Analysis of the U.S. Commodity Loan Program with Marketing Loan Provisions. By Paul C. Westcott and J. Michael Price, Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 801.

Abstract

Over the next several years, crop prices are projected to be below to slightly above commodity loan rates. As a result, marketing loan benefits to farmers, in the form of loan deficiency payments and marketing loan gains from the commodity loan program, are likely to continue to be sizeable. The level of realized per-unit revenues facilitated by marketing loans exceeds commodity loan rates, thereby raising expected net returns to farmers. Model simulations show that the loan program can raise total acreage planted to major field crops, generally increasing levels of domestic use and exports while lowering crop prices. Cross-commodity effects of supply response to relative returns (including marketing loan benefits), however, result in acreage shifts among competing crops, which can lead to reductions in plantings of some crops in some years. Most impacts occur in the years when there are marketing loan benefits, with little effect in subsequent years when prices rise high enough to eliminate marketing loan benefits. The livestock sector benefits from these outcomes because of generally lower feed costs.

Keywords: Commodity loans, marketing loans, nonrecourse loans, loan deficiency payments, price support, commodity programs.

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Summary

The commodity loan program has had significant budgetary outlays over the past few years, largely related to marketing loans. As crop prices declined in the late 1990's, total marketing loan benefits rose from less than $200 million for 1997 crops to more than $3.8 billion for 1998 and about $8 billion for 1999 crops. USDA's February 2000 baseline projections indicate a continuation of sizeable marketing loan budgetary costs for the next several years, as crop prices are projected to be below to slightly above corresponding commodity loan rates, resulting in revenue-increasing, marketing loan benefits to farmers in the form of loan deficiency payments and marketing loan gains.

This report investigates the nature of market effects in the U.S. agricultural sector resulting from the commodity loan program with marketing loans. The analysis uses USDA's 2000 baseline and simulations of an econometric model for the U.S. agricultural sector (FAPSIM). Comparisons are made between a loan program scenario with marketing loans (representing current policy) and a scenario with no commodity loan program.

Commodity loan programs are one of the major domestic support programs in the United States. These programs have been in existence in various forms since the 1930's, primarily covering major field crops. Over the past 15 years, U.S. commodity loan programs for major field crops have added marketing loan provisions to existing nonrecourse loan provisions. As a result, loan programs have effectively moved from providing price support to providing income support without supporting market prices.

The level of realized, per-unit revenues facilitated by marketing loans is shown to exceed commodity loan rates when crop prices are relatively low. Many farmers use a two-step marketing procedure in which they receive program benefits when prices are seasonally low (and program benefits high) and then sell their crop later in the marketing year when prices have risen.

The historical above-loan-rate level of realized per-unit revenues facilitated by marketing loans provides a floor for farmers' expectations of per-unit revenues in subsequent years. This policy effect raises producers' expected net returns and is built into the acreage response functions used in the model simulations to depict the effects of commodity loan programs with marketing loans.

The commodity loan program with marketing loans can influence planting decisions and acreage allocation. Higher total acreage is planted to major field crops due to loan program benefits, raising aggregate production. This leads to generally higher levels of domestic use and exports and lower crop commodity prices as markets respond to the increase in supplies.

The commodity loan program with marketing loans can also induce farmers to shift acreage among competing crops. Acreage changes for individual crops reflect the effects of marketing loan benefits on absolute and relative net returns among

cropping alternatives, as well as acreage response elasticities. In some cases, these cross-commodity effects reduce acreage and production of crops receiving relatively low or no marketing loan benefits, lowering domestic use and exports of those crops while raising their prices.

Most impacts of marketing loans occur in the years when there are marketing loan benefits, with little effect in subsequent years when prices rise high enough to eliminate marketing loan benefits. The livestock sector benefits from these outcomes because of generally lower feed costs.

Analysis of the U.S. Commodity Loan Program with Marketing Loan Provisions

Paul C. Westcott and J. Michael Price

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 1930's, 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.

Over the past 15 years, commodity loan programs for major field crops have added marketing loan provisions to existing nonrecourse loan provisions. As a result, loan programs have effectively moved from providing price support to providing income support without supporting market prices. While annual costs of marketing loans through 1997 were generally small, lower commodity prices in the last few years have led to significant budgetary costs. Total marketing loan benefits rose from less than $200 million for 1997 crops to more than $3.8 billion for 1998 and about $8 billion for 1999 crops. USDA's February 2000 baseline projections indicate a continuation of sizeable marketing loan costs for the next several years, as crop prices are projected to be below to slightly above corresponding commodity loan rates (USDA, Office of the Chief Economist).

This report investigates the nature of market effects in the U.S. agricultural sector resulting from the commodity loan program with marketing loans. The analysis focuses on acreage, production, use, and price effects of the program among major field crops directly affected by marketing loans.

Commodity Loan Programs—Price Supports and Marketing Loans

Commodity loan programs have operated in two major ways: price support and income support. Commodity loan programs supported market prices over most of their history, starting in 1933. With the more recent introduction of marketing loan provisions, starting in the mid-1980's with rice and upland cotton, commodity loan programs now provide income support to producers but do not support market prices.

Loan Program Operation

Commodity loan programs allow producers of designated crops to receive loans from the government at a crop-specific loan rate per unit of production by pledging production as loan collateral. A farmer may obtain a loan for all or part of a crop at any time following harvest through the following March or the following May, depending on the crop.[1] Most loan placements occur shortly after harvest, when prices tend to be seasonally low, and provide short-term financing to farmers.

For production put under loan and pledged as loan collateral, the farmer receives a per-unit amount equal to that year's loan rate (in the farmer's county) for the crop. 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 9- to 10-month loan period.

Before marketing loans were introduced (discussed next), the farmer could satisfy the loan by repaying the loan principal plus accrued interest charges. Alternatively, the farmer could choose to settle the loan at the end of the loan period (loan maturity) by keeping the loan proceeds 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 settling the loan this way, 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 to the government would also make economic sense because the cost of repaying the loan plus interest would be greater than the market value of the crop. The loan program provided price support to the sector by the government's acquiring crops through loan program forfeitures which, in combination with Commodity Credit Corporation (CCC) sales price restrictions, essentially removed crops from the marketplace as long as prices remained low.[2]

Marketing loans were started for rice and upland cotton in 1986 under provisions of the 1985 Farm Act. Subsequent legislation mandated the availability of marketing loans for soybeans and other oilseeds starting in 1991. Marketing loans for wheat and feed grains were implemented starting with 1993 crops, under the General Agreement on Tariffs and Trade (GATT) trigger provisions of the Omnibus Budget Reconciliation Act of 1990. The 1996 Farm Act continued marketing loans for all of these crops. The addition of marketing loan provisions significantly changed the operation of the commodity loan program.

Loan placements under the commodity loan program with marketing loans may occur as described earlier under nonrecourse loan provisions. Marketing loan provisions, however, allow farmers to repay commodity loans at less than the original loan rate (plus interest) when market prices are lower. This feature decreases the loan program's potential effect on supporting prices by reducing the government's accumulation of stocks through forfeitures. Instead, marketing loans provide farmers economic incentives to retain ownership of crops and sell them (hence the term "marketing loan") rather than forfeit ownership of crops to the government to settle loans.

Producers can receive marketing loan benefits through two different channels: the loan program and loan deficiency payments. Under the loan program, farmers place their crop under the commodity loan program, as described earlier, by pledging and storing all or part of

[1] Generally, farm commodity program participation is a requirement for loan program eligibility. 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 required producers to comply with such provisions to be eligible for program benefits, including the loan program and target-price-based deficiency payments. The 1996 Farm Act eliminated supply management programs, but required farmers of program crops 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; Nelson and Schertz). There have been no other program features for oilseeds beyond the loan program, so no program enrollment has been required and all production of oilseeds has been eligible for the loan program.

[2] The 1996 Farm Act removed CCC sales price restrictions.

their production as collateral for the loan, receiving a per-unit loan rate for the crop. But rather than repay the full loan (plus interest), farmers may repay the loan at a lower repayment rate at any time during the loan period that market prices are below the loan rate. Marketing loan repayment rates for wheat, feed grains, and soybeans are based on local, posted county prices (PCP), and repayment rates for rice and upland cotton are based on the prevailing world market price.[3] When a farmer repays the loan at a lower posted county price or prevailing world market price, the marketing loan gain, or the difference between the loan rate and the loan repayment rate, represents a program benefit to producers. In addition, the program waives any accrued interest on the loan when the loan repayment rate is below the loan rate plus interest.

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 (LDP). The LDP option allows the producer to receive marketing loan benefits 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 farmers could obtain for crops under loan. If an LDP is paid on a portion of the crop, that portion cannot subsequently go under loan.

[3] PCPs are calculated daily except weekends and holidays. Prevailing world market prices for rice and upland cotton are calculated weekly.

