

ETHANOL PROFIT MARGINS -- JANUARY 2009

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Iowa, along with several other Midwestern states, is at the tail end of the corn ethanol boom that has generally benefitted the state and many rural communities. However, volatility in corn and ethanol markets, caused by a variety of economic and political factors, has slowed expansion and profitability of the industry.

From a public policy perspective this leaves several questions unanswered. Will ethanol plants go bust? How do high corn or low ethanol prices affect expenses and revenues? What are the expected net profits or losses? Do local incentives matter to the plant's bottom line? The purpose of this analysis is to assist policy makers in understanding the future economic viability of ethanol plants under current price scenarios.

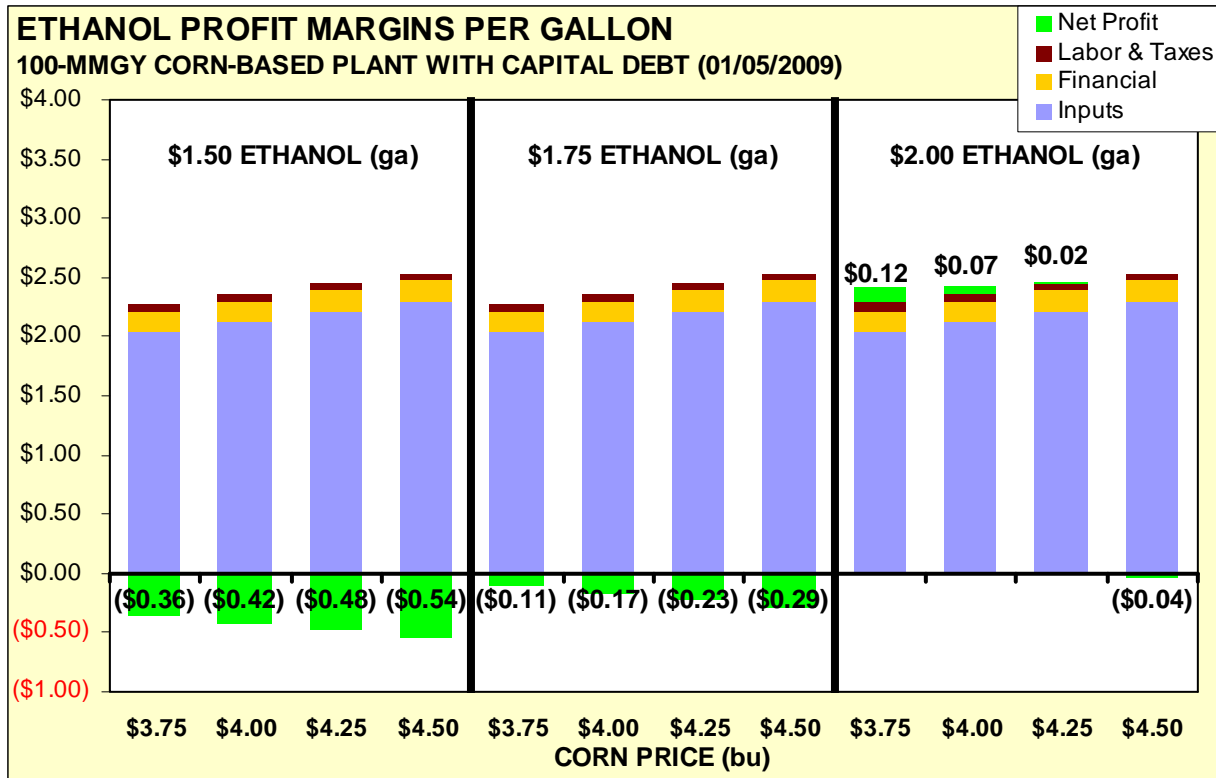
CURRENT PRICES

In early January 2009 spot prices for ethanol at Iowa plants ranged between \$1.45 to \$1.60 per gallon; and ethanol futures ranged from \$1.72 to \$1.79 for delivery after July 2009.

