Potential Impacts of a Partial Waiver of the Ethanol Blending Rules

Preface

Four years ago, as the temperature of rhetoric in the food-versus-fuel debate rose with the prices of corn and oil, Farm Foundation asked three economists from Purdue University to take an objective look at the complex forces that were driving food prices. While oil prices are not at 2008 levels this summer, drought and high temperatures are pushing corn and soybean prices to record levels, and the food vs. fuel debate is once again heated.

Now as then Farm Foundation and Purdue University are not about fueling these fires. Our shared mission is to be a catalyst for sound public policy by providing objective information to foster deeper understanding of the complex issues before our food and agriculture system today. As a result of this shared commitment, Purdue University economists Wallace Tyner, Farzad Taheripour and Chris Hurt have written this paper to examine the effects of what is perhaps the most commonly discussed policy response to this summer's drought—a waiver of the ethanol blending rules mandated in the Energy Independence and Security Act of 2007.

Building on years of work, including a series of three Farm Foundation publications "What's Driving Food Prices", the authors provide a clear description of the complex economics of corn and ethanol markets and a rigorous assessment of the implications and, just as importantly, the uncertainties of changes in U.S. renewable fuels policy.

Perhaps the key to understanding the policy choices facing us is to recognize, as the authors so aptly point out, that at this point the economic damage of this year's drought has been done and policy decisions are now about how the cost will be shared among corn farmers, livestock farmers, taxpayers and consumers, both at home and around the world. The policy choices in front of us are not pleasant or easy. Our hope is that this paper can help provide policy makers and all of the stakeholders in our food and agricultural system with the knowledge to make the choices informed ones.

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The drought has raised concerns about available corn supplies, corn prices and the consequences to end users. As indicated in previous work [1], the United States entered this season with low stocks, and the drought will drop those stocks further. Corn price has gone up about 60% since June 15, and the near futures price is currently about $8/bushel (bu.). The price of corn affects many items consumers purchase:

- Livestock products such as meat, dairy, and eggs;
- Soft drinks and food products containing corn sweeteners;
- Gasoline containing 10% or more ethanol made from corn;
- Other food items that contain corn starch, corn flour, or corn directly.

The lack of corn availability is a critical concern to all end users, including livestock feeders, export customers, the ethanol industry, and ultimately domestic and foreign consumers. There will not be enough corn for everyone to continue consuming at historic rates. Some end users will have to cut back—perhaps sharply. Who will that be?

The Renewable Fuel Standard (RFS) mandates the use of renewable fuel, which translates mainly to ethanol made from corn. However, livestock producers have requested a partial waiver of that mandate reasoning that if less corn moves to ethanol, there may be more, at lower prices, for their industry. Also, Arkansas Gov. Mike Beebe has petitioned for a waiver, and EPA is required to respond to that request.

The focus of this paper is how the drought may impact the corn and ethanol markets, and how an EPA ethanol waiver might affect those markets. The paper describes how the outcomes will depend on a host of factors such as oil prices, corn prices, final corn production, the flexibility of oil refiners and blenders, and the potential use of Renewable Fuel Identification Numbers (RINs).

The drought also will affect the soybean crop and reduce the availability of high protein feed products, but that dimension or biodiesel will not be addressed in this paper. This paper also will not address whether or not there should be a Renewable Fuel Standard, nor will it cover impacts of other policy options beyond a waiver. There are many policy possibilities, which may be explored in future work. This paper is limited to the question of impacts of a possible waiver.

Since mid-June, the price of corn ethanol has increased about 60¢ per gallon (27%), and it may continue to increase. Since gasoline is 10% ethanol, that implies a 6¢/gallon increase in the gasoline pump price due to the drought if all that price increase were passed through to the retail level. However, corn ethanol is still less expensive than

gasoline on a volume (per gallon) basis. Ethanol also is exported, but it is not clear what impact the higher ethanol price will have on ethanol exports. To the extent exports are reduced, that would reduce demand for corn for ethanol and lead to some reduction in the corn price.

