agricultural marketing resource center

Renewable Energy & Climate Change Newsletter

June 2010

in this issue...

prices, profitability and supply/demand

The following spreadsheets have been updated on the AgMRC Renewable Energy web site, http://www.agmrc.org/renewable_energy/.

prices

- •midwest ethanol prices
- •ethanol basis
- •fuel vs. grain (annual)
- •fuel vs. grain (monthly)

profitability

- •ethanol profitability
- •corn profitability
- •biodiesel profitability

supply/demand

- •corn/ethanol balance sheet
- •soy oil biodiesel balance sheet
- •soybean balance sheet
- •distillers grains balance sheet

The Ethanol Blenders' Tax Credit, Part I: Who Gets the Benefits?

By Dr. Robert Wisner, biofuels economist

This is the first of two articles discussing the benefits of ethanol blenders' tax credits.

Congress has provided the motor fuel industry with a tax incentive for blending ethanol with gasoline in the form of 45 cents per gallon of ethanol tax credit. The tax credit was reduced to this level in 2009, from a previous 51 cents per gallon. This tax credit was provided years ago to encourage growth of the infant ethanol industry, to develop an additional market for corn, and to reduce the nation's dependence on imported petroleum. At this writing, the blenders' tax credit has become an important issue for policy discussions. It is scheduled to expire at the end of 2010 unless renewed by Congress. As we indicated in an article last month, the ethanol industry appears to be nearing its long-anticipated blending wall. For that reason, the industry wants high priority to be given to maintaining all current incentives for expansion. On the other hand, partly because of federal budget pressures, others are suggesting the industry has outgrown its need for the tax credit and that blending mandates from the late 2007 energy legislation are sufficient to maintain its growth.(1)

In this article, to shed further light on this discussion, we look at information that may help to understand who ultimately gets to keep the blenders' credit. By law, the blenders of ethanol with gasoline are the receivers of the blenders' credit, but does it stop there or is all or part of it passed back to ethanol producers in higher prices received? Or is part or all of it passed on to motorists who use ethanol blends in their vehicles in the form of lower retail prices? Also, what might be some implications of a failure to renew the blenders' credit beyond the end of this year? So far, the biodiesel blenders' tax credit has not been renewed. Despite government biodiesel blending mandates, industry reports indicate it has resulted in the idling of a large number of biodiesel plants.

The distribution of benefits from the blenders' tax credit has varied over time, depending on conditions in the ethanol and petroleum markets. For example, in 2006 and early 2007 as the oxygen enhancing additive MTBE (methyl tertiary butyl ether) was phased out of use in California and some other states, demand for ethanol was extremely strong. Ethanol was the main alternative to MTBE in meeting clean air standards of states with serious air pollution problems. Ethanol prices were far above those for gasoline because it had a captive market that was forced to buy ethanol. At that time, most or perhaps all of the blenders' credit appears to have gone to ethanol producers and firms blending ethanol with gasoline. Passing some of the benefits on to ethanol producers in the form of higher prices for their products was the market's way of stimulating production to increase supplies. However, conditions in the ethanol market have changed dramatically since that time. Domestic ethanol production has more than doubled. With the sharp increase in production, returns to ethanol producers have dropped dramatically and at this writing are near break-even in some cases. The industry is facing possible excess production capacity later this year and in 2011 as the ethanol market approaches saturation levels.

Historical difference between ethanol and gasoline prices

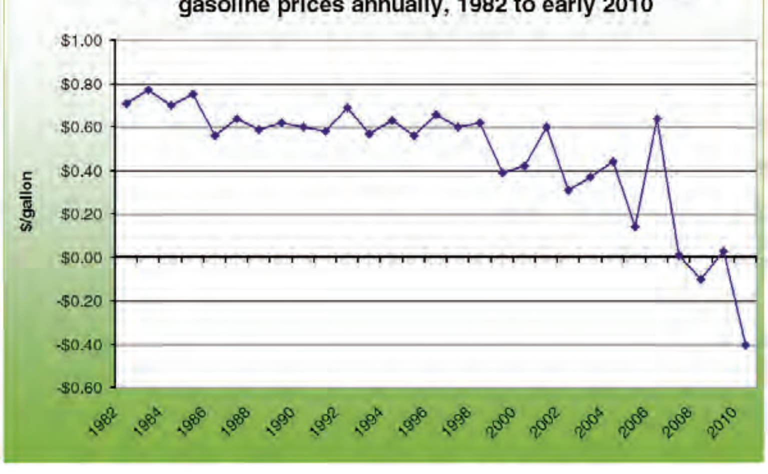
To trace the distribution of ethanol blenders' credit benefits, we start with Omaha rack prices for gasoline and ethanol. These prices are readily available to us through a Nebraska state government web site.(2) Rack prices are those at blending racks (essentially wholesale prices) where blenders mix ethanol with gasoline. Iowa has an advantage over some other states in tracing the distribution of tax credit benefits in that pumps at its motor fuel retail stations have labeling that identifies ethanol blends and ethanol-free gasoline. The Omaha wholesale prices provide a starting point in tracing values through the marketing chain to Iowa retail stations.

Figure 1 shows the historic difference between rack ethanol and gasoline prices in Omaha. Note that for this entire 28-year period, except for 2008 and so far this year, ethanol prices have been well above gasoline. In the first four months of 2010 rack ethanol prices have been at a large discount to unleaded gasoline prices.

April ethanol prices were 71 cents below rack gasoline prices. Even larger discounts of ethanol to gasoline were present at times in some other markets, especially the Chicago and New York futures contracts for these products. The large price discount of ethanol to gasoline reinforces our conclusion in an article last month that the industry is nearing the blending wall.

Depressed ethanol prices relative to gasoline are the market's way of attempting to lower prices enough to create an increased quantity of ethanol being demanded by consumers. Increased quantity being demanded can come by enticing consumers in states that label motor fuel pumps to buy ethanol blends if they have not been doing so. Another small but important potential area for market expansion is the E-85 market, a blend of 85% ethanol and 15% gasoline. This blend is only for flex fuel vehicles, which account for a small fraction of the total vehicle fleet. Thus, the E-85 market is quite limited. Also, studies by the Environmental Protection Agency (EPA) (3) and Consumers Report magazine indicate E-85 has around 25 to 28 percent lower fuel mileage than E-0. The actual mileage differential varies somewhat by vehicle brand and model. Because of sharply lower fuel mileage, expansion of the E-85 market requires a large price discount of ethanol to gasoline at the retail level to make it attractive to consumers.

