Estimating the Impact of Conservation Reserve Program Contract Expiration on Corn and Wheat Prices

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The Conservation Reserve Program reduced available cropland in the United States by 34 million acres under the first nine signup periods (1986–1990). Among these are ten million acres with wheat base and four million acres with corn base, which could potentially produce 288 million bushels of wheat and 340 million bushels of corn per year upon contract expiration. The impacts of expiring CRP contacts on the production and prices of wheat and corn in the United States are estimated. Based on past production practices and post-CRP land-use intentions of contract holders, 48.2% of base acres enrolled in CRP will return to production. Under this scenario, wheat prices will decline by more than 7% and corn prices by more than 2% by 2000, unless ARP levels, normal flex acres percent, or target prices are changed.

Land retirement programs have been used since the early 1900s to control excess capacity and obtain various conservation objectives (Dicks and Osborn). A prominent long term land retirement program is the Conservation Reserve Program (CRP), authorized in the Food Security Act of 1985. The stated objectives of the CRP are to: (1) reduce wind and water erosion, (2) protect our long-term capability to produce food and fiber, (3) reduce sedimentation, (4) improve water quality, (5) create better habitat for fish and wildlife through improved food cover, (6) curb production of surplus commodities, and (7) provide needed income support for farmers (Dicks, Llacuna, and Linsenbigler). Producers participating in the CRP receive an annual rental payment and a one-time cost share allowance in exchange for establishing a vegetative cover on qualifying environmentally sensitive cropland.

The CRP reduced available cropland in the United States by 34 million acres under the first nine signup periods (1986–1990). Among these are 22 million acres with historical crop acreage base (CAB) which will most likely be returned to production upon contract expiration. The number of CRP acres potentially returning to production each year, by crop base, are shown in Table 1. Over ten million acres have wheat base and another four million acres have corn base. These acres could potentially produce 288 million bushels of wheat and 340 million bushels of corn per year (Osborn, Llacuna, and Linsenbigler). The purpose of this research is to determine the impacts of expiring CRP contracts on the production and prices of wheat and corn in the United States.[1]

Most research conducted on the price impacts of the Conservation Reserve Program has concentrated on the impacts of land entering the CRP. In comparison, analyses of the impacts of CRP land returning to crop production has been scarce. However, the earlier estimates of price impacts associated with CRP enrollment may be helpful in determining the changes that could be expected when CRP contracts expire. Commodity price impact estimates made during the implementation of the CRP ranged from a 1.5% increase in the price of wheat to a 19% increase in all grain prices (Taylor; Hertel and Preckel).

Despite these predictions, price levels for most agricultural commodities have not increased significantly during the CRP. The absence of major

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[1] Changes in the production and prices of cotton, soybeans, oats, barley, rice, and sorghum were also estimated and the LP model was permitted to reallocate the acreage among possible alternatives. The cross-price effects of the changes in output levels of these commodities are included in the corn and wheat price changes. However, results do not differ appreciably from corn (representative feed grain) and wheat (representative food grain).

Table 1. Base Acres Enrolled in CRP, by Crop Base and Year of Potential Return to Production

	Year Crop Base Potentially Returns to Production						
Crop Base	1996	1997	1998	1999	2000	2001	2002
Corn	150,411	2,157,145	519,922	539,664	413,090	84,800	190,139
Barley	138,706	954,571	779,764	477,418	381,940	25,206	46,101
Cotton, Upland	50,179	632,839	339,420	190,202	91,512	25,155	41,919
Cotton, ELS	16	404	94	83		178	169
Oats	75,795	437,269	350,736	236,152	191,583	20,151	43,238
Peanuts	251	765	4,568	397	94	20	3
Rice	663	2,039	1,750	4,171	4,222	298	1,195
Sorghum	231,410	994,719	623,995	303,043	205,920	21,326	42,147
Tobacco	57	256	178	157	48	16	24
Wheat	554,256	3,616,743	2,930,032	1,709,883	1,464,888	99,947	243,912

price impacts may be attributed to lower annual set-aside requirements on crop acreage base over the last several years. For example, the ARP for wheat in 1987 was 27.5% of the crop acreage base (CAB). Currently, the ARP on wheat is zero. In effect, the government has used a short-term policy instrument to balance some of the potential effects of a longer-term land retirement policy.

Market outlook for grains depends on expected production. The assumptions and facts used in previous studies of price impacts due to land entering the CRP no longer apply. Since the first CRP contracts expire in 1995, with production from that land potentially affecting markets in the 1996/97 crop year, commodity outlook must include the land use intentions of CRP contract holders to estimate the commodity price impacts of CRP contract expiration.

