Impacts of the U.S. Marketing Loan Program for Soybeans

Paul C. Westcott and J. Michael Price[1]

Abstract: Baseline projections for 1999 and 2000 indicate soybean prices that are lower than the soybean loan rate, resulting in revenue-boosting, marketing loan benefits to soybean farmers in the form of loan deficiency payments and marketing loan gains. Implications of this situation are examined for the soybean sector as well as for effects on other crops. Of particular interest are effects of marketing loans on acreage, prices, and exports to identify and quantify market distortions of this domestic support program in the context of U.S. commitments to the World Trade Organization. The analysis uses USDA's 1999 baseline and simulations of an econometric model for the U.S. agricultural sector (FAPSIM). Comparisons are made between a marketing loan program scenario that represents current policy and a scenario with no commodity loan program. Results indicate somewhat higher soybean acreage due to marketing loans, raising soybean sector exports and lowering soybean prices. Much of the soybean acreage gain comes from corn, sorghum, and upland cotton, reducing production and exports of those crops, while increasing their prices. Most impacts occur in the years when there are soybean marketing loan benefits, with little effect in subsequent years when soybean prices rise above their loan rate.

Introduction

Commodity loan programs in the United States are one of the major domestic support programs and have been in existence in various forms since the 1930s, primarily covering major field crops. Different versions of these programs over time have been designed to provide different benefits to producers, including price support, income support, price stability, and short-term liquidity.

In the past 15 years, loan programs for major field crops have moved from price support programs to marketing loan programs. While costs of marketing loan programs through 1997 were generally quite small, lower commodity prices in the last few years have led to significant program costs. Total marketing loan benefits rose from less than $200 million for 1997 crops to more than $3.7 billion for 1998 and could exceed $5 billion for 1999 crops. For U.S. commitments to the World Trade Organization (WTO) under the 1994 Uruguay Round Agreement on Agriculture, marketing loans are considered to be "amber box" because of their potential to significantly affect production and trade.

This paper investigates the nature of market distortions in the U.S. agricultural sector resulting from the soybean marketing loan program. Effects of the program within the soybean sector as well as cross-commodity effects to other crops are analyzed. Of particular interest are effects of this domestic support program on acreage, prices, and exports to identify and quantify market distortions in the context of U.S. commitments to the WTO.

Commodity Loan Programs—Price Support and Marketing Loan Programs

Commodity loan programs have been operated in two major ways. Commodity loan programs supported market prices over most of their history, starting in 1933. Marketing loans have been used more recently, starting in the mid-1980s with rice and upland cotton, and provide income support but do not support market prices.

Commodity loan programs allow producers of designated crops to receive a loan from the government at a crop-specific loan rate per unit of production by pledging production as loan collateral. Following harvest of the crop, a farmer may obtain a loan for all or part of the new crop.[2] For production put under loan and pledged as loan collateral, the

[1] Agricultural Economists, Market and Trade Economics Division, Economic Research Service, USDA.

[2] Generally, participation in farm commodity programs for the crop has been required for loan program participation. In the past, annual commodity programs for feed grains, wheat, rice, and upland cotton included supply management provisions (such as acreage reduction programs or set-aside programs) and producers were required to comply with such provisions to be eligible for program benefits, including the loan program and target-price-based deficiency payments. Under the 1996 Farm Act, supply management programs were eliminated, but farmers of program crops were required to enroll at least one program crop in the 7-year program to be eligible for program benefits, including production flexibility contract payments and commodity loans (Young and Westcott). For oilseeds, however, there have been no other program features beyond the loan program, so no program enrollment has been required and all production of oilseeds has been eligible for the loan program.

farmer receives a per-unit amount equal to that year's loan rate. Under the loan program, the producer must keep the crop designated as loan collateral in approved storage to preserve the crop's quality. The producer may repay the loan (plus interest) at any time during the length of the loan, usually 9 months for most crops (10 months for cotton).

