Environmental and Economic Issues Facing Today's Ethanol Industry

EPA Farm, Ranch, and Rural Communities Committee (FRRCC) Meeting

September 8, 2008

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Environmental issues facing our industry

What is our industry doing?

- Working to reduce the lifecycle greenhouse gas (GHG) emissions associated with ethanol production
- Enhancing the energy efficiency and sustainability of ethanol production systems
- Ensuring “land use change” modeling is accurate and the best science is considered
- Encouraging a level playing field for the evaluation of the environmental impacts of all fuels

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Lifecycle GHG Emissions

- In the past, lifecycle analysis was largely an academic exercise
- Emerging regulatory frameworks establish lifecycle-based GHG reduction standards for biofuels
  - Federal Renewable Fuels Standard (RFS2)
    - New plants must show 20% GHG reduction compared to gasoline
    - "Advanced" biofuels = 50% GHG reduction
    - "Cellulosic" biofuels = 60% GHG reduction
  - California Low Carbon Fuels Standard
    - Reduce GHG emissions by 10% by 2020
    - Other states looking at similar carbon-based fuel standards

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Lifecycle GHG emissions from current dry-mill corn ethanol

LIFECYCLE GHG EMISSIONS, DRY-MILL CORN ETHANOL vs. GASOLINE	
Agriculture Phase	**44** g CO_2eq./MJ
Biorefinery Phase	**43** g CO_2eq./MJ
Co-product Credit	**-17** g CO_2eq./MJ
TOTAL Global Warming Intensity (GWI)	**70** g CO_2eq./MJ
Gasoline	**92** g CO_2eq./MJ
GHG Reduction Relative to Gasoline	**-24** %

Source: GREET 1.8b and Liska, University of Nebraska.

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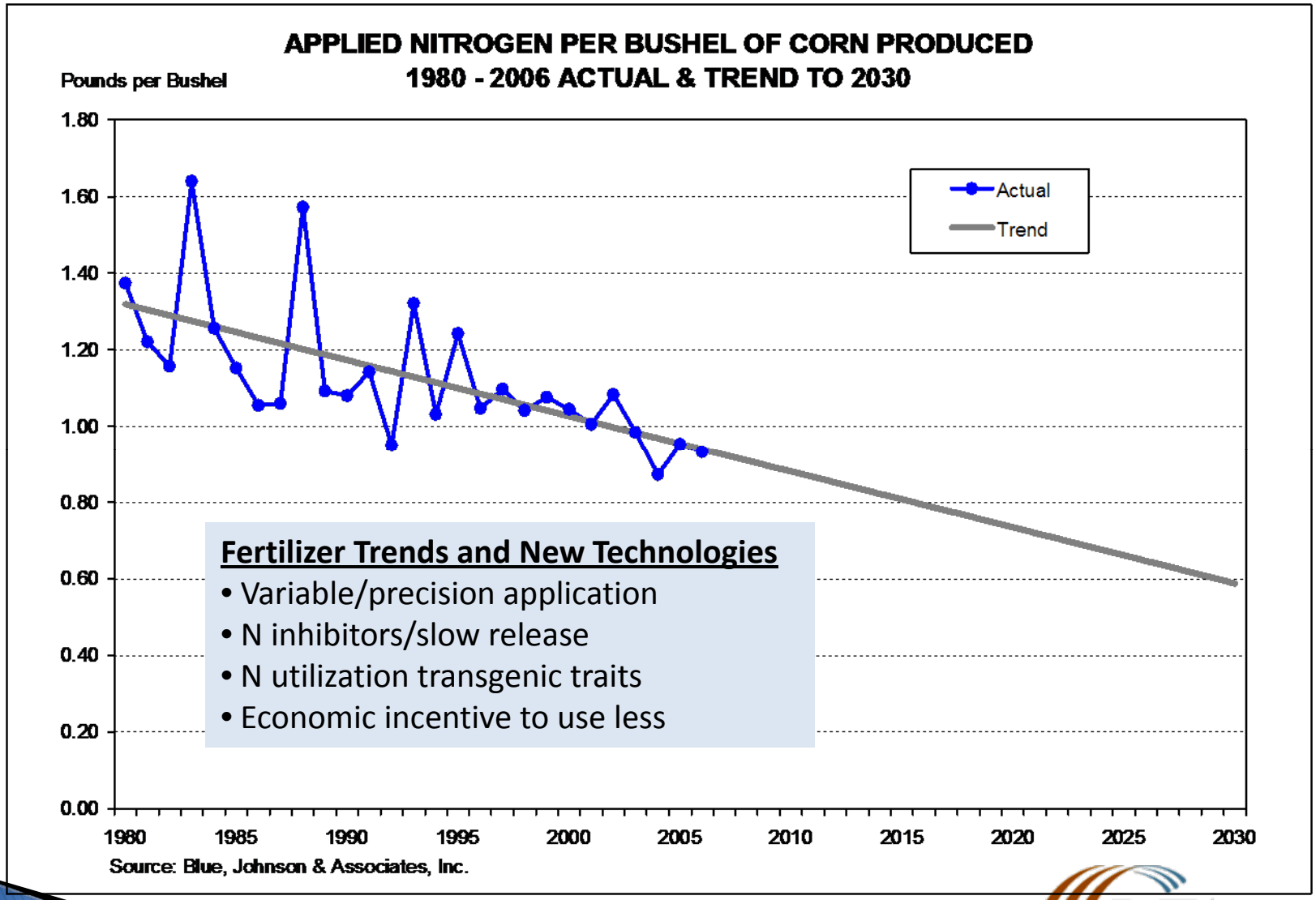
Improving the ag phase: Fertilizer use



