

FAPRI Ethanol Briefing Materials for Congressman Peterson



March 2006

www.fapri.missouri.edu

FAPRI-UMC Report #02-06

FAPRI
At the University of Missouri
Food and Agricultural
Policy Research Institute

MU College of
Agriculture,
Food and
Natural
Resources

Inside Cover Blank Page

Ethanol Briefing Material: Summary

These briefing materials summarize information about ethanol markets and margins for ethanol producers under a continuation of current farm and energy policies.

Key points:

1. FAPRI, USDA, and CBO all project rapid growth in the amount of corn used for ethanol production (Tables 1a and 1b, page 3). While the long-term projections are very similar, some analysts believe actual ethanol industry growth could far exceed the projected levels.
2. FAPRI's projections for ethanol markets indicate that U.S. ethanol production could exceed the levels of renewable fuel use mandated by the Energy Policy Act, even before considering biodiesel, imported ethanol, and other renewable fuels (Table 2, page 3).
3. If ethanol production exceeds the renewable fuel mandate, ethanol will need to be price competitive with gasoline. FAPRI projections indicate ethanol and gasoline prices are likely to decline from 2006 levels (Table 2, page 3).
4. Considering only two major outputs (ethanol and distillers grains) and two major inputs (corn and natural gas), dry mill ethanol producer gross margins are at record levels this marketing year (Tables 3a-3c, page 5). Projected margins decline, but remain high by historical standards.
5. The projected \$0.31 per gallon decline in gross margins between 2005/06 and 2012/13 is due both to lower prices for ethanol and higher prices for corn (Table 4, page 7).
6. The projections depend on a series of assumptions about everything from the weather to the price of petroleum. FAPRI uses stochastic analysis to look at 500 alternative futures where some of these unknowns can take different values.
7. There is a risk of low margins for ethanol producers. In 10% of the stochastic outcomes for 2012/13, the average gross margin for dry mill ethanol producers is only \$0.38 per gallon, comparable to the lowest gross margin experienced in the last 10 years (Table 5, page 7). Since the gross margin does not incorporate all production costs, profits would generally be lower than the gross margins reported, and could be negative for some producers in some circumstances.
8. If the stochastic analysis is reliable, it suggests the main risk faced by ethanol producers is the price of ethanol. Gross margins are most likely to be lowest when unleaded gasoline and ethanol prices are well below average (Table 5, page 7). Corn prices also play a role, but ethanol prices are a more important factor in explaining low margins than are high corn prices, given all the assumptions of the analysis.

Except where noted, the figures presented here are based on FAPRI's January 2006 baseline. The *FAPRI 2006 U.S. Baseline Briefing Book*, FAPRI-UMC Report #01-06 (http://www.fapri.missouri.edu/outreach/publications/2006/FAPRI_UMC_Report_01_06.pdf) provides more detail.

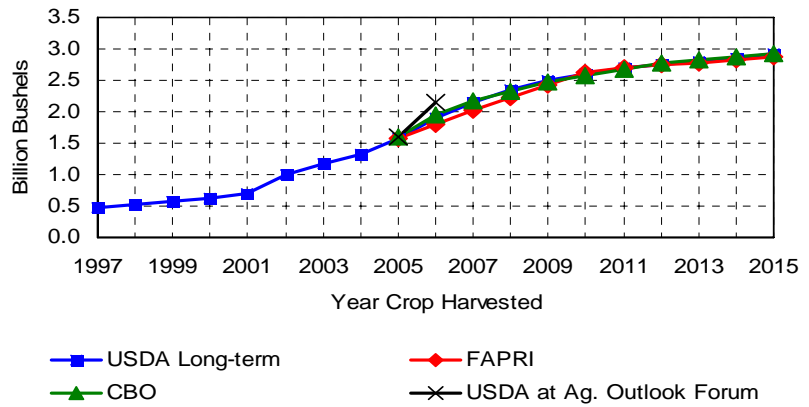
Ethanol Market Projections

- 10-year baseline projections from FAPRI, CBO, and USDA all show similar patterns of growth in the amount of corn used for ethanol production.