Figure 1. Omaha rack ethanol prices minus unleaded gasoline prices annually, 1982 to early 2010



Geographic price differential variations

Price differentials between gasoline and ethanol vary by geographic location, depending on local supply and demand conditions for both products, as well as infrastructure and environmental regulations. Ethanol needs to be shipped long distances by rail rather than by pipeline as gasoline is shipped. Thus, its transport cost from major producing areas of the Midwest to east, west, and southern coasts is greater than that for gasoline. Accordingly, rack price differentials in coastal regions can differ considerably from those in Iowa and Nebraska. Gasoline blends for these areas also can be different than those permitted in rural areas of the Midwest, thus affecting gasoline prices. Because of shipping costs, we expect ethanol to be priced at less of a discount to gasoline in areas long distances from the Midwest -- where much of the ethanol supply is produced. For this analysis, we used the Omaha rack prices because they allow us to work through to the retail level in Iowa, where pumps are clearly labeled as supplying gasoline (E-0), E-10, or E-85. The retail price differentials allow us to at least partially sort out who receives the benefit from the blenders' credit.

Tracing the distribution of benefits

Figure 2 provides more detail for use in sorting out the impact of the blenders' tax credit. It shows the E-100 to E-0 price differential on a volume basis when the federal blenders' credit is deducted from ethanol prices. The blenders' credit further lowers the cost of ethanol in the marketing system. After this adjustment, the wholesale cost of E-100 on a per gallon basis as an average for the first four months of 2010 was 85 cents less per gallon than E-0.

An additional influence on ethanol's price competitiveness is its energy content. It should be noted that ethanol's energy content per gallon is about 65 percent that of gasoline. So a gallon of ethanol contains 35 percent less energy than a gallon of gasoline. Thus, when a consumer buys a gallon of E-10 (10% ethanol), it has an energy content reduction of 3.5 percent versus straight gasoline (35% reduction x 10% ethanol). Moreover, when a consumer buys a gallon of E-85 (85% ethanol) the energy content reduction is 30 percent (35% reduction x 85% ethanol). So a consumer could expect a 3.5 percent mileage reduction from E-10 and a 30 percent mileage reduction from E-85, although there are other factors like ethanol's higher octane level that may impact mileage.

Until recently, many analysts may have taken the view that the price differential without an energy-equivalent adjustment was appropriate since almost all of the production was used for E-10 blends. When purchasing E-10, most consumers may not check their mileage closely enough to notice the small fuel mileage reduction. However, when the market approaches the saturation point, pricing ethanol so that it is competitive on an energy equivalent basis becomes important in enticing increased use. Some consumers check their fuel mileage carefully, and to entice them to buy E-10, a moderate price discount to E-0 may be needed. Discounts clearly are needed for E-85.

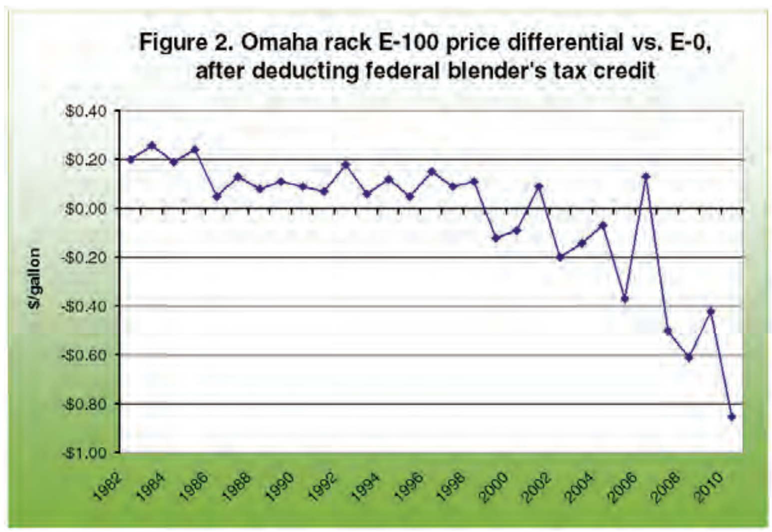
If the Environmental Protection Agency (EPA) allows the E-15 blends that it is now testing, the lower mileage from this blend may be more obvious to motorists than it is for E-10. That would be a slightly negative influence on ethanol prices and would support the need for at least part of the blenders' credit to be passed back to consumers to make it competitive with gasoline.

Figure 2, with adjustment for the blenders' credit, indicates that much of the time since 1999, ethanol rack prices on a volume basis have been below gasoline prices, thus creating the appearance that ethanol is competitive with gasoline. However, we adjust for lower energy content in Figure 3, which also shows what the differentials would look like without the federal blenders' credit. Removal of the blenders' credit and adjustment for lower energy content would make ethanol prices uncompetitive with gasoline, even at recent low ethanol prices and the large volumetric differential to gasoline prices.

Iowa and some other states have state blender or retail credits for ethanol and/or lower motor fuel tax rates for ethanol blends that further increase their attractiveness to consumers. In some states, regulations mandate the use of ethanol so that motorists have no choice of ethanol versus non-ethanol motor fuels. Thus, other policy instruments beyond the federal blenders' credit also influence the use of ethanol/gasoline blends.

Retail prices with the federal blenders' credit

In comparisons made here, the precision of our analysis is slightly limited by the fact that retail prices available to us are on a daily basis versus the monthly average rack prices that are available from Omaha. Thus, our analysis is an approximation of conditions in April but should be close to actual conditions, the most recent month for which Omaha rack (wholesale) prices are available as this is being written. For April, we are using retail Iowa regular (E-0) gasoline prices of $2.859 per gallon. E-10 has been priced at a $0.12 lower price per gallon than E-0 in many stations across the state, although the differential may vary slightly in some cases. Table 1 shows the wholesale prices, indicated merchandising and transportation margin, state and federal tax credits for E-0 and E-10, and approximate average retail price for April 2010 in the table. Iowa has a lower state motor fuel tax for ethanol blends than for E-0 and also has retailer tax credits that vary, depending on the retailers' percentage attainment of the RFS-2 mandates. Note that the mandates apply to the blenders, not the retailers unless



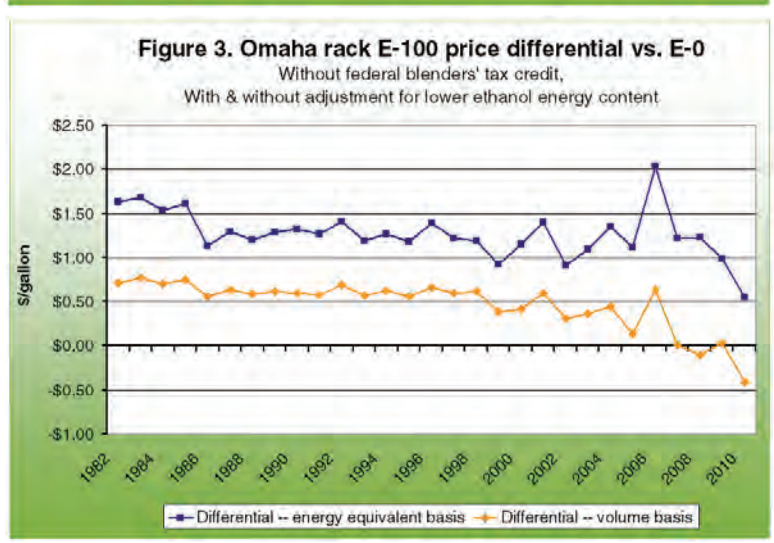


Table 1. E-10 Blending Economics vs. E-0, April 2010, & Potential with Zero Blenders' Credit, $/Gallon

