current and Projected Oilseed Production

	Area Harvested (million acres)		Yield (bu/acre)		Production (million MT)	
	2002	2010	2002	2010	2002	2010
Soybeans						
United States	72.2	74.9	37.8	40.9	74.3	83.4
Brazil	40.4	58.4	38.2	42.5	42.0	67.6
Argentina	28.2	41.7	39.1	43.5	30.0	49.3
China	23.3	24.6	26.7	29.9	16.9	20.0
Rapeseed						
China	17.3	20.6	22.4	27.1	10.5	15.2
Canada	7.8	10.1	16.8	18.3	3.6	5.1
India	12.5	14.3	14.9	16.7	5.0	6.5
Germany	3.2	3.9	44.1	48.6	3.8	5.2
France	2.6	3.1	46.1	51.1	3.2	4.3
Sunflowerseed						
Argentina	5.0	6.1	77.4	87.9	3.8	5.4
Russia	9.5	11.7	37.9	37.9	3.6	4.4
Ukraine	6.7	9.2	48.8	48.8	3.3	4.5
United States	2.2	2.8	51.5	55.6	1.1	1.6

A number of factors, however, could change these results, especially the trends in area harvested. Upward trends eventually have to change due to decreases in available land to convert to oilseed production. The Argentina soybean acreage projection is based on the assumption that the upward trend will return to the pre-1997 rate since land restrictions make the current trend impossible to sustain. Argentina currently has about 84 million acres of arable land. Brazil, on the other hand, has an abundance of land that is available for soybean production. The likelihood that Brazil will continue to increase soybean production at a significant rate depends largely on the development of their transportation system. Government policies also play a role in determining production trends.

Consumption Changes in Major Consuming Countries

The United States is the leading consumer of soybeans, but per capita soybean consumption is the highest in Argentina (Table 7). Soybean consumption over the 10-year period increased the greatest amount in China and Argentina. The United States experienced a major increase, in percentage terms, in rapeseed consumption, but U.S. rapeseed consumption in the early 1990s was minimal.

Table 7. Total and Per capita Oilseed Consumption in Major Consuming Countries

	Total Consumption			*Per capita Consumption*		
Country	1990-92 average	2000-02 average	Change	1990-92 average	2000-02 average	Change
	(1000 MT)		(%)	(kg per capita)		(%)
Soybeans						
United States	36,715	49,295	34	144.8	173.0	19
China	9,540	29,314	207	8.3	23.1	179
Brazil	16,228	27,421	69	105.7	154.2	46
Argentina	8,181	21,964	168	244.1	578.7	137
European Union	15,194	18,666	23	41.4	49.3	19
Japan	4,844	5,224	8	39.1	41.2	5
Mexico	2,519	4,695	86	29.1	46.4	60
India	2,733	4,890	79	3.2	4.8	51
Indonesia	2,148	2,312	8	11.2	10.2	-9
Canada	1,329	2,299	73	47.2	72.8	54
Rapeseed						
China	7,338	12,183	66	6.4	9.6	51
European Union	7,318	9,261	27	20.0	24.5	23
India	5,321	4,198	-21	6.2	4.1	-34
Canada	2,012	2,840	41	71.4	90.0	26
Japan	1,874	2,159	15	15.1	17.0	13
Poland	645	894	39	16.9	23.1	37
Pakistan	230	621	170	2.0	4.3	118
Mexico	257	782	204	3.0	7.7	160
United States	66	773	1077	0.3	2.7	943
Sunflowerseed						
European Union	4,720	4,673	-1	12.9	12.4	-4
Russia	3,027	3,108	3	20.4	21.4	5
Argentina	3,412	3,461	1	102.0	91.3	-11
Ukraine	2,325	2,520	8	44.9	51.7	15
China	1,392	1,731	24	1.2	1.4	13
India	1,084	1,442	33	1.3	1.4	12
United States	1,190	1,362	14	4.7	4.8	2
Turkey	936	886	-5	16.4	13.3	-19
Romania	589	680	16	25.8	30.3	18
South Africa	405	723	79	10.7	17.0	59

Source: PS&D Database, FAS/USDA

WORLD OILSEED MEAL SUPPLY AND DISTRIBUTION

Almost 70 percent of the 170 million metric tons of oilseed meal produced annually from 1998 to 2002 consisted of soybean meal. Other oilseed meals produced include rapeseed meal (20.3 million metric tons per year), cottonseed meal (11.5 million metric tons per year), sunflowerseed meal (9.7 million metric tons per year), peanut meal (5.6 million metric tons per year), palm kernel meal (3.5 million metric tons per year), and copra meal (1.7 million metric tons per year). Seventy-eight percent of the 55 million metric tons that were traded annually consisted of soybean meal. About 43 million metric tons of soybean meal was traded per year, accounting for 36 percent of total soybean meal production. The next most traded oilseed meals were rapeseed meal, palm kernel meal, and sunflowerseed meal. Eighty-eight percent of palm kernel meal production was exported, while only 5 percent of cottonseed meal and peanut meal was traded.

Soybean Meal

The United States, Brazil, Argentina, and China are the leading producers of soybean meal, with annual production averaging 35.2 million metric tons, 18.6 million metric tons, 15.3 million metric tons, and 14.4 million metric tons, respectively, from 1998/99 to 2002/03 (Table 8). Soybean meal production in each of these countries has increased substantially over the last decade. The United States is the major consumer of soybean meal, with consumption rising to 30 million metric tons. China is now the second leading consumer of soybean meal. From 1964 to 1991, Chinese annual consumption was fairly constant, averaging about 1.2 million metric tons. Since 1991, consumption in China has risen considerably, reaching 20.6 million metric tons in 2002/03. Other major consumers of soybean meal include Brazil and the EU.