In this same period, spot bids for corn given at Iowa plants ranged from \$3.77 to \$3.97 per bushel; and 2009 corn futures were \$4.12 for March, \$4.33 for July, and \$4.56 for December.

PROFIT MARGINS – PLANTS WITH CAPITAL DEBT COSTS

This scenario is for a 100 million gallon per year (MMGY) corn-based ethanol plant built in 2005 and financing 60 percent of its capital costs at 8 percent interest per annum for 10 years. Debt and depreciation costs \$0.18 per gallon of ethanol produced, and labor and taxes generally cost \$0.06 per gallon.



At roughly the **current spot price for ethanol of \$1.50 per gallon**, ethanol plants with capital debt are expected to lose money at current and near-time corn prices.

- At \$3.75 per bushel corn prices (close to current spot bids), plants stand to lose \$0.36 per gallon of ethanol produced, equaling \$38.88 million dollars lost annually. For investors this is a 56% loss in the annual equity rate of return.
- At \$4.50 per bushel corn prices (close to December 2009 bids), plants lose \$0.54 per gallon of ethanol produced or a \$53.85 million dollar annual loss. Investors would experience an equity loss of 84% in the current year.
- In order for plants to break even, corn would need to fall to \$2.25 per bushel.

At about the **near-term ethanol futures price of \$1.75 per gallon**, ethanol plants with capital debt are also expected to operate at a net loss. However, the losses are much smaller than under the \$1.50 ethanol scenario.

- At \$3.75 per bushel corn prices, plants lose \$0.11 per gallon of ethanol produced, equaling a \$10.88 million dollar loss annually. The annual equity rate of return for investors is a loss of 17%.
- At \$4.50 per bushel corn prices, plants stand to lose \$0.29 per gallon of ethanol produced, totaling \$28.85 million dollars in annual losses. In the current year investors would experience an equity loss of 45%.
- In order for plants to break even, corn would need to fall to \$3.30 per bushel.



Although near-term ethanol prices are not expected to reach this mark, if the **high price for ethanol were \$2.00 per gallon** plants with capital debt are expected to make a small profit at current corn prices and break even at near-term prices.

- At \$3.75 per bushel corn prices (close to current spot bids), plants earn a net profit of \$0.12 per gallon of ethanol produced, equaling a \$12.43 million dollar annual profit. For investors this is an 18% gain in the annual equity rate of return.
- At \$4.50 per bushel corn prices (close to December 2009 bids), plants lose \$0.04 per gallon of ethanol produced or a \$3.85 million dollar annual loss. Investors would lose 6% in equity returns annually.