This paper describes a) how the RFS works; b) provides a qualitative assessment of some of the drivers that ultimately will determine the impacts of a partial waiver of the RFS for 2013; and c) provides some quantitative estimates of possible waiver impacts over a range of different assumptions.

The drought is the reason for the economic losses, but the EPA and other policy decisions could affect, to some extent, who bears the costs of the drought.

Qualitative assessment

How high corn price affects the ethanol market down the road depends on several factors. Today, ethanol is priced below the benchmark gasoline product, Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB). Generally, when ethanol is cheaper than RBOB, blenders still have an incentive to blend 10% ethanol with gasoline. However, there are many different specifications of gasoline blended with ethanol. Conventional Gasoline Blendstock for Oxygenate Blending (CBOB) is used in every state and generally is less expensive than RBOB. California has its own gasoline specifications. There are many regional markets with different vapor pressure and other specifications. However, in any situation, ethanol has value as an oxygenate and octane enhancer.

If the corn price continues to increase, and ethanol price moving with it surpasses gasoline by a significant margin, blenders may not have an economic incentive to blend ethanol. In fact, there has been an 8% fall in ethanol production over the past seven weeks as the higher corn price puts pressure on ethanol margins. This shows that markets can and do adjust, with less corn being used for ethanol. Adjustment might have been greater in the absence of the mandate.

The United States' statutory RFS requires blenders to use 13.2 billion gallons (BG) of ethanol in 2012 and 13.8 BG in 2013.[1] With about four months left, the remaining 2012 obligation is about 5.6 BG. Blenders receive a credit, called a RIN, for each gallon of renewable fuel blended. It is via RINs that EPA keeps track of compliance with the RFS. If more gallons than required by the RFS are blended in any given year, blenders are allowed to carry-forward unused RINs for possible use in the next year. In fact, by using prior year RINs each year, blenders can roll forward RINs indefinitely. Paulson and Meyer [2] have estimated the stock of RINs currently available to be 2.6 BG. That means, if they chose, blenders could use as little as 3 BG of ethanol for the remainder of 2012 to meet their obligation. To the extent that carry-forward blending credits were used in 2012, more ethanol plant closings and less ethanol production could be seen.

[1] Actually there is no requirement for corn ethanol, just renewable fuel. However, in practice, the conventional biofuel part of the RFS consists today of ethanol from corn or sorghum, mainly corn.

Some technical constraints in ethanol blending could keep ethanol demand from falling quickly. If ethanol demand falls, it would be a slow reduction rather than an abrupt change. Some of the carry-forward RINs might be used in 2012 with the remainder rolled forward to 2013. However, for a number of reasons, most blenders will probably continue blending ethanol at the same 10% rate in 2012 unless the ethanol price surpasses gasoline by a big margin, which seems unlikely in 2012.

In addition, there currently are no financial incentives for blenders to use RINs to meet RFS obligations if the ethanol price is below RBOB. In recent weeks, ethanol prices have been 25¢ to 40¢ below RBOB, but not necessarily below blending products like CBOB. For ethanol to reach RBOB, a) the corn price has to rise significantly, forcing up the ethanol price; b) the gasoline price must fall significantly; or c) some combination of the two. RINs will not be used until the refiners have the economic incentive to do so.

The real question is what happens in 2013, when the ethanol blending obligation increases to 13.8 BG. That increased ethanol demand clearly puts pressure on corn usage and prices, with limited supply due to drought. EPA received a request from several livestock sector groups to initiate a review to reduce the corn ethanol mandate for 2012 and 2013. Normally, EPA issues its decisions on the level of the RFS in November of the year before the RFS is applied. If EPA were to maintain that calendar, the agency would have until October to gather information on the extent of "economic harm" done by the originally stipulated RFS level and to decide whether to issue a partial waiver to reduce the 2013 mandate. We do not think EPA will issue a waiver for 2012.

The impact of a partial waiver for 2013 would depend on: 1) the price of crude oil and thus gasoline; 2) the magnitude of the drought induced corn production loss and the resulting corn price; 3) the extent to which blenders have an economic incentive to reduce ethanol blending; and 4) some technical issues, discussed below, related to conversion from 10% or more ethanol to lower ethanol blends.