- Note that at February's Ag. Outlook Forum, USDA analysts projected a much larger increase in 2006/07 than in the USDA long-term baseline.

- There is much more uncertainty about future ethanol growth than these similar long-term projections would suggest.

Corn Use for Ethanol

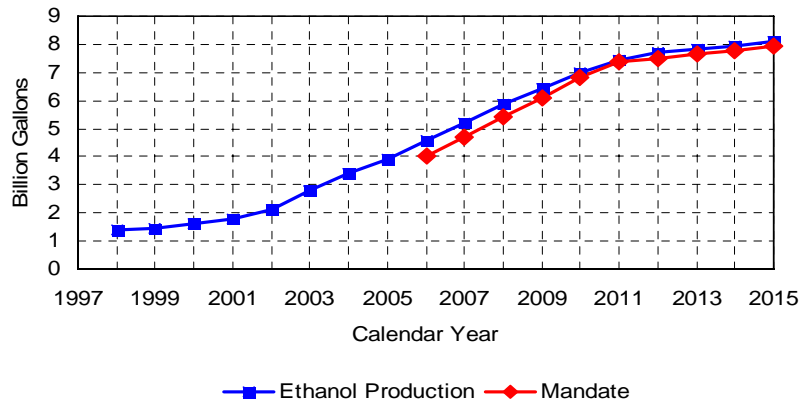


- FAPRI's projected ethanol production exceeds the levels of renewable fuel usage mandated by the Energy Policy Act of 2005.

- Biodiesel, ethanol imports, and other renewable fuels can also be used to satisfy the mandate.

- Thus, the renewable use mandate is never binding under these projections.

Ethanol Production and Renewable Fuel Mandate



- Ethanol prices at the plant typically exceed those of unleaded gasoline. The 51 cent per gallon tax benefit for ethanol makes it price-competitive at the pump.

- Given Global Insight forecasts of petroleum product prices, both gasoline and ethanol prices are projected to decline slightly between 2006 and 2012.

- The ethanol price has varied from \$1.20 in May 2005 to \$2.74 in September, \$1.99 in December, and \$2.52 in February 2006.

Ethanol and Unleaded Gasoline Prices

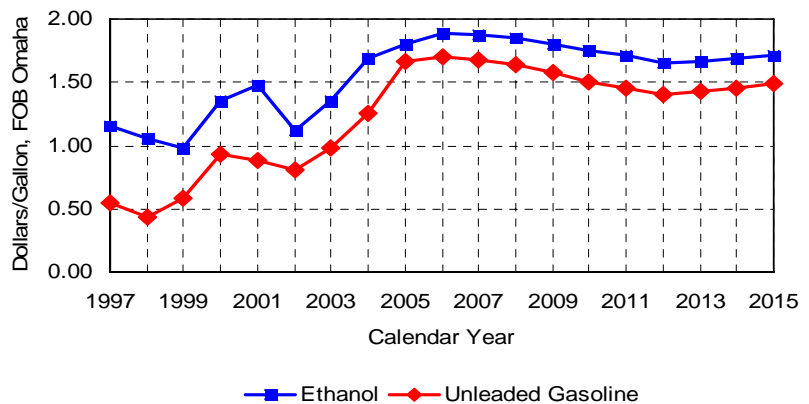


Table 1a. Use of Corn to Produce Ethanol (Historical Data)

Corn Marketing Year	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05
USDA estimates	533	396	429	481	526	566	628	706	996	1,168	1,323

Table 1b. Use of Corn to Produce Ethanol (Alternative Projections)

Corn Marketing Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
FAPRI baseline, 1/06	1,576	1,796	2,024	2,233	2,429	2,618	2,711	2,744	2,781	2,825	2,872
USDA baseline, 11/05	1,575	1,900	2,150	2,350	2,500	2,600	2,690	2,745	2,800	2,860	2,915
CBO baseline, 2/06	1,600	1,950	2,175	2,325	2,475	2,575	2,675	2,775	2,825	2,875	2,925
USDA speech, 2/06	1,600	2,150									