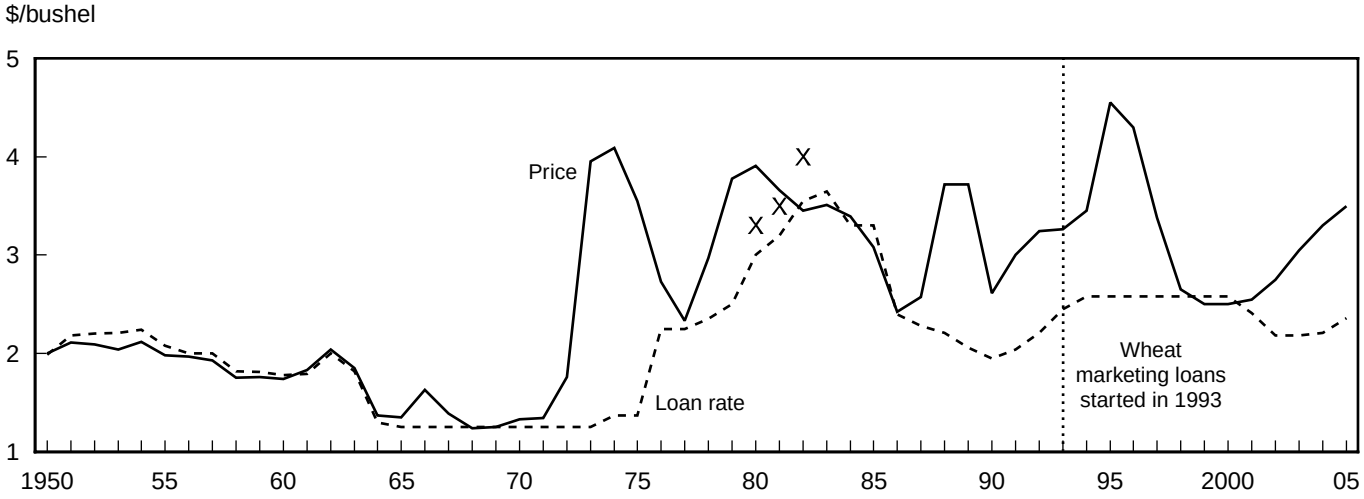
Loan Program History

Figures 1-5 show historical loan rates and annual prices received by farmers for wheat, corn, soybeans, rice, and upland cotton since 1950, as well as USDA's February 2000 baseline projections for these variables (except cotton prices) through 2005. In some years, annual crop prices were above the corresponding loan rates, and farmers used the loan program mostly as a source of short-term liquidity until they sold their crops. In other years, crop prices were near loan rates, and loan program activity supported market prices through placements and forfeitures.

This price-supporting aspect of the loan program was particularly evident before 1970, in the early- to mid-1980's for corn and wheat, in the early 1980's for upland cotton, and in the mid-1980's for soybeans. Loan placements during these periods were generally high, representing a significant portion of production, and farmers forfeited a large amount of those placements to the government. For example, loan placements of the 1985 soybean crop reached nearly 25 percent of production, and farmers forfeited nearly 60 percent of those placements (about 14 percent of the crop) to the government (Schaub, McArthur, Hacklander, Glauber, Leath, and Doty). Season average prices for soybeans for 1985 (when 1985 loan placements occurred) and 1986 (when most 1985-crop

Figure 1

Wheat prices and loan rates, 1950-2005



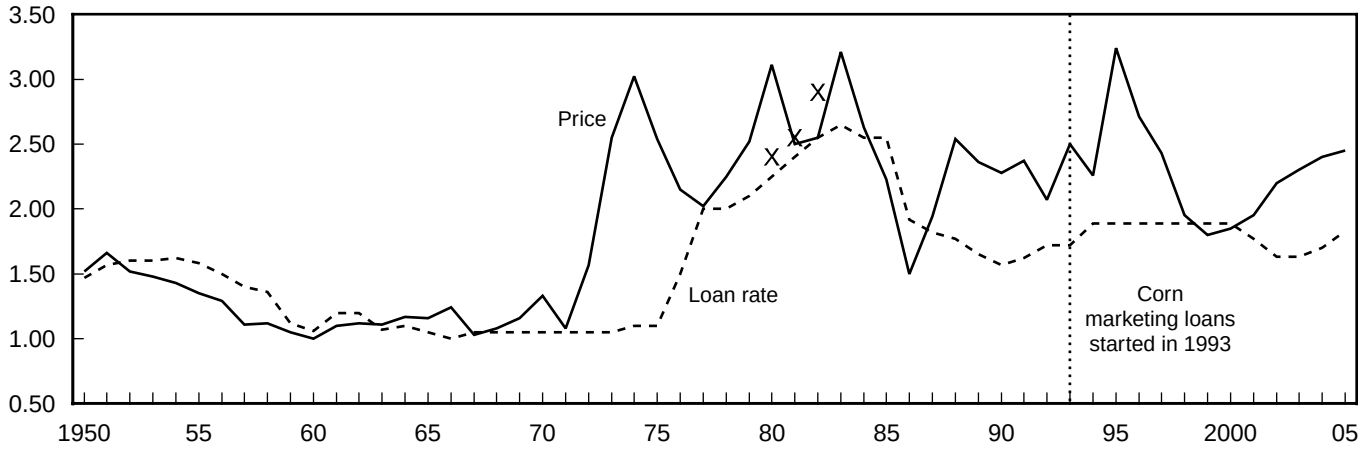
X = Higher FOR loan rate, 1980-82.

Source: 1999-2005, February 2000 USDA baseline projections.

Figure 2

Corn prices and loan rates, 1950-2005

$/bushel



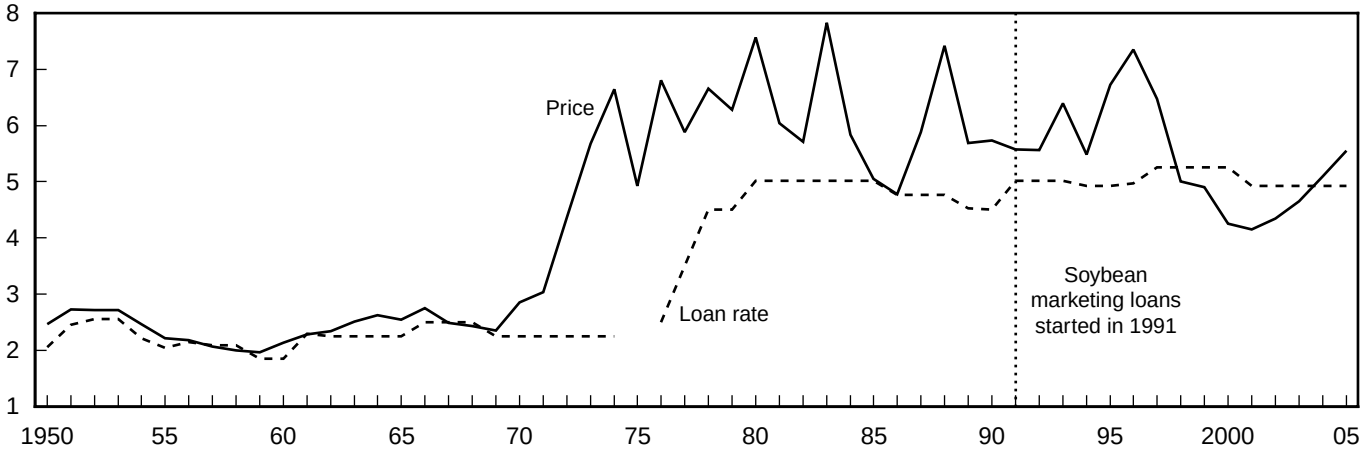
X = Higher FOR loan rate, 1980-82.

Source: 1999-2005, February 2000 USDA baseline projections.

Figure 3

Soybean prices and loan rates, 1950-2005

$/bushel



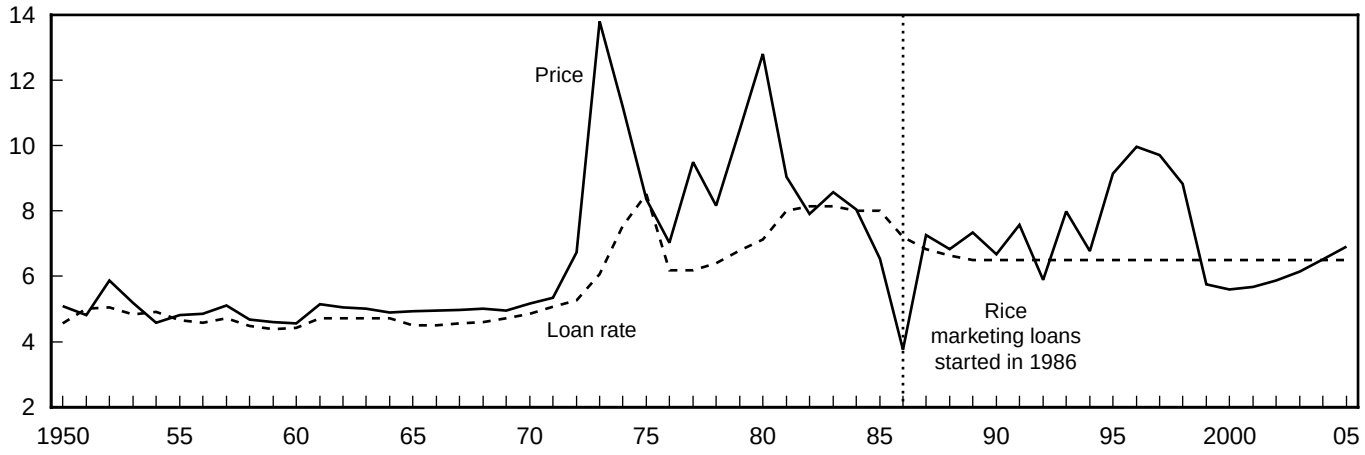
Note: There was no commodity loan program for the 1975 soybean crop.

Source: 1999-2005, February 2000 USDA baseline projections.

