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# Impact on Ethanol, Corn, and Livestock from Imminent U.S. Ethanol Policy Decisions

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## **Abstract**

The next few weeks should bring some clarity to the future of the 45-cent-per-gallon ethanol tax credit and the 54-cent-per-gallon import tariff because both are scheduled to expire on December 31. Although the arguments in support of and against their extension have changed little since the summer, the economic situation in the corn, livestock, and ethanol industries has changed dramatically.

## **Disciplines**

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# Impact on Ethanol, Corn, and Livestock from Imminent U.S. Ethanol Policy Decisions

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The next few weeks should bring some clarity to the future of the 45-cent-per-gallon ethanol tax credit and the 54-cent-per-gallon import tariff because both are scheduled to expire on December 31. Although the arguments in support of and against their extension have changed little since the summer, the economic situation in the corn, livestock, and ethanol industries has changed dramatically. Heavy summer rains and some excessive heat resulted in lower-than-expected U.S. corn yields. These lower yields, combined with the failure of the Russian wheat crop and a weaker U.S. dollar, increased corn prices by about 50% in just six months. What began as a year with a bright outlook for corn farmers is turning out to be their best year on record. And while we might expect the ethanol industry to be hurt by high corn prices, the \$2.00-per-bushel increase in corn prices has been accompanied by a 70-cent-per-gallon increase in the price of ethanol. The net result of these price changes is that profits for the ethanol industry have actually increased. Positive profits for the ethanol industry mean that the industry's demand for corn has increased despite a significant drop in the U.S. supply of corn. With no rationing of demand from the ethanol industry, the burden of coping with the higher corn prices falls on other users of corn, namely, the domestic livestock and food industries, and foreign importers.

Since the price of corn has changed, the trade-offs involved in extending the tax credit and import tariff have also likely changed. It would seem that the domestic livestock sector now has a higher stake in whether the tax credit and import tariffs are extended because if they are not extended, this could moderate the ethanol industry's corn demand. However, high crude oil prices combined with a 12.6-billion-gallon ethanol mandate in 2011 translate into robust corn demand by the domestic ethanol industry even if the tax credit is not extended. Corn use by the ethanol industry would only be reduced if the tariff was eliminated and imports of Brazilian ethanol dramatically increased. But, as pointed out in a recent CARD staff report ([Babcock, Barr, and Carriquiry<sup>1</sup>](#)), robust domestic demand for ethanol in Brazil, combined with a strong Brazilian currency, reduces the amount that Brazilians want to export to the U.S. Thus, the impacts on the U.S. corn and ethanol industries from not extending the tax credit and the import tariff may be modest. Insight into what would happen in 2011 under alternative ethanol policies can be obtained by updating the CARD model to reflect current market conditions. Before exploring what the model says, let's look at the impact of the increase in corn and soybean meal prices on the domestic livestock sector.

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<sup>1</sup> Babcock, B.A., K.J. Barr, and M. Carriquiry, "Costs and Benefits to Taxpayers, Consumers, and Producers from U.S. Ethanol Policies," [Staff Report 10-SR 106](#), Center for Agricultural and Rural Development, Iowa State University, July 2010.

## Impact of Higher Feed Prices on Livestock Production Costs

The price of corn is the most important factor in determining the cost of feeding livestock. Because corn is the dominant feed ingredient that provides energy, it serves as the reference price for other carbohydrate sources, such as barley, grain sorghum, and feed wheat. And because soybeans and corn compete for land, when the price of corn increases, so does the price of soybeans, which in turn increases the price of soybean meal—the reference price of protein in livestock feed. Soybean meal prices have increased by almost \$90 per ton, or by about 30%.

Table 1 shows the impact of higher corn and soybean meal prices on the cost of feeding livestock. The quantities of feed reflect representative feed quantities that were obtained from a variety of sources, including the feed rations in Livestock Gross Margin insurance contracts for dairy, fed cattle, and hogs. Table 2 shows these feed costs multiplied by the price increases for corn (\$2/bu) and soybean meal (\$90/ton) that have occurred since April. As shown, the cost of producing 100 pounds of milk has increased by almost \$4.00. The cost of producing a pound of meat has increased between about 7 cents (for broilers) to 24 cents (for beef). And the cost of producing a dozen eggs has increased by 12 cents. If feed costs stay at current levels, then food costs will eventually reflect these increased production costs.