Before marketing loans were implemented (discussed below), to repay the loan, the farmer would return the loan principal plus accrued interest charges. Alternatively, rather than repaying the loan, the farmer could choose to default on the loan at the end of the loan period, keeping the loan money and forfeiting ownership of the loan collateral (the crop) to the government. If market prices were below the loan rate, the farmer would benefit from defaulting on the loan and keeping the higher loan rate. Additionally, if market prices were above the loan rate, but below the loan rate plus interest, keeping the loan proceeds and forfeiting the crop would also make economic sense because the cost of settling the loan (loan rate plus interest) would be greater than the market value of the crop. Price support to the sector was provided by the acquisition of crops by the government through loan program forfeitures, which essentially removed crops from the marketplace.

With the introduction of marketing loans, the operation of commodity loan programs changed. Marketing loan programs were started for rice and upland cotton in 1986 under provisions of the 1985 Farm Act. Subsequent legislation mandated marketing loan programs for soybeans and other oilseeds starting in 1991. Marketing loan programs for wheat and feed grains were implemented starting with 1993 crops, under the GATT trigger provisions of the Omnibus Budget Reconciliation Act of 1990. The 1996 Farm Act continued marketing loan programs for all of these crops.

Under a marketing loan program, loan placements may occur as described above. However, as implemented, marketing loan provisions allow repayment of commodity loans at less than the original loan rate when market prices are lower. This feature decreases the loan program's potential effect on supporting prices because stock accumulation by the government through loan defaults is reduced. Instead, farmers are provided economic incentives to retain ownership of the crops and sell them (hence the term "marketing loan") rather than default on loans and forfeit ownership of crops to the government.

Producers can receive marketing loan benefits in two different ways. The first way is through the loan program. Farmers place their crop under the commodity loan program, as described above, by pledging and storing some of their production as collateral for the loan, receiving a per-unit loan rate for the crop. But rather than repaying the loan (plus interest) at some time during the loan period, farmers are allowed to repay the loan at a lower loan repayment rate when market prices are below the loan rate. Marketing loan repayment rates are based on local, posted county prices for wheat, feed grains, and oilseeds, or the prevailing world market price for rice and upland cotton. When a farmer repays the loan at the lower posted county price or prevailing world market price, the difference between the loan rate and the loan repayment rate is called a marketing loan gain and represents a program benefit to producers. In addition, any accrued interest on the loan is waived.

Alternatively, farmers of crops covered by the loan programs (except extra-long staple cotton) may choose to receive marketing loan benefits through direct loan deficiency payments (LDPs) when market prices are lower than commodity loan rates. The LDP option allows the producer to receive benefits of the marketing loan program without having to take out and subsequently repay a commodity loan. The LDP rate is the amount by which the loan rate exceeds the posted county price or prevailing world market price, and thus is equivalent to the marketing loan gain that could alternatively be obtained for crops under loan. If an LDP is paid on a portion of the crop, that portion cannot subsequently go under loan. By taking the LDP and immediately selling the crop, a producer can effectively receive a per-unit revenue equal to the loan rate (assuming the sales price equals the posted county price), partly from the market and the rest from the government.

