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Implications of Increased Ethanol Production for U.S. Agriculture

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Executive Summary

Increases in ethanol production have major implications for both energy and agricultural markets. The Energy Policy Act of 2005 encourages further increases in ethanol production by mandating use of 7.5 billion gallons of renewable fuels by 2012.

The study compares three scenarios to the baseline outlook for the U.S. agriculture prepared by the Food and Agricultural Policy Research Institute (FAPRI) in early 2005:

1) a 100 million gallon increase in annual ethanol dry mill capacity,
2) a 100 million gallon increase in annual ethanol wet mill capacity, and
3) implementation of the Energy Policy Act of 2005.

Simulations with FAPRI's stochastic model indicate that additional ethanol production capacity results in an increase in corn prices but reduced prices for ethanol, corn by-products, and soybean meal. Farmers earn more from the marketplace and government payments decline. Net farm income increases on average, but not under all conditions.

Impacts of the Energy Policy Act of 2005 depend on how the legislation is implemented and how market actors respond. The analysis assumes that U.S. production of corn-based ethanol will increase to almost 7.0 billion gallons by 2012, with the remainder of the 7.5 billion gallon mandate filled by biodiesel, imported ethanol, and other renewable fuels. Relative to a baseline with no ethanol mandate, the Act has significant impacts on agricultural markets, farm program costs, and farm income:

- The amount of corn used to produce ethanol exceeds baseline levels by an average of 632 million bushels per year over the 2010/11-2014/15 period. Corn production increases, while corn exports, feed consumption, and stocks decline.

- Corn prices increase by an average of 12.5 cents per bushel above baseline levels, with smaller price increases for other grains.

- In contrast, increased ethanol production results in more production and lower prices of corn by-products. Soybean meal prices are reduced by 10 percent.

- Livestock and poultry sector effects are relatively small in aggregate. Producers who can take advantage of lower corn by-product and soybean meal prices benefit, while those feeding rations heavily dependent on grain face higher costs.

- The taxpayer cost of farm programs is reduced by an average of $1.0 billion per year between 2011 and 2015. Increases in ethanol consumption could reduce tax revenue, given differences in the tax treatment of ethanol and regular gasoline.

- Net farm income exceeds baseline levels by an average of $298 million per year over 2011-2015. Higher corn receipts are partially offset by lower government payments. Rental payments increase, as do other production costs.

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Introduction

Ethanol production doubled between 2000 and 2004 (Energy Information Administration), with major consequences for both energy and agricultural markets. The Energy Policy Act of 2005 (EPA-2005, Government Printing Office) encourages further expansion of ethanol production by mandating the use of 7.5 billion gallons of renewable fuels by 2012.

The study examines the implications for U.S. agriculture of increased ethanol production. Some of the increase in ethanol production can be attributed to supply-side policies, such as value-added grants and tax credits that reduce the cost of plant construction. Generally more important are demand-side policies, such as tax policies that provide favorable tax treatment to U.S.-produced ethanol and the renewable fuel mandate in the EPA-2005. The study examines both supply- and demand-side factors as part of a USDA-funded project to evaluate the impacts of value-added projects.

The analysis is conducted using FAPRI's stochastic model of the U.S. agricultural sector. The stochastic model allows FAPRI to examine not just a single set of likely outcomes for U.S. agricultural markets, government expenditures on farm programs, farm income measures, and consumer food costs, but rather 500 alternative outcomes that take into account the inherent variability and unpredictability of agricultural markets. The approach proves to be particularly important in examining implications of increased ethanol production. Results indicate that outcomes for crop production, government farm program outlays, and net farm income are very sensitive to market conditions; even the direction of certain impacts hinges on underlying market conditions. Unless otherwise noted, all figures reported here represent averages from the stochastic analysis.

The analysis involves a comparison of a baseline and three alternative scenarios:

1) The **baseline** assumes a continuation of farm policies in place in early 2005. The stochastic baseline is built on the same assumptions as the estimates presented in the *FAPRI 2005 U.S. Briefing Book*.[1]
2) The **100 MG dry mill** scenario assumes a 100 million gallon exogenous increase in dry mill ethanol processing capacity, phased in beginning in 2007.
3) The **100 MG wet mill** scenario assumes a100 million gallon exogenous increase in wet mill ethanol processing capacity, also phased in beginning in 2007.
4) The **energy bill** scenario assumes the provisions of the EPA-2005, specifically the renewable fuel mandate.

[1] Slight differences in reported baseline results for measures such as production, prices, and producer returns reflect the difference between the deterministic point estimates reported in the briefing book and the mean of the stochastic outcomes reported here. For government costs and farm income, the figures in the baseline briefing book should precisely match those reported here, as both reports use the mean of the stochastic outcomes as the baseline for government costs and farm income.

The 100 MG dry mill and 100 MG wet mill scenarios can contribute to an evaluation of the impacts of policies that encourage shifts in ethanol supply, while the energy bill scenario focuses on what may prove to be a major shift in the demand for ethanol.

The tables included in the text of the report indicate average results for the last five years covered by FAPRI's ten-year baseline projections. For crop variables, this corresponds to the 2010/11-2014/15 marketing years; for livestock and farm income variables it corresponds to calendar years 2011-2015, and for government commodity program expenditures it corresponds to fiscal years 2011-2015.[2]

More detailed tables showing annual estimates for the variables in question for a ten-year period can be found in the appendices. Appendix A provides baseline results, while Appendices B, C, and D provide estimates of absolute changes from the baseline results for the three alternative scenarios. Table 1 in the text corresponds to Appendix Tables A.1, B.1, C.1, and D.1; Table 2 corresponds to A.2, B.2, C.2, and D.2, etc. Finally, Appendix E briefly describes the enhancements that were made to the FAPRI model to better reflect the economics of the corn processing industry.

Impacts on Corn Markets

Increases in ethanol production result in increased demand for corn (Table 1). Corn prices increase, resulting in reductions in U.S. corn exports and in non-ethanol domestic uses of corn. The direct feed use of corn declines both because of the increase in corn prices and because of increased competition from lower-priced corn by-products. On average, the increase in corn prices increases net returns to corn producers and results in increased corn production.

The two scenarios assuming a 100 million gallon increase in ethanol production capacity have nearly identical impacts on the U.S. corn sector. Once the capacity increase is phased in, the average increase in the amount of corn used for ethanol production is just over 32 million bushels. Corn prices increase by an average of 0.6 cents per bushel, exports decline by about 16 million bushels, and direct feed use of corn is reduced by 11 million bushels. Planted acreage increases by a modest 35,000 acres on average, resulting in a 5 million bushel increase in corn production.

The energy bill scenario results in a much larger increase in ethanol production, so the impacts on the corn sector are much larger as well. The amount of corn used for ethanol production increases by an average of 632 million bushels per year. The magnitude of this increase depends critically on both FAPRI's baseline projections and assumptions

[2] Published tables from the FAPRI 2005 baseline do not include figures for calendar or fiscal years 2015, but those were computed for this analysis to better correspond to the period covered by crop-sector estimates. In the case of the energy bill scenario, the renewable fuel mandate does not reach 7.5 billion gallons until 2012, but the analysis indicates that the largest deviations from baseline values for most variables of interest actually occur prior to 2012. One should take care, therefore, not to conclude that the period-average figures reported are true "long-run" effects of the energy bill.

Table 1. U.S. corn sector impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Area		(million acres)					
Planted Area	83.928	0.035	0.035	0.768	0.04%	0.04%	0.91%
Harvested Area	76.514	0.032	0.032	0.702	0.04%	0.04%	0.92%
		(bushels per acre)					
Yield	160.5	0.0	0.0	0.0	0.00%	0.00%	0.00%
		(million bushels)					
Supply	13,761	-4	-4	-64	-0.03%	-0.03%	-0.47%
Beginning Stocks	1,467	-9	-9	-178	-0.64%	-0.65%	-12.11%
Production	12,279	5	5	114	0.04%	0.04%	0.92%
Imports	15	0	0	0	0.00%	0.00%	0.00%
Domestic Use	9,656	21	21	418	0.21%	0.21%	4.32%
Feed, Residual	6,276	-11	-11	-204	-0.18%	-0.18%	-3.25%
Fuel Alcohol	1,938	32	33	632	1.66%	1.68%	32.62%
HFCS	550	0	-1	-8	-0.07%	-0.10%	-1.41%
Seed	21	0	0	0	0.04%	0.04%	0.92%
Food, Other	870	0	0	-3	-0.02%	-0.02%	-0.32%
Exports	2,641	-16	-16	-302	-0.59%	-0.59%	-11.42%
Total Use	12,296	5	5	116	0.04%	0.04%	0.94%
Ending Stocks	1,465	-9	-9	-180	-0.64%	-0.64%	-12.29%
CCC Inventory	0	0	0	0	n.a.	n.a.	n.a.
Under Loan	259	0	0	-13	-0.19%	-0.19%	-5.01%
Other Stocks	1,206	-9	-9	-167	-0.74%	-0.74%	-13.85%
		(dollars per bushel)					
Farm Price	2.303	0.006	0.006	0.125	0.26%	0.26%	5.41%

regarding how much of the EPA-2005 mandate will be filled by U.S.-produced, corn-based ethanol. If, for example, the baseline included stronger growth in ethanol production, the estimated change from the baseline resulting from the implementation of EPA-2005 would have been smaller. Likewise, if a smaller proportion of the renewable fuel mandate is filled by U.S.-produced, corn-based ethanol, the impacts would also be smaller.

The increase in ethanol production in the energy bill scenario results in an average increase in corn prices of 12.5 cents per bushel between 2010/11 and 2014/15. Higher prices make U.S. corn less competitive in world export markets, and U.S. corn exports decline by 302 million bushels. Higher corn prices and increased competing supplies of corn by-products reduce the direct feed use of corn by 204 million bushels. On average, the increase in corn prices results in increased producer returns, and corn acreage increases by an average of 768,000 acres (0.9 percent). As discussed in the section on "Sensitivity of Results to Market Conditions," the change in net returns and corn area planted depend on the market situation, so the averages reported here mask a range of possible results.

Impacts on Corn Processing and Corn Product Markets

While increases in ethanol dry mill and wet mill capacity have similar impacts on the corn sector, they have different impacts on the corn processing industry (Table 2) and the markets for particular corn products (Table 3). An exogenous increase in dry mill capacity, for example, increases ethanol production from dry mill plants but reduces ethanol production from wet mill plants. Increased production of ethanol and distiller's grains results in marginally lower prices for both products, and prices for corn gluten feed and corn gluten meal also decline slightly.

Combined with higher corn prices, the result is a slight reduction in profit margins for both wet mill and dry mill plants. As a consequence, the 100 million gallon increase in dry mill ethanol production capacity results in an average increase in ethanol production of only 87 million gallons per year between 2010/11 and 2014/15. Similarly, an increase in wet mill capacity also results in lower prices for ethanol and corn by-product feeds. Combined with the increase in corn prices, the result is lower profit margins for ethanol producers and a slight reduction in ethanol produced from dry mill plants. Higher corn prices and reduced by-product prices also reduce margins for wet mill processors producing high-fructose corn syrup (HFCS). HFCS production declines slightly, resulting in a marginal increase in HFCS prices.

In the energy bill scenario, both wet mill and dry mill ethanol production increase by more than 30 percent relative to the baseline. Besides the magnitude of the changes, an important difference in the energy bill results compared to the mill capacity results is the effect on ethanol prices. When there is an exogenous increase in ethanol supply, as occurs in the mill capacity scenarios, the net impact is a small reduction in ethanol prices. In the energy bill scenario, on the other hand, the renewable fuel use mandate results in an increase in ethanol demand, so that ethanol prices exceed baseline levels in spite of a large increase in production.

The magnitude of the ethanol price increase in the energy bill scenario reflects in part analyst judgment about the ethanol and petroleum industry response to the renewable fuel mandate. Under provisions of EPA-2005, the renewable fuel mandate is to be implemented with the help of a credit trading system. Entities that do not wish to use their allocated share of renewable fuels will need to purchase credits from entities using more than their allocated share. If renewable fuel supplies fall short of the mandated use levels, credits should rise in value. The result should be an increase in the wholesale price of ethanol and other renewable fuels.

EPA-2005 should also reduce financial risk for ethanol producers, and this may limit the likely increase in ethanol prices. With a more secure market for ethanol, investors might be more willing to build new plant capacity for any given expected level of return. In terms of the model, this suggests that not only does the energy bill result in an outward shift of the demand curve for ethanol and other renewable fuels, but it may also result in an outward shift of the supply curve as well. Assessing the magnitude of these offsetting impacts is very difficult. Model results reflect a judgment that ethanol prices would have

Table 2. U.S. corn processing sector impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Corn Food, Industrial Use		(million bushels)					
Fuel Alcohol	1,938	32	33	632	1.66%	1.68%	32.62%
HFCS	550	0	-1	-8	-0.07%	-0.10%	-1.41%
Glucose and Dextrose	231	0	0	-1	-0.02%	-0.02%	-0.40%
Starch	294	0	0	-1	-0.01%	-0.01%	-0.29%
Beverage Alcohol	142	0	0	0	-0.01%	-0.01%	-0.30%
Cereals and Other	204	0	0	-1	-0.02%	-0.02%	-0.31%
Total	3,358	32	32	621	0.94%	0.95%	18.51%
Corn Dry Milling							
Corn Dry Milled for Ethanol	1,394	33	-2	461	2.38%	-0.18%	33.03%
Yields per Bushel of Corn							
Ethanol (Gallons)	2.71	0.00	0.00	0.00	0.00%	0.00%	0.00%
Distillers Grains (Pounds)	17.00	0.00	0.00	0.00	0.00%	0.00%	0.00%
Costs and Returns		(dollars per bushel of corn)					
Value of Ethanol	4.08	0.00	0.00	0.14	-0.06%	-0.06%	3.38%
Value of DDG	0.73	0.00	0.00	-0.05	-0.35%	-0.11%	-6.70%
Corn Price	2.30	0.01	0.01	0.12	0.26%	0.26%	5.41%
Natural Gas Cost	0.61	0.00	0.00	0.00	0.00%	0.00%	0.00%
Gross Margin	1.89	-0.01	-0.01	-0.04	-0.58%	-0.49%	-1.89%
Corn Wet Milling		(million bushels)					
Corn Wet Milled for Ethanol	544	-1	35	172	-0.20%	6.43%	31.54%
Other	1,216	0	-1	-10	-0.04%	-0.05%	-0.82%
Total	1,760	-2	34	162	-0.09%	1.95%	9.18%
Yields per Bushel of Corn		(gallons)					
Ethanol	2.68	0.00	0.00	0.00	0.00%	0.00%	0.00%
		(pounds)					
HFCS	34.13	0.00	0.00	0.00	0.00%	0.00%	0.00%
Gluten Feed	11.40	0.00	0.00	0.00	0.00%	0.00%	0.00%
Gluten Meal	3.00	0.00	0.00	0.00	0.00%	0.00%	0.00%
Corn Oil	1.57	0.00	0.00	0.00	0.00%	0.00%	0.00%
Costs and Returns		(dollars per bushel of corn)					
Value of Ethanol	4.03	0.00	0.00	0.14	-0.06%	-0.06%	3.38%
Value of HFCS	4.07	0.00	0.00	0.00	0.01%	0.01%	0.12%
Value of Gluten Feed	0.38	0.00	0.00	-0.01	0.03%	-0.22%	-1.45%
Value of Gluten Meal	0.37	0.00	0.00	-0.04	-0.31%	-0.57%	-9.65%
Value of Corn Oil	0.37	0.00	0.00	0.04	0.33%	0.10%	11.47%
Corn Price	2.30	0.01	0.01	0.12	0.26%	0.26%	5.41%
Natural Gas Cost	0.74	0.00	0.00	0.00	0.00%	0.00%	0.00%
Gross Margin: Ethanol	2.10	-0.01	-0.01	0.01	-0.39%	-0.52%	0.60%
Gross Margin: HFCS	2.15	-0.01	-0.01	-0.12	-0.26%	-0.39%	-5.54%

Table 3. U.S. corn product impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Ethanol		(million gallons)					
Production, Sep.-Aug. Yr.	5,242	87	87	1,710	1.67%	1.66%	32.62%
Production, Cal. Yr.	5,134	86	86	1,653	1.67%	1.67%	32.19%
		(dollars per gallon)					
Price, FOB Omaha, Sep-Aug.	1.502	-0.001	-0.001	0.051	-0.06%	-0.06%	3.38%
High-Fructose Corn Syrup		(thousand tons)					
Production, Oct.-Sep. Yr.	9,386	-7	-10	-133	-0.07%	-0.10%	-1.41%
Production, Cal. Yr.	9,345	-7	-9	-128	-0.07%	-0.10%	-1.37%
Domestic Use, Cal. Yr.	9,306	-7	-9	-128	-0.07%	-0.10%	-1.37%
Net Exports, Cal. Yr.	40	0	0	0	-0.01%	-0.01%	-0.18%
		(cents per pound)					
Price, 42% Midwest	11.92	0.00	0.00	0.01	0.01%	0.01%	0.12%
Distillers Grains		(thousand tons)					
Production (Dry equivalent)	11,850	283	-21	3,915	2.38%	-0.18%	33.03%
		(dollars per ton)					
Price, Lawrenceburg, IN	85.52	-0.30	-0.10	-5.73	-0.35%	-0.11%	-6.70%
Corn Gluten Feed		(thousand tons)					
Production	10,033	-9	195	921	-0.09%	1.95%	9.18%
Domestic Use	5,939	-8	194	929	-0.13%	3.26%	15.64%
Net Exports	4,094	-1	2	-8	-0.03%	0.04%	-0.19%
		(dollars per ton)					
Price, 21%, IL Points	66.06	0.02	-0.15	-0.96	0.03%	-0.22%	-1.45%
Corn Gluten Meal		(thousand tons)					
Production	2,640	-2	51	242	-0.09%	1.95%	9.18%
Domestic Use	1,667	-3	50	230	-0.15%	3.00%	13.80%
Net Exports	974	0	1	12	0.02%	0.15%	1.27%
		(dollars per ton)					
Price, 60%, IL Points	246.88	-0.77	-1.41	-23.81	-0.31%	-0.57%	-9.65%
Corn Oil		(million pounds)					
Production	2,767	-2	54	254	-0.09%	1.95%	9.18%
Domestic Use	1,947	-2	53	260	-0.11%	2.74%	13.33%
Net Exports	819	0	0	-7	-0.04%	0.06%	-0.80%
Ending Stocks	184	0	3	4	-0.21%	1.43%	1.97%
		(cents per pound)					
Chicago Price	23.50	0.08	0.02	2.69	0.33%	0.10%	11.47%

to increase at least enough (about 5 cents per gallon) to leave gross margins for corn processors roughly at baseline levels.

Recent developments in gasoline and ethanol markets add another source of uncertainty to the estimates. In recent months, petroleum and gasoline prices have risen to levels much higher than anticipated in the Global Insight forecasts underlying the FAPRI baseline projections prepared in early 2005. While this would normally tend to support ethanol prices, a variety of factors led to a sharp decline in ethanol prices relative to those for gasoline. Wholesale prices for ethanol were consistently at a significant premium to gasoline prior to this year, but in the first half of 2005, ethanol sold at a significant discount to gasoline. If gasoline prices remain high and ethanol prices return to a more

"normal" (pre-2005) relationship to gasoline prices, then the outlook for returns to corn processors would be brighter than indicated here. If, on the other hand, gasoline prices were to fall sharply and ethanol sells at a sharp discount to gasoline, the outlook would be more pessimistic.

Impacts on Crop Prices, Producer Returns, and Acreage

Increases in ethanol production imply increased demand for the component of corn that is relatively high in calories but low in protein. The result is higher prices not just for corn, but for other grains that primarily provide calories in feed rations: sorghum, barley, oats, and, to a lesser extent, wheat (Table 4). Hay prices increase slightly, as higher corn prices increase the opportunity cost of corn silage production and contribute to a small increase in hay demand.

Because higher corn prices translate into reduced corn exports and increased corn production, the result is an increase in the supply of protein from corn. The result is lower prices not just for corn by-products in greater supply, but also lower prices for soybean meal and other protein meals. Among the corn by-products, the steepest price declines are for corn gluten meal (highest in protein), and the smallest price declines are for corn gluten feed (lowest in protein).

Two other factors are important in understanding impacts on prices of crops and crop products. First, the increase in corn and other feed grain prices results in modest acreage shifts out of other products and into corn and other feed grains. This has the effect of slightly increasing prices for crops such as cotton and rice that are not substitutes for corn on the demand side.

