The Effects of Changes in Feed Grains Policy on the Livestock Sector *

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Abstract

Simulations of a quarterly agriculture sector model suggest that all livestock producers initially benefit from lower feed grain prices. In the longer run, cattle feeders, hog producers, and dairy producers appear to benefit while poultry producers and cow-calf enterprises are apparently worse off. Retail meat prices are generally lower.

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Introduction

This paper examines quarterly adjustments in the livestock sector resulting from changes in feed grain policy announced under the Food Security Act of 1985. Even small policy changes can have large effects on the livestock sector because of the importance of feed grains in the livestock production process. Total U.S. farm expenditures for feed were about $20 billion in 1984 (1), almost 15 percent of all farm production expenses.[1] Feed expenditures exceeded spending on inputs such as seed, fertilizers, and fuel, and nearly equaled the combined interest charges on short-term and real estate debt.

Feed grains account for roughly one-half of the total value of grains, oilseed meals, and hay used in animal feeding. This prominent role means that changes in feed grains policy which alter feed grains prices can have substantial effects on the profitability of livestock production. The effects are direct, through lower feed grain costs, and indirect, through induced changes in costs of complementary and substitute feeds. Additionally, cost-of-production changes cause adjustments in livestock production, which further alter profitability through price changes in livestock and livestock products.

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[1] Underscored numbers in parentheses refer to references at the end of the article.

These cross-commodity effects are often given secondary importance in the formulation and evaluation of crop policies. Historically, the main goal of crop policy has been to enhance the income of crop producers. With cash receipts from feed grains averaging about 24 percent of crop receipts and about 12 percent of total cash receipts over the last 5 years, feed grains policies are a major factor in determining farm income of the crop sector. However, a policy which raises crop sector income may lower livestock sector income, resulting in an uncertain outcome from total U.S. farm income. This paper illustrates quarterly adjustment patterns in major livestock subsectors following a change in feed grains policy. These dynamic adjustments reflect a complex set of cross-commodity linkages and underlying lag structures due to economic, biological, and institutional constraints.

The Policy Scenarios

The most significant departure from recent policies in the commodity titles of the Food Security Act of 1985 is the provision for sharply lower loan rates for crops. The changes which provide for lower feed grain loan rates include: (1) basing the computed loan rate on a percentage of past market prices, with a maximum annual decline limited to 5 percent, (2) authority to lower loan rates up to an additional 20 percent using the so-called Findley Amendment, and (3) authority to allow loan repayment at levels below the loan rate determined for the crop. Moreover, application of the Gramm-Rudman-Hollings balanced budget bill may override the Farm Bill provisions and result in a further lowering of effective loan rates.

During the Farm Bill debate, livestock sector impacts were prominently discussed when grain policy proposals would have sharply worsened livestock profitability, as under the high loan rate and mandatory production control

farm bill proposals (Volkmer; Alexander; and Harkin). However, scant attention was given to the effects of loan rate reductions on the livestock sector. The need for reducing loan rates was almost completely attributed to the loss of competitiveness in export markets, the need to regain market share, and the need to reduce program outlays in order to lower the budget deficit.

This paper examines the effects on the livestock sector of implementing lower feed grain loan rates under the provisions of the Food Security Act of 1985. The analysis is based on a comparison of simulations of a quarterly econometric forecasting model of the U.S. agriculture sector (4, 5). An important feature of this model is its explicit linkages between the crop and livestock subsectors, thereby allowing for an examination of cross-commodity effects of different policies. The quarterly structure allows for a more accurate representation of the time path of adjustments of livestock sector variables than would an annual model, especially for animals with short production periods.