Figure 4

Rice prices and loan rates, 1950-2005

$/cwt

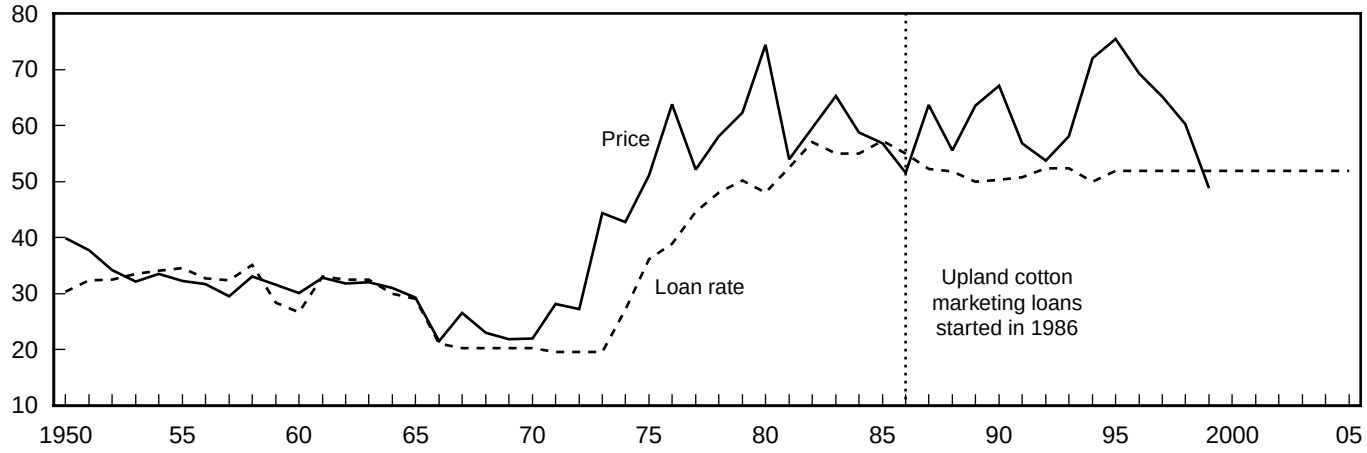


Source: 1999-2005, February 2000 USDA baseline projections.

Figure 5

Upland cotton prices and loan rates, 1950-2005

¢/pound



Note: USDA is prohibited from publishing cotton price projections. The 1999 price shown is the average of the first 2 months of the crop year, reflecting data available when the baseline analysis was conducted.

Source: 1999-2005, February 2000 USDA baseline projections for loan rates.

loan program forfeitures occurred) were within a few cents of the loan rates.

Support to corn and wheat prices in the early- to mid-1980's reflected the loan program augmented by the farmer-owned reserve (FOR). In 1982, for example, loan program forfeitures pushed government-owned stocks of corn to more than 1.1 billion bushels, or 16 percent of annual use, while government-owned stocks of wheat rose to almost 200 million bushels, representing 8 percent of annual use. Incentives provided for crops entered into the multiyear FOR (storage subsidies and, in some years, a higher loan rate) further encouraged loan placement activity for corn and wheat. By 1982, corn held in the FOR rose to almost 1.9 billion bushels, about 26 percent of annual use, and the wheat FOR exceeded 1 billion bushels, representing 44 percent of annual use. The long duration of grain storage under the FOR program, along with high release prices needed for grain to exit the reserve, effectively isolated a large amount of grain from the marketplace and combined with the high level of government-owned stocks to significantly affect corn and wheat prices (Westcott and Hoffman).

In recent years, strong U.S. and global production combined with some weakening of world demand due to the global financial crisis led to a decline in crop prices from the relatively high levels of the mid-1990's. Projected prices in USDA's 2000 baseline remain near or below loan rates for the next several years (USDA, OCE). The introduction of marketing loan provisions to the commodity loan programs, however, has changed the nature of this domestic support program from the price-supporting role of earlier loan programs. While marketing loans still provide an economic incentive to producers, the program benefit is now provided through income transfer rather than price support achieved by government acquisition of the crop through loan program forfeitures. 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 production-influencing effects into the marketplace.

The 1996 Farm Act limited marketing loan benefits (through marketing loan gains or loan deficiency payments) to $75,000 per person per year. For payment limitation purposes, a three-entity rule allows farmers to have a full share in one farm entity and as much as a 50-percent share in two additional farm entities, thereby doubling the effective payment limitation for an individual producer. The payment limitation for marketing loan benefits was subsequently raised to $150,000 for 1999 crops. Further, in early 2000, the availability of commodity certificates resumed. Producers with outstanding nonrecourse loans can purchase commodity certificates and then exchange them for the commodities under loan. Certificates are designed to limit loan program forfeitures of crops to the government. They also enable producers to receive marketing loan benefits unconstrained by payment limitations.

Marketing Loans and Realized Per-Unit Revenues

The availability of marketing loans introduces a number of new influences into the production and marketing decisions of farmers and the resulting level of revenues.

Basic Marketing Loan Operation

In the simplest approach to using marketing loans, a producer can effectively receive a per-unit revenue equal to the loan rate by taking the marketing loan benefit and immediately selling the crop, assuming the sales price equals the posted county price. The marketing loan benefit augments the market price so the total per-unit revenue comes partly from the marketplace and partly from the government. In this situation, marketing loans provide 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.

Marketing loans, however, do 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. For the basic marketing loan case, 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 marketing loan benefits augment market receipts. 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.

Realized Per-Unit Revenues

In practice, however, marketing loans have introduced a two-step crop marketing decision process that has resulted in national average per-unit revenues received by farmers that exceed commodity loan rates. In the first step, the farmer decides when to take the marketing loan benefit (LDP or marketing loan gain, if the crop is placed under loan). In the second step, the farmer decides when to sell the crop.

The program has only a few restrictions on these decisions. First, LDPs can be paid on a crop only when the crop is eligible to be placed under the loan program. Loans may be taken out at any time following harvest through the following March or the following May, depending on the crop. Second, for a crop placed under loan, potential marketing loan gains have to be taken by repaying the loan prior to its expiration (and forfeiture of the loan collateral to the government). Finally, a farmer must still own a crop (beneficial interest) when the marketing loan benefit is taken. That is, the farmer may not take the benefit after the crop is sold. Thus, the first marketing decision of when to take the marketing loan benefit must precede the second marketing decision of when to sell the crop.

In the basic marketing loan operation described earlier, taking the marketing loan benefit and selling the crop occur simultaneously, and the farmer assures a per-unit revenue equal to the loan rate. In practice, however, farmers tend to take the marketing loan benefit when prices are seasonally low and sell the crop at a later date when market prices have risen. Thus, the first marketing decision is to take the marketing loan benefit when that benefit is relatively large, followed by the second marketing decision to sell the crop later when prices have risen. Ironically, the best time to make the first marketing decision and take the marketing loan benefit is when prices are lowest, an atypical situation for sellers to seek.

Because of the seasonality of prices for an annually produced commodity such as field crops, this two-step marketing procedure results in marketing loans facilitating farmers receiving an effective per-unit revenue that on average exceeds the loan rates for eligible crops (see Marketing Loan Benefits box, page 8).

As with any annual average price or per-unit revenue concept, some producers receive more than the average and some less. For example, a risk-averse producer may simply take the marketing loan benefit and immediately sell the crop, thereby receiving the loan rate level of per-unit revenue provided directly by the program. However, other producers will successfully use the two-step marketing procedure and benefit from the direct program effects and the seasonality of prices to attain a greater per-unit revenue.

Raising the realized per-unit revenue above the loan rate also increases the economic incentive to plant crops. This further encourages producers to plant more land to supported crops than they otherwise would and, as discussed earlier, may also influence the mix of crops planted.

Marketing Loan Benefits Push Per-Unit Revenues Above Loan Rates

Marketing loan benefits for 1999 crops illustrate how farmers' average realized per-unit revenues are raised above the loan rate. Through mid-August 2000, 95 percent of the 1999 soybean crop had received a marketing loan benefit. About 88 percent had received an LDP, with an average payment rate of $0.91 per bushel; and about 7 percent had received a marketing loan gain averaging $0.76 per bushel. The rest of the 1999 soybean crop did not receive a marketing loan benefit, although some 1999 soybean commodity loans were still outstanding.

Accounting for LDPs, marketing loan gains, and the portion of the crop with no marketing loan benefit, the weighted-average marketing loan benefit for the 1999 soybean crop was about $0.85 per bushel. This benefit augmented the season-average price of $4.65 per bushel, raising the average per-unit revenue for soybeans to $5.50 per bushel, $0.24 above the 1999 national soybean loan rate of $5.26 per bushel.

Similar benefits went to other field crops with marketing loan provisions in 1999: wheat, corn, grain sorghum, barley, oats, rice, and upland cotton (table), as well as several minor oilseeds. For all of these crops, marketing loan benefits supplemented market receipts, resulting in average per-unit total revenues exceeding the national loan rates. As with soybeans, marketing loan benefits for wheat, corn, grain sorghum, oats, upland cotton, and rice raised the average per-unit revenue above the loan rate from a season-average price that was below the loan rate.

Realized average per-unit revenues increased by marketing loan benefits, 1999

Crop	Season average price	Marketing loan benefit	Average per-unit revenue	1999 commodity loan rate	Realized average revenue above loan rate
			Dollars/bushel		
Corn	1.80	0.23	2.03	1.89	0.14
Sorghum	1.55	0.25	1.80	1.74	0.06
Barley	2.15	0.14	2.29	1.59	0.70
Oats	1.10	0.19	1.29	1.13	0.16
Wheat	2.50	0.40	2.90	2.58	0.32
Soybeans	4.65	0.85	5.50	5.26	0.24
			Dollars/hundredweight		
Rice	6.10	1.80	7.90	6.50	1.40
			Dollars/pound		
Upland cotton	0.449	0.198	0.647	0.5192	0.127

August 2000 *WASDE* report (USDA, WAOB) and August 16, 2000 marketing loan data (based on cumulative LDP and loan activity data from Farm Service Agency's PSL-82R report). Upland cotton price is the average of August 1999 through June 2000.

