The Impacts of Two Policies to Reduce Excess Supplies of Corn and the Cost of Government Programs

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Abstract

The paper examines the consequences of reducing corn target prices and increasing set-aside requirements, utilizing a dynamic econometric model which endogenizes participation rates. For a similar reduction in government costs, increasing set-aside requirements is found to have a smaller negative impact on corn and soybean net returns.

Given record U.S. carryover stocks of corn and unprecedented government expenditures on agriculture, pressure is mounting to devise policies which would simultaneously reduce excess supplies and government costs. Two proposals intended to achieve both goals without making major changes in current legislation call for a reduction in target prices or an increase in set-aside requirements for program participants. In light of the continuing farm financial crisis and the political strength of farm groups, both proposals are likely to meet strong opposition in Congress, since both would likely reduce farm income.

This paper will examine the implications of proposals to reduce target prices or increase set-aside requirements. Specifically, two alternatives will be examined:

1) A 10 percent reduction of corn target prices below baseline levels for the 1987/88 to 1990/91 crop years, and
2) An increase in the corn set-aside requirement from the 20 percent level in the baseline to 30 percent for the 1987/88 to 1990/91 crop years.

Implications of both policies for the corn and soybean sectors will be examined. Particular attention will be paid to the consequences of each policy alternative for government costs, carryover stocks, and net returns to corn and soybean farmers.

The Model

The two policy alternatives were examined using an econometric model of world corn, soybean and wheat markets. The model has been used both to develop market forecasts and to conduct policy analyses (for example, see FAPRI 1987). The demand block of the model is conventional. Domestic

feed and non-feed uses are derived from estimated equations. U.S. commodity exports are obtained from reduced-form equations which, in turn, were derived from regional trade models for each of the three commodities. Free stocks of each commodity are obtained from estimated equations, but government stocks are adjusted by the operator of the model, following various accounting and behavioral rules. The livestock sector is represented by simple equations which roughly approximate the behavior of a larger livestock model.

The supply block draws on the work of de Gorter and Paddock (1985). For corn and wheat, participation rates in government programs are modeled as a function of the difference in expected net returns to participants and non-participants. Acreage planted under the program is an identity, assuming program participants plant all they are allowed (program acreage equals the participation rate, multiplied by the base acreage, multiplied by the proportion of land that participants are allowed to plant). Non-program acreage of corn, wheat and soybeans depend on expected net returns and the acreage planted or diverted under government programs. Corn and wheat yields increase with target prices and with set-aside rates. A modified version of the supply model is presented in Skold and Westhoff (1987). Key demand and supply elasticities are shown in Table 1.

The operation of the supply block in analyzing the two policy alternatives is illustrated in Figures 1 and 2. As indicated in Figure 1, reducing target prices would reduce expected returns to program participation, and would thus reduce participation in the government corn program. As a result, participant corn acreage would fall. Farmers leaving the program can plant corn or beans, so soybean area and non-program corn area would both increase. Since non-participants are

Table 1: Key Price Elasticities in the Model

Variable	Current or Lagged Prices	Point elasticity in 1987 with respect to: Corn Price	Soybean Price	Soymeal Price	Wheat Price	Corn Target Price
Corn Area	(Current)					-0.10
	(Lagged)	0.13	-0.03			
Corn Yield	(Current)					0.19
Corn Feed Use	(Current)	-0.20		0.07	0.08	
Corn Exports	(Current)	-0.24		0.03	0.02	
	(Lagged)	-0.14	0.08		0.06	
Corn Free Stocks	(Current)	-0.49				
Soybean Area	(Current)					-0.18
	(Lagged)	-0.13	0.33			
Soybean Crush	(Current)		-0.43	0.36		
Soybean Exports	(Current)		-0.38	0.65		
	(Lagged)		-0.22	0.36		
Bean Free Stocks	(Current)		-0.74			
Soymeal Use	(Current)	0.10		-0.35		
Soymeal Exports	(Current)		1.11	-3.19		
	(Lagged)		0.52	-1.58		