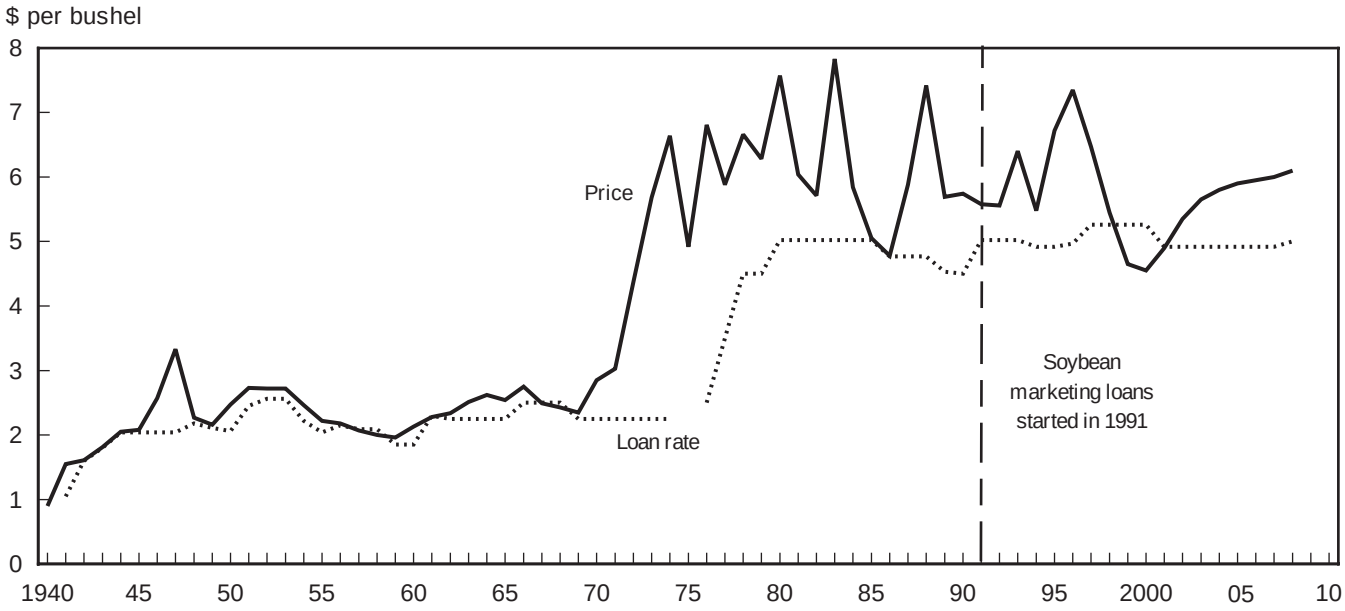
The marketing loan program thereby provides an effective per-unit revenue floor at the loan rate for eligible crops, with a countercyclical effect occurring through marketing loan benefits when the price is below the loan rate. However, the marketing loan program does not establish a floor for market prices since commodities typically remain available to the marketplace rather than being acquired by the government through loan program forfeitures.

Thus, when the expected market price for a given crop is below its loan rate, the loan rate provides the economic incentive to plant that crop because market receipts are augmented by marketing loan benefits. As a result, producers plant more acreage to supported crops than they otherwise would. Further, if loan rates do not reflect relative market prices, the mix of crops planted also may be affected.

Soybean Loan Program Background

The soybean loan program was first introduced in 1941 and has been in place since then except in 1975 (Schaub and others). In most years, particularly since 1970, annual soybean prices have been above the soybean loan rate (fig. A-1), with farmers using the soybean loan program mostly as a source of short-term liquidity until they sold their crop. However, in some years, mostly before 1970 and in the mid-1980s, soybean prices fell to near the loan rate and loan program activity supported market prices through placements and forfeitures. Loan placements of the 1985 soybean crop, for example, reached nearly 25 percent of production, and nearly 60 percent of those placements (about 14 percent of the crop)

Figure A-1
Soybean prices and loan rates



Source: 1998-2008 projections, February 1999 USDA Baseline.

were forfeited to the government. Season average prices for soybeans for 1985 (when 1985 loan placements occurred) and 1986 (when most 1985-crop loan defaults occurred) were within a few cents of the respective loan rates.

Recently, strong U.S. and global production of soybeans have led to large supplies, building stocks and reducing soybean prices. Prices for soybeans in USDA's 1999 baseline projections were below the soybean loan rate for 1999 and 2000 (USDA). However, with the introduction of marketing loan provisions to the commodity loan program for soybeans in 1991, the nature of this domestic support program has changed from the price supporting role of earlier loan programs. Marketing loan provisions still provide an economic incentive to producers equal to the loan rate, although the program benefit is provided through an income transfer rather than through a price support achieved by government acquisition of the crop through loan defaults. Under marketing loan provisions, producers generally retain ownership of the crop and sell it in the marketplace at market prices, without prices being supported by government purchases. Nonetheless, marketing loan benefits to producers mean that the economic incentive for production decisions is related to the loan rate rather than to the market price, thus introducing potential distortions to the soybean market.