<u>Technical and oil market issues</u>

It is useful to understand some of the technical and market constraints related to ethanol blending.

- Much of the regular gasoline that is produced today is 84 octane, and must be brought up to 87 octane for retail sale. It is brought up to 87 octane by blending 10% ethanol, which has 115 octane [3]. According to refinery and industry sources, it may take three to six months for refineries to adjust to producing 87 octane instead of 84 octane. This time lag would only begin once it is economically attractive to make the change. Whether it was economically attractive to continue using ethanol would depend to a significant degree on how the price of ethanol compared with the price of other octane and oxygen sources. Even if technically and economically feasible to make the change, it is not clear if

refineries would make the change if they perceived the waiver to be a one-time event only for 2013.

- Another issue is the vapor pressure of the fuel. Gasoline blends must meet EPA upper limits on vapor pressure to reduce evaporative emissions. The limits are higher (less constraining) in winter months than in summer months. Ethanol, with a vapor pressure of 18 psi, increases the vapor pressure of the blended fuel. But 10% ethanol blends have a higher (1 pound psi) summer threshold, which might make ethanol blending more attractive. High-octane light hydrocarbons might be available to replace ethanol in winter months for a relatively short period. However, the prices of these ethanol alternatives have increased over the past month. The prices, availability and environmental impacts of these products relative to ethanol will be an important determinant in their use to replace ethanol.

- The actions and reactions of refiners and blenders may vary widely. The decision of a company that owns both refineries and ethanol plants could be quite different from a company that has no stake in the ethanol business.

- Existence of take-or-pay contracts also could limit reduction in ethanol demand. A take-or-pay contract requires the buyer to either take the physical product or pay a pre-determined penalty. These contracts would encourage ethanol plants and blenders to continue to produce and consume ethanol. While these contracts are used in the industry, the extent of their use is unknown.

- The following quote from Oil Price Information Service [4] perhaps summarizes the current situation:

  "For most of 2012, and indeed much longer than that, creating finished gasoline by blending in ethanol up to 10% of the final product saved suppliers as much as 5-15 cents/gal. Now many markets have price structures such that blenders are losing money when mixing in ethanol."

  This same article mentions that the prices of alternative octane enhancers also shot up in July.

<u>Possible combinations that could play out in 2013</u>

- If the season average corn price is around $8 or higher, which seems likely, and crude oil remains at $100 or lower, then reducing the RFS could reduce the demand for ethanol--and consequently the demand for corn--if it is economically feasible for refiners and blenders. However, the market response to a waiver is very hard to predict. If the waiver resulted in less demand for ethanol, that would, in turn, lead to less demand for corn and a lower corn price. More ethanol plants may close or operate at less than full capacity, at least temporarily. However, it is not clear how quickly the fuel industry could adjust to not using ethanol or if it would be economically feasible. In other words, for technical and economic

reasons, the waiver could have little or no near-term impact, but it is hard to predict how refineries and blenders would respond.

- If corn price remains around $8, crude oil is less than $100 and blenders did not use their RINs in 2012, they could use them in 2013 if economically warranted. That would effectively waive part of the RFS for 2013. Also, blenders could opt to borrow some 2014 credits to meet 2013 obligations. At this point, that option seems unlikely, as it would lead to very high obligations in 2014. Any waiver from EPA would be in addition to the blending flexibility created by the surplus RINs. The effective blending mandate under this condition would be much lower and could result in lower ethanol demand, lower corn use, lower corn price, and more ethanol plant closings or operating at less than capacity. Again, this might not happen for economic and technical reasons.

- If corn price remains in the $8 range and the price of crude oil increases to the area of $120, waiving part of the RFS would have little impact because ethanol likely would be demanded by the market regardless of the level of the RFS. In addition, with a higher crude price, refiners would have less incentive to convert operations to a lower ethanol blend.

These different possibilities are summarized in Table 1.

