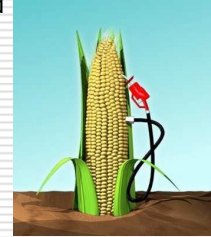


Food vs. Fuel?

Jack Buchanan
MREC Scholar
UW Madison
Master's Candidate, Agroecology

Which food, which fuel?

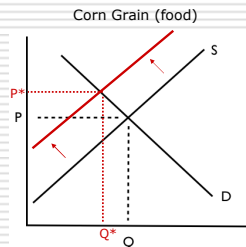
- Ethanol (EtOH) derived from **corn grain**
- U.S. leading producer at 13.2 billion gallons in 2010 (RFA)
- Nearly 40% of US corn harvest currently goes to EtOH production



How does it work?

□ Supply-side

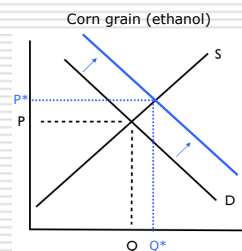
- Diversion of finite cropland
- Diversion of total corn harvest
- Reduced supply → increased price



How does it work?

□ Demand-side

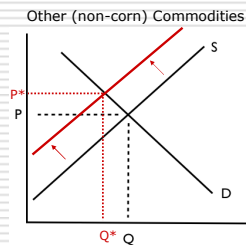
- 45¢/gal subsidy, 54¢/gal tariff
- 15 billion-gallon mandate by 2015
- High energy prices
- Increase demand → increase price



How does it work?

□ Commodity Price Cascade Effect

- Increased corn price leads producers to shift non-corn crops to corn
- Decrease supply → increase price



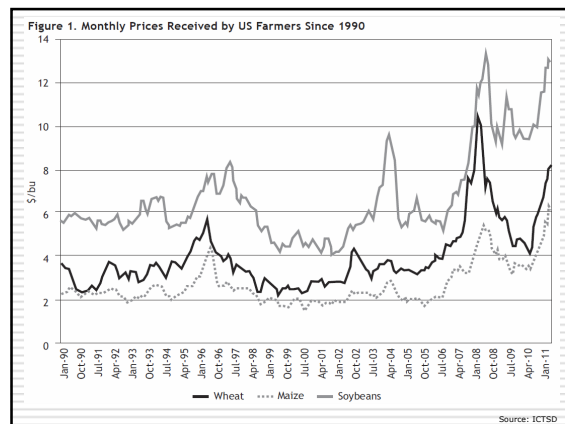
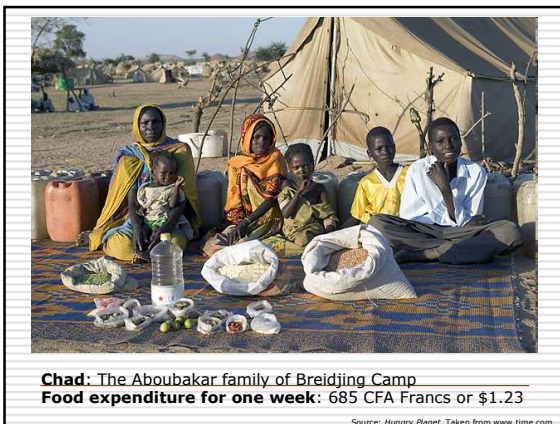
End of Cheap Food?

"[T]he rise in prices is also the self-inflicted result of America's reckless ethanol subsidies. This year biofuels will take a third of America's (record) maize harvest. That affects food markets directly: **fill up an SUV's fuel tank with ethanol and you have used enough maize to feed a person for a year.** And it affects them indirectly, as farmers switch to maize from other crops. **The 30m tonnes of extra maize going to ethanol this year amounts to half the fall in the world's overall grain stocks.**" – *The Economist*



Who's affected?

- The world's poor, disproportionately
 - Food expenditures eat up much higher share of already-marginal income
 - In developed world food processors act as buffers, absorbing much of the increases in commodity prices through economies of scale
 - In developing countries larger proportion of food purchased in its 'raw' un-buffered form



Historical Growth of US Ethanol

Year Millions of Gallons

2000	1,630
2001	1,770
2002	2,130
2003	2,800
2004	3,400
2005	3,904
2006	4,855
2007	6,500
2008	9,000
2009	10,600
2010	13,230



Source: RFA

Are biofuels to blame?