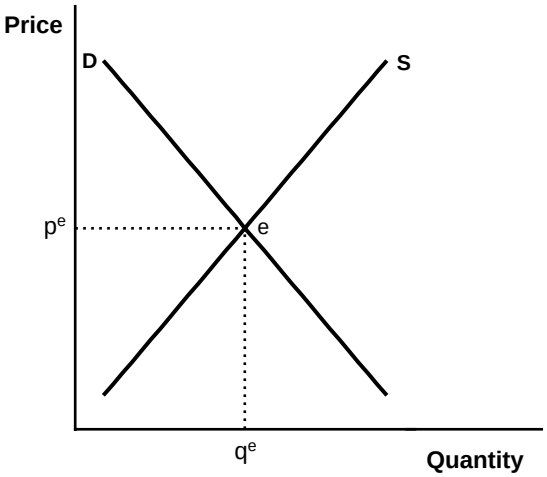
Analytical Framework

Figures 6 through 8 illustrate the effects of marketing loans on commodity markets. Figure 6 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 commodity loan program with marketing loan provisions.

Figure 7 illustrates a commodity loan program with marketing loans, with a loan rate that exceeds the no-program price equilibrium. The basic effect of a commodity loan program with marketing loans 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. In this basic marketing loan case, the loan rate becomes the 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 marketing loans, so it remains the same as in figure 6. A new equilibrium results at point e' at a price of p' and a quantity of q'.

Figure 6

Supply and demand, market equilibrium

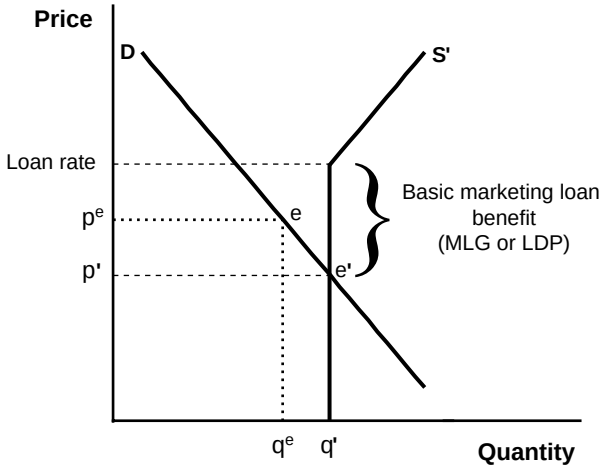


Source: Economic Research Service, USDA.

As discussed earlier, the realized level of per-unit revenue facilitated by marketing loans is higher than the loan rate. Figure 8 depicts this situation. As in figure 7, the supply curve is again kinked and becomes perfectly inelastic, here at a level that exceeds the loan rate by an additional amount of realized per-unit revenue (denoted by "s"). Compared with figure 7, the new equilibrium in figure 8 (at point e") has a lower price (p") and a higher quantity (q"). The higher per-unit revenue of the loan rate plus s is obtained by

Figure 7

Supply and demand, basic effects of marketing loans

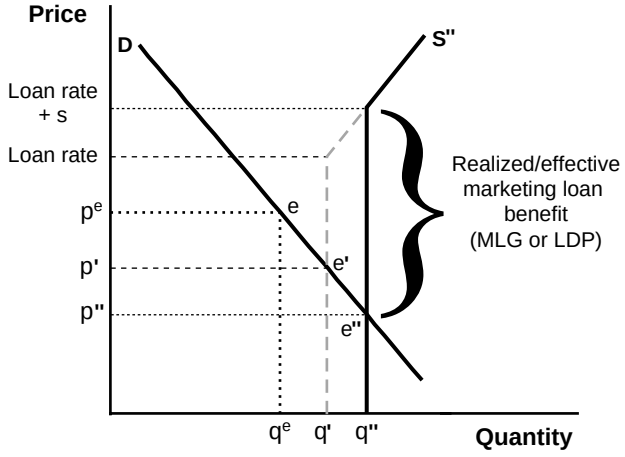


MLG = Marketing loan gain.
LDP = Loan deficiency payment.

Source: Economic Research Service, USDA.

Figure 8

Supply and demand, with realized benefits of marketing loans



MLG = Marketing loan gain.
LDP = Loan deficiency payment.

Source: Economic Research Service, USDA.

augmenting the market price by the marketing loan benefit.[4] This total per-unit revenue becomes the producer incentive price, providing the economic incentive for q" to be produced for all prices below the loan rate plus s (or equivalently, all prices below the market price plus the marketing loan benefit).[5]

Comparisons with the no-program equilibrium at point e provide an indication of the effects introduced by marketing loans. With marketing loans, the producer incentive price rises from the no-program price equilibrium level of p^e to a level equal to the loan rate plus the realized additional revenue (s), which also equals p" plus the marketing loan benefit. That is, in figure 8,

$$LR + s = p'' + MLB$$

with LR representing the loan rate; MLB, the marketing loan benefit; and s and p" defined earlier.[6] In response to this higher producer incentive price, farmers expand production (by $q'' - q^e$ in figure 8). Because marketing loans do not affect the demand function, 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 ($q'' - q^e$), with increases in both domestic use and exports. The increase in production reduces the market price (by $p^e - p''$ in figure 8). While marketing loans raise the producer incentive price to LR + s, the market price is lower at the new equilibrium.

Marketing loan benefits for one crop affect other crops as well. The higher producer incentive price for marketing loan crops shifts the supply curve to the left for other crops that compete with marketing loan crops for planted acreage. The reduction in market prices for marketing loan crops moves the demand curve to the left for crops that compete with (are substitutes for) the marketing loan crops in uses, while moving the demand curve to the right for crops that are demand complements with the marketing loan crops. Empirically, supply adjustments dominate in these cross-commodity effects.

[4] The amount s is not directly observable. However, the market price, the marketing loan benefit, and the loan rate are observable, so s can be derived.

[5] This analytical framework does not include effects of commodity loan programs and marketing loans in reducing downside revenue risk when market prices are near or below loan rates. This effect could shift the vertical portion of the supply curve further to the right in figure 8 and could make some portion of the supply curve more inelastic for prices above the loan rate plus s. As such, some of the impacts discussed in the following sections could be somewhat understated and some could extend for additional time periods.

[6] Although the market price and the marketing loan benefit are observable, they each change and vary inversely with each other. Thus, for analytical purposes the equivalent per-unit revenue to their sum of the loan rate plus s is useful because the loan rate is pre-determined for any given year and a plantings-time expectation for s can be assumed to be relatively constant across years.

Modeling Framework and Implementation

An analysis of the period 1998 to 2005 illustrates the effects of commodity loan programs with marketing loans. The analysis uses USDA's February 2000 baseline and simulations of a U.S. agricultural sector model, FAPSIM (see box, page 13).

The USDA 2000 baseline projects market prices that are lower than the corresponding loan rates (plus s) for the next several years, resulting in a continuation of marketing loan benefits for producers. FAPSIM was initially simulated to depict the 2000 USDA baseline scenario that incorporates the effects of marketing loans, including the higher level of per-unit revenues facilitated by marketing loans. These higher per-unit revenues were incorporated into the model's acreage response equations by augmenting the loan rate terms in net returns calculations by expected values for the additional per-unit revenues (s). The baseline scenario's assumed values for the expected additional per-unit revenues (table 1) were based on 1998 results (Westcott) and initial 1999 data. These values compare favorably for each crop with the realized additional revenues for 1999 shown in the table in the Marketing Loan Benefits box on page 8, with only the realized additional 1999 revenue for rice being much different from that assumed here for the baseline.[7] Figures 9-13 show the resulting average, effective, per-unit revenue floors for wheat, corn, soybeans, rice, and upland cotton along with the baseline loan rates. In each chart, the difference between the two lines represents the additional per-unit revenues facilitated by marketing loans.

Table 1—FAPSIM simulation assumptions for expected additional per-unit revenues (s) facilitated by marketing loans

Crop	Assumed expected average revenue above loan rate
	Dollars/bushel
Corn	0.25
Sorghum	0.10
Barley	0.70
Oats	0.15
Wheat	0.30
Soybeans	0.25
	Dollars/hundredweight
Rice	0.75
	Dollars/pound
Upland cotton	0.14

Acreage decisions are based on expected net returns, which include as their expected price term the higher of the lagged market price or the current loan rate augmented by the additional marketing-loan-facilitated revenue. That is, expected net returns are defined as follows:

$$NR_i^T = \max (p_i^{T-1}, LR_i^T + s) * \text{expected yield}_i^T - \text{variable production costs}_i^T$$

where NR represents expected net returns, p is price, LR is the loan rate, s is the additional, above-loan-rate per-unit revenue facilitated by marketing loans, subscript i denotes the commodity, and superscripts T and T-1 represent annual time periods. The acreage response functions used were of the form:

$$A_i^T = f [NR_i^T, NR_j^T, \text{other terms}]$$
$$= f [\max (p_i^{T-1}, LR_i^T + s), \text{expected yield}_i^T, \text{variable production costs}_i^T, NR_j^T, \text{other terms}]$$

where A represents acreage planted to a crop, subscript j denotes an alternative crop, and other variables are as defined above.[8]

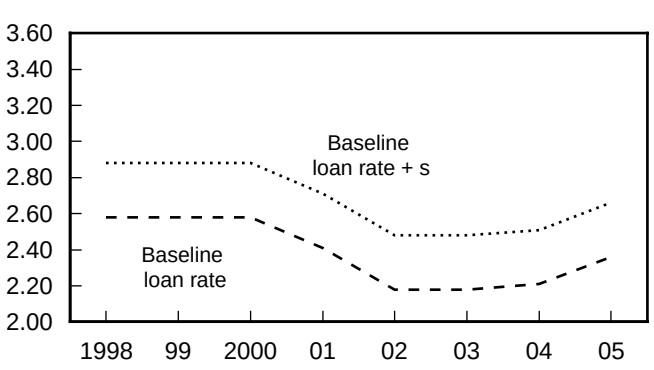
We then ran a second model simulation with FAPSIM, one with no commodity loan program. In this simulation, the terms $LR_i^T + s$ are removed from net returns, so that lagged market prices represent expected per-unit revenues used in the acreage decisions. This simulation provides a reference scenario from which to measure effects of commodity loan programs with marketing loans.