WTO Treatment of Domestic Support Programs

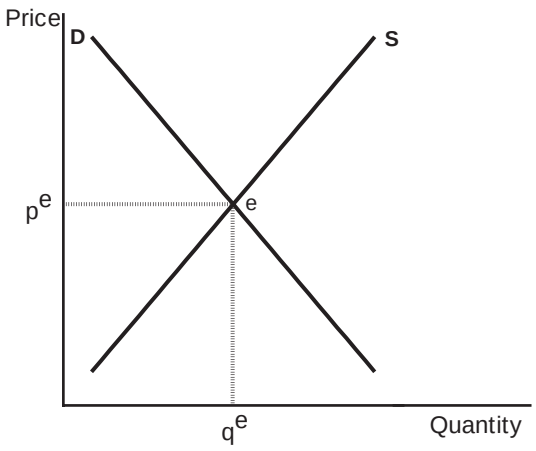
In the 1994 Uruguay Round Agreement on Agriculture, domestic support programs were categorized into groups based on whether the support provided was coupled to production and the degree of the program's potential effect on production and trade (Nelson, Young, Liapis, and Schnepf; Young, Nelson, and Schnepf). Amber box policies cover programs that have the most potential to distort production and trade. These policies are subject to limitations under the WTO with the level of allowable support gradually declining over time. Green box policies are those that have the smallest effect on production and trade and are therefore permitted without limitation under the WTO. Blue box policies include payments made as part of programs that also have production-limiting features.

The U.S. marketing loan program is considered to be an amber box, domestic support program for WTO notifications. This classification reflects the general availability of marketing loan benefits to program participants for production of eligible crops regardless of use, as well as the potential of the program to influence crop production decisions of farmers through economic incentives provided by those program benefits.

Analytical Framework

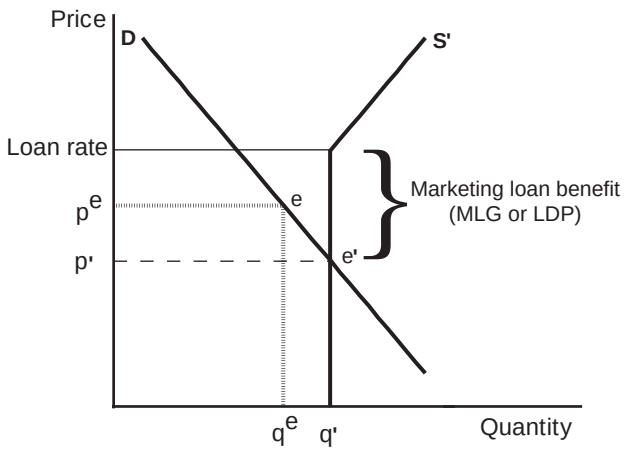
Figures A-2 and A-3 illustrate the effects of marketing loans on commodity markets. Figure A-2 starts with a simple no-program situation without market distortions. Market equilibrium is at the intersection of supply and demand at point e with a price of p^e and an equilibrium quantity of q^e. This no-program equilibrium provides a reference point for assessing impacts of the alternative policy situation of a marketing loan program.

Figure A-2
Supply and demand, market equilibrium



Source: Economic Research Service, USDA.

Figure A-3
Supply and demand, marketing loan program



Source: Economic Research Service, USDA.