Fertilizer Trends and New Technologies

- Variable/precision application
- N inhibitors/slow release
- N utilization transgenic traits
- Economic incentive to use less

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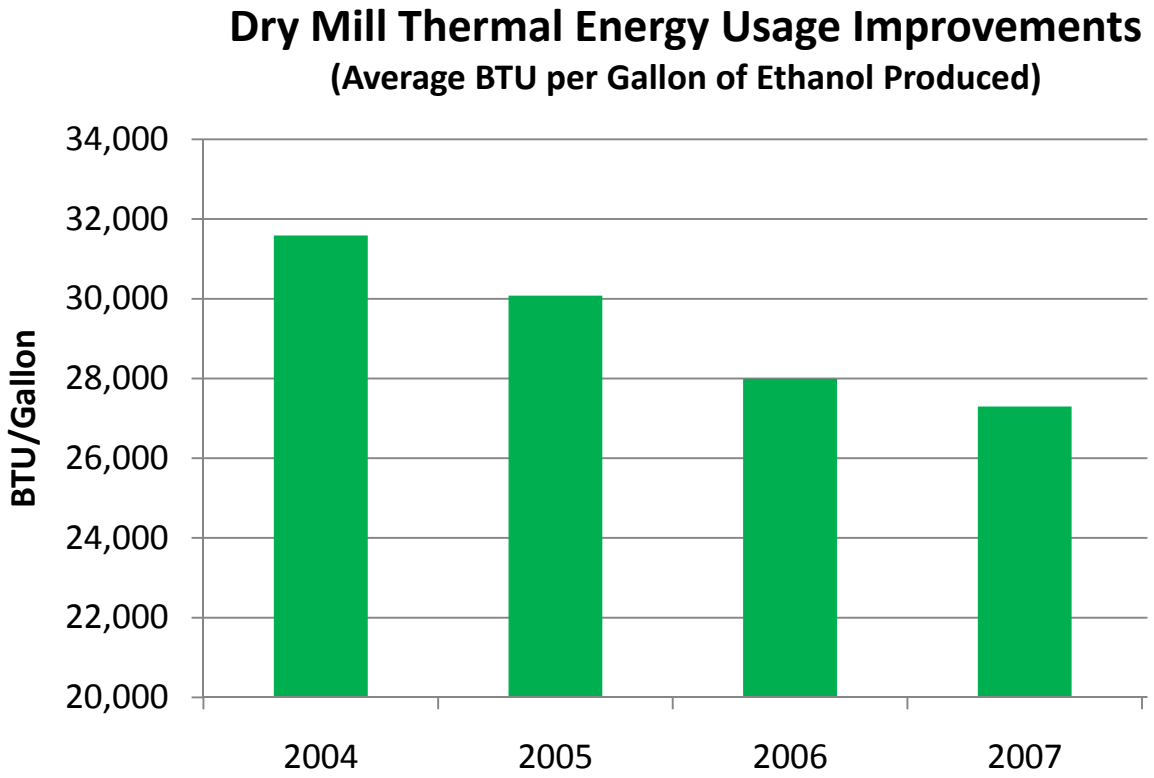
Improving the biorefinery phase: Energy use