- Certainly in part
 - 2007/2008 spike in world food prices provided focal point for analyses
 - World Bank: 100m people worldwide pushed below poverty line by food price spike in 2008
 - More recent spike again in 2010/2011
 - Methodologies, study periods, and political motivations vary widely
 - Estimates range from **3%-75%** of 2008 food price increase attributable to increases in (US) biofuel production
 - Many confounding factors

"Perfect Storm" of Influences


Long-term / Structural	Short-term / Cyclical
1. Increased biofuel production (supply- and demand-side)	1. Depreciation of US Dollar
2. Increase in oil price	2. Bad weather / disease in major producing regions
3. Rising demand for meat (feed) in developing world	3. Increase in protective export bans on commodities as
4. Under-investment in ag/rural research and infrastructure	4. Speculative investment in commodity markets

Summary of Literature


SOURCE	LONG-TERM / STRUCTURAL FACTORS				SHORT-TERM / CYCLICAL FACTORS			
	Biofuels*	Oil Price ^a	Developing Demand	Rural/Ag Under-Investment	Weak US Dollar	Weather / Disease	Export Bans	Commodity Speculation
US Government	3% 18%	-	18%	-	-	X	-	-
World Bank	70-75%	10-15%	0	-	15%	0	X	X
IFPRI	30%	-	X	X	-	-	-	X
Rajagopal 2009	25%	X	X	-	X	X	-	-
Collins 2008	60% ^c	X	X	-	X	X	X	X
IMF	70% ^c	-	-	X	-	-	-	-
ICTSD	28% ^c	-	X	-	-	X	-	-
CME Group	X	X	-	-	X	-	-	0
Biofuels Platform	X	X	X	X	X	X	X	X

X = factor acknowledged as significant but percentage not specified
 0 = factor acknowledged but dismissed as having negligible effect
 * supply- and demand-side factors
^a percentage of effect on price of corn grain only
^c includes related increases in production costs

Highlights from Literature

- US Gov't 
 - White House press release on 14 May 2008 reports outlandishly low **3%**
 - USDA report three days later says up to **10%**
- World Bank
 - Stark contrast to US Gov't at **75%** estimate
 - Stalls publication of report for fear of embarrassing US Gov't
 - Highest estimate - claims speculation and export bans indirectly caused by biofuel policies

Highlights from Literature

- CME Group
 - Large Chicago-based commodity-trading corporation
 - Explicitly denied role of speculation in commodity markets
- Biofuels Platform 
 - Swiss governmental agency
 - Refrained from assigning relative weights to factors, in characteristically neutral fashion
 - De-emphasized the contribution of EU biofuel production and policies

Highlights from Literature

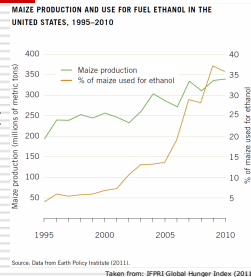
- ICTSD (Int'l Ctr for Trade & Sust. Devpt.)
 - Market-driven expansion of ethanol much more effectual than subsidies
 - "There is no rationale for the blender tax credit. It does little to help the biofuel industry as long as mandates are in place except in years when high gasoline prices have already stimulated demand beyond mandated levels."
- Rajagopal 2009 – highlights counter-effect of lower gasoline prices
 - Benefit to energy consumers
 - Tempered energy-price effects on food prices

Conclusions from Literature

- Extent of biofuels' impact on food prices is **significant**, but **impossible to know** with certainty
- Based on literature review presented, a fair estimate would fall between **one-quarter** and **one-third**
- US corn ethanol the main culprit

Other Considerations – Corn Ethanol Co-products

- “40% corn harvest diverted to ethanol”
 - True but misleading
- Appx. equal amount “diverted” to feed
 - Highlights issue of conversion inefficiencies



Other Considerations – Corn Ethanol Co-products

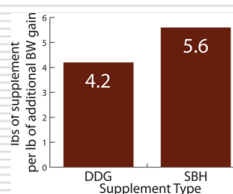
- EtOH co-products make valuable cattle feed
 - Dry Distiller’s Grains (DDG)
 - 145% the feed value of raw corn
 - Also corn oil, gluten & brewer’s rations



Fig. 4 Returning one bushel of corn for every two used. Nearly all corn consumed by ethanol plants comes from the feed corn supply, but since corn ethanol returns livestock feed to the market, the net corn disappearance due to ethanol is only one-half the gross corn consumption of the plant. According to Dr. Terry Klugebein of the University of Nebraska, on a dry weight basis, 33% of the corn is left for utilization as livestock feed in the form of distiller grain. But since DDG has 145% the feed value of raw corn, the net effect is that for every two bushels of corn used to make ethanol, one bushel of feed equivalent is returned. Source: Ethanol Access America

Other Considerations – Corn Ethanol Co-products

- Distortion of soy feed market



“U.S. soy crushers face challenges”
-World-grain.com, Nov. 2011

Source: Samuel Roberts Noble Foundation

Looking to the Future

- 2012 marked the end of the \$6 billion/year ethanol subsidy
 - High energy prices likely to continue to fuel ethanol demand
- Shift to 2nd-gen (cellulosic) ethanol
 - These will involve tradeoffs as well!