[7] Rice marketing loan benefits for the 1998 crop were negligible since rice prices were higher in that crop year. Rice marketing loan benefits were assumed at 75 cents per hundredweight above the loan rate for rice, based on benefits for the 1999 crop known at the time the baseline projections were made. Although realized benefits were subsequently higher, the assumption of 75 cents above the rice loan rate used in the baseline scenario corresponds more closely with producers' expectations at the time of planting.

[8] Effects of payment limitations are not explicitly included in the model. Any such effects are likely to be small, particularly with the availability of commodity certificates starting in early 2000.

Figure 9

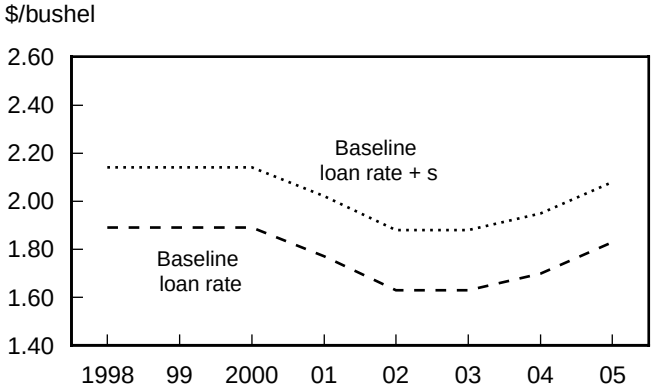
Wheat loan rates and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 10

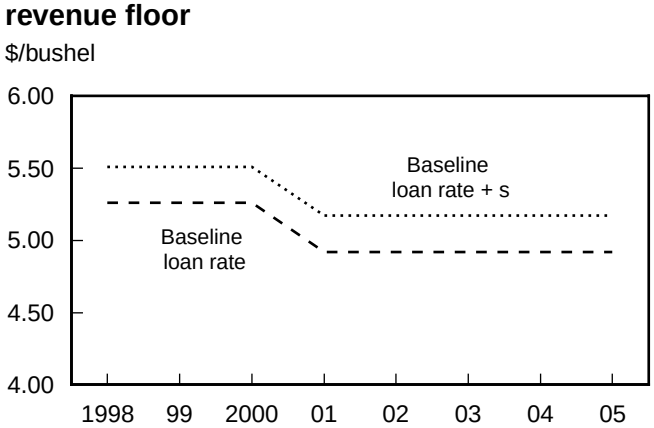
Corn loan rates and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 11

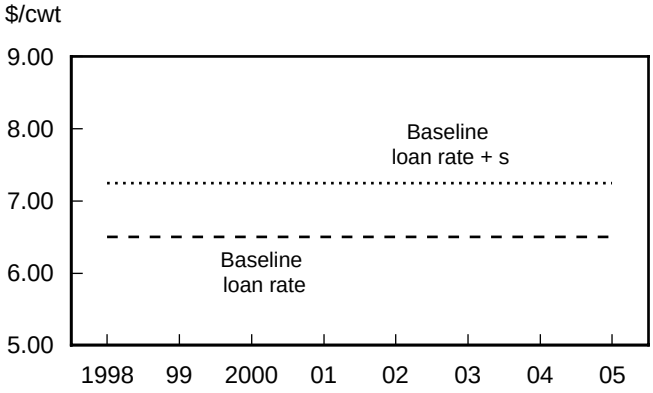
Soybean loan rates and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 12

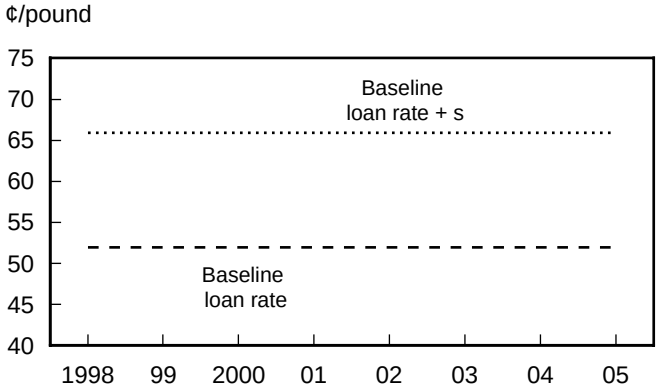
Rice loan rates and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 13

Upland cotton loan rates and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

The Model Simulation System—FAPSIM

The Food and Agricultural Policy Simulator (FAPSIM) is an annual econometric model of the U.S. agricultural sector. The U.S. Department of Agriculture originally developed the model during the early 1980's (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. The model incorporates over 700 equations. Here, we give only a brief discussion of its general structure and content.

FAPSIM 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.

Definitional and institutional equations reflect known relationships that necessarily hold among the variables in the model. Behavioral equations differ because the exact relationship among variables is not known and must be estimated. Economic theory determines the types of variables to include in behavioral equations, but theory does not indicate the precise relationship between the variables. 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 benefits, that can influence planting choices. Additionally, the acreage equations include net returns for other crops that compete with each other for land use.

For the most part, FAPSIM uses a linear relationship to approximate the general functional form for each behavioral relationship. All 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 most 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 commodity markets simultaneously.

The ability of the FAPSIM model to simulate different policies lends itself to analysis of the commodity loan program with marketing loans. Further, the variables in the model reflect USDA's baseline projections, which are a Departmental consensus on a longrun 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 report is based on long-term projections from USDA's February 2000 baseline (USDA, OCE).

Simulation Results

Model simulation results illustrate the effects of commodity loan programs with marketing loan provisions. Results, however, are dependent on features of the USDA 2000 baseline used in the analysis. In particular, impacts depend on the magnitude of marketing loan benefits in the baseline and thus depend on both price projections and loan rate assumptions. For example, larger impacts than discussed here would result for scenarios with lower prices and larger marketing loan benefits. Conversely, smaller impacts would result with higher prices and smaller marketing loan benefits.

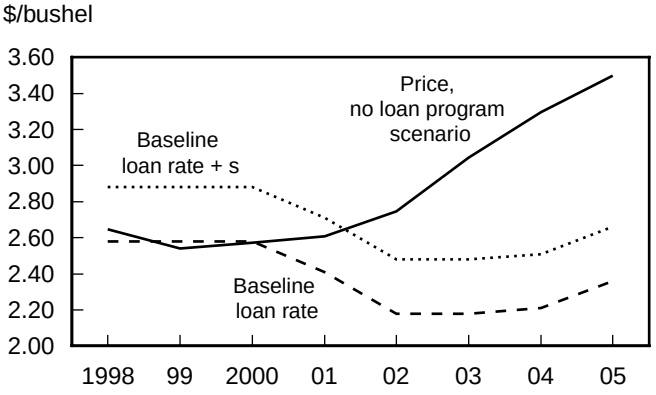
Additionally, a key feature of the USDA 2000 baseline is an assumption that loan rates for corn, wheat, and soybeans would be set following formulas set forth in the 1996 Farm Act, starting for the 2001 crops. Alternatively, if the baseline had assumed that the Secretary of Agriculture would use discretionary authority to leave loan rates at their legislative maximums, as was done for 2000 crops of upland cotton and soybeans, then marketing loan benefits would have been higher in the baseline and simulated impacts of those loan program benefits would be larger than presented here.[9]

Loan Program Benefits

The commodity loan program scenario with marketing loans introduces expectations of program benefits to the sector in 1998 through 2005 because loan rates plus s (additional revenues) exceed expected (lagged) market prices from the "no loan program" scenario for at least one of the marketing loan crops in each of those years—that is, marketing loan benefits would be expected through loan deficiency payments and/or marketing loan gains. As shown in figures 14-18, prices in the "no loan program" scenario from the previous year are below loan rates plus s in the current year for wheat and corn from 1999 through 2001, soybeans from 1999 through 2004, rice from 1999 through 2005, and upland cotton in 1999 and 2000. Thus, the introduction of commodity loans with marketing loan provisions would result in marketing loan benefits expected to occur in those periods. Additional marketing loan benefits would be expected for upland cotton but are not illustrated here because USDA is prohibited from publishing cotton price forecasts.

Figure 14

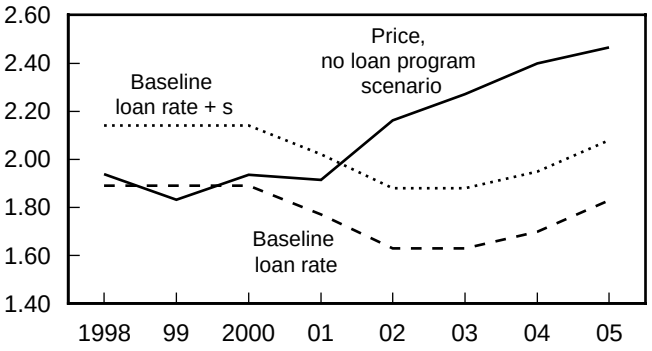
Wheat prices, loan rates, and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 15

Corn prices, loan rates, and effective per-unit revenue floor

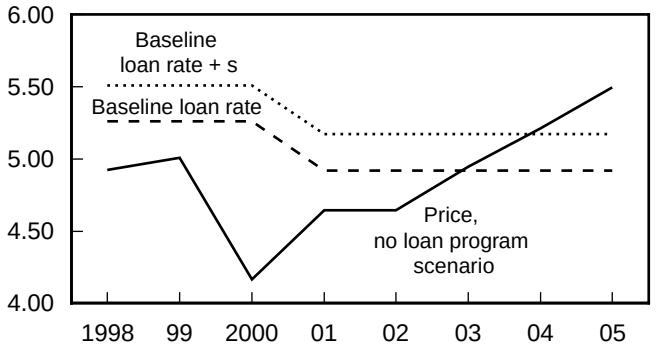


Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

[9] Analysis of alternative loan rates in a commodity loan program with marketing loans is beyond the scope of this report. Higher loan rates, however, such as those set at their legislative maximums in years when formula loan rates would be lower, result in higher budgetary costs. Budgetary costs of marketing loan benefits reflect three factors: (1) the quantity of a crop eligible for commodity loans (currently, nearly all production of loan program crops is eligible for loans), (2) the loan rate, and (3) the market price. With a higher loan rate, each of these three factors moves in a direction that increases budgetary costs. First, the loan rate is higher, increasing the per-unit marketing loan benefit (loan deficiency payment or marketing loan gain). Second, the higher loan rate (and marketing loan benefit) provides an economic incentive for increased production, raising the loan-eligible quantity. Third, the increase in production lowers the market price, further raising the difference to the loan rate and, thus, the per-unit marketing loan benefit.