PROFIT MARGINS – PLANTS WITH NO CAPITAL DEBTS

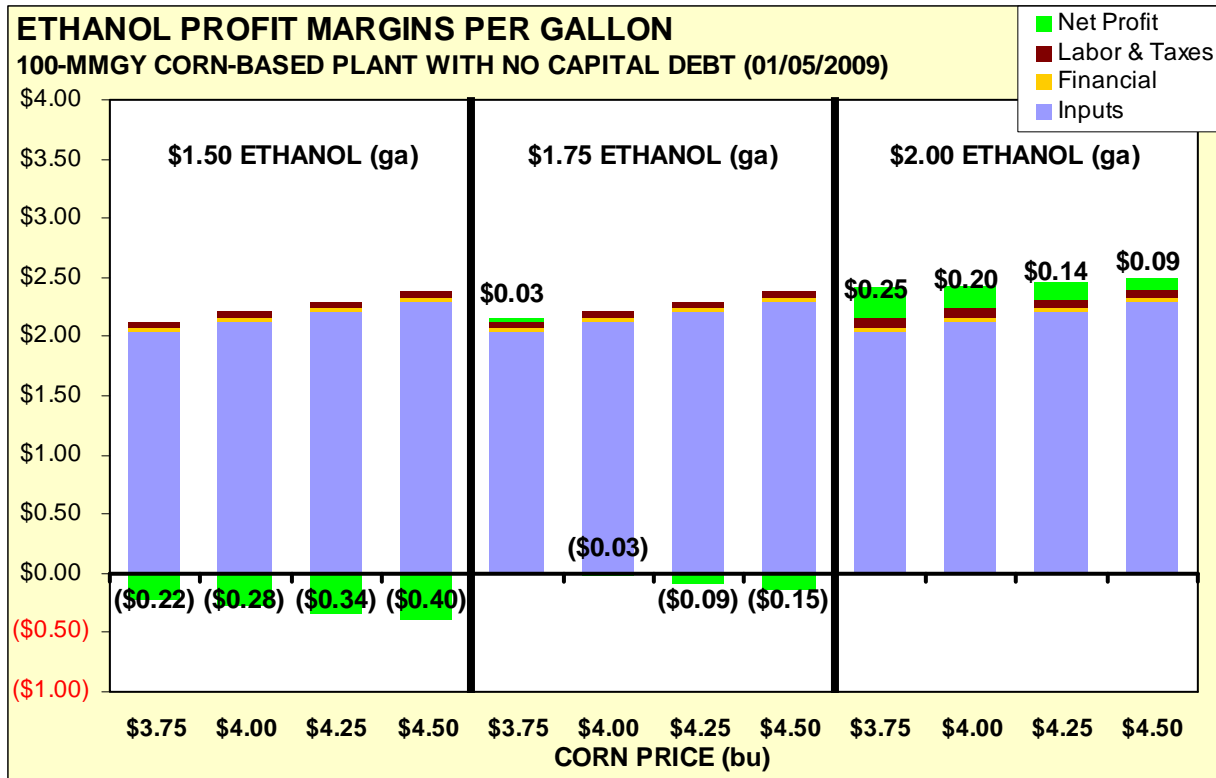
This scenario is for a 100 million gallon per year (MMGY) corn-based ethanol plant built in 2005 that is all investor-owned with no capital debt costs. Labor and taxes generally cost \$0.06 per gallon of ethanol produced, and depreciation costs \$0.04 per gallon.

At the **current spot price for ethanol of \$1.50 per gallon**, debt-free ethanol plants are expected to lose money at current and near-time corn prices.

- At \$3.75 per bushel corn prices (close to current spot bids), plants are expected to lose \$0.22 per gallon of ethanol produced, totaling \$21.60 million dollars annually. For investors this is a 14% loss in the annual equity rate of return.
- At \$4.50 per bushel corn prices (close to December 2009 bids), plants lose \$0.40 per gallon of ethanol produced, equaling a \$39.57 million dollar annual loss. Investors would experience an equity loss of 25% in the current year.
- In order for plants to break even, corn would need to fall to \$2.85 per bushel.

At the **near-term ethanol futures price of \$1.75 per gallon**, debt-free ethanol plants are expected to break even at current prices but experience small net losses at near-term prices.

- At \$3.75 per bushel corn prices, generate a small net profit of \$0.03 per gallon of ethanol produced, amounting to \$2.99 million dollars in profits annually. The annual equity rate of return for investors is a gain of 2%.
- At \$4.50 per bushel corn prices, plants lose \$0.15 per gallon of ethanol produced or a \$14.57 million dollar annual loss. In the current year investors would experience an equity loss of 9%.
- At these ethanol prices the break even corn price \$3.90 per bushel.



Although near-term ethanol prices are not expected to reach this mark, if the **high price for ethanol were \$2.00 per gallon** plants with no capital debt generate sizable profits, especially at current corn prices.

- At \$3.75 per bushel corn prices (close to current spot bids), plants generate a sizable \$0.25 of profit per gallon of ethanol produced or \$24.99 million dollars in annual profits. For investors this represents a 15% gain in the annual equity rate of return.
- At \$4.50 per bushel corn prices (close to December 2009 bids), plants generate a smaller net profit of \$0.09 per gallon of ethanol produced or \$9.18 million dollars in annual profits. Investors would gain 5% in equity returns annually.



