National and Regional Implications of Targeting the Conservation Reserve

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Staff Report 89-SR 39

November 1989

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This report was prepared under Cooperative Agreement Number CR813498-01-2 between the Office of Policy, U.S. Environmental Protection Agency, Washington, D.C., and the Center for Agricultural and Rural Development, Iowa State University.

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Abstract

Within the Conservation Reserve (CR) program, a change in program criteria could reduce the amount of erosion material entering our nation's waterways. The inclusion of land adjacent to water bodies, flowing streams, and river waterways may reduce erosion from these lands and improve water quality. These buffer strip areas, removed from production and placed in the reserve with a vegetative cover, would limit sedimentation and act to prevent upland erosion materials from reaching waterway channels, thus enhancing the programs' environmental benefits.

This paper analyzes the economic benefits of including buffer strips as eligible CR land, and it reviews the problems of identifying such areas. For this study, data from the 1982 Natural Resources Inventory (NRI) were used to estimate eligible acres. Three alternative levels of targeting eligible acres were evaluated. The results suggest that farmers in the Midwest would not be collectively worse off as a result of the targeting options analyzed. In fact, they would experience higher net returns on the basis of higher CR payments and higher commodity prices, which would result from reserve-related reductions in available cropland. Other results indicate that per-acre erosion would increase on land outside the program, because the potential erosion levels on some of the buffer strip land are not as high as those for regular CR land. Regional impacts are highly sensitive to commodity prices and to CR payments.

Introduction

Soil and water conservation continue to be an important focus of environmental policy at both the national and state levels. Soil resource productivity and concerns about water contamination have in recent years prompted a series of major conservation policies and environmental protection programs.

The Food Security Act (FSA) of 1985 includes the continued support for the maintenance of the Agricultural Conservation Program (ACP). The ACP is a cooperative effort by federal and state agencies and agricultural producers to restore and protect land and water resources and the environment. It also provides cost sharing to farmers implementing resource conservation practices on agricultural lands. Available nationally to farmers who have a conservation or pollution problem, the program is administered by the Agricultural Stabilization and Conservation Service (ASCS) at the state and county levels. Assistance for conservation planning is provided by the Soil Conservation Service, the Forest Service, and the Cooperative Extension Service.

The Conservation Reserve (CR), authorized by the Food Security Act of 1985, encourages farmers to idle highly erodible land and to convert it to permanent vegetative cover. The farmer may enter into a ten-year contract with the USDA and receive annual rental payments, made through the ASCS, on the reserved acres of up to $50,000 per farm per year. Cost

sharing is available for establishment of permanent cover on land placed in the reserve.

Under current provisions, two criteria designate cropland as highly erodible: (1) an erodibility index equal to or greater than eight for wind or water erosion, or (2) an erosion rate greater than that recommended by conservation service field technical standards based on soil tolerance. To be eligible for the CR, at least two-thirds of a field must be considered highly erodible and must have been cropped between 1981 and 1985 (USDA 1987.)

Within the reserve program, a change in the targeting criteria could reduce erosion significantly. The inclusion of land adjacent to water bodies, flowing streams, and river waterways may reduce erosion and improve water quality. Such land--termed buffer strips--removed from production and placed in the reserve with a vegetative cover, would limit sedimentation and act to prevent upland erosion materials from reaching waterway channels. This targeting of buffer strip areas for eligibility within the CR could, perhaps, increase the program's environmental benefits.

This paper analyzes the economic benefits of including buffer strips as eligible CR land and reviews problems of identifying such areas. Indeed, there is a real deficiency in the data available for use in identifying land adjacent to streams, rivers, and other water bodies. For this study data from the 1982 Natural Resource Inventory (NRI) were used to estimate eligible buffer strip acres. Once the eligible buffer land was

identified, overlap with regular reserve land had to be determined from sign-up records. Buffer strip land also had to be eligible for CR sign-up in accordance with county limits. After the eligible acres were identified, CARD modeling systems were used to evaluate the impacts of targeting alternatives for erosion, government cost, agricultural commodity prices, and farm income. The baseline projections were from the 1988 FAPRI Ten-Year Outlook (FAPRI 1988), prepared in March 1988 prior to the drought.

Buffer Strip Area and CRP Allocation

This section describes the databases and methods used to estimate total land available for conservation buffer strips, first describing the procedure used to determine total potential buffer strip area, followed by a review of methods used in computing buffer strip and CR eligibility, and a discussion of the allocation of future CR sign-up. Both existing eligibility criteria and proposed rules for qualifying CR land as buffer strips are incorporated.

Buffer Strips

Reliable data on land area adjacent to streams, lakes, ponds, and other water bodies generally are not available. Several alternative data sets exist for approximating this area, including the 1982 NRI (SCS 1987), which is a comprehensive survey of the natural resource and crop land base in the U.S. specific to the substate (multicounty) level. The NRI reports acres for water bodies of fewer than two acres and between two and forty

acres, as well as acres in small perennial streams less than 600 feet wide. These NRI data do not, however, provide information on land class or erodibility levels of land adjacent to the water bodies--information necessary for identifying potential buffer strip areas--nor do they include the bank lengths for the water bodies.

The basic data records in the 1982 NRI are primary sampling units (PSU), which represent a predetermined land area. For instance, most PSUs represent quarter sections (a one-half-mile-square area containing 160 acres), although some 40-acre and 640-acre areas are used. One important category recorded in these data is the distance to the nearest water source for each PSU. Although the type of water source is not listed, it is possible to use this information to allocate the county water body data to land classes. Of course, these data have low statistical validity at the PSU level. Estimates for miles of privately owned river length per state were used in tandem with the NRI data to determine potential buffer strip areas, and to check for the consistency of the NRI data.

The procedure for estimating potential buffer strip area involved a number of steps. First, county-level data for acres of land in streams and water bodies were obtained from the 1982 NRI. It was assumed that all water bodies (i.e., lakes, ponds, etc.) were circular. This ad hoc assumption was used for computational simplicity. County-level estimates of shore length for water bodies were computed as

$$WL_i = 2\pi[(ASQM_i/\pi)^{1/2}]; \qquad i = 1, \ldots, 3112 \text{ counties} \qquad (1)$$

where $ASQM_i = AWB_i \cdot 0.00156$. WL_i denotes the total county shore length for water bodies in thousands of miles; $ASQM_i$ is the total county water body area in acres reported by the NRI; and 0.00156 is a factor (involving π) used to convert acres to square miles. Equation (1) was derived from the standard relations for the area and circumference of a circle.

Second, total acres of small perennial streams (streams up to 600 feet wide), denoted APS_i, were summarized by county from the NRI. State-level data on stream bank length were then apportioned to county level. County-level totals of acres in water were computed as

$$ATOT_i = AWB_i + APS_i; \qquad i = 1, \ldots, 3112. \tag{2}$$

The values from (2) were used to construct a set of homogeneous weights for proportionately converting the state-level bank length data to a county level. Specifically, if CBL_i denotes county bank length, then

$$CBL_i = SBL(ATOT_i / \sum_{i=1}^{N} ATOT_i), \tag{3}$$

where N is the number of counties in state S.

The estimates from (3), combined with the shore length estimates from (1), approximate the total area in a county available for buffer strips. Unfortunately, these estimates provide no information about the land group or the erodibility of land. Also, reserves removed from the available land base must be assigned to the appropriate land classifications to estimate erosion impacts of buffer strips. Of course, past reserve program sign-up

can overlap the buffer strip area, and nontargeted future CR enrollment can include eligible buffer strip land.

Land Classes

"Distance to water" information contained in the NRI was combined with the area estimates above to approximate classes of land along streams and water bodies. Specifically, the NRI data were used to measure endogenous crop acres within a specified distance to water (such as 100 feet) for each county and each land class within a county. A set of weights for apportioning county-level bank and shore lengths to different land classes was then developed by taking endogenous crop acres in land class 1 and dividing by endogenous crop acres in all the land classes for a given county. However, this procedure overestimates the shore and bank length for a land class, since there is more land in a county than that in endogenous crops.

The expression for determining water length (shore length plus bank length) for a land class in a county is

$$SL_{il} = CLB_i(land_{il}^{end}/land_i^p) + WL_i(land_{il}^{end}/land_i), \qquad (4)$$

where $i = 1, \ldots, 3112$; $l = 1, \ldots, 8$; SL_{il} is miles of water length for land class l in county i; $land_{il}^{end}$ is total privately owned acres in county i; $land_i$ represents the total land base in county i; and CBL_i and WL_i are as previously defined.

In equation (4) the denominator for the weights adjusting county bank length, CBA_i, is total acres owned privately in county i, $land_i^p$. This

value was used since the bank length data are already adjusted to reflect privately owned land along river and stream banks. Likewise, the denominator in the weights for adjusting county shore length, WL_i, is the total county land base, $land_i$. Total county area is used because--unlike the bank length data--no distinction is made between private and public water bodies in the NRI.

Future CRP Allocations and Buffer Strip Scenarios

When allocating CR land for the scenarios, a number of issues had to be considered. First, there cannot be more land in Conservation Reserve in a county than is eligible. In addition, total future CR and buffer strip allocations at the county level must match the targeted levels specified in the scenarios. The scenarios evaluated included a base run in which a 45-million-acre CR enrollment was imposed without targeting any CR land as buffer strips (45/0). The three alternative scenarios were: 5 million of the 45 million acres of CR land targeted to buffer strips (45/5), 20 million acres of the 45 million CR acres targeted to buffer strips (45/20), and an expansion of the CRP to 65 million acres, with 25 million acres targeted to buffer strips (65/25).

The legislated limit for county CR sign-up is 25 percent of the total land base. There is evidence, however, that this 25-percent limit has been relaxed in previous sign-ups, bringing up questions about the viability of the 25-percent limit in the buffer strip scenarios. For the 45/5 scenarios the 25-percent limit was continued. However, a 35-percent county limit was

applied for the other scenarios, largely to obtain sufficient eligible land to meet the 20- and 25-million-acre buffer strip targets. Also, buffer strip width had to be expanded, using 100-foot buffer strips for the 45/5 scenario, 230-foot strips for the 45/20 scenario, and 300-foot strips for the 65/25 scenario.