Figure 16

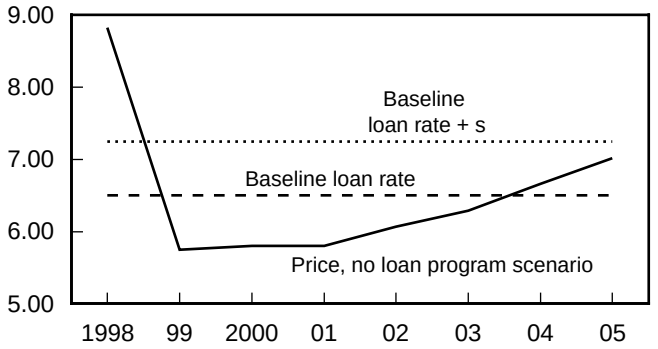
Soybean prices, loan rates, and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 17

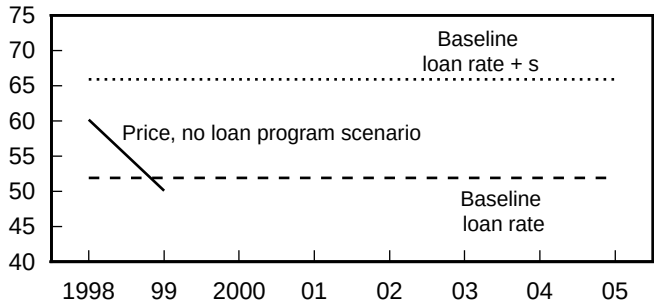
Rice prices, loan rates, and effective per-unit revenue floor



Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Figure 18

Upland cotton prices, loan rates, and effective per-unit revenue floor



Note: USDA is prohibited from publishing cotton price projections. The 1999 "no loan program" price shown reflects a simulated price change from the average cotton price for the first 2 months of the year.

Sources: February 2000 USDA baseline projections and Economic Research Service, USDA.

Aggregate Acreage Impacts

Total plantings of crops are higher in the marketing loan scenario, reflecting the addition of program benefits to the sector from the commodity loan program with marketing loans. Increases in the aggregate level of acreage planted to crops are highest when total marketing loan benefits are largest and when benefits accrue to more of the crops. As shown in figure 19, acreage gains are largest for crop years 1999 through 2001, with aggregate increases for eight major field crops of 2 to 4 million acres compared with the no loan program scenario. In those years, most of the crops receive marketing loan benefits and those marketing loan benefits for each crop are highest because market prices are at their lowest levels.

For 2002 and beyond, total acreage impacts are smaller, falling to under 1 million acres in 2002 and to only 100,000 in 2005, as fewer crops receive benefits and the remaining benefits are smaller. This result reflects a general recovery in crop prices in the USDA baseline projections scenario as well as an assumption in the baseline that loan rates for wheat, corn, and soybeans are lower than their legislated maximums in 2001 through 2005, thereby lowering marketing loan benefits from the 1999 and 2000 highs.

Importantly, aggregate acreage effects beyond 2005 are small. Thus, impacts on plantings are largely confined to years when marketing loan benefits augment expected market returns. Only small dynamic, carryover effects on plantings occur in subsequent years beyond 2005 when prices rise sufficiently above loan rates to eliminate marketing loan benefits.[10]

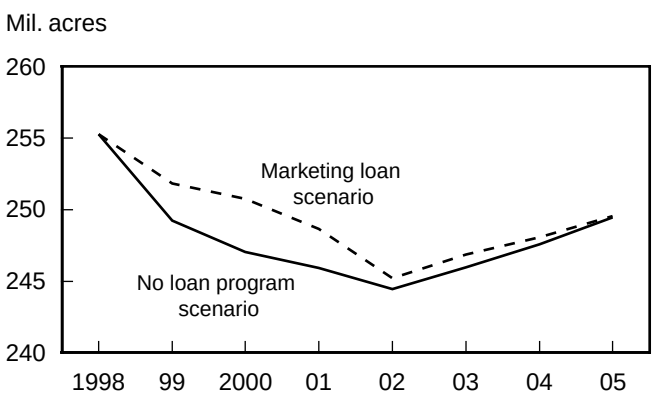
Crop-Specific Acreage Impacts

Within the aggregate increases in plantings because of marketing loans, acreage impacts for individual crops reflect the initial relationship between expected crop prices and their respective loan rates plus s, the effects of corresponding marketing loan benefits on absolute and relative net returns among cropping alternatives, and the acreage response elasticities.

[10] 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 forfeitures in lower priced years led to release of government stocks at a later time, thus extending market impacts over a longer time period. However, multiyear, cumulative impacts under a price-supporting loan program are largely offsetting.

Figure 19

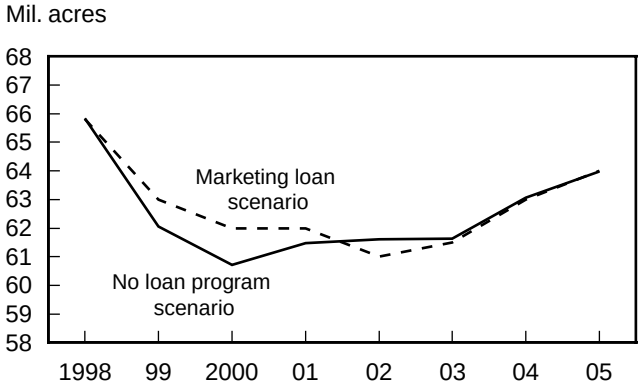
Planted acreage, 8 main field crops



Source: Economic Research Service, USDA.

Figure 20

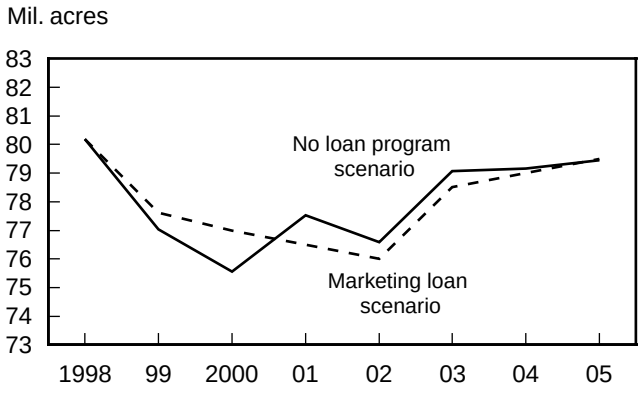
Wheat planted acreage



Source: Economic Research Service, USDA.

Figure 21

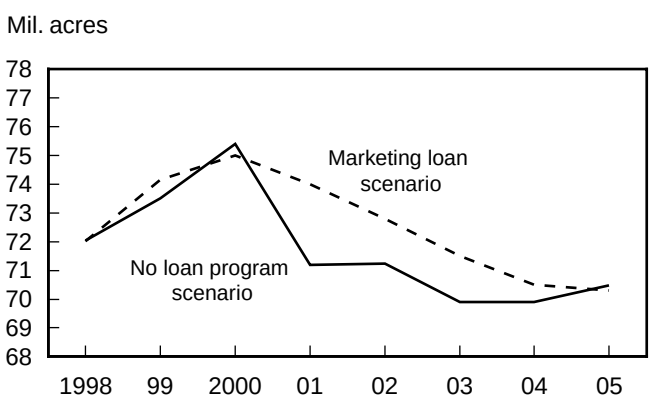
Corn planted acreage



Source: Economic Research Service, USDA.

Figure 22

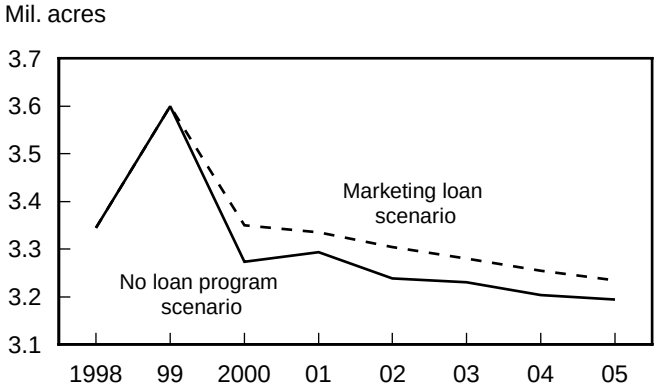
Soybean planted acreage



Source: Economic Research Service, USDA.

Figure 23

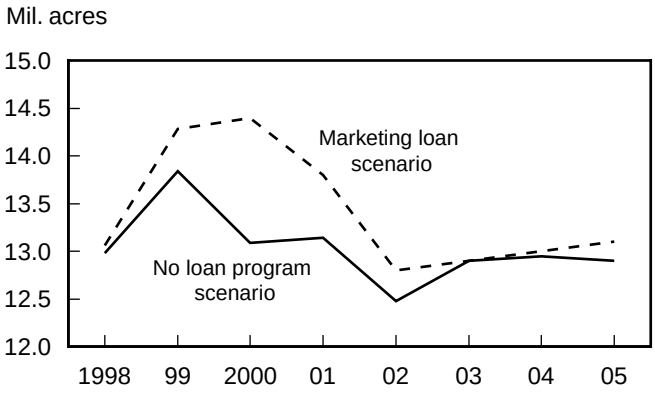
Rice planted acreage



Source: Economic Research Service, USDA.