Marketing loan provisions are then added for the commodity in figure A-3, at a loan rate that exceeds the no-program price equilibrium. The primary effect is that the supply curve is kinked and becomes perfectly inelastic at the loan rate. For any price movement below the loan rate, the producer can capture a marketing loan benefit, through either a marketing loan gain or a loan deficiency payment. Assuming that the sales price for the crop is equal to the posted county price, the marketing loan benefit ensures a per-unit revenue for the crop equal to the loan rate. Thus, the loan rate becomes the effective producer incentive price that applies for the supply curve at all prices below the loan rate. The demand function for the commodity is not affected by the marketing loan program, so it remains the same as in figure A-2. However, a new equilibrium results at point e' at a price of p' and a quantity of q'.

Comparisons to the no-program equilibrium at point e provide an indication of the distortions introduced by the marketing loan program. With the marketing loan program, the producer incentive price has been raised from the no-program price equilibrium level of p^e to the loan rate. In response, farmers expand production, by ($q' - q^e$) in figure A-3. Since the demand function is not affected by the marketing loan program, the increase in production moves the equilibrium down along the demand function. At the new equilibrium, the quantity demanded is augmented by the same amount as the production increase, ($q' - q^e$). To the extent that exports are a portion of this new equilibrium quantity demanded, some part of ($q' - q^e$) represents a program distortion affecting exports. The increase in production reduces the market price, by ($p^e - p'$) in figure A-3. Importantly, while the marketing loan program raises the producer incentive price, the market price at the new equilibrium is lower.

Other crops are affected as well. These effects reflect both the higher producer incentive price provided to farmers of the crop eligible for marketing loan benefits as well as the reduced market price for that crop. The higher producer incentive price for the marketing loan crop shifts the supply curve to the left for other crops that compete with the marketing loan crop for planted acreage. The reduction in market prices for the marketing loan crop moves the demand curve to the left for crops that compete with (are substitutes for) the marketing loan crop in uses, while moving the demand curve to the right for crops that are demand complements with the marketing loan crop. Empirically, supply adjustments dominate in these cross-commodity effects.

Model Simulations and Results

To illustrate the effects of marketing loan provisions, an analysis was conducted for the soybean program. Projections in the 1999 USDA baseline indicate soybean market prices that are lower than the soybean loan rate for 1999 and 2000, resulting in marketing loan benefits for soybean producers.

The analysis uses simulations of a U.S. agricultural sector model, FAPSIM (see box). FAPSIM was initially simulated to depict the 1999 USDA baseline scenario that includes the effects of soybean marketing loans. A second model simulation was then conducted with FAPSIM that removed marketing loan provisions. The simulation without marketing loan provisions provides a reference scenario from which to measure effects of marketing loans.

As a simplifying assumption in the model, marketing loan benefits were assumed in the simulations only when the season average price was below the loan rate. Since marketing loan gains and loan deficiency payments are based on daily or weekly prices, benefits can exist within a crop year even if the season average price exceeds the loan rate due to the seasonal movement of prices. Additional benefits of the program reflect the reduction of downward revenue risk even when expected prices exceed the loan rate. As such, program impacts are somewhat under-represented in the model

The Modeling Framework—FAPSIM

The Food and Agricultural Policy Simulator (FAPSIM) is an annual econometric model of the U.S. agricultural sector. The model was originally developed at the U.S. Department of Agriculture during the early 1980s (Salathe, Price, and Gadson; Gadson, Price, and Salathe). Since that time, FAPSIM has been continually re-estimated and re-specified to reflect changes in the structure of the U.S. food and agricultural sector. Because of the model's size (over 700 equations), only a brief discussion of the general structure and content of the model is presented here.

The model contains three broad types of relationships: definitional, institutional, and behavioral. Definitional equations include identities that reflect mathematical relationships that must hold among the data in the model. For example, total demand must equal total supply for a commodity at any point in time. The model constrains solutions to satisfy all identities of this type.

Institutional equations involve relationships between variables that reflect certain institutional arrangements in the sector. This would include commodity loan rates, for example, that are announced annually for major crops, using fixed formulas established by U.S. farm programs.