Two dynamic simulations of the quarterly model are performed over a 17-quarter period from the October-December quarter of 1986 through the end of calendar year 1990, with different policy assumptions used in each. In the base scenario, regular nonrecourse and farmer-owned reserve (FOR) loan rates for feed grains were assumed to continue at their 1985/86 levels. In the alternative scenario, loan rates for feed grains were assumed to be lowered by about 25 percent from 1985/86 levels beginning in the 1986/87 crop year and extending through the remainder of the simulation. For example, the loan rate for corn during all quarters was $2.55 a bushel under the base scenario while under the alternative scenario the loan rate was reduced to $1.92 a bushel starting in the October-December quarter of 1986. In both simulations, prices for corn and other feed grains in the

model were exogenously set equal to their respective loan rates. All other policy assumptions including such things as target prices and acreage reduction programs for feed grains and other crops were held at 1985/86 levels in the base scenario, but changed to levels consistent with the Findley Amendment of the Food Security Act of 1985 in the alternative scenario.

Livestock sector adjustments to a reduction in feed grain loan rates and prices were determined by comparing the two model solutions. Results from the simulations were additionally embedded into a cost of production framework (2) to derive measures of total revenues minus feed costs for livestock, with impacts also determined by comparing the results of the two model solutions. These comparisons can be used to address a number of questions concerning crop policy changes on livestock. For example, what class of livestock initially benefits the most from lower feed grain prices? As adjustments occur, how do relative net returns among livestock classes change? How long does it take before the initial rise in net returns is eliminated by the livestock production response? How long before benefits to meat consumers begin and how long do they last? The next section discusses these issues.

Results

Tables 1-4 summarize the major impacts in the livestock sector resulting from the approximate 25-percent decline in feed grain loan rates from 1985/86 levels. The tables show percentage changes in each selected variable from the base scenario solution.

Cattle. Table 1 shows selected impacts in the cattle sector. Lower feed prices, particularly for corn, provide economic incentives for increased cattle feeding. This results in increased demand for feeder steers, pushing feeder steer prices higher. Higher receipts minus feed costs for cow-calf

Table 1
Selected Impacts of a 25-Percent Reduction in Feed Grain Loan Rates--Cattle
Simulated Changes from Base Scenario, 1986-IV through 1990

Time period	Cow slaughter	Replacement heifers kept	Calf crop	Feeder steer price	Fed steer price	Beef & veal CPI
			-- percent --			
1986-IV	0.0	0.0	0.0	0.0	0.0	0.0
1987-I	0.0	0.0	0.0	7.5	2.2	2.0
1987-II	-2.3	0.0	0.0	6.1	1.0	3.0
1987-III	-3.2	0.0	0.0	5.1	0.5	2.8
1987-IV	-3.2	0.0	0.0	4.7	0.2	2.6
1988-I	-3.0	1.0	0.9	-2.5	-6.2	-1.0
1988-II	-0.2	1.0	0.9	-3.7	-7.0	-3.8
1988-III	2.0	1.0	0.9	-2.9	-6.3	-3.3
1988-IV	2.7	1.0	0.9	-1.4	-5.1	-1.9
1989-I	2.8	0.6	0.1	-9.0	-11.3	-4.4
1989-II	5.2	0.6	0.1	-8.9	-11.1	-6.2
1989-III	6.7	0.6	0.1	-7.2	-9.7	-5.2
1989-IV	6.4	0.6	0.1	-4.4	-7.3	-3.4
1990-I	5.0	-1.1	-0.7	-11.1	-13.4	-5.7
1990-II	6.6	-1.1	-0.7	-10.5	-12.7	-7.6
1990-III	7.3	-1.1	-0.7	-8.5	-11.0	-6.7
1990-IV	6.4	-1.1	-0.7	-5.0	-8.1	-4.7

Time period	Feedlot placements	Steer & heifer slaughter			Total revenues minus feed costs	
		Fed	Nonfed	Total	Cow-calf	Feeding
			-- percent --			
1986-IV	0.0	0.0	0.0	0.0	2.0	7.3
1987-I	18.6	4.2	-70.8	-0.6	13.3	14.4
1987-II	16.9	7.0	-89.1	0.9	11.2	15.7
1987-III	16.2	9.1	-87.4	1.7	9.1	16.8
1987-IV	13.3	10.5	-69.6	2.2	8.4	17.9
1988-I	17.4	12.2	-84.1	7.8	-1.4	10.2
1988-II	16.6	12.9	-82.9	8.9	-3.0	9.6
1988-III	16.5	13.6	-86.4	8.4	-1.8	11.2
1988-IV	14.0	14.0	-66.4	7.6	-.2	13.5
1989-I	18.1	15.1	-64.3	13.4	-10.6	5.3
1989-II	17.2	15.2	-66.1	13.4	-10.4	5.7
1989-III	17.1	15.4	-79.5	12.1	-7.8	7.9
1989-IV	14.1	15.4	-62.6	10.2	-4.0	11.3
1990-I	18.6	16.3	-18.2	16.0	-13.9	3.3
1990-II	17.3	16.1	-38.1	15.5	-13.1	4.2
1990-III	16.9	16.1	-73.4	13.7	-9.9	6.6
1990-IV	13.7	15.7	-61.5	11.1	-5.2	10.7