Buffer Strips and CR Eligibility

Using the data on buffer strip width, county and land class, water body and stream length, past CR enrollment (through the first four sign-up periods), and the total acres available for future sign-up, it was possible to allocate future CR enrollment. However, several important decisions remained for determining county and land class CR participation. For instance, the definitions used for regular and buffer strip reserve did not preclude the possibility that (1) past CR sign-up had occurred in eligible buffer strip areas, and (2) that future CR sign-up on land meeting the existing eligibility criteria could include targeted buffer strip areas. The potential overlap between regular CR acres and buffer strip CR acres had to be reflected in allocating future CR acres; thus, it was necessary to know the potential land area available for CR meeting the standard eligibility definition, the potential land area meeting the buffer strip criteria, and the overlap area satisfying both criteria.

The 1982 NRI again was used to determine total acres eligible for buffer strips of a prespecified width. The NRI data were scanned to obtain all acres of endogenous crops within 100, 230, and 300 feet of water.

These values were then aggregated to obtain total area available for buffer strips at a county and land-class level, denoted $bland^{e}_{il}$.

Next, the overlap in the two definitions was determined. That is, it was necessary to estimate the eligible CR land in buffer strips that also satisfied two other criteria: those of greater than 2T and of the land class 2-8. This was accomplished using two definitions of regular CR-eligible land: denote land eligible for regular CR within t feet of water (t = 100, 230, 300) as $land^{e,\leq t}_{il}$, and land eligible for regular CR greater than t feet from water as $land^{e,>t}_{il}$. By definition,

$$land^{e}_{il} = land^{e,\leq t}_{il} + land^{e,>t}_{il}; \qquad t = 100, 230, 300. \tag{5}$$

The union set of all available CR land satisfying both the regular CR and the buffer strip eligibility was

$$land^{eu}_{il} = land^{e,>t}_{il} + bland^{e}_{il}, \tag{6}$$

where i = 1, ..., 3112; l = 1, ..., 8; t = 100, 230, 300; and $land^{eu}_{il}$ is the union set of all CRP land that fits both definitions.

County-Level Estimates

The final set was to convert (6) into a value that is both allocatable and eligible for CR with county-level sign-up limits applied. For the county-level percent limits, the land that was both allocatable and eligible under the 25-percent rule was

$$land^{eu}_{il} \qquad \text{if } \sum_{l} land^{eu}_{il} \leq 0.25 \sum_{l} land_{il}$$

$$land_{il}^{aeu} = \begin{cases} CRP_{il}^{p} & \text{if } CRP_{il}^{p} > land_{il}^{eu} \\ fct_{i}^{1} \cdot land_{il}^{eu} & \text{otherwise} \end{cases} \quad (7)$$

An identical definition for allocatable and eligible CR land under the 35-percent county limit rule can be obtained by replacing 0.25 with 0.35 in (7). Expressions similar to (7) can be used to obtain regular CR land (both allocatable and eligible), $land_{il}^{ae,>2T}$, and buffer strip land (both allocatable and eligible), $bland_{il}^{ae}$.

Given that the union set of land allocatable and eligible for future CR sign-up was used in the allocation model, it also became necessary to reflect previous reserve enrollment of buffer strip areas. Unfortunately, these data were not available, and given that lack of data, an ad hoc adjustment was made for past CR sign-up data. Since $land_{il}^{e,\leq t}$ and $land_{il}^{e,t}$ were known from the NRI, it was possible to make adjustments in the past sign-up data to reflect overlap with buffer strip areas. In particular, a proportion ($land_{il}^{e,\leq t}/land_{il}$) was applied to all present CR sign-up land to estimate total land allocatable and eligible for buffer strips not already in previous sign-ups.

Results for Multicommodity Market Models

Likely economic impacts of targeting eligible CR land to include buffer strips were evaluated in early spring 1988 prior to the drought. The results of the analyses are best viewed as an exercise, given the abstractions required to (1) quantify eligible buffer strip area and

eligible CR land and (2) allocate the regular and buffer strip land to future CR sign-up while adhering to both the legislated county limits and the scenario specifications. Most important, the economic conditions for agriculture have changed significantly since the spring of 1988.

Two economic modeling systems were used in the exercise. First, the CARD/FAPRI multimarket commodity modeling system was applied to obtain national results. This system provides estimates of land use, agricultural market prices, and government costs over a projected time horizon. Second, the scenarios were evaluated by plugging the national results into CARD static mathematical programming models at the producing area (PA) level, maximizing annual returns over short-run variable costs for crop production.

Assumptions and Baseline Projections

The multimarket commodity model analysis of CR alternatives proceeds from a baseline scenario keyed to CARD/FAPRI models that reflect macroeconomic conditions and the commodity market situation for spring 1988. The policy assumptions, summarized in Table 1, are for the different CR scenarios, indicated as 45/0, 45/5, 45/20, and 65/25. For the 65-million-acre CR scenario, the program requirements for reduced acreage had to be altered. These adjustments in the commodity program parameters were made to achieve a more level path in stocks and market prices over the ten-year evaluation period.

The FAPRI ten-year projections are highly sensitive to macroeconomic conditions in the United States and in foreign countries. These

Table 1. Major program assumptions of alternative scenarios

Policy Instrument	45-Million-Acre CRP, 0 Targeted (45/0)	45-Million-Acre CRP, 5 Targeted (45/5)	45-Million-Acre CRP, 20 Targeted (45/20)	65-Million-Acre CRP, 25 Targeted (65/25)
Total CRP Acreage	88/89--28 mil. 89/90--38 mil. 90/91--45 mil. 91/92--45 mil.	Same as 45/0	Same as 45/0	88/89--32 mil. 89/90--48 mil. 90/91--60 mil. 91/92--65 mil.
Targeted CRP	None	88/89--2 mil. 89/90--4 mil. 90/91--5 mil. 91/92--5 mil.	5 mil. 14 mil. 20 mil. 20 mil.	5 mil. 15 mil. 22 mil. 25 mil.
Acreage	10-20% of corn base acres and 10-27.5% of wheat acres must be idled to receive deficiency payments	Same as 45/0	Same as 45/0	Rates are adjusted to offset half the changes in planted area that would result from CRP changes
Paid	0-10% of corn base acres may be idled for an additional payment; no diversion is available for wheat	Same as 45/0	Same as 45/0	Rates are adjusted to offset half the changes in planted area that would result from CRP changes
Generic PIK	Heavy usage in making payments, including 50% of CRP payments until 1990/91 and 25% thereafter	Same rules as under 45/0	Same rules as under 45/0	Same rules as under 45/0

projections for U.S. agriculture are made conditional on a macroeconomic set of projections. Additional detail on the policy assumptions and the macroeconomic conditions is provided in the ten-year report (FAPRI 1988). Generally, the macroeconomic conditions projected are consistent with a continuation of the situation in the spring of 1988.

State and Regional CRP Enrollment

The actual sign-up information used for the evaluation is through the fourth period. The CR acreage signed up during this period was concentrated in the Great Plains and the Mountain States. Future sign-up in these states will be limited by the rule that no more than 25 percent of the cropland in a given county can be in the Conservation Reserve.

For the 45/0 scenario, future CR enrollment is projected as heaviest in the Corn Belt. In such states as Iowa, Illinois, and Indiana, current enrollment is limited, but much land is eligible for the CR. A shift toward the Corn Belt for CR acreage implies that rental rates will increase, since land values are higher in the Midwest than in the Great Plains and the Mountain States. Detailed projections of sign-up are provided in Table 2. For the 45/5 scenario, the targeting of five million acres of buffer strips is projected to have limited effects on state CR enrollment, partly because future sign-up in the targeted areas is already projected for heavy increases in the baseline. The 45/5 scenario results in a modest increase in CR acreage in the Corn Belt, Northeast, Delta, and Appalachian regions.

Table 2. State CRP enrollment under the baseline (45/0) and three targeting scenarios

State	Enrollment through 4th sign-up	1990 Enrollment			
		45/0	45/5	45/20	65/25
		(1,000 acres)			
Alabama	308	822	766	763	1,044
Arkansas	97	415	541	841	1,030
California	138	244	286	730	819
Colorado	1,423	2,143	1,993	1,593	2,128
Delaware	0	13	22	29	45
Florida	51	188	169	125	198
Georgia	280	774	717	638	978
Idaho	547	1,260	1,176	916	1,417
Illinois	277	1,822	2,200	2,371	3,704
Indiana	146	997	1,184	1,399	2,157
Iowa	1,253	4,482	4,331	3,547	5,723
Kansas	1,391	2,675	2,608	2,105	3,300
Kentucky	282	778	861	1,255	1,660
Louisiana	43	175	236	333	501
Maine	12	56	50	113	104
Maryland	3	93	127	186	274
Massachusetts	0	14	13	35	46
Michigan	69	389	477	690	1,058
Minnesota	1,194	2,803	2,724	2,083	3,344
Mississippi	396	800	871	1,078	1,425
Missouri	904	2,359	2,587	2,785	4,010
Montana	1,146	3,053	2,765	2,848	3,638
Nebraska	802	2,073	2,036	1,695	2,668
New Jersey	0	53	57	83	121
New Mexico	440	297	264	411	408
New York	25	260	316	519	777
North Carolina	61	510	600	841	1,122
North Dakota	713	2,105	2,042	1,601	2,507
Ohio	103	584	712	1,195	1,753
Oklahoma	709	1,264	1,230	1,074	1,622
Oregon	437	645	587	632	817
Pennsylvania	34	450	541	760	1,151
South Carolina	139	242	231	279	400
South Dakota	456	1,347	1,232	943	1,448
Tennessee	252	863	846	1,312	1,620
Texas	2,253	4,939	4,586	3,215	5,065
Utah	191	253	328	698	593
Vermont	0	15	20	92	84
Virginia	26	250	245	473	548
Washington	688	1,251	1,133	804	1,265
West Virginia	0	45	49	353	335
Wisconsin	235	998	1,010	953	1,493
Wyoming	159	201	235	546	526
Other States	0	0	0	58	71
Total	17,683	45,000	45,000	45,000	65,000

For the 45/20 scenario, in which the number of target acres increases to 20 million, the result for regional/state sign-up is more significant. Substantial changes in regional patterns of CR enrollment are projected. In general, the direction of the impacts is the same as for the 45/5 scenario, but the magnitudes are much larger. CR enrollment drops sharply in such states as Texas, Kansas, and Colorado, where the baseline sign-up is high and there are few targeted or buffer strip acres. Enrollment increases in the Mississippi River basin and in Kentucky, where the baseline sign-up was low but many of the targeted acres are available.