Second are impacts on vegetable oil markets. The reduction in soybean meal prices that results from increased ethanol production causes a slight reduction in soybean crush. For a given level of vegetable oil demand, this results in an increase in soybean oil prices. The effect is only moderated slightly by the increase in corn oil production that results when there is an increase in wet mill production of ethanol. Soybean oil prices increase by an even larger proportion in the energy bill scenario, not just because of the magnitude of the shocks to the ethanol market but because it is assumed that at least a modest proportion of the renewable fuel mandate would be filled by increased use of biodiesel produced from soybean oil.[3] Corn oil is treated as a close substitute to soybean oil in the model, so corn oil prices increase significantly in the energy bill scenario, in spite of increased corn oil production.

Effects on soybean prices reflect a mix of offsetting factors. On the one hand, lower soybean meal prices tend to depress the price of soybeans. On the other hand, higher

[3] Specifically, the energy bill scenario assumes a 450 million pound shift in vegetable oil demand to reflect an increase in biodiesel production of approximately 50 million gallons above baseline levels. It should be noted that the current version of the model does not include an explicit biodiesel sector, in part because of data constraints. The use of soybean oil to make biodiesel is simply part of total soybean oil demand.

Table 4. U.S. crop and crop product price impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
		(dollars per bushel)					
Corn	2.303	0.006	0.006	0.125	0.26%	0.26%	5.41%
Soybeans	5.418	-0.003	-0.003	-0.009	-0.05%	-0.06%	-0.16%
Wheat	3.547	0.003	0.003	0.061	0.08%	0.08%	1.73%
Sorghum	2.140	0.004	0.004	0.089	0.20%	0.20%	4.18%
Barley	2.548	0.005	0.005	0.093	0.18%	0.18%	3.65%
Oats	1.590	0.003	0.003	0.067	0.21%	0.21%	4.21%
		(dollars per hundredweight)					
Rice	7.823	0.001	0.001	0.018	0.01%	0.01%	0.23%
		(cents per pound)					
Peanuts	19.78	0.00	0.00	0.08	0.02%	0.02%	0.39%
Sunflowers	11.84	0.02	0.02	0.86	0.17%	0.17%	7.24%
Upland Cotton	51.68	0.00	0.00	0.10	0.01%	0.01%	0.19%
		(dollars per ton)					
Hay	95.44	0.05	0.05	0.96	0.05%	0.05%	1.01%
Soybean Meal	176.81	-0.67	-0.68	-17.69	-0.38%	-0.38%	-10.01%
Corn DDG	85.52	-0.30	-0.10	-5.73	-0.35%	-0.11%	-6.70%
Corn Gluten Feed	66.06	0.02	-0.15	-0.96	0.03%	-0.22%	-1.45%
Corn Gluten Meal	246.88	-0.77	-1.41	-23.81	-0.31%	-0.57%	-9.65%
		(cents per pound)					
Soybean Oil	23.08	0.08	0.08	2.94	0.33%	0.33%	12.76%
Corn Oil	23.50	0.08	0.02	2.69	0.33%	0.10%	11.47%

soybean oil prices and reduced soybean production tend to support soybean prices. On average, model results suggest there would be little net impact on soybean prices. Many of the same factors affect sunflower seed prices, but given the higher oil content of sunflower seed relative to soybeans, the price-enhancing factors dominate, and sunflower seed prices significantly exceed baseline levels in the energy bill scenario.

Effects of increased ethanol production on crop producer returns depend on both crop prices and changes in government payments (Table 5). Impacts of the scenarios on market net returns per acre (price times yield minus variable production expenses) reflect the estimated changes in crop prices. Corn market net returns increase by an average of $0.97 per acre in the two mill capacity scenarios, and by almost $20 per acre in the energy bill scenario. Higher prices result in smaller absolute increases in market net returns for sorghum, wheat, and cotton producers. With little change in soybean prices, the net effect on average soybean net returns is also nearly zero.[4]

[4] On average, the effect of increased ethanol production on soybean market net returns is marginally negative in all three scenarios. In the two ethanol processing capacity scenarios, the effect is very small but clearly negative. In the energy bill scenario, the effect is also small, and even the direction of the effect is ambiguous. The difference is the increased production of biodiesel assumed in the energy bill scenario. The assumed increase in biodiesel production from vegetable oil (approximately 50 million gallons) is modest; if there were an even larger increase in biodiesel production, the net effect of the energy bill on soybean prices and market net returns could be positive.

Table 5. Crop producer return impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Corn	(dollars per acre planted to corn)						
Market Net Returns	187.42	0.97	0.97	19.87	0.52%	0.52%	10.60%
Loan Program Benefits	13.02	-0.36	-0.36	-6.24	-2.78%	-2.79%	-47.92%
Market + Loan Net Returns	200.44	0.60	0.61	13.63	0.30%	0.30%	6.80%
	(dollars per corn base acre)						
Counter-cyclical Payment	14.39	-0.24	-0.24	-4.82	-1.68%	-1.68%	-33.53%
Direct Payment	24.37	0.00	0.00	0.00	0.00%	0.00%	0.00%
	(dollars per corn base acre planted to corn)						
Net Returns with Payments	239.20	0.36	0.36	8.80	0.15%	0.15%	3.68%
Soybeans	(dollars per acre planted to soybeans)						
Market Net Returns	116.86	-0.12	-0.12	-0.33	-0.10%	-0.11%	-0.28%
Loan Program Benefits	11.30	0.06	0.06	0.21	0.52%	0.53%	1.87%
Market + Loan Net Returns	128.16	-0.06	-0.06	-0.12	-0.05%	-0.05%	-0.09%
	(dollars per soybean base acre)						
Counter-cyclical Payment	4.39	0.02	0.02	0.03	0.34%	0.35%	0.66%
Direct Payment	11.52	0.00	0.00	0.00	0.00%	0.00%	0.00%
	(dollars per soybean base acre planted to soybeans)						
Net Returns with Payments	144.07	-0.05	-0.05	-0.09	-0.03%	-0.03%	-0.06%
Wheat	(dollars per acre planted to wheat)						
Market Net Returns	72.48	0.13	0.13	2.71	0.18%	0.18%	3.74%
Loan Program Benefits	1.18	-0.02	-0.02	-0.32	-1.44%	-1.44%	-27.18%
Market + Loan Net Returns	73.66	0.11	0.11	2.39	0.15%	0.15%	3.24%
	(dollars per wheat base acre)						
Counter-cyclical Payment	3.18	-0.03	-0.03	-0.59	-0.92%	-0.92%	-18.49%
Direct Payment	15.25	0.00	0.00	0.00	0.00%	0.00%	0.00%
	(dollars per wheat base acre planted to wheat)						
Net Returns with Payments	92.09	0.08	0.08	1.80	0.09%	0.09%	1.95%
Upland Cotton	(dollars per acre planted to cotton)						
Market Net Returns	64.80	0.04	0.04	0.78	0.05%	0.05%	1.21%
Loan Program Benefits	52.89	-0.02	-0.02	-0.32	-0.03%	-0.03%	-0.60%
Market + Loan Net Returns	117.69	0.02	0.02	0.47	0.02%	0.02%	0.40%
	(dollars per cotton base acre)						
Counter-cyclical Payment	59.69	-0.01	-0.01	-0.23	-0.02%	-0.02%	-0.39%
Direct Payment	34.23	0.00	0.00	0.00	0.00%	0.00%	0.00%
	(dollars per cotton base acre planted to cotton)						
Net Returns with Payments	211.60	0.01	0.01	0.23	0.00%	0.00%	0.11%
Sorghum	(dollars per acre planted to sorghum)						
Market Net Returns	27.78	0.29	0.29	5.90	1.04%	1.04%	21.24%
Loan Program Benefits	8.92	-0.15	-0.15	-2.83	-1.71%	-1.71%	-31.76%
Market + Loan Net Returns	36.70	0.14	0.14	3.07	0.37%	0.37%	8.35%
	(dollars per sorghum base acre)						
Counter-cyclical Payment	6.10	-0.07	-0.07	-1.35	-1.08%	-1.08%	-22.06%
Direct Payment	16.81	0.00	0.00	0.00	0.00%	0.00%	0.00%
	(dollars per sorghum base acre planted to sorghum)						
Net Returns with Payments	59.61	0.07	0.07	1.72	0.12%	0.12%	2.88%

Certain farm program payments decrease when market prices increase. For example, when posted county prices for corn fall below county loan rates, farmers can receive a loan deficiency payment (LDP) to make up the difference. Given past experience with the loan program, the model assumes that loan program benefits move inversely with market prices whenever the national average price dips below a trigger level.[5] Given model parameters, any time the national average price of corn dips below $2.15 per bushel, the loss of market returns is fully offset by increases in marketing loan program benefits.

The implication of this is that an increase in demand for corn that increases the national average price from, say, $1.95 per bushel to $2.00 per bushel has little or no impact on producer net returns from the market and the loan program considered in combination. The increase in market returns is offset by a corresponding decline in loan program benefits. Only when the price of corn exceeds $2.15 per bushel does an increase in market prices lead to an increase in producer returns from the market and from the loan program in combination.

The counter-cyclical payment (CCP) program further complicates matters. Given current program parameters, producers with corn base acreage receive a CCP whenever the national season-average price of corn falls below $2.35 per bushel. The payment rate is equal to $2.35 minus the greater of the national season-average corn price or the $1.95 loan rate (thus the maximum payment rate is $0.40 per bushel). Unlike LDPs, however, CCPs are not tied to current production levels. Instead, they are paid on a fixed base—the producer's corn base acreage, multiplied by the producer's CCP payment yield (generally lower than average harvested yields), multiplied by 0.85. Producers receive the same CCP regardless of how much corn they produce, or even if they produce no corn at all.

There is no simple or correct way to consider the impacts of CCPs on producer returns, given the lack of correlation between base area and yields and actual production. For purposes of Table 5, corn total net returns are calculated on the basis of dollars per base acre of corn that is actually planted to corn. In addition to CCPs, these total net returns include direct payments, which do not depend on market prices or production levels.

Given the formulas established in law, farmers with base acreage receive smaller CCPs when national season-average corn prices increase in the range between $1.95 and $2.35 per bushel. Considering all revenue sources, the response of total net returns to changes in market prices is significantly different depending on the level of corn prices:

[5] In the case of corn, the trigger level is equal to the national average loan rate ($1.95 per bushel) plus about 20 cents per bushel. This figure was selected based on experience during the last sustained period when prices were low enough to generate large marketing loan benefits (1998-2001): loan deficiency payments and marketing loan gains averaged approximately 20 cents per bushel more than the difference between the national average loan rate and the national season-average price of corn.

1) When national season-average corn prices are greater than $2.35 per bushel, increases in prices have no impact on payments, so a dollar change in market net returns is a dollar change in total net returns from all sources.
2) When the price is between $2.15 and $2.35 per bushel, higher prices translate into higher corn market receipts but lower CCPs. Given program parameters, the average reduction in payments per base acre will be less than the increase in market returns per planted acre, so producers will receive some net benefit from higher prices.
3) When the price is between $1.95 and $2.15 per bushel, higher prices translate into higher corn market receipts, but lower CCPs and lower loan program benefits. Given model parameters, the result is an actual reduction in net returns per base acre for producers who plant exactly their base acreage.
4) Finally, when the price is less than $1.95, higher prices have no effect on CCPs (which are at their maximum level), but have offsetting impacts on market net returns and loan program benefits.

Averaging across all 500 outcomes, the $19.87 per acre increase in corn market net returns in the energy bill scenario is offset by a $6.24 per acre reduction in loan program benefits and a $4.82 per acre reduction in CCPs per base acre. Thus, more than half of the benefit to producers of higher prices is offset by the reduction in government farm program benefits.

The same sort of calculations apply to the other crops included in the analysis. In all cases, government payment effects significantly reduce the average effect on total producer revenues of the estimated changes in market net returns.

The estimated impacts on crop acreage planted (Table 6) are consistent with the estimates of producer net return impacts. The increase in corn net returns translates into increased corn acreage, but the effect is relatively modest because of the reductions in commodity program benefits when prices increase. Acreage for sorghum, barley, oats, and sunflowers also increases, given stronger price increases for those commodities than for competing crops like wheat and soybeans.

Soybean, rice, cotton, and peanut acreage all decline, as returns for those commodities decline relative to corn and other feed grains. Wheat acreage is largely unchanged, as wheat returns increase, but by less than feed grain returns. Implicitly, some wheat acreage shifts to feed grains and sunflowers, but some offsetting shifts occur and some marginal acres that might not otherwise be used for production of major field crops are planted. Aggregating across all the crops included in the model, total planted acreage increase by a few thousand acres in the ethanol production capacity scenarios, and by about 0.12 percent in the energy bill scenario.

As discussed in the “Sensitivity of Results” section, these average impacts mask a range of possible consequences. When baseline corn prices exceed $2.35 per bushel, the increase in prices resulting from increased ethanol production results in larger effects on producer net returns and corn planted acreage than the average figures reported in Tables

Table 6. Crop acreage impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
		(million acres)					
Corn	83.928	0.035	0.035	0.768	0.04%	0.04%	0.91%
Soybeans	72.602	-0.025	-0.025	-0.490	-0.03%	-0.03%	-0.68%
Wheat	57.607	0.002	0.002	-0.011	0.00%	0.00%	-0.02%
Sorghum	7.823	0.001	0.001	0.013	0.01%	0.01%	0.16%
Barley	4.171	0.001	0.001	0.025	0.03%	0.03%	0.60%
Oats	4.015	0.001	0.001	0.009	0.02%	0.02%	0.23%
Rice	3.366	0.000	0.000	-0.005	-0.01%	-0.01%	-0.16%
Peanuts	1.451	0.000	0.000	-0.002	-0.01%	-0.01%	-0.17%
Sunflowers	1.977	0.001	0.001	0.055	0.05%	0.05%	2.76%
Upland Cotton	13.234	-0.002	-0.002	-0.059	-0.02%	-0.02%	-0.44%
10 Major Crops	250.175	0.012	0.012	0.301	0.00%	0.00%	0.12%
Hay Area Harvested	63.027	0.004	0.004	0.061	0.01%	0.01%	0.10%
10 Major Crops + Hay	313.202	0.016	0.016	0.362	0.01%	0.01%	0.12%

5 and 6. On the other hand, when baseline corn prices are below $2.15 per bushel, small increases in market prices do not increase total producer net returns from the market and government in combination, and so the impact on corn production is muted.

Impacts on Livestock, Poultry, Dairy, and Feed Sectors

Increases in ethanol production have offsetting impacts on feed costs to livestock, poultry, and dairy producers. Prices of corn and other grains increase, but prices of corn by-products and protein meals decline. The net effect on ration costs depends on the proportion of grain and protein meal in the ration, and on the ability to access corn by-products.

Poultry consume a higher proportion of protein meal in their ration than hogs and cattle. The estimated decline in protein meal prices more than offsets the increase in corn prices, leaving the average cost of poultry feed rations lower in the increased ethanol production scenarios than in the baseline (Table 7). The result is an increase in poultry production and lower poultry prices. Note that all of these effects are very small—poultry production increases just 0.2 percent in the energy bill scenario.

Hog producers use proportionally less protein meal in their rations than do poultry producers. Average ration costs for pork producers increase slightly under the ethanol scenarios, as increases in corn prices more than offset lower soybean meal prices. The result is a decline in pork production and an increase in hog prices. Again note how small the impacts are—pork production declines by just 0.2 percent in the energy bill scenario.

Table 7. Livestock, poultry, and dairy impacts, 2011-2015 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Production		(billion pounds)					
Beef	29.747	-0.001	-0.001	-0.020	0.00%	0.00%	-0.07%
Pork	22.489	-0.003	-0.003	-0.043	-0.01%	-0.01%	-0.19%
Chicken	42.491	0.001	0.001	0.091	0.00%	0.00%	0.21%
Turkey	6.176	0.000	0.000	0.011	0.01%	0.01%	0.18%
Milk	188.235	-0.004	-0.005	-0.061	0.00%	0.00%	-0.03%
Prices		(dollars per hundredweight)					
Steers, Nebraska Direct	71.54	0.01	0.01	0.10	0.02%	0.02%	0.13%
Feeder Steers, OK City	81.70	-0.04	-0.04	-1.12	-0.05%	-0.05%	-1.37%
Hogs, 51%-52% Lean	46.91	0.02	0.02	0.19	0.03%	0.03%	0.41%
Broilers, 12 City Wholesale	61.27	0.00	0.00	-0.29	0.00%	0.00%	-0.47%
Turkey, East Reg. Wholesale	65.90	-0.01	-0.01	-0.54	-0.02%	-0.02%	-0.82%
All Milk	13.28	0.00	0.00	0.02	0.01%	0.01%	0.13%

Finally, impacts on dairy and beef cattle producers are ambiguous. Beef cattle producers, in particular, use proportionally less protein meal in their rations than pork or poultry producers. By itself, this would suggest that cattle feed costs should rise and production fall, and the results do indicate a very small reduction in beef production. Fed cattle prices increase marginally and feeder cattle prices decline to reflect the increase in estimated feed costs. Similarly, model results suggest a slight reduction in milk production and a small increase in milk prices.

However, much of the increase in corn by-product production is likely to be fed to cattle. Cattle producers with access to cheaper corn by-products will see reduced production costs, while producers who must rely on more expensive grain will see increased production costs. On average, the cost of cattle feed increases slightly, as corn and other grains continue to be the largest component in cattle rations, even with the significant increase in corn by-product availability. While the net impact on the cattle sector as a whole is quite small, there could be disparate effects on different regions, with cattle producers close to new ethanol plants gaining at the expense of those located at a distance.

Increases in ethanol production result in more domestic consumption of corn by-products and less consumption of corn grain and soybean meal (Table 8). Relative to the baseline, the energy bill scenario results in a 4.6 million metric ton increase in domestic feeding of corn by-products. The reduction in use of corn and soybean meal is slightly larger, suggesting a small reduction in estimated feed consumption per unit of livestock production. Taking into account all the modeled feeds (including hay), the net reduction in feed use per animal unit is less than 0.2 percent in the energy bill scenario. A more thorough analysis of the feed value of corn by-products might result in better estimates of these feed sector impacts. The basic story is likely to hold, however: increased use of corn by-products displaces both corn grain and soybean meal in feed rations, leaving total feed consumption largely unchanged.

Table 8. Feed sector impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Corn (mil. bu.)	6,276	-11	-11	-204	-0.18%	-0.18%	-3.25%
Sorghum (mil. bu.)	165	0	0	3	0.09%	0.09%	2.05%
Barley (mil. bu.)	62	0	0	-1	-0.07%	-0.07%	-1.24%
Oats (mil. bu.)	126	0	0	1	0.05%	0.05%	1.01%
Wheat (mil. bu.)	178	1	1	13	0.37%	0.37%	7.52%
Soybean Meal (1000 tons)	38,716	-49	-50	-722	-0.13%	-0.13%	-1.86%
Corn DDGs (1000 tons)	11,850	283	-21	3,915	2.38%	-0.18%	33.03%
Corn Gluten Feed (1000 tons)	5,939	-8	194	929	-0.13%	3.26%	15.64%
Corn Gluten Meal (1000 tons)	1,667	-3	50	230	-0.15%	3.00%	13.80%
Hay (mil. tons)	162.78	0.01	0.01	0.17	0.01%	0.01%	0.11%
		(million metric tons)					
Corn	159.42	-0.28	-0.28	-5.19	-0.18%	-0.18%	-3.25%
Sorghum	4.20	0.00	0.00	0.09	0.09%	0.09%	2.05%
Barley	1.35	0.00	0.00	-0.02	-0.07%	-0.07%	-1.24%
Oats	1.83	0.00	0.00	0.02	0.05%	0.05%	1.01%
Wheat	4.84	0.02	0.02	0.36	0.37%	0.37%	7.52%
Grain sub-total	171.64	-0.26	-0.26	-4.74	-0.15%	-0.15%	-2.76%
Soybean Meal	35.12	-0.04	-0.05	-0.65	-0.13%	-0.13%	-1.86%
Corn By-products	17.65	0.25	0.20	4.60	1.40%	1.15%	26.08%
Total Feed (Excluding Hay)	224.41	-0.06	-0.10	-0.79	-0.02%	-0.05%	-0.35%
Hay	147.68	0.01	0.01	0.16	0.01%	0.01%	0.11%
Total Feed (Including Hay)	372.08	-0.05	-0.10	-0.63	-0.01%	-0.03%	-0.17%
GCAUs	7.10	0.00	0.00	0.00	0.00%	0.00%	0.00%
Grain Feed Use/GCAUs	24.17	-0.04	-0.04	-0.67	-0.15%	-0.15%	-2.76%
HPAUs	55.35	0.00	0.00	0.03	0.00%	0.00%	0.05%
Soymeal Use/HPAUs	0.63	0.00	0.00	-0.01	-0.12%	-0.13%	-1.92%
Total Feed (Exc. Hay)/GCAU	31.60	-0.01	-0.01	-0.11	-0.02%	-0.04%	-0.35%
Total Feed (Inc. Hay)/GCAU	52.40	0.00	-0.01	-0.09	-0.01%	-0.02%	-0.17%

Note: GCAUs are an index of grain-consuming animal units, while HPAUs are an index of high-protein animal units. These indices weight different types of livestock production based on typical rations and feed efficiency measures.

