9. Bio-Energy's Impact on U.S. and World Grain and Feed Markets

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Daniel O'Brien was raised on a grain and livestock farm in south central Nebraska, in which he still has an interest with his father and three brothers. He received both Bachelor of Science (1978) and Master of Science (1980) degrees in Agricultural Economics from the University of Nebraska-Lincoln. The focus of his M.S. thesis was on analyzing the impact of agricultural cooperatives on rural Nebraska fertilizer markets. O'Brien then worked as an extension agent in western (Lincoln County) and northeastern (Pierce County) Nebraska for seven years beginning in early 1981. While attending graduate school at Iowa State University beginning in 1987, O'Brien worked as an Extension Assistant in Agricultural Marketing, focusing on analysis of grain and livestock markets and price risk management strategies. He completed his Ph.D. in December 1993, focusing his dissertation research on developing a method by which to forecast the probability of alternative U.S. harvest time corn futures price outcomes. While working as Extension Farm Management Specialist in Northwest Iowa during 1993 through early 1995, he became heavily involved in analysis of the structural changes in the Iowa livestock industry associated with contract hog production. From March 1995 through May 2003, O'Brien worked as the Extension Agricultural Economist in Northwest Kansas based out of the Northwest Research and Extension Center in Colby. He held the position of Northwest Area Extension Administrative Director starting in June 2003 before returning to his Extension Agricultural Economist position in January 2007. Daniel O'Brien's ongoing extension and applied research interests and efforts are in the areas of a) grain market supply-demand analysis, bioenergy impacts and price-income risk management strategies, b) grain industry market structure, conduct and performance – focusing on grain handling and transportation issues, and c) economic analysis of irrigated and dryland cropping systems, and associated cropland leasing arrangements.

Abstract/Summary

Growth in bioenergy production in the U.S. since 2006 has had a large impact on U.S. grain acreage, production and supply-demand balances, as well as on the agricultural industries using feedgrains and oilseeds. A report titled **"Future Patterns of U.S. Grains, Biofuels and Livestock and Poultry Feeding"** co-authored by Daniel O'Brien of KSU, and sponsored by the Council on Food, Agricultural and Resource Economics (CFARE) and other feed industry groups, examines several issues such as 1) biofuels' impact on livestock feed costs, 2) how saturation of the domestic ethanol market may slow growth in corn demand, 3) how livestock sector adjustments to grain market changes vary by species, and 4) the longer term challenges facing the ethanol industry. These issues will be addressed and discussed in this session.

Bio-Energy's Impact on U.S. & World Grain and Feed Markets

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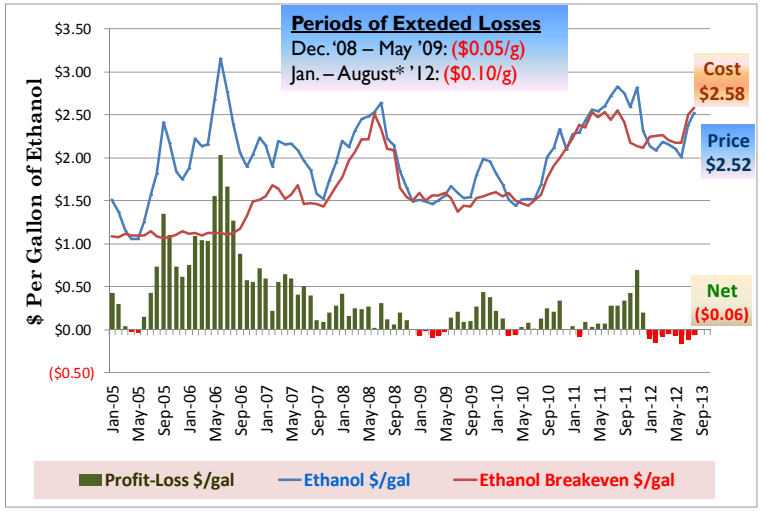
Overview

- Profitability of U.S. Ethanol & Biodiesel
- Trends in U.S. Ethanol Production & Corn Use
- U.S. Renewable Fuels Mandates – History & the Future
- Carryover RINs & their Potential Impact on Corn Use
- How Renewable Fuels Mandates & "Blend Walls" affect U.S. Ethanol Production & Corn Prices
- Thoughts on U.S. Corn Supply-Demand & Ethanol Production Trends in Years 2013-2015

Profitability of Corn Ethanol & Soybean Biodiesel

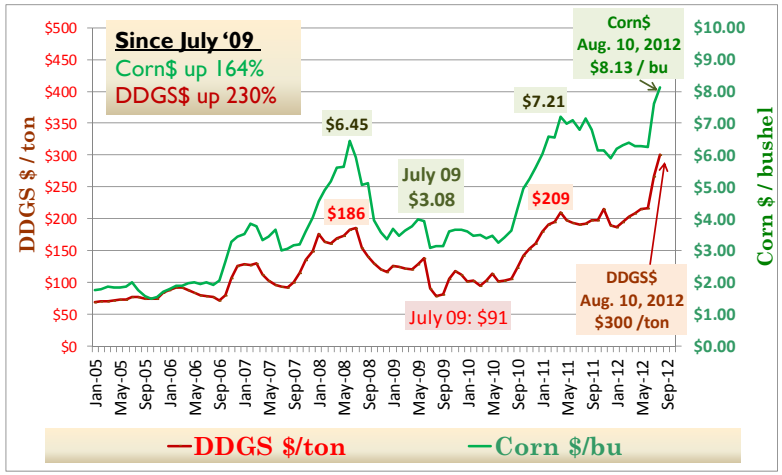
Ethanol Price, Cost & Profits

ISU Ethanol Plant Model (January 2005 – August 10, 2012)