Table 8. Supply and Distribution by Country: Soybean Meal

Country	Production	Exports	Imports	Consumption
World Total	117,689	42,809	42,926	117,752
United States	35,150 (1)	6,470 (3)	106	28,780 (1)
Brazil	18,599 (2)	11,313 (2)	223	7,540 (3)
Argentina	15,291 (3)	15,102 (1)	0	225
China	14,394 (4)	439 (10)	431	14,385 (2)
India	3,625 (5)	2,285 (5)	0	1,332
Mexico	3,485 (6)	0	338	3,816 (8)
Germany	3,407 (7)	1,331 (6)	2,091 (5)	4,168 (6)
Netherlands	3,148 (8)	2,575 (4)	2,698 (2)	3,269 (10)
Japan	2,960 (9)	0	902	3,820 (7)
Spain	2,234 (10)	143	2,499 (4)	4,597 (5)
Italy	1,276	191	2,633 (3)	3,713 (9)
Thailand	1,101	0	1,401 (9)	2,460
Belgium-Luxembourg	902	1,175 (7)	1,435 (8)	1,162
Bolivia	652	505 (9)	0	147
Paraguay	649	541 (8)	0	108
United Kingdom	630	10	1,484 (7)	2,106
France	494	76	4,416 (1)	4,834 (4)
Denmark	86	40	1,577 (6)	1,623
Indonesia	0	0	1,353 (10)	1,352

Unit: 1000 metric tons

Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.

Source: PS&D Database, FAS/USDA; accessed April 2003

Argentina is the top exporter of soybean meal, followed by Brazil and the United States. Exports from Argentina increased considerably throughout the last 15 years to 18.2 million metric tons in 2002/03. Brazilian exports have increased more gradually, while U.S. exports have been fairly steady. France is the leading importer of soybean meal, followed by the Netherlands, Italy, Spain, and Germany. Changes in livestock production significantly affects each country's demand for soybean meal and, therefore, each country's level of imports or exports.

Rapeseed Meal

The major producer of rapeseed meal is China (Table 9). Chinese rapeseed meal production increased to a high of 7.9 million metric tons in 1999 and has since fallen to 6.3 million metric tons in 2002/03. The next leading producers are India, Germany, Canada, and Japan. China is also the major consumer of rapeseed meal. Chinese consumption has doubled over the last 10 to 15 years, though it has declined from a high of 7.2 million metric tons in 2000/01. Consumption in the United States increased throughout the 1980s and 1990s, reaching a high of 1.6 million metric tons in 1999 before declining to 1.2 million metric tons in 2002/03.

Table 9. Supply and Distribution by Country: Rapeseed Meal

Country	Production	Exports	Imports	Consumption
World Total	20,273	3,887	3,694	20,119
China	6,951 (1)	459 (3)	18	6,510 (1)
India	2,568 (2)	192 (6)	0	2,376 (2)
Germany	2,562 (3)	1,175 (1)	306 (4)	1,693 (3)
Canada	1,517 (4)	1,011 (2)	4	510 (9)
Japan	1,210 (5)	0	42	1,254 (5)
United Kingdom	863 (6)	144 (8)	181 (7)	900 (7)
France	743 (7)	62 (10)	345 (3)	1,024 (6)
Poland	486 (8)	198 (5)	10	305
Mexico	453 (9)	0	8	461 (10)
United States	421 (10)	8	971 (1)	1,383 (4)
Belgium-Luxembourg	376	260 (4)	113 (9)	229
Czech Republic	277	151 (7)	6	132
Denmark	177	45	274 (6)	406
Sweden	148	9	100 (10)	241
Netherlands	72	64 (9)	515 (2)	523 (8)
South Korea	2	0	293 (5)	318
Ireland	0	2	129 (8)	127

Unit: 1000 metric tons
Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Germany, Canada, and China have been the major rapeseed meal exporters. German exports have increased fairly substantially over the last 20 years, from 133 thousand metric tons in 1982 to 1.2 million metric tons in 2002/03. Throughout the 1990s, Canada had been the leading exporter of rapeseed meal. Canadian exports increased in the 1990s to a high of 1.42 million metric tons in 1997/98, but their exports have since declined to 750 thousand metric tons in

2002/03. Chinese exports of rapeseed meal have been inconsistent. In the 1980s and early 1990s, Chinese export levels were similar to those from Canada and Germany. In 1992/93, China was the leading exporter, with exports at 898 thousand metric tons, but two years later, exports fell to only 86 thousand metric tons. Chinese exports rebounded the next two years, but then dropped again in 1997/98. Exports by China soared to a record 1.0 million metric tons in 1999/00 but have since fallen substantially.

Since the United States is the fourth leading consumer of rapeseed meal but only the tenth biggest producer, the country has had to import a significant quantity of rapeseed meal, and has been the top importer since 1991. Production in the United States did increase in the 1990s, but not enough to meet the increased demand. U.S. imports reached a high of 1.24 million metric tons in 1997/98 and have since fallen to 840 thousand metric tons in 2002/03. During the last five years, imports have constituted about 70 percent of U.S. consumption.

Sunflowerseed Meal

Argentina, Russia, and Ukraine are the top sunflowerseed meal producers (Table 10). From 1994/95 to 1999/00, annual sunflowerseed meal production averaged 2.20 million metric tons in Argentina. Argentine production dropped to an average of 1.44 million metric tons from 2000/01 to 2002/03. Production in Russia and Ukraine declined in the mid-1990s but has since rebounded in 2002/03 to 1.27 million metric tons in Russia and 1.12 million metric tons in Ukraine. From 1998 to 2002, U.S. sunflowerseed meal production averaged 444 thousand metric tons per year, making the United States the eighth biggest producer. During those five years, U.S. production consistently decreased from 617 thousand metric tons in 1998 to 159 thousand metric tons in 2002.

Russian consumption dropped in the mid-1990s but has increased in recent years to 1.24 million metric tons in 2002/03. France is the second leading consumer behind Russia, with annual consumption averaging 914 thousand metric tons over the last five years. Consumption in India has doubled over the last 10 years, making the country the third leading consumer in 2002.