Table 2. Ethanol Supply, Use, and Prices (FAPRI Projections)

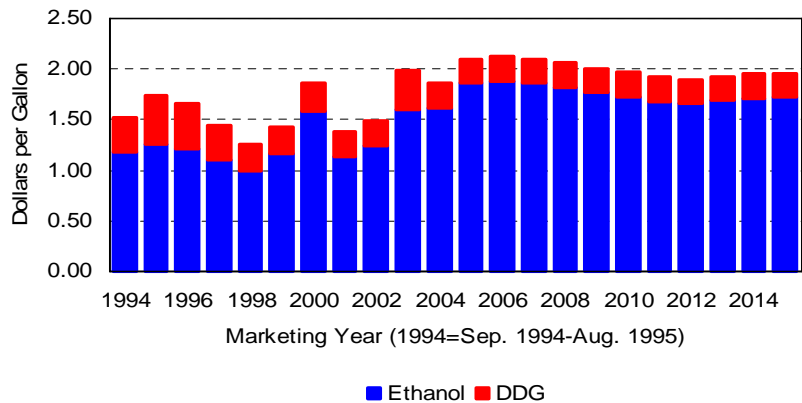
Calendar Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Renew. Fuel Mandate	n.a.	4,000	4,700	5,400	6,100	6,800	7,400	7,500	7,640	7,781	7,925
Ethanol											
Production	3,893	4,589	5,217	5,847	6,434	6,995	7,460	7,694	7,819	7,958	8,115
Imports	81	75	83	93	107	125	140	130	139	147	155
Disappearance	3,976	4,632	5,265	5,903	6,506	7,086	7,572	7,805	7,950	8,098	8,261
Ending Stocks	250	281	316	353	388	422	451	469	477	484	493
Prices, FOB Omaha											
Unleaded Gasoline	1.66	1.70	1.68	1.64	1.58	1.51	1.45	1.41	1.43	1.46	1.49
Ethanol	1.80	1.89	1.88	1.85	1.81	1.75	1.72	1.65	1.67	1.69	1.72

Sources: Historical corn use to produce ethanol is from USDA reports. For the projections, sources are 1) FAPRI's January 2006 baseline, 2) USDA's long-term baseline (prepared in late 2005, but released at the Agricultural Outlook Forum in February 2006), 3) CBO's revised baseline (prepared based on February 2006 data and released in March 2006), and 4) a presentation by a USDA analyst at the Agricultural Outlook Forum in February 2006. Ethanol supply, use, and price projections are from FAPRI's January 2006 baseline (means of stochastic estimates).

Revenues and Costs for Dry Mill Ethanol Plants

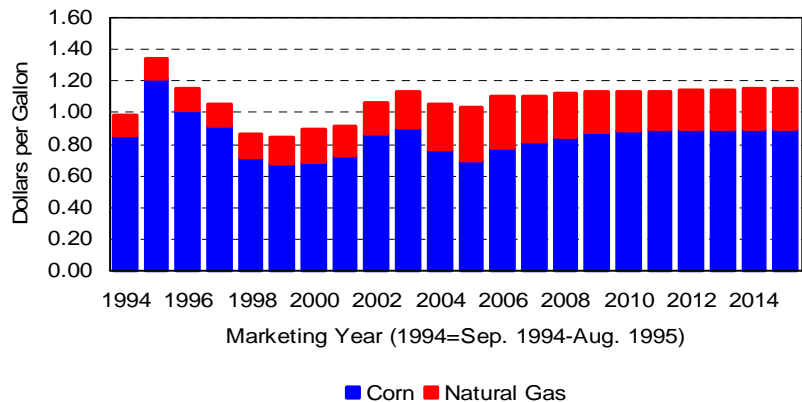
- Projected ethanol prices for 2005/06-2015/16 exceed those for all prior years.
- The value of distillers grains has declined in recent years as supplies have increased.
- Some plants also sell other products, such as carbon dioxide, but ethanol and distillers grains are the most valuable products for most plants.