The increased production costs shown in Table 2 will hurt the financial outlook of the U.S. livestock sector. In response, herds will shrink and prices at the producer,

**Table 1. Quantity of corn and soybean meal used to produce U.S. livestock**  
Quantity of Feed per Unit of Production

Livestock Type	Unit of Production	Quantity of Feed per Unit of Production	
		Corn (pounds)	Soybean Meal (pounds)
Hogs	250 pounds liveweight	784	200
Fed Cattle	500 pounds liveweight	3,360	0
Dairy	100 pounds of milk	72	26
Layers	Dozen eggs	2.3	0.75
Broilers	One pound liveweight	1.25	0.5

Notes: Hog numbers reflect feed for sows and feeder pigs. Dairy cattle numbers reflect feed for dry cows, replacement heifers, and hospital cows.

**Table 2. Change in the cost of feeding U.S. livestock since the summer of 2010**  
Increased Cost of Feed (\$/production unit)

Livestock Type	Unit of Production	Increased Cost of Feed (\$/production unit)			Farm Price	% of Price
		Corn	Soybean Meal	Total		
Hogs	Per pound liveweight	0.11	0.04	0.15	0.56	27%
Fed Cattle	Per pound liveweight	0.24	0.00	0.24	1.00	24%
Dairy	100 pounds of milk	2.57	1.17	3.74	18.00	21%
Layers	Per dozen eggs	0.08	0.04	0.12	1.00	12%
Broilers	Per pound liveweight	0.04	0.02	0.07	0.85	8%

wholesale, and retail levels will eventually rise to reflect these higher production costs. But to what extent could the decision about whether to extend the tax credit and import tariff moderate the production cost increases?

### **Impact of the Tax Credit and Import Tariff on the Price of Corn**

Calculation of the impact of removing the tax credit and the import tariff is not straightforward because the ethanol mandate needs to be accounted for. If the market demand for ethanol with the tax credit and import tariff in place is not strong enough to push U.S. ethanol production beyond mandated levels, then removal of these supports will not have any impact because the mandate would then determine production levels. If the tax credit and import tariff push use of ethanol beyond the 2011 mandate, then their removal will cause ethanol production to decline to the mandated level, with resulting decreases in the prices of corn and ethanol. Whether the mandate is binding or not depends primarily on the price of gasoline and the degree to which the U.S. market for ethanol is saturated because of the 10% blending limit. If gasoline prices move higher, then the tax credit will stimulate production beyond mandated levels and the price of corn will increase. If gasoline prices drop, then the mandate will bind even with the tax credit in place, and its removal will not lower feed costs.

Because we do not know what the price of gasoline will be in 2011, to capture the complexities of the policy and the market for ethanol requires a stochastic model. Our model of corn and ethanol markets described earlier was recalibrated to current market conditions and modified slightly. The model was calibrated using the November USDA World Supply and Demand Estimates. The USDA projects increased export demand and reduced U.S. domestic supply relative to what it projected this summer. One change in the model is that the willingness to pay for ethanol by blenders was increased a bit to reflect the fact that the price of ethanol has exceeded the price of gasoline for the last few months. This strength in ethanol prices is surprising given that many observers feel that the U.S. market for ethanol at current production levels is almost completely saturated.<sup>2</sup>

The recalibrated and modified model was for 5,000 different gasoline prices to capture the uncertainty about future gasoline prices. Table 3 shows the average of these 5,000 runs. The first row of results shows what will happen if the mandate, the tax credit, and