	Iowa April 2010 With Blenders' credit	Hypothetical With no federal Blenders' credit
Wholesale gasoline price [1/]	$2.310	$2.310
Plus:		
Federal Tax, gasoline & ethanol	0.184	0.184
State Tax, gasoline	0.210	0.210
Implied gross Merchandising margin, Reg. Gasoline	0.155	0.155
Retail Pump Price, Reg. (E- 0) gasoline	**2.859**	**2.859**
Rack Ethanol Prices [1/]	$1.600	$1.600
Rack Ethanol Prices [1/] x .1 + gasoline rack price x .9	2.239	2.239
Plus:		
Federal Tax, E-10 ethanol/gasoline	0.184	0.184
State Tax [2/], ethanol (incl. Iowa retailer incentive credit [3/])	0.190	0.190
Implied Gross Merchandising margin, E-10	0.178	0.178
Minus:		
Ethanol blending credit per gallon of E-10	-0.045	0.000
State ethanol tax credit [4/]	-0.007	-0.007
Retail Pump Price, E-10	**$2.739**	**$2.784**
Implied E-0 equivalent cost/gallon if adjusted for lower energy content	$2.838	$2.885
Implied merchandising margin difference, E-10 vs. E-0	$0.022	$0.022
Difference as % of E-10 blenders' credit	-50.0%	

Table 2. E-85 Blending Economics vs. E-0, April 2010, and Potential with Zero Blenders' Credit, $/Gallon

	Iowa April 2010 With Blenders' credit	Hypothetical With no federal Blenders' credit
Wholesale gasoline price [1/]	$2.310	$2.310
Plus:		
Federal Tax, gasoline & ethanol	0.184	0.184
State Tax, gasoline	0.210	0.210
Implied gross Merchandising margin, Reg. Gasoline	0.155	0.155
Retail Pump Price, Reg. (E- 0) gasoline	**$2.859**	**$2.859**
Rack Ethanol Prices [1/]	$1.600	$1.600
Rack Ethanol Prices [1/] x .85 + gasoline rack price x .15	1.707	1.707
Plus:		
Federal Tax, E-10 ethanol/gasoline	0.184	0.184
State Tax [2/], ethanol (incl. Iowa retailer incentive credit [3/])	0.190	0.190
Implied Gross Merchandising margin, E-85	0.428	0.428
Minus:		
Ethanol blending credit per gallon of E-85	-0.383	0.000
State ethanol tax credit	-0.007	-0.007
State E-85 retailer income tax credit [4/]	-0.200	-0.200
Retail Pump Price, E-85	**$1.919**	**$2.386**
Implied E-0 equivalent cost/gallon if adjusted for lower energy content	$2.732	$3.396
Implied merchandising margin difference, E-10 vs. E-0	$0.273	$0.273
Difference as % of E-10 blenders' credit	71.2%	

[1/] From Nebraska state government: http://www.neo.ne.gov/statshtml/66.html.

[2/] Source of state tax information: American Coalition for Ethanol web site, http://www.ethanol.org/pdf/contentmgmt/ACE120_Status_07_web-1.pdf.

[3/] Iowa Ethanol promotion tax credit may vary by retail station average percent achievement of RFS2. Credit shown here is for retailers who meet or exceed RFS2 schedule. Iowa goal: state-wide average blend of renewable fuels (gasoline & diesel) be 10% in 2009 and increase to 25% by 2020.

[4/] See http://www.iowa.gov/tax/forms/0841142.pdf.

they also are blenders. Thus, some retailers may sell less ethanol than required by the mandates. The comparisons in Table 1 are the wholesale price of gasoline plus federal and state taxes, and a merchandising and transport margin reflecting the cost of marketing and other expenses of getting the product from the wholesale location to retail stations. A similar comparison is shown for E-10 ethanol/gasoline blends, but with the different tax rates and deductions for the federal and state tax credits.

From these calculations, we conclude that in Iowa and probably in parts of surrounding states, at least half of the blenders' tax credit has recently been passed on to consumers in the form of lower prices at the pump. About half of the blenders' credit appears to have been retained for blenders and retailers through the larger merchandising margin than for E-0 (Note last line of Table 1).

There may be other economic incentives for blending ethanol with gasoline in addition to government incentives, depending on market conditions. One example might be the use of ethanol to increase the octane level of lower-grade and lower-cost gasoline to an acceptable level. We lack the necessary information at this writing to determine whether such an incentive exists and if so, the size of the incentive. Also, blending incentives vary by state since gasoline-ethanol price differentials change as ethanol shipping distance increases. In addition, a few states, California and Minnesota for example, have mandated use of ethanol.

Impact on retail E-10 prices from eliminating the federal blenders' tax credit

The right-hand column in Table 1 compares E-10 with E-0, using the same wholesale prices, merchandising margin and taxes as in April 2010, but with the federal blenders' tax credit eliminated. The comparison indicates that eliminating the blenders' tax credit would be expected to increase the retail cost of E-10 by about 4.5 cents per gallon under April 2010 conditions. However, under recent gasoline-ethanol market conditions, removal of the blenders' tax credit would still be expected to allow retail E-10 prices to be about seven cents below those of E-0. On an energy equivalent basis, E-10 under those conditions would be slightly more expensive than E-0. Since ethanol has about 2/3 the energy content of gasoline, we adjusted the energy content of E-10 downward proportionately to obtain an E-0 equivalent energy cost. If fuel mileage drops by the same percentage, this would reduce the value of E-10 to the consumer by about 10 cents per gallon versus E-0. The actual mileage reduction may vary by vehicle, and in some cases may be less than this because of higher octane levels of E-10 than in E-0.(4) There are anecdotal reports of greater mileage reductions than built into Table 1 for some light-duty trucks. A key question in evaluating the market impact of removing the blenders' credit is whether the slightly higher energy-equivalent cost of E-10 relative to E-0 would discourage some motorists from using ethanol. Many users of E-10 may not check their mileage closely, and likely would continue to be attracted to it by the lower price than E-0.

For consumers who carefully compare fuel mileage of E-10 with E-0, the net energy cost differential if the blenders' credit is eliminated might discourage them from using E-10 in states where pump labeling allows motorists to identify ethanol blends.