Figure 1: Short-Run Impacts of Reducing Corn Target Prices 10%

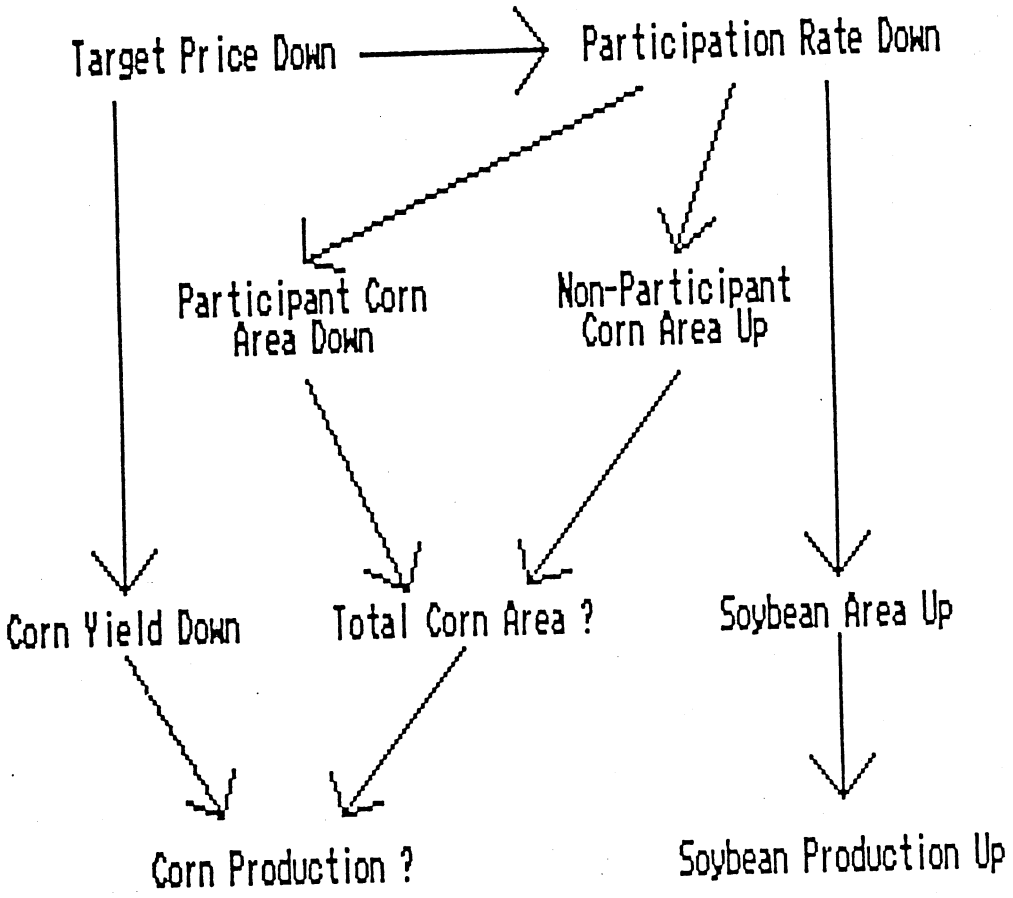
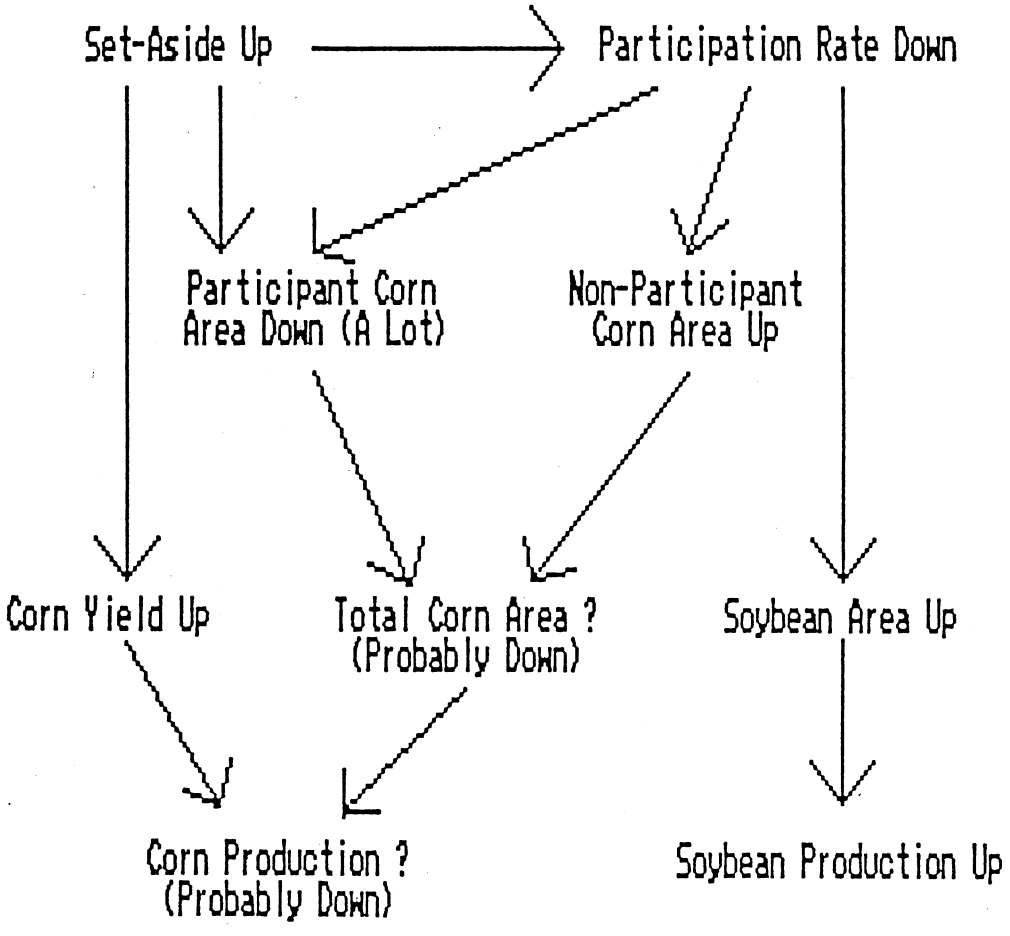