Table 1. Possible Waiver Impacts Under Different Technical and Market Assumptions

Market and Technical Conditions	**Likely Waiver Impact on Ethanol Demand**
High corn price Moderate crude oil (<$100) Limited refining and blending flexibility	Little impact of a waiver
High corn price Moderate crude oil (<$100) Refining and blending flexibility	Possible waiver impact
High corn price Moderate crude oil (<$100) Refining and blending flexibility RIN credits available for use in 2013	Possible significant waiver impact
High corn price High crude oil price (>$120) Limited refining and blending flexibility	Little impact of waiver
High corn price High crude oil price (>$120) Refining and blending flexibility	Likely small impact of waiver, but possibility of larger impact

Another possibility would be for EPA to totally waive the “other advanced” mandate, which is 0.75 BG for 2013. Sugarcane ethanol is included in that category. If that mandate were waived, all the sugarcane-based ethanol would move into the

conventional category with lower RIN prices. It would then be counted toward meeting the implied mandate, which could reduce corn ethanol production. This would only represent about 275 million bushels of corn. But the sum of the other advanced mandate plus carry-forward RINs could potentially be about 1.2 billion bushels of corn. That represents about 24% of the effective corn mandate, which is roughly the size of the projected corn crop shortfall. With the higher corn ethanol price, more sugarcane ethanol would be imported, which also effectively lowers the demand for corn ethanol.

Quantitative assessment

A range of possible impacts depends on the price of oil, the price of corn, the magnitude of the drought, the economics of switching away from ethanol, and technical flexibility of refiners and blenders. First, assuming limited flexibility on the part of refiners and blenders in the near term, the impact of a waiver would be very small or nil. If refiners and blenders cannot or choose not to change their current practice of using 10% ethanol blends, then a waiver does not matter. Technical and market constraints would override the waiver.

However, refiners and blenders may have some degree of flexibility in production. This is certainly true the longer the time horizon, so the question is to what extent it is true in the confines of one year. There is not a complete answer to that question, but many of the factors that will determine it are described above.

The next question: What would be the impact of a partial waiver under the assumption that refiners and blenders do have some flexibility in reducing ethanol use and substituting other octane and oxygen additives for ethanol to meet final product specifications? For this paper, estimates were done using a partial equilibrium model developed and used for previous ethanol policy work [5-9]. The model was updated, tuned according to recent observations, and modified for this work on drought impacts. The analysis was done for several levels of partial waiver or use of available RINs in 2013. As indicated above, it is unlikely any waiver will be issued for 2012.

The model for this analysis includes expectations before the drought with a full 13.8 BG RFS for 2013. Then it assumes the drought with three alternative ethanol blending levels: 11.8 BG, 10.4 BG, and 7.75 BG. For this analysis, it does not matter whether the reduced blending levels result because of the use of RINs or a partial waiver. However, the 11.8 BG level could be seen as no waiver and the use of 2 BG of RINs. (Use of some RINs in 2012 and surplus 2013 RINs carried forward to 2014 could limit the 2013 usage to around 2 BG.) The case of 10.4 BG represents 75% of the 13.8 BG RFS and could result through any combination of waiver, use of prior RINs, or use of sugarcane ethanol. The drought may reduce corn production 25% from pre-drought expectations, so EPA might consider a case that could reduce corn ethanol use through some combination of RINs and waiver by that same fraction. Finally, the case of 7.75 BG represents a waiver of 3.45 BG (25% of RFS) plus use of all the estimated available 2.6 BG of RINs, estimated to be the maximum possible ethanol reduction level if economic and technical hurdles could be overcome.

These simulations were run for three possible degrees of drought severity: stronger, median, and weaker. The target corn production levels for these three cases are 10.5, 11.0, and 11.5 billion bushels. Corn production varies a little bit among the ethanol demand cases, as more corn is harvested with the higher corn price than with lower corn price. In other words, there is some very limited supply response even after the drop is in the ground as farmers make harvest and use decisions. The 11 billion bushel case was the median from a recent Reuters survey of analysts [10]. It is also the level in a recent F.C. Stone report [11].