Impact on retail E-85 prices from eliminating the federal blenders' tax credit

Table 2 shows blending economics for E-85 with and without the blenders' tax credit, using the same wholesale prices, taxes, and format as in Table 1. Retail prices may vary some by state, individual station, and through time depending on whether the retailer is running a special on E-85. Retail price spreads versus E-0 used here are typical of recent spreads in the Central Iowa area. Prices for E-85 at other locations by state on a current-day basis and historically are available at http://e85prices.com/iowa.html. Earlier data suggested that the merchandising margin for E-85 blends in the past was substantially smaller than for E-10 and E-0 than at present.(5) At this writing, pricing of E-85 suggests the merchandising margin is considerably larger than for the other two fuel grades. The volume of E-85 sold through retail facilities is much less than for other blends and grades. Fixed costs of the retail tank and pump are spread over fewer gallons than with other fuel grades, thus increasing that portion of the cost per gallon substantially. Even so, low wholesale ethanol prices, state incentives for marketing E-85 and a desire to spread costs of facilities over a larger volume may be making retail prices for this product more competitive than in the past. Recently in Central Iowa, retail E-85 prices have been at a 33% discount to E-0 and about a 30% discount to E-10. The differential in Iowa is now large enough for most vehicles to justify a shift from E-0 to E-85, even when the energy content difference is considered. The differential versus E-10 also is large enough to attract the attention of many owners of flex-fuel vehicles and to cause them to consider shifting from E-10 to E-85, if retail E-85 stations are available in their area.

The analysis in Table 2 indicates a significant part of the blenders' credit and/or low ethanol price in E-85 blends is being retained by Iowa E-85 retailers. To substantially expand this market, a sizeable part of these ethanol benefits needs to continue to be passed on to consumers as appears to be happening currently in Iowa. More E-85 retail stations and more flex fuel vehicles are needed to significantly expand this part of the ethanol market. Recent reports indicate flex fuel vehicles make up less than 5% of the total U.S. vehicle fleet, but manufacturers plan to expand production substantially in the next several years. E-85 incentives are less outside key ethanol producing area. We will look at this aspect of E-85 pricing in more detail in a forthcoming article.

An examination of retail E-85 versus E-0 prices by state shows large variations within states and from state to state. In general, most states that are far from the heart of the ethanol producing region have much lower price differentials of E-85 to E-0 than in Iowa. This is to be expected since costs of transporting ethanol are much higher than for gasoline, and most ethanol has to be transported from the Midwest to western states and costal areas. Thus, by far, the greatest incentive for using E-85 is in the Midwest.

Impact on E-85 demand if the blenders' credit is eliminated

If the federal blenders' credit is eliminated, with recent merchandising margins, we would expect the advantage of E-85 over E-0 and E-10 to disappear. This is shown in the third and fourth lines from the bottom of Table 2, where both the retail price of E-85 and its energy equivalent cost are above those of E-0. Thus, we would expect a serious shrinkage in the size of the already small E-85 market if the blenders' credit is eliminated.

Summary

This is the first in a series of two articles examining the impacts of the U.S. ethanol blenders' credit. In this article, we focus on the question of whether consumers, retailers, blenders or other participants in the ethanol industry receive most of the benefits from the blenders' credit under recent market conditions.

If we had provided a detailed historical review, it would have shown that the distribution of benefits has varied over time. In the early 2000's much of the benefit likely went directly to ethanol biorefineries. From late 2006 through mid-2008, it likely was shared by corn growers and the ethanol producers. More recently, as the ethanol market has approached a saturation point commonly called the blending wall, it appears that a substantial part of the benefit from the blenders' credit has been passed on to motorists in lower prices for E-10 and E-85, relative to E-0, at least for the heart of the Midwest ethanol producing region, in an effort to expand the market

Total elimination of the blenders' credit under current conditions likely would increase the cost of both E-10 and E-85 to consumers. For E-85, it would very likely shrink the already small market by creating an energy-equivalent-basis disadvantage for this fuel in the Midwest and increasing the current disadvantage in other parts of the country. Thus, eliminating the blenders' credit would discourage fuel ethanol use and market expansion, especially for E-85. This is a small market for ethanol because of the limited number of flex fuel vehicles and a very limited number of E-85 retail facilities. The industry and policy makers have been viewing E-85 as a future growth market, but removing the blenders' credit would likely reduce its long-term potential. For E-10, the 4.5 cent per gallon increase in price relative to gasoline along with its small reduction in energy content versus E-0 might cause a limited number of consumers who check fuel mileage closely to shift back to gasoline. That would be the case in states where retail pumps are labeled to indicate their fuel contains ethanol. However, for the majority of motorists, it is doubtful that the small increase in price per gallon relative to gasoline would have a big impact on their usage of E-10 ethanol blends.

Next month, we will address the issue of whether the mandates alone are a sufficient incentive to maintain U.S. ethanol production and use without the blenders' credit. This is a critically important question for the ethanol industry as well as for other users of corn, the corn production sector and industries related to it. It also is a complex question that involves international competitiveness, trade policies, the degree to which the blenders' credit has been capitalized into corn prices and land rents, and other factors.

References

[1] Bruce Babcock, "Mandates, Tax Credits, and Tariffs: Does the U.S. Biofuels Industry Need Them All?" CARD Policy Brief 10-PB 1, CARD, Iowa State University, March 2010.

[2] Omaha Rack Prices.

[3] EPA web site showing fuel mileage of E-85 for various makes and models of vehicles.

[4] In Iowa, E-10 typically is typically rated as 89 octane versus 87 octane for E-0. In some cases, E-10 in other states may have the same octane level as E-0.

[5] For examples of implied E-85 merchandising and transportation margins at a previous time, See R. Wisner, "Ethanol blending economics, the "blending wall" and government mandates", Renewable Energy Newsletter, Ag Marketing Resource Center, January 2009.

June 2010

Analysis of the CO_2 Emissions from Land Use Changes caused by U.S Corn Ethanol Production

by Don Hofstrand, Co-director, Agricultural Marketing Resource Center, dhof@iastate.edu

A recent research report from the Agricultural Economics Department of Purdue University sheds new light on the hotly debated issue of carbon dioxide emissions from the land use changes caused by the U.S. corn ethanol industry.

The passage of the Energy Independence and Security Act (EISA) of 2007 mandated certain levels of U.S. corn-starch ethanol production under the Renewable Fuels Standard (RFS). As shown in Table 1, the EISA requires the minimum amount of corn-starch ethanol blended in gasoline to gradually increase annually until 15 billion gallons are reached in 2015. The industry can blend more than mandated amounts if economic conditions encourage it.

Table 1. Ethanol Production Mandates of the Renewable Fuels Standard

Year	Renewable Fuel	Corn-Starch Ethanol
2006	4,000	4,000
2007	4,700	4,700
2008	9,000	9,000
2009	11,100	10,500
2010	12,950	12,000
2011	13,950	12,600
2012	15,200	13,200
2013	16,550	13,800
2014	18,150	14,400
2015	**20,500**	**15,000**
2016	22,250	15,000
2017	24,000	15,000
2018	26,000	15,000
2019	28,000	15,000
2020	30,000	15,000
2021	33,000	15,000
2022	36,000	15,000

The RFS has triggered concerns about the large shift away from corn for food and feed use to ethanol. The discussion centers around the concern that the reduction in food and feed availability will stimulate corn production around the world on land not currently used for crop production (forests and grasslands). Converting this land to crop production will release carbon that was previously sequestered in the timber, grasses and soils. The land use argument concludes that these emissions should be assigned to U.S. corn ethanol production.

