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Soybean Backgrounder

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Abstract

U.S. soybean plantings peaked at 75.2 million acres in 2004, pushing output and use to record levels. Future increases in acreage and production, however, could be limited by competition for area from other U.S. crops, possible constraints on yield growth from changing rotations and new diseases, and increasing foreign competition. The U.S. share of global soybean and soybean product exports has steadily diminished due to the phenomenal growth of foreign soybean output and exports, particularly by Brazil and Argentina. The development of nontraditional soybean uses (such as biodiesel) and growth in demand for food use could provide some support to the U.S. soybean sector. In 2004, at least three-quarters of all soybean-producing farms had farm operations that were considered profitable. Since 2002, government payments to the soybean sector have been relatively small, consisting primarily of fixed direct payments. Domestic market conditions, Federal budget deficits, and multilateral trade negotiations will be important considerations for new farm legislation.

Keywords: United States, soybeans, demand, supply, trade, policy, trade agreements, biodiesel, income, expenses.

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Approved by USDA's World Agricultural Outlook Board

Introduction

Over the past decade, U.S. soybean production has climbed steadily, responding to increased domestic and global demand for the coproducts of soybean crushing—high-protein soybean meal for animal feed, and soybean oil for edible and inedible uses. During the same period, policy changes have allowed soybean producers to respond to market signals, especially with nearly complete planting flexibility following the 1996 Farm Act.

By the 2004/05 crop year, U.S. soybean output and consumption had both achieved record levels. However, the U.S. soybean sector faces unprecedented competition in export markets. Future soybean acreage could also be constrained by the market and policy developments affecting demand for other crops. In particular, a mandate for increased production of renewable fuels (mainly ethanol, which is primarily derived from corn) will have a major impact on the economics of growing soybeans.

Growth prospects for domestic per capita soybean oil consumption, soybean meal demand, and exports are considered relatively stable, so U.S. revenues from soybeans may increasingly rely on the expansion of less traditional sources of demand. In particular, policies and market factors affecting biodiesel demand could have a significant impact on soybean consumption. Food uses (e.g., protein supplements, soy beverages) also show promise as niche markets for soybeans.

Soybeans are among the key crops covered by the main government commodity programs (marketing loans, direct payments, and countercyclical payments) of the Farm Security and Rural Investment Act of 2002 (2002 Farm Act). Consequently, soybean producers and Direct and Countercyclical Payment Program (DCP) participants with soybean base acres have a strong interest in future farm policies. Government payments to soybean producers have been relatively modest since 2002 due to high prices, but future funding of domestic farm programs may be influenced by projected Federal budget deficits. Trade policy and domestic support issues—particularly related to the World Trade Organization's (WTO) ongoing Doha Round negotiations—are also likely to factor into new farm legislation. A WTO agreement may require some redesign of U.S. commodity policies.

U.S. Market Background

Soybeans account for about 90 percent of U.S. oilseed production. In 2005, planted soybean acreage was 72.1 million acres and farm production value was nearly $17 billion, trailing only corn in U.S. crop area and production value (fig. 1).

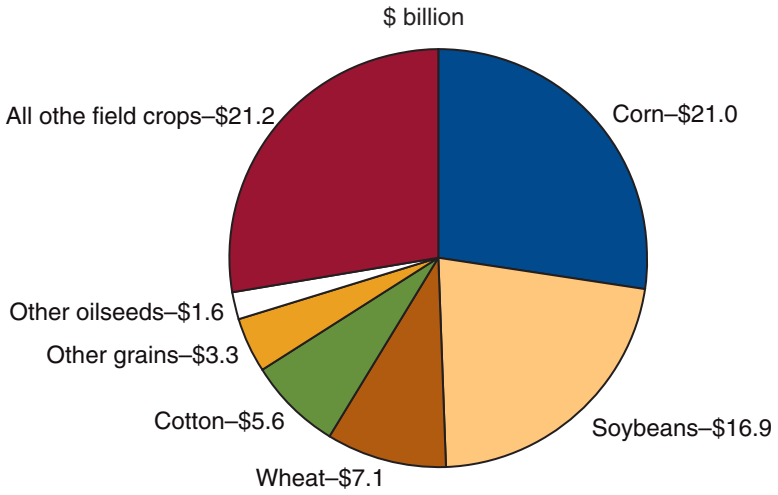
In the United States, soybeans are most commonly grown in rotation with corn. More than 80 percent of soybean acreage is in the upper Midwest, with significant acreage in the Delta and Southeast (fig. 2). Acreage is concentrated where soybean yields are highest. (For more information on the characteristics of U.S. soybean farms, see appendices 1 and 2). Nearly all soybeans are either crushed domestically (to separate and extract the oil and high protein meal) or sold for export. Domestic soybean processors sell soybean oil and meal for domestic use and in global markets for these products. A small amount of whole soybeans are used for seed, roasted for snacks or onfarm dairy feed, or processed into traditional soyfoods such as tofu. New uses for soybeans and their derivatives, such as biodiesel made from soybean oil, show promise due to recent energy market and public policy developments.

Since it accounts for nearly 80 percent of the physical output from processing soybeans, meal is typically the most valuable end product. Depending on the prices of soybean meal versus soybean oil, soybean meal can range from 50 to 75 percent of the processing value. Soybean meal is by far the world's most important protein feed, accounting for nearly 65 percent of world protein feed supplies. Livestock feeds account for 98 percent of U.S. soybean meal consumption, with the remainder used in human foods such as bakery ingredients and meat substitutes.

Soybean oil generally contributes less than soybean meal to the value of processed soybean products, as it constitutes just 18-19 percent of the

Figure 1

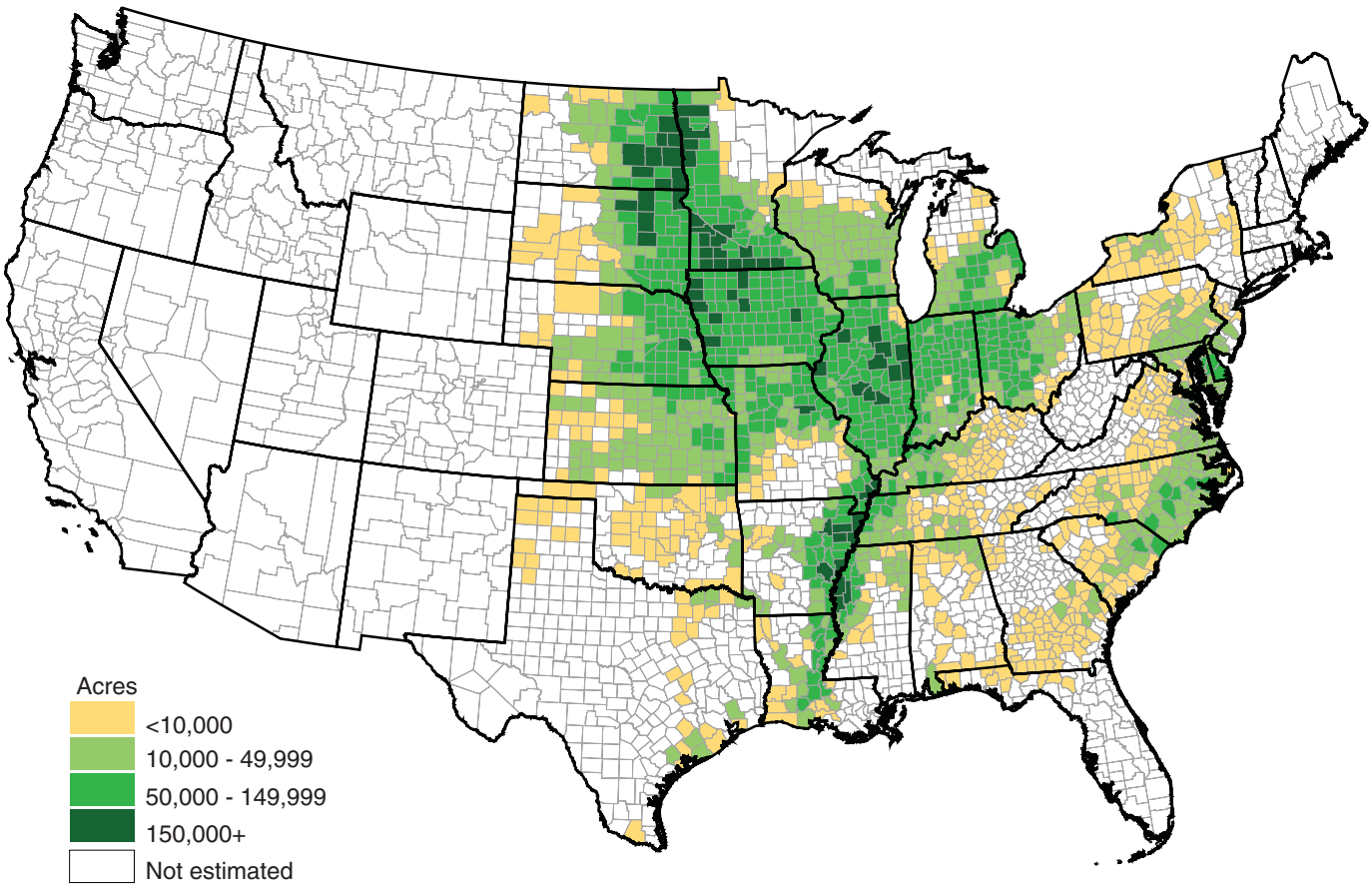
Soybeans ranked second among U.S. crops in farm value in 2005



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Figure 2

Soybean planted acres by county, 2004



Source: www.ers.usda.gov/data/baseacres/

weight of soybeans. The oil yield of soybeans is considerably lower than oilseeds such as sunflowerseed and canola. However, the dominance of soybeans in crop production allows soybean oil to account for about two-thirds of total U.S. consumption of vegetable oils and rendered animal fats. It is mainly used in salad and cooking oil, bakery shortening, frying fat, and margarine, as well as in a number of industrial applications.

Domestic Supply Developments and Prospects

Planting Flexibility and Yield Growth Have Propelled Soybean Production Since 1990

Compared with corn, wheat, and some other crops, soybeans were a minor U.S. crop until after the Second World War, when demand for vegetable oil and meat consumption rose rapidly with increasing incomes and population. Soybean acreage rose rapidly after 1945, but after surpassing 71 million acres in 1979, generally declined. In spite of several years of high prices during the 1980s, U.S. soybean acreage stagnated largely due to farm programs for other crops.

During this period, farmers were reluctant to risk future government payments for "program" crops (such as corn, wheat, upland cotton, and rice) for any temporary advantage in market returns from planting soybeans. Deficiency payments to producers were determined by historical plantings and yields of specific crops, which did not include soybeans or minor oilseeds. In fact, when some program crops were in oversupply during the 1980s and the government implemented its acreage reductions for these crops, soybean plantings would often slip as farmers attempted to preserve their program base acreage. U.S. farm programs tended to support soybean prices, encouraging an expansion in South American soybean acreage.

Beginning in the early 1990s, soybean planting decisions became more market oriented, and acreage generally increased. The Food, Agriculture, Conservation, and Trade Act of 1990 (1990 Farm Act) allowed up to 15 percent of crop base acres to be planted to any crop without affecting crop bases or deficiency payments. After 1996, the Federal Agriculture Improvement and Reform Act (1996 Farm Act) eliminated nearly all planting restrictions on crop bases (except provisions excluding fruit and vegetable plantings). Consequently, when soybean prices increased because of rising world consumption or smaller foreign harvests, U.S. producers could respond to these higher prices with increased soybean plantings. Low prices have had a lesser impact on soybean plantings because the marketing loan program ensures a minimum revenue per bushel for soybeans. Soybean expansion also occurred as the number of Corn Belt farmers adopting half-corn/half-soybean rotations increased and acreage shifted from wheat and small grains in the Plains. These changes were facilitated by the growing availability of herbicide-tolerant soybean varieties, which lowered production costs and improved weed control in the rotation crops. U.S. soybean plantings peaked at 75.2 million acres in 2004, a 30-percent increase from the 57.8 million acres planted in 1990. In contrast, the total acreage planted to wheat declined by 17.4 million acres over the same period.

In addition to an increase in acreage, steadily rising yields also contributed to the growth in soybean production through 2004. New seed varieties, improved fertilizer and pesticide applications, and new management practices have all contributed to higher yields. For example, the adoption of narrow-row planting (7- to 8-inch rows vs. 30-inch rows) benefited soybean

yields throughout the 1990s as it usually increased the number of pods per acre. Many producers adopted conservation tillage to meet conservation compliance requirements enacted in farm legislation, but the practice also contributed to higher yields from improved retention of soil moisture.