USDA's August 10, 2012, WASDE projection [12] is 10.8 billion bushels, with a yield of 123.4 bushels/acre, which is between the stronger and median drought cases. The results for all three cases are summarized in Table 2.

Table 2. Waiver Impact Simulation Results under Varying Blending Levels and Degrees of Drought Severity

Description	**Expectation Before Drought**	**Drought with 13.8 BG Ethanol**	**Drought with 11.8 BG Ethanol**	**Drought with 10.4 BG Ethanol**	**Drought with 7.75 BG Ethanol**
Stronger Drought:					
Corn production (Bil. bu.)	14.65	10.50	10.45	10.42	10.35
Corn used for ethanol	5.11	5.11	4.37	3.85	2.87
Domestic food and feed use	6.72	3.96	4.59	5.03	5.58
Exports	1.82	1.43	1.49	1.53	1.63
Corn price ($/bu.)	5.26	8.57	7.89	7.45	6.58
Median Drought:					
Corn production (Bil. bu.)	14.65	11.00	10.95	10.92	10.85
Corn used for ethanol	5.11	5.11	5.11	3.85	2.87
Domestic food and feed use	6.72	4.39	5.02	5.45	6.25
Exports	1.82	1.49	1.56	1.62	1.73
Corn price ($/bu.)	5.26	7.81	7.14	6.67	5.80
Weaker Drought:					
Corn production (Bil. bu.)	14.65	11.50	11.45	11.42	11.35
Corn used for ethanol	5.11	5.11	5.11	3.85	2.87
Domestic food and feed use	6.72	4.81	5.42	5.84	6.62
Exports	1.82	1.58	1.66	1.72	1.86
Corn price ($/bu.)	5.26	7.02	6.36	5.89	5.02

Note: The corn yields for these three cases are 120, 126, and 132 bu/ac.

Domestic corn use for feed and food varies with the level of ethanol production and drought severity. For example, in the median case, corn used for food and feed would be about 4.4 billion bushels with a full RFS. If ethanol production drops to 10.4 BG, corn use for food and feed would be about 5.5 billion bushels. Corn exports for the case of median drought are about 1.5 billion bushels with a full RFS and around 1.6

billion bushels with 10.4 BG of ethanol. These results are not directly comparable with August 2012 WASDE values because of differences in assumptions on ethanol, feed, export uses and stock changes.

With the full RFS and no prior year RINs credits, the corn price ranges between $7.02 and $8.57 depending on the severity of the drought. It is not clear to what extent the corn market has already priced in not only the median level of drought, but also some use of carry-forward RINs.

Reducing blending to 11.8 BG reduces corn price between $0.66 and $0.68 per bushel depending on the severity of the drought. In other words, with no EPA action, the carry-forward RINs could result in the corn price falling about $0.67/bu. At least part of that decline may already be priced in to the corn market. Assuming the 11.8 BG level is the realistic base for considering waiver impacts, given that the prior blending credits can be used, the movement to 10.4 BG reduces corn price an additional $0.44 to $0.47 per bushel. Going to 7.75 BG from 11.8 BG reduces price by $1.31 to $1.34 per bushel in total.

The bottom line: if refineries and blenders have flexibility to reduce ethanol usage in the short term, use of prior blending RINs credits and/or a waiver could reduce corn price around $1.30/bu for a large waiver or $0.47/bu for a modest waiver. This analysis does not do a full evaluation of feed costs for the livestock industry; such an analysis would also need to evaluate the impacts of lowering the mandate on other feed ingredients, such as distillers grains, soybean meal, forages and other grains or feedstuffs that may be used in rations.

Comparison with other reports

To date, two other studies have been released related to this topic. Bruce Babcock [13] used a model developed at Iowa State University to estimate the impact of carry-forward RINs plus an additional waiver. He assumed an average yield of 138 bu/ac. Our paper assumes yields 18, 12 and 6 bu/ac lower for the three cases. Babcock's numerical results appear to be driven largely by the yield assumption and the assumption of the nature of ethanol demand. His ethanol demand structure has flexibility for the first level of ethanol reduction, due to either carry-forward RINs or waiver, but little or no flexibility beyond that. He simulates three cases: 1) a full RFS mandate assumed to be 13.6 BG; 2) use of 2.4 BG of RINs (flexible mandate); and 3) a full waiver. His analysis gets a difference in corn price between the full mandate and the flexible mandate cases of $0.91/bu. for the 2.4 BG use of RINs—similar to this paper's analysis of $0.67/bu for a 2 BG RIN usage.