While it is likely that corn ethanol production of the magnitude mandated by the RFS will result in significant land use changes, measuring the amount of land use change and subsequent carbon dioxide emissions from this shift is difficult. Previous research on this topic estimated a sizable level of carbon dioxide emissions (AgMRC Newsletter, Climate Change – Are Biofuels Good or Bad).cfm The Purdue study provides new insight into the magnitude of land use changes and subsequent carbon dioxide emissions caused by corn ethanol production. Our summary below draws heavily upon the study report.

Economic model

The basic objective of this research was to estimate land use changes associated with U.S. corn-starch ethanol production up to the 15 billion gallon by 2015 mandated by the Renewable Fuel Standard. Greenhouse gas emissions associated with corn ethanol production were computed based on these land use changes.

The economic model used in the analysis is a special version of the Global Trade Analysis Project (GTAP) model. Although analysis of this type is very complex with substantial uncertainty, the basic GTAP model has withstood the test of time and peer review. It is a computable general equilibrium model that is global in scope. The version used for this analysis has up to 87 world regions and 57 economic sectors plus the biofuel sectors that were added for this analysis. It is widely used for analysis of trade, energy, climate change, and environmental policy issues. The version used in this analysis contains energy, GHG emissions and land use, and encompasses many changes to the GTAP model to improve the analysis of corn ethanol.

Improvements in the model include the following

- The three major biofuels have been incorporated into the model: corn ethanol, sugarcane ethanol, and biodiesel.
- Cropland pasture in the U.S. and Brazil and Conservation Reserve Program lands have been added to the model.
- The energy sector demand and supply elasticities have been re-estimated and calibrated to the 2006 reality. Current demand responses are more inelastic than previously.
- Corn ethanol co-product (DDGS) has been added to the model. The treatment of production, consumption, and trade of DDGS is significantly improved.
- The structure of the livestock sector has been modified to better reflect the functioning of this important sector.
- Corn yield response to higher corn prices has been estimated econometrically and included in the model.
- The method of treating the productivity of marginal cropland has been changed so that it is now based on the ratio of net primary productivity of new cropland to existing cropland in each country and agro-ecological zone (AEZ).

Three groups of simulations were developed to evaluate the land use implications of U.S. ethanol production.

1) The first group of simulations calculated the land use implications of U.S. ethanol production using the 2001 database. This approach isolates the impacts of U.S. ethanol production from other changes which shape the world economy.
2) The second group used a baseline that represents changes in the world economy during the time period of 2001-2006. Then the land use impact of U.S. ethanol production from the updated 2006 database was calculated, while following the principles of the first group of simulations for the time period of 2006-2015.

3) The third group of simulations used the updated 2006 database obtained from the second group of simulations with the assumption that population and crop yields will continue to increase during the time period of 2006-2015.

The land use induced emissions from the GTAP model are then combined with the direct emission estimates associated with corn and ethanol production from the GREET life cycle model developed by the Argonne National Laboratory. This is done to provide an estimate of the total greenhouse gas emissions from corn ethanol production and use.

Results

After two years of study by the authors, the results show that current and prospective future carbon dioxide emissions (including land use changes) from U.S. corn ethanol production are less than those of gasoline. As shown in Table 2, for the third group of simulations outlined above, greenhouse gas emissions from corn ethanol (column 4) are 83 percent of those of gasoline (17 percent reduction). This is a significant reduction from the original estimates made in 2009 (92.4 percent of gasoline).

The original analysis by the authors occurred in January of 2009 (column 1 in Table 2) and is presented here as a point of reference. Since that time the authors have made substantial improvements in the model (outlined above) to more accurately portray the land use changes and subsequent greenhouse gas emissions from corn ethanol production. The impact of these improvements when applied to the 2001 data base (first group of simulations) is shown in column 2. Column 3 shows the analysis when the baseline is updated to 2006 (second group of simulations). Column 4 uses the 2006 baseline and assumes growth in demand and supply (third group of simulations).

Some of the results are fairly stable over the three simulations. For example, the distribution of land use change between forestland and cropland varies from 25% / 75%, and 35% / 65% among the three simulations. Also the distribution of land use change between the U.S. and the rest of the world varies from 25% / 75% and 34% / 66%.

Other results of the three simulations tend to be more variable. For example, the amount of additional land needed to produce 1,000 gallons of corn ethanol ranged from 0.12 hectares of (.30 acres) to 0.22 hectares (.54 acres) of land. Also, the land use greenhouse gas emissions range from 1,116 grams (2.46 pounds) to 1,676 grams (3.69 pounds) per gallon of ethanol.

Emissions per gallon of gasoline equivalent represent total greenhouse gas emissions. This is the summation of the direct emissions from producing ethanol (GREET model) and emissions from land use change (GTAP model). This range is from 9,490 grams (20.9 pounds) to 10,342 grams (22.8 pounds) per gallon of gasoline equivalent. These results appear to vary less because the same level of emissions from producing ethanol (GREET model) are used in all three simulations.

Conclusion

Although corn ethanol would meet a 10 percent greenhouse gas reduction standard, the study results suggest that it may not meet the 20 percent reduction standard required by the Renewable Fuel Standard of the Energy Independence and Security Act (EISA). However, the authors believe that it cannot be concluded that corn ethanol would not meet the 20 percent reduction standard due to uncertainty of the analysis and the potential improvement in direct emissions associated with corn and ethanol production.

For more information on the research analysis, go to the website below.

Land Use Changes and Consequent CO2 Emissions due to US Corn Ethanol Production: A Comprehensive Analysis, Wallace E. Tyner, Farzad Taheripour, Qianlai Zhuang, Dileep Birur, Uris Baldos, April 2010, Department of Agricultural Economics, Purdue University.

Table 2. Summary of the Different Modeling Results

Items	Units	Original Jan. 09 estimates (1)	Model improvements with 2001 data base (2)	Baseline updated to 2006 (3)	Updated baseline & growth in demand & yield (4)
Land needed for ethanol	hectares / 1000 gallons	0.27 ha	0.22 ha	0.15 ha	0.12 ha
Distribution of land use change between forest and pasture	% forest / % pasture	23% / 77%	25% / 75%	35% / 65%	35% / 65%
Distribution of land use change between U.S. and rest of world	% US / % others	35% / 65%	34% / 66%	25% / 75%	28% / 72%
Average emissions of 15 billion gallons program	grams CO2 / gallon of ethanol	1,931 g	1,676 g	1,407 g	1,116 g
Emissions per gallon gasoline equivalent	grams CO2 / gallon	10,564 g	10,342 g	9,933 g	9,490 g
Total ethanol emissions as % of gasoline	**percent**	**92.40%**	**90.50%**	**86.90%**	**83.00%**

Measuring Supply-Use of Distillers Grains in the United States

Daniel M. O'Brien, Extension Agricultural Economist, Kansas State University

As grain-based ethanol production has expanded in the United States in recent years, so too has the production of distillers grains, a co-product of dry mill ethanol production processes. Distillers grains in its various forms are used in livestock feed rations as a competitive substitute for feed grains and sometimes soybean meal. This article examines the projected supply and use of distillers grains in the United States during next decade, i.e., from the 2010-11 through 2019-20 feed grain marketing years, as well as the potential effect of the availability of distillers grains on U.S. corn use.