Higher yields reduce per-bushel production costs and enhance profitability. Soybean production costs and returns vary significantly across regions (www.ers.usda.gov/data/CostsandReturns/testpick.htm). Midwestern soybean producers generally have higher yields and lower cash costs per acre than Southern and Eastern producers.

Future Production Gains for Soybeans Hinge on Yield Growth

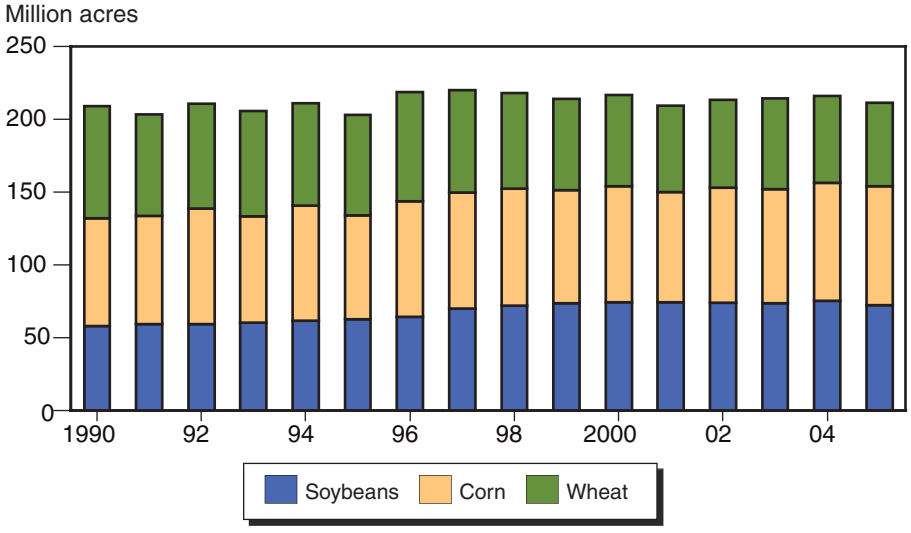
Although U.S. soybean acreage expanded strongly over the past decade, the extent of future acreage and production increases could be limited by several factors, particularly competition for area from other crops (primarily corn) and possible constraints on yield growth.

During the past 15 years, aggregate acreage sown to the three primary U.S. field crops (corn, soybeans, and wheat) has tended to be very stable, consistently hovering within 5 percent of 212 million acres (fig. 3). Higher soybean acreage was mainly possible due to an expansion into areas formerly dominated by wheat. However, a rapid rise in corn demand for conversion into ethanol production could gradually squeeze the acreage available for both soybeans and wheat. A conversion of marginally productive (and more fragile) farmland currently under Conservation Reserve Program contracts back into cropland might ease the acreage constraint, but that would require modifying environmental goals articulated by Congress two decades ago. The return of this marginal farmland could also slow growth in soybean yields, particularly if higher corn prices, boosted by ethanol demand, allowed corn to displace soybeans on higher yielding soils.

The limits on acreage mean that the potential for expanding U.S. soybean output will depend heavily on the ability to improve yields. Over the last 2 years, soybean yields have been record-high due mainly to favorable weather (fig. 4). Yet, to meet the projected increase in demand for corn to produce ethanol, some corn-soybean rotations in the Midwest may evolve toward planting soybeans every 3 years instead of every 2. Even if soybean acreage increases elsewhere, the advance of corn onto the most productive lands in the Midwest may make it harder to sustain the long-term growth of soybean yields and production (fig. 5).

Figure 3

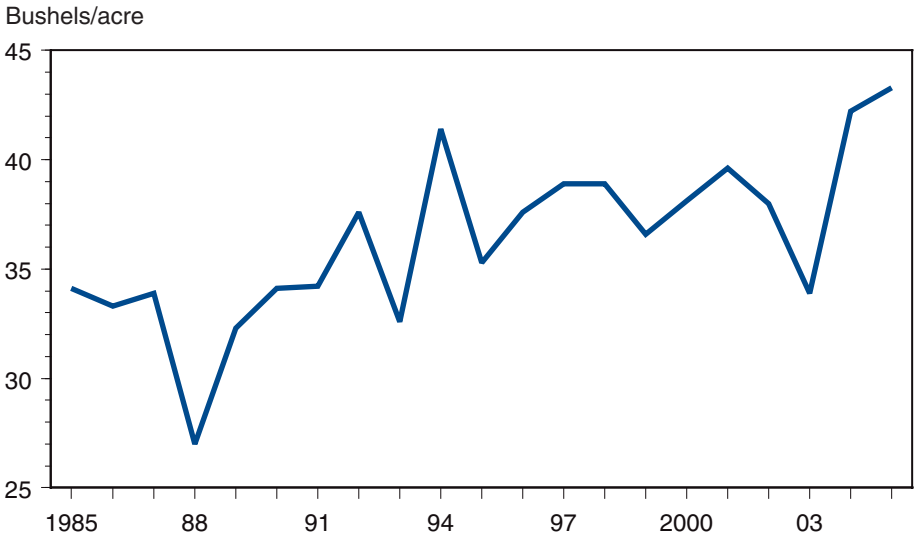
Land allocated to major U.S. crops remains stable



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Figure 4

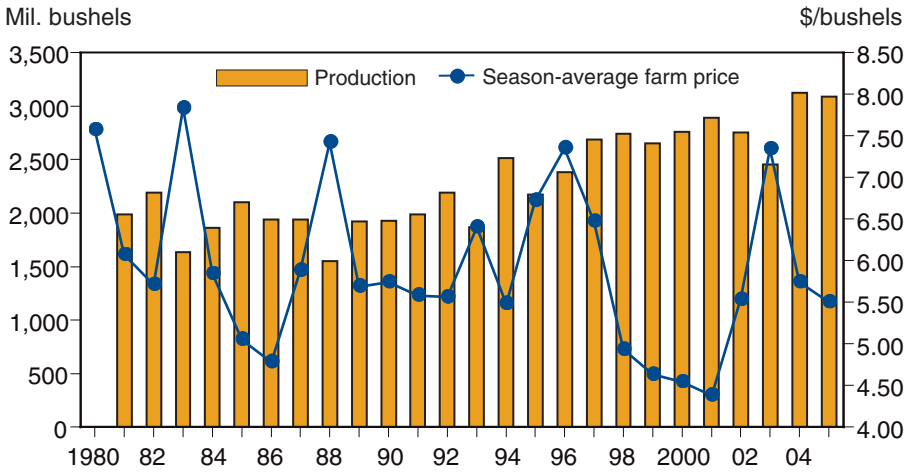
Recent U.S. soybean yield gains set basis for future growth



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Figure 5

U.S. soybean production gains help temper price increases



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Another potentially long-term problem for soybean yields is Asian soybean rust, which was discovered in Louisiana in November 2004 and later detected in nearly a dozen Southern States. Soybean rust has been endemic throughout South America for several years, but had not previously been found in North America. Soybean rust is a windborne fungal disease that attacks many legumes and other plant species. If left untreated, the highly pathogenic disease can cause severe losses through rapid defoliation of a crop. A soybean variety resistant to soybean rust is not currently available, although an array of fungicides proved effective in reducing its damage in South America. The typically aggressive progression of soybean rust can require repeated (and costly) chemical applications. The most persistent threat of soybean rust may be in the Gulf Coast States, where conditions

most favor its survival over the winter on other live plant hosts. In 2005, the disease was detected in more than 100 counties in 7 Southern States, yet it caused relatively little damage because of quick detection and effective treatment on limited soybean acres. Nevertheless, the random and opportunistic nature of soybean rust (its severity can vary with humidity, temperature, and stage of crop development at infection) could threaten major U.S. soybean production areas in any given year.[1]

The upward trend in soybean yields is largely the result of new varieties that perform better under climate and pest pressures. New lines are now being introduced that tolerate the soybean cyst nematode, the most destructive of the current crop pests. Varieties that resist soybean aphids are expected within 3 years. Research is underway to find varieties with tolerance for Asian soybean rust, as is government research to map the entire genetic sequence of the soybean.

[1] See *Economic and Policy Implications of Wind-Borne Entry of Asian Soybean Rust into the United States,* www.ers.usda.gov/publications/OCS/Apr04/OCS04D02/OCS04D02.pdf.

Revenue Outlook Also Tied to Foreign Developments

Over the coming decade, relatively stable growth in U.S. soybean production is anticipated, so revenue prospects may depend on changes in domestic use, as well as supply and demand developments abroad. One factor limiting domestic use is a rapid expansion in supplies of distillers' grains (a byproduct of ethanol production). This mid-protein feed is substituting for a portion of the soybean meal used in domestic feed rations. Provided there is solidly growing demand for soybean oil, there could be a surplus of soybean meal, allowing U.S. meal exports to stay competitive. While U.S. exports have generally trended upward, the rate of growth will increasingly depend on foreign demand and competition from several key regions and countries. Over time, the U.S. soybean industry could become more domestically oriented since foreign suppliers may be better able to expand production and capture an increasing share of the global soybean market.

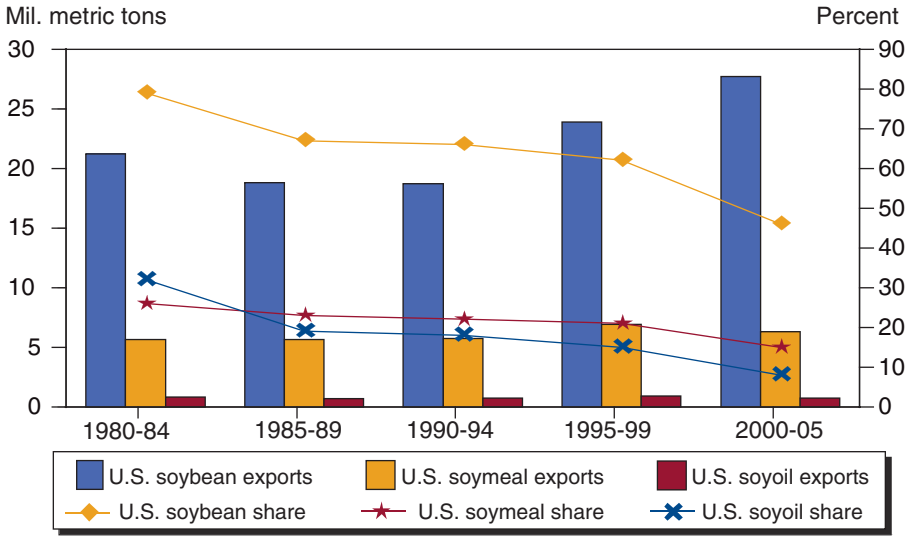
U.S Dominance of Global Soybean Markets Has Eroded

The 2002/03 marketing year was the first under the current 2002 Farm Act. In many respects, it was also a watershed year for international soybean trade. It was the first year that soybean exports from South America exceeded U.S. shipments. It also marked the emergence of China as the dominant force in global imports, which helped U.S. soybean exports reach a near-record in 2002/03.

The U.S. position in the world soybean market has undergone a major transformation since the early 1990s. Despite substantial output growth for soybeans and soybean products and steady gains in export volume, the U.S. share of global exports has steadily diminished (fig. 6). During the 1970s,

Figure 6

U.S. export volumes for soybeans and soybean products edge higher, but market shares decline



Source: U.S. Department Agriculture, Foreign Agricultural Service, PS&D database.

Transportation Infrastructure Improvements May Shape Competitiveness

The capacity of the U.S. bulk transportation system has been tested by the record-large domestic harvests of recent years. Bulk transportation costs for barges, rail, and ships can all affect the local price basis that soybean merchandisers offer to farmers. More than half of U.S. soybean exports traverse some portion of the Mississippi River system. A modernization of the locks on this system would reduce barge rates. Most of the locks on the Upper Mississippi and Illinois Rivers have 600-foot locking chambers that require tows to be split, locked through as separate sections, and then reconfigured. The replacement of these older locks with 1,200-foot chambers would reduce transit times and lower costs for shippers, but it would also require substantial public investment for construction and environmental mitigations.

The increased use of container shipments for soybean exports, mainly to Asian markets, is also an important development. Steep discounts for backhauls in freight containers are encouraging the trend. Containers can be loaded at any shipping port and do not require a bulk grain loading facility. Wider use of this method could help lessen demands upon the Mississippi River system.