Figure 2: Short-Run Impacts of Increasing Corn Set-Aside Rates 10%



not restricted in the amount of corn they plant, it is not known, *a priori*, whether total corn area would rise or fall. The higher the set-aside and diversion requirements, the more likely it is that a drop in target prices would actually result in an increase in corn area. Corn yields would likely fall, as less marginal land is idled under the program, and as the incentive to intensify production is reduced. Thus, the net effect on corn production is ambiguous, but soybean production would be expected to increase in the short run.

Figure 2 shows that an increase in the set-aside requirement would have many of the same effects. Participation rates would fall with participant net returns. Participant corn acreage would be reduced directly by the increased set-aside requirement, and indirectly because of the reduced participation rates. Non-participant corn area would increase, but probably not enough to offset the large decrease in participant acreage. Corn yields would likely increase, as more marginal land is removed from production by the increased set-aside requirement. The net effect on corn production is ambiguous, but production is likely to fall in the short run. Soybean production would increase, as some of the farmers leaving the corn program choose to plant soybeans.

Results

Important assumptions made under the baseline and the two policy alternatives are shown in Table 2. The analysis was conducted in the spring of 1987, and the baseline reflects conditions prevailing at the beginning of 1987. Under the target price scenario, corn target prices are 10 percent below baseline levels in each year between 1987/88 and

Table 2: Key Assumptions for the Baseline (BASELINE), Reduced Target Price (TARGET) and Increased Set-Aside (SET-ASIDE) Scenarios for the 1987/88-1990/91 Crop Years