The February 2010 USDA Agricultural Baseline Projections of grain and livestock supply, use and agricultural commodity prices for the 2010 through 2019 period is used as an initial basis for this analysis. United States corn and livestock supply-use projections were taken "as is" from this source with only minor adjustments. See USDA Agricultural Baseline Projections.

USDA agricultural projections for 2010-2019

As stated by the USDA Economic Research Service, the USDA Agricultural Projections for 2010-19, released in February 2010, provide long run projections for the United States farm sector for the next decade. These baseline projections were used "as is" in this analysis with a few exceptions. First, the U.S. Renewable Fuels Standard requirement of increasing grain-based U.S. ethanol use (i.e., and implicitly, ethanol production) to 15 billion gallons annually by year 2015 was explicitly "forced" into the projection of U.S. corn supply-use for the period. Increases in U.S. corn use for ethanol production were directly offset by decreases in U.S. corn feed and residual use to maintain the projections of U.S. corn exports and ending stocks in the base 2010-19 U.S. Agricultural Baseline Projections. Second, some livestock population estimates by specific species and class were not explicitly identified in the U.S. Agricultural Baseline Projections.

Annual estimates of these non-identified livestock species and class populations were developed by estimating the historic relationship between the broader aggregates used in the USDA projection and historic species populations during the 2007-2009 period, and then projecting those relationships forward in the 2010-19 time period. Third, more current projections of U.S. corn supply-demand balances for the 2009-10 through 2010-11 marketing years were taken from the May 11, 2010 USDA World Agricultural Supply-Demand Estimates (WASDE). In particular, minor adjustments were made in the USDA's February baseline projections to be consistent with updated projections of corn production, ethanol use, non-ethanol food-seed-industrial use, exports, and feed and residual use as indicated in the May 2010 WASDE report.

U.S. corn supply-use baseline

Adjusted baseline assumptions of U.S. corn use and ending stocks for the 2009-10 through 2019-20 marketing years are given in Figure 1.

Corn feed and residual use is projected to average 5.5 billion bushels (bb) per marketing year (MY) over this 10 year period, increasing to 5.8 bb in 2019-20 from 5.35 bb in MY 2010-11. Uses of corn for non-ethanol food, seed and industrial production are projected to average 1.355 bb per marketing year, increasing to 1.375 bb in MY 2019-20. Exports of U.S. corn are projected to average 2.29 bb per marketing year, increasing to 2.425 bb in MY 2019-20. Under current U.S. ethanol production policy (i.e., 15 billion gallons of ethanol used by year 2015, level production thereafter), use of U.S. corn and grain sorghum for ethanol production is projected to increase to 5.357 bb in MY 2015-16. Assuming 50 million bushels (mb) of annual use of U.S. grain sorghum for ethanol, then U.S. corn use for ethanol production would reach 5.307 bb in MY 2015-16 and succeeding years through MY 2019-20. After adjusting for the full implementation of the current Renewable Fuels Standard by 2015, U.S. corn ending stocks are projected to average 1.48 bb per marketing year, declining to as low as 1.281 bb in MY 2015-16 during the 10 year period

Potential U.S. DDGS use by livestock species

Using U.S. livestock inventory projections provided by and implied from the USDA Agricultural Baseline Projections for 2010-19, and consensus University analyst assumptions about maximum DDGS

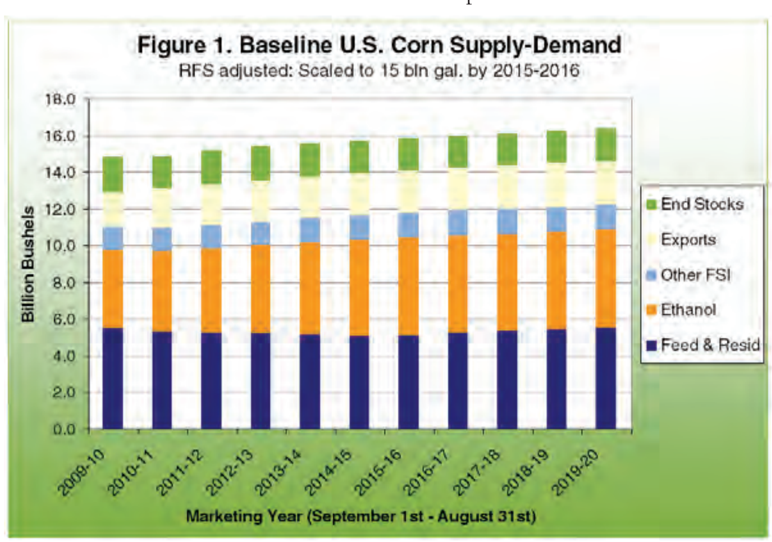
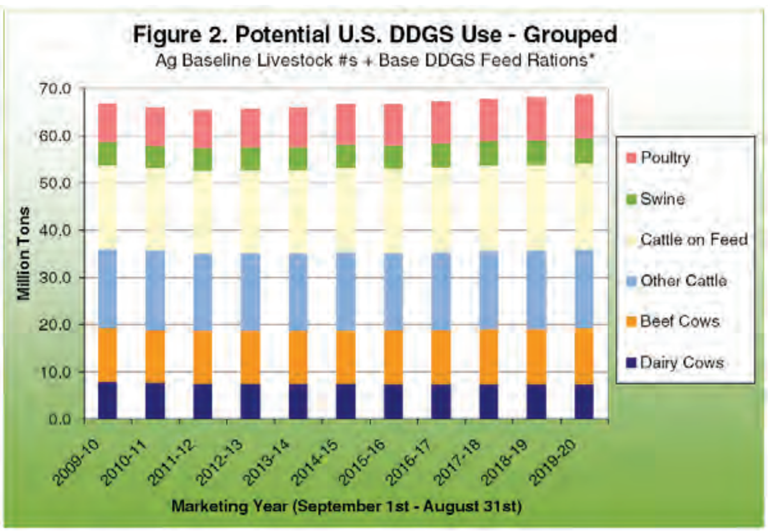
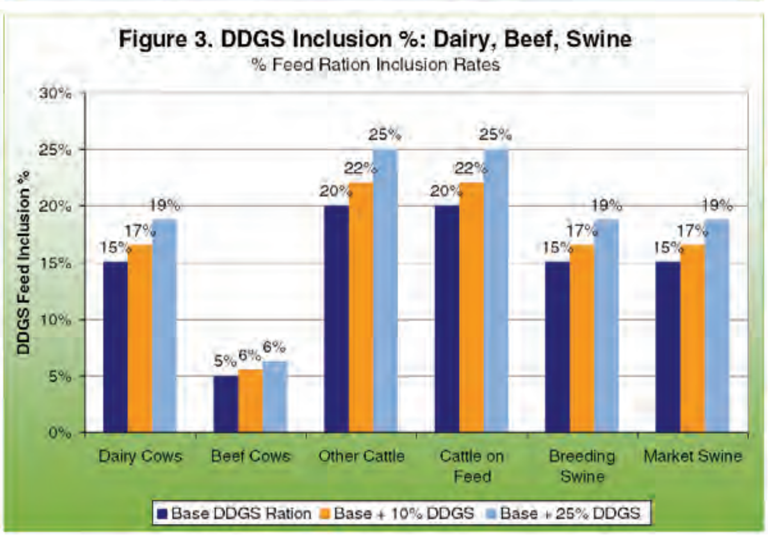