The cost of rail grain shipping has risen with higher fuel costs and greater competition for rail capacity from other classes of traffic. Railroads have passed on their higher fuel costs to shippers through fuel surcharges. Capacity constraints are reflected in higher prices for guaranteed car service during grain shipping peaks, which cause shippers to bid lower for soybeans from farmers.

the United States accounted for more than 95 percent of world soybean trade. While U.S. exports have gradually increased, foreign exports have grown even faster. The U.S. share of global soybean trade is now below 50 percent, with less than 15 percent of the export market in soybean meal and less than 8 percent of the soybean oil market.[2]

Competition From Brazil and Argentina Intensifies

The decline in the U.S. share of global exports has been hastened by the phenomenal growth of foreign soybean production and exports, particularly by Brazil and Argentina (fig. 7). Foreign soybean production now exceeds that of the United States, and soybean exports from South America have exceeded U.S. exports since 2002/03 (including 2004/05, despite a record U.S. harvest and export volume).[3] With increased foreign production, and more rapid expansion of trade in soy products than unprocessed soybeans, Brazil and Argentina have each surpassed the United States in soybean meal and soybean oil exports.[4]

Brazil has massive growth potential in agriculture due to the availability of virgin lands in its vast interior. Under the right economic circumstances, much

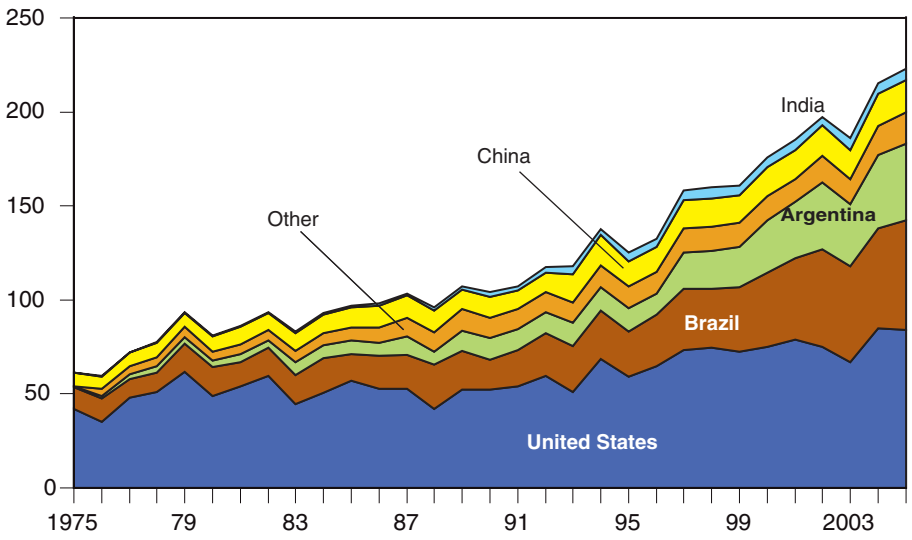
[2] If one included all oilseeds and oilseed products, the U.S. share of global production and trade would be even smaller. U.S. soybeans account for about 35 percent of world soybean production, but no more than 21 percent of global oilseed production. Other oilseeds that compete with soybeans include rapeseed (canola), cottonseed, peanuts, copra, palm kernel, and sunflowerseed.

[3] For more background on the factors that have encouraged production growth in these countries, see "Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops," www.ers.usda.gov/publications/wrs013.

[4] Another factor that has restrained U.S. soybean and product exports over the last 10 years is the general expansion of U.S. meat production and exports. By raising domestic meal consumption, exports of meat products are indirectly replacing the exports of soybeans and soybean meal.

Figure 7

South American soybean production has grown rapidly since 1980



Source: U.S. Department Agriculture, Foreign Agricultural Service, PS&D database.

more of that land could be converted to soybean production. Brazilian soybean producers have proven to be remarkably competitive in terms of relative production costs, and Brazil's average soybean yield has exceeded the U.S. average in some years. Once the newly cultivated areas have been conditioned, overall yields have also tended to rise. Yet, the country's production growth has stagnated since 2002/03 due to two consecutive severe droughts, a widespread invasion of soybean rust, and a strengthening of its exchange rate against the U.S. dollar. The latter has lowered soybean values within Brazil, exacerbating the effects of recent drought-reduced soybean yields and higher production costs. This combination of factors has left Brazil's farmers with a large accumulation of unpaid debts.

In Argentina, a financial crisis in early 2002 forced the government to abandon its fixed exchange rate regime. The peso subsequently depreciated by more than two-thirds, instantly improving the country's competitiveness in agricultural commodities. Even when the Argentine government substantially increased its soybean export tax to 23.5 percent, devaluation greatly improved the financial condition of farmers. They paid down their debts and there has since been a strong recovery in farmland prices. Recent growth in Argentine soybean yields, production, and exports has been very robust. Still, Argentina's potential to raise soybean output is more limited than Brazil's due to fewer opportunities for cropland expansion. A rise in Argentine soybean production would have to rely mainly on improving yields (which are already comparable with U.S. yields) or attracting area away from other crops. Exports of soybeans from Argentina have surged recently due to rising imports by China, but the country remains predominantly an exporter of soybean meal and soybean oil.[5]

While South American soybeans and soybean products are likely to capture larger export market shares, their growth potential is not unlimited. Recent global trade has been influenced by South American soybean yields, costs

[5] A lower export tax for soybean products (20 percent) versus soybeans (23.5-percent) favors the exports of soybean products from Argentina. While the tax itself is a major cost to the industry, the tax differential and currency devaluation have enhanced the country's dominance of international oilseed product exports. Consequently, Argentine crushing capacity has expanded substantially since 2002. In contrast, the Brazilian soybean processing industry is disadvantaged by domestic sales taxes imposed on soybean shipments between states. The country's crushing capacity is concentrated in the south, so it depends on acquiring soybean supplies from the distant locations (in the interior center-west) for filling deficits in local supplies. Foreign buyers of soybeans are exempt from the taxes, giving them an edge in bidding for supplies against domestic processors.

Exports Vital to Soybean Sector

International market developments are extremely important to the U.S. soybean sector. Oilseed and oilseed product exports, particularly soybeans, represent a significant source of demand for U.S. producers and make a large net contribution to the U.S. agricultural trade balance. Soybean and soybean product exports account for 40-45 percent of U.S. soybean production. U.S. exports are also critical to the world market, accounting for 35-40 percent of global trade in soybean and soybean products. Processed soybeans are the largest source of protein feed and second largest source of vegetable oil in the world.

Among all U.S. agricultural products, only grains and grain products outrank the oilseed sector in total export value and net exports. In the past 5 years, the average value of U.S. oilseed and product exports exceeded $9 billion, nearly half the farm-level value of oilseed production (Economic Research Service/FATUS). Main export destinations for U.S. oilseeds, oilseed meal, and vegetable oil include the European Union (EU), Japan, Mexico, China, and Taiwan. Other important markets include South Korea, Indonesia, and Thailand. The Philippines, Saudi Arabia, and Venezuela usually import significant quantities of U.S. oilseed meals. U.S. vegetable oil exports are more widely dispersed and are heavily influenced by food aid to developing nations through the P.L. 480 program.

In the first half of this decade, U.S. imports of oilseeds and oilseed products averaged over $2 billion annually, comprised primarily of canola seed, canola meal, and canola oil from Canada. The other main imported oilseeds and oilseed products include olive oil from Europe and tropical oils from the Philippines, Indonesia, and Malaysia.

of production, transportation, and exchange rates. A critical challenge for raising Brazil's export potential will be to expand the capacity of its transportation infrastructure, especially rail and barge systems. Currently, the country's soybean exports depend heavily on high-cost truck shipments. Most of Brazil's soybean crop must be moved hundreds of miles over roads that are unimproved or in poor condition. The trucks then face long backlogs at ports that need new investment in storage and loading capacity. New road projects, designed to shorten the distances to river ports, have been delayed by a lack of capital and by environmental considerations. Also moderating the short-term expansion of soybean area in Brazil is a relatively flat trend for domestic prices (due to exchange rate appreciation against the U.S. dollar) and rising fungicide costs for the control of Asian soybean rust.

U.S. Trade Also Affected by Developments in Other Major Markets

Brazil and Argentina have been the main competition in global export markets, but supply and demand developments in other markets can also influence global trade and prices.

China and Southeast Asia

China and Southeast Asia have been among the strongest import markets for soybeans and soybean meal in recent years and should continue to be growth markets over the next decade. Even though China is the world's fourth largest producer of soybeans and the second largest producer of oilseeds, the rapid growth of its economy has spurred food consumption and demand for higher protein foods. To meet its rising vegetable oil and animal feed demand, China now must import 55-60 percent of its total consumption of soybeans.

In a very short time, changes in China's agricultural and trade policies have greatly transformed world oilseed markets. Prior to 1995, China imported very little soybeans or soybean products but has now become the world's leading soybean importer. More than 40 percent of current world trade in soybeans goes to China. In 2002, the country joined the World Trade Organization (WTO) and its accession agreement eliminated quantitative restrictions on imports and stipulated a progressive reduction of import tariffs for vegetable oil. Afterward, the country avoided massive imports of vegetable oils by accelerating an expansion of its oilseed crushing capacity. Thus, China's soybean imports more than doubled in a single year—to 21.4 million metric tons (mmt) in 2002/03 from 10.4 mmt in 2001/02—with more than a third coming from the United States. The 2002/03 marketing year was the first that China's soybean imports had exceeded its own domestic production. Despite massive soybean imports, China also vies with India as the world's leading importer of soybean oil.

Despite comparatively strong growth in China's domestic consumption of meal and oil, overcapacity has come to plague its oilseed crushing industry. Efficient new coastal mills operated by private-government ventures have taken business away from uneconomic state-owned enterprises. Many of the latter faced default in mid-2004 when soybean prices suddenly collapsed, making the imports en route to China worth much less than their contracted price. Most were spared from the financial consequences of this price collapse when China's inspection agency determined that cargoes of Brazilian soybeans were contaminated by a prohibited fungicide. On this occasion, few U.S. soybean exports were affected, although for a time China used the previously unannounced phytosanitary standard to ban all shipments by most Brazilian exporters. The interruption slashed 2003/04 soybean imports into China to 16.9 mmt. The supply glut eased quickly and imports recovered in 2004/05 to a record-high 25.8 mmt.

For China and Southeast Asia, the robust growth of soybean meal demand has been led by a rapidly expanding poultry sector, with significant gains for hog feeding and aquaculture as well. A continuation of soybean meal use there, however, could depend on the region's ability to control avian influenza, one of the factors that precipitated the sharp reduction in China's 2003/04 soybean imports. This highly pathogenic disease has depressed poultry trade in recent years due to import bans on uncooked poultry products from affected countries. Limiting the rapid spread of the virus is difficult because populations of migratory birds can infect the many backyard poultry flocks in Asia. Similarly, any widening of the disease in Europe,

India, the Middle East, or Africa could fundamentally alter production practices and poultry demand, and therefore the worldwide demand for feed protein. Consumers switching to other meats, such as pork, could offset some of the impact on soybean meal demand.

India

India was the world's fifth leading producer of oilseeds in 2005. In the past decade, Indian production of soybeans and other traditionally grown oilseeds—such as peanuts, rapeseed, and cottonseed—has increased slowly. However, due to the poor use of farm inputs, Indian oilseed production is hampered by yields that are among the world's lowest. With its large population and rising incomes, India is unable to meet its vegetable oil needs through domestic oilseed production. India imposes prohibitive barriers on oilseed imports, so its deficit is met by large imports of vegetable oil. Even with relatively high tariffs (at or above 45 percent), India is now among the world's largest importers of vegetable oil. In contrast, India is a minor consumer of soybean meal, so it has historically exported surpluses of domestically crushed oilseed meals to other Asian countries. However, more of the country's domestic soybean meal output is being fed to poultry, eroding the supplies available for export.

The European Union (EU-25)

For decades, a large deficit between the European Union's domestic oilseed output and its consumption has kept it the world's top importer of soybean meal and second-leading importer of soybeans (recently surpassed by China). Yet, modest projected growth rates for EU-25 income, population, and livestock production will limit future import increases. Margins for EU-25 processors of imported soybeans are under increasing pressure due to ever cheaper soybean meal imports from South America. Also, EU-25 soybean crushers are handicapped by a lack of demand for soybean oil in food uses, due to the deterrent of required labeling for any foods derived from biotech ingredients. Now, with legal approval to sow biotech varieties in Brazil, costs to obtain biotech-free soybeans in the EU-25 will likely rise even higher.