The two preceding types of equations reflect known relationships that necessarily hold among the variables in the model. Behavioral equations are quite different because the exact relationship is not known and must be estimated. Economic theory is used to determine the types of variables to include in behavioral equations, but theory does not indicate precisely how the variables should be related to each other. Examples of behavior relationships in FAPSIM are the acreage equations for different field crops. Economic theory indicates that production should be positively related to the price received for the commodity and negatively related to prices of inputs required in the production process. Producer net returns are used in the FAPSIM acreage equations to capture these economic effects. The net returns measures also include policy features, such as marketing loan provisions, that can influence planting choices. Additionally, net returns for other crops that compete with each other for land use are included in the acreage equations.

For the most part, a linear relationship is used to approximate the general functional form for each behavioral relationship. All of the parameters in the linear behavioral relationships were estimated by single equation regression methods. The large size of the model precludes the use of econometric methods designed for systems of equations. Ordinary least squares was used to estimate the majority of the equations. If statistical tests indicated the presence of either autocorrelation or heteroscedasticity in the error structure of an equation, maximum likelihood methods or weighted least squares were used.

Commodities included in FAPSIM are corn, sorghum, barley, oats, wheat, rice, upland cotton, soybeans, cattle, hogs, broilers, turkeys, eggs, and dairy. Each commodity submodel contains equations to estimate production, prices, and the different demand components. The submodels are then linked together through common variables that are important to the different commodities. The model solution computes the market prices that equilibrate supply and demand in all of the commodity markets simultaneously.

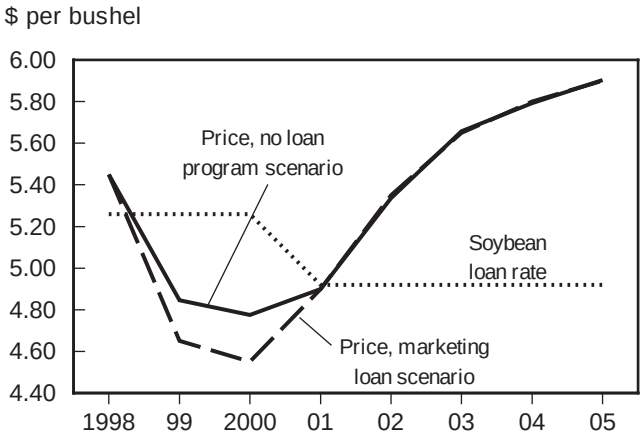
The ability of the FAPSIM model to simulate different policies lends itself to analysis of marketing loan provisions. Further, the variables in the model reflect USDA's baseline projections, which are a Departmental consensus on a long-run scenario for the U.S. agricultural sector. The baseline projections are based on specific assumptions regarding the macroeconomy, international developments, weather, and agricultural policies. Thus, the baseline provides a well-defined scenario from which alternative scenarios can be compared. The analysis in this article is based on long-term projections from USDA's February 1999 baseline (USDA).

simulations. However, this modeling simplification allows the analysis to focus on effects of marketing loan provisions for just one crop since soybeans is the only crop in the 1999 USDA baseline with season average prices projected lower than its loan rate.

The marketing loan scenario introduces program benefits to soybean producers in 1999 and 2000 because loan rates exceed market prices in those 2 years (fig. A-4). The higher implicit producer incentive price in those years raises soybean net returns as well as relative net returns compared with other crops. In response, soybean producers plant more soybeans. With soybean price expectations initially 40 to 50 cents below the soybean loan rate in 1999 and 2000, soybean marketing loans are estimated in the model simulations to add 1.1 to 1.2 million acres to soybean plantings in those years (fig. A-5).