A major unknown for analysts and agribusiness decision makers over the next few years is the extent to which CRP acreage will return to crop production. Characteristics of land enrolled in the CRP and the conservation practices developed under the program coupled with various land use policy provisions make the determination of post-CRP land use somewhat difficult. Contract holders are faced with numerous choices when the CRP expires. Most important among these choices is whether to leave the conservation practice in place or to use the land for crop or livestock production.

As CRP contracts expire, the need to earn income on these acres may provide an economic incentive for producers to return these acres to crop production. To take advantage of the income support provided by the commodity programs producers may be required to return their CRP acres to crop production when their contracts expire to protect their CAB. Since native or introduced grass cover are the main conservation covers established on CRP acres, conversion to cropland may be achieved with a minimum of cost and effort.

Government programs and policy provisions will also influence the use of CRP land as contracts expire. Conservation compliance, legislated by the Food Security Act of 1985, provides economic disincentives for crop production. Producers must develop and implement an approved conservation plan on highly erodible cropland in order to remain eligible for Federal program benefits, including Commodity Credit Corporation (CCC) storage loans and payments, crop insurance, disaster payments and other cost-share assistance. The economic costs of conservation compliance and the potential loss of government payments may discourage producers from returning highly erodible land enrolled in the CRP to crop production. However, only 36% of the CRP acreage is very highly erodible (Erodibility Index of 15 or greater), another 38% is moderately erodible, and 26% is not erodible. Conservation compliance will certainly increase the costs of production on the very highly erodible land but may have little effect on the moderately erodible and no effect on the non-erodible land. Thus, conservation compliance may not present a strong economic deterent for cropping most CRP acreage.

CRP land may also remain idled under the acreage reduction program (ARP) or be placed into production of nonprogram crops through flexibility provisions (normal flex acres) and participation in underplanting programs (i.e. 0-50/92) while retaining participation in government programs. Because it is not known whether producers consider these provisions as viable alternatives, the determination of post-CRP land use is somewhat uncertain.

The fate of land enrolled in the CRP as contracts expire was estimated in several recent studies. In 1990, the Soil and Water Conservation Society (SWCS) conducted a national survey of CRP contract holders. Forty-two % of respondents indicated they would return some CRP acreage to crop production (Nowak et al.). Osborn weighted responses to this survey by the number of acres controlled by each respondent to find crop production would resume on 52.7% of CRP acres. However, these estimates were made based on the survey data without testing the data for bias.

Recent work by Garrison et al. has shown the SWCS survey data suffered from two sources of nonresponse bias. A two-limit Tobit model was used for response imputation to adjust the data. After correcting for nonresponse bias the mean of recropping weighted by CRP acres was calculated. Results indicate producers intend to return 48.2% of the CRP land enrolled in the first nine signups to crop production. While many factors may change the intentions of the surveyed contract holders, these estimates reflect the best estimates of post-CRP land use intentions. And, recent state and regional surveys of post-CRP land use intentions indicate similar planting intentions (NCT-163). These recropping predictions are incorporated into market outlook in order to predict the most likely changes in production and prices of wheat and corn in the post-CRP era.

Procedure

Producer intentions represented by the SWCS survey are for land enrolled in the CRP from 1986 to 1990. For this reason, the analysis will focus on the expiration of contracts entered in this period although subsequent signups have added nearly 2 million acres. Enrollment eligibility is based on land characteristics including land capability class, soil loss tolerance, and inherent erodibility. The most highly erosive land was enrolled in the first signups, so it will be the first eligible to return to production. The later sign-ups focused more on highly erodible and other environmentally sensitive cropland. The fourth signup offered incentives commonly referred to as the "corn bonus" to entice producers from the Corn Belt to enroll in the CRP. Because signup criteria differ among years, the market outlook for wheat and corn will be forecast by year from 1996 through 2000.

Although several alternatives to reauthorized CRP have been discussed in various forums, this analysis assumes the Conservation Reserve will not be renewed in the 1995 farm legislation. However, the analysis considers two alternative proportions of land returning to crop production.

First, a baseline market forecast is made assuming all CRP contracts are extended. From this baseline, changes in the wheat and corn markets are predicted assuming first that 48.2% and then 100% of base acres for all crops enrolled in CRP will return to production. When producers enrolled marginal cropland in the CRP they were required to reduce their Crop Acreage Base (CAB) by a proportionate amount. Because past land use is a strong indicator of the most profitable land use, the analysis assumes only land which has established CAB will return to production. The 12 million acres which do not have CAB are assumed to be maintained in trees, grass, structural practices, fallowed, idled, or abandoned. Therefore, impacts due to land returning to soybean production are not explicitly estimated and the predicted changes in the wheat and corn markets may be conservative.