In contrast, the world vegetable oil market, particularly within the EU-25, is undergoing a pivotal structural change with a growing demand for biodiesel. EU-25 processors' demand for domestically grown rapeseed has never been better due its utility as an oil source for biodiesel. The costs for petrodiesel have nearly doubled over the past 2 years, making biofuel alternatives much more attractive. EU-25 policymakers are clearly committed to reducing carbon emissions into the atmosphere and supporting the incomes of oilseed farmers by exempting biodiesel production from fuel taxes. The European Commission has set an ambitious goal for biofuels (including ethanol) to account for 5.75 percent of member states' fuel supply by 2010.

A long-term constraint in Europe and elsewhere is the lack of available farmland to produce biomass crops sufficient to meet the huge energy requirements. The deficit is already leading to record-high EU-25 imports of palm oil, with several new refineries being constructed primarily for producing biofuels from it. EU-25 demand for food oil might see a substan-

tial shift toward sunflowerseed oil imports, which could stimulate more output from processors in Argentina, Ukraine, and Russia. Until now, technical standards for biodiesel have limited the use of soybean oil, although a relaxation of its allowance in fuel blends may soon be prompted by a rising domestic deficit in vegetable oil.

NAFTA Partners

Under the North American Free Trade Agreement (NAFTA), Mexico immediately reduced its soybean tariff on NAFTA partners to 10 percent, and phased it out completely by 2003. With reforms in Mexico's domestic crop support programs, imports have virtually displaced domestic soybean production, with nearly all imports coming from the United States. As a consequence, U.S. soybean exports to Mexico have doubled since 1993 to over $900 million. Strong income growth among Mexican consumers has boosted consumption of meat and vegetable oils and increased demand for soybeans. Improvements in Mexico's rail links at the border have also expedited soybean and soybean meal trade. Likewise, the value of U.S. oilseed and product exports to Canada has more than doubled (to approximately $1 billion) since NAFTA was signed, while U.S. imports from Canada (mostly canola and canola products) have grown at a slightly slower pace. U.S. exports of soybeans and soybean meal have a dominant transportation advantage over competing suppliers in both markets.

Malaysia and Indonesia

U.S. exporters of soybean oil face competitive challenges not only from South American producers but also from palm oil producers in Southeast Asia. For the first time in 2004/05, world output of palm oil surpassed soybean oil production. The attractiveness of palm oil prices keeps pressure on the soybean oil market.[6] Palm oil shipments also benefit from lower freight costs to the primary Asian import markets.

The land available for additional palm acreage in Malaysia (currently the world's leading palm oil producer) is being depleted, and production gains will depend on the replacement of trees with higher-yielding varieties. Thus, growing demand in the food and biodiesel markets is mainly helping to promote an expansion of Indonesian palm area. Indonesia is richly endowed with available land and labor for palm oil production, and Malaysian-owned companies are investing capital and technical expertise there. But it will take several years for newly planted trees to bear fruit. Considerable investment in infrastructure will also be needed to deliver output from the new plantations to market. Some environmental organizations are opposed to expansion of Indonesian oil palm area, concerned that the necessary land clearing may damage wildlife habitat.

[6] Producers of palm oil in Indonesia and Malaysia also have a large stake in the international development of biodiesel markets. Palm plantations yield around four times more oil per acre than soybeans, and palm oil is less expensive than other vegetable oils. Exports of palm oil for biodiesel production or direct exports of biodiesel could become a major source of earnings in these countries. By 2007, Malaysia—to save on consumer fuel subsidies—will mandate use of a 5-percent palm-oil-based biodiesel blend in its domestic fuel supply.

Domestic Use of Soybeans for Bioenergy and Food To Expand

In coming years, the traditional (feed and food) uses for soybean meal and soybean oil are expected to rise gradually, roughly at the pace of U.S. population growth. In contrast, soybeans for nontraditional uses such as renewable fuels and bioproducts are expected to increase more quickly. Ethanol produced from corn has long been at the forefront of U.S. biofuels production. But, commercial development of a biodiesel industry has recently built up considerable momentum, and is becoming an important new source of demand for soybeans. Although biodiesel can be made from other oils and fats, soybean oil is the predominant raw material currently used in U.S. biodiesel production. More industrial applications or food uses (e.g., soy isoflavones, soy beverages) for soybeans hold some promise for supporting prices through higher overall demand and/or premiums for value-enhanced characteristics.

Bioenergy

The technical process (transesterification) for converting a vegetable oil or fat source into biodiesel is fairly straightforward. The normal conversion process for the fuel uses a ratio of 100 pounds of oil to 10 pounds of methanol (or ethanol) plus a catalyst (such as sodium hydroxide) that accelerates a chemical reaction. The end product is 100 pounds of a fatty ester (i.e., biodiesel) and 10 pounds of the byproduct glycerine. While there are minor performance differences, engines in current use can run well on a blend containing 20 percent biodiesel (B20) without any major modifications. Biodiesel has modestly lower fuel efficiency per gallon than regular diesel (Radich, 2004).

The main hurdle for biodiesel as a viable substitute for petroleum diesel has been its production economics. The cost of its feedstock relative to petroleum diesel is a primary determinant of the feasibility for producing biodiesel. Until recently, the cost of producing 100-percent biodiesel exceeded petrodiesel prices by $1.00-$1.50 per gallon, but a sharp rise in petrodiesel costs has narrowed its price advantage. Further cost improvements might be achieved through a promising new production technique that converts biodiesel directly from soybeans, instead of the conventional process using solvent-extracted soybean oil.[7] With the goals of environmental benefits and less U.S. dependence on foreign energy sources, a combination of government-mandated uses, tax subsidies, and procurement preferences has further brightened the outlook for biodiesel.

A desire to use more soybean oil for biofuels could spur research toward enhancing the oil content of soybeans. An increase in the oil extraction rate of just 1 percentage point would expand domestic soybean oil production by 1 billion pounds, or around 5 percent of current yearly use.

Currently, U.S. production capacity dedicated solely to biodiesel is more than 200 million gallons, with many new plants scheduled to open over the next year. In addition, the oleochemical industry could provide another 110

[7] Also needed are more buyers (domestic or export) for the joint products from the output of soybean oil and biodiesel (soybean meal and glycerine). Unless new markets are found for rising supplies of glycerine, the lower byproduct value could also constrain the profitability of biodiesel production. Traditional uses for glycerine are in toothpaste, cosmetics, and pharmaceuticals. Research for new glycerine applications include windshield fluid, antifreeze, and airplane de-icing products.

million gallons if the value of methyl esters for biodiesel were to exceed its value in other current uses. Actual U.S. biodiesel production may double in 2006 (from approximately 66 million gallons in 2005), but this is still less than capacity and far less than on-road diesel consumption of approximately 40 billion gallons per year.

The Environmental Protection Agency (EPA) describes biodiesel as a higher-oxygen fuel whose combustion creates fewer pollutants than petro diesel. Emission tests on B20 indicate average reductions of 21 percent for hydrocarbons, 11 percent for carbon monoxide, and 10 percent for particulate matter, compared with regular diesel fuel. As part of the 1990 Clean Air Act amendments, EPA will implement a lower standard on the sulfur content of fuels. Beginning June 1, 2006, a new standard will be established for ultra-low sulfur diesel.[8] The transition will be phased in, with up to 20 percent of diesel production allowed to meet the current sulfur standard through May 2010.

Just to meet the lower sulfur standard alone could require an annual biodiesel output of up to 400 million gallons, assuming it was used as the sole fuel additive and at a moderate additive rate of 1 percent by volume. Assuming that biodiesel produced from soybean oil were to account for all of the fuel additives, the soybean oil requirement could eventually be more than 3 billion pounds, or nearly 15 percent of current domestic supply. But other chemical additives can provide lubricity, so biodiesel must compete on cost-effectiveness.

The U.S. Energy Policy Act of 2005 sets a national renewable fuels (a combination of ethanol and biodiesel) standard of 4 billion gallons for 2006. This will increase to 7.5 billion gallons by 2012, although ethanol alone can likely fulfill the mandate. The first statewide mandate for biodiesel use was implemented in Minnesota during 2005, upon meeting a statutory minimum for production capacity. The law requires a 2-percent biodiesel blend for all diesel fuel sold in Minnesota, although implementation has been temporarily suspended due to initial failures in meeting fuel quality specifications.

The Federal Government is now providing a tax incentive for biodiesel production, and many States are considering them, too. The Federal tax incentive began January 1, 2005, and has been extended through 2008. It provides a Federal excise tax credit (at 1-cent-per-gallon per percent of inclusion) to biodiesel producers using new vegetable oil. Biodiesel producers using recycled vegetable oils can claim a tax credit at a half-cent-per-gallon.[9] With 2005 retail prices for petrodiesel rising as high as $3.00 per gallon and biodiesel production costs approaching that, the tax credit provides biodiesel producers the means to be more price competitive.

Biodiesel production has also been encouraged by USDA's Bioenergy Program, which subsidized purchases of soybean oil and animal fats for producing biodiesel. In fiscal year 2005, 66 million gallons of biodiesel (92 percent derived from soybean oil) were produced under the program. Subsidies averaged $0.63 per gallon on the additional production above the previous year's base amount, with much lower subsidies for production within the base. Program funding was originally capped at $150 million per fiscal year. Budgetary appropriations limited the program to $100 million

[8] Sulfur is a lubricity agent in diesel fuel, providing internal lubrication to engine parts as the fuel is consumed. With lower lubricity, ultra-low sulfur diesel fuel could add to mechanical wear in engines not designed to run on it. Biodiesel has good lubricity properties and could have potential as a fuel additive in older engines not designed for the new fuel standards.

[9] Recycled feedstocks (such as yellow grease), despite getting only half the tax credit of new oil, have a large cost discount that could gain them share increases in the future. The Internal Revenue Service interprets current law to permit biodiesel made from imported oils such as palm oil to also qualify for the full credit.

for fiscal year 2005 and $60 million for fiscal year 2006. Available funds cover only the first three quarters of fiscal year 2006, and program provisions are set to expire at the end of the fiscal year.

Procurement practices by government agencies have been another element in inaugurating a biodiesel market. Since the 1992 Energy Policy Act, the Federal Government has required portions of its vehicle fleet to operate on alternative fuels. Beginning in March 2005, the U.S. Navy requires use of B20 for all of its nontactical vehicles. Numerous Federal, State, and local government agencies are following suit. In 2005, California began to use biodiesel in all its government-owned vehicles. Distribution of biodiesel has been mostly limited to government truck-bus fleets and corporate users. Eventually, greater availability of the fuel should lead to wider retail distribution.

The transportation uses of biofuels have been studied far more extensively than their use as home heating oil, but its potential for oil furnaces and boilers could be just as great. USDA's Agricultural Research Service estimates that 50 million gallons of heating oil could be saved annually if all oil furnaces in the Northeast used a 5-percent biodiesel blend.

Bioproducts

Many manufactured products can be made from soybeans and soybean oil. These include nontoxic plastics, printing inks, lubricants, waxes, hydraulic fluids, electric transformer fluids, and solvents. The volume of soybeans being used in these applications is still small, but (compared with traditional uses) can be much more valuable on a per-pound basis. Many of the business ventures now producing bioproducts are operated by or in conjunction with farm cooperatives in rural areas. They not only can provide a market for farmers' output but could provide rural households with off-farm employment. To encourage commercial development, the 2002 Farm Act provided for preferential procurement of specified biobased products by all Federal agencies. The law also set aside $1 million annually for bioproduct testing.

Technology advances also promise more uses for soybean products. A major impediment to commercialization of soy-based industrial lubricants has been its low oxidative stability. The oil will oxidize rapidly during use (if untreated with antioxidants) and thicken toward a plastic-like consistency. Most soybean yield and quality improvements still come through conventional breeding, although biotechnology may accelerate the release of new varieties. A recent biotechnology breakthrough created a soybean variety with a high oleic content that is naturally stable and costs less to process. However, any soybean variety derived from biotechnology (either for its improved yield or use properties) must undergo an extensive approval process before commercially released both in the United States and soybean-importing countries.

Expanding Food Uses

Currently, U.S. soybean use in soy beverages, soyflour, and other foods is small, but these uses are growing rapidly. U.S. sales of soyfoods and supplements grew 5 percent in 2004 to $4 billion, with U.S. sales of soymilk

growing 16 percent to $917 million. Even a moderate increase in soyfood intake could eventually have a substantial impact on U.S. soybean demand. If every American consumed the U.S. recommended daily allowance (RDA) of 25 grams of soy protein, current U.S. soybean meal use (34 million tons) would expand by approximately 6 percent.