operators trigger an increase in the breeding herd through reduced cow slaughter and the retention of more heifers for breeding. Higher cow inventories and a larger number of heifers kept for replacement in the alternative scenario result in increased calf crops in the second and third simulation years. Feedlot placements, cattle on feed, and fed cattle marketings are all higher in the alternative scenario, resulting in higher fed steer and heifer slaughter. Nonfed slaughter, however, is lower as more cattle are placed in feedlots and added to or retained in the breeding herd. Consequently, total steer and heifer slaughter is initially reduced before increasing starting in the third quarter of the simulation reflecting higher fed slaughter. Consumers face higher retail beef prices for about a year before the effects of the increased total meat production pushes prices below the base scenario levels. Lower fed steer prices after the first simulation year are offset by the lower grain prices. Consequently, total revenues minus feed costs for cattle feeders are higher than the base throughout the simulation period, with the difference narrowing as fed slaughter increases. With lower fed prices, feeder prices are bid down, reducing net returns for cow-calf operators after the first simulation year. This results in increased breeding herd liquidations in the last two and a half years of the simulation as well as lower replacement heifers kept and calf crops in the last simulation year.

Hogs. Table 2 shows selected impacts in the hog sector. Total revenues minus feed costs initially rise sharply. Similar to the adjustments in the cattle sector, this diminishes breeding herd liquidation in the first year, with sow slaughter and boar slaughter lower for the first 4 simulation quarters. The larger breeding herd leads to increased sow farrowings, pig crop, and barrow and gilt slaughter. As a consequence of these adjustments, total hog slaughter is initially lower, but then rises above the base scenario levels. Combined with other livestock sector supply responses,

this results in intially higher hog prices for the first 2 simulation quarters, followed by lower prices thereafter. Similarly, consumer prices for pork are initially higher but then fall below base levels after the third simulation quarter. Total revenues minus feed costs decrease for a year from the base scenario levels after 4 simulation quarters before again rising above the base starting in late 1988. Consequently, breeding herd liquidations are higher for about a year before declining again when net returns rise. The resulting cyclical patterns of receipts minus feed costs and the breeding herd liquidation are shorter and of a greater amplitude than in the cattle sector, reflecting the shorter biological lags in hog production, the larger portion of production costs accounted for by feed grains, and the importance of mixed enterprise farms in the hog industry. Having a mixed corn/hog operation provides more production options as corn can be marketed through hog feeding or sold directly.

Table 2
Selected Impacts of a 25-Percent Reduction in Feed Grain Loan Rates--Hogs
Simulated Changes from Base Scenario, 1986-IV through 1990