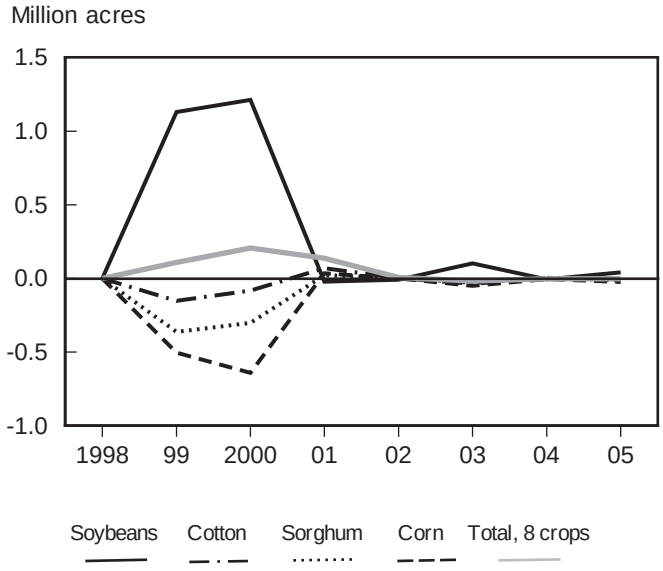
Cross-commodity effects draw much of the increase in soybean plantings from competing crops, particularly corn, sorghum, and upland cotton, reflecting the effects of soybean marketing loan benefits on relative net returns among the cropping alter-

Figure A-4
Soybean prices and loan rates



Source: Economic Research Service, USDA.

Figure A-5
Acreage impacts of soybean marketing loans



Reflects effects of soybean marketing loan benefits in 1999 and 2000.

Source: Economic Research Service, USDA.

natives. However, total planted acreage for eight major field crops increases 100,000 to 200,000 acres, as the aggregate effect on acreage reflects the addition of a subsidy to the sector.

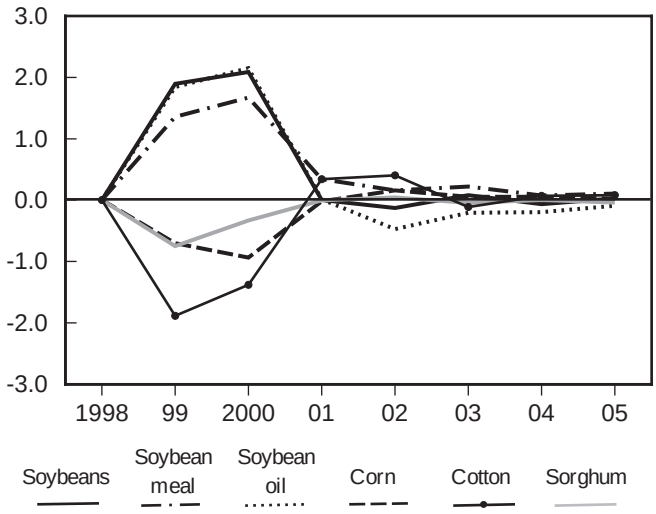
Importantly, acreage effects are largely confined to those years where prices are below the loan rate for soybeans (1999 and 2000 in the model simulations), years when marketing loan benefits augment expected market returns and distort production incentives. Only small dynamic, carryover effects on plantings occur in subsequent years (2001 and beyond) when prices rise above loan rates and soybean marketing loan benefits are no longer present in the simulations.

Trade-distorting effects of soybean marketing loan provisions result from the effects on planted acreage. With increased production, the soybean market clears at lower prices with a higher equilibrium quantity demanded, including soybean exports. Domestic soybean crush is also increased with exports of soybean meal and soybean oil raised as well. U.S. exports for soybeans, soybean meal, and soybean oil for 1999 and 2000 are generally 1 to 2 percent higher in the model simulations (fig. A-6). For corn, sorghum, and cotton, however, reduced production leads to lower exports at somewhat higher prices. Cotton exports decline by 1 to 2 percent in the simulations, while corn and sorghum exports decline by less than 1 percent. These soybean sector and cross-commodity impacts on exports provide trade-distorting effects to global markets for those crops. However, as for the acreage effects, U.S. export and trade impacts are primarily in the 2 years in the scenarios when marketing loan benefits existed, with limited effects in subsequent years.[3]