One factor spurring the use of soy protein in foods (both in this country and abroad) is the evidence of its health benefits. The FDA now allows any food containing a 5-gram serving of soy protein to carry a health claim on its label stating it could reduce the risk of heart disease. Use of soy isoflavones (a more concentrated product) is growing rapidly in fortified foods and nutritional supplements for the prevention of osteoporosis. One challenge has been to make soyfoods taste better, which may require further product innovations. Another is to remove the allergens that affect many children.[10]

Proponents of good diets have focused on making soybean oil a better food ingredient, particularly with regard to trans-fatty acids—a type of fat primarily created through partial hydrogenation of vegetable oils.[11] Medical studies have shown that trans-fatty acids in food can raise the LDL and lower the HDL cholesterol levels in the blood, both indicators of a higher cardiovascular risk. These concerns prompted FDA to require, as of January 1, 2006, food manufactures to disclose the number of grams of trans-fatty acids a food contains within the nutrition facts panel on every food label. Nutrition panels for foods with less than 0.5 gram of trans-fatty acids per serving can declare zero-percent content. In response, food manufacturers are seeking out vegetable oils that are low in trans-fatty acids. One way to do this is by using oils other than soybean oil, although current domestic output of these oils (sunflowerseed, canola, corn) is limited.

Instead, new methods of processing soybean oil are producing lower levels of trans-fatty acids. One involves a new technological advance that reduces the creation of trans-fatty acids while retaining the same product functionality for margarine and shortenings. Another technique uses lower temperatures during hydrogenation, which can greatly reduce the creation of trans-fatty acids. Scientists could also entirely eliminate the need to hydrogenate soybean oil through genetics, by altering the fatty acid profile of soybeans. Conventionally bred, low-linolenic soybean varieties, for example, were grown on 300,000 acres nationally in 2005, and could expand to nearly 1 million acres in 2006. Oil processors are currently offering growers production contracts for low-linolenic soybeans that pay price premiums of 35-40 cents per bushel over conventional varieties. Value-enhanced soybeans such as these require additional farm management. Yet, the advance guarantees on prices and markets may help producers reduce their financial risks.

[10] Beginning on January 1, 2006, FDA implemented a new requirement for all packaged foods that contain any of 8 major food allergens (including soy protein) to explicitly note its presence on the label.

[11] Hydrogenation is a process that saturates and hardens the fatty acids in liquid oils, enabling them to be used in solid products such as margarine, shortening, and fillings. The process also stabilizes soybean oil used for deep-fat frying.

Domestic and Trade Policy Issues

Specific changes in program provisions affecting soybeans are deliberated within the larger context of budget priorities, international obligations, market conditions, and policy developments. The Farm Security and Rural Investment Act of 2002 (2002 Farm Act) provisions were being considered at a time when projected budget surpluses allowed for increased spending on domestic farm programs. However, for the upcoming legislative review of farm programs, concerns over projected Federal budget deficits could affect future funding. Funding levels, types of support, and program eligibility are all sources of uncertainty for soybean producers and Direct and Countercyclical Program Payment participants with soybean base acres. Trade policy and domestic support issues—particularly related to ongoing Doha Round World Trade Organization (WTO) negotiations—will also shape discussions.

Overview of 2002 Farm Act Commodity Provisions

The 2002 Farm Act (http://www.ers.usda.gov/features/farmbill) governs Federal farm programs for the 2002-2007 crops and includes the following provisions for the soybean sector:

Marketing assistance loans—Soybean producers are eligible for marketing loans for current production at a U.S.-average $5.00 per bushel. Marketing assistance loans are intended to provide short-term liquidity until the farmer's crop is marketed, and also provide guaranteed minimum revenue for production. Marketing assistance loans first became available for soybeans under the 1990 Farm Act, starting with the 1991 crop, and continued in the 1996 and 2002 Farm Acts. The producer may settle the 9-month loan any day before maturity at an alternative loan repayment rate, known as the posted county price (PCP), if the PCP is below the loan rate. This benefit is known as a marketing loan gain (MLG). Another way to receive the marketing loan benefit is through a loan deficiency payment (LDP). These direct cash payments are made to producers who are eligible to receive a marketing loan, but agree to forgo one. The LDP payment rate equals the difference between the loan rate and the market-determined PCP. Thus, although market prices are not supported, farmers are guaranteed a minimum per-bushel revenue regardless of how low market prices fall.[12] USDA's Commodity Credit Corporation (CCC) absorbs the cost of these marketing loan benefits.

Direct and countercyclical payments (DCP)—Under the 2002 Farm Act, farmers could establish soybean base acres for the first time. Farmers who established soybean base acres (53.7 million acres) are now eligible for fixed direct payments based on a share of historical production. Soybean direct payments are the product of the 44-cent-per-bushel payment rate, 85 percent of the farm's soybean base acres, and the farm's direct payment yield.

Depending on market prices, farmers and DCP participants with soybean base can also receive countercyclical payments (CCPs) that can range from

[12] When marketing loan benefits are available, many farmers have even been able to achieve per bushel returns somewhat above the loan rate. This can occur through timing of the LDP when the PCP is the lowest relative to the loan rate, and by having either forward-contracted prior to harvest at a higher price or selling it after harvest once the price has risen.

0 to 36 cents per bushel. CCPs are the product of the national payment rate, 85 percent of the farm's base acres, and the farm's countercyclical payment yield. The payment rate for a soybean CCP is the difference between the target price ($5.80 per bushel) and, if lower, the "effective price"—which is the direct payment rate plus the higher of the national season-average farm price or the soybean marketing loan rate. Benefits are tied to historical plantings (soybean base acres) rather than current soybean plantings. The CCP rate was zero for the 2002 and 2003 crops. An initial CCP installment was paid out in the fall of 2004, but a subsequent rise in the market price eliminated the CCP for the 2004 crop, requiring a full reimbursement of the advance. Currently, no CCPs are expected for the 2005 crop.

Payment limitations—Annual limits on farm program payments per person have been a feature of U.S. farm policy since 1971. Changes in subsequent legislation have specified which types of payments are covered, and the dollar limits for each type of payment. Also, a "person" and that person's required contribution to one or more farm entities has been redefined. Under current law, a person is allowed to receive up to $40,000 in direct payments, $65,000 in countercyclical payments, and up to $75,000 in LDPs and MLGs per crop year. An individual can also receive half of their payment limits for their interests in two other farm entities, for a maximum total payment per person of $360,000.

Payment limits are designed to target farm payments toward smaller producers. A 2003 congressionally mandated report by the Commission on the Application of Payment Limitations for Agriculture[13] concluded that, regardless of their level, payment limitations for LDPs and MLGs have had little effect on payments, farm income, farmland values, or markets. Few producers reach the current limits, and the largest producers often can restructure their farms to lessen the effects of payment limitations. Producers can also pledge a portion of their crop as collateral for a 9-month nonrecourse loan, wait the full 9 months until loan maturity, and forfeit the commodity used as collateral. To discourage the CCC's accumulation of forfeited commodities, the law permits a producer who takes out a loan to exchange the commodity (prior to maturity) and purchase commodity certificates at that day's posted county price. The producer later exchanges the commodity certificates with CCC to re-establish control over the original collateral. No payment limits currently exist on either the amount of forfeiture gains or commodity certificate exchange gains a producer may receive, even though such gains provide essentially the same benefits to producers as LDPs or MLGs.

[13] www.usda.gov/agency/oce/reports/payment_limits/paymentLimitsAll.pdf

Risk Management Policies

Over the last decade, U.S. farmers have acquired a variety of new instruments for controlling their production and price risks. The Federal Crop Insurance Corporation offers two ways to minimize crop yield risk: (1) multiple-peril crop insurance (coverage based on farm-level yields), or (2) a group risk plan with coverage based on county-level yields. The rates for these policies, which are sold by private insurance companies, are federally subsidized. Currently, the government covers the full premium cost for catastrophic yield losses (exceeding 50 percent), with buy-up coverage available to guarantee a higher

percentage of the expected yield. Many farmers were encouraged last spring to increase insurance coverage for soybean acreage because of the new risk for Asian soybean rust. Another alternative for producer risk management is a variety of crop revenue insurance plans. Each plan differs on the specifics of how losses are determined, but all pay indemnities to farmers based on a shortfall in a crop's gross revenue rather than yield.[14]

Despite the wide availability of yield and revenue insurance, Congress regularly passes disaster relief legislation to compensate producers for yield and quality losses. Previous Administration proposals would have encouraged higher levels of insurance coverage and reduced government costs. These included requiring farmers to purchase crop insurance as a condition to receive commodity payments, reducing the government's subsidy at lower coverage levels, assessing higher fees for only catastrophic coverage, and a lower reimbursement for the administrative costs of private crop insurers. Such changes would also be consistent with the U.S. position in world trade negotiations to reduce non-commodity specific, trade-distorting spending. Some producers may prefer a more comprehensive insurance product that covers whole-farm revenue instead of separate coverage for individual commodities.

[14] For more information, see the ERS briefing room on Farm Risk Management, www.ers.usda.gov/Briefing/RiskManagement

Farm Program Costs and Budget Issues

During crop years 2002-04, the marketing loan benefits and direct/countercyclical payments for all eligible crops amounted to about $31 billion, or 15 percent of production value for those crops.[15] Soybean producers and DCP participants with soybean base acres received $2.1 billion over the same period in marketing loan benefits, direct payments, and CCPs. Of this amount, soybean producers received $315 million on LDPs, MLGs, and gains from certificate exchanges for soybeans, considerably less than the $8.3 billion received for the 1999-2001 crops.

[15] Source: Government payments from Commodity Estimates book for the President's FY 2007 Budget (February 2006). See Output 16, 18, 50. Production value from USDA-NASS "*Crop Values: 2005 Summary*" (February 2006).

The 2002-04 payments represent a relatively small share (4 percent) of the production value for soybeans (fig. 8), and are lower per base acre than some other crops. The maximum payment per base acre for soybeans ranked seventh out of the nine crops eligible for direct and countercyclical payments (fig. 9). Nevertheless, soybean outlays could increase substantially if soybean prices decline.[16]

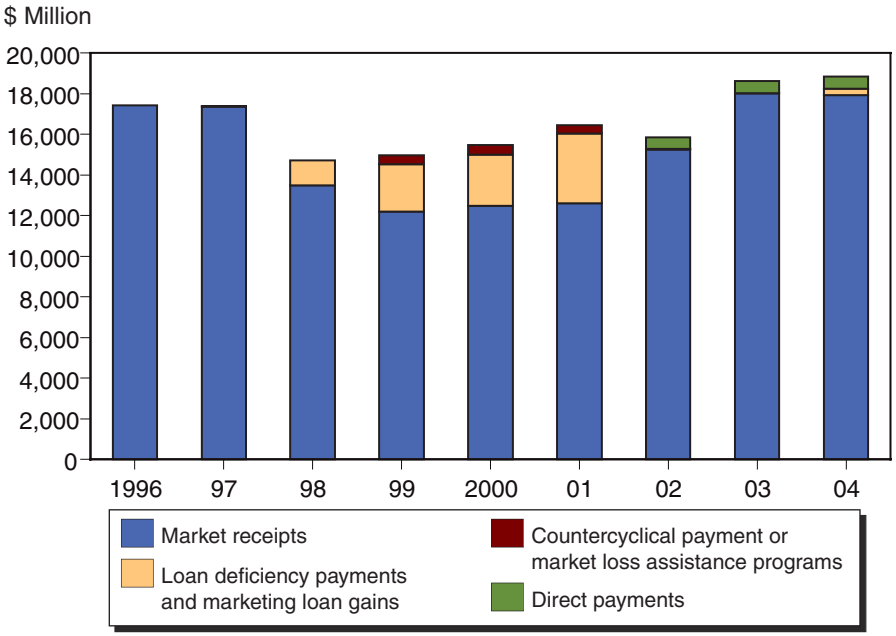
[16] LDPs and MLGs were particularly important in providing income support following sharp price declines in crop years 1999 and 2000, when soybean producers received $2.3 billion and $2.5 billion. Payments were also higher in these years because the soybean loan rate was $5.26 per bushel, 5 percent above the current $5.00 rate.

Although actual and projected commodity program outlays under the 2002 Act have been generally lower than the average spending during 1999-2001 (when emergency payments were high), they are higher than levels that prevailed throughout most of the 1990s (fig. 10). Commodity programs constitute a large share of projected spending on non-nutritional programs, and were expected to account for 62.7 percent of total non-nutrition program spending under the 2002 Farm Act, based on Congressional Budget Office estimates at the time (fig. 11).