When the total size of the reserve is increased to 65 million acres, with 25 million acres in buffer strips, the regional composition of the CR again alters significantly. Increases in enrollment are the most pronounced in states where eligible acres are concentrated and where the current sign-up is limited. Enrollment in CR increases over baseline levels in every region, with the largest gains occurring in the Corn Belt. The results for each of these scenarios by state, as used in the multimarket commodity model analysis, are summarized in Table 2.

Baseline (45/0)

The baseline results are summarized first, since the scenarios are evaluated as comparisons to these projections. In general, the area planted to major program crops increases slowly from 1988/89 onward, while the total area idled declines gradually beginning in 1989/90. Further, the area idled by annual programs falls more rapidly as the CR increases. Given normal weather in the United States and abroad, corn prices are projected to increase gradually from the lowest levels in 1986/87. Soybean prices increase more rapidly in 1988/89 but adjust in the following year as

production responds to the price increase and demand is similar to that of the previous year.

One important consequence of the large acreage reduction and expanding imports in the projection period is a decline in stocks of corn or feed grains and wheat, so that by 1991/92, these stocks have been reduced to normal levels. The rules of operating the program (summarized in Table 1) were set to utilize these stocks on an even basis, generating a relatively smooth market price path for the grains involved, and not inducing significant shocks for the livestock economy.

Net conservation compliance expenditures, which decline slightly from FY 1987, are projected to decrease more significantly in FY 1988 and to reach the $10-billion level by FY 1991. A large portion of the decline in FY 1988 is due to reduced loan outlays. Operating the program so as to not overly depress market prices with stocks of wheat and coarse grains would yield government cost savings greater than those from a program that would release stocks more rapidly, driving the market prices lower in the immediate out-years. Generally, the baseline shows increasing prices, a slow reduction in stocks, continued use of acreage reduction provisions in the commodity programs, and a growing world demand for agricultural commodities stimulated by moderately optimistic macroeconomic conditions.

Base Acreage Adjustments

The results of the exercises using these scenarios for base acreage are provided in Table 3. Increasing the CR reduces the number of "base" acres eligible for government payments. After the fourth sign-up, the total reserve enrollment of 17.7 million acres had reduced the base acreage

Table 3. Base reductions under the baseline (45/0) and three targeting scenarios

		1987/88	88/89	89/90	90/91	91/92	1988-91 Average	Change from Base	Percent Change
					(million acres)				
Wheat	45/0	4.96	6.85	9.29	11.00	11.00	9.54		
	45/5	4.96	6.72	9.12	10.80	10.80	9.36	-0.18	-1.8
	45/20	4.96	6.45	8.75	10.36	10.36	8.98	-0.55	-5.8
	65/25	4.96	7.26	10.88	13.61	14.74	11.62	2.09	21.9
Corn	45/0	2.32	5.03	6.83	8.08	8.08	7.01		
	45/5	2.32	5.21	7.07	8.38	8.38	7.26	0.26	3.6
	45/20	2.32	5.35	7.26	8.60	8.60	7.45	0.45	6.4
	65/25	2.32	6.41	9.61	12.01	13.01	10.26	3.26	46.5
Barley	45/0	1.28	1.82	2.47	2.93	2.93	2.54		
	45/5	1.28	1.72	2.34	2.77	2.77	2.40	-0.14	-5.4
	45/20	1.28	1.69	2.30	2.72	2.72	2.36	-0.18	-7.1
	65/25	1.28	1.84	2.76	3.45	3.74	2.95	0.41	16.2
Sorghum	45/0	1.34	1.77	2.40	2.84	2.84	2.46		
	45/5	1.34	1.74	2.36	2.80	2.80	2.43	-0.04	-1.5
	45/20	1.34	1.56	2.11	2.50	2.50	2.17	-0.29	-12.0
	65/25	1.34	1.81	2.72	3.40	3.68	2.90	0.44	17.9
Oats	45/0	0.55	0.98	1.33	1.58	1.58	1.37		
	45/5	0.55	0.97	1.31	1.56	1.56	1.35	-0.02	-1.3
	45/20	0.55	0.88	1.20	1.42	1.42	1.23	-0.14	-10.1
	65/25	0.55	1.06	1.59	1.98	2.15	1.70	0.33	23.9
Cotton	45/0	0.74	1.01	1.38	1.63	1.63	1.41		
	45/5	0.74	0.95	1.29	1.53	1.53	1.33	-0.09	-6.2
	45/20	0.74	0.90	1.06	1.17	1.17	1.08	-0.34	-23.9
	65/25	0.74	1.06	1.41	1.68	1.79	1.49	0.07	5.1
Rice	45/0	0.00	0.01	0.01	0.01	0.01	0.01		
	45/5	0.00	0.01	0.01	0.01	0.01	0.01	0.00	27.5
	45/20	0.00	0.01	0.02	0.02	0.02	0.02	0.01	92.2
	65/25	0.00	0.01	0.02	0.02	0.02	0.02	0.01	117.1
Total	45/0	11.19	17.47	23.71	28.07	28.07	24.33		
	45/5	11.19	17.32	23.50	27.85	27.85	24.13	-0.20	-0.8
	45/20	11.19	16.84	22.70	26.79	26.79	23.28	-1.05	-4.3
	65/25	11.19	19.45	28.99	36.15	39.13	30.93	6.60	27.1

of the seven program crops modeled by 11.2 million acres. Projections of future reductions in base acreage depend on enrollment by state. For each state and commodity, the 1990 base reduction was set equal to the 1987 base reduction, multiplied by the ratio of the 1990 state CR to the 1987 state CR. National base reductions for each of the commodities were simply the sum of the state reductions.

After the fourth sign-up, the wheat base had been reduced by almost 5.0 million acres because of the CR, whereas the corn base had been reduced only by 2.3 million acres. However, in the baseline scenario, it is projected that future CR enrollment will reduce corn base acreage almost as much as that for wheat. This is due to the already mentioned shift in future CR enrollment from the Great Plains to the Corn Belt.

The results of scenarios for base acreage reduction are also summarized in Table 3. For the 45/5 scenario, more corn acres are enrolled in CR when five million acres are targeted to buffer strips. Except for rice, the amount of base acreage enrolled in the CR falls for each of the other major crops. The changes are relatively small; the largest absolute affect is the 300,000-acre reduction for the corn base in 1990.

The 45/20 scenario, targeting 20 million acres to buffer strips in the 45-million-acre CR, magnifies the effects observed in the 45/5 scenario. Total base acreage enrolled in the CR falls by almost 1.3 million acres in 1990, since much of the targeted land is located where fewer program crops are grown. The greatest absolute effects are for wheat and corn, while the largest proportional effect is for cotton. In 1990 almost one-half million

fewer base cotton acres are enrolled in the CR under the 45/20 scenario than in the baseline.

For the 65/25 scenario, buffer strips reduce total base acreage by 11 million acres from the 45/0 levels. Other than rice (where the baseline CR enrollment is low), the largest percent increases in CR enrollment occur for corn. This follows since the eligible acreage is concentrated in the Midwest and upper Mississippi River basin. Enlarging the CR necessarily has a significant effect on corn and wheat supply that will be apparent on the price paths developed.

Base reductions by the 45/0 base and the scenarios for 1987/88 and 1990/91 are summarized in Figure 1. These figures demonstrate the magnitude of the impacts on base program crop acreage that would occur as a result of the different scenarios in 1991. Figure 2 summarizes the impacts of the 45/5, 45/20, and 65/25 scenarios on base acreage reduction by crop: wheat, corn, barley, sorghum, oats, cotton, and rice.

Planted Acreage

Planted acreage for the major crops is determined in the modeling system by parameters of government programs and economic conditions. Increasing base acreage enrolled in the CR for a given commodity will tend to reduce the planted acreage of that crop. However, this direct effect is countered by changes in other government programs and increases in market prices, which in turn affect participation and planted acreage.

Figure 1. Current/Future Base Reduct.