Until recent years, the export market for sunflowerseed meal has been dominated by Argentina. Argentina is still the major exporter, but their exports have fallen from a high of 2.42 million metric tons in 1998/99 to 1.20 million metric tons in 2002/03. Meanwhile, Ukraine has become a major exporter. European countries are the major importers of sunflowerseed meal. The Netherlands had been the top importer for several years, but their imports have fallen recently. The United Kingdom has been the leading importer since 2000/01.

Consumption Changes in Major Consuming Countries

Table 11 shows total consumption and consumption per capita for the leading meal consuming countries during the 1990-92 and 2000-02 periods. Per capita soybean meal consumption is the highest in the United States and the European Union, and the greatest increases in consumption have been in China and Thailand. While total rapeseed meal consumption is the highest in China, per capita consumption is the highest in Canada, the European Union, and Japan. Per capita sunflowerseed meal consumption is the highest in Hungary.

Table 10. Supply and Distribution by Country: Sunflower Meal

Country	Production	Exports	Imports	Consumption
World Total	9,703	2,979	2,928	9,651
Argentina	1,808 (1)	1,610 (1)	0	186
Russia	1,042 (2)	81 (8)	5	966 (1)
Ukraine	846 (3)	438 (2)	0	408
France	682 (4)	105 (5)	337 (3)	914 (2)
India	558 (5)	9	0	549 (5)
Spain	506 (6)	30 (10)	78	555 (4)
China	487 (7)	0	0	487 (8)
United States	444 (8)	22	5	428 (10)
Romania	411 (9)	130 (4)	8	289
Turkey	386 (10)	2	125 (9)	508 (7)
Italy	344	7	219 (5)	560 (3)
Netherlands	300	209 (3)	419 (2)	510 (6)
Hungary	240	49 (9)	84	274
Germany	194	97 (6)	181 (6)	279
Belgium-Luxembourg	73	96 (7)	143 (8)	123
Denmark	20	0	281 (4)	300
United Kingdom	11	0	447 (1)	458 (9)
Ireland	0	2	148 (7)	146
Thailand	0	0	108 (10)	108

Unit: 1000 metric tons

Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Table 11. Total and Per capita Meal Consumption in Major Consuming Countries

	Total Consumption			*Per capita Consumption*		
Country	1990-92 average	2000-02 average	Change	1990-92 average	2000-02 average	Change
	(1000 MT)		(%)	(kg per capita)		(%)
Soybean Meal						
European Union	21,688	30,201	39	59.1	79.8	35
United States	21,195	29,261	38	83.6	102.7	23
China	1,929	16,388	750	1.7	12.9	674
Brazil	3,456	7,950	130	22.5	44.7	99
Mexico	2,206	4,097	86	25.5	40.5	59
Japan	3,654	3,953	8	29.5	31.2	6
Thailand	847	2,970	251	15.1	47.1	212
S. Korea	1,313	2,425	85	30.3	50.9	68
Canada	1,324	2,271	71	47.1	71.9	53
Indonesia	357	1,650	363	1.9	7.2	290
Rapeseed Meal						
China	3,471	6,773	95	3.0	5.3	77
European Union	4,558	5,484	20	12.4	14.5	17
India	2,580	2,197	-15	3.0	2.2	-28
Japan	1,298	1,255	-3	10.5	9.9	-6
United States	510	1,278	151	2.0	4.5	124
Canada	359	541	51	12.8	17.1	34
Mexico	147	434	195	1.7	4.3	152
Poland	273	288	6	7.1	7.5	5
S. Korea	431	277	-36	9.9	5.8	-41
Pakistan	131	247	88	1.1	1.7	52
Sunflowerseed Meal						
European Union	3,605	3,605	0	9.8	9.5	-3
Russia	1,017	1,052	3	6.9	7.2	6
India	282	586	108	0.3	0.6	75
Ukraine	860	498	-42	16.6	10.2	-38
Turkey	382	435	14	6.7	6.5	-2
China	507	434	-14	0.4	0.3	-22
South Africa	176	328	87	4.6	7.7	66
Hungary	280	230	-18	27.0	22.8	-16
Argentina	113	195	72	3.4	5.2	52
United States	386	317	-18	1.5	1.1	-27

Source: PS&D Database, FAS/USDA; U.S. Census Bureau

WORLD OIL SUPPLY AND DISTRIBUTION

The four major varieties of oil are soybean oil, palm oil, rapeseed oil, and sunflowerseed oil. Other varieties include oils from peanut, cottonseed, coconut, palm kernel, and olive. From 1998/99 to 2002/03, the annual average production of total world oils was 87.96 million metric tons. Eighty-one percent of total oil production was composed of the four major varieties. Soybean oil production was 27.06 million metric tons per year, palm oil 23.27, rapeseed oil 12.44, and sunflowerseed oil 8.63 million metric tons. The consumption pattern closely follows production worldwide with small differences reflected in the changing stocks at the end of each year.

International trade of oils has two distinct characteristics. One is the large share of oils traded. In the last five years, the annual average export volume was 35.59 million metric tons, or 40.5 percent of total world production. A large share of palm oil, especially, is traded (72 percent of production). The other characteristic is that trading volumes for different oil varieties do not follow the production pattern. The most traded oil is palm oil (16.50 million metric tons per year), followed by soybean oil (8.64), sunflowerseed oil (3.21), and rapeseed oil (2.73).

Soybean Oil

For soybean oil, world production has been 27 million metric tons per year in the last five years (Table 12). Major producing countries are the United States (8.3 million metric tons), Brazil (4.5), Argentina (3.6), and China (3.1). Production in the United States has been relatively stable in recent years above 8 million metric tons. In contrast, production in Brazil and Argentina has been increasing dramatically. The increased South American production brings intense competition to the international oil market. Major consumer countries of soybean oil are the United States, China, Brazil, and India. High levels of consumption are largely related to the large population in these countries.