Figure 1. Baseline U.S. Corn Supply-Demand
RFS adjusted: Scaled to 15 bln gal. by 2015-2016

inclusion and daily feed intake rates, it is possible to project the maximum amount of DDGS that can be used in feed rations by the U.S. livestock industry annually for the next decade. Figure 2 shows projected maximum U.S. livestock feed use by species groups and selected major categories within those species groupings for the 2010-11 through 2019-20 U.S. corn marketing years. The categories represented include a) dairy cows, b) beef cows, c) other cattle (feeder cattle, beef breeding stock, etc.), d) cattle on feed, e) swine (including both breeding and market swine), and f) poultry (including layers, broilers, pullets and turkeys). Projected species population numbers are available in the USDA Agricultural Baseline Projection for inventories of milk cow numbers, all cattle, beef cows, December 1st hog inventories, federally inspected young chicken and turkey slaughter. The species population numbers not expressly available in the USDA Agricultural Baseline Projection were estimated using historic relationships between meat or egg production by species and livestock populations.

For the period of corn MY 2010-11 through MY 2019-20, average maximum consumption of DDGS for dairy cattle is projected to be 7.3 million tons (mt) (10.9% of total maximum DDGS use). Beef cows' average MY maximum DDGS use is 11.5 mt (17.2% of total DDGS). Average MY maximum DDGS use by other cattle is 16.5 mt (24.7% of total DDGS). Cattle on feed average MY maximum DDGS use is 17.9 mt (26.8% of total DDGS). Average MY maximum DDGS use by swine is 5.0 mt (7.4% of total DDGS).





Average MY maximum DDGS use by poultry is 8.7 mt (13.0% of total DDGS). Taken together, beef cattle account on average for 45.9 mt and 68.7% of maximum potential DDGS use in the U.S. during the 2010-19 period.

The DDGS inclusion rates and average daily amounts of DDGS fed to dairy cattle, beef cows, other cattle, cattle on feed, breeding swine and market swine (Figure 3) and for broilers, layers, pullets and turkeys (Figure 4) were taken from previous University studies. The "base" rations represent the amounts used in the primary maximum DDGS use calculations in this study. The "base + 10% DDGS" and "base + 25% DDGS" scenarios represent the maximum DDGS inclusion rates (Figure 5a) and maximum per animal DDGS use (lbs. / head / animal) with 10% and 25% increases in daily DDGS feed intake, respectively.

Combined corn and DDGS supply-demand balance sheet

The combined corn and DDGS supply-demand balance sheet in Table 1 is patterned after the U.S. corn supply-demand tables provided in monthly USDA World Agricultural Supply-Demand Estimates (WASDE) reports. Along with estimates of corn usage for ethanol production, non-ethanol food, seed and industrial use, exports, and feed and residual use, this table also provides estimates of DDGS production, feed use and exports. A 1 pound of DDGS to 1 pound of corn weight relationship is assumed in this combined table, allowing for DDGS to be represented on the basis of 56 pound or "bushel" equivalent units (i.e., DDGS cn equiv). Four corn marketing years are used to represent the baseline combined "corn + DDGS cn equiv" supply-demand balance sheet in Table 1, i.e., the current 2009-10 marketing year, MY 2012-13, MY 2015-16 (i.e., when the current 15 billion gallon ethanol RFS will be fully implemented), and MY 2019-20 (i.e., the last period in the 10 year projection).

Table 1 shows that both corn use and DDGS cn equiv production, feed use and exports are projected to increase until MY 2015-16 (in accordance with the current U.S. RFS), but then remain steady through MY 2019-20. Exports of DDGS are assumed to be 21% of annual DDGS production, following assumptions used by Wisner (2010) in a similar set of distiller's grains supply-demand calculations on the Iowa State University Agricultural Marketing Resource Center website. As stated above, it is assumed in this supply-demand projection that U.S. corn exports and U.S. corn ending stocks are unchanged from original USDA Agricultural Baseline Projections. It is also assumed that all DDGS cn equiv produced are used in the same marketing year, i.e., that ending stocks of DDGS cn equiv do not accumulate in any appreciable amount due to their bio-degradable properties, and are therefore assumed to be equal to zero. Accordingly, only corn ending stocks are assumed to be non-zero in this corn + DDGS cn equiv supply-demand table.

Although appreciable ending stocks of U.S. DDGS cn equiv are assumed to not exist (equal to zero), positive amounts of DDGS cn equiv feed use and exports are accounted for in figuring total use of corn and DDGS cn equiv. Consequently, the percent ending stocks-to-use of corn plus DDGS cn equiv is marginally smaller than for corn alone (i.e., because total use of corn plus DDGS cn equiv is greater than total use of corn alone).

The conclusion can be drawn that if DDGS is a 1-to-1 substitute for corn in livestock rations, then standard U.S. corn supply-demand balance sheets at least marginally misrepresent livestock feed supply-demand balances in the U.S., implying a larger U.S. ending stocks-to-use ratio situation than actual exists when corn plus DDGS cn equiv are accounted for.

Conclusions

Future work on this subject may best involve an integrated, comprehensive grain and livestock market segment analysis and modeling effort to better capture and represent the competitive tradeoffs and directional changes in corn and DDGS use that may occur if and when higher ethanol inclusion rates are adapted. Whereas this analysis looked at the tradeoffs that would need to occur between alternative uses of corn and DDGS in order to maintain certain levels of U.S. corn exports and ending stocks over the coming decade should higher levels of ethanol use be allowed in blended fuels, it is likely that a more comprehensive modeling effort could better assess the relative profitability of alternative corn and DDGS uses over time, and also do a better job of determining which segments of the U.S. and World corn and DDGS use industry will be able to compete most readily and either retain or expand their share of U.S. corn and DDGS use over time (likely at the expense of their competitors).