Selected Revenues for Dry Mill Ethanol Plant



- Corn and natural gas are the two largest variable expenses for dry mill ethanol plants.
- Projected corn prices rise from \$1.90 per bushel in 2005/06 to \$2.50 per bushel in 2015/16.
- Plants would also have labor and other variable expenses, as well as capital costs.

Selected Costs for Dry Mill Ethanol Plant



- Considering only these two outputs (ethanol and DDG) and two inputs (corn and natural gas), the projected gross margin for 2005/06 is a record.
- Projected gross margins decline between 2005/06 and 2012/13, as corn prices rise and ethanol prices fall, but remain above the 1994/95-2004/05 average of \$0.58 per gallon.
- The lowest historical gross margins occurred in 1995/96 (high corn prices), 1997/98 and 1998/99 (low ethanol prices).

Selected Revenues and Costs for Dry Mill Plant

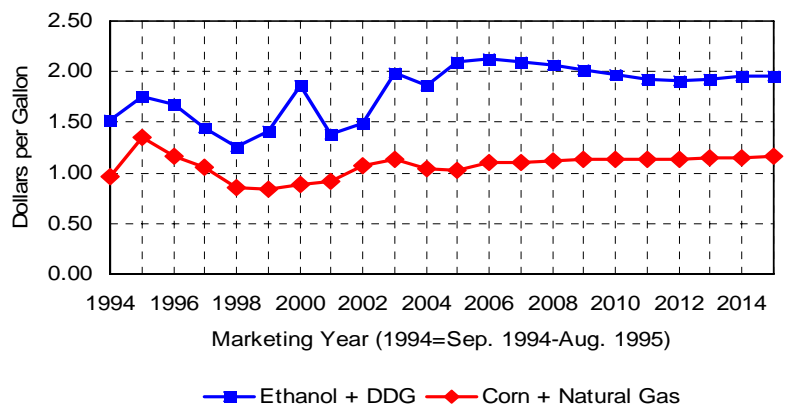


Table 3a. Selected Revenues and Costs for a Typical Dry-Mill Ethanol Plant (Historical)

Corn Marketing Year	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05
	(dollars per gallon)										
Value of Ethanol	1.18	1.26	1.21	1.10	0.99	1.17	1.59	1.13	1.25	1.60	1.62
Value of DDG	0.34	0.48	0.45	0.34	0.27	0.26	0.27	0.25	0.24	0.38	0.24
Selected Revenues	1.52	1.75	1.67	1.44	1.26	1.42	1.86	1.38	1.49	1.98	1.86
Corn Cost	0.85	1.21	1.01	0.91	0.72	0.68	0.69	0.73	0.86	0.90	0.77
Natural Gas Cost	0.13	0.13	0.14	0.14	0.14	0.16	0.20	0.18	0.20	0.23	0.28
Selected Costs	0.97	1.35	1.16	1.05	0.86	0.84	0.89	0.92	1.07	1.14	1.04
Gross Margin	0.54	0.40	0.51	0.39	0.39	0.58	0.97	0.46	0.42	0.84	0.82

Table 3b. Selected Revenues and Costs for a Typical Dry-Mill Ethanol Plant (Projected)

Corn Marketing Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
	(dollars per gallon)										
Value of Ethanol	1.86	1.88	1.86	1.82	1.77	1.73	1.68	1.66	1.69	1.71	1.72
Value of DDG	0.24	0.24	0.24	0.25	0.24	0.24	0.24	0.24	0.24	0.24	0.23
Selected Revenues	2.10	2.12	2.10	2.07	2.02	1.97	1.92	1.91	1.93	1.95	1.95
Corn Cost	0.70	0.78	0.81	0.84	0.87	0.88	0.89	0.89	0.89	0.89	0.89
Natural Gas Cost	0.33	0.32	0.29	0.28	0.26	0.25	0.24	0.25	0.25	0.26	0.26
Selected Costs	1.03	1.10	1.10	1.12	1.13	1.13	1.14	1.14	1.15	1.15	1.16
Gross Margin	1.07	1.03	1.00	0.95	0.89	0.84	0.78	0.77	0.78	0.79	0.80