SUMMARY

For ethanol plants with **capital debt costs** the **ethanol break even price ranges from \$1.85 to \$2.05 per gallon**. This is higher than the near-term ethanol price of \$1.72 to \$1.75 per gallon. Thus, ethanol plants with capital costs are expected to generate net losses in the near-term.

- At \$3.75 corn the ethanol break even price with debt is \$1.85 per gallon.
- At \$4.00 corn the ethanol break even price with debt is \$1.90 per gallon.
- At \$4.25 corn the ethanol break even price with debt is \$2.00 per gallon.
- At \$4.50 corn the ethanol break even price with debt is \$2.05 per gallon.

For **debt-free** ethanol plants with no capital costs **the ethanol break even price ranges from \$1.70 to \$1.90 per gallon**. Under near-term ethanol prices, debt-free plants are expected generate small net profits when corn prices range between \$3.75 and \$4.00 per bushel. However, debt-free plants begin to generate larger net losses as corn rises above \$4.25 per bushel.

- At \$3.75 corn the ethanol break even price is \$1.70 per gallon.
- At \$4.00 corn the ethanol break even price is \$1.80 per gallon.
- At \$4.25 corn the ethanol break even price is \$1.85 per gallon.
- At \$4.50 corn the ethanol break even price is \$1.90 per gallon.

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TECHNICAL NOTES

To understand ethanol plant economics requires a model of how plants operate in terms of revenues and costs. This analysis models a 100-MMGY ethanol plant that was constructed in 2005 and represents the viability of most ethanol plants in Iowa and Nebraska.

In terms of production capacity, the 100-MMGY plant is assumed to operate at 100 percent capacity with an ethanol yield of 2.9 per bushel, a dry distiller's grains yield of 19.0 lbs. per bushel of corn, and a carbon dioxide yield of 17.5 lbs. per bushel of corn. Energy and water inputs 7 gallons of water per bushel of corn, 1.1 kilowatt hours of electricity per gallon of ethanol, and 35,000 BTUs of natural gas per gallon of ethanol. Production information is taken from Tiffany and Eidman (2003) at the University of Minnesota, and Swenson and Eathington (2006) at Iowa State University.

Investment costs are the total capital needed to construct and equip an ethanol plant. Capital costs of a 100-MMGY plant built in 2005 are estimated at \$160 million in nominal dollars. Investment information is taken from Gallagher, Brubaker, and Shapouri (2005) at Iowa State University. For financial matters it is assumed that plants are financed through 60 percent debt (paid over 10 years at 8 percent interest per annum) and 40 percent equity (with an expected return of 15 percent per annum). Straight-line depreciation is assumed over 20 years with a salvage value equaling 25 percent of total investment costs.

Labor requirements assume that a 100-MGY plant will need to employ 45 workers at an average annual wage per job of \$47,750. Benefits are estimated at 13 percent of the wage base. Other labor and management costs are assumed to be 10 percent of total wage costs. Labor information is taken from the Nebraska Department of Labor's employment and wages database.

In terms of inputs, corn costs are taken from the Chicago Board of Trade and Ethanol Plant Reports from USDA Market News. Water costs are taken from the Iowa Department of Natural Resources. Electricity and natural gas costs for Iowa are taken from the U.S. Department of Energy. Costs of secondary inputs are taken from primary data collected by Tiffany and Eidman (2003) and Swenson and Eathington (2006). Secondary inputs include enzymes, denaturants, yeasts, chemicals for processing and cooling, various antibiotics, waste management, maintenance, transportation costs, and miscellaneous administrative costs. Transportation costs are estimated by assuming the plant ships out ethanol on rail to rack markets 200 miles away, and trucks in corn from 15 miles away.