Looking to the Future

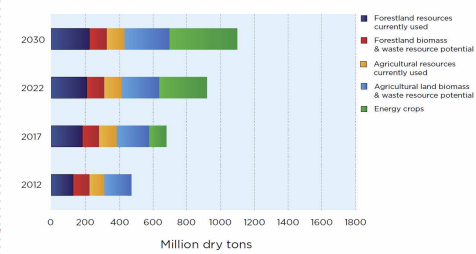
- Billion-ton Study II - key findings
 - “Dedicated energy crops” are the way forward, producing as much as half the total biomass available by 2030
 - Volumes are highly impacted by price
 - Baseline of \$60 per dry ton biomass
 - 30 million acres cropland, 49 million acres pastureland shift to energy crops by 2030
 - Up to 4x current forest biomass contributions

Looking to the Future

- Billion-ton Study II – food vs. fuel
 - “For the baseline scenario, results do show a loss of commodity crop acres to energy crops and **higher commodity crop prices**...The large-scale deployment of energy crops could require the **displacement of tens of millions of acres of cropland and pasture.**”

Looking to the Future

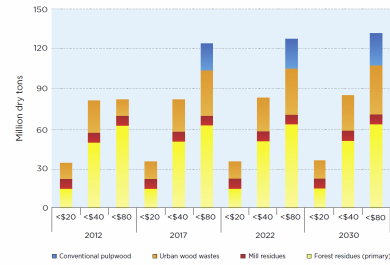
Figure ES.4 Summary of currently used and potential resources at \$60 per dry ton or less identified under baseline assumptions



Source: US Billion-Ton Update

Looking to the Future

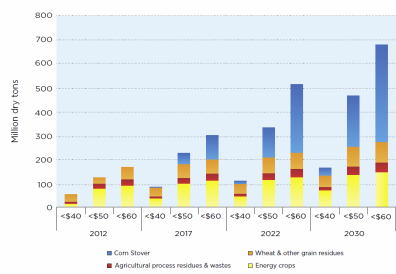
Figure ES.1 Estimated forest biomass under baseline assumptions



Source: US Billion-Ton Update

Looking to the Future

Figure ES.2 Estimated agricultural biomass under baseline assumptions



Source: US Billion-Ton Update

Forest vs. Fuel?

Food vs. Fuel round 2?



Soil & Water vs. Fuel?

References

- Biofuels Platform, "The debate 'food vs. biofuels.'" <http://www.biofuels-platform.eu/en/info/food.php#note7>. Retrieved 12/21/11.
- CME Group, "Commodity Markets: Fundamental Factors Affecting Agriculture." May 11, 2009.
- Collins, Keith, "The Role of Biofuels and Other Factors in Increasing Farm and Food Prices: A Review of Recent Development with a Focus on Feed Grain Markets and Market Prospects," June 15, 2008.
- Ethanol Across America. White Paper: "Rethinking the Value of Corn-Ethanol Co-products in Lifecycle Assessments," Summer 2009.
- [ICTSD] International Centre for Trade and Sustainable Development. Bruce Babcock, "The Impact of US Biofuel Policies on Agricultural Price Levels and Volatility," 2011. ICTSD Programme on Agricultural Trade and Sustainable Development. Issue Paper 35. Geneva.
- [IMF] International Monetary Fund. John Lipsky, "Commodity prices and global inflation," May 8, 2008.
- [IFPRI] International Food Policy Research Institute. Mark Rosegrant, "Biofuels and Grain Prices: Impacts and Policy Responses," May 7, 2008.
- [IFPRI] International Food Policy Research Institute. "Global Hunger Index," October 2011. Bonn, Washington, DC, Dublin.
- Rajagopal, D., Sexton, S., Hochman, G., Roland-Holst, D. Zilberman, D. "Model estimates food-versus-biofuel trade-off. California Agriculture," 63 (4) (2009), pp. 199-201
- [RFA] Renewable Fuels Association. "Industry Statistics: Monthly US Fuel Ethanol Production/Demand". <http://www.ethanolrfa.org/pages/statistics.php>. Retrieved 12/22/11
- Samuel Roberts Noble Foundation, Ryan Reuter, "Supplement Conversion Ratio," November 2009. <http://www.srnoble.org/bioenergy/bioenergydocuments/ethanolconversionratio.html>. Retrieved 12/21/12
- The Economist. "The End of Cheap Food," Dec. 6, 2007. <http://www.economist.com/node/10252015>
- US Government. Testimony of Edward P. Lazear, Chairman, Council of Economic Advisers. May 14, 2008. Associated Press (May 15, 2008). White House Disputes Role of Biofuels in Food Prices.
- [USDA] US Department of Agriculture. USDA officials briefing with reporters on the case for Food and Fuel USDA. Release No. 0301.08. May 19, 2008. Washington, DC.
- [US DOE] US Department of Energy. "US Billion-Ton Update," August 2011.
- World Bank, Donald Mitchell, "A note on rising food prices," July 2008.