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<sup>2</sup> There are a number of possible explanations for this unexpected high price. Blenders' maximum willingness to pay for ethanol could equal the gasoline price plus the tax credit. This relationship between ethanol and gasoline prices can only exist if a lack of competition between blenders allows them to charge consumers for a gallon of ethanol as if it had the same energy content as gasoline. Another explanation is that blenders want to buy large quantities of ethanol in 2010 because they fear that the tax credit is going to expire. Buying ethanol in 2010 allows them to capture the tax credit today and to generate a renewable identification number (RIN) that they can use in 2011. A third explanation for the strong price is that ethanol is being blended with a splash of gasoline in the U.S., thereby capturing the blenders tax credit, and the resulting blend is exported to a region, such as Europe, where the market for ethanol is not saturated. The [\*Financial Times\* \(Nov. 14, 2010\)](#) reports that this is occurring for at least a portion of U.S. exports. And lastly, the price could be strong because the mandate is binding and RIN prices are high. This last explanation is not consistent with the fact that ethanol production in 2010 will exceed mandated levels.

the import tariff are maintained. The second row of results shows what will happen, on average, if the tax credit and import tariff are allowed to expire but the mandate is kept in place. As shown, U.S. ethanol production drops by an average of 600 million gallons. Ethanol imports increase by an average of 120 million gallons. And the price of corn drops by 35 cents per bushel, or by an average of 6.8%. The average cost of meeting the mandate, as measured by the average RIN price, increases by 28 cents per gallon.

The modest drop in the average price of corn reveals that there is a good chance that the mandate in 2011 will be binding even if ethanol demand is subsidized with the tax credit. An examination of each of the 5,000 model solutions shows that 45% of the solutions have U.S. ethanol consumption at mandated levels. This means that there is almost a 50% chance that there will be no 2011 impact on corn prices and U.S. ethanol consumption if the tax credit and import tariff are not extended.

If the tax credit and import tariff are extended at their current levels, then there is a 55% chance that ethanol demand will be stimulated beyond mandated levels. On average, the amount of U.S. ethanol consumption that will be stimulated beyond the mandate from the tax credit in 2011 is 600 million gallons. Dividing the \$5.95 billion taxpayer cost of extending the tax credit in 2011 by the additional ethanol produced results in a taxpayer cost of just under \$10 per gallon of additional ethanol. This shows that most of the benefit of the tax credit flows to oil companies and perhaps to fuel consumers to the extent that blended gasoline prices reflect the tax credit.

Table 3 also reports the results if there is no mandate in 2011. This could occur if the Environmental Protection Agency (EPA) is asked to waive the 2011 mandate and the waiver is granted. In 2008, Texas governor Rick Perry requested just such a waiver, but the EPA denied the request. With no mandate in 2011, U.S. ethanol production would decline by another 1.7 billion gallons. This decline would free up about 460 million net bushels (net of the drop in distillers grains production) of corn for domestic and foreign livestock feeders. The drop in demand from the ethanol industry would reduce average corn prices to \$3.84 per bushel. This decline in corn prices would make the corn ethanol industry more competitive so that it would still be profitable to produce almost 11 billion gallons of corn ethanol despite a significantly lower ethanol price.

**Table 3. Average results for ethanol policy scenarios in 2011**

<b>Ethanol Policies in Place</b>	<b>Corn Price</b>	<b>U.S. Ethanol Price<sup>a</sup></b>	<b>RIN<sup>b</sup> Price</b>	<b>U.S. Ethanol Production</b>	<b>Imported Ethanol</b>
	<b>(\$/bu)</b>	<b>(\$/gal)</b>	<b>(\$/gal)</b>	<b>(BG<sup>c</sup>)</b>	<b>(MG<sup>d</sup>)</b>
Mandate, Tax Credit, Tariff	5.21	2.18	0.12	13.22	90
Mandate Only	4.86	2.05	0.40	12.62	210
No Programs	3.84	1.78	0.0	10.92	90

<sup>a</sup>Average U.S. wholesale price, including any RIN price.

<sup>b</sup>Renewable Identification Number.

<sup>c</sup>Billion gallons.

<sup>d</sup>Million gallons.

A drop of about 7% in the price of corn from elimination of the tax credit and import tariffs would help the livestock industry. But corn and feed prices would stay high because of the mandate. Only if the mandate is waived in 2011 would corn prices fall significantly. Table 4 calculates the change in feed costs under the three policy options considered in Table 3. As shown, the livestock industry would still be faced with higher feed costs even if all ethanol subsidies were eliminated and the mandate was waived. Strong world demand for U.S. corn combined with a competitive ethanol industry would still increase 2011 feed costs. However, the magnitude of the cost increase would be much lower than if all ethanol programs were kept in place.