Impacts on Government Outlays

Increased ethanol production results in higher grain prices and lower government payments to producers (Table 9). In the two scenarios assuming increased ethanol production capacity, the net reduction in marketing loan and countercyclical payments averages about $52 million per year over crop years 2010/11-2014/15. In the energy bill scenario, the net reduction in payments is more than $1.0 billion per year, or about 9 percent of total baseline payments to crop producers.

Table 9. Government payment impacts, 2010/11-2014/15 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
		(million dollars)					
Direct Payments	5,305	0	0	0	0.00%	0.00%	0.00%
Marketing Loan Benefits	3,011	-28	-28	-545	-0.92%	-0.92%	-18.11%
Counter-cyclical Payments	3,135	-24	-24	-491	-0.76%	-0.76%	-15.65%
Total	11,450	-52	-52	-1,036	-0.45%	-0.45%	-9.05%

Table 10. Government outlay impacts, FY 2011-2015 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
Feed Grains		(million dollars)					
Corn	4,425	-50	-50	-905	-1.13%	-1.13%	-20.45%
Sorghum	383	-2	-2	-35	-0.47%	-0.47%	-9.03%
Barley	149	-1	-1	-19	-0.68%	-0.68%	-12.49%
Oats	17	0	0	-3	-1.15%	-1.16%	-20.25%
Food Grains							
Wheat	1,746	-3	-3	-58	-0.17%	-0.17%	-3.32%
Rice	875	0	0	-3	-0.01%	-0.01%	-0.33%
Oilseeds							
Soybeans	1,794	5	5	18	0.27%	0.27%	0.99%
Peanuts	236	0	0	-3	-0.06%	-0.06%	-1.42%
Other Oilseeds	33	0	0	-6	-0.56%	-0.56%	-18.94%
Upland Cotton	2,807	0	0	-7	-0.02%	-0.02%	-0.26%
Other Net Costs	4,212	0	0	-3	0.00%	0.00%	-0.07%
Net CCC Outlays	16,676	-52	-52	-1,025	-0.31%	-0.31%	-6.14%

On a fiscal year basis, the average net effect on farm program outlays by the Commodity Credit Corporation (CCC) is almost identical to the estimated changes in crop year payments. Reduced payments to corn producers account for almost 90 percent of the reduction in net CCC outlays. Soybean program outlays increase slightly, as marginally lower soybean prices translate into greater soybean LDPs and CCPs.

These estimates of changes in net farm commodity program outlays do not constitute a full accounting of the budget implications of increased ethanol production. For example, increased ethanol production and use is likely to correspond to some reduction in use of gasoline. Under current tax law, the result would be a reduction in federal tax revenues, given the higher rate of taxes per gallon for gasoline vs. ethanol. Increased ethanol production would also have important secondary impacts on the economy that would

have revenue and outlay implications. Estimating the magnitude or even the nature of all these impacts is beyond the scope of this study.

Impacts on Net Farm Income

Increased ethanol production results in higher corn prices and higher market cash receipts to corn producers (Table 11). In the two ethanol production capacity scenarios, the increase in corn receipts averages approximately $77 million per year between 2011 and 2015. In the energy bill scenario, corn cash receipts increase by almost $1.6 billion per year over the same period, a 7 percent increase over baseline levels.

Soybean and total oilseed receipts decline marginally, but other crop receipts increase. Livestock sector impacts on net farm income are modest. In the energy bill scenario, livestock cash receipts dip slightly ($246 million per year) relative to baseline levels, but this is largely offset by the reduction in the cost of purchased livestock ($211 million per year) caused by reduced feeder cattle prices.

Feed costs increase slightly ($154 million per year in the energy bill scenario), as the impact of higher prices for corn and other grains slightly outweighs the impact of lower prices for corn by-products and protein meals. The increase in net returns for producing corn and other grains translates into a modest increase in rent paid to non-operator landlords ($181 million per year). A slight increase in other production expenses leaves total production expenses up by about $173 million per year in the energy bill scenario.

Table 11. Net farm income impacts, 2011-2015 averages

		Absolute Effects of:			Percentage Effects of:		
	Baseline	100 MG Dry Mill	100 MG Wet Mill	Energy Bill	100 MG Dry Mill	100 MG Wet Mill	Energy Bill
		(million dollars)					
Corn Receipts	22,344	77	77	1,578	0.34%	0.35%	7.06%
Oilseed Receipts	15,827	-14	-14	-95	-0.09%	-0.09%	-0.60%
All Other Crop Receipts	77,795	12	12	230	0.02%	0.02%	0.30%
Total Crop Cash Receipts	115,966	74	74	1,713	0.06%	0.06%	1.48%
Livestock Cash Receipts	110,257	0	-1	-246	0.00%	0.00%	-0.22%
Government Payments	18,108	-49	-50	-990	-0.27%	-0.27%	-5.47%
Sum of Above	244,331	25	24	477	0.01%	0.01%	0.20%
Feed Expenses	28,393	14	14	154	0.05%	0.05%	0.54%
Purchased Livestock	16,887	-9	-9	-211	-0.05%	-0.05%	-1.25%
Rent to Non-Operators	12,623	5	5	181	0.04%	0.04%	1.44%
Other Production Expenses	166,645	2	2	49	0.00%	0.00%	0.03%
Total Production Expenses	224,548	12	12	173	0.01%	0.01%	0.08%
All Other Net Income*	34,249	0	0	-6	0.00%	0.00%	-0.02%
Net Farm Income	54,032	12	12	298	0.02%	0.02%	0.55%

*Farm-related income, non-money income, and value of inventory change

Finally, the reduction in government payments offsets much of the remaining increase in farm income resulting from increased ethanol production. In the energy bill scenario, government payments to producers fall by about $1.0 billion per year over calendar years 2011-2015, offsetting more than half of the increase in crop receipts. Considering all these effects, the net effect of the energy bill is to increase net farm income by an average of $298 million per year, less than one fifth of the increase in corn receipts.

Sensitivity of Results to Market Conditions

Many of the results reported here are sensitive to market conditions. Not only the magnitude but sometimes even the direction of scenario impacts depends on the baseline situation. To illustrate, stochastic model results are segregated based on 2010/11 baseline prices for corn (Tables 12). In 250 of the 500 stochastic outcomes for 2010/11, the baseline price of corn is less than $2.23 per bushel, and in 250 outcomes it is greater. In the 250 low-price outcomes, the average price of corn is $1.98 per bushel; in the 250 high-price outcomes, the average price is $2.56 per bushel.

In the high-price outcomes, an increase in corn demand caused by an increase in ethanol production results in higher corn prices and market returns. At prices over $2.23 per bushel, there are no loan program benefits, so the higher prices do not result in any reduction in LDPs. Only at prices below $2.35 per bushel do CCPs result, so for most of the high-price outcomes, there is also no impact on CCPs when prices increase. In the scenario increasing dry mill capacity by 100 million gallons, the average increase in corn market returns in the 250 high-price outcomes is about $0.95 per acre, and only $0.16 of that is offset by lower CCPs per base acre.

In contrast, in the 250 low-price outcomes, the increase in market returns caused by the increase in ethanol production capacity is about $1.03 per acre (the per-acre effect is larger because yields are higher on average in the low-price outcomes than in the high-price outcomes). However, this increase in market returns is more than offset by reductions in loan program benefits and CCPs. As discussed in the section on producer returns, there is a range of prices ($1.95-$2.15 per bushel in the model) where every penny increase in market prices is offset by a penny reduction in loan program benefits and a further reduction in CCPs. Net returns per base acre planted to corn actually decline slightly from baseline levels when increased ethanol production results in higher corn prices.

Not surprisingly, then, the increase in corn acreage is much larger in the 250 high-price outcomes than it is in the 250 low-price outcomes. Average corn government outlays in fiscal year 2011 (the year in which most payments associated with the 2010/11 marketing year are made) fall by an average of more than four times as much in the low-price outcomes as in the high-price outcomes. In the low-price outcomes, the increase in ethanol demand actually results in a modest decline in 2010 and 2011 net farm income, as the lost government payments more than offset the increase in corn market receipts.

Table 12. Ethanol dry mill capacity scenario results sorted by 2010/11 corn prices

	Bottom 50% Baseline 2010/11 Corn Price				Top 50% Baseline 2010/11 Corn Price			
		100 MG	Change from Base			100 MG	Change from Base	
	Baseline	Dry Mill	Absolute	Percent	Baseline	Dry Mill	Absolute	Percent
Corn, 2010/11								
Corn Price ($/bu)	1.983	1.990	0.006	0.32%	2.558	2.565	0.006	0.25%
Corn Market Gross Returns ($/a.)	320.42	321.45	1.03	0.32%	382.81	383.76	0.95	0.25%
Corn Loan Program Benefits ($/a.)	28.68	27.81	-0.87	-3.05%	0.00	0.00	0.00	n.a.
Corn CCPs ($/base a.)	30.48	30.08	-0.40	-1.32%	1.83	1.66	-0.16	-8.89%
Corn Total Net Returns ($/base a.)	230.52	230.27	-0.25	-0.11%	236.38	237.17	0.79	0.33%
Corn, 2011/12								
Corn planted area (mil. a.)	82.77	82.78	0.01	0.01%	84.89	84.95	0.06	0.07%
Corn Processing, 2010/11								
Ethanol Price ($/gallon)	1.446	1.445	-0.001	-0.06%	1.448	1.447	-0.001	-0.06%
DDG Price ($/ton)	77.82	77.55	-0.27	-0.35%	94.18	93.88	-0.30	-0.32%
Dry Mill Gross Margin ($/bu.)	2.01	2.00	-0.01	-0.54%	1.58	1.57	-0.01	-0.72%
Wet Mill Gross Margin ($/bu.)	2.22	2.21	-0.01	-0.38%	1.81	1.80	-0.01	-0.46%
Government costs, FY 2011								
Corn Outlays ($mil.)	6,577	6,482	-94	-1.44%	2,753	2,733	-20	-0.73%
Net CCC Outlays ($mil.)	20,676	20,576	-99	-0.48%	13,816	13,793	-23	-0.17%
Net Farm Income								
Net Farm Income, 2010 ($mil.)	54,285	54,266	-18	-0.03%	51,843	51,863	20	0.04%
Net Farm Income, 2011 ($mil.)	51,610	51,586	-24	-0.05%	52,272	52,303	32	0.06%

Table 13. Energy bill scenario results sorted by 2010/11 corn prices

	Bottom 50% Baseline 2010/11 Corn Price				Top 50% Baseline 2010/11 Corn Price			
		Energy	Change from Base			Energy	Change from Base	
	Baseline	Bill	Absolute	Percent	Baseline	Bill	Absolute	Percent
Corn, 2010/11								
Corn Price ($/bu)	1.983	2.118	0.135	6.81%	2.558	2.699	0.141	5.50%
Corn Market Gross Returns ($/a.)	320.42	342.18	21.76	6.79%	382.81	403.79	20.99	5.48%
Corn Loan Program Benefits ($/a.)	28.68	13.50	-15.18	-52.93%	0.00	0.00	0.00	n.a.
Corn CCPs ($/base a.)	30.48	20.67	-9.82	-32.20%	1.83	0.06	-1.76	-96.61%
Corn Total Net Returns ($/base a.)	230.52	227.28	-3.24	-1.41%	236.38	255.60	19.22	8.13%
Corn, 2011/12								
Corn planted area (mil. a.)	82.77	83.20	0.42	0.51%	84.89	86.12	1.24	1.46%
Corn Processing, 2010/11								
Ethanol Price ($/gallon)	1.446	1.481	0.036	2.48%	1.448	1.483	0.035	2.44%
DDG Price ($/ton)	77.82	72.95	-4.88	-6.27%	94.18	88.78	-5.40	-5.73%
Dry Mill Gross Margin ($/bu.)	2.01	1.93	-0.08	-3.95%	1.58	1.49	-0.09	-5.75%
Wet Mill Gross Margin ($/bu.)	2.22	2.18	-0.04	-1.83%	1.81	1.77	-0.05	-2.60%
Government costs, FY 2011								
Corn Outlays ($mil.)	6,577	4,830	-1747	-26.57%	2,753	2,461	-292	-10.59%
Net CCC Outlays ($mil.)	20,676	18,795	-1880	-9.09%	13,816	13,462	-354	-2.56%
Net Farm Income								
Net Farm Income, 2010 ($mil.)	54,285	54,093	-192	-0.35%	51,843	52,381	539	1.04%
Net Farm Income, 2011 ($mil.)	51,610	51,156	-455	-0.88%	52,272	53,127	856	1.64%

A similar story holds in the case of the energy bill scenario (Table 13). In the 250 low-price outcomes for 2010/11, the increase in ethanol demand caused by the energy bill actually reduces corn producer net returns per base acre of corn planted to corn. Because of these differing impacts on net returns, the estimated acreage impacts for 2011 are very different. In the low-price outcomes, 2011 corn acreage in the energy bill scenario only exceeds baseline levels by an average of 420,000 acres; in the high-price outcomes, the average impact on 2011 acreage is 1.24 million acres.

Under the energy bill scenario, farm program outlays in FY 2011 fall by almost $1.9 billion in the low-price outcomes, compared to just $0.4 billion in the high-price outcomes. Net farm income declines by $455 million in 2011 in the low-price outcomes; it increases by $856 million in the high-price outcomes.

Factors Influencing Returns to Ethanol Producers

The stochastic model results can also be used to examine the factors that influence returns to ethanol producers (Table 14). Stochastic baseline results for 2010/11 are sorted by the gross margins earned by ethanol dry millers (in the model, the sum of receipts from ethanol and distiller's grains minus the cost of corn and natural gas used in the manufacturing process). In the 50 outcomes with the smallest gross margins to ethanol dry millers, the average corn price was $2.86 per bushel and the average ethanol price was $1.34 per gallon. In contrast, in the 50 outcomes with the largest gross margins, the average corn price was $1.95 per bushel and the average ethanol price was $1.60 per gallon.

Table 14. Sources of variation in baseline gross margins for ethanol dry millers

2010/11 Data	Bottom 10% of Dry Mill Margins	Top 10% of Dry Mill Margins	Absolute Difference	Percent Difference
Prices				
Corn Price ($/bu)	2.86	1.95	-0.91	-31.8%
Ethanol Price ($/gallon)	1.34	1.60	0.26	19.6%
DDG Price ($/ton)	100.68	78.45	-22.22	-22.1%
Returns ($/bu.)				
Value of Ethanol	3.63	4.34	0.71	19.6%
Value of DDG	0.86	0.67	-0.19	-22.1%
Cost of Corn	2.86	1.95	-0.91	-31.8%
Natural Gas Cost (held constant)	0.59	0.59	0.00	0.0%
Dry Mill Gross Return	1.05	2.48	1.43	136.9%

It is not a surprise that ethanol manufacturers make better returns when corn prices are low and ethanol prices are high. Perhaps less intuitive is the result that distiller's grain prices are actually below average in the outcomes with the top gross margins. In the model, corn-byproduct prices are closely tied to the prices of corn and soybean meal. When corn prices are low, ethanol producers gain more from low corn prices than they lose from low distiller's grain prices.

Note that gross margins are $1.43 per bushel of corn greater in the top 50 outcomes than in the bottom 50, presumably the difference between healthy profits and large losses (accounting for capital and miscellaneous operating costs excluded from these gross margin calculations). Of that $1.43 difference, almost exactly half is accounted for by differences in ethanol prices and half by the sum of the differences in corn and distiller's grain prices.[6]

Concluding Comments

The paper estimates impacts of three scenarios that increase production of corn-based ethanol. The outcome of the analysis generally conforms to prior expectations: increased ethanol production results in higher corn prices, more corn production, and increased net farm income.

The stochastic analysis also reveals a number of less expected results. Government commodity program provisions mean that much of the increase in crop receipts is offset by lower government payments to crop producers. Results can be very different, depending on underlying market conditions. Sometimes even the direction of impacts on important measures like net farm income can differ depending on whether corn markets are fundamentally strong or weak in a given year.

The study is based on information currently available, but suffers from inadequate data and resulting model limitations. It is hoped that both data and models can be improved as we gather more information on how increased production of ethanol and other renewable fuels affects energy and agricultural markets.

[6] Natural gas prices and other non-corn inputs into the production process could also be important sources of variability in returns to ethanol production, but variability in non-corn input costs is not considered in the current version of the model.

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Table A.1. U.S. corn supply and use under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Area						(million acres)						
Planted Area	81.0	82.8	83.3	83.7	83.7	83.9	83.8	83.9	84.0	84.0	83.6	83.9
Harvested Area	73.5	75.2	75.7	76.1	76.2	76.3	76.4	76.5	76.6	76.7	76.0	76.5
						(bushels per acre)						
Yield	146.5	148.2	150.4	152.2	154.4	156.1	158.5	160.5	162.5	164.6	152.3	160.5
						(million bushels)						
Supply	12,719	12,787	12,961	13,133	13,296	13,430	13,591	13,750	13,927	14,106	13,130	13,761
Beginning Stocks	1,941	1,638	1,565	1,538	1,524	1,495	1,470	1,452	1,454	1,464	1,542	1,467
Production	10,763	11,134	11,381	11,580	11,757	11,920	12,106	12,282	12,459	12,627	11,573	12,279
Imports	15	15	15	15	15	15	15	15	15	15	15	15
Domestic Use	8,893	9,029	9,124	9,226	9,335	9,447	9,559	9,660	9,756	9,856	9,229	9,656
Feed, Residual	5,940	5,997	6,056	6,116	6,160	6,203	6,244	6,279	6,311	6,343	6,111	6,276
Fuel Alcohol	1,572	1,644	1,667	1,703	1,758	1,819	1,882	1,940	1,996	2,053	1,709	1,938
HFCS	530	531	540	539	544	545	547	549	552	556	541	550
Seed	21	21	21	21	21	21	21	21	21	21	21	21
Food, Other	830	836	840	847	852	858	864	870	876	883	846	870
Exports	2,188	2,193	2,299	2,382	2,465	2,513	2,579	2,636	2,708	2,767	2,382	2,641
Total Use	11,081	11,222	11,423	11,609	11,800	11,960	12,139	12,296	12,464	12,622	11,611	12,296
Ending Stocks	1,638	1,565	1,538	1,524	1,495	1,470	1,452	1,454	1,464	1,483	1,519	1,465
CCC Inventory	0	0	0	0	0	0	0	0	0	0	0	0
Under Loan	260	262	260	260	259	260	257	257	257	260	260	259
Other Stocks	1,378	1,303	1,278	1,264	1,236	1,210	1,195	1,196	1,206	1,223	1,259	1,206
						(dollars per bushel)						
Farm Price	2.14	2.18	2.21	2.22	2.25	2.27	2.29	2.31	2.32	2.32	2.22	2.30