Time period	Sow slaughter	Sow farrowings	Pig crop	Barrow & gilt slaughter	Hog slaughter	Hog price	Total revenues minus feed costs	Pork CPI
				-- percent --				
1986-IV	-6.9	0.0	0.0	0.0	-0.4	0.8	18.8	0.2
1987-I	-9.0	3.3	3.3	0.0	-0.4	1.3	20.7	1.0
1987-II	-5.8	4.9	4.9	1.1	0.8	-2.6	19.3	.5
1987-III	-1.8	6.2	6.2	4.1	3.7	-8.3	3.8	-1.8
1987-IV	1.7	4.7	4.7	5.3	5.1	-12.0	-3.6	-4.1
1988-I	4.5	4.9	4.9	5.4	5.4	-16.6	-12.5	-7.0
1988-II	7.8	2.6	2.6	4.5	4.6	-17.7	-15.0	-9.1
1988-III	6.6	0.4	0.4	4.0	4.2	-14.0	-6.2	-8.2
1988-IV	3.7	-2.5	-2.5	1.8	1.9	-8.8	3.2	-5.5
1989-I	-1.1	-2.6	-2.6	-0.7	-0.7	-7.8	4.6	-4.6
1989-II	-3.0	-2.5	-2.5	-2.3	-2.3	-4.4	17.2	-4.1
1989-III	-5.1	-2.7	-2.7	-2.6	-2.7	-2.8	16.2	-2.8
1989-IV	-5.9	-3.1	-3.1	-2.6	-2.7	-0.2	20.3	-1.3
1990-I	-9.7	-1.0	-1.0	-2.8	-3.1	-4.1	12.6	-2.3
1990-II	-6.3	-0.1	-0.1	-2.2	-2.4	-5.7	16.5	-4.1
1990-III	-4.0	-0.0	-0.0	-0.6	-0.8	-7.9	8.3	-4.7
1990-IV	-2.2	-1.3	-1.3	-0.1	-0.2	-6.5	10.3	-4.3

Poultry. In the poultry industry, broiler and turkey production each increase relative to the base scenario (table 3). Even here, lower feed costs mean higher short-run prices which reflect initially reduced supplies of red meats. However, prices then decline as poultry and red meat production increase. Poultry production adjustments are largest in the first 3 to 6 quarters before cattle and hog sector adjustments lead to higher red meat production and lower poultry prices. Consequently, after an initial increase in total revenues minus feed costs, net returns are then generally lower than the base beginning in 1988. The production adjustment pattern reflects relatively short biological constraints for poultry compared to cattle and hogs which allows poultry producers to respond faster to changing market conditions, thereby giving them a competitive advantage in the short run. They can put

Table 3
Selected Impacts of a 25-Percent Reduction in Feed Grain Loan Rates--Poultry
Simulated Changes from Base Scenario, 1986-IV through 1990

Time period	Broiler production	Broiler price	Broiler revenues minus feed costs	Turkey production	Turkey price	Turkey revenues minus feed costs	Poultry CPI
				-- percent --			
1986-IV	0.0	0.3	12.6	0.0	0.2	9.2	0.1
1987-I	0.3	0.3	12.5	0.0	0.5	9.5	.4
1987-II	1.4	-4.8	8.1	3.0	-1.9	10.3	-.7
1987-III	1.1	-6.6	3.6	2.3	-3.6	6.2	-1.7
1987-IV	0.5	-6.5	2.6	1.8	-4.0	4.3	-2.4
1988-I	0.7	-12.2	-5.4	2.4	-8.3	-1.0	-4.9
1988-II	0.7	-14.3	-7.0	1.6	-9.3	-2.2	-6.7
1988-III	0.3	-11.2	-3.2	0.2	-7.9	-1.7	-5.9
1988-IV	0.2	-7.8	1.2	0.2	-5.3	1.1	-4.0
1989-I	0.7	-11.9	-4.6	0.7	-8.5	-2.6	-4.7
1989-II	0.7	-12.2	-3.2	1.1	-8.2	-.8	-5.1
1989-III	0.3	-9.3	.2	0.1	-6.8	0	-4.2
1989-IV	0.5	-6.8	3.6	0.4	-4.5	2.6	-2.8
1990-I	1.0	-12.7	-5.1	1.0	-8.8	-2.5	-4.5
1990-II	0.8	-14.3	-6.1	1.3	-9.5	-2.3	-5.9
1990-III	0.3	-12.1	-3.5	0.0	-8.6	-2.5	-5.7
1990-IV	0.4	-9.3	.2	0.1	-6.2	.3	-4.5

more product on the market sooner and take advantage of the initially higher meat prices. Poultry price declines are larger after the first simulation year, beyond when poultry production adjustments are largest, reflecting the increased production of red meats then and the sharp drop in cattle and hog prices. Consumer prices for poultry also are lower after the initial 2 simulation quarters, with the largest declines occurring when red meat production is higher.