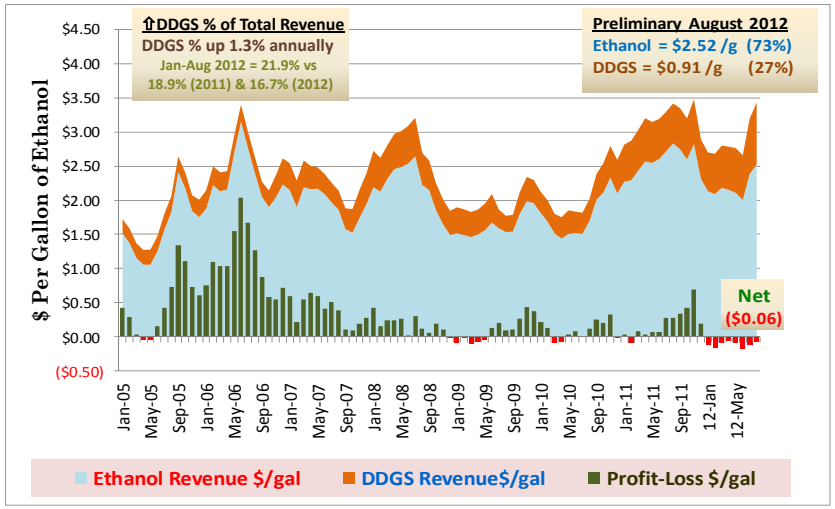
Ethanol DDGS & Corn Input Prices

ISU Ethanol Plant Model (January 2005 – August 10, 2012)



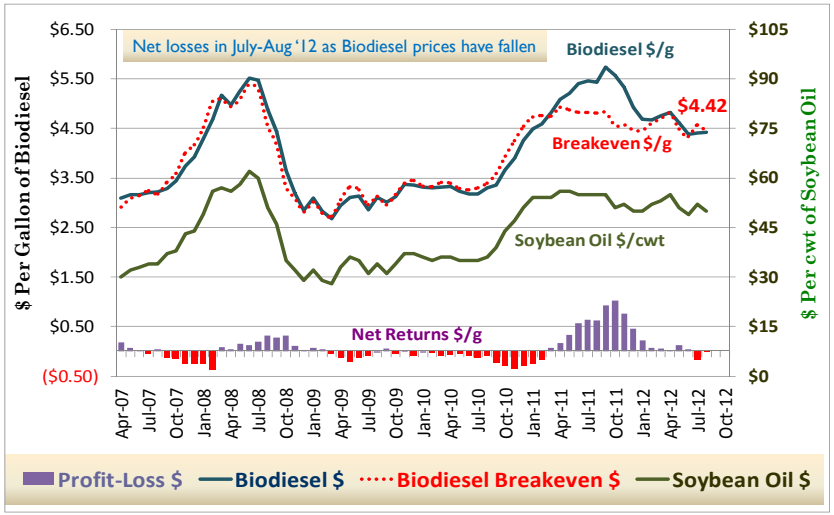
Ethanol Revenues & Net Returns

ISU Ethanol Plant Model (January 2005 – August 3, 2012)



Biodiesel Price, Cost & Profits

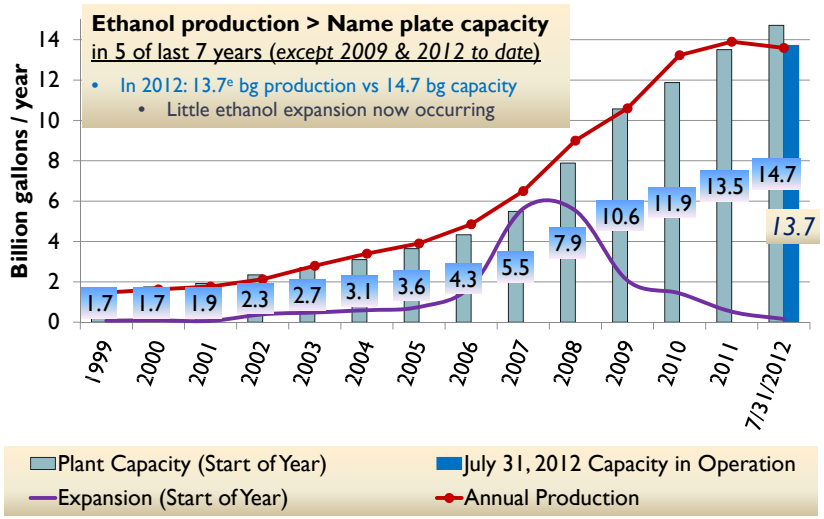
ISU Biodiesel Plant Model (April 2007 – August 3, 2012)