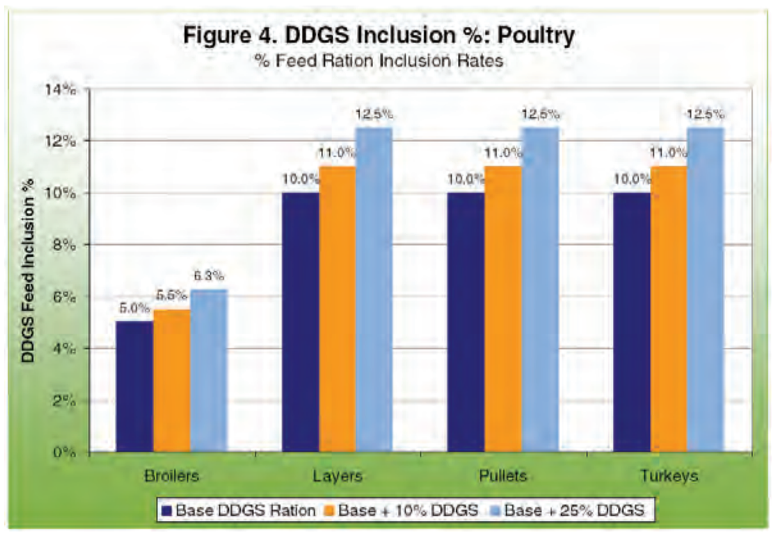


Table 1. U.S. Corn + DDGS Supply-Demand

Base Ethanol & Livestock Feed Scenario (Billion Bushels)

Item	2009-10	2012-13	2015-16	2019-20
Corn Production	13.110	13.530	14.024	14.593
DDGS Prodn. (Corn equivalent)	1.336	1.460	1.611	1.611
Feed & Residual: Corn	5.375	5.300	5.500	5.800
Feed: DDGS (Corn equivalent)	1.328	1.451	1.602	1.602
Ethanol: Corn	4.400	4.808	5.307	5.307
Non-Ethanol FSI: Corn	1.330	1.350	1.350	1.375
Exports: Corn	1.950	2.250	2.325	2.425
Exports: DDGS (Corn equivalent)	0.281	0.300	0.338	0.338
Total Use: Corn + DDGS	14.383	15.159	16.084	16.509
End Stocks: Corn + DDGS(=0)	1.738	1.652	1.218	1.403
% End S/U: Corn + DDGS	12.1%	10.9%	8.0%	8.5%

Value-added business success factors -- organizational issues

June 2010

by Don Senechal, Founding Pricipal, The Windmill Group, F. Larry Leistritz, Professor, Department of Agribusiness and Applied Economics, North Dakota State University, Nancy Hodur, Research Scientist, Department of Agribusiness and Applied Economics, North Dakota State University

(Fourth in a series of six)

There here has been a surge of interest in farmer-owned business ventures that seek to capture additional value from commodities past the farm gate. Some of these ventures have been very successful, some marginally successful, and some have failed. Supported by funding from the Ag Marketing Resource Center at Iowa State University, we conducted in-depth interviews with farmer-owned businesses to determine the key factors that influenced the relative success or failure of these ventures. A better understanding of why some ventures succeeded while others failed provides valuable insight for the success of future farmer-owned businesses. This article focuses on the role of organizational issues on business success.

Research method

To identify factors having the greatest impact on the success or failure of farmer-owned business ventures, a cross-section of seven farmer-owned commodity processing businesses formed since 1990 in North Dakota, South Dakota, and Minnesota were selected. Extensive interviews were conducted with individuals who played, or continue to play, an important role in the formation and operation of the business. This included leaders in the formation of the business, key members of the management team, selected board members, lenders, local leaders and others.

Research results

Most New Generation Cooperatives (NGC) were organized prior to the mid-1990s. Organizational structure was less important at that time than it is today. There were no viable alternative legal business structures for farmers that wanted to band together to form a new business venture to add value to their commodities. So, for a time, this structure met the needs of farmer-owned business ventures. It provided limited liability and pass through taxation. But many ventures realized that the business principles that served distribution and supply cooperatives well did not work for capital intensive processing ventures that characterized most NGC.

In the early to mid-1990s, many states passed legislation to allow agricultural ventures, as well as other types of ventures, to organize as limited liability companies (LLCs). It retained the principles of a traditional cooperative but removed some of the restrictions that made the cooperative cumbersome for farmer-owned processing facilities. The LLC retains key characteristics of traditional cooperatives such as limited liability and pass through taxation, but removes restrictions on non-farmer investors and membership delivery requirements.

Legal organizational structure -- An early decision for a group organizing a farmer-owned venture is the legal organizational structure to be adopted. In recent years, most farmer groups have formed as an LLC or corporation (subchapter C). These are more favorable organizational structures than a traditional cooperative. An LLC offers similar advantages as an NGC with fewer restrictions on membership and purchasing inputs (no delivery requirements).

For other groups, a corporation was most appropriate by providing better access to capital from non-producer investors or equity funds. However, a corporation's earnings are taxed twice -- once at the corporate level and again when distributed as dividends to the owners.

Although more options for organizational structure are available today, the traditional cooperative structure is still the model of choice for certain types of farmer-owned businesses. An example is the highly successful sugar beet cooperatives of North Dakota and Minnesota. Sugar beets and other specialized commodities that lack spot markets find the traditional NGC model preferable.

Decision making -- Another consideration when deciding on a business model is the seemingly cumbersome decision making process inherent in the traditional cooperative structure. All major decisions must be approved by the members in a one-member, one-vote process. Not only is the process cumbersome but there are issues of confidentiality. Some of the businesses we interviewed stated that some companies prefer not to do business with cooperatives because of confidentiality issues. For example, an agribusiness company might wish to discuss a joint venture project with a cooperative but prefer to have the information kept confidential until the details are worked out. However, maintaining confidentiality may not be possible with a cooperative where management and the board must obtain member approval. In any event, the LLC appears to be the preferred organizational form for most new farmer-owned businesses (e.g., new ethanol plants). Many businesses that were organized prior to advent of the LLC have subsequently converted to an LLC.

Board composition and training -- A critical decision when organizing a new venture is the composition and size of the board of directors. Board members with previous board experience and appropriate business or industry experience is critical. Because farmer-owners seldom have sufficient experience or expertise in the production and marketing of processed products or experience in managing an organization as large or complex as a processing venture, including outside board members (board members from industry who may not be owners) is often desirable.

It is also important to conduct training for board members. This includes not only training for new board members but on-going board training programs as well. Just like the business itself, the board must make an investment in the form of on-going board training to maintain its industry competitiveness.

Board size and the meeting schedule should be manageable. Even an experienced and well-trained board of directors can encounter problems if the board size or meeting agenda is unmanageable. Two of the organizations we interviewed had boards of directors with more than 20 members. They suggested that their boards were too large. The desire for equitable representation of the business's farmer-investors often leads to large board size. However, this desire should not be allowed to jeopardize the board's ability to effectively lead the company.

Professional team -- When making important business decisions, access to business, legal, financial, and industry expertise is critical. Early in the process, founding members should seek professional expertise. While retaining professional services can be costly for a start-up with little or no working capital, the importance of professional council cannot be over-emphasized. For some businesses, state assistance was available and pivotal in financing feasibility studies and business plans. Another business reported that their attorneys worked on a contingency basis during the early days of the organization. State and local economic development programs may be a good place to find access to, or funding for, professional services.

(next article - the role of management and operations)

Major funding for this research provided by the Agricultural Marketing Resource Center. Additional funding provided by Farmers Union Marketing and Processing Association Foundation, Co-Bank and Ag Ventures Alliance.

The Ag Marketing Resource Center Renewable Energy Newsletter is available on-line at: http://www.agmrc.org/renewable_energy/