

How Grain Ethanol Plants Affect Local Grain Prices

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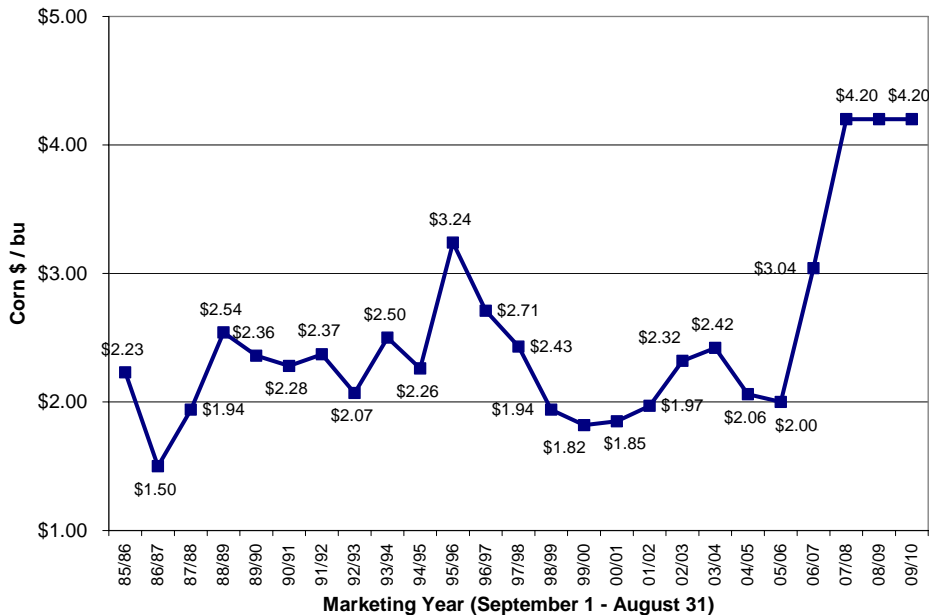
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Crop producers in the United States have had both local and broader economic motivations for construction of starch-based ethanol plants in the United States over the last two to three decades. In local grain markets crop producers often sought to boost regional feedgrain demand and market prices through the establishment of local ethanol plants. In situations where farmers had actual ownership interests in these same ethanol plants, they were also motivated by the potential profits that those plants could earn. From a broader economic perspective, crop producers and their representative organizations have also worked to increase demand for U.S. feedgrains through the growth of the U.S. grain ethanol industry.

Feedgrain prices in the U.S. trended level-to-sideways from the 1985/86 through 2005/06 marketing years. This sideways price trend persisted at the same time that costs of feedgrain production continued to increase. To try to maintain or increase their profitability in this economic environment, feedgrain producers relied on genetic improvements in crop yields and cost efficiency-increasing management practices (including increasing farm size to attain production cost diminishing economies of size). During the 20 year period beginning with the 1985/86 marketing year, U.S. corn prices averaged \$2.23 per bushel, ranging from \$1.50 to \$3.24, with a very slight negative trend of $-\$0.00225$ per bushel (Figure 1). Throughout this period U.S. annual weighted average cash corn prices only averaged greater than \$2.71 per bushel one time (i.e., \$3.24 per bu. during the 1995/96 marketing year).

Figure 1. U.S. Corn Weighted Average Prices



However, U.S. grain prices have increased markedly since the 2006/07 marketing year due to a) increased feedgrain demand from ethanol production, b) tightening U.S. and World stocks of feedgrains, wheat and oilseeds, and c) spillover effects from volatile energy, currency and financial markets. As a result, U.S. weighted average corn prices climbed to \$3.04 per bushel for the 2006/07 marketing year, and up to \$4.20 during the 2007/08 – 2009/10 marketing years (Figure 1). Although there are a number of reasons why U.S. corn prices have increased during the last four marketing years, increased demand for feedgrains for use in ethanol production has been a major contributing factor.

In perspective, the prolonged period of relatively low grain prices from the 1985/86 through 2005/06 marketing years provided U.S. crop producers with strong incentives to support and promote efforts to increase feedgrain demand, including the development of the U.S. grain ethanol industry. To the degree that the existence of grain ethanol plants in local / regional grain markets had a positive affect upon local feedgrain prices, farmers benefited in terms of increased feedgrain sales revenues.