Global exports of soybean oil are about 8.6 million metric tons per year in the last five years, or 32 percent of total production. The largest exporter is Argentina. Its annual average export quantity was 3.5 million metric tons in the past five years. Brazil is second at 1.65 million metric tons per year, and the United States holds third place at 0.88 million metric tons. The emergence of Argentina and Brazil in the international soybean oil market has attracted considerable attention and created an important challenge for the industry in the United States.

Major importers of soybean oil are India, Iran, and China. In the past five years, annual import quantities reached 1.3 million metric tons in India, 0.88 in Iran, and 0.61 in China. It is worth emphasizing that imports by China have been very unstable in recent years due to its changing trade policies. Imports of soybean oil were over 1.6 million tons in the early 1990s but were close to zero in the past two years. One of the major reasons for the drop in Chinese imports of soybean oil is that China has attempted to protect its domestic crushing industry by encouraging imports of soybeans.

Table 12. Supply and Distribution by Country: Soybean Oil

	Production	Exports	Imports	Consumption
World Total	27,056	8,643	8,277	26,742
United States	8,332 (1)	886 (3)	32	7,453 (1)
Brazil	4,478 (2)	1,645 (2)	160	3,041 (3)
Argentina	3,566 (3)	3,500 (1)	0	113
China	3,059 (4)	74	611 (3)	3,591 (2)
India	818 (5)	6	1,295 (1)	2,107 (4)
Germany	765 (6)	475 (5)	62	349
Mexico	750 (7)	9	159	899 (5)
Netherlands	719 (8)	639 (4)	92	175
Japan	682 (9)	0	2	689 (7)
Spain	508 (10)	229 (7)	19	289
Taiwan	204	265 (6)	233 (8)	173
Korea	75	173 (8)	137	37
Belgium-Lux.	88	115 (9)	884 (2)	857 (6)
Paraguay	146	108 (10)	0	38
Iran	336	2	41	383 (9)
Malaysia	212	6	162	372 (10)
Russia	55	1	323 (5)	372
Egypt	54	0	301 (6)	355
Morocco	35	0	268 (7)	302
Pakistan	30	0	196 (10)	228
Venezuela	29	0	210 (9)	240
Bangladesh	0	0	509 (4)	498 (8)

Unit: 1000 metric tons.
Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Palm Oil

For palm oil, annual world production has been about 23.3 million metric tons during the past five years (Table 13). Palm oil is produced mainly in Southeast Asia. Malaysia is the single largest producer with 50 percent of the world's production, while Indonesia follows with more than 30 percent of global production. In the past five years, annual production was 11.17 million metric tons in Malaysia and 8 million metric tons in Indonesia. Production in these two countries has been steadily increasing. Production in other countries is small; these countries include Nigeria (0.75 million metric tons), Thailand (0.62), and Colombia (0.53).

Consumption of palm oil in Malaysia is much smaller than that in Indonesia. Other large consumer countries import palm oil. The largest consumer country is India (3.45 million metric tons), followed by Indonesia (3.3), China (1.8), Malaysia (1.6), and Pakistan (1.2).

Exports of palm oil are mainly from Malaysia (9.7 million metric tons) and Indonesia (4.7). Large importers are all in Asia: India (3.5 million metric tons), China (1.8), and Pakistan (1.15). Most countries have stable imports, but India has been increasing its imports dramatically. In total, annual exports of palm oil have been around 16 million metric tons, or 72 percent of total production. The large export quantities in the international oil market have exerted a huge impact on other oil varieties, such as soybean oil.

Table 13. Supply and Distribution by Country: Palm Oil

	Production		Exports		Imports		Consumption	
World Total	23,271		16,498		16,242		22,863	
Malaysia	11,169	(1)	9,674	(1)	216		1,641	(4)
Indonesia	7,980	(2)	4,671	(2)	5		3,288	(2)
Nigeria	752	(3)	0		224		976	(6)
Thailand	623	(4)	94	(8)	7		534	(8)
Colombia	528	(5)	88	(10)	1		442	
Papua New Guinea	338	(6)	282	(4)	5		61	
Cote d'Ivoire	274	(7)	89	(9)	27		212	
Ecuador	270	(8)	32		0		236	
Cameroon	152	(9)	15		8		145	
Zaire	150	(10)	1		1		151	
India	0		373	(3)	864	(4)	487	(10)
China	0		263	(5)	370	(9)	119	
Pakistan	0		256	(6)	353	(10)	97	
United Kingdom	0		114	(7)	166		52	
Egypt	40		0		3,480	(1)	3,453	(1)
Netherlands	0		0		1,824	(2)	1,824	(3)
Germany	0		0		1,150	(3)	1,156	(5)
Japan	0		31		609	(5)	577	(7)
Singapore	0		0		511	(7)	511	(9)
Hong Kong	0		85		553	(6)	469	
United Arab Emirates	0		0		385	(8)	385	
United States	0		5		178		171	

Unit: 1000 metric tons. Note: average of five marketing years from 1998/99 to 2002/03, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Rapeseed Oil

For rapeseed oil, annual world production has been about 12.4 million metric tons during the past five years (Table 14). Major producing countries are China (3.7 million metric tons), Germany (1.7), India (1.25), and Canada (1.1). The United States produces only a small quantity (267 thousand metric tons). Consumption is closely related to the production in a country because trading is not very active.

Dissimilar to other major oil varieties such as soybean oil and palm oil, exports of rapeseed oil are just a small part of total production. During the past five years, annual exports were 2.7 million metric tons, or 22 percent of total production. The major reason for the small level of trade is that China and India are two of the largest producers and consumers of rapeseed oil, and they engage in little trade activity. The largest exporter is Germany (0.87 million metric tons per year), followed by Canada (0.64 million metric tons). The largest importer is the United States, with 0.52 million metric tons imported per year. Overall, production and trade of rapeseed oil have been relatively stable, and variation over time is small.