Trends in U.S. Ethanol Production & Corn Usage

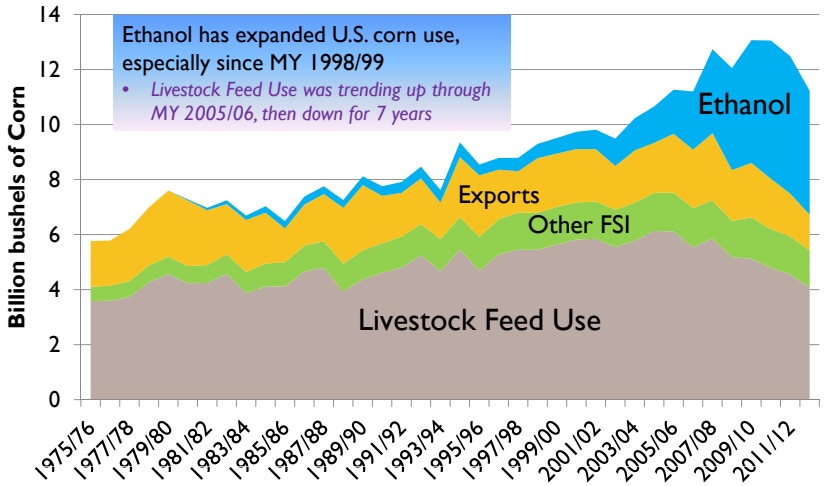
U.S. Ethanol Capacity & Production

Years:1999-2012 Estimate (Source: Renewable Fuels Association)



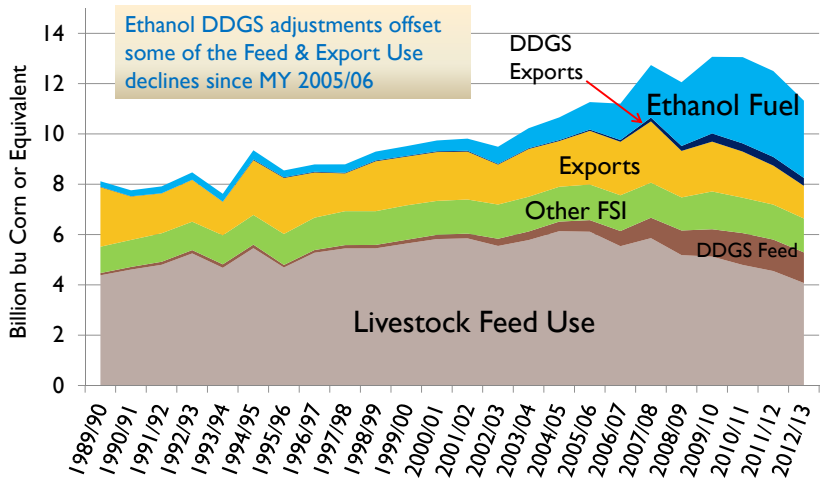
U.S. Corn Use – "Long Term"

1975/76 – 2012/13 Marketing Years



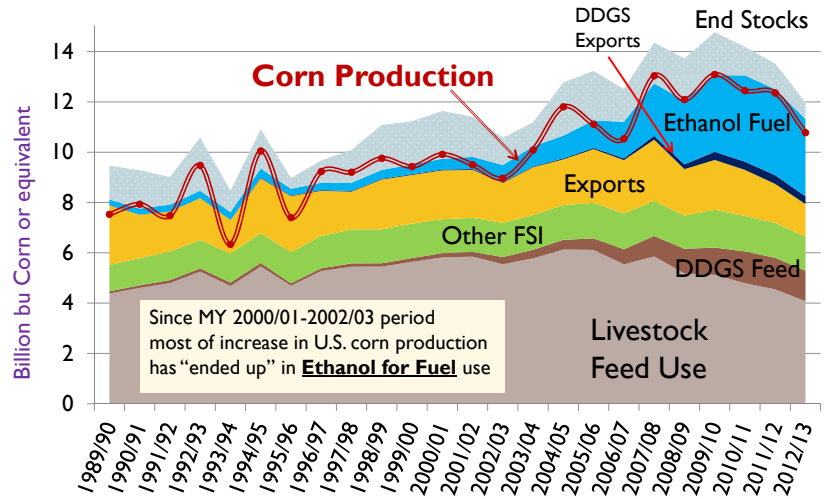
Recent U.S. Corn Use With DDGS #s

1989/90 - 2012/13 Marketing Years



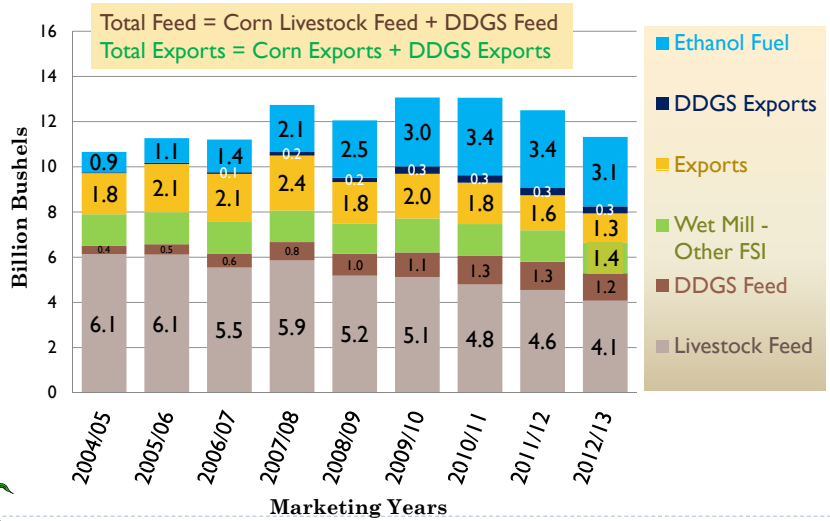
U.S. Corn Production & Use (+DDGSs)

1989/90 - 2012/13 Marketing Years



U.S. Corn Use Trends (+ DDGSs)