Table A.2. U.S. corn processing under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn Food, Industrial Use						(million bushels)						
Fuel Alcohol	1,572	1,644	1,667	1,703	1,758	1,819	1,882	1,940	1,996	2,053	1,709	1,938
HFCS	530	531	540	539	544	545	547	549	552	556	541	550
Glucose and Dextrose	225	226	226	227	228	229	230	231	232	233	227	231
Starch	279	280	283	285	287	289	291	294	296	298	285	294
Beverage Alcohol	134	135	136	137	138	140	141	142	143	144	137	142
Cereals and Other	192	194	196	197	199	200	202	204	206	207	197	204
Total	2,932	3,011	3,047	3,088	3,154	3,223	3,294	3,359	3,424	3,491	3,096	3,358
Corn Dry Milling												
Corn Dry Milled for Ethanol	1,084	1,153	1,184	1,219	1,265	1,311	1,356	1,396	1,435	1,473	1,223	1,394
Yields per Bushel of Corn												
Ethanol (Gallons)	2.70	2.70	2.70	2.71	2.71	2.71	2.71	2.71	2.72	2.72	2.71	2.71
Distillers Grains (Pounds)	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	4.50	4.22	3.86	3.75	3.82	3.92	4.02	4.09	4.15	4.20	3.81	4.08
Value of DDG	0.68	0.70	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.72	0.72	0.73
Corn Price	2.14	2.18	2.21	2.22	2.25	2.27	2.29	2.31	2.32	2.32	2.22	2.30
Natural Gas Cost	0.66	0.62	0.57	0.55	0.57	0.59	0.60	0.62	0.63	0.64	0.56	0.61
Gross Margin	2.38	2.12	1.81	1.71	1.74	1.79	1.86	1.89	1.92	1.97	1.75	1.89
Corn Wet Milling						(million bushels)						
Corn Wet Milled for Ethanol	488	492	483	484	493	508	526	544	561	580	487	544
Other	1,168	1,173	1,185	1,189	1,197	1,203	1,209	1,216	1,223	1,231	1,190	1,216
Total	1,656	1,665	1,668	1,672	1,690	1,711	1,736	1,759	1,784	1,811	1,677	1,760
Yields per Bushel of Corn						(gallons)						
Ethanol	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68
						(pounds)						
HFCS	34.13	34.13	34.13	34.13	34.13	34.13	34.13	34.13	34.13	34.13	34.13	34.13
Gluten Feed	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40
Gluten Meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Corn Oil	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57	1.57
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	4.46	4.18	3.82	3.72	3.78	3.88	3.97	4.04	4.10	4.15	3.77	4.03
Value of HFCS	4.16	4.10	4.19	3.97	4.09	4.05	4.07	4.07	4.07	4.08	4.08	4.07
Value of Gluten Feed	0.35	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.37	0.37	0.38
Value of Gluten Meal	0.34	0.35	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Value of Corn Oil	0.34	0.35	0.36	0.36	0.36	0.36	0.36	0.37	0.37	0.38	0.36	0.37
Corn Price	2.14	2.18	2.21	2.22	2.25	2.27	2.29	2.31	2.32	2.32	2.22	2.30
Natural Gas Cost	0.80	0.74	0.68	0.67	0.68	0.70	0.72	0.74	0.75	0.77	0.68	0.74
Gross Margin: Ethanol	2.55	2.32	2.03	1.93	1.96	2.01	2.07	2.10	2.14	2.19	1.97	2.10
Gross Margin: HFCS	2.25	2.24	2.39	2.19	2.27	2.19	2.17	2.14	2.12	2.12	2.28	2.15

Table A.3. U.S. corn product supply and use under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Ethanol						(million gallons)						
Production, Sep.-Aug. Yr.	4,232	4,430	4,493	4,594	4,747	4,915	5,088	5,247	5,402	5,560	4,611	5,242
Production, Cal. Yr.	3,975	4,298	4,451	4,527	4,645	4,803	4,973	5,141	5,299	5,455	4,541	5,134
						(dollars per gallon)						
Price, FOB Omaha, Sep-Aug.	1.67	1.56	1.43	1.39	1.41	1.45	1.48	1.51	1.53	1.55	1.41	1.50
High-Fructose Corn Syrup						(thousand tons)						
Production, Oct.-Sep. Yr.	9,052	9,066	9,215	9,198	9,281	9,306	9,342	9,377	9,421	9,482	9,232	9,386
Production, Cal. Yr.	9,086	9,052	9,066	9,215	9,198	9,281	9,306	9,342	9,377	9,421	9,160	9,345
Domestic Use, Cal. Yr.	9,083	9,040	9,048	9,186	9,168	9,247	9,270	9,302	9,334	9,375	9,134	9,306
Net Exports, Cal. Yr.	3	12	18	29	30	34	37	40	43	46	26	40
						(cents per pound)						
Price, 42% Midwest	12.19	12.00	12.28	11.63	12.00	11.87	11.92	11.94	11.94	11.95	11.97	11.92
Distillers Grains						(thousand tons)						
Production (Dry equivalent)	9,214	9,797	10,060	10,360	10,754	11,143	11,526	11,867	12,193	12,521	10,392	11,850
						(dollars per ton)						
Price, Lawrenceburg, IN	79.58	82.28	84.35	85.25	85.95	86.00	85.92	85.72	85.30	84.66	85.18	85.52
Corn Gluten Feed						(thousand tons)						
Production	9,439	9,488	9,505	9,533	9,634	9,754	9,893	10,028	10,168	10,320	9,557	10,033
Domestic Use	5,281	5,357	5,391	5,426	5,537	5,661	5,801	5,936	6,074	6,221	5,451	5,939
Net Exports	4,158	4,131	4,114	4,107	4,097	4,093	4,092	4,092	4,094	4,099	4,106	4,094
						(dollars per ton)						
Price, 21%, IL Points	61.13	63.02	64.33	64.94	65.64	65.94	66.14	66.26	66.16	65.79	64.97	66.06
Corn Gluten Meal						(thousand tons)						
Production	2,484	2,497	2,501	2,509	2,535	2,567	2,603	2,639	2,676	2,716	2,515	2,640
Domestic Use	1,536	1,548	1,552	1,556	1,578	1,605	1,636	1,665	1,696	1,731	1,562	1,667
Net Exports	948	949	950	953	957	962	968	974	979	985	953	974
						(dollars per ton)						
Price, 60%, IL Points	226.56	236.51	244.13	248.00	249.88	249.52	248.63	247.20	245.44	243.63	247.34	246.88
Corn Oil						(million pounds)						
Production	2,603	2,617	2,621	2,629	2,657	2,690	2,728	2,766	2,804	2,846	2,636	2,767
Domestic Use	1,793	1,815	1,818	1,823	1,845	1,876	1,911	1,945	1,982	2,023	1,829	1,947
Net Exports	803	804	805	807	810	813	816	819	821	823	807	819
Ending Stocks	184	182	180	179	180	181	183	184	185	185	180	184
						(cents per pound)						
Chicago Price	21.66	22.18	22.63	22.85	22.87	23.02	23.19	23.34	23.69	24.27	22.78	23.50

Table A.4. U.S. crop and crop product prices under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(dollars per bushel)						
Corn	2.14	2.18	2.21	2.22	2.25	2.27	2.29	2.31	2.32	2.32	2.22	2.30
Soybeans	4.76	5.01	5.24	5.37	5.41	5.42	5.42	5.41	5.41	5.43	5.34	5.42
Wheat	3.21	3.24	3.30	3.35	3.41	3.46	3.50	3.55	3.60	3.63	3.35	3.55
Sorghum	1.97	1.96	1.98	2.00	2.03	2.06	2.10	2.15	2.18	2.20	2.00	2.14
Barley	2.46	2.52	2.53	2.52	2.52	2.53	2.53	2.54	2.56	2.57	2.52	2.55
Oats	1.47	1.49	1.51	1.53	1.55	1.57	1.58	1.60	1.60	1.60	1.53	1.59
						(dollars per hundredweight)						
Rice	7.00	6.98	7.25	7.34	7.46	7.58	7.69	7.84	7.95	8.06	7.35	7.82
						(cents per pound)						
Peanuts	19.69	19.32	19.45	19.51	19.51	19.62	19.72	19.80	19.82	19.97	19.49	19.78
Sunflowers	11.23	11.64	11.87	11.86	11.93	11.92	11.89	11.81	11.80	11.80	11.89	11.84
Upland Cotton	43.62	45.57	45.80	46.26	47.95	49.71	50.64	51.34	52.63	54.06	46.67	51.68
						(dollars per ton)						
Hay	87.61	88.92	90.13	91.62	92.33	93.42	94.24	95.81	96.50	97.22	91.36	95.44
Soybean Meal	158.52	166.94	173.33	176.60	178.41	178.38	177.96	177.07	175.90	174.73	176.11	176.81
Corn DDG	79.58	82.28	84.35	85.25	85.95	86.00	85.92	85.72	85.30	84.66	85.18	85.52
Corn Gluten Feed	61.13	63.02	64.33	64.94	65.64	65.94	66.14	66.26	66.16	65.79	64.97	66.06
Corn Gluten Meal	226.56	236.51	244.13	248.00	249.88	249.52	248.63	247.20	245.44	243.63	247.34	246.88
						(cents per pound)						
Soybean Oil	21.07	21.62	22.07	22.30	22.34	22.53	22.73	22.92	23.31	23.93	22.24	23.08
Corn Oil	21.66	22.18	22.63	22.85	22.87	23.02	23.19	23.34	23.69	24.27	22.78	23.50

Table A.5. U.S. crop producer returns under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn						(dollars per acre)						
Market Gross Returns	310.86	320.55	329.18	334.29	344.14	351.61	360.51	367.91	374.23	378.55	335.87	366.56
- Variable Costs	171.87	171.24	170.26	168.62	170.06	173.03	175.84	179.36	181.75	185.70	169.65	179.14
= Market Net Returns	138.99	149.31	158.92	165.67	174.07	178.58	184.66	188.54	192.48	192.85	166.22	187.42
+ Loan Program Benefits	18.26	17.96	17.74	18.03	15.73	14.34	13.25	12.50	12.42	12.58	17.17	13.02
= Market + Loan Net Returns	157.25	167.27	176.66	183.70	189.80	192.92	197.92	201.05	204.90	205.43	183.39	200.44
						(dollars per corn base acre)						
+ Counter-cyclical Payment	20.99	18.82	18.40	17.93	16.46	16.15	14.66	14.21	13.53	13.38	17.59	14.39
+ Direct Payment	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37	24.37
						(dollars per corn base acre planted to corn)						
= Net Returns w/ Payments	202.62	210.46	219.43	226.00	230.63	233.45	236.95	239.62	242.80	243.18	225.36	239.20
Soybeans						(dollars per acre)						
Market Gross Returns	185.61	197.29	208.49	214.94	218.88	220.94	222.91	224.27	226.41	228.54	214.10	224.62
- Variable Costs	100.26	100.60	101.36	101.67	102.81	104.38	105.92	107.94	109.30	111.23	101.94	107.76
= Market Net Returns	85.35	96.68	107.13	113.27	116.07	116.56	116.99	116.34	117.11	117.31	112.16	116.86
+ Loan Program Benefits	25.62	20.17	15.08	13.31	10.96	10.91	11.45	12.04	10.82	11.28	13.12	11.30
= Market + Loan Net Returns	110.97	116.86	122.21	126.59	127.02	127.47	128.44	128.37	127.93	128.59	125.27	128.16
						(dollars per soybean base acre)						
+ Counter-cyclical Payment	7.53	6.20	5.18	4.58	4.31	4.30	4.70	4.40	4.22	4.32	4.69	4.39
+ Direct Payment	11.52	11.52	11.52	11.52	11.52	11.52	11.52	11.52	11.52	11.52	11.52	11.52
						(dollars per soybean base acre planted to soybeans)						
= Net Returns w/ Payments	130.02	134.57	138.91	142.69	142.86	143.29	144.66	144.29	143.66	144.43	141.48	144.07
Wheat						(dollars per acre)						
Market Gross Returns	133.18	136.01	139.49	142.49	146.21	149.44	152.51	155.93	158.81	161.46	142.73	155.63
- Variable Costs	76.49	76.72	77.33	77.46	78.52	79.99	81.48	83.30	84.61	86.38	77.77	83.15
= Market Net Returns	56.68	59.28	62.16	65.03	67.68	69.45	71.03	72.64	74.20	75.07	64.96	72.48
+ Loan Program Benefits	2.97	3.41	2.67	2.61	2.16	1.88	1.33	1.00	0.82	0.88	2.48	1.18
= Market + Loan Net Returns	59.66	62.69	64.83	67.65	69.85	71.33	72.36	73.64	75.03	75.95	67.44	73.66
						(dollars per wheat base acre)						
+ Counter-cyclical Payment	7.18	7.06	5.92	5.54	4.72	4.15	3.68	3.15	2.57	2.35	5.39	3.18
+ Direct Payment	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25
						(dollars per wheat base acre planted to wheat)						
= Net Returns w/ Payments	82.08	85.00	85.99	88.44	89.82	90.73	91.29	92.05	92.85	93.55	88.08	92.09
Upland Cotton						(dollars per acre)						
Market Gross Returns	364.84	381.12	384.99	390.99	405.76	420.87	430.47	438.34	450.93	464.49	393.91	441.02
- Variable Costs	354.25	353.37	352.83	352.06	355.89	362.81	368.75	376.81	381.63	391.11	353.59	376.22
= Market Net Returns	10.59	27.75	32.16	38.93	49.87	58.06	61.73	61.53	69.30	73.38	40.32	64.80
+ Loan Program Benefits	89.69	85.03	85.42	80.25	67.30	59.00	57.58	54.69	48.90	44.26	77.66	52.89
= Market + Loan Net Returns	100.28	112.78	117.59	119.18	117.17	117.06	119.31	116.22	118.20	117.64	117.98	117.69
						(dollars per upland cotton base acre)						
+ Counter-cyclical Payment	73.89	72.54	71.32	70.89	68.41	64.62	62.50	61.70	57.13	52.50	70.20	59.69
+ Direct Payment	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23	34.23
						(dollars per upland cotton base acre planted to upland cotton)						
= Net Returns w/ Payments	208.40	219.54	223.13	224.29	219.81	215.91	216.03	212.14	209.55	204.37	222.41	211.60
Sorghum						(dollars per acre)						
Market Gross Returns	123.82	123.51	126.05	127.71	130.88	134.40	137.80	141.38	144.41	146.99	128.21	141.00
- Variable Costs	108.18	107.38	106.65	105.89	106.89	109.03	110.84	113.33	114.88	117.99	106.47	113.21
= Market Net Returns	15.65	16.14	19.40	21.82	23.99	25.37	26.95	28.05	29.54	29.00	21.74	27.78
+ Loan Program Benefits	13.35	15.33	14.48	14.33	12.77	11.46	9.85	8.56	7.69	7.05	13.86	8.92
= Market + Loan Net Returns	29.00	31.46	33.89	36.15	36.77	36.83	36.81	36.61	37.23	36.05	35.60	36.70
						(dollars per sorghum base acre)						
+ Counter-cyclical Payment	8.90	8.85	8.50	8.37	7.81	7.50	6.68	6.00	5.46	4.86	8.23	6.10
+ Direct Payment	16.81	16.81	16.81	16.81	16.81	16.81	16.81	16.81	16.81	16.81	16.81	16.81
						(dollars per sorghum base acre planted to sorghum)						
= Net Returns w/ Payments	54.70	57.13	59.20	61.33	61.39	61.15	60.30	59.42	59.49	57.71	60.64	59.61

Table A.6. U.S. crop acreage under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2008-09 Average	2010-14 Average
						(million acres)						
Corn	81.01	82.80	83.31	83.71	83.69	83.86	83.83	83.92	84.03	84.00	83.70	83.93
Soybeans	72.86	71.96	71.93	72.15	72.48	72.50	72.56	72.62	72.63	72.70	72.32	72.60
Wheat	58.07	58.86	58.42	58.25	58.07	57.98	57.76	57.51	57.46	57.32	58.16	57.61
Sorghum	8.15	8.27	8.19	8.13	8.06	7.97	7.89	7.82	7.76	7.69	8.09	7.82
Barley	4.69	4.41	4.40	4.39	4.33	4.28	4.22	4.16	4.12	4.08	4.36	4.17
Oats	4.18	4.23	4.20	4.17	4.12	4.08	4.04	4.01	3.98	3.96	4.14	4.02
Rice	3.19	3.37	3.37	3.39	3.39	3.37	3.36	3.37	3.37	3.36	3.39	3.37
Peanuts	1.46	1.47	1.46	1.46	1.46	1.46	1.45	1.45	1.45	1.45	1.46	1.45
Sunflowers	2.28	1.99	2.03	2.04	2.02	2.01	1.99	1.98	1.96	1.95	2.03	1.98
Upland Cotton	13.71	13.26	13.48	13.52	13.43	13.26	13.26	13.25	13.24	13.16	13.48	13.23
10 Major Crops	249.62	250.61	250.80	251.22	251.05	250.78	250.36	250.08	249.99	249.67	251.14	250.18
Hay Area Harvested	62.73	62.71	62.76	62.84	62.94	62.98	63.01	63.02	63.06	63.07	62.89	63.03
10 Major Crops + Hay	312.35	313.31	313.56	314.06	314.00	313.76	313.37	313.10	313.05	312.74	314.03	313.20

Table A.7. U.S. livestock, poultry, and dairy under baseline policies

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
Production						(billion pounds)						
Beef	25.77	26.66	27.32	27.98	28.45	29.00	29.55	29.94	30.14	30.12	27.92	29.75
Pork	21.26	21.25	21.14	21.18	21.62	22.09	22.47	22.53	22.59	22.77	21.31	22.49
Chicken	36.66	37.47	38.32	39.13	39.94	40.77	41.62	42.47	43.34	44.24	39.13	42.49
Turkey	5.69	5.77	5.85	5.92	5.99	6.05	6.11	6.17	6.24	6.31	5.92	6.18
Milk	176.61	178.85	180.64	182.32	183.75	185.22	186.64	188.11	189.77	191.43	182.24	188.23
Prices						(dollars per hundredweight)						
Steers, Nebraska direct	80.52	78.87	76.75	74.53	72.98	71.37	70.55	70.60	71.66	73.51	74.75	71.54
Feeder steers, OK City	100.51	98.18	94.73	90.59	86.45	82.76	79.98	80.10	81.75	83.92	90.59	81.70
Hogs, 51%-52% lean	39.67	40.95	44.52	48.15	46.54	44.34	42.90	46.36	49.62	51.31	46.40	46.91
Broilers, 12 city wholesale	63.14	61.47	61.00	60.62	60.78	60.96	60.98	61.20	61.42	61.78	60.80	61.27
Turkey, East region wholesale	67.00	66.07	65.59	65.49	65.68	65.66	65.75	65.81	66.14	66.12	65.59	65.90
All milk	13.60	13.41	13.23	13.11	13.12	13.14	13.17	13.27	13.37	13.44	13.15	13.28

Table A.8. U.S. feed and residual use under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn (mil. bu.)	5,940	5,997	6,056	6,116	6,160	6,203	6,244	6,279	6,311	6,343	6,111	6,276
Sorghum (mil. bu.)	182	206	206	203	197	190	178	164	152	142	202	165
Barley (mil. bu.)	83	73	72	71	68	66	63	61	60	61	70	62
Oats (mil. bu.)	133	133	132	131	130	128	127	126	125	123	131	126
Wheat (mil. bu.)	198	208	206	200	194	188	184	179	173	166	200	178
Soybean meal (1000 tons)	35,243	35,399	35,761	36,218	36,811	37,490	38,140	38,736	39,306	39,906	36,263	38,716
Corn DDGs (1000 tons)	9,214	9,797	10,060	10,360	10,754	11,143	11,526	11,867	12,193	12,521	10,392	11,850
Corn gluten feed (1000 tons)	5,281	5,357	5,391	5,426	5,537	5,661	5,801	5,936	6,074	6,221	5,451	5,939
Corn gluten meal (1000 tons)	1,536	1,548	1,552	1,556	1,578	1,605	1,636	1,665	1,696	1,731	1,562	1,667
Hay (mil. tons)	157.11	158.00	158.99	159.56	160.63	161.36	162.22	162.83	163.53	163.98	159.73	162.78
						(million metric tons)						
Corn	150.88	152.33	153.83	155.36	156.46	157.56	158.61	159.49	160.30	161.13	155.22	159.42
Sorghum	4.63	5.22	5.23	5.17	5.02	4.83	4.53	4.18	3.87	3.62	5.14	4.20
Barley	1.80	1.59	1.57	1.54	1.49	1.43	1.37	1.32	1.32	1.32	1.53	1.35
Oats	1.93	1.93	1.92	1.90	1.89	1.86	1.85	1.83	1.81	1.79	1.90	1.83
Wheat	5.38	5.66	5.61	5.44	5.28	5.10	5.00	4.86	4.71	4.51	5.44	4.84
Grain sub-total	164.62	166.73	168.15	169.41	170.14	170.79	171.35	171.68	172.00	172.36	169.23	171.64
Soybean meal	31.97	32.11	32.44	32.86	33.39	34.01	34.60	35.14	35.66	36.20	32.90	35.12
Corn by-products	14.54	15.15	15.43	15.73	16.21	16.70	17.20	17.66	18.11	18.57	15.79	17.65
Total feed (excluding hay)	211.13	213.99	216.01	218.00	219.74	221.50	223.16	224.48	225.77	227.14	217.92	224.41
Hay	142.53	143.34	144.24	144.75	145.72	146.39	147.16	147.71	148.36	148.76	144.90	147.68
Total feed (including hay)	353.66	357.33	360.25	362.75	365.47	367.88	370.32	372.20	374.12	375.90	362.82	372.08
GCAUs	6.73	6.79	6.83	6.88	6.94	7.02	7.09	7.11	7.13	7.15	6.88	7.10
Grain feed use/GCAUs	24.46	24.55	24.62	24.64	24.50	24.33	24.18	24.13	24.11	24.11	24.59	24.17
HPAUs	49.03	49.89	50.64	51.47	52.49	53.57	54.58	55.38	56.17	57.03	51.53	55.35
Soymeal use/HPAUs	0.65	0.64	0.64	0.64	0.64	0.63	0.63	0.63	0.63	0.63	0.64	0.63
Total feed (exc. hay)/GCAU	31.38	31.51	31.63	31.71	31.65	31.55	31.49	31.55	31.65	31.77	31.66	31.60
Total feed (inc. hay)/GCAU	52.56	52.62	52.76	52.76	52.63	52.41	52.26	52.31	52.45	52.58	52.71	52.40