Dairy. In the dairy sector, impacts on production, commercial use, and prices are relatively small (table 4). Milk cow inventories are increased some but expansion is constrained by biological lags. Production per cow initially falls reflecting the implicit retention at the margin of cows that would have otherwise been culled. Production per cow then rises because of lower soybean meal prices. The resulting production gains, however, are minimal as are

Table 4
Selected Impacts of a 25-Percent Reduction in Feed Grain Loan Rates--Dairy
Simulated Changes from Base Scenario, 1986-IV through 1990

Time period	Milk cow inventory	Milk production	Commercial milk use	Milk price	Net Government removals	Total revenues minus feed costs	Dairy CPI
				-- percent --			
1986-IV	0.00	0.00	0.000	0.0	0.0	9.1	0.0
1987-I	0.04	0.04	0.001	0.0	0.3	9.6	0.0
1987-II	0.07	0.03	0.001	0.0	0.2	10.0	0.0
1987-III	0.10	0.05	0.001	0.0	1.0	9.7	0.0
1987-IV	0.14	0.08	0.002	-0.1	2.0	9.1	0.0
1988-I	0.22	0.17	0.004	-0.2	1.4	8.6	-.1
1988-II	0.31	0.32	0.008	-0.3	2.4	9.0	-.1
1988-III	0.40	0.43	0.010	-0.4	11.2	9.0	-.2
1988-IV	0.47	0.50	0.011	-0.4	16.9	8.6	-.2
1989-I	0.60	0.60	0.015	-0.5	5.1	7.9	-.2
1989-II	0.73	0.79	0.019	-0.8	6.7	8.2	-.3
1989-III	0.84	0.91	0.019	-0.8	39.9	8.2	-.4
1989-IV	0.92	0.98	0.021	-0.8	55.5	8.2	-.4
1990-I	1.06	1.08	0.025	-1.0	9.9	7.6	-.5
1990-II	1.20	1.29	0.029	-1.3	12.3	7.9	-.6
1990-III	1.32	1.42	0.029	-1.3	176.1	8.1	-.7
1990-IV	1.40	1.51	0.030	-1.3	275.3	8.3	-.7

changes in commercial use and prices. Nonetheless, increases in production exceed those in use resulting in higher net Government removals of dairy products. In the absence of an accompanying revision in dairy policy, reduced loan rates for feed grains would increase Government costs of the dairy programs.

Net returns. The differential impact of the change in feed grain prices on producers of the various type of animals can be measured by comparing changes in their total revenues minus feed costs. Figure 1 compares the net return changes presented in the tables. The initial rise in net returns is led by hog and broiler producers. However, cattle feeders and dairy producers appear to benefit the most in the long run. Impacts on net returns for hog producers display a pronounced cyclical pattern; however, except for 4 simulation quarters, hog producers also benefit from lower feed grain prices. Broiler producers and cow-calf enterprises are apparently worse off in the long run with lower feed grain costs as their net returns are generally lower after the first 5 quarters.

Consumer prices. Consumer prices for all meats ultimately are lower under the reduced loan rate scenario (figure 2). In the short run, however, retail prices are higher as production is reduced in order to expand breeding herds.