Going from the flexible mandate case to no mandate yields another $0.28/bu. price reduction in Babcock's analyses. This result is driven by the assumed shape of the demand curve for ethanol.

Starting from the full mandate case, what this paper calls refining and blending flexibility is assumed, but after dropping to about 10 BG there is no further flexibility. Thus, for the first reduction in ethanol demand from use of carry-forward RINs, refining and blending flexibility are assumed. The first part of the waiver case from 11.2 to about 10 BG has a little flexibility, but after that, it is equivalent to this paper's no flexibility case, which means no ethanol use response. In fact, based on the demand curve that is presented in the Babcock paper, there would be no difference between a 2 BG waiver and a full waiver. After about 10 BG, there is no response of ethanol demand to the price ratio of ethanol and gasoline. Babcock recognizes this is a critical assumption and states, "If this demand curve overstates the value of ethanol to blenders, then the effects of removing the mandate would be larger." There are many other results reported in the Babcock paper, but these are the key values to compare with the results of this paper.

The results from use of carry-forward RINs are comparable in the two papers, but waiver impacts are different. Babcock essentially assumes a no flexibility case and gets little impact from a waiver, as does this paper. This paper's empirical results assume there is some degree of refining and blending flexibility over a fairly large range, so a larger corn price response results. However, it is important to repeat that in this paper, the range of corn price impacts from a partial waiver is zero to $1.30/bu. Babcock's value of $0.28/bu. falls within that range.

The second paper was done by Scott Irwin and Darrell Good from the University of Illinois [14]. They have a demand for ethanol assumption similar to Babcock. They do not do empirical estimates. They simply argue that the use of carry-forward RINs would be enough to reach the perfectly elastic portion of the demand curve, so a waiver would have no impact on corn price. Their assumption is equivalent to that of this paper's no flexibility case, which projects zero impact. However, the degree of refiner and blender flexibility if a waiver were issued is unknown. Unlike the Irwin/Good paper, this paper argues there is limited flexibility to adjust to lower corn use for ethanol in the short-run, i.e. 2012, but there could be some reduction in corn use below the blend wall over the entire September 2012 through August 2013 marketing year.