Higher soybean production pushes prices further below the soybean loan rate. Soybean prices are reduced 20 to 25 cents a bushel in 1999 and 2000 in the simulations (fig. A-7), with corresponding higher marketing loan benefits resulting. Lower production for crops that lose acreage to soybeans pushes their prices up. Price increases for corn and

[3] This result differs from the effects of price-supporting loan programs as existed prior to the introduction of marketing loans. For such programs, stock accumulation by the government through loan defaults in lower-priced years leads to release of government stocks at a later time, thus extending market impacts, including exports effects, over a longer time period. However, multi-year, cumulative impacts under a price-supporting loan program are largely offsetting.

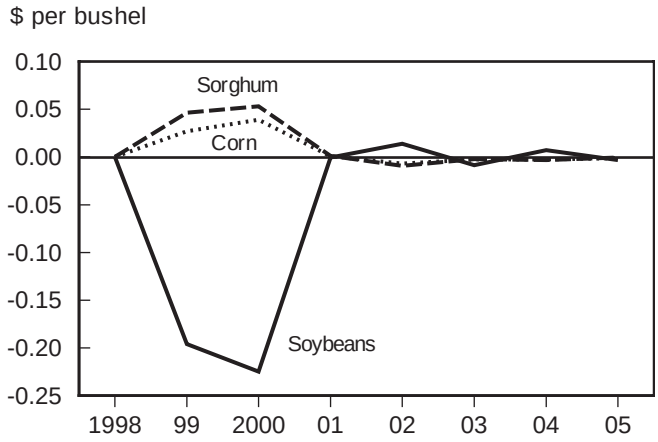
Figure A-6
Export impacts of soybean marketing loans



Reflects effects of soybean marketing loan benefits in 1999 and 2000.

Source: Economic Research Service, USDA.

Figure A-7
Price impacts of soybean marketing loans



Reflects effects of soybean marketing loan benefits in 1999 and 2000.

Source: Economic Research Service, USDA.

sorghum are less than 6 cents a bushel, while cotton prices rise by less than 1 percent. Again, impacts are mostly in years when soybean marketing loan benefits occur in the model simulations.

Conclusions

The marketing loan program in the United States has the potential to distort domestic production, U.S. exports, and global trade. Consequently, the program is classified as an amber box, domestic support policy in WTO notifications. Market effects primarily reflect increased production incentives provided to farmers through the loan program or loan deficiency payments when market prices fall below commodity loan rates. Because marketings of crops are not directly affected by the program, increased production that results for the marketing loan crop leads to a new equilibrium with a lower price and an increased quantity demanded. That is, most distortions for the supported crop derive from the increase in its production and reflect the market response to the larger supply. Additionally, most of the effects of marketing loan programs occur in the years when prices are below the loan rates and marketing loan benefits exist. Only small dynamic, carryover effects occur in later years after prices rise above loan rates.

Cross-commodity effects also are important. Increased acreage for the marketing loan crop draws land from competing crops, reflecting program-related changes in relative net returns. This results in reduced production, lower exports, and higher market prices for crops that lose acreage to the supported crop.

For the soybean marketing loan scenario analyzed in this article, acreage and export impacts are generally below 2 percent and price impacts are lower than 5 percent. Because of modeling simplifications assumed in the empirical analysis, these impacts are likely to somewhat under-represent the full effects of marketing loans. Additionally, the magnitudes of these impacts are dependent on the size of the initial marketing loan benefits analyzed in the scenario, 40 to 50 cents a bushel. Larger impacts would result for scenarios with lower prices and larger marketing loan benefits. Conversely, smaller effects would result with higher prices and smaller marketing loan benefits. Nonetheless, the results illustrate some of the key properties of how marketing loan programs affect agricultural commodity markets.

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