Local Grain Market Impacts of Ethanol Plants

To help determine whether local grain prices were actually increased by the existence of grain ethanol plants, Agricultural Economists Kevin McNew and Duane Griffith published a study in 2005 on “Measuring the Impact of Ethanol Plants on Local Grain Prices” (Review of Agricultural Economics, volume 27, pages 164-180). Their study developed a model of “spatial equilibrium” that illustrated the impact on regional corn prices from introducing an ethanol plant. With this model McNew and Griffith (hereafter referred to as “McNew-Griffith”) were able to estimate the local impact on cash corn prices from twelve (12) local corn-based ethanol plants that opened in the United States between 2001 and 2003.

One focus of their research was on how transportation costs lead to declining grain prices as the distance away from a grain demand center (such as an ethanol plant or grain export terminal) increases. A second focus was on how shocks to national and local grain demand, supply, or transportation costs can cause changes in patterns of grain trade, and lead to differential impacts on farm-level and terminal grain market prices. The introduction of a new demand source such as a corn-ethanol plant can cause shifts in grain trade patterns as well as adjustments to the geographic or spatial relationships of grain prices in the area around the ethanol plant.

Recent examination of the Kansas grain market (O’Brien, 2009) has produced preliminary results at odds with those of McNew-Griffith in regards to the impact of ethanol plants on local grain prices. This article will first examine the McNew-Griffith study in detail, and then address the question of why the findings of other studies may differ from it.

Description of the McNew-Griffith Study

Twelve (12) regions of the U.S. were studied in which ethanol plants had been established during the 2001-2003 period. Geographically, these plants ranged widely in location from Missouri to Michigan to South Dakota and Illinois. Grain price bids were available for 316 locations within

150 square mile areas centered on these 12 newly established ethanol plants. The purpose of the study was to determine whether the level of local cash corn price levels (i.e., basis bid levels) changed when ethanol plants were established.

“Upstream” and “Downstream” Market Locations: This study differentiated between “upstream” and “downstream” markets relative to the location of the ethanol plants and other terminal markets for corn. An “upstream” market is located farther away from a terminal market / demand center than the ethanol plant is. If grain from an upstream market were to be shipped downstream to a major terminal market, it would be first hauled by the ethanol plant and then on to the terminal market to be marketed. A “downstream” market is one that is located closer to a major terminal market / demand center than the ethanol plant. If grain from a downstream location were to be transported directly to a terminal market, it would not need to by-pass the ethanol plant. A downstream grain elevator is actually located somewhere between the terminal market / demand center and the ethanol plant, leaving a crop producer or grain transporter to decide literally whether it is more profitable to transport grain one direction to the ethanol plant or another direction to the terminal market.

Study Results

The findings of the McNew-Griffith study were as follows:

- **Changes in Corn Production Affect Cash Grain Basis Levels:** Corn production at the national and state levels tended to influence grain basis levels, with larger crop supplies leading to lower or weaker corn basis levels. During the 2001-2003 period, a 500 million bushel increase in the size of the U.S. corn crop caused local corn basis levels to widen by 2.3 cents per bushel. Also, decreases in state level corn production caused local basis levels to narrow or strengthen in 8 of the 9 states studied (Illinois being the only exception).
- **Effect of Ethanol Plant Distance:** Although distance from ethanol plant showed significant impacts upon grain basis in each of the regions of the U.S. that were studied, the results were not uniformly significant across all grain elevator / cash bid locations studied. Basis levels tended to increase or decrease more in accordance with ethanol plant distance when considering north / south directions than east / west directions.
- **Impact upon Cash Corn Prices from Ethanol Plants:** All 12 ethanol plant regions showed higher prices after their corresponding plants opened. The narrowing basis levels and corresponding improvement in relative cash corn prices ranged from a low of 1.5 cents to a high of 12 cents, depending on region. On average, a 5.9 cent basis increase or improvement per bushel occurred across the 150 square mile area centered around the ethanol plants in these 12 regions.
- **Cash Grain Basis Impact at the Ethanol Plant Site:** Grain price impacts were greater in the immediate geographic vicinity of the ethanol plant sites than over the whole 150 square mile area in these 12 regions. In other words, the price improvement tended to be spatially concentrated near the ethanol plant. These plant-site corn price impacts ranged from 4.6 to 19.3 cents per bushel, with an average of 12.5 cents increase in corn prices at the plants across these 12 regions.