Table 14. Supply and Distribution by Country: Rapeseed Oil

	Production		Exports		Imports		Consumption	
World Total	12,436		2,731		2,569		12,263	
China	3,741	(1)	35	(9)	78	(10)	3,784	(1)
Germany	1,713	(2)	867	(1)	95	(9)	950	(3)
India	1,253	(3)	0		101	(8)	1,331	(2)
Canada	1,119	(4)	636	(2)	51		534	(7)
Japan	874	(5)	0		3		882	(4)
United Kingdom	589	(6)	75	(7)	179	(4)	691	(5)
France	549	(7)	236	(4)	163	(5)	474	(8)
Poland	326	(8)	11		14		327	(10)
Mexico	321	(9)	0		76		398	(9)
United States	267	(10)	106	(6)	516	(1)	682	(6)
Netherlands	49		283	(3)	302	(2)	70	
Belgium-Lux.	264		230	(5)	191	(3)	220	
Denmark	118		64	(8)	47		99	
Australia	150		30	(10)	0		114	
Italy	22		5		149	(6)	164	
Hong Kong	0		30		106	(7)	76	

Unit: 1000 metric tons. Note: average of five marketing years from 1998/1999 to 2002/2003, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Sunflower Oil

For sunflower oil, annual world production has been around 8.6 million metric tons in the recent five-year period (Table 15). Major producing countries are Argentina with 1.76 million metric tons, followed by Russia (1.1 million metric tons), Ukraine (0.86), and France (0.53). Major consumption countries are Russia (1.19 million metric tons), India (0.8), and Argentina (0.5).

Exports of sunflower oil reach 3.2 million metric tons per year, or 37 percent of total production. Argentina exports the most at 1.25 million metric tons per year, followed by Ukraine (0.45) and France (0.27). Importing countries are quite diverse and include India (0.36 million metric tons), Algeria (0.22), and Russia (0.19). Overall, international trade of sunflower oil has been characterized by one large exporter (i.e., Argentina) and many small importers.

Consumption Changes in Major Consuming Countries

Table 16 shows total consumption and consumption per capita for the leading oil consuming countries during the 1990-92 and 2000-02 periods. Significant increases include China and India's consumption of soybean oil and palm oil and Egypt's consumption of soybean oil. Per capita palm oil consumption is the highest, by a considerable margin, in Malaysia. Canada has the highest per capita rapeseed oil consumption, and per capita sunflower oil consumption is the highest in Argentina.

Table 15. Supply and Distribution by Country: Sunflower Oil

	Production		Exports		Imports		Consumption	
World Total	8,626		3,215		3,129		8,570	
Argentina	1,762	(1)	1,246	(1)	0		520	(3)
Russia	1,108	(2)	121	(7)	192	(3)	1,187	(1)
Ukraine	857	(3)	445	(2)	6		416	(6)
France	530	(4)	274	(3)	146	(6)	408	(7)
Spain	483	(5)	81	(9)	48		450	(5)
India	441	(6)	0		365	(1)	800	(2)
Turkey	430	(7)	67	(10)	116		487	(4)
United States	384	(8)	236	(4)	7		158	
Romania	298	(9)	62		11		245	(10)
South Africa	287	(10)	18		83		351	(8)
Netherlands	220		225	(5)	183	(4)	174	
Belgium-Lux.	54		122	(6)	147	(5)	78	
Hungary	214		81	(8)	17		154	
Germany	141		51		145	(9)	235	
Iran	18		8		129	(10)	139	
United Kingdom	8		6		146	(7)	149	
Egypt	2		0		146	(8)	147	
Italy	250		26		66		293	(9)
Algeria	0		0		215	(2)	215	

Unit: 1000 metric tons. Note: average of five marketing years from 1998/1999 to 2002/2003, world rank in parentheses.
Source: PS&D Database, FAS/USDA; accessed April 2003.

Table 16. Total and Per capita Oil Consumption in Major Consuming Countries

		Total Consumption			*Per capita Consumption*		
	Country	1990-92 average	2000-02 average	Change	1990-92 average	2000-02 average	Change
		(1000 MT)		(%)	(kg per capita)		(%)
Soybean Oil	United States	5,655	7,582	34	22.3	26.6	19
	China	830	4,210	407	0.7	3.3	359
	Brazil	2,209	3,137	42	14.4	17.6	23
	India	477	2,254	372	0.6	2.2	298
	European Union	1,782	1,983	11	4.9	5.2	8
	Mexico	501	949	89	5.8	9.4	62
	Iran	462	901	95	7.8	13.5	73
	Japan	655	700	7	5.3	5.5	4
	Bangladesh	266	513	93	2.4	3.9	63
	Egypt	28	407	1335	0.5	5.7	1065
Palm Oil	India	155	3,868	2401	0.2	3.8	1987
	Indonesia	1,603	3,594	124	8.4	15.8	89
	European Union	1,479	2,901	96	4.0	7.7	90
	China	890	2,216	149	0.8	1.7	125
	Malaysia	1,069	1,828	71	59.6	82.2	38
	Pakistan	866	1,208	39	7.4	8.3	12
	Nigeria	703	1,023	45	7.4	8.0	9
	Thailand	220	595	171	3.9	9.4	141
	Egypt	332	487	47	5.7	6.8	18
	Colombia	287	455	58	8.6	11.3	32
Rapeseed Oil	China	2,435	3,988	64	2.1	3.1	49
	European Union	1,739	3,233	86	4.7	8.5	80
	India	1,626	1,178	-28	1.9	1.2	-39
	Japan	772	878	14	6.2	6.9	11
	United States	352	696	97	1.4	2.4	76
	Canada	415	491	18	14.7	15.6	6
	Poland	246	328	33	6.4	8.5	32
	Mexico	247	374	51	2.9	3.7	29
	Pakistan	74	182	145	0.6	1.3	98
	Czech Republic						
Sunflower Oil	European Union	1,808	2,093	16	4.9	5.5	12
	Russia	1,062	1,248	18	7.2	8.6	20
	India	362	699	93	0.4	0.7	63
	Argentina	346	464	34	10.3	12.2	18
	Turkey	537	437	-19	9.4	6.6	-30
	Ukraine	889	431	-51	17.2	8.8	-48
	South Africa	261	306	17	6.9	7.2	4
	Romania	271	228	-16	11.9	10.2	-14
	Algeria	141	202	43	5.5	6.4	17
	China	220	182	-18	0.2	0.1	-25