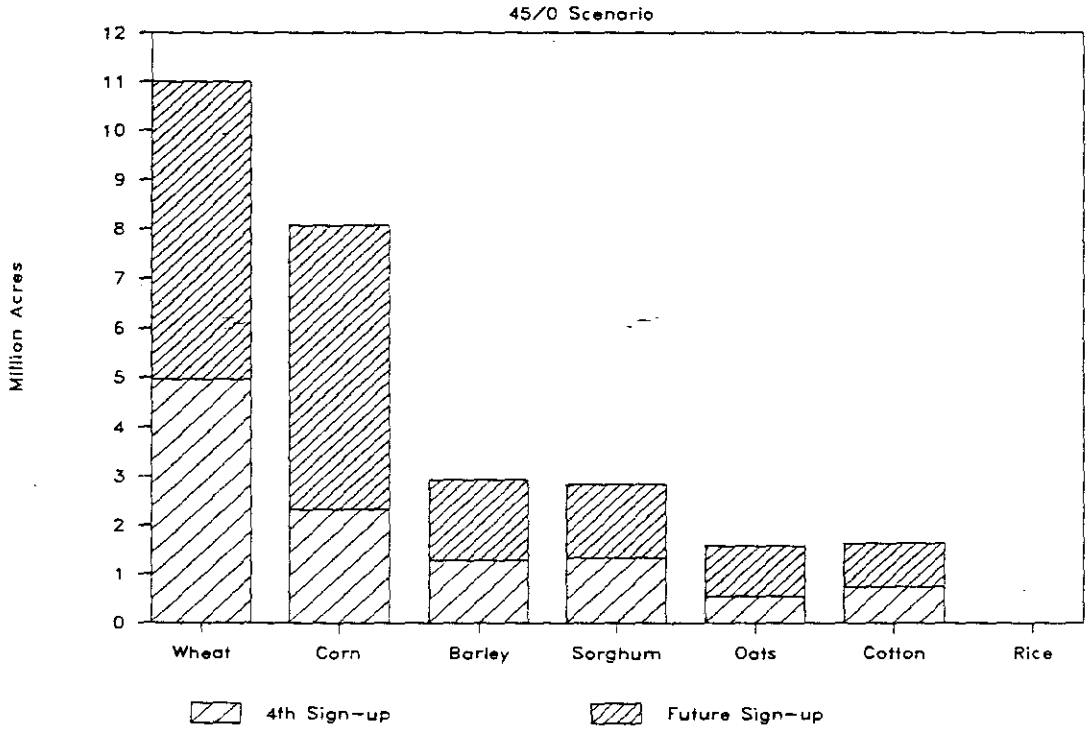
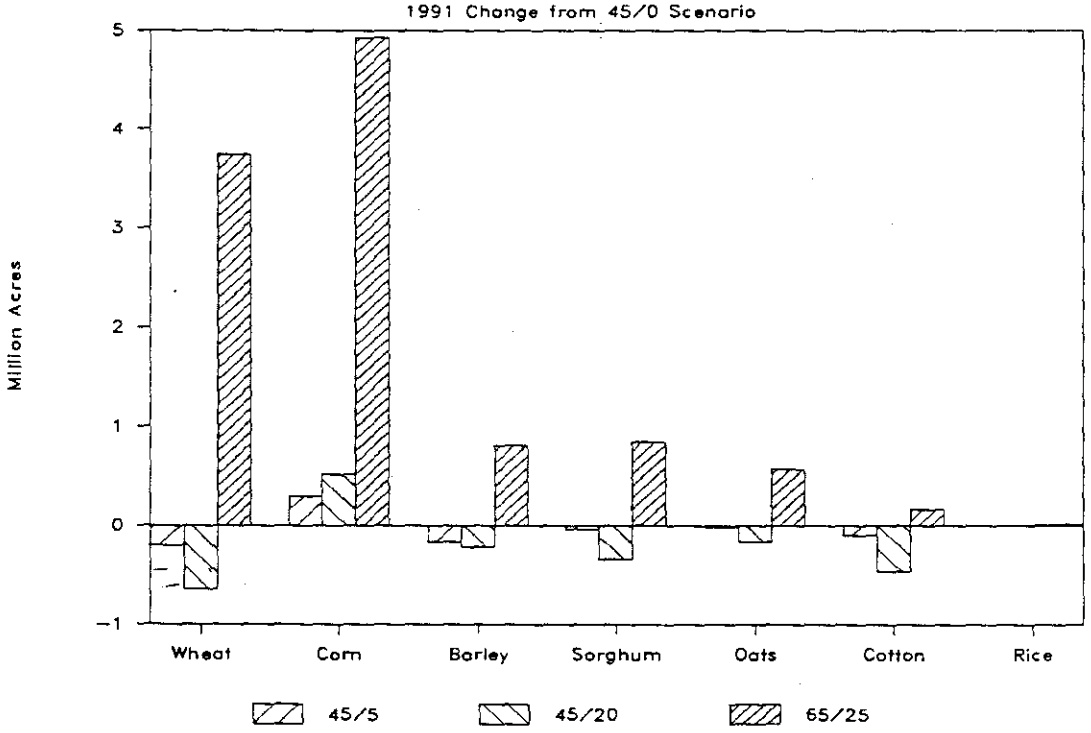


Figure 2. Changes in Base Reductions



In the baseline, the planted acreage for wheat, corn, and cotton expands between 1987 and 1991. Relaxation of idle land requirements for commodity programs and increased market prices more than offset the effect of the expansion in CR acreage. In contrast, the barley and sorghum area contracts until 1990. This is because the CR has a larger proportional effect on these crops. For soybeans, cotton, and rice, large acreage increases are projected for 1988 with smaller changes in planted acreage between then and 1991. Planted acreage in oats falls in part because fewer corn set-aside acres require a cover crop.

Investigation of the impacts of the targeting and CR scenarios for planted acreage shows that there are significant supply effects. In the 45/5 scenario there was little effect on planted acreage. In fact, for all eight major crops, the planted acreage differs from the baseline by less than 1 percent (Table 4). Corn and soybean acreage falls slightly, while wheat, barley, sorghum, and cotton acreages increase.

Targeting the 20 million acres to buffer strips under the 45/20 scenario increases sorghum and cotton areas planted by about 2 percent above the baseline level. Acres planted to wheat, barley, and oats increase by smaller amounts. Corn, soybeans, and rice acreages fall compared to the baseline. Sorghum and cotton are affected most because of the sharp drop in CR enrollment due to targeting in Kansas and Texas.

The results for the 65/25 scenario suggest more significant impacts. Increasing the size of the CR to 65 million acres reduces total planted

Table 4. Planted acreage under the baseline (45/0) and three targeting scenarios

		1987/88	88/89	89/90	90/91	91/92	1988-91 Average	Change from Base	Percent Change
					(million acres)				
Wheat	45/0	65.8	65.3	72.0	73.8	73.7	71.2		
	45/5	65.8	65.4	72.2	73.9	73.9	71.4	0.2	0.2
	45/20	65.8	65.6	72.5	74.3	74.3	71.7	0.5	0.7
	65/25	65.8	65.0	71.3	72.7	72.1	70.3	-0.9	-1.3
Corn	45/0	65.7	66.9	67.8	69.1	73.1	69.2		
	45/5	65.7	66.8	67.7	68.9	72.9	69.1	-0.1	-0.2
	45/20	65.7	66.7	67.5	68.8	72.7	68.9	-0.3	-0.4
	65/25	65.7	66.4	66.7	67.8	71.2	68.0	-1.2	-1.7
Barley	45/0	11.0	11.0	10.7	10.6	11.3	10.9		
	45/5	11.0	11.1	10.7	10.6	11.3	10.9	0.0	0.2
	45/20	11.0	11.1	10.7	10.6	11.3	10.9	0.0	0.2
	65/25	11.0	11.1	10.7	10.7	11.2	10.9	0.0	0.2
Sorghum	45/0	11.8	11.6	11.1	11.4	12.7	11.7		
	45/5	11.8	11.6	11.2	11.5	12.7	11.8	0.1	0.4
	45/20	11.8	11.7	11.4	11.7	13.0	12.0	0.3	2.1
	65/25	11.8	11.7	11.1	11.5	12.6	11.7	0.0	0.2
Oats	45/0	18.0	14.3	13.7	13.3	13.0	13.6		
	45/5	18.0	14.3	13.7	13.3	13.0	13.6	0.0	0.0
	45/20	18.0	14.4	13.8	13.4	13.1	13.7	0.1	0.7
	65/25	18.0	14.3	13.6	13.1	12.7	13.4	-0.2	-1.1
Cotton	45/0	10.4	12.0	11.6	11.5	11.8	11.7		
	45/5	10.4	12.0	11.6	11.6	11.8	11.8	0.0	0.4
	45/20	10.4	12.1	11.8	11.8	12.0	11.9	0.2	1.6
	65/25	10.4	12.0	11.6	11.5	11.7	11.7	-0.0	-0.3
Rice	45/0	2.4	2.9	2.9	2.9	3.0	2.9		
	45/5	2.4	2.9	2.9	2.9	3.0	2.9	0.0	0.0
	45/20	2.4	2.9	2.9	2.9	2.9	2.9	-0.0	-0.3
	65/25	2.4	2.9	2.9	2.9	2.9	2.9	-0.0	-0.3
Soybeans	45/0	57.4	62.0	64.6	62.6	61.9	62.8		
	45/5	57.4	62.0	64.5	62.6	61.8	62.7	-0.0	-0.1
	45/20	57.4	62.0	64.5	62.6	61.8	62.7	-0.0	-0.1
	65/25	57.4	61.4	63.9	61.4	60.6	61.8	-0.9	-1.5
Total	45/0	242.5	245.9	254.4	255.2	260.4	254.0		
	45/5	242.5	246.1	254.5	255.3	260.4	254.0	0.1	0.0
	45/20	242.5	246.4	255.0	256.1	261.1	254.7	0.7	0.3
	65/25	242.5	244.7	251.7	251.6	255.0	250.8	-3.2	-1.3

acreage in the eight major crops by more than five million acres by 1991. This effect would have been larger had annual acreage diversion parameters for the commodity programs not been relaxed. For example, the 1991 acreage reduction program for corn was reduced from 10 to 5 percent in order to adjust for the supply-reducing effects of the reserve program. The 20-million-acre increase in 1991 can be accounted for as follows: planted acreage in the eight program crops is reduced by 5.3 million; the land in annual acreage retirement programs falls by 6 million acres; 5.7 million acres of the expanded CR come from nonprogram crops; and the total land use increases by 3 million acres due to higher crop prices.

Figure 3 summarizes these planted acreage results for the CR scenarios. It shows the base levels for 1987 and 1991, and Figure 4 shows the changes from the base implied by the 45/5, 45/20, and 65/25 scenarios; here, sharp reductions in planted acreage are apparent for the 65/25 scenario.

Market Prices

Market prices for major commodities are determined in the multimarket commodity model by the interaction of supply and demand. Given domestic production and beginning stocks, domestic use, exports, and ending stocks, prices are jointly determined. Thus, for example, lower production will result in higher prices, lower exports, lower domestic use, and reduced carryover stocks.