New farm legislation might consider ways to alter the overall level of spending through changes in the basic structure of commodity programs or by modifying the parameters of existing programs. For example, loan rates, direct and countercyclical payment rates, the percentage of base acres

Figure 8

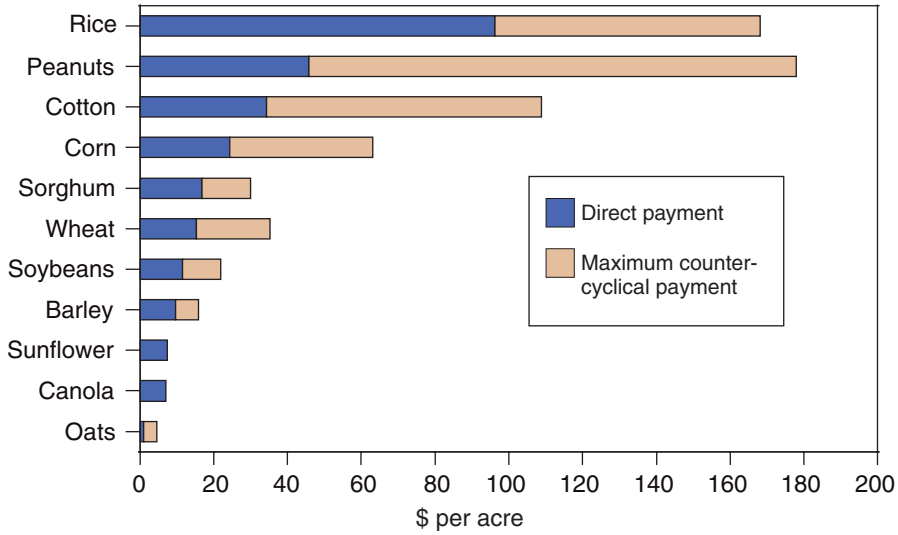
Government payments and market receipts for soybeans



Sources: Government payments: U.S. Department of Agriculture, Farm Service Agency, unpublished data: Market receipts: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Figure 9

Value of direct and countercyclical payments per base acre[1]



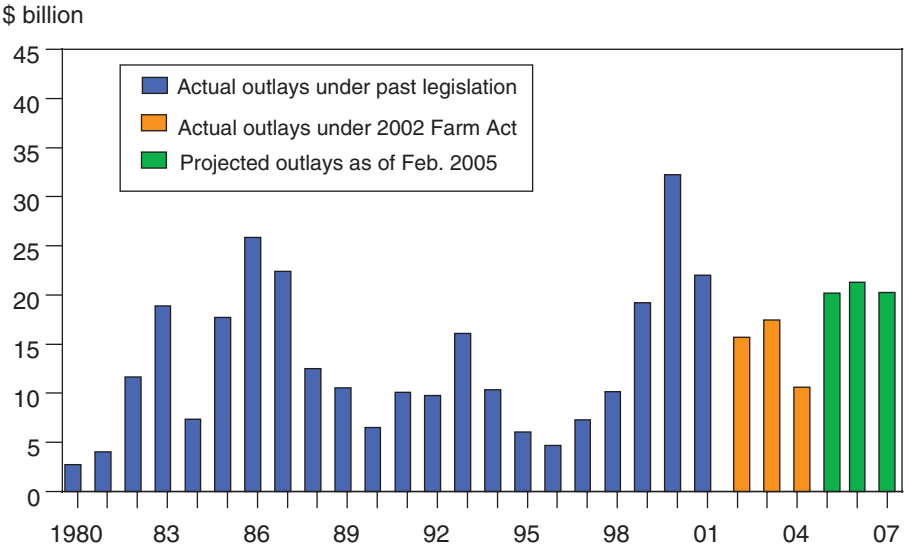
[1]Assumes national average payment yields and maximum countercyclical payments.

Source: Young et al, 2005.

covered by payments, the use of commodity certificates, payment limitations, and crop insurance provisions could be reconsidered. Funding for crops currently supported by commodity programs could compete with proposals to expand support for conservation programs or to provide support for other commodities. The latter condition could arise from a potential

Figure 10

Commodity Credit Corporation (CCC) net outlays*

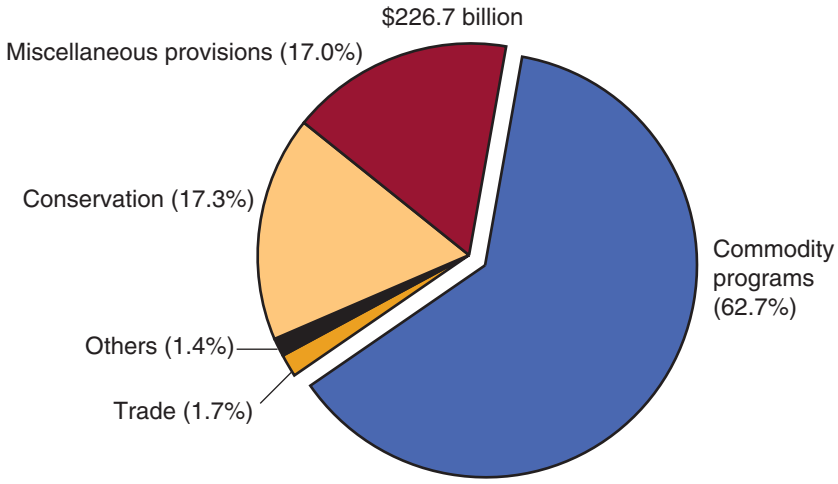


*The Commodity Credit Corportion (CCC) is a federally owned and operated corporation within the U.S. Department of Agriculture created to stabilize, support, and protect farm income and prices through loans, purchases, payments, and other operations. All money transactions for agricultural price and income support and related programs are handled through the CCC.

Source: www.ers.usda.gov/briefing/farmpolicy/gov-pay.htm

Figure 11

2002 Farm Act projected spending for non-nutritional programs, 2002-11



Note: Others include energy (0.18%), forestry (0.04%), research (0.69%) and rural development (0.45%).

Source: www.ers.usda.gov/briefing/farmpolicy/questions/cust2002act.htm

elimination of current restrictions on planting fruits and vegetables (Womach, 2005) on base acres.

Government program payments, such as direct and countercyclical payments, are partially capitalized into land values and rental rates (Barnard et al., 2001). Effects include impacts on the wealth of farmland owners

through increased land values, increased rental income of farmland owners, and producers' production costs (increased rental payments or costs to buy land). Nearly two-thirds of program acreage is leased. Consequently, future changes to government payments would affect land values and rental rates, which would affect future income statements and/or balance sheets of the farm sector.

Trade Policies

Trade policy concerns associated with international trade agreements, such as those of the WTO, have become a crucial part of the review of U.S. farm policy. In 2001, the WTO launched another round (the "Doha Round") of negotiations on agricultural trade that are still ongoing. Current negotiations are focusing on limiting the use of trade-distorting policies, such as tariff and nontariff barriers, export subsidies, and the types and levels of domestic agricultural support in member countries. Under the 1994 Uruguay Round Agreement on Agriculture, the United States and other countries capped the amount of trade-distorting domestic support provided to the agricultural sector. Soybean producers benefit from marketing loans, counter-cyclical payments, and crop insurance subsidies that are, or may be, subject to aggregate spending limits under the existing WTO agreement.[17] Spending limits could be further reduced or modified if an agreement can be reached under the Doha Round.

Current negotiations and proposals are focusing on developing a framework that would substantially increase market access (i.e., lower tariffs), eliminate export subsidies, and reduce domestic farm program payments, particularly those not decoupled from current production or price. Specific U.S. negotiating proposals include a 60-percent reduction in its own aggregate spending on trade-distorting support and a 55- to 90-percent reduction in developed-country import tariffs.[18] It would call for the EU-25, which has even higher levels of trade-distorting subsidies, to reduce spending by as much as 83 percent. Also proposed are reductions for each country's allowance of "non-commodity specific" trade-distorting support, from the current 5 percent of agricultural production value to 2.5 percent.

Even without a new trade agreement, the legality of some domestic farm policies is being challenged under current WTO rules and may affect policy options. Brazil's successful challenge to some segments of the U.S. cotton program, while not directly related to soybeans (except for the export credit programs), may have ramifications for U.S. commodity programs in general. The influence would extend to the marketing loan and countercyclical payment programs. The United States has already made some adjustments to its export credit guarantee programs to comply with one aspect of the WTO ruling on export subsidies. Specifically, the United States has adopted new risk-based fees on borrowers and eliminated the GSM-103 credit program to ensure that, over the long term, borrower fees entirely cover program costs. In fiscal 2005, credit programs financed U.S. exports of oilseeds ($414 million), protein meals ($170 million), and vegetable oils ($78 million).

[17] To date, the United States has not notified to the WTO how commodity support program payments under the 2002 Farm Act would be classified.

[18] In October 2005, the United States proposed major reform for the Doha Round of WTO negotiations (Office of the United States Trade Representative, 2005.) For details on this and any subsequent proposals, see www.ustr.gov.

Although trade in unprocessed soybeans is relatively unhindered by global tariffs, lower tariffs on imports of soybean oil and soybean meal could benefit domestic processors. Applied tariffs on soybean oil, for example, average about 20 percent for the world's top importers of the commodity, compared with rates generally at or below 10 percent for soybeans.[19] Modest achievements have been made in liberalizing access to these import markets through recent bilateral trade agreements, but a broader multinational agreement within the Doha Round could extend access for U.S. soybeans and products to other markets.

A world trade agreement could also be accompanied by further disciplines on the allowable forms of food aid, export credits, and activities of state trading enterprises. New disciplines on food aid would prevent commodity donations from displacing commercial sales. U.S. food aid programs operate with commodity donations from CCC-owned stocks or CCC tenders, which are sold in foreign markets for the financing of local development projects. U.S. food aid exports of vegetable oil in FY 2004 totaled $232 million, accounting for 19 percent of the total export value. The Bush Administration has proposed providing 25 percent of U.S. food aid under Title II in the form of cash, which could be quickly used to purchase commodities closer to a sudden food emergency.

[19] Agricultural tariff schedules for World Trade Organization (WTO) member countries report the current maximum permissible duties. In addition to tariffs, both exporters and importers have used other trade-distorting policies, such as differential export taxes in Argentina and in Brazil (prior to 1996) and phytosanitary barriers in India. These policies create incentives to boost domestic oilseed production or encourage exports of processed products, which tend to displace U.S. oilseed exports and shift the composition of U.S. exports toward whole oilseeds and away from value-added oilseed meals and vegetable oils.

Conclusions

Prior to 1996, U.S. policies to protect farm income were primarily based on controlling supply and prices through programs to restrict acreage, manage stocks, and limit imports. Such programs caused unintended consequences and adversely affected the competitiveness of U.S. agriculture. Today, the policy initiatives are focused on increasing demand through trade liberalization, expanding new uses, enhancing crop yields and quality, expediting cost efficiencies of production and transportation, conserving farm resources, and providing better ways to manage risk.

Since 2002, government payments to the soybean sector have been relatively small, consisting primarily of fixed direct payments, but potential outlays could increase if prices decline. Domestic market conditions, Federal budget deficit concerns, and multilateral trade negotiations will be important considerations throughout the review of new farm legislation.

Other policy considerations include the level of funding for farm conservation, infrastructure, rural development, and research programs. Under the WTO, many of these non-commodity-specific payments are not considered trade distorting and are not subject to discipline. A reallocation of Federal funding to these types of programs could aid U.S. efforts to stay within its current ($19.1 billion) limit on trade-distorting domestic support, and a possibly lower limit if and when a new trade agreement is reached. Farm incomes of soybean producers could be supported by a net expansion of exports from trade liberalization, which could offset any decline of domestic supports. Throughout the U.S. soybean sector, there are opportunities to discover new product uses and improvements in crop quality, develop more versatile risk management instruments, and lower costs of crop production and transportation.

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Useful Links

Oil Crops Yearbook tables (www.ers.usda.gov/publications/so/view.asp?f=field/ocs-bb/) include historical data covering domestic soybean production, trade, use, and prices.

Production, Supply and Distribution (PSD) database (www.fas.usda.gov/psd/) contains official USDA data on production, supply, and distribution of agricultural commodities for the United States and major importing and exporting countries. The database provides projections for the coming year and historical data for more than 200 countries and major crop, livestock, fishery, and forest products.

WTO Agricultural Trade Policy Commitments Database (www.ers.usda.gov/db/wto/) contains data on implementation of trade policy commitments by WTO member countries. Data on domestic support, export subsidies, and tariffs are organized for comparison across countries. This queriable database offers various options for viewing and downloading data.