Although the characteristics of land enrolled in each signup differ, there is little difference in the average productivity of land between signups (Osborn, Llacuna, and Linsenbigler). Therefore, all land returning to crop production is assumed to be of average productivity for the area where it returns. Under these assumptions and scenarios the impacts of CRP contract expiration on the production and prices of wheat and corn are predicted for each year of contract expiration.

The analysis is accomplished using a comprehensive simulation model, called POLYSYS. POLYSYS combines linear programming and econometric simulation to determine the impacts of policy changes (Dicks, Ray, and Ugarte; Ray; Dicks). The linear programming capabilities of POLYSYS optimize land resource allocation among crops in the first scenario based on empirical producer intentions measured by SWCS survey responses and in the second scenario by assuming all land eligible for government participation will return to crop production. The two components of POLYSYS (POLYSIM and RASS) and the methods used to conduct this analysis are briefly described in order.

POLYSIM (Policy Simulator) is the econometric component used to estimate annual supply and demand, as well as prices for major U.S. commodities. POLYSIM uses a baseline set of data over the analysis period in order to predict policy-induced changes in prices and production (Dicks, Ray, and Ugarte). For this analysis, the Food and Agriculture Policy Research Institute (FAPRI) baseline assumptions (November 1992) are used to construct the baseline supply and demand estimates for POLYSIM. This baseline assumes continuation of current agricultural policies (eg. ARP levels remain constant, 0/92 and flex are available).

POLYSIM uses percentage changes from baseline values and supply and demand price elasticities, capturing cross-price relationships, to estimate the effects of changes in farm policy (Ray; Dicks, Ray, and Ugarte). The initial simulation using the modified FAPRI baseline provides a measure of the production and price changes that could be expected if the CRP is extended, with none of the land returning to production. The estimates of price for each year of analysis are incorporated into RASS (Resource Allocation Summary System), the second component of POLYSYS, to predict changes in harvested acreage, yields, and variable production costs as CRP land returns to crop production.

RASS is an interregional linear programming model which estimates the expected distribution of crop production activities across 105 production areas of the contiguous United States (Dicks). RASS combines variable cost, yield, price, acreage, and commodity program participation for each crop in each of the production areas. The linear programming model uses a profit maximizing objective function to solve for the optimal allocation of crop production activities in each production area. Total acreage available and shifts in crop acreage are restricted to historic levels (Dicks, Ray, and Ugarte). All policy options (e.g. deficiency payments, normal and optional flex, and 0-50/92) are available in each production area. Acreage available for crop production due to yearly CRP contract expiration is added to the total acreage available and the current allocation of crop acreage in each production area.

RASS and POLYSIM are linked in a recursive framework which uses the forecasting abilities of POLYSIM to provide expected prices, costs, and yields. Based on these expectations, RASS determines cropping activities for all regions and aggregates them to a national level. The output from RASS is then supplied to POLYSIM to estimate the price response associated with the estimated levels of harvested acreage.

For this analysis the expected price, variable costs, and national program acreage for 1996 obtained from the adjusted FAPRI baseline in POLYSIM are supplied to RASS. The changes in available crop acreage in each production area due to contract expiration under each scenario for 1996 are made in RASS. RASS is then used to predict changes in national yields, cost of production, and commodity program participation that will occur as a result of changes in land use. These percentage changes for each crop are then provided to POLYSIM to estimate the impacts of CRP expiration on production and prices of wheat and corn for 1996. Using these predictions, the 1997 price under the alternative scenarios of recropping for each crop is forecast by POLYSIM. The procedure is repeated under each land-use scenario to obtain the impacts of contract expiration in 1997 along with a forecast for 1998. This recursive procedure is repeated for each year from 1996 through 2000 to determine the yearly impacts of CRP contract expiration of the first nine signups.

Results

As CRP land returns to production, price and production estimates from POLYSYS diverge from the FAPRI baseline estimates. Because predictions are based on deviations from a set of baseline assumptions affecting supply and demand in each year, price does not consistently decline or production increase in absolute terms over time. Rather, price diverges from the baseline prediction as land returns to crop production over time. The impacts of the Conservation Reserve Program contract expiration on the market outlook for corn and wheat are discussed separately.

Predicted corn production under the alternative scenarios is shown in Table 2. The percentage changes in corn production increasingly diverge from the baseline predicted in POLYSIM in each year of contract expiration. By 2000, production is expected to be 2% higher than the baseline under the 48.2% scenario, and 5% higher under the 100% scenario.