In the baseline, prices for wheat, corn, barley, and sorghum are projected to increase for the next five years. Increased demand, programs

Figure 3. Planted Acreage/Major Crops

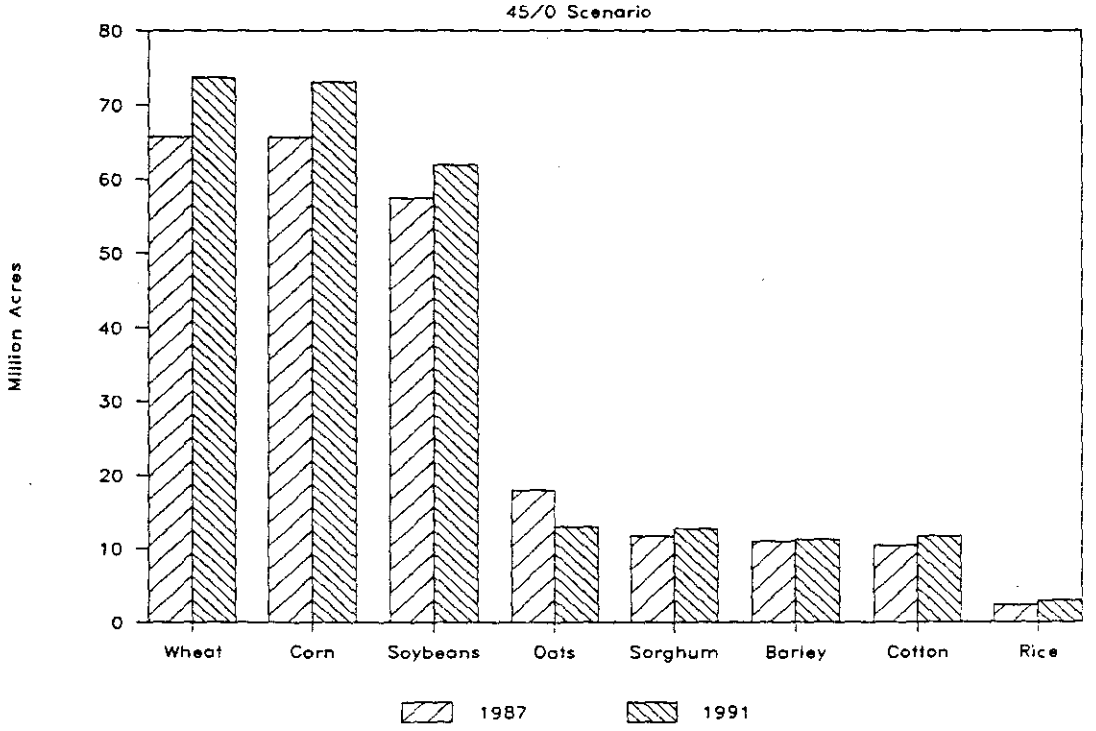
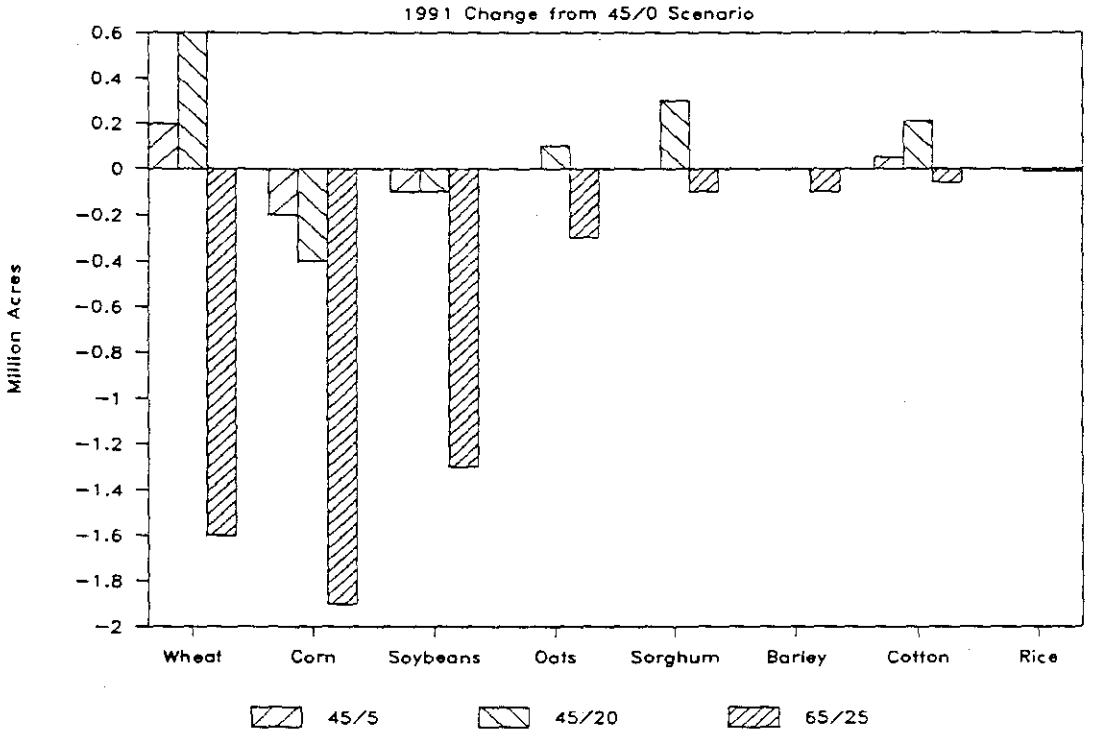


Figure 4. Changes in Planted Acreage



to reduce production, and falling stock levels result in continued modest upward movements in the prices from the very depressed levels of 1986/87. In the 45/5 scenario, there is little impact on the planted area or acreage base; thus, in turn there is little impact on market prices. Production levels for the commodities included in the model change little due to the targeting of the 5 million acres of the 45-million-acre reserve in buffer strips.

Price changes are more pronounced under the 45/20 scenario, since production shifts are larger than under the baseline or the 45/5 scenario. The direction of the changes is, however, the same as for the 45/5 scenario. (See Table 5.) The largest price effect is for cotton, which also has the largest proportional change in planted acreage. In the 65/25 CR scenario, higher prices for all eight major commodities are projected. Prices increase most dramatically for corn and soybeans, since much of the increased conservation acreage is from the Corn Belt. These higher prices have significant impacts on the cost of operating the commodity programs.

The 1991 market prices for the baseline as a percent of 1987 and the changes in the market prices between the baseline and the three targeting scenarios are provided in Figures 5 and 6. Figure 5 shows that prices over the 1987-1991 period increase for all major crops. These percentage increases are large, again due to the adjustments in planted acreage from changed program parameters, the Conservation Reserve, and the projected increase in market demand. Changes in market prices from the baseline or

Table 5. Market prices under the baseline (45/0) and three targeting scenarios

		1987/88	88/89	89/90	90/91	91/92	1988-91 Average	Change from Base	Percent Change
		(dollars per bushel)							
Wheat	45/0	2.56	2.86	3.00	3.05	3.09	3.00		
	45/5	2.56	2.86	3.00	3.05	3.09	3.00	0.00	0.0
	45/20	2.56	2.85	2.99	3.04	3.09	2.99	(0.01)	-0.2
	65/25	2.56	2.89	3.11	3.23	3.33	3.14	0.14	4.7
Corn	45/0	1.71	1.91	2.00	2.05	2.11	2.02		
	45/5	1.71	1.92	2.01	2.06	2.13	2.03	0.01	0.6
	45/20	1.71	1.92	2.02	2.08	2.15	2.04	0.02	1.2
	65/25	1.71	1.95	2.10	2.19	2.31	2.14	0.12	5.9
Barley	45/0	1.80	2.02	2.07	2.15	2.11	2.09		
	45/5	1.80	2.01	2.07	2.14	2.10	2.08	(0.01)	-0.4
	45/20	1.80	2.01	2.06	2.13	2.09	2.07	(0.02)	-0.7
	65/25	1.80	2.02	2.12	2.18	2.19	2.13	0.04	1.9
Sorghum	45/0	1.60	1.74	1.91	2.04	2.03	1.93		
	45/5	1.60	1.74	1.91	2.04	2.03	1.93	0.00	0.0
	45/20	1.60	1.73	1.89	2.03	2.02	1.92	(0.01)	-0.6
	65/25	1.60	1.76	1.97	2.13	2.16	2.01	0.07	3.9
Oats	45/0	1.65	1.46	1.52	1.60	1.65	1.56		
	45/5	1.65	1.47	1.52	1.60	1.66	1.56	0.00	0.3
	45/20	1.65	1.47	1.52	1.61	1.66	1.57	0.01	0.5
	65/25	1.65	1.47	1.52	1.62	1.69	1.58	0.02	1.1
Cotton[a]	45/0	0.630	0.602	0.584	0.593	0.606	0.596		
	45/5	0.628	0.597	0.575	0.582	0.594	0.587	(0.009)	-1.6
	45/20	0.626	0.586	0.551	0.545	0.551	0.558	(0.038)	-6.4
	65/25	0.632	0.605	0.589	0.600	0.615	0.602	0.006	1.0
Rice[b]	45/0	6.96	5.91	6.18	6.49	6.59	6.29		
	45/5	6.96	5.91	6.18	6.49	6.59	6.29	0.00	0.0
	45/20	6.96	5.92	6.20	6.52	6.62	6.32	0.02	0.4
	65/25	6.96	5.93	6.22	6.57	6.68	6.35	0.06	0.9
Soybeans	45/0	5.63	6.14	5.23	5.24	5.79	5.60		
	45/5	5.63	6.15	5.25	5.26	5.80	5.62	0.01	0.3
	45/20	5.63	6.15	5.25	5.28	5.81	5.62	0.02	0.4
	65/25	5.64	6.42	5.63	5.86	6.48	6.10	0.50	8.9

[a]Dollars per pound.
[b]Dollars per hundredweight.