In terms of revenues, ethanol prices are taken from the Chicago Board of Trade and Ethanol Plant Reports from USDA Market News. Dry distiller grain prices are assumed to be 90 percent of corn prices on a dry-matter basis. Prices for carbon dioxide are taken from Tiffany and Eidman (2003).

Taxes are estimated from data provided by the Iowa Department of Revenue. Property taxes are estimated at 1.75 percent of assessed valuation (estimated at 90 percent of total investment). Sales taxes are assumed to be levied on 50 percent of the input costs for enzymes, yeasts, and chemicals. Corporate income taxes are applied to any gross profit, with a rate of 6 percent on the first \$25,000 raising to 12 percent on profits over \$250,000. Insurance trust taxes are estimated at 10 percent of total wages paid; and includes Social Security, Medicare, unemployment, and workers compensation. No federal or state ethanol production tax credits are including in this analysis. Local incentives, such as tax increment financing, are not considered in this analysis.

Gallagher, P., H. Brubaker, and H. Shapouri. 2005. "Plant-Size: Capital Costs Relationships in the Dry Mill Ethanol Industry." *Biomass and Bioenergy* 28: 565-571.

Swenson, D. and L. Eathington. 2006. *Determining the Regional Economic Value of Ethanol Production in Iowa Considering Different Levels of Local Investment*. BIOE-2006-01. Ames, IA: Department of Economics, Iowa State University.

Tiffany, D. and V.R. Eidman. 2003. *Factors Associated with Success of Fuel Ethanol Producers*. P037. St. Paul, MN: Department of Applied Economics, University of Minnesota.

U.S. Department of Energy. 2006. *State Energy Consumption, Price, and Expenditure Estimates* [datafile]. Washington, DC: Energy Information Administration, U.S. Department of Energy [producer].



**ETHANOL PLANT ECONOMICS TOOL FOR
Hypothetical 100 MGY Plant with Capital Debt Costs
Central Iowa, January 2009**

OPERATIONS ANALYSIS

	BASE	<u>\$1.50 PER GALLON ETHANOL</u>				<u>\$1.75 PER GALLON ETHANOL</u>				<u>\$2.00 PER GALLON ETHANOL</u>			
		<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>	<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>	<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>
PRODUCTION INFORMATION													
<i>PRIMARY INPUT REQUIRMENTS</i>													
Corn (bu)		34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759
Water (ga)		241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310
Electricity (KwH)		110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000
Natural Gas (millionBTU)		3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000
<i>PRODUCTION YIELD</i>													
Denatured Alcohol (ga)		100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Distillers Grains (ton)		327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586
CO**2 (ton)		301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724
COSTS													
<i>INPUT COSTS</i>													
Corn, including transport costs		\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414	\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414	\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414
Water plus Treatment		\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750
Electricity		\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868
Natural Gas		\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606
Enzymes		\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220
Yeasts		\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184
Chemicals: Processing & Antibiotics		\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703
Chemicals: Boiling & Cooling		\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204
Denaturants		\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202
Waste Management		\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538
Maintenance		\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197
Alcohol Rail Transportation		\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808
Corn Truck Transportation		\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513
Management		\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832
All Other & Unspecified		\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610
<i>FINANCIAL COSTS</i>													
Debt Payment		\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029	\$14,281,029
Depreciation		\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000
<i>LABOR COSTS AND TAXES</i>													
Wages and Salaries		\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323
Benefits		\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282
Insurance Trust Taxes		\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832
State Sales Taxes		\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219
Local Property Taxes		\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000
Local Sales Taxes		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Special Tax Assessments & Payments		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Costs		\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335	\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335	\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335
REVENUES													
Denatured Alcohol		\$150,000,000	\$150,000,000	\$150,000,000	\$150,000,000	\$175,000,000	\$175,000,000	\$175,000,000	\$175,000,000	\$200,000,000	\$200,000,000	\$200,000,000	\$200,000,000
Distillers Grains		\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319	\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319	\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319
CO**2		\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155
Total Revenues		\$191,083,254	\$193,715,328	\$196,347,401	\$198,979,474	\$216,083,254	\$218,715,328	\$221,347,401	\$223,979,474	\$241,083,254	\$243,715,328	\$246,347,401	\$248,979,474