Quick Stats: Agricultural Statistics Database (www.nass.usda.gov/Quick-Stats/) offers U.S., State, and county-level agricultural statistics for many commodities and data series. Quick Stats offers the ability to query by commodity, State, and year. The dataset can be downloaded for easy use in a database or spreadsheet.

Agricultural Atlas of the United States (www.nass.usda.gov/research/atlas02/) provides maps showing county-level data from the 2002 Census and some maps showing increases and decreases from 1997 Census data.

Farm policy background, program provisions, and history (www.ers.usda.gov/Briefing/FarmPolicy/historyOfFarm.htm) provides access to previous Farm Acts and policy backgrounders prepared by ERS for those Acts.

Farm Program Acres (www.ers.usda.gov/data/baseacres/) allows downloading and mapping of county-level farm program and planted acreage data for nine major program crops (corn, grain sorghum, barley, oats, wheat, rice, cotton, peanuts, and oilseeds).

Farm Programs, Price Supports, Participation, and Payment Rates (www.ers.usda.gov/Briefing/FarmPolicy/data/Provisions.xls) contains program parameters for individual commodities.

CCC Net Outlays by Commodity and Function (www.fsa.usda.gov/dam/bud/CCC%20Estimates%20Book/2006PresBud/Pres%20Bud%20Table%2035.pdf) provides total Commodity Credit Corporation expenditures by commodity.

U.S. and State farm income data include calendar year data on direct government payments.

• **Direct government payments, history** (www.ers.usda.gov/data/FarmIncome/finfidmu.htm#payments)

• **Latest forecast**
(www.ers.usda.gov/Briefing/FarmIncome/Data/GP_T7.htm)

Price Support Loan and LDP Activity Report (www.fsa.usda.gov/dafp/psd/Reports.htm) includes data on year-to-date and the previous 4 years of marketing loan and loan deficiency payment expenditures.

National and County Commodity Loan Rates (www.fsa.usda.gov/dafp/psd/LoanRate.htm) provides county and national marketing loan rates.

U.S. WTO Domestic Support and Support Reduction Commitments (www.ers.usda.gov/briefing/FarmPolicy/usnotify.htm) summarizes the U.S. domestic support notifications to the WTO.

Appendix 1—Comparison of Operating and Financial Characteristics Between More Specialized and Less Specialized Soybean Farms

According to the 2004 Agricultural Resource Management Survey (ARMS)[1], farms that grew soybeans averaged 550 acres of cropland in 2004, of which 545 acres were harvested crop acres (appendix table 1). Soybeans accounted for 266 (nearly half) of the harvested crop acres and for 42 percent of the farm value of production. Production specialty (determined by the largest proportion of gross commodity receipts from the farm operation) across farms growing soybeans was nearly equally divided between corn and soybeans. Soybeans were the production specialty on 31 percent of farms and corn the production specialty on 33 percent of farms. Soybeans are typically grown in a 2- to 3-year rotation on farms that also grow corn and wheat. Farms that grew soybeans were concentrated in the Heartland (68 percent) and the Northern Crescent (13 percent).[2]

[1] For more information on ARMS and to access data, see www.ers.usda.gov/Briefing/ARMS/

[2] For more information on ERS Farm Resource Regions, see www.ers.usda.gov/Briefing/ARMS/resourceregions/resourceregions.htm

Farms vary widely in size and characteristics, ranging from very small retirement and residential farms to establishments with sales in the millions. ERS combines occupations of operators and sales classes of farms to assign farms into one of three categories:

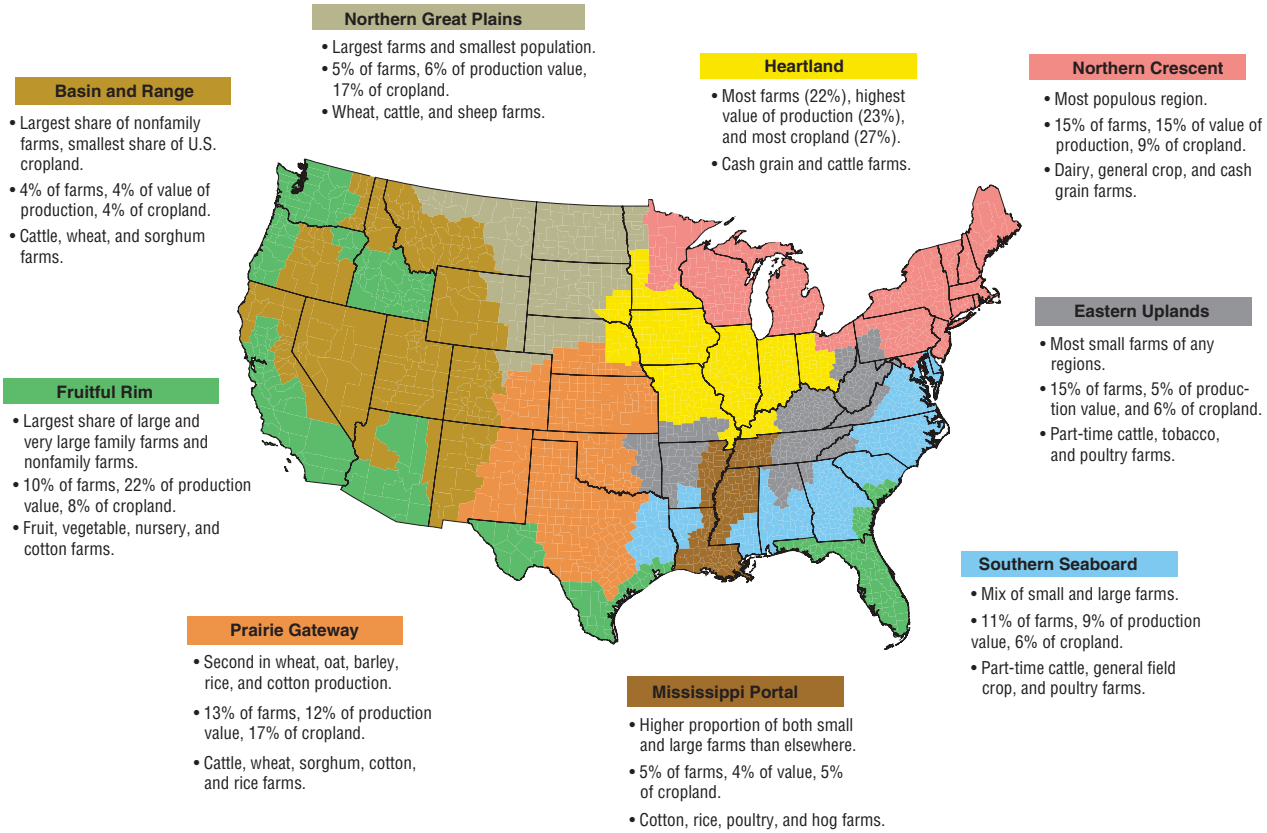
- Commercial farms (any farms with annual sales of $250,000 or more);
- Intermediate farms (farms with sales less than $250,000 and whose operators report farming as their primary occupation); and
- Rural-residence farms (farms with annual sales less than $250,000 and whose operators report their primary occupation as either retirement or off-farm).

Farms that grew soybeans were mostly rural residence and intermediate farms (appendix table 2). Commercial farms accounted for 20 percent of the total number of soybean farms, versus 45 percent rural residence and 35 percent an intermediate type.

Operational Characteristics of More and Less Specialized Soybean Farms

Farms growing soybeans where soybeans accounted for more than half of the total value of production (more specialized soybean farms) were distinct from farms where soybeans accounted for less than half of the total value of production (less specialized soybean farms). Farms specializing in soybeans were generally smaller in size and level of sales than less specialized soybean farms. More specialized soybean farms had, on average, much lower gross and net farm incomes and substantially fewer financial assets than less specialized soybean farms. Both groups were primarily located in the Heartland and Northern Crescent with over 50 percent of each group located in the Heartland (appendix tables 3 and 4).

Farm Resource Regions



In 2004, more specialized soybean farms accounted for 31 percent of all farms producing soybeans and for 24 percent of total soybean production, versus 69 percent and 76 percent on less specialized soybean farms (appendix table 1). On average, soybeans accounted for 65 percent of the total value of production on more specialized soybean farms and 38 percent on less specialized soybean farms.

The principal competing crops on farms producing soybeans were corn and wheat. The predominant crop on less specialized soybean farms was corn, with 48 percent of farms growing mostly corn. Less specialized soybean farms also had more livestock, primarily beef cattle, than more specialized soybeans farms. More specialized soybean farms grew almost as much wheat as less specialized soybean farms, but harvested much less corn.

Although most soybean farms were located in the Heartland, they were mostly the less specialized farms. More specialized farms had a larger representation in the Northern Crescent, and were more predominant in the Southern Seaboard and Mississippi Portal than the less specialized soybean farms.

More specialized soybean farms in all regions were smaller in size and sales than less specialized soybean farms. In the Northern Crescent, more specialized soybean farms were much smaller in size and sales than those in the Heartland (appendix table 3). The Northern Great Plains and Mississippi Portal had the largest farm size and highest average soybean acreage of all more specialized soybean farms in 2004 (appendix table 4). Soybean farms

were also more diverse in these two regions. Wheat, corn, rice, cotton, and sorghum were grown on Mississippi Portal soybean farms. Corn, wheat, and barley were grown on soybean farms in the Northern Great Plains.

About two-thirds of more specialized soybean farms were classified as rural-residence farms and 8 percent as commercial farms versus 35 percent rural-residence and 26 percent commercial for less specialized soybean farms (appendix table 2). About 45 percent of both more specialized and less specialized soybean farms were classified as rural-residence farms and 20 percent as commercial farms. Thus, less than 10 percent of the more specialized soybean farms are commercial farms with over $250,000 in sales, versus 26 percent of less specialized soybean farms.

Financial Characteristics of More and Less Specialized Soybean Farms

More specialized soybean farms were much smaller in terms of sales than less specialized soybean farms (appendix table 5). The less specialized soybean farms had gross crop sales over twice as large as sales on more specialized soybean farms. Cash expenses of the less specialized soybean farms were also more than double those of more specialized soybean farms.

Net farm income for more specialized soybean farms was half that of less specialized soybean farms. Partially offsetting this net farm income gap was off-farm sources of income. More specialized farms had nearly 11 percent higher off-farm incomes, as their operators were more likely to report a non-farm job. On more specialized soybean farms, 36 percent of farm operators listed farming as their primary occupation. On less specialized soybean farms, farming was reported as the primary occupation by 65 percent of operators (appendix table 2).

Farm asset and equity positions of less specialized soybean farms were much higher than the more specialized soybean farms. Financial positions (debt-to-asset ratio) were similar.

Farm and Operator Characteristics of Profitable Soybean Farms in 2004

Profitable soybean farms (farms with income greater than farm expenses) in 2004 had more cropland, harvested more soybean acreage, and had a higher soybean yield than unprofitable soybean farms (appendix table 6). Profitable soybean farms were more likely to specialize in corn production and be located in the Heartland than soybean farms that were not profitable.

Operators of profitable soybean farms were older and had more education than operators of farms that were not profitable (appendix table 7). Also, profitable soybean farms were more likely to be commercial farms (sales of $250,000 or more) and less likely to be intermediate farms (sales less than $250,000) than soybean farms that were not profitable.

Appendix table 1

Characteristics of soybean farms, 2004

Item	More specialized[1]	Less specialized	All soybean farms
Total farms	66,112	145,028	211,140
ARMS share (percent):			
Soybean farms	31	69	100
Soybean acres	25	75	100
Soybean production	24	76	100
Farm size (average acres):			
Operated	390	730	623
Owned	175	287	252
Rented	215	442	371
Cropland	338	647	550
Harvested	330	642	545
Sales class (percent of farms):			
Less than $40,000	58	24	35
$40,000 -$99,000	18	27	24
$100,000 - $249,999	16	24	22
$250,000 - $499,999	5	17	13
$500,000 or more	3	8	6
Soybean acreage (average):			
Harvested	216	289	266
Yield (bushels/acre)	41	43	43
Other crop acreage (average):			
Corn for grain	65	258	198
Wheat	31	46	41
Production specialty (percent of farms):[2]			
Soybean	100	0	31
Corn	0	48	33
Beef cattle	0	4	2
Wheat	0	3	2
Farm resource region (percent of farms):			
Heartland	58	72	68
Northern Crescent	19	11	13
Northern Great Plains	2	4	4
Prairie Gateway	5	6	5
Eastern Uplands	2	2	2
Southern Seaboard	8	2	4
Mississippi Portal	6	3	4

[1] We define more specialized soybean farms as farms where soybean value of production is greater than 50 percent of total value of production.