Table A.9. U.S. government payments under baseline policies

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(million dollars)						
Direct Payments	5,310	5,309	5,307	5,307	5,307	5,306	5,304	5,304	5,304	5,304	5,307	5,305
Marketing Loan Benefits	5,122	4,682	4,239	4,080	3,511	3,229	3,126	3,043	2,840	2,815	3,943	3,011
Counter-cyclical Payments	4,540	4,254	4,019	3,905	3,639	3,481	3,282	3,147	2,942	2,822	3,854	3,135
Total	14,972	14,245	13,565	13,292	12,456	12,016	11,713	11,495	11,086	10,941	13,104	11,450

Table A.10. Government costs under baseline policies

Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Feed Grains												
Corn	5,745	5,218	4,649	5,114	4,862	4,665	4,515	4,367	4,316	4,264	4,875	4,425
Sorghum	417	412	372	396	380	364	347	329	316	304	383	332
Barley	156	148	150	150	147	147	143	140	137	135	149	140
Oats	20	19	19	18	15	14	13	13	12	12	17	13
Food Grains												
Wheat	1,938	1,902	1,804	1,756	1,677	1,606	1,552	1,502	1,459	1,415	1,746	1,507
Rice	960	959	894	879	852	811	823	795	783	770	875	796
Oilseeds												
Soybeans	2,829	2,407	1,909	1,821	1,651	1,643	1,690	1,737	1,641	1,545	1,794	1,651
Peanuts	293	312	234	235	237	232	231	226	228	229	236	229
Other Oilseeds	41	35	33	34	32	31	33	36	33	30	33	32
Other Commodities												
Upland Cotton	3,429	3,385	3,380	3,300	3,099	2,944	2,911	2,878	2,726	2,575	3,259	2,807
Sugar	5	2	80	103	37	51	36	35	34	33	73	38
Dairy	264	251	253	244	222	187	174	179	148	118	240	161
CCC Conservation												
Conservation Reserve	2,027	2,123	2,267	2,275	2,257	2,299	2,322	2,318	2,328	2,337	2,266	2,321
Other CCC Conservation	2	1	0	0	0	0	0	0	0	0	0	0
Other												
Disaster Payments, NAP	325	325	325	325	325	325	325	325	325	325	325	325
Other Net Costs	1,586	1,651	1,684	1,807	1,889	1,927	1,913	1,897	1,883	1,869	1,793	1,898
Net CCC Outlays	20,036	19,149	18,053	18,455	17,683	17,246	17,028	16,776	16,369	15,962	18,064	16,676

Table A.11. Net farm income under baseline policies

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(billion dollars)						
Corn Receipts	20.14	21.11	21.74	22.33	22.96	23.56	24.14	24.66	25.07	25.48	22.34	24.58
Oilseed Receipts	14.06	14.79	15.43	15.90	16.14	16.30	16.44	16.59	16.73	16.87	15.83	16.59
All Other Crop Receipts	73.10	74.67	76.17	77.81	79.41	80.97	82.58	84.22	85.82	87.43	77.80	84.20
Total Crop Cash Receipts	107.30	110.57	113.34	116.04	118.51	120.82	123.16	125.48	127.63	129.78	115.97	125.37
Livestock Cash Receipts	109.39	109.60	110.30	110.50	109.97	109.50	109.71	112.04	114.89	117.74	110.26	112.77
Government Payments	19.43	17.78	18.70	18.12	17.51	17.14	16.85	16.56	16.28	16.01	18.11	16.57
Sum of Above	236.12	237.95	242.34	244.66	245.99	247.46	249.72	254.07	258.80	263.52	244.33	254.71
Feed Expenses	26.02	27.00	27.73	28.38	29.07	29.73	30.30	30.77	31.10	31.43	28.39	30.67
Purchased Livestock	17.29	17.45	17.26	16.93	16.46	16.10	15.88	16.09	16.48	16.87	16.89	16.28
Rent to Non-Operators	12.88	12.28	12.30	12.67	12.90	13.01	13.09	13.24	13.45	13.66	12.62	13.29
Other Production Expenses	160.03	162.16	164.13	166.34	169.47	172.27	175.09	177.65	180.45	183.26	166.65	177.74
Total Production Expenses	216.21	218.88	221.42	224.32	227.90	231.11	234.36	237.74	241.48	245.22	224.55	237.98
All Other Net Income*	32.25	32.84	33.53	34.25	34.98	35.59	36.14	36.82	37.54	38.25	34.25	36.87
Net Farm Income	52.15	51.91	54.45	54.59	53.06	51.94	51.50	53.15	54.86	56.56	54.03	53.60

*Farm-related income, non-money income, and value of inventory change

Table B.1. U.S. corn supply and use, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(million acres)						
Area												
Planted Area	0.000	0.000	0.000	0.022	0.031	0.033	0.033	0.037	0.035	0.035	0.018	0.035
Harvested Area	0.000	0.000	0.000	0.020	0.028	0.030	0.030	0.034	0.032	0.032	0.016	0.032
						(bushels per acre)						
Yield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						(million bushels)						
Supply	0.0	0.0	0.0	-2.6	-4.4	-5.0	-5.0	-4.2	-3.9	-3.9	-2.3	-4.4
Beginning Stocks	0.0	0.0	0.0	-5.6	-8.7	-9.7	-9.7	-9.5	-9.1	-9.1	-4.8	-9.4
Production	0.0	0.0	0.0	3.0	4.3	4.7	4.7	5.4	5.2	5.3	2.4	5.1
Imports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Domestic Use	0.0	0.0	10.0	15.3	17.9	19.3	20.1	20.8	21.3	21.7	14.4	20.6
Feed, Residual	0.0	0.0	-6.8	-9.2	-10.4	-10.9	-11.2	-11.1	-11.0	-10.9	-8.8	-11.0
Fuel Alcohol	0.0	0.0	17.0	25.0	28.8	30.7	31.8	32.4	32.8	33.0	23.6	32.2
HFCS	0.0	0.0	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.4
Seed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food, Other	0.0	0.0	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Exports	0.0	0.0	-4.4	-9.2	-12.6	-14.5	-15.5	-15.9	-16.1	-16.1	-8.8	-15.6
Total Use	0.0	0.0	5.6	6.1	5.3	4.7	4.5	4.9	5.2	5.6	5.7	5.0
Ending Stocks	0.0	0.0	-5.6	-8.7	-9.7	-9.7	-9.5	-9.1	-9.1	-9.4	-8.0	-9.4
CCC Inventory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Under Loan	0.0	0.0	-0.4	-0.4	-0.5	-0.4	-0.5	-0.5	-0.5	-0.6	-0.4	-0.5
Other Stocks	0.0	0.0	-5.3	-8.3	-9.2	-9.3	-9.0	-8.6	-8.7	-8.9	-7.6	-8.9
						(dollars per bushel)						
Farm Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006

Table B.2. U.S. corn processing, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn Food, Industrial Use						(million bushels)						
Fuel Alcohol	0.0	0.0	17.0	25.0	28.8	30.7	31.8	32.4	32.8	33.0	23.6	32.2
HFCS	0.0	0.0	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.4
Glucose and Dextrose	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Starch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beverage Alcohol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cereals and Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	16.8	24.6	28.3	30.2	31.3	31.9	32.3	32.5	23.2	31.6
Corn Dry Milling												
Corn Dry Milled for Ethanol	0.0	0.0	17.5	25.8	29.8	31.8	32.9	33.5	33.9	34.1	24.4	33.2
Yields per Bushel of Corn												
Ethanol (Gallons)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distillers Grains (Pounds)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Value of DDG	0.000	0.000	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.003	-0.003	-0.002	-0.003
Corn Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin	0.000	0.000	-0.007	-0.010	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011	-0.009	-0.011
Corn Wet Milling						(million bushels)						
Corn Wet Milled for Ethanol	0.0	0.0	-0.4	-0.8	-1.0	-1.1	-1.1	-1.1	-1.1	-1.0	-0.7	-1.1
Other	0.0	0.0	-0.2	-0.4	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.4	-0.5
Total	0.0	0.0	-0.7	-1.2	-1.5	-1.6	-1.6	-1.6	-1.6	-1.5	-1.1	-1.6
Yields per Bushel of Corn						(gallons)						
Ethanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(pounds)						
HFCS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Meal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Value of HFCS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Value of Gluten Feed	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Value of Gluten Meal	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Value of Corn Oil	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Corn Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin: Ethanol	0.000	0.000	-0.006	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.007	-0.008
Gross Margin: HFCS	0.000	0.000	-0.004	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006	-0.005	-0.005	-0.006

Table B.3. U.S. corn product supply and use, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Ethanol						(million gallons)						
Production, Sep.-Aug. Yr.	0.0	0.0	46.1	67.6	78.0	83.4	86.2	88.0	89.1	89.8	63.9	87.3
Production, Cal. Yr.	0.0	0.0	15.4	53.3	71.1	79.8	84.3	86.8	88.3	89.3	46.6	85.7
						(dollars per gallon)						
Price, FOB Omaha, Sep-Aug.	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
High-Fructose Corn Syrup						(thousand tons)						
Production, Oct.-Sep. Yr.	0.0	0.0	-2.8	-5.0	-6.2	-6.7	-6.7	-6.6	-6.4	-6.2	-4.7	-6.5
Production, Cal. Yr.	0.0	0.0	0.0	-2.8	-5.0	-6.2	-6.7	-6.7	-6.6	-6.4	-2.6	-6.5
Domestic Use, Cal. Yr.	0.0	0.0	0.0	-2.8	-5.0	-6.2	-6.7	-6.7	-6.6	-6.4	-2.6	-6.5
Net Exports, Cal. Yr.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						(cents per pound)						
Price, 42% Midwest	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001
Distillers Grains						(thousand tons)						
Production (Dry equivalent)	0.0	0.0	148.4	219.1	253.4	270.7	279.7	284.8	287.8	289.7	207.0	282.5
						(dollars per ton)						
Price, Lawrenceburg, IN	0.00	0.00	-0.18	-0.24	-0.27	-0.29	-0.30	-0.30	-0.31	-0.30	-0.23	-0.30
Corn Gluten Feed						(thousand tons)						
Production	0.0	0.0	-3.8	-6.8	-8.5	-9.2	-9.3	-9.1	-8.9	-8.6	-6.4	-9.0
Domestic Use	0.0	0.0	-2.8	-5.3	-6.9	-7.7	-7.9	-7.8	-7.7	-7.5	-5.0	-7.7
Net Exports	0.0	0.0	-1.0	-1.5	-1.6	-1.5	-1.4	-1.2	-1.2	-1.1	-1.3	-1.3
						(dollars per ton)						
Price, 21%, IL Points	0.00	0.00	0.02	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.03	0.02
Corn Gluten Meal						(thousand tons)						
Production	0.0	0.0	-1.0	-1.8	-2.2	-2.4	-2.4	-2.4	-2.3	-2.3	-1.7	-2.4
Domestic Use	0.0	0.0	-1.2	-2.0	-2.4	-2.6	-2.7	-2.6	-2.5	-2.5	-1.8	-2.6
Net Exports	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
						(dollars per ton)						
Price, 60%, IL Points	0.00	0.00	-0.48	-0.60	-0.68	-0.73	-0.76	-0.78	-0.80	-0.80	-0.58	-0.77
Corn Oil						(million pounds)						
Production	0.0	0.0	-1.1	-1.9	-2.3	-2.5	-2.6	-2.5	-2.4	-2.4	-1.8	-2.5
Domestic Use	0.0	0.0	-0.8	-1.5	-2.0	-2.2	-2.3	-2.2	-2.2	-2.1	-1.4	-2.2
Net Exports	0.0	0.0	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3
Ending Stocks	0.0	0.0	-0.1	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.4
						(cents per pound)						
Chicago Price	0.00	0.00	0.02	0.05	0.07	0.07	0.08	0.08	0.08	0.08	0.05	0.08

Table B.4. U.S. crop and crop product prices, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(dollars per bushel)						
Corn	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Soybeans	0.000	0.000	-0.005	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.004	-0.003
Wheat	0.000	0.000	0.001	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003
Sorghum	0.000	0.000	0.003	0.004	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004
Barley	0.000	0.000	0.003	0.004	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.005
Oats	0.000	0.000	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
						(dollars per hundredweight)						
Rice	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001
						(cents per pound)						
Peanuts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sunflowers	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02
Upland Cotton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per ton)						
Hay	0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.05
Soybean Meal	0.00	0.00	-0.41	-0.52	-0.59	-0.63	-0.66	-0.68	-0.69	-0.69	-0.51	-0.67
Corn DDG	0.00	0.00	-0.18	-0.24	-0.27	-0.29	-0.30	-0.30	-0.31	-0.30	-0.23	-0.30
Corn Gluten Feed	0.00	0.00	0.02	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.03	0.02
Corn Gluten Meal	0.00	0.00	-0.48	-0.60	-0.68	-0.73	-0.76	-0.78	-0.80	-0.80	-0.58	-0.77
Soybean Oil	0.00	0.00	0.02	0.05	0.06	0.07	0.07	0.08	0.08	0.08	0.05	0.08
Corn Oil	0.00	0.00	0.02	0.05	0.07	0.07	0.08	0.08	0.08	0.08	0.05	0.08

Table B.5. U.S. crop producer returns, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.61	0.89	0.99	0.99	0.98	0.96	0.95	0.95	0.83	0.97
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.61	0.89	0.99	0.99	0.98	0.96	0.95	0.95	0.83	0.97
+ Loan Program Benefits	0.00	0.00	-0.28	-0.41	-0.42	-0.44	-0.37	-0.35	-0.34	-0.32	-0.37	-0.36
= Market + Loan Net Returns	0.00	0.00	0.33	0.48	0.57	0.56	0.61	0.60	0.62	0.64	0.46	0.60
						(dollars per corn base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.16	-0.24	-0.26	-0.28	-0.24	-0.24	-0.23	-0.22	-0.22	-0.24
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per corn base acre planted to corn)						
= Net Returns w/ Payments	0.00	0.00	0.17	0.23	0.31	0.27	0.37	0.36	0.39	0.42	0.24	0.36
Soybeans						(dollars per acre)						
Market Gross Returns	0.00	0.00	-0.19	-0.13	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.12
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	-0.19	-0.13	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.12
+ Loan Program Benefits	0.00	0.00	0.10	0.06	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.06
= Market + Loan Net Returns	0.00	0.00	-0.09	-0.06	-0.06	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.06
						(dollars per soybean base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per soybean base acre planted to soybeans)						
= Net Returns w/ Payments	0.00	0.00	-0.07	-0.05	-0.05	-0.04	-0.04	-0.05	-0.05	-0.05	-0.06	-0.05
Wheat						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.04	0.10	0.13	0.14	0.13	0.13	0.13	0.12	0.09	0.13
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.04	0.10	0.13	0.14	0.13	0.13	0.13	0.12	0.09	0.13
+ Loan Program Benefits	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02
= Market + Loan Net Returns	0.00	0.00	0.03	0.07	0.10	0.11	0.11	0.11	0.11	0.11	0.07	0.11
						(dollars per wheat base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.01	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per wheat base acre planted to wheat)						
= Net Returns w/ Payments	0.00	0.00	0.02	0.04	0.06	0.08	0.08	0.08	0.09	0.09	0.04	0.08
Upland Cotton						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.04
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.04
+ Loan Program Benefits	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02
= Market + Loan Net Returns	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.02
						(dollars per upland cotton base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	0.00	-0.01
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per upland cotton base acre planted to upland cotton)						
= Net Returns w/ Payments	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Sorghum						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.17	0.26	0.30	0.30	0.30	0.29	0.28	0.28	0.24	0.29
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.17	0.26	0.30	0.30	0.30	0.29	0.28	0.28	0.24	0.29
+ Loan Program Benefits	0.00	0.00	-0.12	-0.18	-0.19	-0.19	-0.16	-0.15	-0.14	-0.12	-0.16	-0.15
= Market + Loan Net Returns	0.00	0.00	0.06	0.08	0.11	0.11	0.13	0.14	0.14	0.16	0.08	0.14
						(dollars per sorghum base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.04	-0.05	-0.07	-0.07	-0.07	-0.06	-0.07	-0.06	-0.05	-0.07
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per sorghum base acre planted to sorghum)						
= Net Returns w/ Payments	0.00	0.00	0.01	0.03	0.04	0.04	0.07	0.07	0.08	0.10	0.03	0.07

Table B.6. U.S. crop acreage, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2008-09 Average	2010-14 Average
						(million acres)						
Corn	0.000	0.000	0.000	0.022	0.031	0.033	0.033	0.037	0.035	0.035	0.026	0.035
Soybeans	0.000	0.000	0.000	-0.019	-0.022	-0.024	-0.024	-0.026	-0.025	-0.026	-0.020	-0.025
Wheat	0.000	0.000	0.000	-0.002	-0.001	0.001	0.002	0.001	0.002	0.002	-0.002	0.002
Sorghum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001
Barley	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Oats	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Rice	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peanuts	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sunflowers	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001
Upland Cotton	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
10 Major Crops	0.000	0.000	0.000	0.001	0.007	0.011	0.011	0.014	0.013	0.012	0.004	0.012
Hay Area Harvested	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.004	0.003	0.003	0.002	0.004
10 Major Crops + Hay	0.000	0.000	0.000	0.002	0.010	0.014	0.015	0.017	0.017	0.015	0.006	0.016