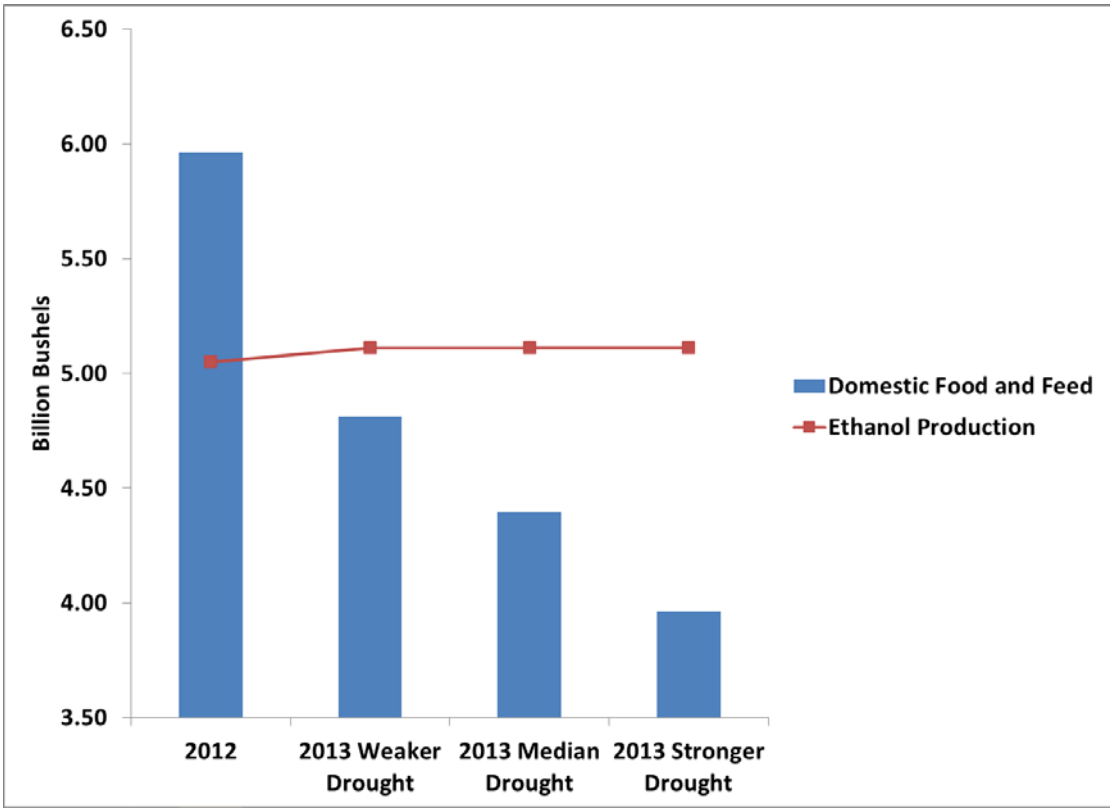
Summary

In making its waiver decision, EPA will have to weigh the economic harm of higher corn prices to livestock producers and to food and fuel consumers, against the interests of crop producers and ethanol producers. Livestock producers face substantially higher feed costs, much of which they cannot pass on to consumers in the short run. If there is limited flexibility to reduce corn use for ethanol, livestock producers must do more of the adjustment, i.e. reduce herd size or find other feed options, as illustrated in Figure 1. The line depicts the steady ethanol use of corn under different drought assumptions, and the bars show domestic food and feed use assuming the mandated amounts of corn ethanol are produced.

However, there likely would be some adjustment, such as the drop in ethanol production that is already occurring. The August 10, 2012 WASDE report indicates a 500 million

bushel drop in corn use in ethanol, compared with USDA's pre-drought forecast. That amounts to 1.38 BG of ethanol. So clearly Figure 1 represents an extreme case with absolutely no adjustment in ethanol demand for corn in the base. In addition, some downward adjustments in corn use can come from foreign buyers, and there may be some opportunity to draw down stocks somewhat.

Figure 1. Illustration of Domestic Food and Feed Use in 2013 with No Flexibility in Ethanol Corn Demand



Ultimately, consumers will face higher prices for all livestock products and food items that use corn and higher fuel costs. Many ethanol producers entered the business because of the government guarantee of a market. A waiver might reduce that market and thus harm those producers. Ethanol producers already face tighter margins with the higher corn prices.

Corn producers who have a corn crop would be harmed by any action that lowers corn prices. However, federally-subsidized crop insurance will provide a substantial cushion for the sector if the individual producers have adequate coverage.

EPA will have to determine what impact a waiver actually would have given the way the market functions. The most likely technical outcome is that refiners and blenders could and probably would reduce ethanol use to some extent, but how much is uncertain for 2013. If conditions are such that issuing a waiver would have little impact, the decision becomes more symbolic than one with real impact.

If refiners and blenders do not have or choose not to use short-term blending flexibility, a partial waiver would not reduce the amount of corn used for ethanol. To the extent they do have flexibility, a small waiver could reduce corn price around $0.47/bu, and a large waiver could reduce it as much as $1.30/bu over the case of RINs alone being used. The carry-forward RINs alone provide about $0.67 corn price reduction, so the range of impact of a RFS waiver on corn price is zero to $1.30/bu given the assumptions used for this analysis.