- **Variation in “Upstream” and “Downstream” Price Impacts:** Consistent with pre-study expectations, 8 of the 12 plant regions showed constant positive impacts on grain prices from ethanol plants for “upstream” locations (i.e., those farther away from the ethanol plant than relevant terminal markets), and decaying corn price impacts at downstream locations. This left 4 of the 12 plant regions that did not show constant positive “upstream” price impacts. This finding may be due to the approach used in the study of only measuring linear distance from an ethanol plant rather than the specific type of transportation mode commonly used (i.e., truck or rail) to move grain over that distance.
- **“Downstream” Corn Price Impacts:** Given that the price impact of an ethanol plant tends to fade in downstream regions as distances from the plant grow larger and the proximity to the terminal markets grows greater, it is of interest to estimate how far “downstream” the price impact of the ethanol plant actually reaches. The estimated distance of the downstream price impact ranged from a low of 31.6 miles to a high of 101.4 miles. On average across the 9 plants for which a distance calculation could be made, the downstream price impact of the ethanol plant reached 68 miles.
- **Plant Size Relative to Local Corn Supplies:** The relative size of an ethanol plant’s feedgrain processing capacity in comparison to the size of locally available feedgrain supplies only weakly influenced local corn prices.

Preliminary Findings in Kansas Grain Markets

In a recent study of factors affecting 2008 corn and wheat prices in Kansas grain markets found preliminarily that geographic proximity to grain-ethanol plants did **not** have a significant positive impact upon corn price levels. This study by O’Brien titled “The Effects of Micro-Market Structure for Kansas Grain Elevators on Spatial Grain Differentials”, was presented on April 20th at the NCCC-134 Conference in St. Louis, Missouri. There are a number of reasons why the results of these two studies may be at odds.

- 1) **Declining Ethanol Plant Profitability in 2008:** Lower ethanol plant profitability in 2008 likely affected the aggressiveness with which ethanol plants competitively bid for feedgrains in Kansas during that same time period. Lower ethanol profitability likely reduced the incentive and ability of ethanol feedstock buyers to “bid-up” for corn and grain sorghum supplies in local market during 2008 relative to the circumstances faced by ethanol plants during the 2001-2003 period studied in the McNew-Griffith study.
- 2) **Geographic Location of Kansas Ethanol Plants:** It is reasonable to ask whether Kansas ethanol plants were purposefully located in areas of weaker feedgrain basis instead of other parts of the state. If so, the lack of positive impact on Kansas grain prices from ethanol plants in 2008 may reflect preexisting weak corn basis relationships in some areas that were not affected positively enough by ethanol plant location to change their relative positions of basis weakness. Plans are to investigate this issue further within the framework of the O’Brien (2009) study.
- 3) **The Need for Pre / Post Ethanol Plant Price Information:** McNew-Griffith measured the price impact of new ethanol plants against corn basis levels that existed prior to ethanol plant establishment in those same areas. The O’Brien (2009) study only

examined 2008 corn basis levels without comparison to local corn basis history prior to the construction of the Kansas ethanol plants. Efforts are underway to include 2006 and 2007 Kansas corn price and grain industry data in this study to attempt to measure before and after feedgrain price effects from grain-ethanol plant establishment.

- 4) **Persistence of Ethanol Plant Corn Price Impacts Over Time:** In discussing their results McNew-Griffith indicated that their study did not address the degree to which corn basis impacts from ethanol plants would persist unchanged over time. It was their observation that the local corn price impact of an ethanol plant would tend to diminish as local producers respond to higher prices and corn enterprise revenues by increasing feedgrain supplies over time. As such, they stated that the likely short-run impacts of an ethanol plant would be less than those in the long run after the local market participants adjusted to changing price and enterprise profitability signals.
- 5) **Impact of Plant Ownership Regime:** If an ethanol plant is wholly farmer owned business, farmer-owners may be required to deliver corn to the plant at prices that are less than “top of the market” or fully competitive with other grain marketing opportunities in that region. In these situations, the farmers may be accepting lower prices for selling their corn to the ethanol plant in anticipation of financial returns on their ownership investments in the ethanol plants. As McNew-Griffith indicated, “...there seems to be a trade-off between farm ownership of a plant and the impact on grain prices.”

Conclusion

Grain ethanol plants appear to have had positive impacts on feedgrain basis levels and prices in local and national grain markets in the recent past. The findings of McNew-Griffith indicate that local corn prices in regions near selected ethanol plants were positively affected during the 2001-2003 period. Observation of feedgrain price levels and movements during the 2005/06 – 2008/09 marketing years seems to indicate that for many ethanol plants these types and levels of positive corn price impacts persisted, at least until grain prices fell in unison during the fall of 2008. Since that time, ethanol plants’ impact on local grain prices may have been lessened or muted in the later months of 2008 as a result of declining industry profitability. When / if higher levels of profitability return to the U.S. ethanol industry as a whole, then there will be more impetus for local ethanol plants to competitively and aggressively bid for feedgrains, and heighten the impact of ethanol plants upon local feedgrain basis and market price levels.