Table B.7. U.S. livestock, poultry, and dairy, 100 million gallon dry mill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
Production						(billion pounds)						
Beef	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.003	0.000	-0.001
Pork	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003	-0.001	-0.003
Chicken	0.000	0.000	0.000	-0.001	-0.001	-0.001	0.000	0.001	0.001	0.002	-0.001	0.001
Turkey	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Milk	0.000	0.000	-0.001	-0.003	-0.005	-0.005	-0.006	-0.005	-0.003	-0.003	-0.003	-0.004
Prices						(dollars per hundredweight)						
Steers, Nebraska direct	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.00	0.01
Feeder steers, OK City	0.00	0.00	-0.04	-0.06	-0.06	-0.06	-0.05	-0.04	-0.04	-0.03	-0.05	-0.04
Hogs, 51%-52% lean	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.02
Broilers, 12 city wholesale	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turkey, East region wholesale	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	0.00	-0.01
All milk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table B.8. U.S. feed and residual use, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn (mil. bu.)	0	0	-7	-9	-10	-11	-11	-11	-11	-11	-9	-11
Sorghum (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Barley (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Oats (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Wheat (mil. bu.)	0	0	0	1	1	1	1	1	1	1	1	1
Soybean meal (1000 tons)	0	0	-23	-37	-44	-47	-49	-50	-50	-50	-35	-49
Corn DDGs (1000 tons)	0	0	148	219	253	271	280	285	288	290	207	283
Corn gluten feed (1000 tons)	0	0	-3	-5	-7	-8	-8	-8	-8	-7	-5	-8
Corn gluten meal (1000 tons)	0	0	-1	-2	-2	-3	-3	-3	-3	-2	-2	-3
Hay (mil. tons)	0.000	0.000	0.006	0.010	0.010	0.010	0.009	0.008	0.008	0.008	0.009	0.009
						(million metric tons)						
Corn	0.000	0.000	-0.172	-0.234	-0.264	-0.278	-0.285	-0.281	-0.280	-0.277	-0.223	-0.280
Sorghum	0.000	0.000	0.005	0.006	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.004
Barley	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.000	-0.001
Oats	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Wheat	0.000	0.000	0.012	0.019	0.020	0.019	0.018	0.018	0.017	0.017	0.017	0.018
Grain sub-total	0.000	0.000	-0.153	-0.209	-0.239	-0.254	-0.263	-0.259	-0.258	-0.256	-0.200	-0.258
Soybean meal	0.000	0.000	-0.021	-0.034	-0.040	-0.043	-0.044	-0.045	-0.046	-0.046	-0.032	-0.045
Corn by-products	0.000	0.000	0.131	0.192	0.221	0.236	0.244	0.249	0.252	0.254	0.182	0.247
Total feed (excluding hay)	0.000	0.000	-0.043	-0.051	-0.058	-0.061	-0.063	-0.056	-0.052	-0.048	-0.050	-0.056
Hay	0.000	0.000	0.006	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.008	0.008
Total feed (including hay)	0.000	0.000	-0.037	-0.041	-0.048	-0.052	-0.054	-0.048	-0.044	-0.041	-0.042	-0.048
GCAUs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Grain feed use/GCAUs	0.000	0.000	-0.022	-0.030	-0.034	-0.035	-0.036	-0.035	-0.035	-0.035	-0.029	-0.035
HPAUs	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.002
Soymeal use/HPAUs	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Total feed (exc. hay)/GCAU	0.000	0.000	-0.006	-0.007	-0.007	-0.007	-0.007	-0.006	-0.006	-0.005	-0.007	-0.007
Total feed (inc. hay)/GCAU	0.000	0.000	-0.005	-0.005	-0.005	-0.005	-0.005	-0.004	-0.004	-0.004	-0.005	-0.005

Table B.9. U.S. government payments, 100 million gallon dry mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(million dollars)						
Direct Payments	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Loan Benefits	0	0	-17	-32	-34	-35	-29	-27	-25	-23	-28	-28
Counter-cyclical Payments	0	0	-15	-24	-26	-28	-24	-24	-22	-21	-22	-24
Total	0	0	-32	-56	-60	-63	-53	-51	-47	-44	-49	-52

Table B.10. Government costs, 100 million gallon dry mill scenario absolute change from baseline

Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Feed Grains												
Corn	0	-2	-29	-50	-55	-57	-52	-49	-47	-45	-45	-50
Sorghum	0	0	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2
Barley	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Oats	0	0	0	0	0	0	0	0	0	0	0	0
Food Grains												
Wheat	0	0	-2	-4	-4	-4	-3	-3	-3	-2	-3	-3
Rice	0	0	0	0	0	0	0	0	0	0	0	0
Oilseeds												
Soybeans	0	0	7	5	4	4	5	5	5	5	6	5
Peanuts	0	0	0	0	0	0	0	0	0	0	0	0
Other Oilseeds	0	0	0	0	0	0	0	0	0	0	0	0
Other Commodities												
Upland Cotton	0	0	0	0	0	0	0	0	0	0	0	0
Sugar	0	0	0	0	0	0	0	0	0	0	0	0
Dairy	0	0	0	0	0	0	-1	0	0	0	0	0
CCC Conservation												
Conservation Reserve	0	0	0	0	0	0	0	0	0	0	0	0
Other CCC Conservation	0	0	0	0	0	0	0	0	0	0	0	0
Other												
Disaster Payments, NAP	0	0	0	0	0	0	0	0	0	0	0	0
Other Net Costs	0	0	0	0	0	0	0	0	0	0	0	0
Net CCC Outlays	0	-2	-26	-52	-60	-61	-55	-51	-48	-45	-46	-52

Table B.11. Net farm income, 100 million gallon dry mill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Corn Receipts	0	20	54	71	78	77	77	77	77	76	68	77
Oilseed Receipts	0	-7	-13	-13	-13	-13	-14	-14	-15	-15	-13	-14
All Other Crop Receipts	0	3	8	11	12	13	12	12	11	11	11	12
Total Crop Cash Receipts	0	16	49	70	78	76	76	75	73	72	65	74
Livestock Cash Receipts	0	0	-6	-6	-5	-2	-2	-1	1	2	-5	0
Government Payments	0	-13	-43	-58	-60	-58	-52	-50	-46	-42	-54	-49
Sum of Above	0	4	0	6	13	16	22	24	28	33	6	25
Feed Expenses	0	0	10	18	19	17	15	13	12	11	16	14
Purchased Livestock	0	0	-6	-10	-11	-10	-9	-8	-8	-7	-9	-9
Rent to Non-Operators	0	0	1	1	2	3	4	6	7	8	1	5
Other Production Expenses	0	0	1	1	1	1	2	2	2	2	1	2
Total Production Expenses	0	0	5	10	11	11	12	12	13	14	9	12
All Other Net Income*	0	0	1	1	-1	-1	0	0	0	1	0	0
Net Farm Income	0	4	-4	-3	1	4	10	11	16	20	-2	12

*Farm-related income, non-money income, and value of inventory change

Table C.1. U.S. corn supply and use, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Area						(million acres)						
Planted Area	0.000	0.000	0.000	0.022	0.031	0.034	0.033	0.037	0.035	0.035	0.018	0.035
Harvested Area	0.000	0.000	0.000	0.020	0.028	0.031	0.030	0.034	0.032	0.032	0.016	0.032
						(bushels per acre)						
Yield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						(million bushels)						
Supply	0.0	0.0	0.0	-2.6	-4.4	-5.0	-5.0	-4.2	-3.9	-3.9	-2.4	-4.4
Beginning Stocks	0.0	0.0	0.0	-5.7	-8.7	-9.7	-9.8	-9.6	-9.1	-9.2	-4.8	-9.5
Production	0.0	0.0	0.0	3.0	4.3	4.7	4.7	5.4	5.2	5.3	2.4	5.1
Imports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Domestic Use	0.0	0.0	10.1	15.4	18.0	19.4	20.1	20.9	21.4	21.7	14.5	20.7
Feed, Residual	0.0	0.0	-6.8	-9.3	-10.5	-11.0	-11.3	-11.2	-11.1	-11.0	-8.9	-11.1
Fuel Alcohol	0.0	0.0	17.2	25.3	29.1	31.1	32.1	32.8	33.1	33.4	23.9	32.5
HFCS	0.0	0.0	-0.2	-0.4	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.4	-0.6
Seed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food, Other	0.0	0.0	-0.1	-0.1	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Exports	0.0	0.0	-4.4	-9.3	-12.7	-14.6	-15.6	-16.0	-16.1	-16.1	-8.8	-15.7
Total Use	0.0	0.0	5.7	6.1	5.3	4.8	4.6	5.0	5.2	5.6	5.7	5.0
Ending Stocks	0.0	0.0	-5.7	-8.7	-9.7	-9.8	-9.6	-9.1	-9.2	-9.5	-8.0	-9.4
CCC Inventory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Under Loan	0.0	0.0	-0.4	-0.4	-0.5	-0.4	-0.5	-0.5	-0.5	-0.6	-0.4	-0.5
Other Stocks	0.0	0.0	-5.3	-8.3	-9.2	-9.4	-9.1	-8.7	-8.7	-8.9	-7.6	-8.9
						(dollars per bushel)						
Farm Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006

Table C.2. U.S. corn processing, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn Food, Industrial Use						(million bushels)						
Fuel Alcohol	0.0	0.0	17.2	25.3	29.1	31.1	32.1	32.8	33.1	33.4	23.9	32.5
HFCS	0.0	0.0	-0.2	-0.4	-0.5	-0.6	-0.6	-0.6	-0.6	-0.5	-0.4	-0.6
Glucose and Dextrose	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Starch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beverage Alcohol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cereals and Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	0.0	16.9	24.7	28.5	30.4	31.4	32.1	32.4	32.7	23.4	31.8
Corn Dry Milling												
Corn Dry Milled for Ethanol	0.0	0.0	-0.9	-1.7	-2.2	-2.4	-2.5	-2.5	-2.4	-2.4	-1.6	-2.4
Yields per Bushel of Corn												
Ethanol (Gallons)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distillers Grains (Pounds)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Value of DDG	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Corn Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin	0.000	0.000	-0.006	-0.008	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.008	-0.009
Corn Wet Milling						(million bushels)						
Corn Wet Milled for Ethanol	0.0	0.0	18.1	27.0	31.3	33.5	34.7	35.2	35.6	35.8	25.5	35.0
Other	0.0	0.0	-0.3	-0.5	-0.6	-0.7	-0.7	-0.7	-0.7	-0.6	-0.5	-0.7
Total	0.0	0.0	17.8	26.4	30.7	32.8	34.0	34.6	34.9	35.1	25.0	34.3
Yields per Bushel of Corn						(gallons)						
Ethanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(pounds)						
HFCS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Meal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Value of HFCS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Value of Gluten Feed	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Value of Gluten Meal	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Value of Corn Oil	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Corn Price	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin: Ethanol	0.000	0.000	-0.007	-0.010	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011	-0.009	-0.011
Gross Margin: HFCS	0.000	0.000	-0.006	-0.008	-0.009	-0.009	-0.008	-0.008	-0.008	-0.008	-0.007	-0.008

Table C.3. U.S. corn product supply and use, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Ethanol						(million gallons)						
Production, Sep.-Aug. Yr.	0.0	0.0	46.0	67.6	78.0	83.3	86.1	87.8	88.8	89.5	63.9	87.1
Production, Cal. Yr.	0.0	0.0	15.3	53.2	71.1	79.7	84.2	86.7	88.1	89.1	46.5	85.6
						(dollars per gallon)						
Price, FOB Omaha, Sep-Aug.	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
High-Fructose Corn Syrup						(thousand tons)						
Production, Oct.-Sep. Yr.	0.0	0.0	-3.8	-6.9	-8.8	-9.6	-9.8	-9.7	-9.5	-9.2	-6.5	-9.6
Production, Cal. Yr.	0.0	0.0	0.0	-3.8	-6.9	-8.8	-9.6	-9.8	-9.7	-9.5	-3.6	-9.5
Domestic Use, Cal. Yr.	0.0	0.0	0.0	-3.8	-6.9	-8.8	-9.6	-9.8	-9.7	-9.5	-3.6	-9.5
Net Exports, Cal. Yr.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						(cents per pound)						
Price, 42% Midwest	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001
Distillers Grains						(thousand tons)						
Production (Dry equivalent)	0.0	0.0	-7.7	-14.5	-18.7	-20.7	-21.3	-21.2	-20.7	-20.2	-13.6	-20.8
						(dollars per ton)						
Price, Lawrenceburg, IN	0.00	0.00	-0.06	-0.06	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.06	-0.10
Corn Gluten Feed						(thousand tons)						
Production	0.0	0.0	101.5	150.8	175.0	187.2	193.6	197.1	199.0	200.2	142.4	195.4
Domestic Use	0.0	0.0	100.7	149.6	173.6	185.7	192.0	195.5	197.5	198.7	141.3	193.9
Net Exports	0.0	0.0	0.8	1.1	1.3	1.5	1.6	1.6	1.6	1.5	1.1	1.6
						(dollars per ton)						
Price, 21%, IL Points	0.00	0.00	-0.08	-0.10	-0.12	-0.14	-0.14	-0.15	-0.15	-0.15	-0.10	-0.15
Corn Gluten Meal						(thousand tons)						
Production	0.0	0.0	26.7	39.7	46.0	49.3	50.9	51.9	52.4	52.7	37.5	51.4
Domestic Use	0.0	0.0	25.8	38.3	44.6	47.7	49.4	50.4	50.9	51.3	36.2	50.0
Net Exports	0.0	0.0	0.9	1.3	1.5	1.5	1.5	1.5	1.4	1.4	1.2	1.5
						(dollars per ton)						
Price, 60%, IL Points	0.00	0.00	-0.83	-1.12	-1.27	-1.36	-1.40	-1.42	-1.43	-1.43	-1.07	-1.41
Corn Oil						(million pounds)						
Production	0.0	0.0	28.0	41.6	48.3	51.6	53.4	54.4	54.9	55.2	39.3	53.9
Domestic Use	0.0	0.0	26.2	40.5	47.5	51.0	52.8	53.8	54.4	54.8	38.1	53.4
Net Exports	0.0	0.0	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.5
Ending Stocks	0.0	0.0	1.4	2.1	2.4	2.5	2.6	2.6	2.7	2.7	1.9	2.6
						(cents per pound)						
Chicago Price	0.00	0.00	-0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.01	0.02

Table C.4. U.S. crop and crop product prices, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(dollars per bushel)						
Corn	0.000	0.000	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.005	0.006
Soybeans	0.000	0.000	-0.005	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.004	-0.003
Wheat	0.000	0.000	0.001	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003
Sorghum	0.000	0.000	0.003	0.004	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004
Barley	0.000	0.000	0.003	0.004	0.005	0.005	0.005	0.005	0.004	0.004	0.004	0.005
Oats	0.000	0.000	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
						(dollars per hundredweight)						
Rice	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001
						(cents per pound)						
Peanuts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sunflowers	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02
Upland Cotton	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per ton)						
Hay	0.00	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.05
Soybean Meal	0.00	0.00	-0.41	-0.53	-0.60	-0.64	-0.67	-0.69	-0.70	-0.70	-0.51	-0.68
Corn DDG	0.00	0.00	-0.06	-0.06	-0.07	-0.08	-0.09	-0.10	-0.11	-0.11	-0.06	-0.10
Corn Gluten Feed	0.00	0.00	-0.08	-0.10	-0.12	-0.14	-0.14	-0.15	-0.15	-0.15	-0.10	-0.15
Corn Gluten Meal	0.00	0.00	-0.83	-1.12	-1.27	-1.36	-1.40	-1.42	-1.43	-1.43	-1.07	-1.41
Soybean Oil	0.00	0.00	0.02	0.05	0.07	0.07	0.08	0.08	0.08	0.08	0.05	0.08
Corn Oil	0.00	0.00	-0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.01	0.02

Table C.5. U.S. crop producer returns, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.61	0.89	0.99	1.00	0.98	0.96	0.96	0.96	0.83	0.97
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.61	0.89	0.99	1.00	0.98	0.96	0.96	0.96	0.83	0.97
+ Loan Program Benefits	0.00	0.00	-0.28	-0.42	-0.42	-0.44	-0.37	-0.35	-0.34	-0.32	-0.37	-0.36
= Market + Loan Net Returns	0.00	0.00	0.33	0.48	0.57	0.56	0.61	0.60	0.62	0.64	0.46	0.61
						(dollars per corn base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.16	-0.25	-0.26	-0.28	-0.24	-0.24	-0.23	-0.22	-0.22	-0.24
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per corn base acre planted to corn)						
= Net Returns w/ Payments	0.00	0.00	0.17	0.23	0.31	0.27	0.37	0.36	0.39	0.42	0.24	0.36
Soybeans						(dollars per acre)						
Market Gross Returns	0.00	0.00	-0.19	-0.13	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.12
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	-0.19	-0.13	-0.11	-0.11	-0.12	-0.12	-0.13	-0.13	-0.14	-0.12
+ Loan Program Benefits	0.00	0.00	0.10	0.06	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.06
= Market + Loan Net Returns	0.00	0.00	-0.09	-0.06	-0.06	-0.05	-0.06	-0.07	-0.07	-0.07	-0.07	-0.06
						(dollars per soybean base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per soybean base acre planted to soybeans)						
= Net Returns w/ Payments	0.00	0.00	-0.07	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06	-0.05
Wheat						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.04	0.10	0.13	0.14	0.13	0.13	0.13	0.12	0.09	0.13
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.04	0.10	0.13	0.14	0.13	0.13	0.13	0.12	0.09	0.13
+ Loan Program Benefits	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02
= Market + Loan Net Returns	0.00	0.00	0.03	0.07	0.10	0.11	0.11	0.11	0.11	0.11	0.07	0.11
						(dollars per wheat base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.01	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per wheat base acre planted to wheat)						
= Net Returns w/ Payments	0.00	0.00	0.02	0.04	0.06	0.08	0.08	0.08	0.09	0.09	0.04	0.08
Upland Cotton						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.04
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.04
+ Loan Program Benefits	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02
= Market + Loan Net Returns	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.00	0.02
						(dollars per upland cotton base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	0.00	-0.01
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per upland cotton base acre planted to upland cotton)						
= Net Returns w/ Payments	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Sorghum						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.17	0.26	0.30	0.30	0.30	0.29	0.28	0.28	0.24	0.29
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.17	0.26	0.30	0.30	0.30	0.29	0.28	0.28	0.24	0.29
+ Loan Program Benefits	0.00	0.00	-0.12	-0.18	-0.19	-0.19	-0.16	-0.15	-0.14	-0.12	-0.16	-0.15
= Market + Loan Net Returns	0.00	0.00	0.06	0.09	0.11	0.11	0.13	0.14	0.14	0.16	0.08	0.14
						(dollars per sorghum base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.04	-0.05	-0.07	-0.07	-0.07	-0.06	-0.07	-0.06	-0.05	-0.07
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per sorghum base acre planted to sorghum)						
= Net Returns w/ Payments	0.00	0.00	0.01	0.03	0.04	0.04	0.07	0.07	0.08	0.10	0.03	0.07

Table C.6. U.S. crop acreage, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2008-09 Average	2010-14 Average
						(million acres)						
Corn	0.000	0.000	0.000	0.022	0.031	0.034	0.033	0.037	0.035	0.035	0.027	0.035
Soybeans	0.000	0.000	0.000	-0.019	-0.022	-0.024	-0.024	-0.026	-0.025	-0.026	-0.021	-0.025
Wheat	0.000	0.000	0.000	-0.002	-0.001	0.001	0.002	0.001	0.002	0.002	-0.002	0.002
Sorghum	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001
Barley	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Oats	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Rice	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Peanuts	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sunflowers	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001
Upland Cotton	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
10 Major Crops	0.000	0.000	0.000	0.001	0.007	0.011	0.011	0.014	0.013	0.012	0.004	0.012
Hay Area Harvested	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.004	0.003	0.003	0.002	0.004
10 Major Crops + Hay	0.000	0.000	0.000	0.002	0.010	0.014	0.015	0.017	0.017	0.015	0.006	0.016

Table C.7. U.S. livestock, poultry, and dairy, 100 million gallon wet mill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
Production						(billion pounds)						
Beef	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.003	0.000	-0.001
Pork	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003	-0.001	-0.003
Chicken	0.000	0.000	0.000	-0.001	-0.001	-0.001	0.000	0.001	0.002	0.002	-0.001	0.001
Turkey	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Milk	0.000	0.000	-0.001	-0.003	-0.005	-0.005	-0.006	-0.005	-0.003	-0.005	-0.003	-0.005
Prices						(dollars per hundredweight)						
Steers, Nebraska direct	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.00	0.01
Feeder steers, OK City	0.00	0.00	-0.04	-0.06	-0.07	-0.06	-0.05	-0.04	-0.04	-0.03	-0.05	-0.04
Hogs, 51%-52% lean	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.02
Broilers, 12 city wholesale	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turkey, East region wholesale	0.00	0.00	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
All milk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table C.8. U.S. feed and residual use, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn (mil. bu.)	0	0	-7	-9	-10	-11	-11	-11	-11	-11	-9	-11
Sorghum (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Barley (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Oats (mil. bu.)	0	0	0	0	0	0	0	0	0	0	0	0
Wheat (mil. bu.)	0	0	0	1	1	1	1	1	1	1	1	1
Soybean meal (1000 tons)	0	0	-23	-38	-45	-48	-49	-50	-51	-51	-35	-50
Corn DDGs (1000 tons)	0	0	-8	-14	-19	-21	-21	-21	-21	-20	-14	-21
Corn gluten feed (1000 tons)	0	0	101	150	174	186	192	195	197	199	141	194
Corn gluten meal (1000 tons)	0	0	26	38	45	48	49	50	51	51	36	50
Hay (mil. tons)	0.000	0.000	0.006	0.010	0.010	0.010	0.009	0.008	0.008	0.008	0.009	0.009
						(million metric tons)						
Corn	0.000	0.000	-0.173	-0.236	-0.266	-0.280	-0.287	-0.283	-0.282	-0.279	-0.225	-0.282
Sorghum	0.000	0.000	0.005	0.006	0.005	0.004	0.004	0.004	0.004	0.004	0.005	0.004
Barley	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.000	-0.001
Oats	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Wheat	0.000	0.000	0.012	0.019	0.020	0.019	0.019	0.018	0.017	0.017	0.017	0.018
Grain sub-total	0.000	0.000	-0.154	-0.211	-0.241	-0.257	-0.265	-0.262	-0.260	-0.258	-0.202	-0.260
Soybean meal	0.000	0.000	-0.021	-0.034	-0.041	-0.043	-0.045	-0.046	-0.046	-0.046	-0.032	-0.045
Corn by-products	0.000	0.000	0.108	0.157	0.181	0.193	0.200	0.204	0.207	0.208	0.149	0.202
Total feed (excluding hay)	0.000	0.000	-0.068	-0.088	-0.101	-0.107	-0.110	-0.104	-0.100	-0.096	-0.085	-0.103
Hay	0.000	0.000	0.006	0.009	0.009	0.009	0.008	0.008	0.007	0.007	0.008	0.008
Total feed (including hay)	0.000	0.000	-0.062	-0.078	-0.092	-0.098	-0.102	-0.096	-0.092	-0.089	-0.077	-0.095
GCAUs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Grain feed use/GCAUs	0.000	0.000	-0.022	-0.030	-0.034	-0.036	-0.036	-0.036	-0.035	-0.035	-0.029	-0.036
HPAUs	0.000	0.000	0.000	-0.001	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	-0.002
Soymeal use/HPAUs	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Total feed (exc. hay)/GCAU	0.000	0.000	-0.010	-0.012	-0.014	-0.014	-0.014	-0.013	-0.013	-0.012	-0.012	-0.013
Total feed (inc. hay)/GCAU	0.000	0.000	-0.009	-0.010	-0.012	-0.012	-0.012	-0.011	-0.011	-0.010	-0.010	-0.011