**Table 4. Increased cost of 2011 feed under different ethanol policies**

Livestock Type	Unit of Production	Maintain Current Policy	Mandate Only	No Programs
		(\$ per production unit)		
Hogs	Per pound liveweight	0.15	0.12	0.06
Fed Cattle	Per pound liveweight	0.24	0.20	0.09
Dairy Cattle	Per 100 pound of milk	3.74	3.09	1.42
Laying Hens	Per dozen eggs	0.12	0.10	0.05
Broilers	Per pound liveweight	0.07	0.06	0.03

*Note:* Calculations assume that the soybean meal price increase since the summer would be reduced by the same percentage as the price of corn. Justification for this assumption is that lower corn prices would decrease soybean prices because of lower land competition in 2011. Lower soybean prices would then decrease soybean meal prices.

### The Policy Choice

Because ethanol substitutes closely for gasoline, its market demand is much more sensitive to price than is the demand for livestock feed. This means that if markets were free to adjust, then it would be the ethanol market that would do most of the adjusting to feed grain supply shocks. If corn supplies were tight, ethanol production would decline and gasoline blenders would reduce the percentage of ethanol in their blends. This reduction would free up corn for livestock feeders, and the price impacts on feed markets would be relatively small. If corn supplies were plentiful and corn prices would otherwise drop dramatically (animals can only eat so much corn), the ethanol industry would ramp up production and blenders would find it profitable to increase the percentage of ethanol in their blends. The surplus of corn would be much smaller, thereby ameliorating the price drop. Looking to the future, excess capacity in the ethanol industry has the potential to dramatically stabilize corn prices. Instead of facing an inelastic demand, corn producers would face an elastic demand, thereby decreasing price volatility.

The EPA's recent policy decision to allow higher blends in the U.S. gasoline supply should facilitate blenders' freedom to take advantage of inexpensive ethanol when corn supplies are abundant. However, ethanol mandates, demand subsidies, and import barriers reduce the ability of world feed markets to cope with unexpected supply disruptions by forcing most of the adjustment to take place in the livestock industry rather than in the ethanol industry. Because the demand for livestock feed is relatively



price insensitive (demand is inelastic), supply disruptions such as a failure of the Russian wheat crop can have large impacts on feed costs, with resulting financial difficulties of livestock feeders. The dramatic increases in the prices of corn and soybean meal that we are currently experiencing are a direct result of our current ethanol policy, which forces demand adjustments in the livestock sector rather than in the sector (blended gasoline) that can more easily adjust.

The recent corn and soybean price increases have starkly revealed the economic consequences of U.S. ethanol policy. Congress faces a decision about stimulating demand for domestic corn ethanol through subsidies and taxes on imported ethanol when corn prices are already so high. If Congress decides that it does not make sense to stimulate demand when supply is short, then allowing the tax credit and import tariff to expire on schedule makes sense.

A decision to let the tax credit expire may not be that difficult politically because the credit's effects are so modest. It will cost taxpayers about \$10 for each additional gallon of ethanol that is stimulated by the tax credit. And there is no better time to let the import tariff expire because there is so little Brazilian ethanol available for export. Strong domestic demand in Brazil, high prices for sugar, and a strong Brazilian currency all have worked to limit the availability of Brazilian ethanol in export markets.

The results reported here also show that if stability in feed costs is a policy objective, then waiving the mandate in years of tight corn supplies would allow the fuel sector to help absorb corn supply disruptions rather than burdening only the livestock sector. Because the ethanol mandate creates a floor on ethanol demand, the fuel sector cannot help limit the economic consequences of tight supplies on the U.S. and world food sectors. A more flexible policy on mandates would complement the policy decision to allow higher blends in our fuel supplies. Moving toward an ethanol policy that allows blends to adjust to the relative price of ethanol and gasoline might become attractive if U.S. corn production cannot keep pace with domestic and world demand.

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