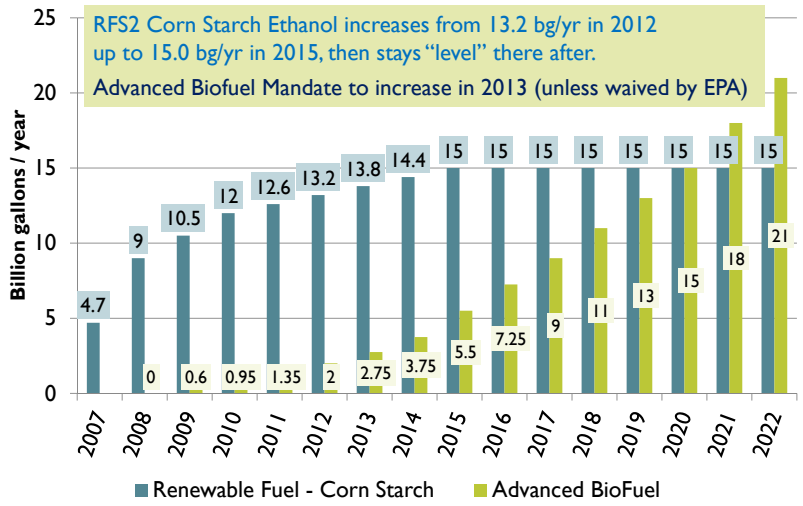
MY 2004/05 thru MY 2012/13



United States Renewable Fuels Mandates – History & the Future

RFS2 Renewable Fuel Volumes

Source: 2007 U.S. Energy Independence & Security Act / EPA



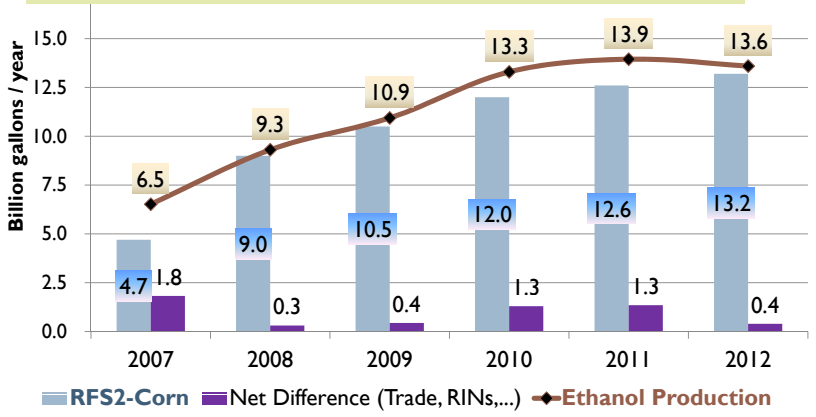
EPA Blending Mandates for 2012

	Actual Gallons	EPA Corn-Starch Equivalent Gallons
Total Renewable Fuels		
+ Corn-starch Ethanol	13.2 bln. gal.	13.2 bln. gal.
+ Advanced Biofuels (see below)	2.0 bln. gal.	2.0 bln. gal.
= Total Renewable Fuels	**15.2 bln. gal.**	**15.2 bln. gal.**
Advanced Biofuels		
+ Biomass-based Diesel	1.0 bln. gal.	*1.5 bln. gal.
+ Cellulosic Biofuel	8.65 million gal.	10.45 million gal.
≈ Advanced Biofuels	**2.0 bln. gal.**	**2.0 bln. gal.**

U.S. Ethanol Production vs RFS2

For Years 2007 – 2012 (Sources: Paulson-Purdue & RFA)

U.S. Ethanol Production > U.S. Corn RFS2 mandates since 2007
Net difference due to ethanol exports, generation of excess of RINs, etc.

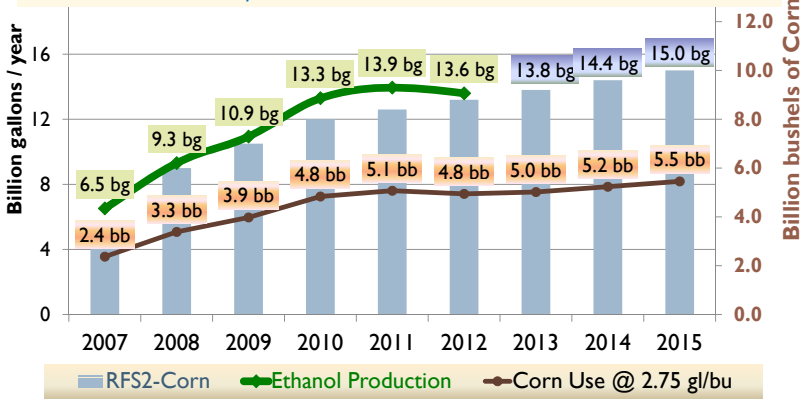


U.S. Ethanol Production vs RFS2

For Years 2007 - 2015

Projected increases in RFS2 & U.S. corn-for-ethanol use for 2012-2015 period

***Key Question**:Will 2012 drought, short corn crop, & high corn $s "throw a wrench" in these RFS2 mandated production levels?*



What are Ethanol RINs?