Figure 24

Upland cotton planted acreage



Source: Economic Research Service, USDA.

Wheat and corn plantings are initially higher with marketing loans as the effects of their program benefits are larger than cross-commodity effects from marketing loan benefits of other crops (figs. 20-21). From 2001 to 2004, however, corn plantings are lower, largely because marketing loan benefits for soybeans draw land away from corn. Similarly, wheat plantings are lower in 2002 because marketing loan benefits for competing crops switch land away from wheat.

Soybean plantings are higher with marketing loans through 2004 except in 2000 (fig. 22). Marketing loan benefits increase soybean net returns relative to returns for other crops in most years of the simulations, providing an economic incentive to plant more soybeans. In 2000, however, relatively large marketing loan benefits for corn pull land away from soybeans.

Rice and cotton plantings are also larger (figs. 23-24) as effects of their own marketing loan benefits on net returns and plantings exceed cross-commodity effects from other crops.

Export Impacts

Effects on U.S. exports of commodity loan programs with marketing loan provisions reflect the effects on planted acreage. In figure 8, to the extent that exports are a portion of the new equilibrium quantity demanded, some part of $q'' - q^e$ represents a program effect on exports. These export impacts and related effects on global trade have important implications for treatment of U.S. programs under the World Trade Organization (see WTO box, page 19).

In years and for commodities with increased acreage and production, agricultural markets clear at lower prices with a higher equilibrium quantity demanded, including exports. Conversely, in years and for crops with lower acreage and production (due to relatively stronger cross-commodity effects of marketing loan benefits for competing crops), U.S. exports may be lower. Thus, the export effects shown for wheat, corn, soybeans and products, rice, and cotton in figures 25-31 reflect the impacts on acreage discussed earlier.

Under the marketing loan scenario, wheat exports are higher through 2001, reflecting increased wheat plantings, higher production, and lower prices in those years. U.S. exports of corn are higher in the marketing loan simulations in 1999 and 2000 as corn plantings are increased, but then corn exports fall slightly for 2001 through 2003, reflecting the reduction in corn plantings due to relatively strong effects of marketing loan benefits for soybeans. Exports of soybeans are increased through 2004 except in 2000 when corn program benefits lead to lower soybean plantings. Exports of soybean meal and soybean oil rise as well when soybean acreage increases as higher domestic crush of soybeans leads to higher production and lower prices in soybean product markets. Rice and cotton exports also increase due to higher production and lower prices for those crops.

As for the acreage effects, U.S. export impacts occur primarily in the years when marketing loan benefits exist, with limited effects in subsequent years.

Domestic Use Impacts

With generally higher plantings in the marketing loan scenario, lower prices tend to raise domestic use as well. However, for some crops in some years, acreage reductions resulting from relatively higher marketing loan benefits of competing crops lead to higher prices and somewhat reduced domestic use. In the model simulations, this result is most evident for corn from 2001 to 2003 as soybean program benefits draw land from corn, leading to somewhat lower domestic use of corn.

Higher soybean production, however, leads to lower soybean prices and increased crush, resulting in lower soybean meal prices and higher domestic use of soybean meal by the livestock sector. Overall, even with higher corn prices in some years, the reduction in soybean meal prices results in lower overall livestock feeding costs, particularly for the poultry sector, which tends to use feed rations with higher protein content. Thus, in general, the livestock sector benefits from lower overall feed prices. Meat production expands somewhat, although output changes are less than 0.5 percent.

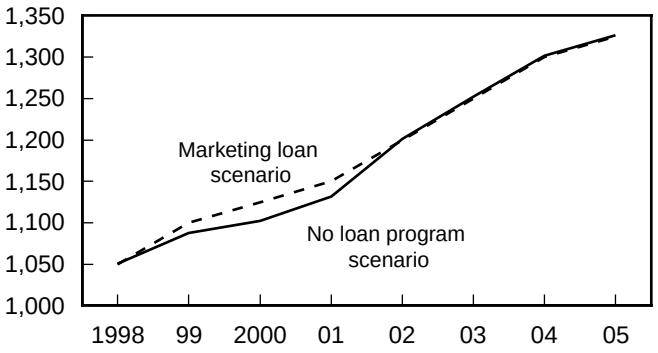
Price Impacts

As shown in figures 32-36 for wheat, corn, soybeans, rice, and upland cotton, in years with gains in acreage, higher production of these crops lowers their prices. In the early years of the simulations, this reduction in prices pushes them further below the corresponding loan rates. Reflecting these price declines, marketing loan benefits correspondingly rise from their initial levels. And overall, the combination of price reductions with production increases adds to total budget costs of marketing loans through both the rise in the per-unit marketing loan benefit and the increase in the quantity eligible for benefits.

Figure 25

Wheat exports

Mil. bushels

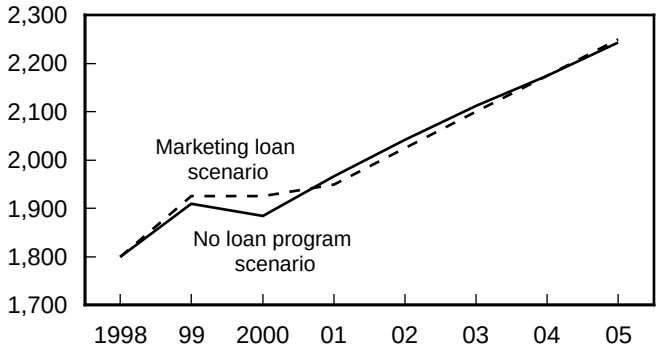


Source: Economic Research Service, USDA.

Figure 26

Corn exports

Mil. bushels

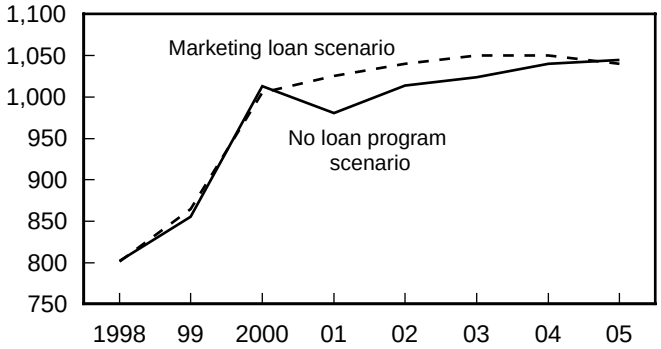


Source: Economic Research Service, USDA.

Figure 27

Soybean exports

Mil. bushels

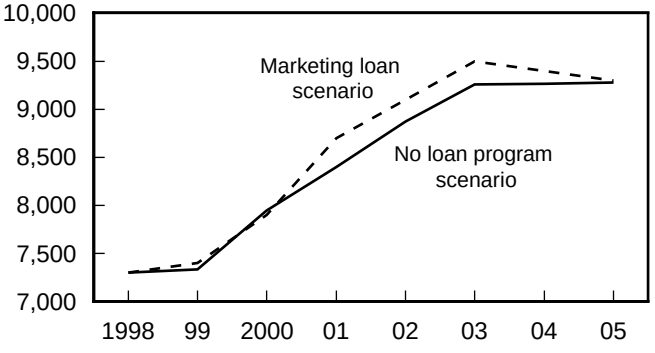


Source: Economic Research Service, USDA.

Figure 28

Soybean meal exports

1,000 tons

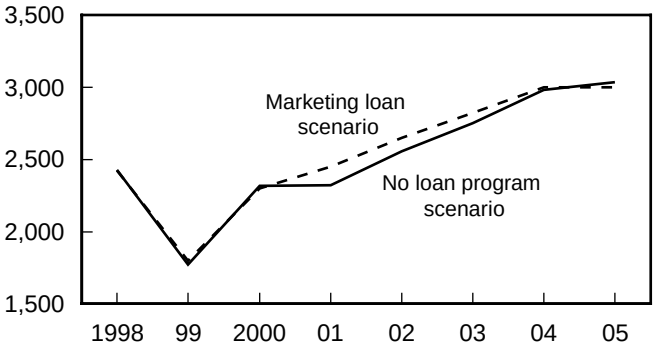


Source: Economic Research Service, USDA.

Figure 29

Soybean oil exports

Mil. lbs

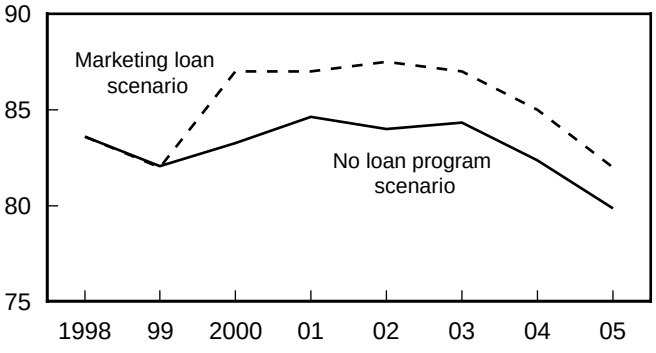


Source: Economic Research Service, USDA.

Figure 30

Rice exports

Mil. cwt



Source: Economic Research Service, USDA.

U.S. Export Impacts and the World Trade Organization

As a domestic support program, the effects of marketing loans on U.S. exports are important in the context of U.S. commitments to the World Trade Organization (WTO). For U.S. commitments to the WTO under the 1994 Uruguay Round Agreement on Agriculture (URAA), marketing loan benefits are considered to be "amber box" because of their potential to significantly affect production and trade.

WTO Treatment of Domestic Support Programs

The 1994 URAA categorized domestic support programs as amber box, green box, or blue box policies 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 falling over time. U.S. amber box limitation commitments under the agreement declined 20 percent over the 6-year implementation phase-in period for developed countries (1995-2000), from a base level of $23.879 billion to $19.103 billion for 2000.