Source: PS&D Database, FAS/USDA; U.S. Census Bureau

U.S. OILSEEDS SUPPLY AND DEMAND

Estimating U.S. Demand for Oilseeds

An Almost Ideal Demand System (AIDS) model is developed to estimate U.S. demand for oilseeds, meals, and oils. The AIDS specification of demand is

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln \frac{E}{P^*} + \varepsilon_i \,, \tag{3}$$

where w_i is the expenditure share of the ith good, p_j is the price of the jth good, E is the total expenditure on the group of goods, and P* is Stone's price index. Three AIDS models are estimated for U.S. domestic consumption of oilseeds, meals, and oils. Annual data are used from 1977 to 2002 for oilseeds, from 1978 to 2002 for oils, and from 1979 to 2002 for meals. Consumption data are from the USDA's Production, Supply, and Distribution (PS&D) online database, and price data are from the USDA's 2002 Oil Crops Yearbook and the most recent Oil Crops Outlook.

The oilseeds model examines consumption of soybeans, cottonseed, peanuts, sunflowerseed, and rapeseed. Due to the unavailability of rapeseed price data prior to 1989 and the low quantity of rapeseed consumption during that period, sunflowerseed and rapeseed are grouped together by adding consumption and calculating a consumption-weighted price. Missing rapeseed prices are estimated as a function of the other oilseed prices. The meals model estimates consumption of soybean meal, cottonseed meal, sunflowerseed meal, and rapeseed meal; the oils model estimates consumption of soybean oil, cottonseed oil, corn oil, sunflower oil, and rapeseed oil, with sunflower and rapeseed oil grouped together. U.S. domestic consumption is dominated by soybeans, soybean meal, and soybean oil, with the biggest competitors being cottonseed, rapeseed meal, and corn oil.

Uncompensated price elasticities and expenditure elasticities are calculated from the results of Equation 3. The own-price elasticities and expenditure elasticities are shown in Table 17. As expected, the own-price elasticities are negative, and the expenditure elasticities are positive. An own-price elasticity of –0.87 for soybeans indicates that a 1 percent increase in soybean price decreases domestic consumption by 0.87 percent. Results indicate that soybean consumption is more price elastic than consumption of other oilseeds, and that peanut consumption is the least elastic. The higher expenditure elasticity for rapeseed and sunflowerseed indicate that consumption of these commodities responds more to changes in income. The price elasticities for meals are higher than those for oilseeds or oils, indicating that consumption of meals responds more sensitively to changes in price. This result could be explained by the fact that meals are fed to animals, and animal producers are likely to respond to changes in price by changing the feed ration given to their animals. Consumption of rapeseed meal is found to be the most elastic, with respect to both price and income. The cross-price elasticities are not reported here since a number of them have wrong signs and are insignificant, which may indicate that the commodities are not strong substitutes. The insignificance of a number of price elasticities may be due to a low number of observations.

Table 17. Estimated U.S. Demand Elasticities

Commodity	Own-price elasticity	Expenditure elasticity
Oilseeds		
Soybeans	-0.867*	0.980*
Cottonseed	-0.618*	1.314*
Peanuts	-0.031	0.408*
Rapeseed + Sunflowerseed	-0.540	2.505*
Meals		
Soybean Meal	-1.041*	1.011*
Cottonseed Meal	-1.559	-0.482
Sunflowerseed Meal	-1.409*	0.598*
Rapeseed Meal	-2.303	3.957*
Oils		
Soybean Oil	-0.774*	0.830*
Cottonseed Oil	-0.592*	0.762*
Corn Oil	-0.018	1.062*
Sunflower + Rapeseed Oil	0.083	3.170*

*Significant at the 5 percent level.

U.S. consumption of oilseeds, meals, and oils was then estimated as a function of income. The purpose of this estimation is to determine how changes in income affect domestic consumption of these three groups of commodities. Real GDP data from the Bureau of Economic Analysis are used in the estimation. Results indicate that a 1 percent increase in real GDP leads to a 0.5 percent increase in expenditures on oilseeds, a 0.7 percent increase in expenditures on meals, and a 0.8 percent increase in expenditures on oils. Real GDP projections from the Congressional Budget Office are used to project expenditures on oilseeds, meals, and oils for 2010. The estimated expenditure elasticities from Equation 3 are used to project consumption of individual commodities (Table 18). Soybean consumption is projected to increase from 47.8 million metric tons to 58.5 million metric tons. The greatest increase in percentage terms is consumption of rapeseed and rapeseed products.

Exportable Surplus of Soybeans

Comparing projected production in Table 6 with projected domestic consumption in Table 18 shows the projected exportable surplus the United States will have for soybeans (Table 19). Consumption is projected to increase slightly more than production, with the exportable surplus decreasing from 26.5 million metric tons to 24.9 million metric tons.