Source: John Gelbard, RINXchange

- The EPA requires that each gallon of renewable fuel produced have a unique serial number attached to it
- These "**Renewable Identification Numbers (RINs)**" are turned into the EPA each year by petroleum refiners to prove they have blended the required amount of renewable fuel into their gasoline
  - *Refiners can avoid blending renewables into gasoline themselves by purchasing excess RINs from other refiners who have used more renewable fuel than was required of them*
- Anyone registered with the EPA can buy & sell RINs, which means that RINs function as somewhat of a "*renewable energy currency*"

Ethanol RIN Stocks Calculations

RINs = Renewable Identification Numbers for ethanol; (million gallons)

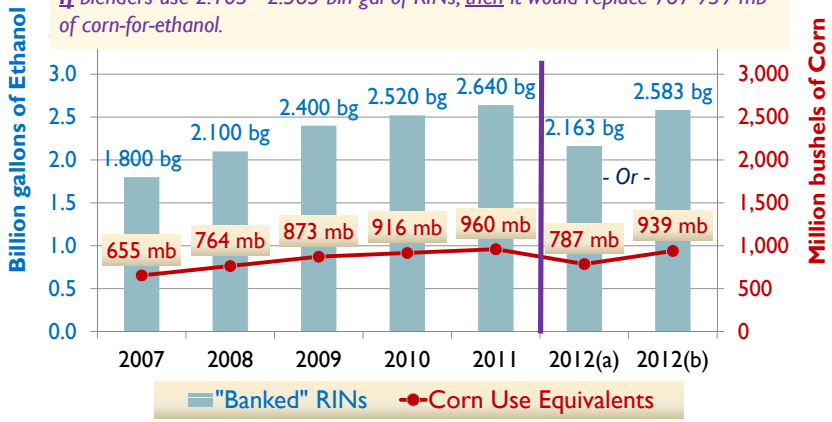
Year	Starting RINs	Ethanol Production	Less Ethanol Exports	Less RFS Mandate (For only to non advanced)	Ending RIN Stocks	RINs Banking Cap (20% x Mandate)	Actual Banked RINs
2007	0	6,521	0	4,700	1,821	1,800	1,800
2008	1,800	9,309	0	9,000	2,109	2,100	2,100
2009	2,100	10,938	0	10,500	2,583	2,400	2,400
2010	2,400	13,298	398	12,000	3,300	2,520	2,520
2011	2,520	13,948	1,195	12,600	2,673	2,640	2,640
2012(a)	2,640	13,595	872	13,200	2,163	2,760	2,163
2012(b)	2,640	14,015	872	13,200	2,583	2,760	2,583
2013**				13,800			
2014**				14,400			
2015**				15,000			

2012 Ethanol RINs Availability

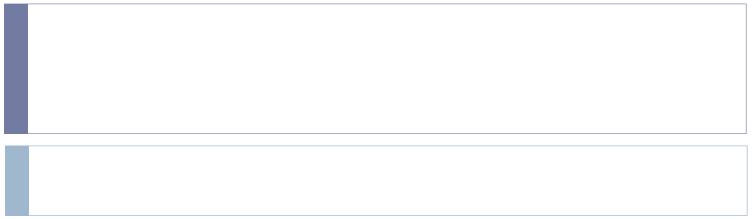
& Corn Use Equivalents

Gasoline blenders can use **carryover RINs** to offset short 2012 supplies

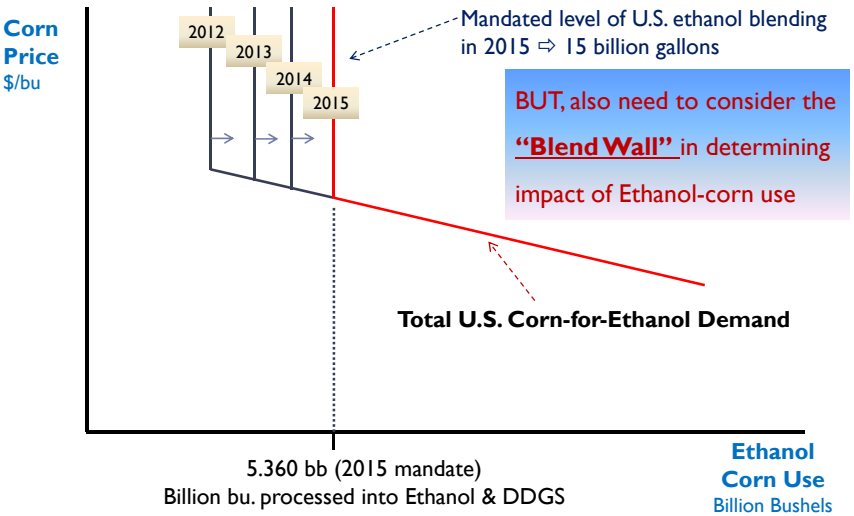
If blenders use 2.163 - 2.583 bln gal of RINs, then it would replace 787-939 mb of corn-for-ethanol.



How Renewable Fuels Mandates & "Blend Walls" affect *U.S. Ethanol Production & Corn Prices*



U.S. RFS Mandates Give Ethanol a Corn Input Purchasing Advantage (i.e., Inflexible demand)



What is the Ethanol "Blend Wall"?

- The **"blend wall"** is the upper limit to the total amount of ethanol that can be blended into U.S. gasoline.
- The **blend wall** is set by the 10% limit to blending ethanol in gasoline, with the exception of fuels sold to flex-fuel vehicles (FFVs) that are approved for higher blends such as E30 or E85.
  - FFVs make up < 20 % of the car pool, but with limited availability of blender pumps in locations where the majority of those FFVs are located, the market share is much less.
  - Increasing gasoline blends from E10 to E15 could solve the blend wall issue, but it creates other problems that would need to be resolved.
- The U.S. consumes ≈ 132-138 billion gallons of gasoline / year
  - If every gallon of gasoline included in the RFS were blended with 10% ethanol, refiners would hit the "blend wall" around **13.2-13.8 billion gallons** in 2012