[2] Production specialty is the farm's production classification that represents the largest proportion of gross commodity receipts from the farm operation.

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 2

Farm operator characteristics of soybean farms, less versus more specialized, 2004

Item	More specialized	Less specialized	All soybean farms
Operator age (years)	54	55	54
Age of operator (percent of farms):			
Less than 50 years	37	35	36
More than 50 years	63	65	64
Education (percent of farms):			
Less than high school	7	4	5
High school degree	46	47	46
Some college	26	27	27
Completed college	21	22	22
Primary occupation (percent of farms):			
Farming	36	65	56
Retirement	17	9	12
Nonfarm job	47	26	32
Farm typology (percent of farms):[1]			
Rural residence	66	35	45
Intermediate	26	39	35
Commercial	8	26	20

[1] Rural residence farms had operators whose occupation was retirement or a nonfarm job. Intermediate and commercial farms had operators whose primary occupation was farming. Intermediate farms had sales less than $250,000, whereas commercial farms had sales of $250,000 or more.

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 3

Characteristics of more specialized soybean farms for regions with the most soybean farms, 2004

Item	Heartland	Northern Crescent	All more specialized soybean farms
Total farms	38,827	12,415	66,112
ARMS share (percent):			
Soybean farms	59	19	100
Soybean acres	55	8	100
Soybean production	62	7	100
Farm size (average acres):			
Operated	376	195	390
Owned	186	108	175
Rented	190	86	215
Cropland	330	164	338
Harvested	320	149	330
Sales class (percent of farms):			
Less than $40,000	48	84	58
$40,000 - $99,999	24	9	18
$100,000 - $249,999	20	5	16
$250,000 - $499,999	6	1	5
$500,000 or more	2	1	3
Soybean acreage (average):			
Harvested	203	94	216
Yield (bushels/acre)	47	36	42
Other crop acreage (average):			
Corn for grain	85	31	65
Wheat	21	13	31
Sorghum	1	0	2

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 4

Characteristics of more specialized soybean farms for regions with the highest average soybean acreage, 2004

Item	Northern Great Plains	Mississippi Portal	All more specialized soybean farms
Total farms	1,381	3,848	66,112
ARMS share (percent):			
Soybean farms	2	6	100
Soybean acres	8	17	100
Soybean production	5	16	100
Farm size (average acres):			
Operated	1,693	920	390
Owned	520	224	175
Rented	1,173	696	215
Cropland	1,525	804	338
Harvested	1,332	845	330
Sales class (percent of farms):			
Less than $40,000	23	38	58
$40,000 - $99,999	4	11	18
$100,000 - $249,999	38	28	16
$250,000 - $499,999	24	12	5
$500,000 or more	11	11	3
Soybean acreage (average):			
Harvested	803	636	216
Yield (bushels/acre)	26	38	42
Other crop acreage (average):			
Wheat	379	82	31
Corn for grain	97	56	65
Rice	0	25	2
Cotton	0	20	2
Sorghum	0	11	2
Barley	24	0	1

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 5

Financial characteristics of soybean farms, 2004

Item	More specialized	Less specialized	All soybean farms
Gross value of production ($)	90,822	219,238	179,029
Soybean value of production ($)	59,442	82,404	75,214
Soybean value of production (percent)	65	38	42
Farm income statement ($ per farm):			
Gross cash income	117,169	212,973	182,975
Livestock sales	25,581	13,978	17,611
Crop sales	67,333	142,966	119,378
Government payments	9,032	21,234	17,413
Commodity-program payments	7,821	19,930	16,132
Conservation payments	1,211	1,304	1,281
Cash expenses	74,143	144,805	122,679
Net cash farm income	43,026	68,168	60,296
Depreciation	8,768	20,167	16,598
Net farm income[1]	27,795	55,187	46,610
Farm balance sheet ($ per farm):			
Farm assets	662,099	1,183,555	1,020,277
Farm liabilities	64,360	126,051	106,734
Farm equity	597,739	1,057,504	913,543
Debt/asset ratio (percent)	0.10	0.11	0.10
Favorable position[2]	71	72	71
Farm household income ($ per household):			
Total household income	91,250	106,986	102,010
Farm-related income[3]	27,436	49,487	42,515
Off-farm income	63,813	57,498	59,495
Earned sources	49,329	40,685	43,419
Unearned sources	14,484	16,813	16,077

[1] Net farm income is net cash farm income less costs for depreciation and noncash benefits for hired workers, plus the value of the inventory change in 2004 and any nonmoney income. Nonmoney income includes the value of farm products consumed on the farm and an imputed rental value for the farm dwelling.

[2] Favorable position means a positive income and debt/asset ratio less than 0.40. These farms are generally considered financially stable.

[3] Farm-related income is that portion of farm income that is accrued by the farm household. Farm-related income is then adjusted to reflect any other households that share in the farm business income, and the farm earnings of household members other than the farm operator.

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 6

Characteristics of soybean farms, 2004

Item	Not profitable[1]	Profitable	All soybean farms
Total farms	51,451	159,690	211,140
ARMS share (percent)			
Soybean farms	24	76	100
Soybean acres	21	79	100
Soybean production	20	80	100
Farm size (average acres):			
Operated	597	632	623
Owned	243	255	252
Rented	355	377	371
Cropland	506	564	550
Harvested	495	561	545
Sales class (percent of farms):			
Less than $40,000	43	32	35
$40,000 - $99,000	21	25	24
$100,000 - $249,999	23	21	22
$250,000 - $499,999	10	14	13
$500,000 or more	3	8	6
Soybean acreage (average):			
Harvested	216	289	266
Yield (bushels/acre)	40	44	43
Other crop acreage (average):			
Corn for grain	175	205	198
Wheat	40	42	41
Production specialty (percent of farms):[2]			
Soybean	31	31	31
Corn	30	34	33
Beef cattle	3	2	2
Wheat	3	2	2
Farm resource region (percent of farms):			
Heartland	64	68	68
Northern Crescent	16	13	13
Northern Great Plains	4	4	4
Prairie Gateway	6	5	5
Eastern Uplands	4	2	2
Southern Seaboard	4	5	4
Mississippi Portal	3	4	4

[1] We define not profitable soybean farms as those where total farm expenses are greater than farm income.

[2] Production specialty is the farm's production classification that represents the largest proportion of gross commodity receipts from the farm operation.

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix table 7

Farm operator characteristics of soybean farms, profitable versus nonprofitable, 2004

Item	Not profitable	Profitable	All soybean farms
Operator age (years)	53	55	54
Age class (percent of farms):			
Less than 50 years	38	35	36
More than 50 years	62	65	64
Education (percent of farms):			
Less than high school	9	4	5
High school degree	48	46	46
Some college	23	28	27
Completed college	20	22	22
Primary occupation (percent of farms):			
Farming	59	55	56
Retirement	6	14	12
Nonfarm job	35	31	32
Farm typology (percent of farms)[1]:			
Rural residence	45	45	45
Intermediate	40	33	35
Commercial	15	22	20

[1] Rural residence farms had operators whose occupation was retirement or a nonfarm job. Intermediate and commercial farms had operators whose primary occupation was farming. Intermediate farms had sales less than $250,000 or more, whereas commercial farms had sales of $250,000 or more.

Source: 2004 USDA Agricultural Resource Management Survey.

Appendix 2—Soybean Production Costs and Returns Without Government Payments

In the short run, annual production decisions are typically based on the relationship between operating costs and expected prices. Operating costs for soybean production include such items as seed, fertilizer, pesticides, fuel, and custom operations. As the planning span increases and capital assets have to be replaced, producers must consider total economic costs in relation to prices. In addition to operating costs, total economic costs include the annualized cost of maintaining the capital investment (depreciation and interest) in machinery, equipment, and facilities, and costs for property taxes, insurance, land, and upaid labor. The replacement of farm assets requires substantial investments, so farmers often make that decision in conjunction with determining whether to continue producing a particular commodity.

To provide some insight on how production costs compare with per unit production revenues excluding Government payments, appendix figure 2a shows both operating and total economic costs of soybean production for crop years 2000-2004. During these years, the season-average price for soybeans ranged from a low of $4.38 per bushel in 2001 to a high of $7.34 in 2003. In all years, the U.S. soybean season-average price was above the average operating and total economic costs for soybeans at the national level.

Soybean Farm Operator Reliance on Program Payments

One way to assess the extent to which farmers rely on subsidy payments to cover their economic costs of production is via the economic cost ratio (ECR), a ratio of expenses to revenues. The ECR gives the economic rather than accounting cost required to produce each dollar of agriculture's value of producing crops and livestock. An ECR greater than 100 percent suggests that the farm operation is in difficulty, although it may be still be able to operate in the short run.[1] An ECR equal to 100 percent indicates a state of equilibrium in which there is no theoretical incentive for change.

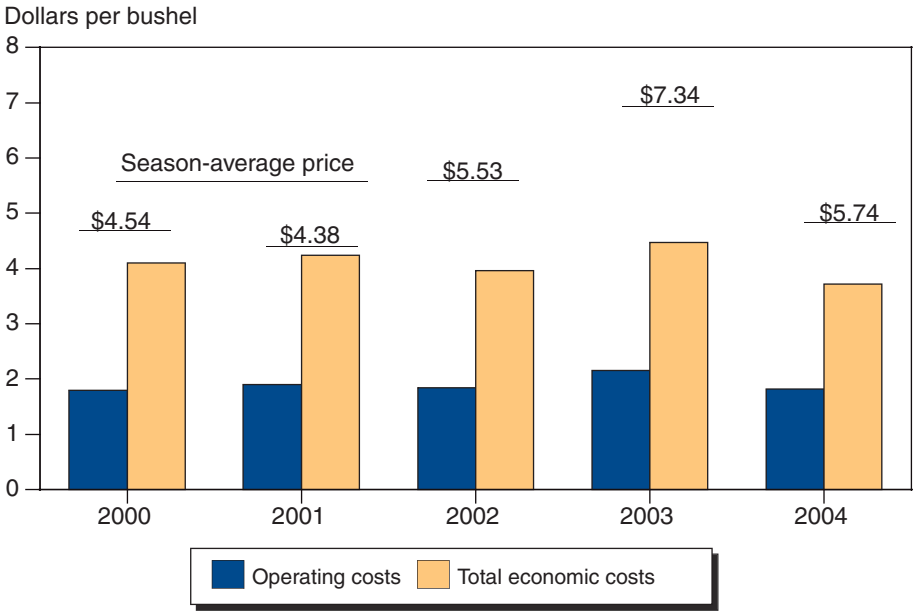
Comparing ECR with and without government payments (appendix figure 2b) shows the importance of program payments to the ECR. Of particular interest is the horizontal distance between the cumulative distribution of the ECR with payments and without. This horizontal distance can be considered the dependence of farms—in the context of the ECR—on program payments.

In 2004, 70 percent of all soybean-producing farms had whole-farm operations that were considered profitable. About 30 percent of soybean-growing farms, therefore, were unable to cover farm economic costs with farm-related income. The portion able to cover economic costs rises to 76 percent when government payments are included as farm revenues.

[1] Economic costs are total cash costs plus an allowance for depreciation, along with an imputed return to management and to unpaid labor of the operator and family.

Appendix figure 2a

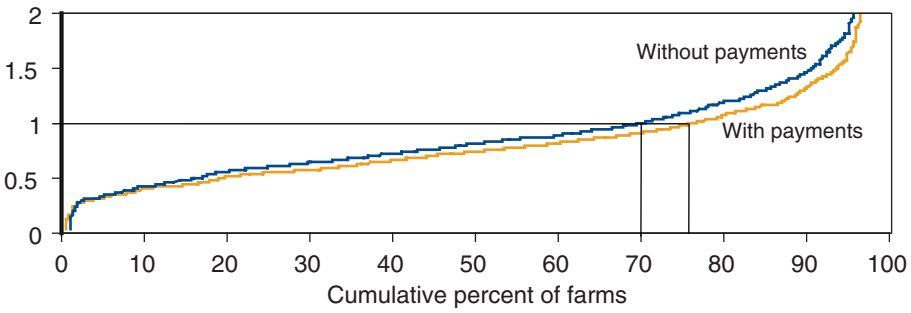
U.S. soybean production costs, 2000-2004



Note: These costs do not include storage and marketing costs. Ownership costs include land costs. Here, costs refer to costs solely related to soybean production.
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quick Stats data base.

Appendix figure 2b

Distribution of all soybean farms by economic costs per dollar of revenue, 2004



Note: Costs and revenues refer to the whole-farm operation of farms that grow soybeans.
Source: 2004 USDA Agricultural Resource Management Survey.