



## Updated Corn Ethanol Economics

Posted by [Robert Rapier](#) on June 25, 2008 - 10:00am

Topic: [Alternative energy](#)

Tags: [corn prices](#), [economics](#), [ethanol](#), [ethanol prices](#), [investing](#), [natural gas](#), [original](#) [[list all tags](#)]

37  
diggs

[digg it](#)

**Executive Summary:** The current cost to produce a gallon of ethanol is approximately \$3/gal. The current price of ethanol is \$2.86/gal, which explains why [ethanol producers are shutting down](#). If corn and natural gas prices remain high, I think ethanol has to rise to something like \$3.40-\$3.60/gal to make it worthwhile to ethanol producers. So, if I was a commodities investor, I would probably go long ethanol right now. The only risk factors I can see - given that there is a mandated (and rising) demand for ethanol - is if corn or natural gas prices collapse. The other remote possibility is that that mandate is repealed, but I don't see that happening.

This is an update to a post I originally made back in February 2008: [Corn Ethanol Economics](#). While this is approximate, I think I captured most of the major economic considerations. In fact, one of the comments I received following the first essay was: *"I work in an ethanol plant. Those numbers are pretty accurate, but the price we get for ethanol has been going up lately. Our margins have been poor lately, but are improving. But you did capture the important economic factors that have hurt us lately."*

Since then, natural gas, corn, and ethanol prices have all risen. So what do the economics look like today? The following is my previous analysis, with updated numbers.

I found multiple references for all of the numbers I am going to use, but I will only reference a single source. According to [Ethanol Reshapes the Corn Market](#), one 56-pound bushel of corn will yield up to 2.7 gallons of ethanol and 17.4 pounds of [distiller's dried grains](#) with solubles (DDGS).

The [price of corn for July delivery](#) as of this writing is \$7.24/bushel, so each gallon of ethanol contains  $\$7.24/2.7$ , or \$2.68 of corn per gallon of ethanol. However, the DDGS can be sold, so a credit is applied for that. The [current price of DDGS](#) as of this writing is \$175/ton, which is \$0.0875/lb. Given that a bushel of corn yields 17.4 pounds of DDGS, there is then a \$1.52 credit, which spread over 2.7 gallons is equal to \$0.56 gallon. This reduces our cost per gallon to \$2.68 minus \$0.56, or \$2.12 for just the corn input. (Note that there is sometimes a credit for carbon dioxide sales, but it is very small relative to the other costs and credits).

I still have to consider utilities (natural gas is a major cost), labor, enzyme and yeast costs, and depreciation. I have a spreadsheet from an actual ethanol plant, but there isn't much in the public domain that I could find on this. The closest thing to a source on these is the spreadsheet in the presentation [Fossil Fuels and Ethanol Plant Economics](#) (for a standard dry mill process). If you look at Page 16 of the presentation, you can see that all of the miscellaneous costs together total approximately as much as the corn inputs. If you take the spreadsheet on Page 24 and change the natural gas price to the [current price of \\$13.20/MMBTU](#), you get an overall energy cost of

\$0.51/gal of ethanol. (You can play around with the original spreadsheet that is in the PDF [here](#)). The sum of enzymes, yeast, and other chemicals comes out to be \$0.14/gal, and labor, maintenance, and various miscellaneous expenses add another \$0.23/gal.

On depreciation, I have several sources for capital costs that are pretty consistent. In the EIA's [Energy Outlook 2006](#), capital costs per daily barrel of corn ethanol ranged from \$20,000 to \$30,000, depending on the size of the plant. This breaks down to between \$1.30 and \$1.95 per gallon of installed capacity. This is also consistent with [A Guide for Evaluating the Requirements of Ethanol Plants](#), which states "*Current capital cost per annual gallon of installed capacity for an ethanol plant ranges from \$1.25 to \$2.00.*" So let's be conservative and say that we want to build a big plant, so the capital costs are on the low end at \$1.30/gallon. Depreciate that over 15 years and this portion amounts to about \$0.08 per gallon (but is captured above already).

However, for biomass to liquids facilities - which would include the biomass gasification to ethanol that some are calling cellulosic ethanol - the capital costs in the EIA's Energy Outlook 2006 are listed at around 5 times that of a conventional corn ethanol plant. Thus, the capital depreciation portion is going to be around \$0.40 per gallon of ethanol. (On the other hand, the feed costs should be much lower).

## Summary

Times are tough for ethanol producers. This is what the economics roughly look like at \$7.24 per bushel of corn and \$13.20/MMBTU of natural gas. To produce 1 gallon of ethanol requires:

- \$2.68 of corn
- \$0.51 of energy
- \$0.14 of enzymes, yeast, etc.
- \$0.23 of labor, maintenance, and various miscellaneous expenses

There is a DDGS credit per gallon of ethanol of \$0.56. Thus, the total cost to produce a gallon of ethanol today is \$2.68 + \$0.51 + \$0.14 + \$0.23 - \$0.56, or exactly \$3/gallon of ethanol. For reference, the [July contract for ethanol in the Midwest](#) closed yesterday at \$2.86. And \$3/gallon is merely cost of production. It doesn't take into account any return on investment.

Also note that due to the lower energy content, this production cost is equivalent to a \$4.48 per gallon production cost for gasoline (\$3/0.67) - and that this production cost is a moving target: As long as the ethanol mandates are driving up the price of corn and increasing the demand for and cost of natural gas, corn ethanol producers must [chase their tails in a vicious circle](#).

Producers are going to be hard-pressed to ever match the 2006 windfall that was given to them when the MTBE phaseout drove ethanol prices sky-high. But my conclusion is - since ethanol is mandated - some marginal producers will shut down and prices will rise. If everything else remained constant, I think ethanol would have to rise to something like \$3.40-\$3.60/gal to make it worthwhile to ethanol producers. So, if I was a commodities investor, I would probably go long ethanol right now.



This work is licensed under a [Creative Commons Attribution-Share Alike 3.0 United States License](#).