With expanded output, the price of corn steadily diverges from the baseline price predicted by

Table 2. Predicted Corn Production Deviations and Percent Deviations from the Baseline, 1996–2000

Year	Baseline (Million bushels)	Estimated Change: 48.2% Scenario	Percent Change 48.2% Scenario	Estimated Change: 100% Scenario	Percent Change: 100% Scenario
1996	8822.2	8.8	0.10	16.8	0.19
1997	8887.7	120.9	1.36	251.5	2.83
1998	8919.0	148.9	1.67	308.6	3.46
1999	9013.5	178.5	1.98	373.2	4.14
2000	9140.3	203.8	2.23	424.1	4.64

Table 3. Predicted Corn Price Deviations and Percent Deviations from the Baseline, 1996–2000

Year	Baseline ($/bu.)	Estimated Change: 48.2% Scenario	Percent Change: 48.2% Scenario	Estimated Change: 100% Scenario	Percent Change: 100% Scenario
1996	2.48	0.0	0.00	−0.01	−0.40
1997	2.39	−0.04	−1.67	−0.07	−2.93
1998	2.38	−0.04	−1.68	−0.09	−3.78
1999	2.45	−0.05	−2.04	−0.11	−4.48
2000	2.58	−0.06	−2.32	−0.13	−5.04

POLYSIM. The impacts on corn price for each year of contract expiration are shown in Table 3. The price impact of contract expiration in 1996 is minimal. The biggest year-to-year impact on corn prices is in 1997, the year contracts for land enrolled under the corn bonus expire. By 2000, under the 48.2% CRP recropping scenario, a 1.7% price decline from the predicted baseline is estimated. Under the 100% recropping scenario, a 5% price decline is estimated.

By the year 2000, CRP lands returning to wheat will boost production 6% above the baseline under the 48.2% scenario, and 12.5% above the baseline under the 100% scenario (Table 4). While corn price does not show real decline from the baseline until 1997, Table 5 shows the price of wheat is expected to drop 0.5% from the baseline in 1996 under the 48.2% scenario, and 1% under the 100% scenario. By the year 2000, wheat price is expected to be 7% below the baseline under the 48.2% scenario and nearly 13% below the baseline under the 100% scenario.

The price impacts estimated in this analysis due to increased wheat and corn production suggest a near-unitary demand elasticity, since percentage increases in production are nearly matched by percentage decreases in price. This would be an inappropriate representation of agricultural markets in general. However, the elasticity is a long-run estimate of both the wheat and corn markets covering a period of five years. It takes into account the cumulative impacts of CRP contract expiration including increasing grain stocks and cross-price effects. Thus, the results imply elasticities within the range of those historically estimated for agricultural commodities.

Summary and Implications

The results clearly suggest that CRP contract expiration *ceteris paribus* will influence the price of wheat and corn. Based on past production practices and the post-CRP land-use intentions of CRP contract holders, 48.2% of the base acres enrolled in the CRP will return to production. Under this scenario, corn price declines by more than 2% from baseline by 2000, and the wheat price declines by more than 7%.

Lower farm prices for wheat and corn may cause a decrease in net farm returns. Also, government program costs for these and other commodity program crops may rise substantially by 2000 unless the administration increases ARP levels or the percent of normal flex acres or reduces target prices.

The future of the CRP will not be certain until the 1995 farm legislation. The objectives stated by the Clinton administration have been both to protect the environment and to reduce the federal budget deficit. The relative importance of these objectives will have a profound impact on the future of the CRP. In addition, the actual amount of land which will be returned to crop production as contracts expire will depend on the economic and pol-

Table 4. Predicted Wheat Production Deviations and Percent Deviations from the Baseline, 1996–2000

Year	Baseline (Million bushels)	Estimated Change: 48.2% Scenario	Percent Change: 48.2% Scenario	Estimated Change: 100% Scenario	Percent Change: 100% Scenario
1996	2535.4	7.9	0.31	16.5	0.65
1997	2499.2	59.0	2.36	123.7	4.95
1998	2495.0	102.0	4.09	213.1	8.54
1999	2461.1	125.8	5.11	262.8	10.68
2000	2464.9	147.4	5.98	308.1	12.50

Table 5. Predicted Wheat Price Deviations and Percent Deviations from the Baseline, 1996–2000

Year	Baseline ($/bu.)	Estimated Change: 48.2% Scenario	Percent Change: 48.2% Scenario	Estimated Change: 100% Scenario	Percent Change: 100% Scenario
1996	3.67	−0.02	−0.54	−0.04	−1.09
1997	3.75	−0.12	−3.20	−0.26	−6.93
1998	3.65	−0.20	−5.48	−0.35	−9.58
1999	3.81	−0.24	−6.30	−0.43	−11.29
2000	4.04	−0.29	−7.18	−0.52	−12.87

icy circumstances beginning in 1995. Although this research provides estimates of production and price impacts under reasonable scenarios, consideration of other policy and producer alternatives as more information becomes available would provide more detail for policy makers and agribusiness decision makers.

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