		<u>\$1.50 PER GALLON ETHANOL</u>				<u>\$1.75 PER GALLON ETHANOL</u>				<u>\$2.00 PER GALLON ETHANOL</u>			
PROFITS AND LOSSES	BASE	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn
GROSS AND NET PROFIT/LOSS													
Total Revenues		\$191,083,254	\$193,715,328	\$196,347,401	\$198,979,474	\$216,083,254	\$218,715,328	\$221,347,401	\$223,979,474	\$241,083,254	\$243,715,328	\$246,347,401	\$248,979,474
Total Costs		\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335	\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335	\$226,967,266	\$235,587,956	\$244,208,645	\$252,829,335
Less Federal & State Govt Incentives		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Less Local Govt Incentives		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gross Profit/Loss		(\$35,884,012)	(\$41,872,628)	(\$47,861,245)	(\$53,849,861)	(\$10,884,012)	(\$16,872,628)	(\$22,861,245)	(\$28,849,861)	\$14,115,988	\$8,127,372	\$2,138,755	(\$3,849,861)
Less Corporate Income Taxes		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1,686,419	\$967,785	\$249,151	\$0
Net Profit/Loss		(\$35,884,012)	(\$41,872,628)	(\$47,861,245)	(\$53,849,861)	(\$10,884,012)	(\$16,872,628)	(\$22,861,245)	(\$28,849,861)	\$12,429,570	\$7,159,587	\$1,889,605	(\$3,849,861)
ALLOCATION OF NET PROFIT/LOSS													
Annual Reserves		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$621,478	\$357,979	\$94,480	\$0
Cumulative Reserves		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Debt Reduction Payment		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equity Dividends		(\$35,884,012)	(\$41,872,628)	(\$47,861,245)	(\$53,849,861)	(\$10,884,012)	(\$16,872,628)	(\$22,861,245)	(\$28,849,861)	\$11,808,091	\$6,801,608	\$1,795,125	(\$3,849,861)
Local Dividends		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equity Rate of Return		(56%)	(65%)	(75%)	(84%)	(17%)	(26%)	(36%)	(45%)	18%	11%	3%	(6%)
PROFIT/LOSS PER GALLON													
	BASE	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn
Total Revenues Per Gallon		\$1.91	\$1.94	\$1.96	\$1.99	\$2.16	\$2.19	\$2.21	\$2.24	\$2.41	\$2.44	\$2.46	\$2.49
Denatured Alcohol		\$1.50	\$1.50	\$1.50	\$1.50	\$1.75	\$1.75	\$1.75	\$1.75	\$2.00	\$2.00	\$2.00	\$2.00
Distillers Grains		\$0.39	\$0.42	\$0.45	\$0.47	\$0.39	\$0.42	\$0.45	\$0.47	\$0.39	\$0.42	\$0.45	\$0.47
CO ²		\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02
Total Costs Per Gallon		\$2.27	\$2.36	\$2.44	\$2.53	\$2.27	\$2.36	\$2.44	\$2.53	\$2.27	\$2.36	\$2.44	\$2.53
Input Costs Per Gallon		\$2.04	\$2.12	\$2.21	\$2.29	\$2.04	\$2.12	\$2.21	\$2.29	\$2.04	\$2.12	\$2.21	\$2.29
Financial Costs Per Gallon		\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18	\$0.18
Labor Costs & Taxes Per Gallon		\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06
Less Government Incentives		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Gross Profit/Loss Per Gallon		(\$0.36)	(\$0.42)	(\$0.48)	(\$0.54)	(\$0.11)	(\$0.17)	(\$0.23)	(\$0.29)	\$0.14	\$0.08	\$0.02	(\$0.04)
Less Corporate Income Tax		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.02	\$0.01	\$0.00	\$0.00
Net Profit/Loss Per Gallon		(\$0.36)	(\$0.42)	(\$0.48)	(\$0.54)	(\$0.11)	(\$0.17)	(\$0.23)	(\$0.29)	\$0.12	\$0.07	\$0.02	(\$0.04)