Table C.9. U.S. government payments, 100 million gallon wet mill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(million dollars)						
Direct Payments	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Loan Benefits	0	0	-17	-32	-34	-35	-29	-27	-25	-23	-28	-28
Counter-cyclical Payments	0	0	-15	-24	-26	-28	-24	-24	-22	-21	-22	-24
Total	0	0	-32	-56	-60	-63	-53	-52	-47	-44	-50	-52

Table C.10. Government costs, 100 million gallon wet mill scenario absolute change from baseline

Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Feed Grains												
Corn	0	-2	-29	-50	-56	-57	-52	-49	-47	-45	-45	-50
Sorghum	0	0	-1	-2	-2	-2	-2	-2	-2	-2	-2	-2
Barley	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Oats	0	0	0	0	0	0	0	0	0	0	0	0
Food Grains												
Wheat	0	0	-2	-4	-4	-4	-3	-3	-3	-2	-3	-3
Rice	0	0	0	0	0	0	0	0	0	0	0	0
Oilseeds												
Soybeans	0	0	7	5	4	5	5	5	5	5	6	5
Peanuts	0	0	0	0	0	0	0	0	0	0	0	0
Other Oilseeds	0	0	0	0	0	0	0	0	0	0	0	0
Other Commodities												
Upland Cotton	0	0	0	0	0	0	0	0	0	0	0	0
Sugar	0	0	0	0	0	0	0	0	0	0	0	0
Dairy	0	0	0	0	0	0	-1	0	0	0	0	0
CCC Conservation												
Conservation Reserve	0	0	0	0	0	0	0	0	0	0	0	0
Other CCC Conservation	0	0	0	0	0	0	0	0	0	0	0	0
Other												
Disaster Payments, NAP	0	0	0	0	0	0	0	0	0	0	0	0
Other Net Costs	0	0	0	0	0	0	0	0	0	0	0	0
Net CCC Outlays	0	-2	-26	-53	-60	-61	-55	-51	-48	-45	-46	-52

Table C.11. Net farm income, 100 million gallon wet mill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Corn Receipts	0	20	54	72	78	77	78	78	77	76	68	77
Oilseed Receipts	0	-7	-13	-13	-13	-13	-14	-15	-15	-15	-13	-14
All Other Crop Receipts	0	3	8	11	13	13	12	12	11	11	11	12
Total Crop Cash Receipts	0	16	49	70	78	77	76	75	73	72	66	74
Livestock Cash Receipts	0	0	-6	-6	-5	-3	-2	-1	0	2	-6	-1
Government Payments	0	-13	-43	-58	-60	-58	-52	-50	-46	-42	-54	-50
Sum of Above	0	4	0	6	12	15	22	24	28	32	6	24
Feed Expenses	0	0	10	18	19	17	15	13	12	11	16	14
Purchased Livestock	0	0	-6	-10	-11	-11	-9	-8	-8	-7	-9	-9
Rent to Non-Operators	0	0	1	1	2	3	4	6	7	8	1	5
Other Production Expenses	0	0	1	1	1	1	2	2	2	2	1	2
Total Production Expenses	0	0	5	10	11	11	12	12	13	14	9	12
All Other Net Income*	0	0	1	1	-1	-1	0	0	0	1	0	0
Net Farm Income	0	4	-4	-3	1	4	10	11	15	20	-2	12

*Farm-related income, non-money income, and value of inventory change

Table D.1. U.S. corn supply and use, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Area						(thousand acres)						
Planted Area	0.000	0.000	0.000	0.121	0.463	0.627	0.830	0.967	0.720	0.695	0.195	0.768
Harvested Area	0.000	0.000	0.000	0.110	0.421	0.571	0.755	0.881	0.656	0.645	0.177	0.702
Yield	0.0	0.0	0.0	0.0	0.0	(bushels per acre) 0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply	0.0	0.0	0.0	-13.9	-43.5	(million bushels) -62.5	-71.6	-65.2	-63.8	-57.4	-19.1	-64.1
Beginning Stocks	0.0	0.0	0.0	-30.4	-108.2	-151.0	-193.4	-206.8	-172.2	-164.8	-46.2	-177.7
Production	0.0	0.0	0.0	16.5	64.7	88.4	121.9	141.7	108.5	107.4	27.1	113.6
Imports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Domestic Use	0.0	0.0	54.3	193.7	286.8	389.1	450.3	426.8	411.8	409.4	178.3	417.5
Feed, Residual	0.0	0.0	-29.6	-111.6	-153.2	-207.8	-231.2	-203.1	-193.3	-185.5	-98.1	-204.2
Fuel Alcohol	0.0	0.0	85.3	310.4	447.9	607.5	693.3	640.5	615.0	604.1	281.2	632.1
HFCS	0.0	0.0	-0.9	-3.4	-5.5	-7.6	-8.7	-8.1	-7.5	-7.0	-3.3	-7.8
Seed	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2
Food, Other	0.0	0.0	-0.5	-1.9	-2.6	-3.2	-3.4	-2.7	-2.5	-2.3	-1.7	-2.8
Exports	0.0	0.0	-23.9	-99.4	-179.3	-257.7	-315.1	-319.7	-311.5	-303.9	-100.9	-301.6
Total Use	0.0	0.0	30.4	94.3	107.5	131.4	135.3	107.1	100.3	105.5	77.4	115.9
Ending Stocks	0.0	0.0	-30.4	-108.2	-151.0	-193.4	-206.8	-172.2	-164.8	-162.9	-96.5	-180.1
CCC Inventory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Under Loan	0.0	0.0	-2.0	-7.2	-11.3	-13.3	-16.4	-11.7	-11.8	-11.5	-6.9	-12.9
Other Stocks	0.0	0.0	-28.3	-100.9	-139.6	-180.1	-190.4	-160.5	-153.1	-151.5	-89.6	-167.1
Farm Price	0.000	0.000	0.022	0.078	0.108	(dollars per bushel) 0.138	0.147	0.121	0.111	0.106	0.069	0.125

Table D.2. U.S. corn processing, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn Food, Industrial Use						(million bushels)						
Fuel Alcohol	0.0	0.0	85.3	310.4	447.9	607.5	693.3	640.5	615.0	604.1	281.2	632.1
HFCS	0.0	0.0	-0.9	-3.4	-5.5	-7.6	-8.7	-8.1	-7.5	-7.0	-3.3	-7.8
Glucose and Dextrose	0.0	0.0	-0.2	-0.6	-0.8	-1.0	-1.1	-0.9	-0.8	-0.8	-0.5	-0.9
Starch	0.0	0.0	-0.2	-0.6	-0.8	-1.0	-1.0	-0.8	-0.7	-0.7	-0.5	-0.8
Beverage Alcohol	0.0	0.0	-0.1	-0.3	-0.4	-0.5	-0.5	-0.4	-0.4	-0.3	-0.3	-0.4
Cereals and Other	0.0	0.0	-0.1	-0.4	-0.6	-0.7	-0.8	-0.6	-0.5	-0.5	-0.4	-0.6
Total	0.0	0.0	83.9	305.1	439.8	596.7	681.2	629.7	605.0	594.8	276.3	621.5
Corn Dry Milling												
Corn Dry Milled for Ethanol	0.0	0.0	71.5	273.3	373.5	473.7	527.5	460.6	427.9	413.0	239.4	460.5
Yields per Bushel of Corn												
Ethanol (Gallons)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distillers Grains (Pounds)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	0.007	0.018	0.050	0.097	0.134	0.151	0.153	0.154	0.025	0.138
Value of DDG	0.000	0.000	-0.007	-0.024	-0.032	-0.044	-0.050	-0.050	-0.050	-0.049	-0.021	-0.049
Corn Price	0.000	0.000	0.022	0.078	0.108	0.138	0.147	0.121	0.111	0.106	0.069	0.125
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin	0.000	0.000	-0.023	-0.084	-0.090	-0.085	-0.063	-0.020	-0.009	-0.002	-0.066	-0.036
Corn Wet Milling						(million bushels)						
Corn Wet Milled for Ethanol	0.0	0.0	13.7	37.2	74.4	133.8	165.8	179.9	187.1	191.1	41.8	171.5
Other	0.0	0.0	-1.3	-4.9	-7.5	-10.1	-11.3	-10.2	-9.4	-8.8	-4.6	-10.0
Total	0.0	0.0	12.4	32.3	66.9	123.8	154.5	169.7	177.6	182.3	37.2	161.6
Yields per Bushel of Corn						(gallons)						
Ethanol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(pounds)						
HFCS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Feed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gluten Meal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn Oil	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Costs and Returns						(dollars per bushel of corn)						
Value of Ethanol	0.000	0.000	0.007	0.018	0.050	0.095	0.132	0.149	0.151	0.152	0.025	0.136
Value of HFCS	0.000	0.000	0.000	0.001	0.002	0.003	0.005	0.005	0.005	0.005	0.001	0.005
Value of Gluten Feed	0.000	0.000	0.000	0.001	0.000	-0.002	-0.004	-0.006	-0.008	-0.008	0.000	-0.005
Value of Gluten Meal	0.000	0.000	-0.005	-0.015	-0.022	-0.032	-0.037	-0.037	-0.037	-0.037	-0.014	-0.036
Value of Corn Oil	0.000	0.000	0.004	0.012	0.022	0.032	0.042	0.047	0.046	0.045	0.013	0.042
Corn Price	0.000	0.000	0.022	0.078	0.108	0.138	0.147	0.121	0.111	0.106	0.069	0.125
Natural Gas Cost	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gross Margin: Ethanol	0.000	0.000	-0.017	-0.063	-0.058	-0.044	-0.013	0.032	0.041	0.047	-0.046	0.013
Gross Margin: HFCS	0.000	0.000	-0.023	-0.080	-0.105	-0.136	-0.141	-0.111	-0.105	-0.101	-0.069	-0.119

Table D.3. U.S. corn product supply and use, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Ethanol						(million gallons)						
Production, Sep.-Aug. Yr.	0	0	230	839	1,211	1,642	1,875	1,733	1,664	1,635	760	1,710
Production, Cal. Yr.	0	0	77	433	963	1,353	1,720	1,828	1,707	1,655	491	1,653
						(dollars per gallon)						
Price, FOB Omaha, Sep-Aug.	0.000	0.000	0.002	0.007	0.019	0.036	0.049	0.056	0.056	0.057	0.009	0.051
High-Fructose Corn Syrup						(thousand tons)						
Production, Oct.-Sep. Yr.	0.0	0.0	-15.1	-58.3	-94.5	-129.4	-148.0	-138.1	-128.5	-119.5	-56.0	-132.7
Production, Cal. Yr.	0.0	0.0	0.0	-15.1	-58.3	-94.1	-129.4	-148.0	-138.5	-128.5	-24.5	-127.7
Domestic Use, Cal. Yr.	0.0	0.0	0.0	-15.0	-58.3	-94.0	-129.3	-147.9	-138.5	-128.4	-24.4	-127.6
Net Exports, Cal. Yr.	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	-0.1
						(cents per pound)						
Price, 42% Midwest	0.000	0.000	0.000	0.002	0.006	0.010	0.014	0.016	0.015	0.014	0.003	0.014
Distillers Grains						(thousand tons)						
Production (Dry equivalent)	0	0	608	2,323	3,175	4,026	4,484	3,915	3,637	3,510	2,035	3,915
						(dollars per ton)						
Price, Lawrenceburg, IN	0.00	0.00	-0.87	-2.83	-3.79	-5.14	-5.89	-5.88	-5.92	-5.82	-2.50	-5.73
Corn Gluten Feed						(thousand tons)						
Production	0.0	0.0	70.9	184.3	381.3	705.4	880.7	967.3	1,012.4	1,039.4	212.1	921.0
Domestic Use	0.0	0.0	74.4	198.1	398.2	722.0	895.2	972.9	1,014.6	1,040.2	223.6	929.0
Net Exports	0.0	0.0	-3.5	-13.9	-17.0	-16.6	-14.5	-5.7	-2.2	-0.8	-11.4	-7.9
						(dollars per ton)						
Price, 21%, IL Points	0.00	0.00	-0.01	0.11	0.04	-0.33	-0.62	-1.11	-1.34	-1.40	0.05	-0.96
Corn Gluten Meal						(thousand tons)						
Production	0.0	0.0	18.7	48.5	100.3	185.6	231.8	254.5	266.4	273.5	55.8	242.4
Domestic Use	0.0	0.0	17.1	43.7	93.0	174.5	219.0	241.7	253.7	261.1	51.3	230.0
Net Exports	0.0	0.0	1.6	4.8	7.4	11.1	12.8	12.8	12.8	12.4	4.6	12.4
						(dollars per ton)						
Price, 60%, IL Points	0.00	0.00	-3.12	-10.07	-14.48	-21.00	-24.37	-24.36	-24.79	-24.54	-9.22	-23.81
Corn Oil						(million pounds)						
Production	0.0	0.0	19.6	50.8	105.1	194.5	242.9	266.8	279.2	286.7	58.5	254.0
Domestic Use	0.0	0.0	20.1	53.3	108.7	197.3	249.0	273.9	284.9	292.7	60.7	259.6
Net Exports	0.0	0.0	-0.6	-2.1	-3.9	-5.1	-6.6	-7.4	-6.9	-6.7	-2.2	-6.6
Ending Stocks	0.0	0.0	0.1	-0.2	0.1	2.5	3.0	3.2	4.4	5.0	0.0	3.6
						(cents per pound)						
Chicago Price	0.00	0.00	0.23	0.74	1.42	2.04	2.65	3.00	2.90	2.89	0.80	2.69

Table D.4. U.S. crop and crop product prices, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(dollars per bushel)						
Corn	0.000	0.000	0.022	0.078	0.108	0.138	0.147	0.121	0.111	0.106	0.069	0.125
Soybeans	0.000	0.000	-0.019	-0.056	-0.030	-0.043	-0.016	0.020	-0.004	0.000	-0.035	-0.009
Wheat	0.000	0.000	0.005	0.023	0.043	0.061	0.070	0.066	0.058	0.053	0.024	0.061
Sorghum	0.000	0.000	0.015	0.053	0.075	0.097	0.105	0.088	0.081	0.076	0.047	0.089
Barley	0.000	0.000	0.014	0.052	0.077	0.099	0.108	0.092	0.085	0.080	0.048	0.093
Oats	0.000	0.000	0.011	0.038	0.054	0.070	0.077	0.067	0.062	0.059	0.034	0.067
						(dollars per hundredweight)						
Rice	0.000	0.000	0.000	0.002	0.007	0.015	0.020	0.023	0.014	0.018	0.003	0.018
						(cents per pound)						
Peanuts	0.00	0.00	0.00	0.01	0.03	0.05	0.07	0.10	0.09	0.07	0.01	0.08
Sunflowers	0.00	0.00	0.07	0.21	0.44	0.64	0.84	0.97	0.92	0.92	0.24	0.86
Upland Cotton	0.00	0.00	0.00	0.02	0.06	0.08	0.11	0.14	0.09	0.08	0.02	0.10
						(dollars per ton)						
Hay	0.00	0.00	0.10	0.41	0.73	0.96	1.11	1.04	0.91	0.78	0.41	0.96
Soybean Meal	0.00	0.00	-2.42	-7.93	-11.11	-15.78	-18.21	-18.04	-18.33	-18.11	-7.15	-17.69
Corn DDG	0.00	0.00	-0.87	-2.83	-3.79	-5.14	-5.89	-5.88	-5.92	-5.82	-2.50	-5.73
Corn Gluten Feed	0.00	0.00	-0.01	0.11	0.04	-0.33	-0.62	-1.11	-1.34	-1.40	0.05	-0.96
Corn Gluten Meal	0.00	0.00	-3.12	-10.07	-14.48	-21.00	-24.37	-24.36	-24.79	-24.54	-9.22	-23.81
Soybean Oil	0.00	0.00	0.25	0.80	1.53	2.24	2.89	3.26	3.17	3.16	0.86	2.94
Corn Oil	0.00	0.00	0.23	0.74	1.42	2.04	2.65	3.00	2.90	2.89	0.80	2.69