Figure 5. 1991 Mkt. Prices, % of 1987

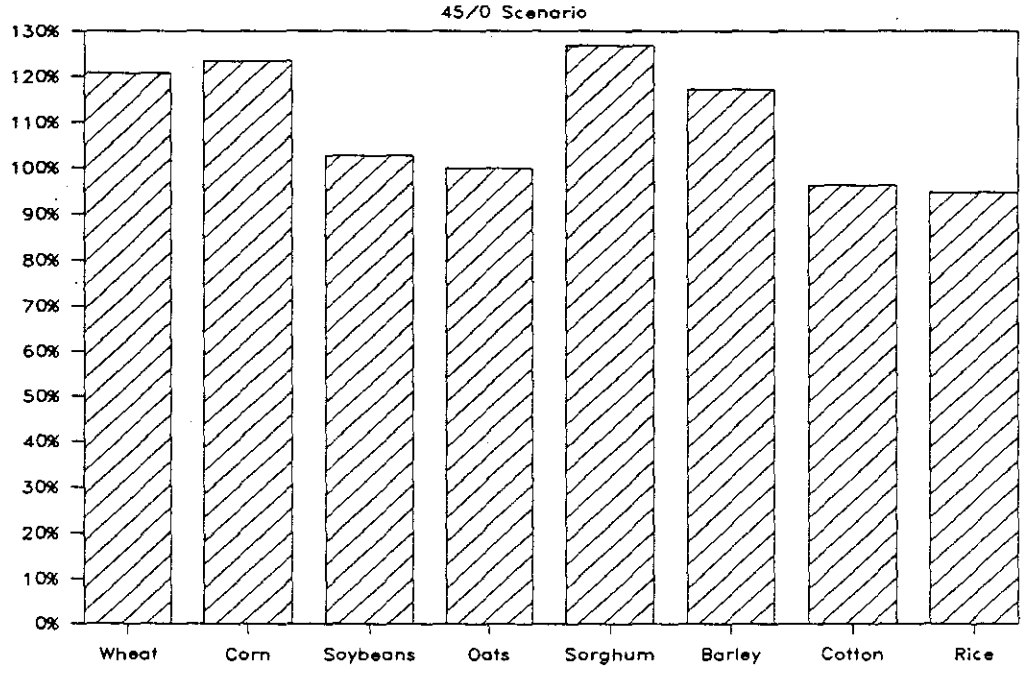
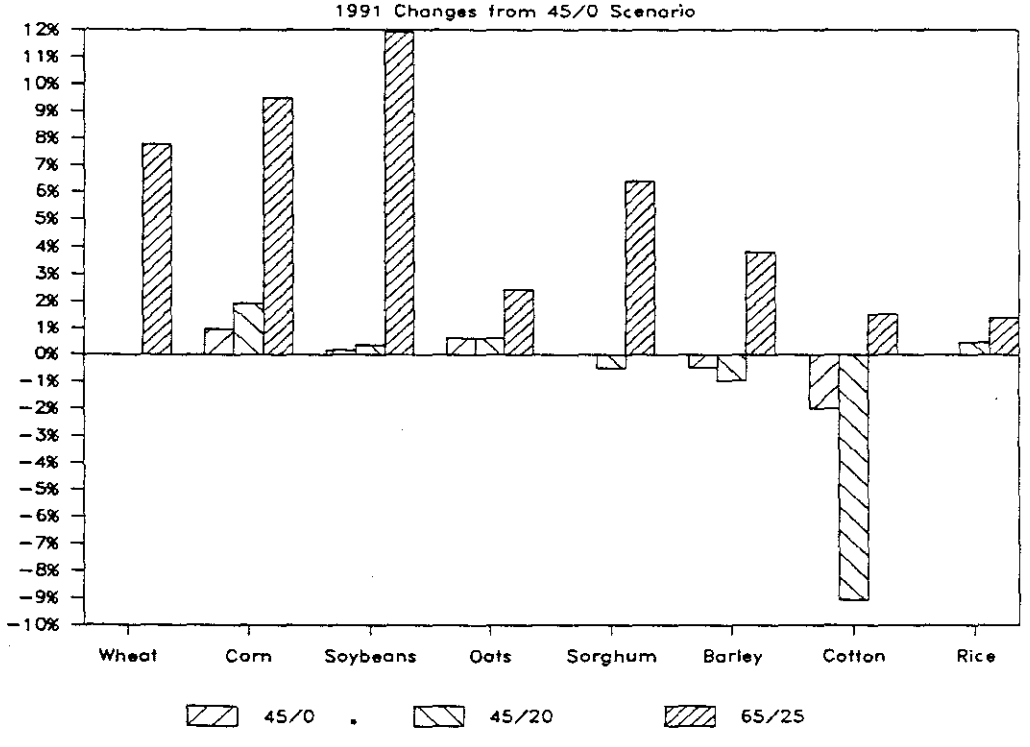


Figure 6. Changes in Market Prices



45/0 scenario are presented in Figure 6; the pattern observed is generally as implied by the discussion of planted acreage changes.

Government Costs

Government costs of the Conservation Reserve and commodity programs are calculated using an accounting framework designed to replicate the actions of the Commodity Credit Corporation (CCC). Government costs are computed on a cash basis. When a CR payment is made in a Payment-In-Kind (PIK) certificate instead of cash, it is not recorded as a cost to the program. This certificate is then used to repay a corn loan, and the cost is ascribed to the corn program; thus, while the certificate is not lost, its use skews the allocation of recorded costs by commodity.

For the baseline scenario, the government cost of the agricultural commodity programs is projected to fall dramatically in FY 1988 to about $14 billion from levels in excess of $20 billion in FY 1986 and 1987 (Table 6). More modest declines occur in out-years. The reported CR costs are on a cash basis, and it is assumed in the analysis that 50 percent of the rental payments will be made in certificates until 1992. Thus, the true CR costs are almost double those reported. In FY 1992, the certificate proportion of the CR payment is assumed to fall to 25 percent. The rental rate of $52.78 per acre (up from $48.70) is projected since the land bid into the CR is more productive.

As for planted acreage, the cost impacts of the 45/5 scenario are minimal. The conclusion from the analysis is that a modest targeting of the CR can occur at the 45-million-acre level without significant impacts

Table 6. Government costs under the baseline (45/0) and three targeting scenarios

		FY-88	FY-89	FY-90	FY-91	FY-92	1988-92 Average	Change from Base	Percent Change
		(billion dollars, cash accounting)							
Wheat	45/0	1.21	1.70	1.65	1.74	1.53	1.57		
	45/5	1.21	1.70	1.66	1.74	1.53	1.57	0.00	0.0
	45/20	1.23	1.72	1.68	1.75	1.54	1.58	0.02	1.1
	65/25 LO	1.19	1.56	1.36	1.33	1.05	1.30	(0.27)	-17.1
	65/25 HI	1.19	1.57	1.39	1.38	1.08	1.32	(0.24)	-15.6
Feed Grains	45/0	8.89	6.37	4.41	3.46	3.27	5.28		
	45/5	8.86	6.34	4.33	3.32	3.19	5.21	(0.07)	-1.3
	45/20	8.86	6.32	4.31	3.21	3.06	5.15	(0.13)	-2.4
	65/25 LO	8.67	5.94	3.78	2.28	2.11	4.56	(0.72)	-13.7
	65/25 HI	8.67	5.97	3.85	2.36	2.16	4.60	(0.68)	-12.8
Cotton	45/0	0.77	0.73	0.73	0.66	0.54	0.69		
	45/5	0.79	0.77	0.79	0.74	0.61	0.74	0.06	8.2
	45/20	0.81	0.86	0.98	1.04	0.93	0.92	0.24	34.7
	65/25 LO	0.76	0.71	0.69	0.62	0.48	0.65	(0.03)	-5.0
	65/25 HI	0.76	0.71	0.69	0.62	0.48	0.65	(0.03)	-5.0
Soybeans	45/0	(1.71)	(0.17)	0.29	(0.00)	(0.10)	(0.34)		
	45/5	(1.71)	(0.18)	0.27	(0.01)	(0.07)	(0.34)	(0.00)	-0.8
	45/20	(1.71)	(0.18)	0.28	(0.02)	(0.07)	(0.34)	(0.00)	-1.1
	65/25 LO	(1.72)	(0.23)	0.11	(0.04)	(0.08)	(0.39)	(0.05)	-15.5
	65/25 HI	(1.72)	(0.23)	0.11	(0.04)	(0.08)	(0.39)	(0.05)	-15.5
CRP	45/0	0.83	1.08	1.23	1.15	1.73	1.21		
	45/5	0.83	1.09	1.24	1.17	1.75	1.22	0.01	0.7
	45/20	0.83	1.09	1.25	1.17	1.75	1.22	0.01	0.9
	65/25 LO	0.98	1.43	1.71	1.76	2.56	1.69	0.48	39.9
	65/25 HI	0.98	1.59	2.04	2.23	3.34	2.04	0.83	68.7
Other	45/0	4.01	3.47	2.91	2.80	2.75	3.19		
	45/5	4.01	3.46	2.91	2.80	2.75	3.19	(0.00)	-0.1
	45/20	4.01	3.46	2.90	2.79	2.74	3.18	(0.01)	-0.3
	65/25 LO	4.00	3.43	2.83	2.72	2.68	3.13	(0.06)	-1.8
	65/25 HI	4.01	3.43	2.84	2.73	2.68	3.14	(0.05)	-1.6
Total	45/0	14.01	13.18	11.23	9.81	9.71	11.59		
	45/5	14.00	13.19	11.20	9.76	9.75	11.58	(0.01)	-0.1
	45/20	14.03	13.27	11.40	9.92	9.95	11.71	0.13	1.1
	65/25 LO	13.88	12.84	10.48	8.68	8.80	10.93	(0.65)	-5.6
	65/25 HI	13.89	13.05	10.92	9.28	9.66	11.36	(0.23)	-2.0

on government costs, prices, or planted acreage. Even when the number of targeted acres is increased to 20 million, total government cost is not significantly affected. Holding state bid rates constant, the national average bid rate for future sign-up is $53.86. Cotton program costs rise by as much as $390 million for 1992 due to lower prices and increased program acreage. Were it not for cotton costs, total government costs would actually fall for this scenario. The high cost of the cotton program could be reduced if the program acreage reduction rate were increased to offset the reductions in CR acreage. In general, these results show that if the CR acreage is targeted, thereby directing sign-up to the Corn Belt, the cotton acreage reduction program should be altered to reflect the increased land available for cotton production.

When the CR is expanded to 65 million acres, the net impact on government costs depends on the magnitudes of two effects working in opposite directions. Base acreage reductions result in higher commodity prices. These higher commodity prices cause relatively large reductions in deficiency payments and commodity program costs. However, larger total rental payments must be made on the expanded CR acreage, and bid rates may well have to increase the draw of potentially productive land into the CR. With state bid rates assumed constant, the average net cost saving to the government averages approximately $650 million per year over the next five years. If the assumed average bid rates increase by 40 percent (to $75.49 per acre), the cost savings fall to $230 million per year, and beyond 1992 government costs essentially remain unchanged.

Results of Mathematical Programming Analysis

The mathematical programming models used to evaluate CR levels and targeting were for five producing areas. The prices and acreages determined earlier were incorporated, as was the CARD/FAPRI multimarket commodity analysis. These PAs are in the upper Midwest, covering the Mississippi River basin (Figure 7). Detailed descriptions of the models are provided in Holtkamp et al. 1988. Generally, the models use a static linear programming framework. Each PA is modeled as a representative farm. The maximization is for net returns over variable costs of crop production. The livestock sector is not endogenous, but it is included in terms of feed demand requirements that are constant for the scenarios. Crops are identified in rotations typical of those in the upper Mississippi River basin. Budgets for crop production and for erosion are from ARIMS (English et al. 1987).