**ETHANOL PLANT ECONOMICS TOOL FOR
Hypothetical 100 MGY Plant with No Debt
Central Iowa, January 2009**

OPERATIONS ANALYSIS

	BASE	<u>\$1.50 PER GALLON ETHANOL</u>				<u>\$1.75 PER GALLON ETHANOL</u>				<u>\$2.00 PER GALLON ETHANOL</u>			
		<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>	<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>	<u>\$3.75 Corn</u>	<u>\$4.00 Corn</u>	<u>\$4.25 Corn</u>	<u>\$4.50 Corn</u>
PRODUCTION INFORMATION													
<i>PRIMARY INPUT REQUIRMENTS</i>													
Corn (bu)		34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759	34,482,759
Water (ga)		241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310	241,379,310
Electricity (KwH)		110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000	110,000,000
Natural Gas (millionBTU)		3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000	3,500,000
<i>PRODUCTION YIELD</i>													
Denatured Alcohol (ga)		100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Distillers Grains (ton)		327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586	327,586
CO**2 (ton)		301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724	301,724
COSTS													
<i>INPUT COSTS</i>													
Corn, including transport costs		\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414	\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414	\$129,310,345	\$137,931,034	\$146,551,724	\$155,172,414
Water plus Treatment		\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750	\$1,054,750
Electricity		\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868	\$5,378,868
Natural Gas		\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606	\$32,382,606
Enzymes		\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220	\$5,711,220
Yeasts		\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184	\$2,619,184
Chemicals: Processing & Antibiotics		\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703	\$2,380,703
Chemicals: Boiling & Cooling		\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204	\$596,204
Denaturants		\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202	\$4,165,202
Waste Management		\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538	\$1,983,538
Maintenance		\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197	\$1,378,197
Alcohol Rail Transportation		\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808	\$11,040,808
Corn Truck Transportation		\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513	\$799,513
Management		\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832
All Other & Unspecified		\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610	\$4,568,610
<i>FINANCIAL COSTS</i>													
Debt Payment		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Depreciation		\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000	\$3,600,000
<i>LABOR COSTS AND TAXES</i>													
Wages and Salaries		\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323	\$2,148,323
Benefits		\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282	\$279,282
Insurance Trust Taxes		\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832	\$214,832
State Sales Taxes		\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219	\$339,219
Local Property Taxes		\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000	\$2,520,000
Local Sales Taxes		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Special Tax Assessments & Payments		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Costs		\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306	\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306	\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306
REVENUES													
Denatured Alcohol		\$150,000,000	\$150,000,000	\$150,000,000	\$150,000,000	\$175,000,000	\$175,000,000	\$175,000,000	\$175,000,000	\$200,000,000	\$200,000,000	\$200,000,000	\$200,000,000
Distillers Grains		\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319	\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319	\$39,481,099	\$42,113,172	\$44,745,246	\$47,377,319
CO**2		\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155	\$1,602,155
Total Revenues		\$191,083,254	\$193,715,328	\$196,347,401	\$198,979,474	\$216,083,254	\$218,715,328	\$221,347,401	\$223,979,474	\$241,083,254	\$243,715,328	\$246,347,401	\$248,979,474