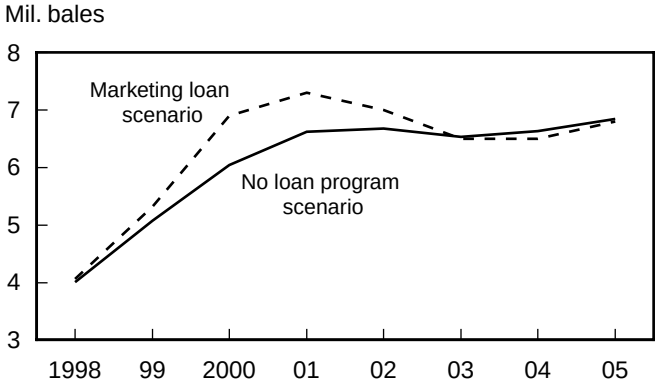
Green box policies are those that have the smallest effect on production and trade and are therefore permitted without limitation under the WTO. Blue box policies include payments made as part of programs that also have production-limiting features.

Marketing loans are 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 marketing loan benefits to influence crop production decisions of farmers through economic incentives provided by those benefits.

In 1999 through 2001, wheat prices are lowered 4 to 7 cents per bushel in the marketing loan simulation, while corn prices are reduced 3 to 9 cents per bushel in 1999 and 2000. Later, when marketing loan benefits shift land into soybeans (2001 through 2004), prices for soybeans are reduced, with the largest impact of 49 cents occurring in 2001 when acreage gains for the crop are highest. Rice prices are reduced throughout the simulation period, with declines of 10 to 20 cents per hundredweight in 2000 through 2005. Simulated price reductions for upland cotton range from 1 to 5 cents per pound through 2002, the years of the largest cotton acreage increases due to marketing loan benefits.

Figure 31

Upland cotton exports



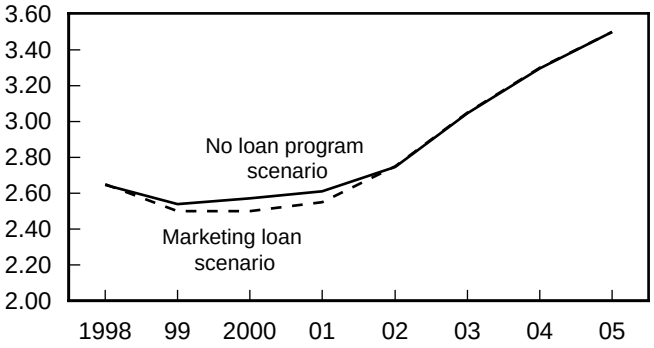
Source: Economic Research Service, USDA.

In other years, lower production for some crops that lose acreage to competing crops pushes their prices up. In particular, corn prices increase by 3 to 4 cents per bushel in 2001 through 2003, as acreage shifts from corn to soybeans.

As with other marketing loan effects, crop price impacts occur mostly in years when there are marketing loan benefits in the model simulations, with little carryover effect to subsequent years after marketing loan benefits are no longer present.

Figure 32

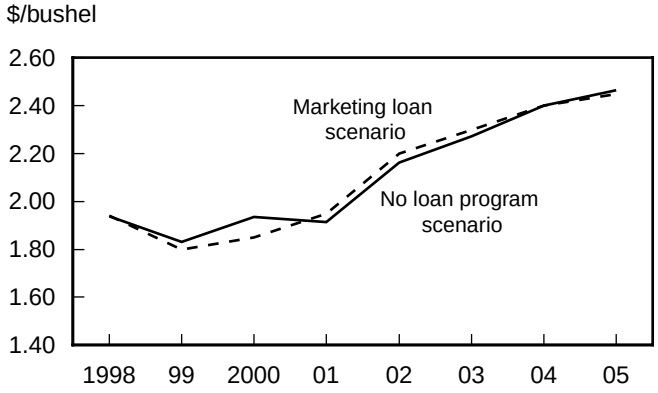
Wheat prices: No loan program and marketing loan scenarios



Source: Economic Research Service, USDA.

Figure 33

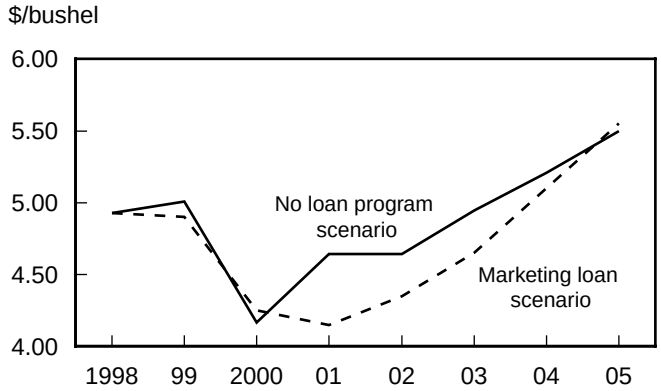
Corn prices: No loan program and marketing loan scenarios



Source: Economic Research Service, USDA.

Figure 34

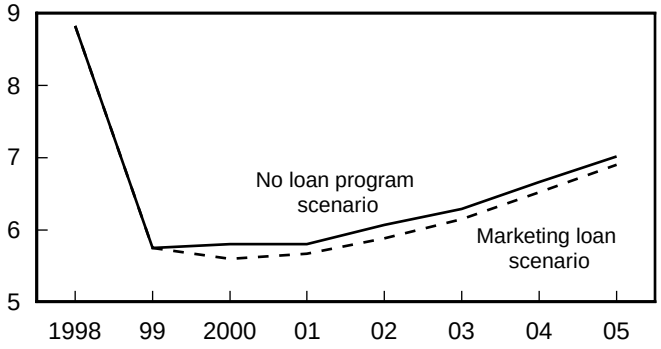
Soybean prices: No loan program and marketing loan scenarios



Source: Economic Research Service, USDA.

Figure 35

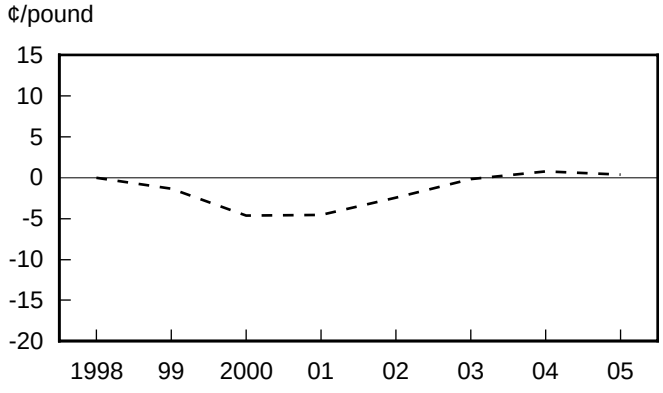
Rice prices: No loan program and marketing loan scenarios



Source: Economic Research Service, USDA.

Figure 36

Model-simulated upland cotton price changes, marketing loan effects



Cotton price changes between scenarios are shown because USDA is prohibited from publishing cotton price projections.

Source: Economic Research Service, USDA.

Conclusions

The U.S. commodity loan program with marketing loan provisions provides countercyclical program benefits to farmers of major field crops through revenue-boosting loan deficiency payments and marketing loan gains when market prices are low. Marketing loans enable producers to realize a level of per-unit revenues that, on average, exceeds the commodity loan rate—many farmers use a two-step marketing procedure in which they receive program benefits when prices are seasonally low (and program benefits high) and then sell their crop later in the marketing year when prices have risen. The historical above-loan-rate level of realized per-unit revenues facilitated by marketing loans provides a floor for farmers' expectations of per-unit revenues in subsequent years.

Marketing loans influence planting decisions and acreage allocation because program benefits are linked to farmers' current production, thereby affecting expected net returns for crops. Most effects for a marketing loan crop reflect an increase in its production and the resulting market response to the larger supply. That is, additional market impacts on domestic use, U.S. exports, and crop prices primarily reflect market adjustments to the increased production for the marketing loan crop, leading to a new equilibrium at a lower price and an increased quantity demanded.

Cross-commodity effects also are important, reflecting acreage shifts among competing crops. Acreage changes for individual crops reflect the effects of marketing loan benefits on absolute and relative net returns among cropping alternatives, as well as acreage response elasticities. In some cases, cross-commodity effects reduce acreage and production of crops receiving relatively low or no marketing loan benefits, lowering domestic use and exports of those crops while raising their prices.

Most effects of marketing loans occur in the years when prices are low enough that marketing loan benefits exist. Only small dynamic, carryover effects occur in later years after prices rise sufficiently to eliminate marketing loan benefits. This result differs from that of price-supporting loan programs that existed prior to the introduction of marketing loans.

Simulations of an econometric model for the U.S. agricultural sector (FAPSIM) were used with the February 2000 USDA baseline to compare a commodity loan program scenario with marketing loans that represents current policy and a scenario with no commodity loan program. Overall, increased support to the sector increases total plantings of crops. Within this aggregate, results show that direct marketing loan benefits dominate in most years for most crops, with higher acreage, production, domestic use, and exports, and lower prices. However, for some crops in some years, cross-commodity effects dominate, causing declines in acreage, production, domestic use, and exports and increases in prices, as marketing loan benefits draw land to competing crops.

Magnitudes of the simulated impacts are dependent on the size of the marketing loan benefits included in the 2000 USDA baseline. 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. Additionally, larger impacts would result if loan rates for corn, wheat, and soybeans in the USDA baseline were assumed to remain at their legislated maximums instead of being lowered from those levels to reflect 1996 Farm Act formulas for loan rate determination. Nonetheless, results shown in this report illustrate some of the key properties of how commodity loan programs with marketing loan provisions affect agricultural commodity markets.

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