Variable	Scenario	87/88	88/89	89/90	90/91
Corn Target Price ($/bu.)	BASELINE, SET-ASIDE	3.03	2.97	2.88	2.74
	TARGET	2.73	2.67	2.59	2.47
Corn Set-Aside (% of Base)	BASELINE, TARGET	20	20	20	20
	SET-ASIDE	30	30	30	30
Corn Diversion (% of Base)	BASELINE, TARGET, SET-ASIDE	15	15	15	15
Corn Cons. Reserve (Mn. Ac.)	BASELINE, TARGET, SET-ASIDE	2.2	3.3	5.2	7.0
Bean Cons. Reserve (Mn. Ac.)	BASELINE, TARGET, SET-ASIDE	2.5	3.7	5.9	8.1

1990/91. Under the set-aside scenario, participants are required to idle 30 percent of their base acres each year, compared to 20 percent under the baseline.

Key impacts of the two policy alternatives on corn and soybean markets are shown in Table 3. Increasing set-aside requirements and reducing target prices have similar impacts on participant net returns in 1987/88. Thus, the impact of either alternative on 1987/88 participation rates is almost the same. Non-program corn acreage and soybean acreage would thus be approximately the same under either alternative, but participant corn acreage would fall more under the increased set-aside option.

Total corn acreage increases slightly under the target price alternative, as non-participant acreage increases more than non-participant acreage falls. This result is plausible, since non-participants would not be required to idle 20 percent of their base acres. Corn yields fall more than area increases, so corn production falls slightly in 1987/88 under the target price option. Model results

Table 3: Impacts on Corn and Soybean Markets of Reducing Corn Target Prices 10% (TARGET) and Increasing Set-Aside Rates 10% (SET-ASIDE) for the the 1987/88-1990/91 Crop Years

Variable	Scenario	87/88	88/89	89/90	90/91	Average	Absolute Impact	Percent Impact
Corn Partic. Rate	BASELINE	86.7	87.0	86.4	71.8	83.0		
(Percent)	TARGET	78.9	79.7	79.8	69.9	77.1	-5.9	-7.1%
	SET-ASIDE	78.7	77.7	74.1	60.2	72.7	-10.3	-12.4%
Corn Area Planted	BASELINE	67.8	65.7	64.0	64.8	65.6		
(Million Acres)	TARGET	68.6	67.1	65.3	66.0	66.8	1.2	1.8%
	SET-ASIDE	62.6	61.6	60.9	62.6	61.9	-3.6	-5.6%
Corn Yield	BASELINE	118.4	120.9	123.1	124.5	121.7		
(Bushels/Acre)	TARGET	116.2	118.8	121.1	122.7	119.7	-2.0	-1.7%
	SET-ASIDE	119.8	122.3	124.5	125.9	123.1	1.4	1.2%
Corn Production	BASELINE	7065	6990	6930	7101	7022		
(Million Bushels)	TARGET	7006	7005	6948	7121	7020	-2	-0.0%
	SET-ASIDE	6626	6650	6685	6950	6728	-294	-4.2%
Corn Total Demand	BASELINE	7161	7299	7163	7450	7268		
(Million Bushels)	TARGET	7127	7288	7170	7474	7265	-4	-0.0%
	SET-ASIDE	7035	7096	6948	7268	7087	-182	-2.5%
Corn Ending Stocks	BASELINE	5348	5040	4808	4460	4914		
(Million Bushels)	TARGET	5323	5041	4820	4468	4913	-1	-0.0%
	SET-ASIDE	5050	4605	4343	4025	4506	-408	-8.3%
Corn Farm Price	BASELINE	1.66	1.69	1.97	1.71	1.76		
(Dollars/Bushel)	TARGET	1.70	1.67	1.88	1.68	1.73	-0.03	-1.4%
	SET-ASIDE	1.82	1.90	2.16	1.86	1.94	0.18	10.1%
Soybean Area Planted	BASELINE	60.0	59.5	59.1	65.0	60.9		
(Million Acres)	TARGET	61.0	60.5	60.2	62.9	61.2	0.3	0.4%
	SET-ASIDE	60.6	59.6	58.9	65.3	61.1	0.2	0.3%
Soybean Production	BASELINE	1893	1900	1910	2118	1955		
(Million Bushels)	TARGET	1925	1930	1946	2051	1963	8	0.4%
	SET-ASIDE	1913	1904	1905	2128	1963	7	0.4%
Soybean Total Demand	BASELINE	1994	2062	2085	2126	2067		
(Million Bushels)	TARGET	2004	2069	2139	2098	2078	11	0.5%
	SET-ASIDE	2006	2071	2085	2131	2073	7	0.3%
Soybean End. Stocks	BASELINE	519	357	182	174	308		
(Million Bushels)	TARGET	540	401	207	160	327	19	6.2%
	SET-ASIDE	526	359	180	176	310	2	0.7%
Soybean Farm Price	BASELINE	4.63	4.65	5.90	5.57	5.19		
(Dollars/Bushel)	TARGET	4.51	4.53	4.91	6.17	5.03	-0.16	-3.0%
	SET-ASIDE	4.53	4.64	6.04	5.58	5.20	0.01	0.2%