		<u>\$1.50 PER GALLON ETHANOL</u>				<u>\$1.75 PER GALLON ETHANOL</u>				<u>\$2.00 PER GALLON ETHANOL</u>			
PROFITS AND LOSSES	BASE	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn
GROSS AND NET PROFIT/LOSS													
Total Revenues		\$191,083,254	\$193,715,328	\$196,347,401	\$198,979,474	\$216,083,254	\$218,715,328	\$221,347,401	\$223,979,474	\$241,083,254	\$243,715,328	\$246,347,401	\$248,979,474
Total Costs		\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306	\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306	\$212,686,237	\$221,306,926	\$229,927,616	\$238,548,306
Less Federal & State Govt Incentives		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Less Local Govt Incentives		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gross Profit/Loss		(\$21,602,983)	(\$27,591,599)	(\$33,580,215)	(\$39,568,832)	\$3,397,017	(\$2,591,599)	(\$8,580,215)	(\$14,568,832)	\$28,397,017	\$22,408,401	\$16,419,785	\$10,431,168
Less Corporate Income Taxes		\$0	\$0	\$0	\$0	\$400,142	\$0	\$0	\$0	\$3,400,142	\$2,681,508	\$1,962,874	\$1,244,240
Net Profit/Loss		(\$21,602,983)	(\$27,591,599)	(\$33,580,215)	(\$39,568,832)	\$2,996,875	(\$2,591,599)	(\$8,580,215)	(\$14,568,832)	\$24,996,875	\$19,726,893	\$14,456,911	\$9,186,928
ALLOCATION OF NET PROFIT/LOSS													
Annual Reserves		\$0	\$0	\$0	\$0	\$149,844	\$0	\$0	\$0	\$1,249,844	\$986,345	\$722,846	\$459,346
Cumulative Reserves		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Debt Reduction Payment		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equity Dividends		(\$21,602,983)	(\$27,591,599)	(\$33,580,215)	(\$39,568,832)	\$2,847,032	(\$2,591,599)	(\$8,580,215)	(\$14,568,832)	\$23,747,032	\$18,740,548	\$13,734,065	\$8,727,582
Local Dividends		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equity Rate of Return		(14%)	(17%)	(21%)	(25%)	2%	(2%)	(5%)	(9%)	15%	12%	9%	5%
PROFIT/LOSS PER GALLON													
	BASE	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn	\$3.75 Corn	\$4.00 Corn	\$4.25 Corn	\$4.50 Corn
Total Revenues Per Gallon		\$1.91	\$1.94	\$1.96	\$1.99	\$2.16	\$2.19	\$2.21	\$2.24	\$2.41	\$2.44	\$2.46	\$2.49
Denatured Alcohol		\$1.50	\$1.50	\$1.50	\$1.50	\$1.75	\$1.75	\$1.75	\$1.75	\$2.00	\$2.00	\$2.00	\$2.00
Distillers Grains		\$0.39	\$0.42	\$0.45	\$0.47	\$0.39	\$0.42	\$0.45	\$0.47	\$0.39	\$0.42	\$0.45	\$0.47
CO ²		\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02	\$0.02
Total Costs Per Gallon		\$2.13	\$2.21	\$2.30	\$2.39	\$2.13	\$2.21	\$2.30	\$2.39	\$2.13	\$2.21	\$2.30	\$2.39
Input Costs Per Gallon		\$2.04	\$2.12	\$2.21	\$2.29	\$2.04	\$2.12	\$2.21	\$2.29	\$2.04	\$2.12	\$2.21	\$2.29
Financial Costs Per Gallon		\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04	\$0.04
Labor Costs & Taxes Per Gallon		\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06	\$0.06
Less Government Incentives		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Gross Profit/Loss Per Gallon		(\$0.22)	(\$0.28)	(\$0.34)	(\$0.40)	\$0.03	(\$0.03)	(\$0.09)	(\$0.15)	\$0.28	\$0.22	\$0.16	\$0.10
Less Corporate Income Tax		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.03	\$0.03	\$0.02	\$0.01
Net Profit/Loss Per Gallon		(\$0.22)	(\$0.28)	(\$0.34)	(\$0.40)	\$0.03	(\$0.03)	(\$0.09)	(\$0.15)	\$0.25	\$0.20	\$0.14	\$0.09