Table 3c. Assumptions Used to Generate the Projected Revenues and Costs

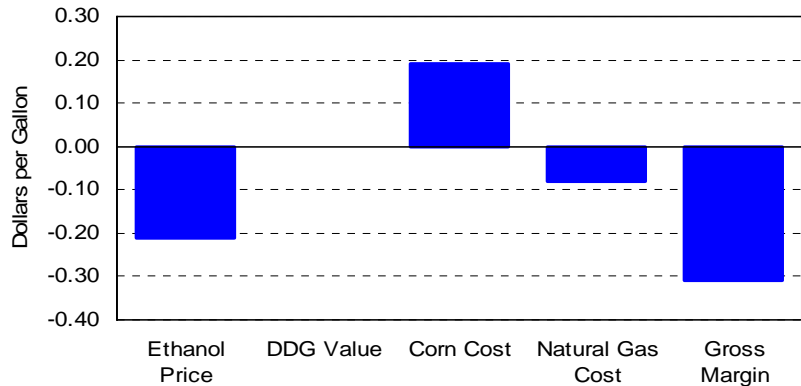
Corn Marketing Year	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
	(dollars per gallon)										
Price of Ethanol	1.86	1.88	1.86	1.82	1.77	1.73	1.68	1.66	1.69	1.71	1.72
	(dollars per ton)										
Price of DDG	76.81	76.97	78.21	78.99	78.68	78.82	79.06	78.80	78.64	77.98	76.82
	(dollars per bushel)										
Price of Corn	1.90	2.10	2.20	2.30	2.37	2.43	2.46	2.46	2.48	2.49	2.50
	(gallons per bushel of corn)										
Ethanol Yield	2.70	2.71	2.72	2.73	2.74	2.75	2.76	2.77	2.78	2.79	2.80
	(pounds per bushel of corn)										
DDG Yield	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00

Sources: Historical corn and DDG prices are from USDA reports. Historical ethanol prices are from <http://www.neo.state.ne.us/statshtml/66.html>, a website maintained by the state of Nebraska reporting ethanol prices, FOB Omaha. Historical natural gas costs are based on various reports of average natural gas costs and historical movements in natural gas prices, as reported by Global Insight. Yields are based on various industry reports. Projections are the stochastic means of FAPRI's January 2006 baseline.

Risks to Margins at Dry Mill Ethanol Plants

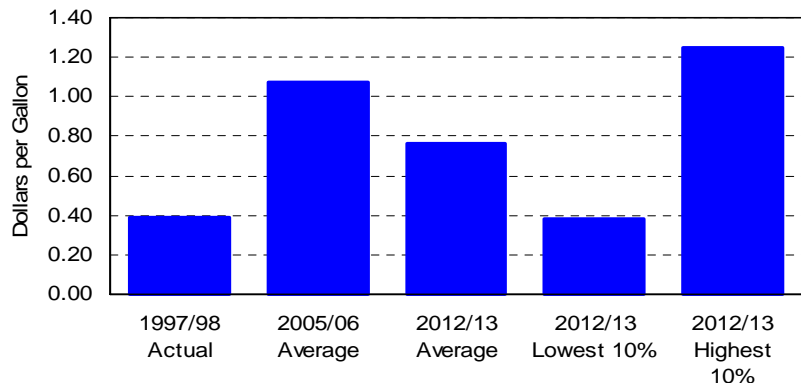
- Gross margins at dry mill ethanol plants are projected to decline by \$0.31 per gallon between 2005/06 and 2012/13.
- Ethanol prices are projected to decline by \$0.21 per gallon, while distillers grain prices are about the same.
- Projected corn prices increase \$0.57 per bushel, increasing ethanol costs by \$0.19 per gallon. Natural gas costs are projected to decline relative to the high levels of the final months of 2005.