The PA models include constraints for land (three groups), machinery, operator labor, and commodity acreage bases. The commodity acreage bases are keyed to scenarios and the CARD/FAPRI results. For the analysis, it is important to determine the trade-offs between commodity program payments, the increased cost of the CR and, perhaps, production cost. Participation in commodity programs is endogenized, using program and market price differentials and the value of the acreage base, assuming current commodity programs are continued. Finally, CR enrollment is exogenously specified, given the allocation developed earlier and the state results previously reported. The model chooses participation in commodity programs and crop

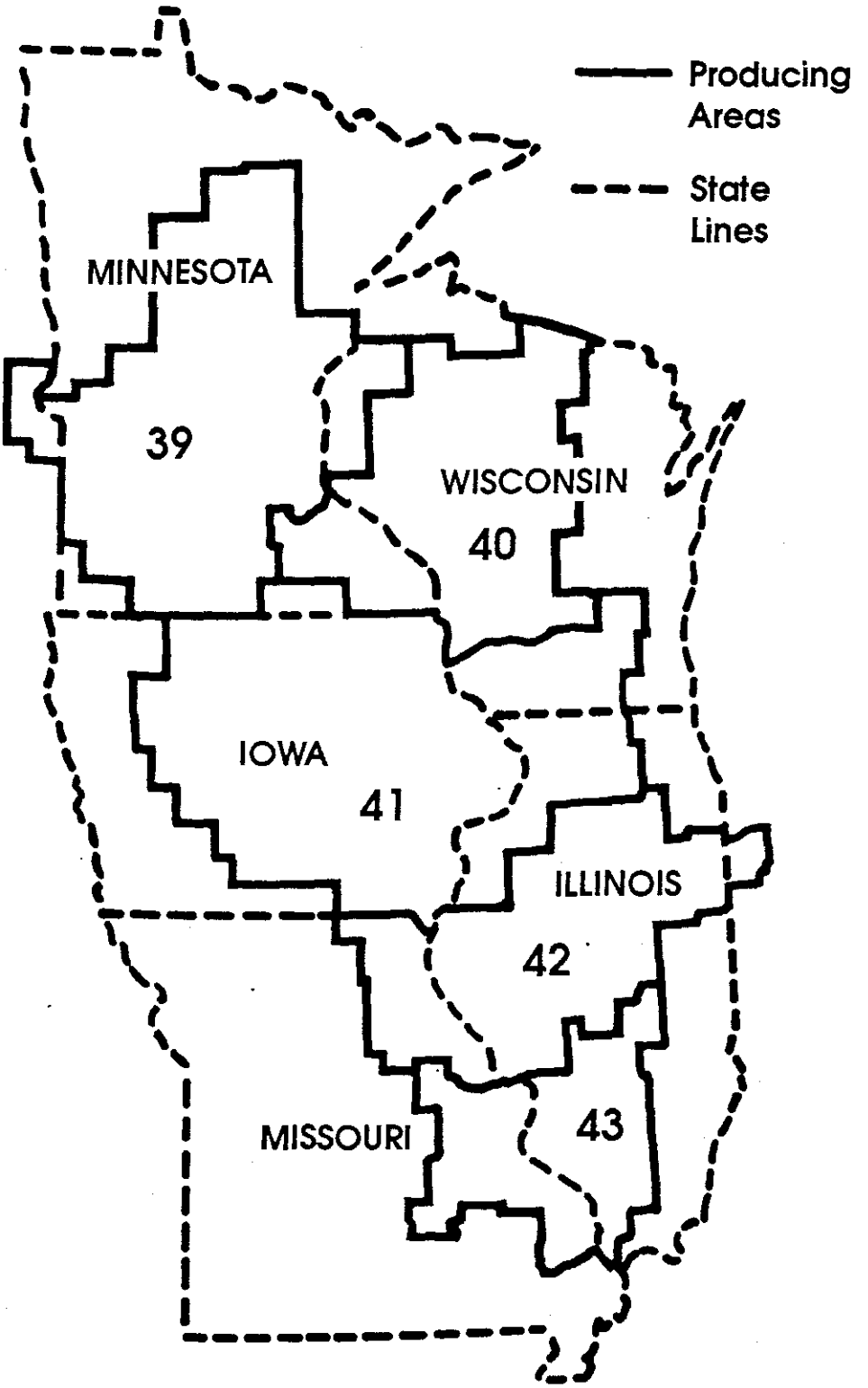


Figure 7. The five producing areas of the upper Mississippi basin area

production patterns that maximize net returns over variable production costs.

Base Run and Scenarios

The evaluations are for scenarios compared to a base run. The base run (45/0) assumes that the CR is fully implemented (Table 7). Again, commodity program and market prices, reduced acreage requirements, etc., are for 1990 and from the FAPRI 1988 baseline.

45/5 Scenario Compared to the Baseline

Results comparing the 45/5 scenario to the baseline are summarized in Table 8. Projected corn and soybean prices under the 45/5 scenario are slightly higher. Acreage enrolled in the CR is down in PAs 39 and 41 and up in PAs 40, 42, and 43. Relatively large increases in CR enrollment are implied for PAs 42 and 43.

Planted acreages for corn, wheat, and soybeans are lower in PAs 42 and 43; there is, however, relatively small change in land-use patterns in the other PAs. Set-aside and base acreage changes follow the changes in CR enrollment. Acres of corn participating in commodity programs change little. In fact, major changes are related to the base acreage adjustments. Commodity programs for corn are still profitable compared to corn grown outside the commodity programs.

In assessing the overall results, the changes are relatively minor. Production patterns remain similar; changes in net farm income are negligible. The use of all pesticides is down in PAs 40, 42, and 43,

Table 7. Estimates of net income, production, land use, pesticide use, and land rental value for the baseline scenario by PA

	Producing Area				
	PA 39	PA 40	PA 41	PA 42	PA 43
	(million dollars)				
Net income, crops	1,688	868	3,321	1,825	585
Production	(million units)				
Corn (bu.)	497.66	183.80	1220.73	665.97	175.48
Soybeans (bu.)	154.03	38.33	364.98	229.37	52.14
Wheat (bu.)	111.00	31.27	29.71	67.76	72.95
Hay (tons)	6.02	10.31	9.78	1.19	0.82
Land use	(million acres)				
Corn	4.25	1.69	10.41	5.61	1.57
Soybeans	4.50	1.25	10.42	6.51	1.57
Wheat	2.25	0.55	0.57	1.19	1.22
Hay	1.62	2.33	2.39	0.42	0.32
Set aside	0.75	0.33	2.06	0.90	0.21
CRP	1.46	0.67	3.72	1.08	0.59
Idle land % of total land	14.9%	14.7%	19.5%	12.6%	14.7%
CRP % of total land base	9.8%	9.9%	12.6%	6.8%	10.8%
Commodity program	(million acres)				
Corn base	3.46	1.93	12.57	4.87	0.92
Wheat base	2.14	0.10	0.16	1.26	0.76
Participation					
Corn	2.88	1.61	10.25	4.04	0.77
Wheat	1.48	0.07	0.05	0.75	0.45
Base reduction					
Corn	0.34	0.21	1.73	0.23	0.07
Wheat	0.24	0.01	0.05	0.20	0.13
Participation rate					
Corn	0.83	0.83	0.82	0.83	0.84
Wheat	0.69	0.64	0.30	0.60	0.59
Tillage method	(million acres)				
Conventional	8.88	4.84	17.63	9.43	3.38
Reduced till	3.73	0.73	6.17	4.10	1.28
No till	0.00	0.25	0.00	0.19	0.00
Pesticide use	(million lbs. of active ingredient)				
Alachlor	13.11	3.76	30.85	14.68	4.16
Atrazine	5.75	2.29	13.95	7.37	2.05
Dual	0.00	1.92	0.00	0.32	0.00
Sencor	1.92	0.47	4.47	2.63	0.61
Treflan	3.56	0.82	8.29	4.66	1.06
Land rental values	(dollars/acre)				
Soil class one	65.99	28.50	43.73	57.97	38.26
Soil class two	68.77	60.66	80.33	85.17	91.94
Soil class three	99.55	86.80	82.51	105.45	104.72
CRP shadow price	98.76	91.34	112.20	112.86	107.00

Table 8. Percentage difference estimates for the 45/5 scenario as compared to the baseline, by PA

	Producing Area				
	PA 39	PA 40	PA 41	PA 42	PA 43
Net income, crops (percent)	-0.2	-0.3	-0.5	-0.2	-0.1
Production					
Corn (bu.)	1.0	-0.2	0.4	-1.8	-2.0
Soybeans (bu.)	-0.1	-0.3	0.4	-1.0	-2.2
Wheat (bu.)	-0.0	0.0	3.3	-1.1	0.1
Hay (tons)	-0.2	-0.1	0.0	0.6	0.1
Land use					
Corn	0.9	0.0	0.6	-2.0	-4.2
Soybeans	-0.2	0.1	0.5	-1.4	-4.2
Wheat	0.0	0.0	3.3	-1.7	-1.4
Hay	0.0	0.0	0.0	0.0	0.0
Set aside	0.3	-0.3	0.5	-1.5	-0.9
CRP	-2.5	1.2	-3.4	20.9	10.0
Idle land % of total land	-1.5	0.6	-2.0	10.7	8.9
CRP % of total land base	-2.4	1.1	-3.4	21.0	11.9
Commodity program					
Corn base	0.3	-0.1	0.5	-1.0	-0.1
Wheat base	0.0	0.0	0.0	0.0	0.0
Participation					
Corn	0.3	-0.6	0.5	-1.0	-0.6
Wheat	14.6	20.9	111.9	21.8	25.4
Base reduction					
Corn	-2.9	1.4	-3.4	21.0	1.4
Wheat	-2.9	1.4	-3.5	21.1	9.6
Participation rate					
Corn	0.1	-0.5	0.0	-0.0	-0.5
Wheat	14.6	20.9	111.9	21.8	25.4
Tillage method					
Conventional	0.5	0.0	0.1	-0.3	0.6
Reduced till	0.0	-1.0	1.6	0.0	1.6
No till	--	0.0	--	-86.5	--
Pesticide use					
Alachlor	1.0	-0.3	0.3	-0.9	-1.9
Atrazine	1.0	-0.1	0.7	-1.9	-1.4
Dual	--	-70.7	--	-91.1	--
Sencor	-0.1	-0.5	0.3	-3.1	-1.6
Treflan	-0.2	-0.5	0.2	-0.9	-1.7
Land rental values					
Soil class one	-0.3	0.4	-1.8	1.8	0.0
Soil class two	-0.2	0.1	-1.9	6.9	0.0
Soil class three	-0.3	-0.1	-1.9	3.3	0.0
CRP shadow price	-0.5	-0.3	-0.6	4.5	-0.2

NOTE on Assumptions:	Corn	Wheat	Soy	Hay
Price chg. from base:	+0.5%	0%	+0.5%	0%
Deficiency pmt.:	$0.69	$0.95		
Set aside rqmt.:	20%	10%		

because of changes in crop rotation and tillage practices and in total acreage planted. The larger differentials involve the shadow prices. The shadow, or imputed, price for CR enrollment in PA 42 due to the increase in the level is relatively high. This would indicate that the CR rental rate required to actually buy out the level of reserve land imposed for PA 42 would be considerably higher than that used in the multimarket evaluation.