Ethanol Mandate Impact on Corn $s

Full, Flexible & No Mandate Effect in MY 2012/13 (Babcock – ISU)

	Full Mandate *(RFS2 met in full)*
U.S. Corn Price ($/bu)	$6.97
Renewable Fuels Standard (RFS2)	13.6 bg
U.S. Ethanol Production (billion gallons)	14.3 bg
U.S. Corn Use for Ethanol (billion bu.)	5.2 bb
Ethanol RINs Used (billion gallons)	0 bg
Ethanol Price ($/gallon)	(BrkEvn$) $2.62
Ethanol RIN Price ($/gallon)	(High $s) $1.01
U.S. Ethanol Exports (to Brazil) (billion gallons)	0.67 bg
U.S. Ethanol Imports (from Brazil) (bln gallons)	0.48 bg

What happens to U.S. corn use & price as the RFS2 Mandate is relaxed by using carryover RINs?

Ethanol Mandate Impact on Corn $s

Full, Flexible & No Mandate Effect in MY 2012/13 (Babcock – ISU)

	Full Mandate *(RFS2 met in full)*	Flexible Mandate *(RFS2 met using 2.4 bg of RINs)*
U.S. Corn Price ($/bu)	$6.97	$6.06
Renewable Fuels Standard (RFS2)	13.6 bg	13.6 bg
U.S. Ethanol Production (billion gallons)	14.3 bg	12.9 bg
U.S. Corn Use for Ethanol (billion bu.)	5.2 bb	4.7 bb
Ethanol RINs Used (billion gallons)	0 bg	2.4 bg
Ethanol Price ($/gallon)	(BrkEvn$) $2.62	(BrkEvn$) $2.37
Ethanol RIN Price ($/gallon)	(High $s) $1.01	(⇩corn $) $0.16
U.S. Ethanol Exports (to Brazil) (billion gallons)	0.67 bg	1.16 bg
U.S. Ethanol Imports (from Brazil) (bln gallons)	0.48 bg	0.48 bg

What if the RFS2 Mandate is eliminated?

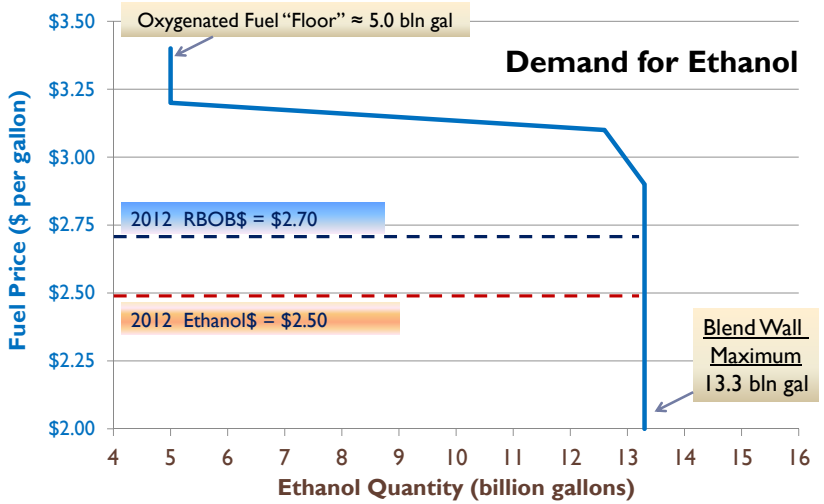
Ethanol Mandate Impact on Corn $s

Full, Flexible & No Mandate Effect in MY 2012/13 (Babcock – ISU)

	Full Mandate *(RFS2 met in full)*	Flexible Mandate *(RFS2 met using 2.4 bg of RINs)*	No Mandate *("Blend Wall" demand only)*
U.S. Corn Price ($/bu)	$6.97	$6.06	$5.78
Renewable Fuels Standard (RFS2)	13.6 bg	13.6 bg	0 bg
U.S. Ethanol Production (billion gallons)	14.3 bg	12.9 bg	12.3 bg
U.S. Corn Use for Ethanol (billion bu.)	5.2 bb	4.7 bb	4.5 bb
Ethanol RINs Used (billion gallons)	0 bg	2.4 bg	0 bg
Ethanol Price ($/gallon)	(BrkEvn$) $2.62	(BrkEvn$) $2.37	(BrkEvn$) $2.30
Ethanol RIN Price ($/gallon)	(High $s) $1.01	(⇩corn $) $0.16	(no RFS2) $0.00
U.S. Ethanol Exports (to Brazil) (billion gallons)	0.67 bg	1.16 bg	0.95 bg
U.S. Ethanol Imports (from Brazil) (bln gallons)	0.48 bg	0.48 bg	0 bg

Ethanol Demand Model for 2012

Depends on Blend Wall, RBOB vs Ethanol $s, limited fuel substitution



Model from Irwin, Good – Illinois, August 2012)