Margin Changes Between 2005/06 and 2012/13



- To get a rough sense of the risk to ethanol dry mill gross margins in the future, we looked at 500 alternative solutions for 2012/13.
- On average, the projected gross margin is about \$0.76 per gallon in 2012/13.
- In the 50 outcomes (10% of the total outcomes) with the lowest gross margins, the average gross margin was \$0.38 per gallon, about the same as the 1997/98 margin (the lowest margin in the last 10 years).

Gross Margin Comparisons



- If the stochastic analysis is reliable, it appears the biggest risk to ethanol dry mill gross margins is the price of ethanol.
- In the 50 outcomes for 2012 with the lowest gross margins, the average ethanol price was \$0.34 per gallon below the average projected price. These low ethanol prices were in turn associated with low unleaded gasoline prices.
- Corn prices were also higher in those outcomes with low margins, but the corn price only accounted for \$0.09 per gallon in reduced margins.

2012 Gross Margins: Lowest 10% vs. Average

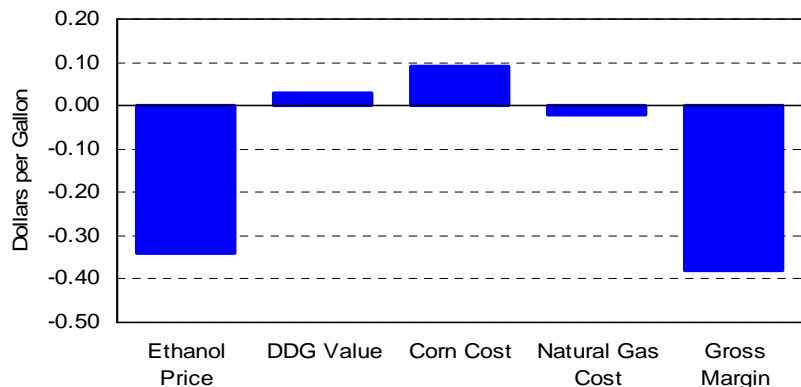


Table 4. Years with High and Low Ethanol Gross Margins

	Lowest Margin in Last 10 Years (1997/98)	Highest Margin in Next 10 Years (2005/06)	Lowest Margin in Next 10 Years (2012/13)	2012/13 vs. 2005/06
	(dollars per gallon)			
Value of Ethanol	1.10	1.86	1.65	-0.21
Value of DDG	0.34	0.24	0.24	0.00
Selected Revenues	1.44	2.10	1.90	-0.21
Corn Cost	0.91	0.70	0.89	0.19
Natural Gas Cost	0.14	0.33	0.25	-0.08
Selected Costs	1.05	1.03	1.14	0.10
Gross Margin	0.39	1.07	0.76	-0.31
Unleaded Gasoline Price	0.55	1.66	1.41	-0.25
	(dollars per bushel)			
Corn Price	2.43	1.90	2.46	0.57

Table 5. Ethanol Gross Margins in 2012: Stochastic Results

	Average of All 500 Outcomes	50 Outcomes with Highest Margins	50 Outcomes with Lowest Margins	50 Lowest Outcomes vs. Avg. of All 500 Outcomes
	(dollars per gallon)			
Value of Ethanol	1.65	2.15	1.32	-0.34
Value of DDG	0.24	0.22	0.27	0.03
Selected Revenues	1.90	2.37	1.59	-0.30
Corn Cost	0.89	0.86	0.98	0.09
Natural Gas Cost	0.25	0.27	0.23	-0.02
Selected Costs	1.14	1.13	1.22	0.08
Gross Margin	0.76	1.25	0.38	-0.38
Unleaded Gasoline Price	1.41	2.11	0.92	-0.49
	(dollars per bushel)			
Corn Price	2.46	2.38	2.72	0.26

Source: FAPRI estimates.