45/20 Scenario Compared to the Baseline

The major change between this scenario and the baseline and the 45/5 scenario is increased targeting of the CR land. Generally the quality or productivity of the CR land available for targeting is higher than land enrolled under existing regulations. Thus, there are larger impacts on net net income and on the imputed rental rates for the reserve land, and in fact, these are the major differences between the 45/20 scenario and the baseline. Planted acre changes in the PAs are similar to those for the 45/5 scenario. Shadow prices for CR enrollment are up significantly for all PAs, due primarily to the higher quality land being removed as buffer strips. Moreover, these costs derive from the increases in the level of CR enrollment. Interestingly, net income increases by approximately 20 percent in all PAs, with price changes (multimarket commodity market results) and increases in receipts from the CR. Generally, however, the changes are comparatively modest and easily anticipated based on the structure of the model (Table 9).

Table 9. Percentage difference estimates for the 45/20 scenario as compared to the baseline, by PA

	Producing Area				
	PA 39	PA 40	PA 41	PA 42	PA 43
Net income, crops (percent)	9	7	10	11	9
Production					
Corn (bu.)	9	6	4	-4	16
Soybeans (bu.)	-1	-6	4	-5	-10
Wheat (bu.)	-1	0	-22	-5	-17
Hay (tons)	-3	0	0	-22	0
Land use					
Corn	9	7	4	3	17
Soybeans	-1	-4	4	-4	-11
Wheat	-0	0	-22	-5	-18
Hay	0	0	0	-28	0
Set aside	3	0	3	-2	-2
CRP	-26	-4	-22	30	18
Idle land % of total land	-16	-3	-13	16	13
CRP % of total land base	-26	-5	-22	30	18
Commodity program					
Corn base	5	0	3	-1	-1
Wheat base	-8	-10	-26	-21	-19
Participation					
Corn	3	0	3	-1	-1
Wheat	20	17	118	20	23
Base reduction					
Corn	-26	-4	-22	30	18
Wheat	31	30	193	52	53
Participation rate					
Corn	-2	-0	1	0	-0
Wheat	-26	-4	-22	30	18
Tillage method					
Conventional	4	-1	-1	-1	-1
Reduced till	0	4	14	-2	-4
No till	--	0	--	-65	--
Pesticide use					
Alachlor	8	9	2	3	15
Atrazine	9	7	4	2	17
Dual	--	-73	--	-84	--
Sencor	-2	-5	8	-6	-10
Treflan	-3	-4	1	-7	-10
Land rental values					
Soil class one	16	55	24	20	16
Soil class two	28	24	13	17	8
Soil class three	20	19	13	13	7
CRP shadow price	34	15	11	15	8

NOTE on Assumptions:	Corn	Wheat	Soy	Hay
Price chg. from base:	1.5%	0%	1.0%	0%
Deficiency pmt.:	$0.67	$0.96		
Set aside rqmt.:	20%	10%		

65/25 Scenario Compared to the Baseline

The projected prices for corn, soybeans, and wheat are up significantly in this scenario, based on projections from the multimarket commodity results. CR enrollments are up in all producing areas because of the increase in the total reserve land and the large share of the buffer land available in these five PAs.

Results of the analysis are consistent with those obtained by comparing the 45/5 and 45/20 scenarios. Higher net farm income in all PAs is a result of CR payments and higher commodity prices (Table 10). Government program participation is down, and government costs for the operation of the combined commodity and CR programs are reduced. Planted acreage and production of all crops is generally lower or unchanged in all PAs except 43. CR shadow prices increase in all PAs, primarily because of the larger quantity of land in the reserve and the targeting of buffer strips. Tillage practices are similar to those in the baseline. Thus, the major impacts follow from the higher CR restrictions, targeting, and the higher commodity prices.

Summary

The results from the producing areas models, together with the price changes simulated by the multimarket commodity model, suggest that farmers in the Midwest would not be collectively worse off as a result of the options analyzed. In fact, they would be better off with the 45/20 and 65/25 options. The higher net returns for farmers in these options are

Table 10. Percentage difference estimates for the 65/25 scenario as compared to the baseline, by PA

	Producing Area				
	PA 39	PA 40	PA 41	PA 42	PA 43
Net income, crops (percent)	16	15	17	21	18
Production					
Corn (bu.)	-4	11	-4	2	4
Soybeans (bu.)	1	-38	-4	-5	4
Wheat (bu.)	-4	0	-26	-36	-39
Hay (tons)	-2	0	0	-100	-11
Land use					
Corn	-4	11	-4	2	3
Soybeans	0	-40	-4	-5	3
Wheat	-4	0	-26	-100	-41
Hay	-1	0	0	-100	-3
Set aside	-2	-5	-4	-6	-7
CRP	19	50	28	103	70
Idle land % of total land	12	32	17	61	50
CRP % of total land base	19	50	28	113	70
Commodity program					
Corn base	1.6	-5.3	-3.7	-4.8	-4
Wheat base	-13.5	-18.0	-41.3	-32.9	-28
Participation					
Corn	-1.7	-5.5	-3.9	-4.7	-5
Wheat	-2.9	7.1	71.4	25.3	10
Base reduction					
Corn	18.8	50.1	28.0	102.8	70.0
Wheat	18.8	50.1	28.0	102.8	70.0
Participation rate					
Corn	-3.2	-0.2	-0.2	0.1	-0.5
Wheat	12.2	30.7	191.7	86.8	52.6
Tillage method					
Conventional	9.2	1.0	-0.9	-5.0	-2
Reduced till	-30.3	-50.6	-12.5	-9.3	-22
No till	--	0.0	--	-100.0	--
Pesticide use					
Alachlor	-5.0	13.7	-4.3	4.6	3
Atrazine	-4.3	9.5	-4.1	1.6	3
Dual	0.0	-99.4	0.0	-100.0	0
Sencor	-0.1	-37.8	76.5	-6.6	3
Treflan	-0.2	-35.6	-100.0	-3.2	3
Land rental values					
Soil class one	33.9	122.0	45.0	51.9	51
Soil class two	50.1	61.5	39.9	46.1	27
Soil class three	35.6	49.0	40.2	37.0	23
CRP shadow price	41.7	34.2	18.7	30.3	20

NOTE on Assumptions:	Corn	Wheat	Soy	Hay
Price chg. from base:	+7.0%	+6.0%	+12.0%	0%
Deficiency pmt.:	$0.56	$0.77		
Set aside rqmt.:	20%	10%		

attributable to the CR payments and the higher commodity prices that would result from reserve-related reductions in available cropland. However, other model results (not discussed here) indicate that total erosion levels would be increased, because the potential erosion levels on some of the buffer strip lands are not as high as those for the other eligible CR land.

Generally, the regional impacts are highly sensitive to commodity prices and CR rental payments. The market prices of commodities are in turn sensitive to the CR, world market conditions, and the macroeconomic conditions of the international domestic economy. However, in these five Midwestern PAs, it would appear that agricultural income would not be significantly affected--and might even be improved--with a larger Conservation Reserve and the targeting of buffer strips.

Conclusions

The conclusions of the targeting exercise, conducted using the 1988 FAPRI baseline, emphasize the important interrelationships among commodity programs and the Conservation Reserve. In effect, the analysis is of substituting CR for the acreage reduction that is requisite to participation in commodity programs. Total cropped acres stay more or less the same, and the targeting criteria determine the impact by crop. The result for government costs is, in the short run, highly dependent on the level of stocks, which affects Payments In Kind and moderates market prices. In future years, tightness in available land for planted acres will cause higher commodity prices. These higher prices increase the

consumers' cost of the reserve program in the out-years. An important aspect of the CR targeting is that it places societal priorities on the idled acres of cropland.

Results of the mathematical programming analysis are subordinate to those for the baseline and CR targeting scenarios. Important questions for targeting relate to whether or not it will significantly affect the type of farming by region. The five PAs selected for analysis were from the Corn Belt, where the major impacts of the CR targeting would be felt. Generally, the programming analysis results show little impact on net farm income.

For the 65/25 scenario, with higher market prices and higher assumed CR rental payments, net farm income is higher. This increase is partly due to acreage planted outside the commodity programs producing crops that sell at higher market prices. Overall, other impacts of the reserve program on the input utilization pattern detailed in the discussion of results, except for the 65/25 scenario, are relatively small.

Generally, the trade-off between commodity program deficiency payments and CR rental, at least for the 45/5 and 45/20 scenarios, is almost even; government costs, market prices, production, exports, and other indicators of the performance of the sector are affected only modestly. The increase to 65 million acres for the CR and the targeting of 25 million acres to buffer strips produces more significant changes. Government costs are reduced slightly and market prices rise more rapidly when more land is taken out of production. In fact, there are even some estimated savings.

But, these estimates of savings are highly sensitive to the parameters of the commodity programs and the rental rates assumed. The programming analysis results for shadow prices on CR land constraints are higher than the rental rates assumed.

Finally, a cautionary note is in order for the 65-million scenario. There is tightness in the idle-versus-planted acreage under this scenario. If demand for exports were to increase more rapidly than projected, a considerably higher commodity price path would result from the targeting requirement for including 25 million acres of buffer strips in the CR and the increase of the limit to 65 million acres.

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