Ethanol Blending Profits Depend on ***RBOB Gasoline $'s*** vs ***Ethanol $'s***

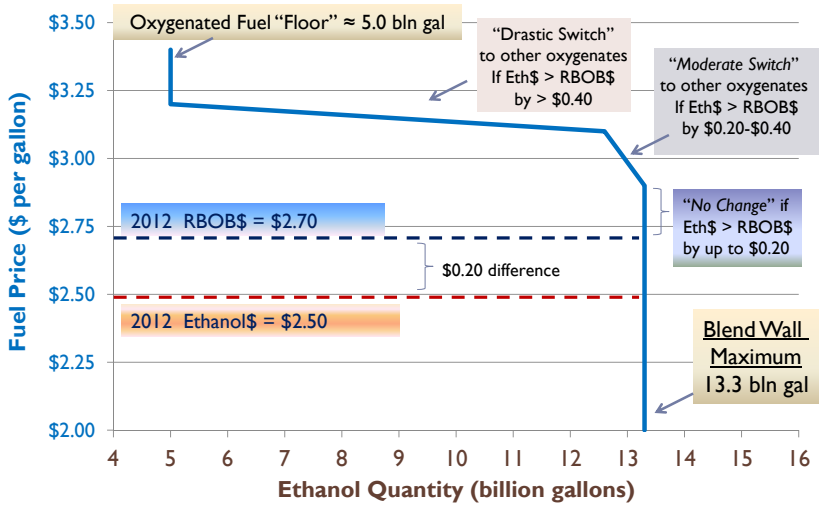
- RBOB gasoline SEP 2012 futures (8/17/2012) = $3.02^{66} /gallon
- Ethanol SEP 2012 futures (8/17/2012, 10:30 a.m) = $2.59 /gallon
  - RBOB$/Ethanol$ = 117%, or a $0.43^{66} / gallon differential

RBOB$ NYH Unleaded Gasoline

Ethanol Futures$ CBOT

Ethanol Demand Model: MY 2012/13

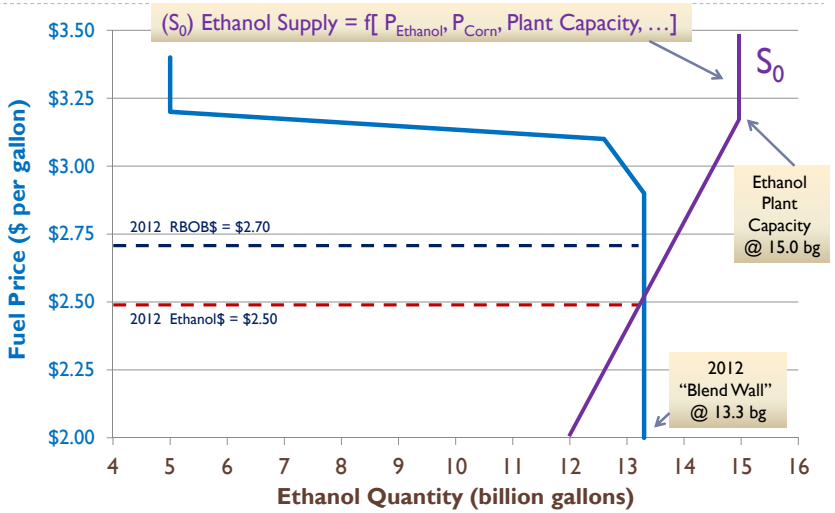
Depends on Blend Wall, RBOB vs Ethanol $s, limited fuel substitution



Model from Irwin, Good – Illinois, August 2012

Ethanol Supply-Demand for 2012

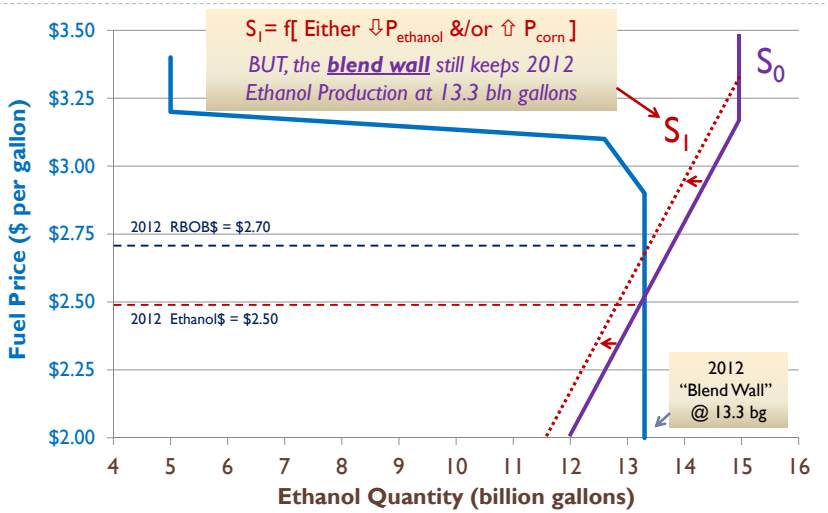
Supply responds to price up to maximum ethanol plant capacity



Model from Irwin, Good – Illinois, August 2012

2012 Shift in Corn Ethanol Supply

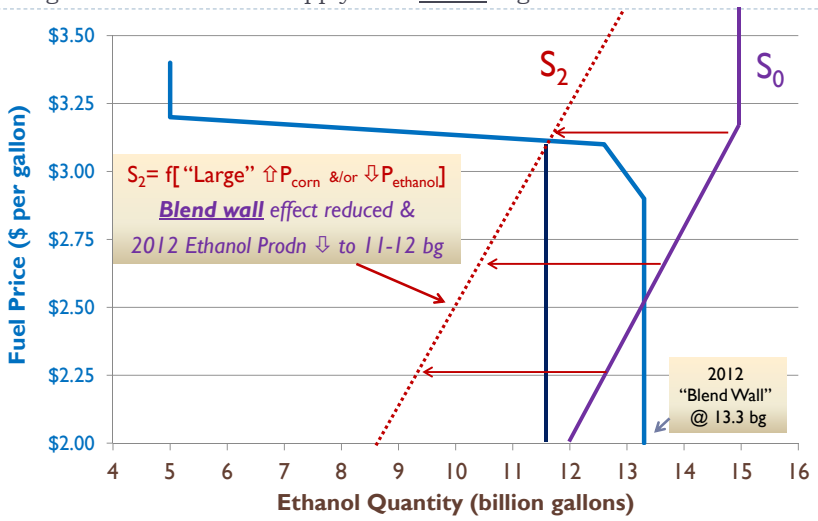
"Small-Medium" shift in ethanol supply from higher U.S. Corn Prices