indicate a sharp drop in total corn area in response to an increase in set-aside requirements. Even though corn yields rise, the net effect on corn production is still strongly negative.

Lower corn production results in higher 1987/88 corn prices under both scenarios. Likewise, increased soybean production results in lower soybean prices under both alternatives. Since the set-aside scenario results in a greater drop in corn production, corn prices increase more under that policy option. Higher 1987/88 corn prices provide a greater disincentive to 1988/89 program participation, and also reduce incentives to plant soybeans. Participation rates and soybean area, therefore, are lower in 1988/89 under the set-aside scenario than under the target price scenario. Due to the impact of the set-aside requirement, however, corn area and production also remain lower under the set-aside scenario.

Table 3 traces the effects of the alternative scenarios on the corn and soybean sectors through 1990/91. Corn production slightly exceeds baseline levels under the target price scenario beginning in 1988/89, as lower soybean prices increase corn area just enough to offset lower yields. Also worthy of note is the soybean price path under the alternative policies. Under the baseline and set-aside scenarios, CCC soybean stocks are exhausted in 1989/90, resulting in a sharp increase in market prices. However, greater soybean production under the target price scenario means that CCC stocks are not used up until 1990/91, so the sharp soybean price increase is delayed one year.

Table 4 presents the impacts of the two scenarios on net returns to corn and soybean farmers. Under the set-aside scenario, the value of corn production increases relative to the baseline, as higher prices outweigh lower production. This is due to the inelasticity of demand in the model,

Table 4: Impacts on Net Returns to Corn and Soybean Farmers of Reducing Corn Target Prices 10% (TARGET) and Increasing Set-Aside Rates 10% (SET-ASIDE) for the 1987/88-1990/91 Crop Years