Table 18. Current and Projected U.S. Consumption

	2002	2010
	(1000 MT)	
Soybeans	47,812	58,487
Cottonseed	5,388	7,054
Peanuts	1,545	1,681
Rapeseed + Sunflowerseed	1,712	2,845
Soybean meal	29,075	37,641
Cottonseed meal	991	874
Sunflowerseed meal	142	166
Rapeseed meal	1,065	2,830
Soybean oil	7,711	9,534
Cottonseed oil	308	374
Corn oil	635	833
Sunflower + Rapeseed oil	724	1,594

Table 19. Projected U.S. Exportable Surplus for Soybeans

	2002	2010
	(million MT)	
Production	74.3	83.4
Consumption	47.8	58.5
Surplus	26.5	24.9

ISSUES RELATED TO THE COMPLEX OF OILSEEDS, MEALS, AND OILS

There are several issues related to the complex that merit more attention and research.

Competitiveness of U.S. Soybean and Soybean Product Exports

There is increasing competition between the United States, Brazil, and Argentina in exports of soybeans and soybean products. Production and exports by Argentina and Brazil have increased rapidly in recent years, and there is potential for substantially greater expansion of Brazilian soybean production (USDA/FAS, January 2003). Soybean yields in Brazil and Argentina have increased in recent years and are estimated to be higher than U.S. yields in 2002/03. Moreover, sunflowerseed yields are higher in Argentina than in the United States. Argentina continues to be the dominant exporter of soybean and sunflower oils.

Other researchers have conducted analyses about the production costs of oilseeds in Argentina and Brazil (Dohlman et al. 2001, McVey et al. 1999, Arburn et al. 1991). Dohlman et al. (2001)

compared marketing, transportation, and farm-level production costs in the late 1990s and found that Brazil and Argentina maintained a competitive advantage over the United States in production costs, mainly due to higher land costs in the United States. They found that lower transportation and marketing costs in the United States partially offset the production cost disadvantage, but Brazil and Argentina have been reducing these costs in recent years. Huerta and Martin (2002) also note that land values are lower in Brazil and Argentina, but that these two countries face other issues that reduce their competitive advantage, including economic instability and inadequate transportation infrastructure. Flaskerud (2003) estimated that costs of production for the 2003 harvest are lower in Mato Grosso, Brazil, than in North Dakota and Iowa, even when freight costs are considered. He calculated total cost per bushel, including freight cost to Rotterdam, as $4.57 in Mato Grosso, $5.76 in North Dakota, and $7.21 in Iowa. Costs are higher in North Dakota than Mato Grosso primarily because of higher land and machinery expenses and lower yields. Production cost is highest in Iowa because the state has the highest land costs.

Macroeconomic variables have also been deemed important by researchers. Thraen et al. (1992) analyzed the impact that U.S. monetary growth has on the competitive position of U.S. soybean exports through exchange rates. Anderson and Garcia (1989) examined the effects of exchange rate uncertainty on bilateral soybean trade flows, and Larson and Rask (1992) evaluated the changing competitiveness in world soybean markets relative to government policy and natural resources. These are important issues to study as the United States has been losing market share to Brazil and Argentina. The FAS of the USDA (May 2003) is forecasting that intense competition from South American soybeans will cause U.S. exports to decline in 2003/04. It is important to evaluate the competitiveness of U.S. exports in the long-term.

Since China is the biggest and fastest-growing market for soybeans, the ability of the United States to compete with Brazil in this country is critically important. In recent years, the United States held close to a 50 percent market share in China, and Brazil held about a quarter of the market. As China's soybean imports doubled in 2002/03 to 21 million metric tons, U.S. soybean exports to the country reached a high of 7.7 million tons, which is more than a quarter of all U.S. soybean exports. However, U.S. market share in China dropped to 38 percent, while Brazil's market share increased to 36 percent. For the first time, Brazil's market share is nearly equal to the U.S. market share in China (USDA/FAS, October 2003).

Changing Trade Policies in Importing Countries

Trade policies for major importing countries have been changing. Taking China as an example, the government has been under pressure to protect its domestic crushing industry. Because both meals and oils are by-products from crushing oilseeds, there is a dynamic relationship among oilseed, meal, and oil with regard to international trade. In 1995, China lifted their value-added tax on soybean meal to encourage growth in their livestock sector, and as a result, imports of soybean meal rose (Hsu 2001). China re-imposed the value-added tax on soybean meal in 1999. This policy led to a rapid increase in soybean imports and a decline in imports of oils and meals. Chinese regulations on genetically modified crops temporarily halted soybean exports to China in the spring of 2002 (USDA/ERS 2002). Interim biotech rules, which are scheduled to expire in April 2004, allowed shipments to China to resume in June 2002. Domestic farm price policies in China that have favored corn production over soybean production have also affected import demand by causing China to rely heavily on soybean imports rather than domestic production to meet consumption needs (Hsu 2001). Chinese production, though, has been slowly increasing,

and the Chinese government continues to protect domestic producers from the full effect of the world market (USDA/FAS, March 2003). It is important to evaluate the effects of these policies and predict whether or not the policies are temporary.

Influence of Palm Oil

Palm oil presents a unique challenge for the world vegetable oil market. Production of palm oil has been dominated by two countries: Malaysia and Indonesia. Both countries have enormous production capacities, and most of the palm oil has to be exported. In the past five years, 16.50 million tons of palm oil have been exported per year, which represents 72 percent of total palm oil production and 46 percent of total oils exported worldwide. Palm oil production in Malaysia has been influenced not only by domestic socioeconomic factors but also by the demands from international trade regulations (Fold 2000). Palm oil is very important economically to these two exporting countries.

Palm oil has flooded the international market, especially in Asia. In contrast, trade in oilseeds and meals is dominated by soybeans, and the related demand is mainly from proteins and the feed industry. Soybean oil is second to palm oil in international trade. There is strong competition between palm oil and other oil varieties, such as soybean oil. In turn, this situation affects the trade of soybeans and soybean meal significantly.

The harvesting and price volatility of palm oil have been documented in the literature (Voituriez 2001, Liew 1998). Considering there are only two palm oil exporters and palm oil is dominating the edible oil world, it would be fruitful to closely observe the development of the palm oil market and evaluate the competition.