Table D.5. U.S. crop producer returns, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn						(dollars per acre)						
Market Gross Returns	0.00	0.00	3.31	11.76	16.57	21.37	23.20	19.26	18.05	17.39	10.54	19.85
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.02	-0.04	-0.02	0.00	-0.01
= Market Net Returns	0.00	0.00	3.31	11.76	16.57	21.37	23.19	19.28	18.09	17.41	10.54	19.87
+ Loan Program Benefits	0.00	0.00	-1.48	-4.97	-6.09	-7.59	-7.12	-6.10	-5.30	-5.08	-4.18	-6.24
= Market + Loan Net Returns	0.00	0.00	1.83	6.80	10.48	13.78	16.06	13.18	12.79	12.32	6.37	13.63
						(dollars per corn base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.89	-3.18	-4.27	-5.79	-5.35	-4.86	-4.17	-3.94	-2.78	-4.82
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per corn base acre planted to corn)						
= Net Returns w/ Payments	0.00	0.00	0.94	3.62	6.21	7.99	10.71	8.32	8.62	8.38	3.59	8.80
Soybeans						(dollars per acre)						
Market Gross Returns	0.00	0.00	-0.74	-2.27	-1.20	-1.73	-0.65	0.85	-0.15	-0.01	-1.40	-0.34
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.01	0.00	-0.01
= Market Net Returns	0.00	0.00	-0.74	-2.27	-1.20	-1.73	-0.65	0.86	-0.13	0.00	-1.40	-0.33
+ Loan Program Benefits	0.00	0.00	0.38	1.08	0.59	0.80	0.38	-0.30	0.10	0.08	0.69	0.21
= Market + Loan Net Returns	0.00	0.00	-0.36	-1.19	-0.61	-0.93	-0.27	0.55	-0.03	0.08	-0.72	-0.12
						(dollars per soybean base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.08	0.24	0.14	0.20	0.06	-0.10	0.01	-0.03	0.15	0.03
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per soybean base acre planted to soybeans)						
= Net Returns w/ Payments	0.00	0.00	-0.28	-0.95	-0.47	-0.73	-0.21	0.46	-0.02	0.05	-0.57	-0.09
Wheat						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.22	0.99	1.87	2.62	3.05	2.91	2.58	2.36	1.02	2.71
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00
= Market Net Returns	0.00	0.00	0.22	0.99	1.87	2.62	3.05	2.91	2.60	2.36	1.02	2.71
+ Loan Program Benefits	0.00	0.00	-0.05	-0.22	-0.34	-0.44	-0.44	-0.31	-0.23	-0.19	-0.20	-0.32
= Market + Loan Net Returns	0.00	0.00	0.17	0.77	1.53	2.19	2.61	2.60	2.37	2.17	0.82	2.39
						(dollars per wheat base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.08	-0.32	-0.54	-0.64	-0.73	-0.68	-0.51	-0.38	-0.31	-0.59
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per wheat base acre planted to wheat)						
= Net Returns w/ Payments	0.00	0.00	0.09	0.45	1.00	1.55	1.88	1.92	1.86	1.79	0.51	1.80
Upland Cotton						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.01	0.11	0.41	0.60	0.91	1.04	0.67	0.59	0.18	0.76
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.03	-0.07	-0.03	0.00	-0.02
= Market Net Returns	0.00	0.00	0.01	0.11	0.41	0.60	0.89	1.07	0.74	0.62	0.18	0.78
+ Loan Program Benefits	0.00	0.00	-0.01	-0.11	-0.31	-0.33	-0.39	-0.46	-0.23	-0.18	-0.15	-0.32
= Market + Loan Net Returns	0.00	0.00	-0.01	0.00	0.10	0.27	0.50	0.61	0.51	0.44	0.03	0.47
						(dollars per upland cotton base acre)						
+ Counter-cyclical Payment	0.00	0.00	0.00	-0.03	-0.11	-0.15	-0.27	-0.35	-0.17	-0.23	-0.05	-0.23
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per upland cotton base acre planted to upland cotton)						
= Net Returns w/ Payments	0.00	0.00	-0.01	-0.03	-0.01	0.12	0.23	0.27	0.34	0.21	-0.02	0.23
Sorghum						(dollars per acre)						
Market Gross Returns	0.00	0.00	0.93	3.37	4.83	6.31	6.87	5.74	5.43	5.11	3.04	5.89
- Variable Costs	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	-0.03	-0.01	0.00	-0.01
= Market Net Returns	0.00	0.00	0.93	3.37	4.83	6.31	6.86	5.75	5.45	5.12	3.04	5.90
+ Loan Program Benefits	0.00	0.00	-0.62	-2.16	-2.89	-3.56	-3.44	-2.78	-2.39	-2.00	-1.89	-2.83
= Market + Loan Net Returns	0.00	0.00	0.31	1.21	1.94	2.75	3.42	2.97	3.06	3.12	1.15	3.07
						(dollars per sorghum base acre)						
+ Counter-cyclical Payment	0.00	0.00	-0.22	-0.75	-1.10	-1.52	-1.52	-1.35	-1.26	-1.08	-0.69	-1.35
+ Direct Payment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
						(dollars per sorghum base acre planted to sorghum)						
= Net Returns w/ Payments	0.00	0.00	0.09	0.46	0.83	1.23	1.90	1.63	1.80	2.04	0.46	1.72

Table D.6. U.S. crop acreage, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2008-09 Average	2010-14 Average
						(thousand acres)						
Corn	0.000	0.000	0.000	0.121	0.463	0.627	0.830	0.967	0.720	0.695	0.292	0.768
Soybeans	0.000	0.000	0.000	-0.093	-0.347	-0.423	-0.570	-0.600	-0.416	-0.442	-0.220	-0.490
Wheat	0.000	0.000	0.000	-0.017	-0.042	-0.029	-0.027	-0.020	0.012	0.008	-0.029	-0.011
Sorghum	0.000	0.000	0.000	0.000	0.002	0.002	0.009	0.021	0.012	0.020	0.001	0.013
Barley	0.000	0.000	0.000	0.004	0.017	0.022	0.028	0.033	0.022	0.020	0.010	0.025
Oats	0.000	0.000	0.000	0.002	0.008	0.010	0.012	0.011	0.007	0.007	0.005	0.009
Rice	0.000	0.000	0.000	-0.001	-0.003	-0.004	-0.006	-0.007	-0.005	-0.006	-0.002	-0.005
Peanuts	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.003	-0.003	-0.002	-0.002	-0.001	-0.002
Sunflowers	0.000	0.000	0.000	0.004	0.010	0.029	0.044	0.059	0.073	0.069	0.007	0.055
Upland Cotton	0.000	0.000	0.000	-0.007	-0.028	-0.047	-0.061	-0.072	-0.058	-0.055	-0.017	-0.059
10 Major Crops	0.000	0.000	0.000	0.013	0.079	0.185	0.257	0.388	0.365	0.313	0.046	0.301
Hay Area Harvested	0.000	0.000	0.000	0.006	0.023	0.043	0.061	0.068	0.068	0.063	0.014	0.061
10 Major Crops + Hay	0.000	0.000	0.000	0.019	0.103	0.229	0.318	0.455	0.433	0.376	0.061	0.362

Table D.7. U.S. livestock, poultry, and dairy, energy bill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
Production						(billion pounds)						
Beef	0.000	0.000	0.000	0.000	0.002	0.006	-0.003	-0.016	-0.035	-0.053	0.001	-0.020
Pork	0.000	0.000	-0.001	-0.007	-0.018	-0.032	-0.046	-0.051	-0.047	-0.039	-0.009	-0.043
Chicken	0.000	0.000	0.001	-0.001	-0.002	0.017	0.043	0.091	0.137	0.167	-0.001	0.091
Turkey	0.000	0.000	0.001	0.003	0.004	0.007	0.010	0.012	0.013	0.013	0.003	0.011
Milk	0.000	0.000	-0.006	-0.030	-0.055	-0.073	-0.090	-0.089	-0.028	-0.025	-0.030	-0.061
Prices						(dollars per hundredweight)						
Steers, Nebraska direct	0.00	0.00	0.01	0.02	0.02	0.01	0.07	0.08	0.12	0.20	0.02	0.10
Feeder steers, OK City	0.00	0.00	-0.20	-0.74	-1.10	-1.43	-1.43	-1.12	-0.91	-0.72	-0.68	-1.12
Hogs, 51%-52% lean	0.00	0.00	0.01	0.06	0.13	0.22	0.28	0.23	0.14	0.09	0.07	0.19
Broilers, 12 city wholesale	0.00	0.00	0.00	0.02	0.02	-0.06	-0.14	-0.32	-0.44	-0.48	0.01	-0.29
Turkey, East region wholesale	0.00	0.00	-0.05	-0.12	-0.17	-0.34	-0.43	-0.57	-0.67	-0.67	-0.11	-0.54
All milk	0.00	0.00	0.00	0.01	0.01	0.02	0.03	0.02	0.01	0.00	0.01	0.02

Table D.8. U.S. feed and residual use, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
Corn (mil. bu.)	0	0	-30	-112	-153	-208	-231	-203	-193	-186	-98	-204
Sorghum (mil. bu.)	0	0	1	4	4	5	4	3	2	3	3	3
Barley (mil. bu.)	0	0	0	0	0	0	-1	-1	-1	-1	0	-1
Oats (mil. bu.)	0	0	0	1	1	2	2	1	1	1	1	1
Wheat (mil. bu.)	0	0	2	9	12	15	16	13	12	11	8	13
Soybean meal (1000 tons)	0	0	-93	-391	-584	-765	-856	-736	-642	-608	-356	-722
Corn DDGs (1000 tons)	0	0	608	2,323	3,175	4,026	4,484	3,915	3,637	3,510	2,035	3,915
Corn gluten feed (1000 tons)	0	0	74	198	398	722	895	973	1,015	1,040	224	929
Corn gluten meal (1000 tons)	0	0	17	44	93	174	219	242	254	261	51	230
Hay (mil. tons)	0.000	0.000	0.035	0.127	0.178	0.215	0.212	0.161	0.144	0.132	0.113	0.173
						(million metric tons)						
Corn	0.000	0.000	-0.751	-2.835	-3.892	-5.278	-5.872	-5.159	-4.910	-4.713	-2.493	-5.187
Sorghum	0.000	0.000	0.029	0.091	0.105	0.116	0.108	0.075	0.060	0.071	0.075	0.086
Barley	0.000	0.000	0.003	0.004	-0.005	-0.008	-0.017	-0.020	-0.020	-0.018	0.000	-0.017
Oats	0.000	0.000	0.005	0.018	0.021	0.025	0.024	0.016	0.014	0.014	0.015	0.018
Wheat	0.000	0.000	0.066	0.238	0.334	0.411	0.433	0.357	0.318	0.299	0.212	0.364
Grain sub-total	0.000	0.000	-0.648	-2.485	-3.437	-4.735	-5.323	-4.731	-4.539	-4.347	-2.190	-4.735
Soybean meal	0.000	0.000	-0.084	-0.354	-0.529	-0.694	-0.777	-0.668	-0.583	-0.552	-0.323	-0.655
Corn by-products	0.000	0.000	0.635	2.327	3.326	4.466	5.078	4.654	4.450	4.365	2.096	4.603
Total feed (excluding hay)	0.000	0.000	-0.098	-0.513	-0.640	-0.964	-1.021	-0.745	-0.671	-0.534	-0.417	-0.787
Hay	0.000	0.000	0.032	0.115	0.162	0.195	0.192	0.146	0.131	0.120	0.103	0.157
Total feed (including hay)	0.000	0.000	-0.066	-0.398	-0.479	-0.768	-0.829	-0.599	-0.540	-0.414	-0.314	-0.630
GCAUs	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.002	0.000	0.001	0.002	-0.001	0.000
Grain feed use/GCAUs	0.000	0.000	-0.095	-0.359	-0.490	-0.670	-0.745	-0.664	-0.640	-0.615	-0.315	-0.667
HPAUs	0.000	0.000	0.000	-0.004	-0.011	-0.008	-0.001	0.025	0.055	0.076	-0.005	0.029
Soymeal use/HPAUs	0.000	0.000	-0.002	-0.007	-0.010	-0.013	-0.014	-0.012	-0.011	-0.011	-0.006	-0.012
Total feed (exc. hay)/GCAU	0.000	0.000	-0.014	-0.072	-0.086	-0.131	-0.136	-0.103	-0.100	-0.085	-0.057	-0.111
Total feed (inc. hay)/GCAU	0.000	0.000	-0.009	-0.053	-0.058	-0.099	-0.104	-0.082	-0.085	-0.075	-0.040	-0.089

Table D.9. U.S. government payments, energy bill scenario absolute change from baseline

Crop Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	2007-09 Average	2010-14 Average
						(million dollars)						
Direct Payments	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Loan Benefits	0	0	-101	-353	-501	-617	-620	-575	-466	-447	-318	-545
Counter-cyclical Payments	0	0	-83	-301	-424	-571	-549	-509	-426	-397	-269	-491
Total	0	0	-184	-654	-925	-1,188	-1,169	-1,084	-893	-844	-587	-1,036

Table D.10. Government costs, energy bill scenario absolute change from baseline

Fiscal Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Feed Grains												
Corn	0	-9	-171	-557	-805	-1,019	-1,047	-930	-820	-709	-511	-905
Sorghum	0	-1	-8	-22	-32	-40	-41	-35	-31	-26	-21	-35
Barley	0	-1	-7	-14	-18	-23	-21	-18	-17	-15	-13	-19
Oats	0	0	-2	-3	-4	-4	-4	-3	-3	-3	-3	-3
Food Grains												
Wheat	0	-2	-16	-42	-62	-71	-73	-64	-49	-33	-40	-58
Rice	0	0	0	-1	-2	-3	-5	-4	-2	-1	-1	-3
Oilseeds												
Soybeans	0	1	32	83	51	60	27	-27	0	28	55	18
Peanuts	0	0	0	0	-2	-2	-3	-5	-4	-3	-1	-3
Other Oilseeds	0	0	-1	-2	-3	-5	-6	-8	-7	-6	-2	-6
Other Commodities												
Upland Cotton	0	0	0	-2	-7	-8	-12	-12	-6	1	-3	-7
Sugar	0	0	0	0	0	0	0	0	0	0	0	0
Dairy	0	0	0	-1	-2	-3	-4	-4	-3	-2	-1	-3
CCC Conservation												
Conservation Reserve	0	0	0	0	0	0	0	0	0	0	0	0
Other CCC Conservation	0	0	0	0	0	0	0	0	0	0	0	0
Other												
Disaster Payments, NAP	0	0	0	0	0	0	0	0	0	0	0	0
Other Net Costs	0	0	0	0	0	0	0	0	0	0	0	0
Net CCC Outlays	0	-12	-173	-561	-887	-1,117	-1,188	-1,109	-939	-769	-541	-1,025

Table D.11. Net farm income, energy bill scenario absolute change from baseline

Calendar Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2008-10 Average	2011-15 Average
						(million dollars)						
Corn Receipts	0	108	512	1,030	1,451	1,737	1,771	1,571	1,460	1,349	998	1,578
Oilseed Receipts	0	-27	-118	-165	-176	-173	-93	-57	-70	-82	-153	-95
All Other Crop Receipts	0	19	82	157	221	266	257	233	210	186	153	230
Total Crop Cash Receipts	0	99	477	1,021	1,497	1,830	1,935	1,748	1,600	1,453	998	1,713
Livestock Cash Receipts	0	0	-36	-112	-137	-221	-196	-244	-272	-299	-95	-246
Government Payments	0	-75	-371	-765	-1,012	-1,193	-1,134	-1,017	-874	-731	-716	-990
Sum of Above	0	25	70	145	347	416	605	487	455	423	187	477
Feed Expenses	0	0	49	197	281	306	284	136	60	-15	176	154
Purchased Livestock	0	0	-34	-126	-189	-249	-257	-214	-184	-153	-116	-211
Rent to Non-Operators	0	2	11	29	62	111	162	195	211	227	34	181
Other Production Expenses	0	0	4	22	40	48	64	42	44	45	22	49
Total Production Expenses	0	2	31	122	194	216	253	159	131	103	115	173
All Other Net Income*	0	2	11	24	20	1	1	-27	-10	6	18	-6
Net Farm Income	0	24	50	47	173	201	352	300	313	326	90	298

*Farm-related income, non-money income, and value of inventory change

Appendix E: Model Enhancements

FAPRI's stochastic model of the U.S. agricultural sector is comprised of approximately 1,000 equations that estimate the supply, demand, and prices for major agricultural commodities. The model also computes a number of other indicators, such as government farm program outlays, net farm income, and consumer food price indices.

Recent model enhancements provide detailed treatment of the corn processing sector. The following is a brief overview of the new equations; a more detailed documentation of the overall FAPRI modeling system is being prepared.

Coverage

The corn processing module covers markets for ethanol, HFCS, distiller's grains, corn gluten feed, corn gluten meal, and corn oil. Production and prices are estimated for each commodity. Where data permit, domestic consumption, net trade, and ending stocks are also estimated. In the case of ethanol, the equations generate separate estimates of production from wet and dry mill plants. The model also includes simplified single-equation representations of the use of corn to produce glucose and dextrose, beverage alcohol, corn starch, and cereals.

Data

Data are compiled from a variety of sources. USDA reports price data for most modeled commodities, detailed supply and demand data for HFCS and corn oil, and data concerning the amount of corn used for various purposes. The Energy Information Administration provides ethanol production data. Ethanol price data is taken from a state of Nebraska website (http://www.neo.state.ne.us/statshtml/66.html).

Much of the data underlying the model, however, is unpublished and imprecise at best. In some cases, desirable model components are omitted because of data limitations, and in other cases, assumptions were made to construct series. The following is a partial list of cases where data limitations affected the study:

- No public source was identified that reported the amount of ethanol produced by wet and dry mill plants. Series were constructed based on assumed proportions of total ethanol production occurring in each type of plant. Those proportions, in turn, were based in part on anecdotal (and often contradictory) comments from industry publications and experts.
- No public supply and use data for distiller's grains, corn gluten feed, or corn gluten meal were identified. In the case of distiller's grains, it is simply assumed that each bushel of corn used in dry milling yields 17 pounds of distiller's grains (dry equivalent). A similar approach is used to estimate production of corn gluten feed and corn gluten meal. Trade data was available for corn gluten feed and corn gluten meal, so it was possible to generate an estimate of domestic consumption given the assumed production level and the reported level of net trade.

- When the model was under construction, no source for ethanol trade or domestic consumption data had been identified. Thus the model estimates ethanol prices and production, but not consumption or trade. Trade data found recently on the Energy Information Administration website will facilitate future model enhancements.
- Information about how technical parameters have changed over time is anecdotal at best. Given the reliance on constructed data, it is almost impossible to back out implied changes over time in ethanol yields per bushel of corn and other important indicators. As elsewhere, assumptions are made based on discussions with industry experts.

It is hoped that data availability and quality will improve as the industry grows. In many cases, the present study had to extrapolate from available information much more than would be desired. Better data would make better analysis possible.

Model equations

For each of the major products, prices are determined by an inverse demand equation. Prices generally are a function of the prices of close substitutes and domestic consumption levels (with production as a proxy when consumption data are unavailable):

1) Ethanol price = f(gasoline price, tax exemption/credit, ethanol production).

2) HFCS wholesale prices = f(raw sugar prices, domestic consumption of HFCS).

3) Distiller's grain price = f(corn price, soymeal price, distiller's grain production).

4) Gluten feed price = f(corn price, soymeal price, gluten feed consumption).

5) Gluten meal price = f(soymeal price, gluten meal consumption).

6) Corn oil price = f(soyoil price, corn oil consumption).

Note that in the energy bill scenario, a positive adjustment term was added to the ethanol price equation to reflect an assumed outward shift of the ethanol demand curve.

The gross margins for dry and wet mill plants used in the model consider only selected variable revenues and expenses:

7) Dry mill gross margin =
Ethanol yield per bushel times ethanol price
plus distiller's grain yield per bushel times distiller's grain price
minus corn price
minus natural gas costs (based on a price index).

8) Wet mill ethanol plant gross margin =

Ethanol yield per bushel times ethanol price
plus corn gluten feed yield per bushel times gluten feed price
plus corn gluten meal yield per bushel times gluten meal price
plus corn oil yield per bushel times corn oil price
minus corn price
minus natural gas costs (based on a price index).

9) Wet mill HFCS plant gross margin =

HFCS yield per bushel times HFCS price
plus corn gluten feed yield per bushel times gluten feed price
plus corn gluten meal yield per bushel times gluten meal price
plus corn oil yield per bushel times corn oil price
minus corn price
minus natural gas costs (based on a price index).

Production of ethanol and HFCS depend on these gross margins. Lagged dependent variables in the equations mean that long-run responses are larger (by a factor of 2) than short-run responses, reflecting in part the time it takes to change production capacity. Trends and adjustment factors also play a part in these equations, as much of the growth in the ethanol industry in particular, cannot simply be explained by changes in margins over time.

10) Corn used in dry mill ethanol plants = f(lagged dependent variable, dry mill gross margin, trend).

11) Corn used in wet mill ethanol plants = f(lagged dependent variable, ethanol wet mill gross margin, trend).

12) Corn used in HFCS production = f(lagged dependent variable, HFCS wet mill gross margin, trend).

13) Ethanol production = Wet and dry mill use of corn for ethanol multiplied by technical yield coefficients.

14) HFCS production = Wet mill use of corn for HFCS multiplied by a technical yield coefficient.

Simple equations estimate net trade and stocks, where data are available:

15) HFCS net exports = f(HFCS price).

16) Corn gluten feed net exports = f(corn gluten feed price, soymeal price).

17) Corn gluten meal net exports = f(corn gluten meal price, soymeal price).

18) Corn oil net exports = f(corn oil price, soyoil price).

19) Corn oil ending stocks = f(corn oil price, corn oil production).

Finally, model-closing identities determine domestic consumption:

20) HFCS domestic consumption = production minus net exports.

21) Corn gluten feed consumption = production minus net exports.

22) Corn gluten meal consumption = production minus net exports.

23) Corn oil consumption = production plus beginning stocks minus net exports minus ending stocks.

Finally, a number of equations not detailed here are necessary to translate crop year data into calendar or fiscal year data.

Most of the model equations are linear, although the price (inverse demand) equations generally are a function of the natural logarithm of the consumption level (so that every 1 percent increase in consumption has the same absolute effect on price).

While many equations in the FAPRI stochastic model of the U.S. agricultural sector are estimated econometrically, these new equations representing the corn processing sector are all synthetic equations based on assumed elasticities. Model parameters are available upon request, and they will be detailed in a formal documentation of the FAPRI stochastic model targeted for release in late 2005.

As with the rest of the FAPRI modeling system, equation specifications and particular parameters will change over time, based on new information. Econometric estimation and reviewer comments are two common sources of new information. FAPRI welcomes comments on both the results of the analysis and on the modeling approach used to generate the estimates.