Model from Irwin, Good – Illinois, August 2012

Large Shift in '12 Ethanol Supply

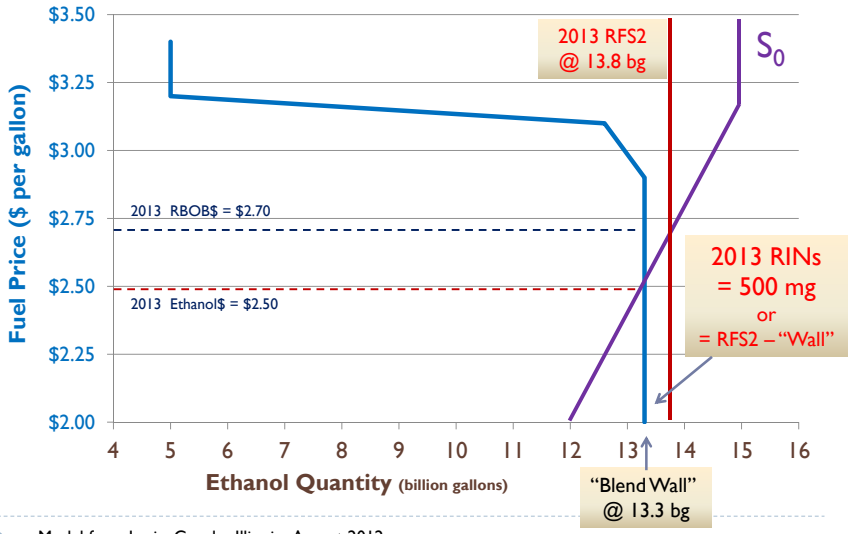
"Large"" shift in ethanol supply from **much** higher U.S. Corn Prices



Model from Irwin, Good – Illinois, August 2012

Ethanol S-D & RFS2 in 2013

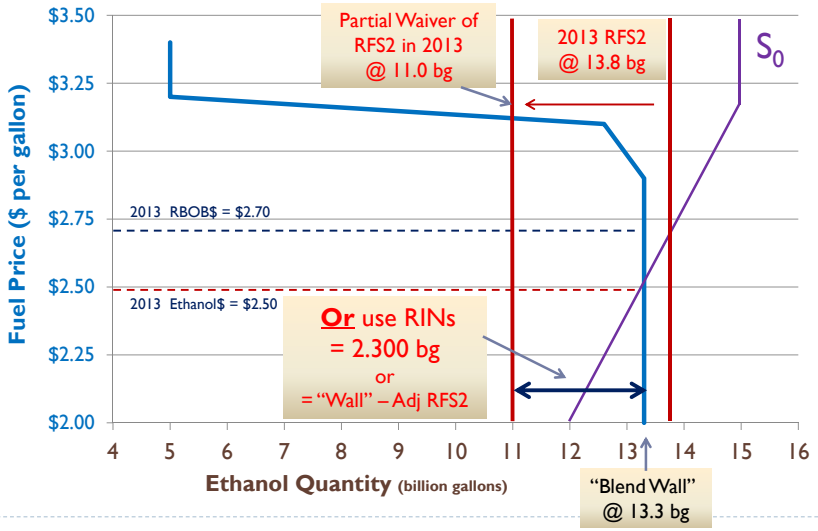
Corn RFS2 (13.8 bg) > Blend Wall (13.3 bg)



Model from Irwin, Good – Illinois, August 2012

Partial Waiver of RFS2 in 2013

⇩ 2013 Ethanol Production (to say 11.0 bg) by Waiver ***or*** RINs



Model from Irwin, Good – Illinois, August 2012

Thoughts on U.S. Corn Supply-Demand & Ethanol Production Trends in Years 2013-2015

#1: "Blend Wall" vs Future RFS2

- In 2012, Ethanol **Blend Wall** of 13.2-13.5 bg ≈ **Corn Ethanol RFS2** of 13.2 bg
  - **For 2013** if U.S. gasoline use =133.0 bg ➲ 10% "**blend wall**" at **13.3 bg of ethanol**, while **RFS2 = 13.8** bg, **then** need to use 500 mg of banked RINs (***if*** available after 2012)
- **"Blend Wall" less RFS2 shortfall** may grow in 2014 (RFS2 = 14.4 bg) & 2015 (RFS2 = 15.0 bg)
  - E-15 &/or E-85 adoption would be solution (problematic)
- **(Long Term) U.S. gasoline demand will "drive" U.S. Ethanol policy (D. O'Brien opinion)**
  - Unless > E10 used, ethanol program may need to adjust

#2: 2012 Action to Waive RFS2?

- U.S. Agricultural interests & some in U.S. Congress are now requesting that **EPA lower or waive RFS2** in years 2012-2013 in response to the 2012 drought & fears of damage to livestock & export industries
- RFS2 Flexibility from Banked RINs will help reduce MY 2012/13 corn use "some" (up to 780-950 mb)
- Economic analysis shows that large reductions in U.S. ethanol production will not occur **unless both** the **RFS2** and the **"blend wall"** are adjusted