In summary, the drought will ultimately impact consumers of food and fuel and the businesses that produce that food and fuel. The magnitude and direction of the impacts depend to some extent on the decision by the EPA to reduce the RFS depending on conditions highlighted in this paper. USDA is estimating that 2013 food prices will rise 3% to 4% [15]. Prices of some food items will be affected for subsequent years as well. For fuel, the short-term impact of the drought could be limited to some increase in pump prices due to higher ethanol prices caused by higher corn prices. If EPA issued a large partial waiver, and if the refining and blending sectors had flexibility, ethanol use could fall, and gasoline prices might fall a bit, as well. But estimating that change is beyond the scope of this paper. Longer term impacts depend on what happens not only to corn price, but to crude oil price and government policy.

It is important to understand that economic harm in the tens of billions of dollars has already been done by the drought. The corn price is substantially higher than would have transpired in a normal year. In considering a waiver, EPA cannot change the loss, but can only redistribute it among the affected parties—ethanol producers, livestock producers, corn growers, and ultimately domestic and foreign consumers. To the extent that the refining and blending industry has flexibility, issuing a waiver helps livestock producers and livestock product consumers, and it hurts ethanol producers and crop growers. To the extent that little short-run flexibility exists among refiners and blenders, the waiver does little to change the status quo. It is therefore critical that EPA does a thorough assessment of the extent of flexibility in refining and blending operations before reaching a waiver decision.

What should be clear is that high uncertainty remains on the possible impact of an EPA partial waiver of the RFS. A partial waiver certainly is not a “stroke of the pen” solution as implied by a recent *New York Times* editorial [16]. This paper has described what will ultimately be the major determinants of the impacts. The longer term implications of a waiver go beyond the scope of this paper.

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References

1. Abbott, P., C. Hurt, and W.E. Tyner, *What's Driving Food Prices in 2011?*, in *Issue Report* 2011, Farm Foundation.
2. Paulson, N. and S. Meyer, *An Update on RIN Stocks and Implications for Meeting the RFS2 Mandates with Corn Ethanol*, in *FarmDocDaily* August 1, 2012, University of Illinois.
3. Platts, *Methodology and Specifications Guide - Petroleum Products & Gas Liquids: US, Caribbean and Latin America,* June 2012.
4. Oil Price Information Service, *July Brings Blenders to Knees.* Independent Refined Products Prices and Comprehensive Analysis for All US Markets, July 23, 2012. **33**(30).
5. Tyner, W.E. and F. Taheripour, *Renewable Energy Policy Alternatives for the Future.* American Journal of Agricultural Economics, 2007. **89** (5): p. 1303-1310.
6. Tyner, W.E. and F. Taheripour, *Policy Options for Integrated Energy and Agricultural Markets.* Review of Agricultural Economics, 2008. **30** (3): p. 387-396.
7. Tyner, W.E., F. Taheripour, and D. Perkis, *Comparison of Fixed Versus Variable Biofuels Incentives.* Energy Policy, 2010. **38**: p. 5530-5540.
8. Tyner, W.E., *The Integration of Energy and Agricultural Markets.* Agricultural Economics, 2010. **41**(6).
9. Tyner, W.E., *Policy Alternatives for the Future Biofuels Industry.* Journal of Agricultural and Food Industrial Organization,, 2007. **5** (2): p. article 2.
10. Nelson, S. *POLL - US Crop shrinks further: bottom may be near*. Thompson Reuters, July 31, 2012.
11. F.C. Stone. *August 2012 FC Stone Survey*. August 3, 2012.
12. U.S. Department of Agriculture, *World Agricultural Supply and Demand Estimates, August 10, 2012*: Washington, D. C.
13. Babcock, B.A., *Preliminary Assessment of the Drought's Impacts on Crop Prices and Biofuel Production*, in *CARD Policy Brief 12-PB-7* 2012, Center for Agricultural and Rural Development, Iowa State University.
14. Irwin, S. and D. Good, *Ethanol-Does the RFS Matter?*, in *FarmDocDaily* August 2, 2012, University of Illinois.
15. U.S. Department of Agriculture Economic Research Service. *CPI Food Price Index*. August 6, 1012; Available from: http://www.ers.usda.gov/data-products/food-price-outlook.aspx
16. Carter, C.A. and H.I. Miller, *Corn for Food, Not Fuel*, in *New York Times* July 30, 2012: New York.