Variable	Scenario	87/88	88/89	89/90	90/91	Average	Absolute Impact	Percent Impact
Value of Corn Prod.	BASELINE	11,728	11,813	13,652	12,143	12,334		
(Million Dollars)	TARGET	11,910	11,698	13,062	11,963	12,159	-175	-1.4%
	SET-ASIDE	12,059	12,635	14,440	12,927	13,015	681	5.5%
Deficiency Payments	BASELINE	6,026	6,255	4,685	4,397	5,341		
(Million Dollars)	TARGET	4,124	4,316	3,350	3,261	3,763	-1578	-29.5%
	SET-ASIDE	4,629	4,090	2,702	2,688	3,527	-1814	-34.0%
Diversion Payments	BASELINE	1,522	1,546	1,559	1,109	1,434		
(Million Dollars)	TARGET	1,370	1,382	1,433	1,055	1,310	-124	-8.6%
	SET-ASIDE	1,370	1,373	1,335	909	1,247	-187	-13.1%
Corn Total Receipts	BASELINE	19,276	19,614	19,896	17,649	19,109		
(Million Dollars)	TARGET	17,404	17,397	17,845	16,279	17,231	-1877	-9.8%
	SET-ASIDE	18,057	18,098	18,477	16,524	17,789	-1320	-6.9%
Corn Variable Costs	BASELINE	10,464	10,632	10,957	11,573	10,906		
(Million Dollars)	TARGET	10,543	10,811	11,141	11,771	11,067	160	1.5%
	SET-ASIDE	9,773	10,063	10,497	11,222	10,389	-517	-4.7%
Corn Net Returns	BASELINE	8,812	8,982	8,939	6,076	8,202		
(Million Dollars)	TARGET	6,861	6,585	6,704	4,508	6,165	-2038	-24.8%
	SET-ASIDE	8,285	8,034	7,980	5,302	7,400	-802	-9.8%
Bean Total Receipts	BASELINE	8,765	8,835	11,269	11,797	10,166		
(Million Dollars)	TARGET	8,682	8,743	9,555	12,655	9,909	-258	-2.5%
	SET-ASIDE	8,666	8,835	11,506	11,874	10,220	54	0.5%
Bean Variable Costs	BASELINE	4,025	4,182	4,395	5,071	4,418		
(Million Dollars)	TARGET	4,092	4,253	4,476	4,907	4,432	14	0.3%
	SET-ASIDE	4,066	4,189	4,380	5,095	4,432	14	0.3%
Bean Net Returns	BASELINE	4,739	4,653	6,874	6,726	5,748		
(Million Dollars)	TARGET	4,589	4,490	5,078	7,747	5,476	-272	-4.7%
	SET-ASIDE	4,600	4,645	7,126	6,780	5,788	40	0.7%
Total Net Returns*	BASELINE	13,551	13,635	15,814	12,802	13,950		
(Million Dollars)	TARGET	11,451	11,076	11,782	12,255	11,641	-2310	-16.6%
	SET-ASIDE	12,885	12,680	15,106	12,081	13,188	-762	-5.5%
Total Gov't Cost**	BASELINE	7,548	7,801	6,244	5,506	6,775		
(Million Dollars)	TARGET	5,494	5,699	4,782	4,316	5,073	-1702	-25.1%
	SET-ASIDE	5,998	5,463	4,037	3,597	4,774	-2001	-29.5%

* Corn and soybeans only

** Corn deficiency payments and diversion payments only

but the qualitative results would remain unchanged even if demand were twice as elastic as the model indicates. Reduced program planting reduces deficiency payments, and lower total corn acreage reduces variable production costs under the set-aside scenario. Soybean net returns are essentially unchanged.

The net effect of implementing the set-aside alternative is an average decline of $762 million in corn and soybean net returns. Corn program participants would lose because lower deficiency payments would not be offset by higher market returns and lower production costs, but non-participants would gain. The modest drop in net returns compares to an average decline in government expenditures on deficiency and diversion payments of $2.0 billion. Actual government cost savings would be greater, as government corn stocks are reduced substantially under the set-aside scenario.

The value of corn production under the target price scenario is slightly lower than the baseline on average, due primarily to lower corn prices in 1989/90. Lower target prices and participation rates translate directly into lower deficiency and diversion payments. Corn production costs are slightly higher due to greater planted acreage. Soybean net returns fall modestly on average, due to lower prices.

The net effect of the target price scenario on corn and soybean net returns is an average decline of $2.3 billion from the baseline. Both participants and non-participants would lose, due to the fall in bean, corn and target prices. The decline in net returns exceeds the average $1.7 billion in government cost savings on deficiency and diversion payments.

Figures 3 and 4 illustrate the net return and government cost information in Table 4. Under the set-aside scenario, corn and soybean net returns follow a path similar to the baseline, only at a slightly lower level. Under the target price scenario, no sharp increase occurs in 1989/90, but net returns are actually higher in 1990/91 than under the set-aside scenario. This is because the soybean price increase occurs one year later under the target price scenario. Extending the analysis past 1990/91 would likely show set-aside scenario net returns again above those under the target price scenario.

In Figure 4, note that government cost savings are greater in 1987/88 under the target price scenario, but costs are lower under the set-aside scenario in all subsequent years. The difference would be even greater were savings associated with lower government stocks considered. Government stocks remain essentially unchanged when target prices are reduced, but fall substantially when set-aside requirements increase.