Figure 1--Impacts on Total Revenues Minus Feed Costs

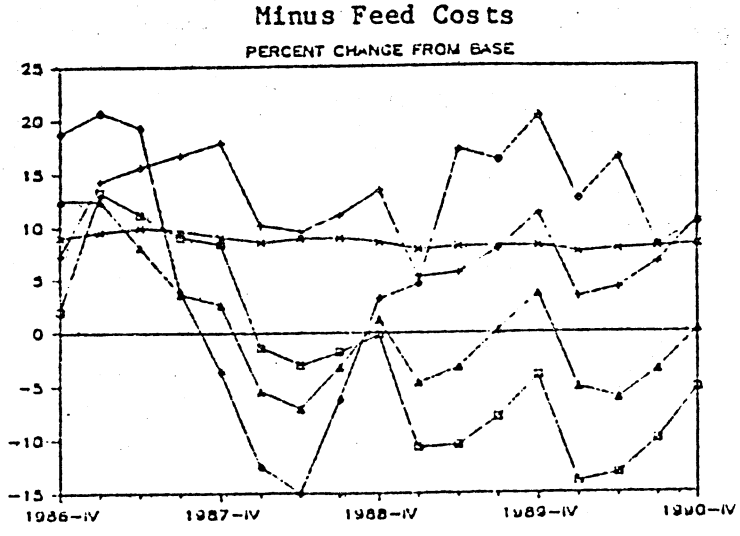
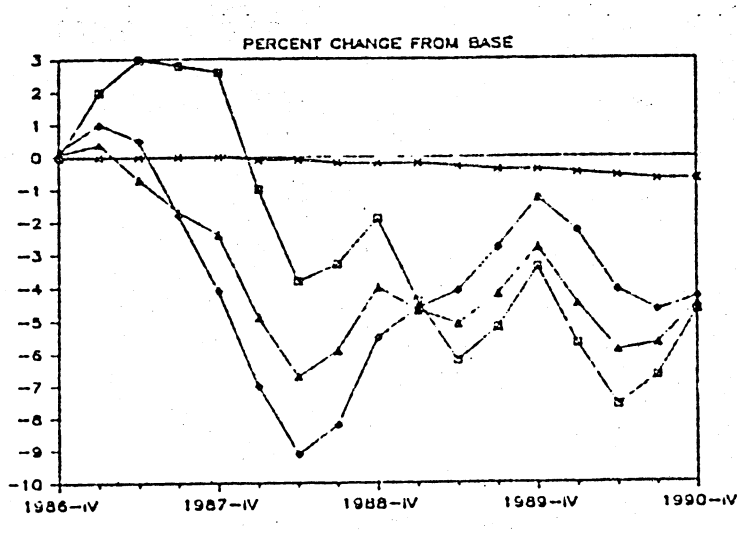


Figure 2--Consumer Price Index Impacts



The length of time that retail prices are higher for each meat category reflects the biological constraints involved, with poultry prices higher in the impact and 1 subsequent quarter; pork prices, 2 subsequent quarters; and beef prices, 4 subsequent quarters.

Conclusions

The results of the model simulations suggest that all livestock producers initially benefit from lower feed grain loan rates and prices. Adjustments in the different livestock subsectors, however, differ sharply in both magnitude and speed due to underlying biological constraints, feed-use efficiencies, and industry structures. In the longer run, cattle feeders and dairy producers appear to benefit the most while poultry producers and cow-calf enterprises are apparently worse off. Hog producers also benefit from lower feed grain prices although impacts on their net returns display a pronounced cyclical pattern.

Cattle feeders have the largest percentage increase among meat producers of total revenues minus feed costs over the simulation period. Biological lags, however, restrict the speed and degree of expansion in the short run. Cow-calf enterprises initially have higher net returns as well, but appear to be worse off in the longer run with lower feed grain prices as their net returns become lower.

The speed and magnitude of expansion in the hog sector is less constrained by biological factors than cattle. Additionally, the importance of mixed enterprise farms in the hog industry facilitates the marketing of corn through hog feeding as an alternative to selling corn directly. As a consequence, the hog sector "over responds" to the lower grain prices, resulting in a pattern of cyclical adjustments.

The largest poultry production adjustments are in the short run as they are the least constrained by biological lags. Over the longer run, poultry production adjustments are the smallest among meat producers. Reductions in producer prices, however, are larger in the longer run, reflecting increased production of red meats. As a result, poultry producers appear to be generally worse off in the long run with lower feed grain prices as the impacts on their net returns are, for the most part, negative starting in the sixth simulation quarter.

Dairy producers benefit from the reduction in feed loan rates and market prices. Their costs are reduced but production, consumption and prices of milk change little, largely because of biological constraints to herd expansion. Government removals of dairy products, however, were higher throughout the simulation.

Consumers also benefit--retail prices for meats are generally lower following an initial period of somewhat higher meat prices when breeding herds are increased while current production is reduced.

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