Changing Demand by Major Importing Countries

Although there are many importing countries in the international market, several major importers are becoming increasingly important. Demand in these countries has influenced the market dramatically. India and China are the two largest countries among these importers. Both countries have a large population, so the demand for vegetable oils and proteins is high. In contrast to some countries, such as Japan, that have stable imports, imports by China and India have been changing in recent years. These changes mainly come from changing domestic policies on production.

For example, China's grain policy now focuses on maintaining self-sufficiency in corn and food grains, while soybeans are more liberalized. Chinese policymakers' favorable treatment of food grains and corn will erode soybean production and promote imports of soybeans and bean products. China's decision-makers continue to struggle to find policies that achieve their intended goal. It will be important to analyze possible changes in these policies and the effect on future demand (Hsu and Tuan 2001). In addition, with imports increasing by these countries, a related issue worthy of further analysis is the importers' potential gain in market power in the importing market.

Self-sufficiency policies related to oilseed, meal, and oil will likely be the main long-term policies in many large countries. Vegetable oils and fats are usually considered essential consumer goods, and some of the large developing-country importers have attached great importance to an increase in the domestic production of oilseeds. For instance, India's production of oilseeds increased tremendously during the 1990s as a response to a self-

sufficiency policy implemented in 1987 (Fold 2000). Future research needs to evaluate these policies and their impacts on the international market.

Trade Liberalization

As negotiations for free trade continue at global and regional levels with the WTO and the Free Trade Area of the Americas (FTAA), it is important to evaluate the impact of further trade liberalization on the oilseed complex (Meike et al. 2001). These agreements could have significant impacts on agricultural trade flows. The FTAA would create a free trade agreement encompassing 34 Western Hemisphere countries, and the goal of the current round of WTO agricultural negotiations is to substantially reduce tariffs and other barriers to trade, as well as domestic support and export subsidies. Under the FTAA, U.S. producers may be able to take advantage of increased access to Latin American markets (USDA/ERS 1998; Mattson and Koo 2003). However, they will face competition from producers in Brazil and Argentina. A report by the USDA's Economic Research Service (1998) concludes that the FTAA would expand soybean oil exports to the Caribbean and would cause many countries that now crush soybeans to import soybean meal and soybean oil instead. They also conclude that if the United States decides not to become a member of the FTAA, U.S. producers would be at a disadvantage in relation to producers in Brazil and Argentina in exporting soybeans and soybean products to Latin American countries.

GMOs and Trade

The development of genetically modified organisms (GMO) has progressed rapidly in recent years. GM soybeans already have a significant presence in the world. The presence of DNA in foodstuffs which are GMOs is the basic requirement for labeling of GMO food. Research indicates that no genetic material can be recovered after the first processing steps of soybean oil (Gryson et al. 2002).

The development of GM oilseeds will impact the sector from several aspects. Different countries have varying levels of acceptance of and restrictions about GMOs, based on perceptions of safety. Before scientists can fully understand the safety of GMOs, worldwide trade will continue to feel the impact of these regulations. GM oilseeds may affect the crushing industry directly. Future studies are needed to monitor and evaluate these changes and their impacts.

The biggest export markets for U.S. soybeans are China, the EU, Japan, and Mexico. Despite GMO resistance, the EU has continued to import soybeans from the United States. Unlike corn, U.S. exports to the EU did not collapse once GM crops were introduced. This could be due to a strong import demand for soybeans in the EU, a small number of producers in the world market, and a lack of substitutes (Cunningham and Unnevehr 2000). The EU, however, has raised barriers to the import of soybeans intended for human consumption. U.S. soybean exports to Japan, which has also resisted GMOs, have been rather steady the last 10 years.

CONCLUSIONS

The world of oilseeds, meals, and oils has been evolving, both by variety and country. By variety, soybeans have dominated the production, consumption, and trade of oilseeds and meals. In the past five years, about 56 percent of oilseeds produced and 80 percent of oilseeds traded worldwide have been soybeans. Rapeseed and sunflowerseed are other important varieties in the oilseed and meal markets. In the oil market, palm oil has emerged as a strong competitor to soybean oil. Although the total production of soybean oil still is more than that for palm oil, oil trade in the world has been led by palm oil in recent decades. Perhaps due to the high value per unit, 40 percent of oils produced in the world have been exported. For palm oil, 72 percent of production has been exported in the past five years. There is intense competition between palm oil, soybean oil, and other varieties.

By country, the United States has been the largest player in the complex, mainly due to its dominant position in soybeans and soybean meals. However, this dominance of the United States has been challenged. Specifically, the growth of Brazil and Argentina in the production of soybeans and soybean meal has eroded the market share of the United States in recent years. In the oil market, with the exception of traditional competition from Canadian rapeseed oil, Malaysia and Indonesia have been aggressively marketing their palm oil, especially in Asia, resulting in intense competition for the soybean oil exported from the United States. The two major exporting countries, Malaysia and Indonesia, rely on the international market for their palm oil industry, so it is expected that the competition will continue.

With these changes in the international market, many new issues have emerged for researchers and policy makers. First of all, great attention should be paid to the growth of the soybean sector in Brazil and Argentina. Similarly, palm oil production and exports from Malaysia and Indonesia are dominating the vegetable oil market, which is closely related to the development of soybean oil production in the United States. Second, there is a need to better understand the demand and trade policy changes in major importing countries, such as China and India. These factors have affected the international market significantly and will continue to impact soybean and related products in the United States. Third, the progress of free trade negotiation under the frame of the WTO and FTAA is worthy of close observation. These agreements and the associated changes in tariffs are expected to significantly affect the relative competitiveness between countries. Finally, the development of GMOs is expected to impact the sector from crushing and transportation to final consumption. Further research is needed to analyze the specific and interlinked impacts from the technological progress.

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