Implications and Caveats

If the model results are valid, it would appear that increasing set-aside requirements would be a more efficient means of reducing goverment costs at minimum cost to farmers. However, three major caveats are in order:

1) The analysis was conducted using a baseline prepared in early 1987, reflecting conditions at that time. Results would change modestly if a more current baseline were used. Demand now appears to be slightly stronger than anticipated, which would result in lower stock levels. However, there is no reason to believe the

Fig. 3: Corn and Soybean Net Returns

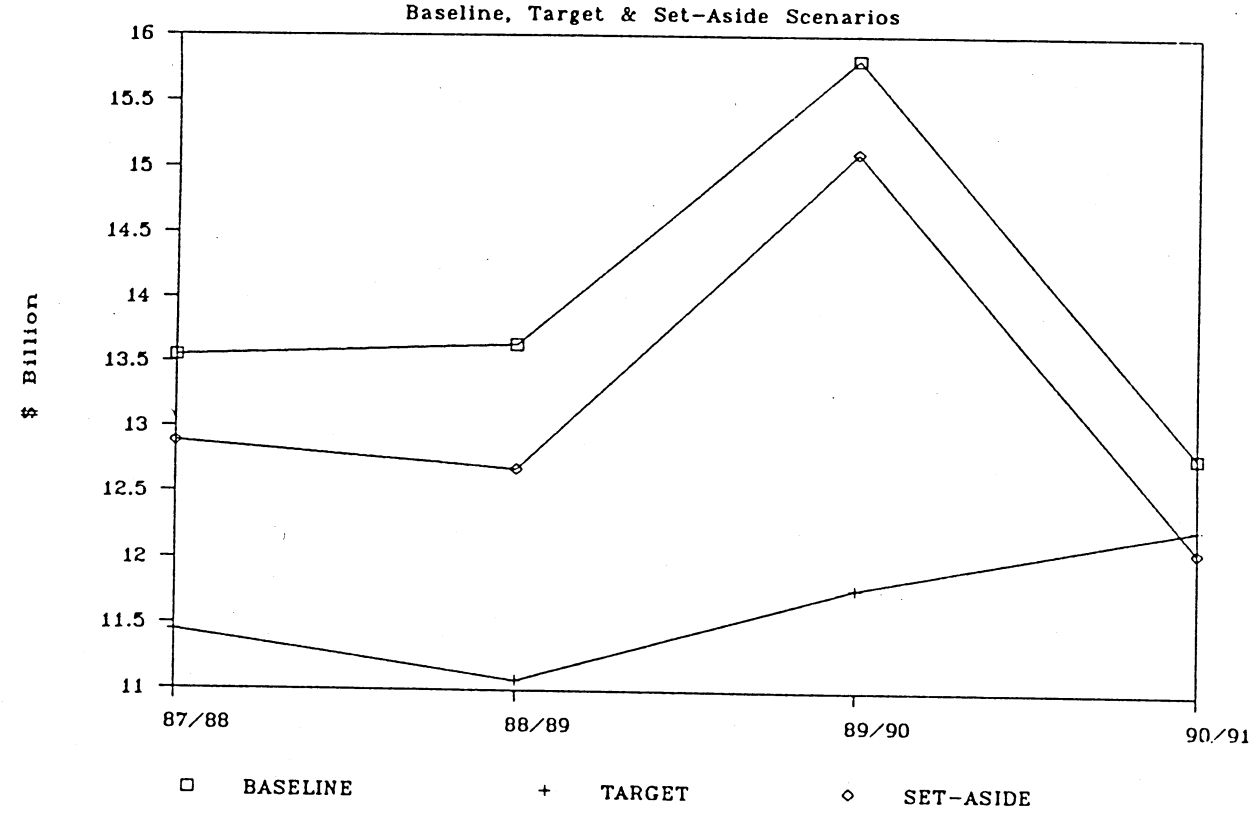
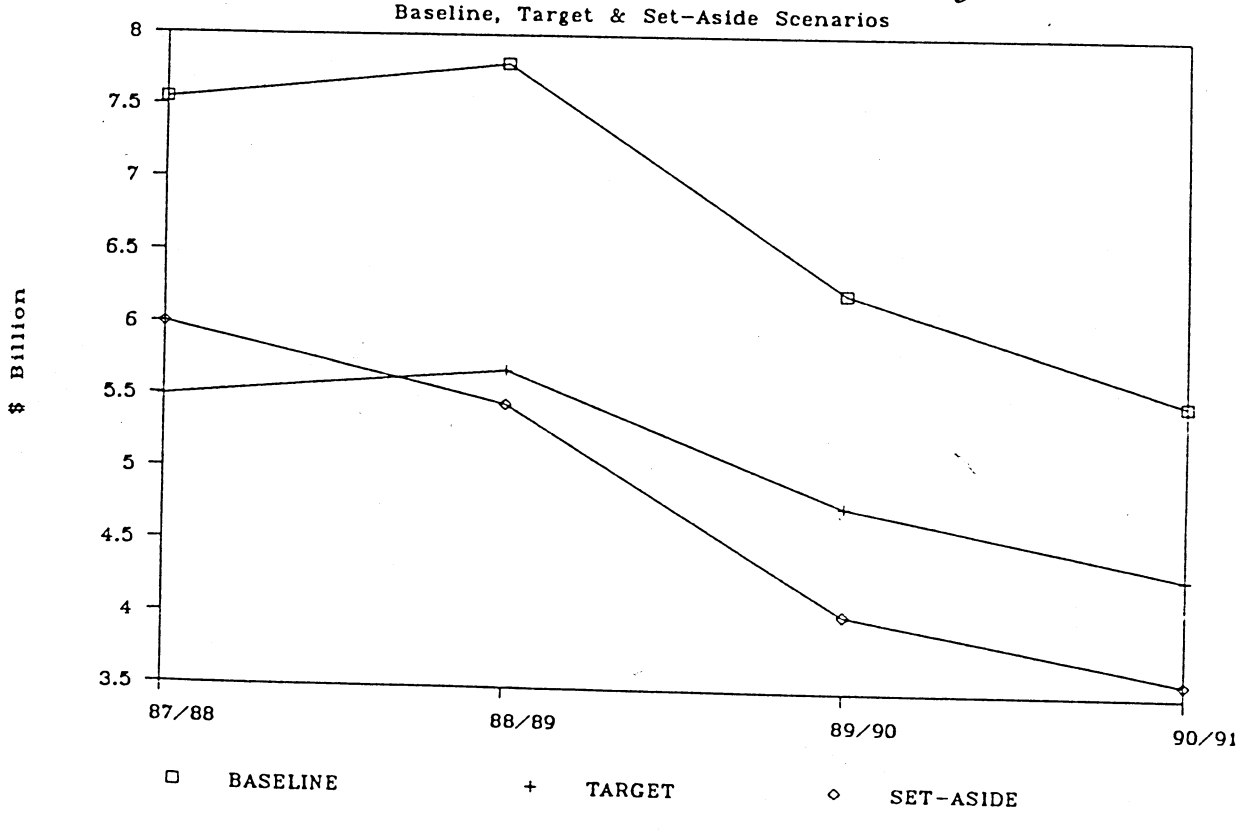


Fig. 4: Deficiency & Diversion Payments



qualitative results of the analysis would be affected by using a more current baseline.

2) The analysis focused only on the corn and soybean sectors. Including the livestock sector might change the conclusions somewhat. Since higher set-aside requirements result in higher corn prices, feed costs would increase, and livestock industry profits would be squeezed until adjustment occurs. Thus, the drop in corn and soybean net returns under the set-aside scenario may understate the impact on net farm income.

3) The model used to conduct this analysis is a model-in-development, and as a result, is far from ideal. Most of the equations in the domestic model are linear equations estimated using OLS. Changes in model specification are needed, other functional forms should be considered, and more appropriate estimation techniques should be utilized.

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