- New technologies have reduced the energy required to produce ethanol
- Producers have great incentive to reduce energy costs
- Increasing use of process heat from non-fossil fuels (biomass)



Source: Christianson & Associates. "U.S. Ethanol Industry Efficiency Improvements: 2004 through 2007" August 5, 2008

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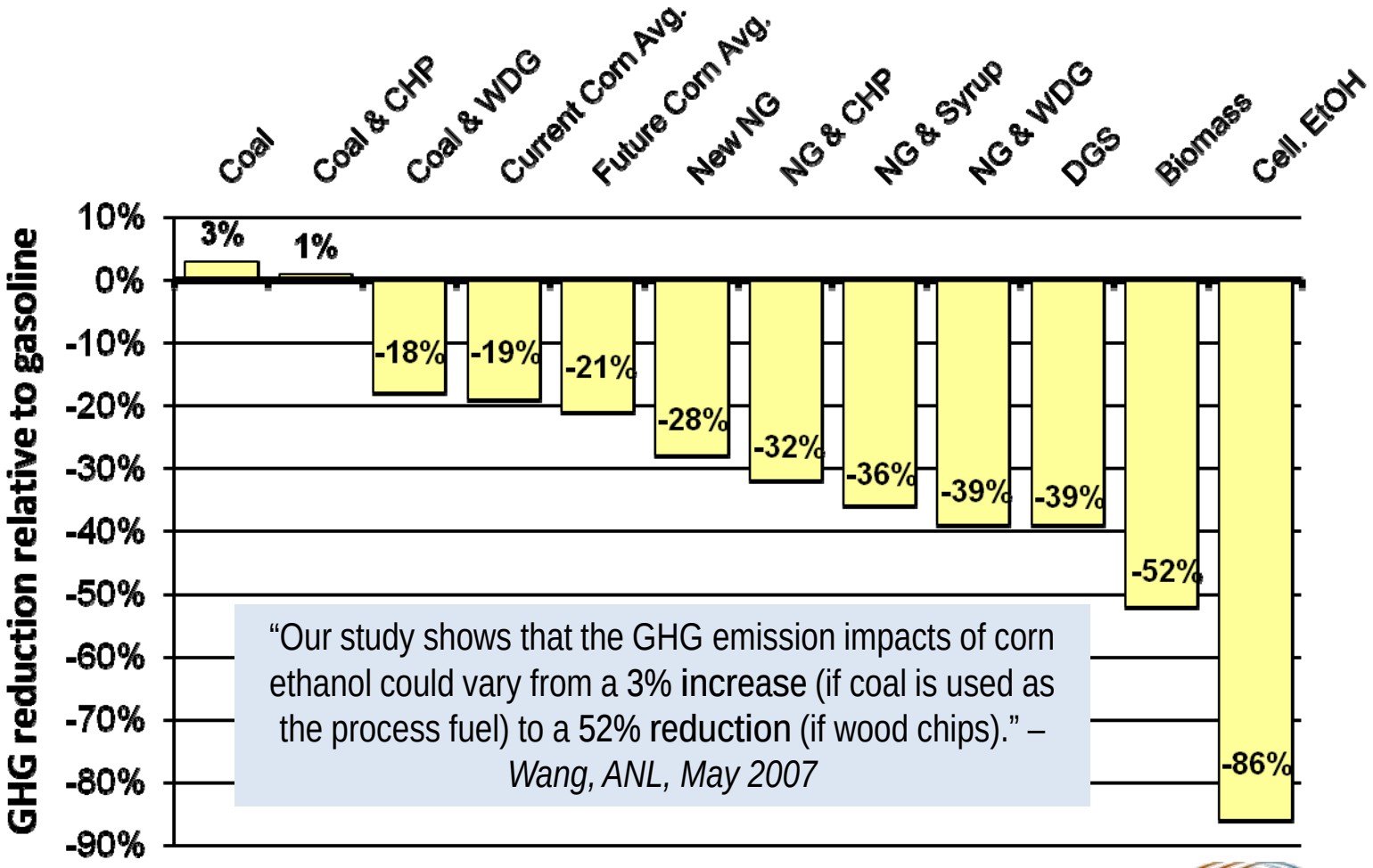
GHG emission reductions from ethanol based on various practices & technologies



"Our study shows that the GHG emission impacts of corn ethanol could vary from a 3% **increase** (if coal is used as the process fuel) to a 52% **reduction** (if wood chips)." – *Wang, ANL, May 2007*

Source: Wang et al., May 2007.

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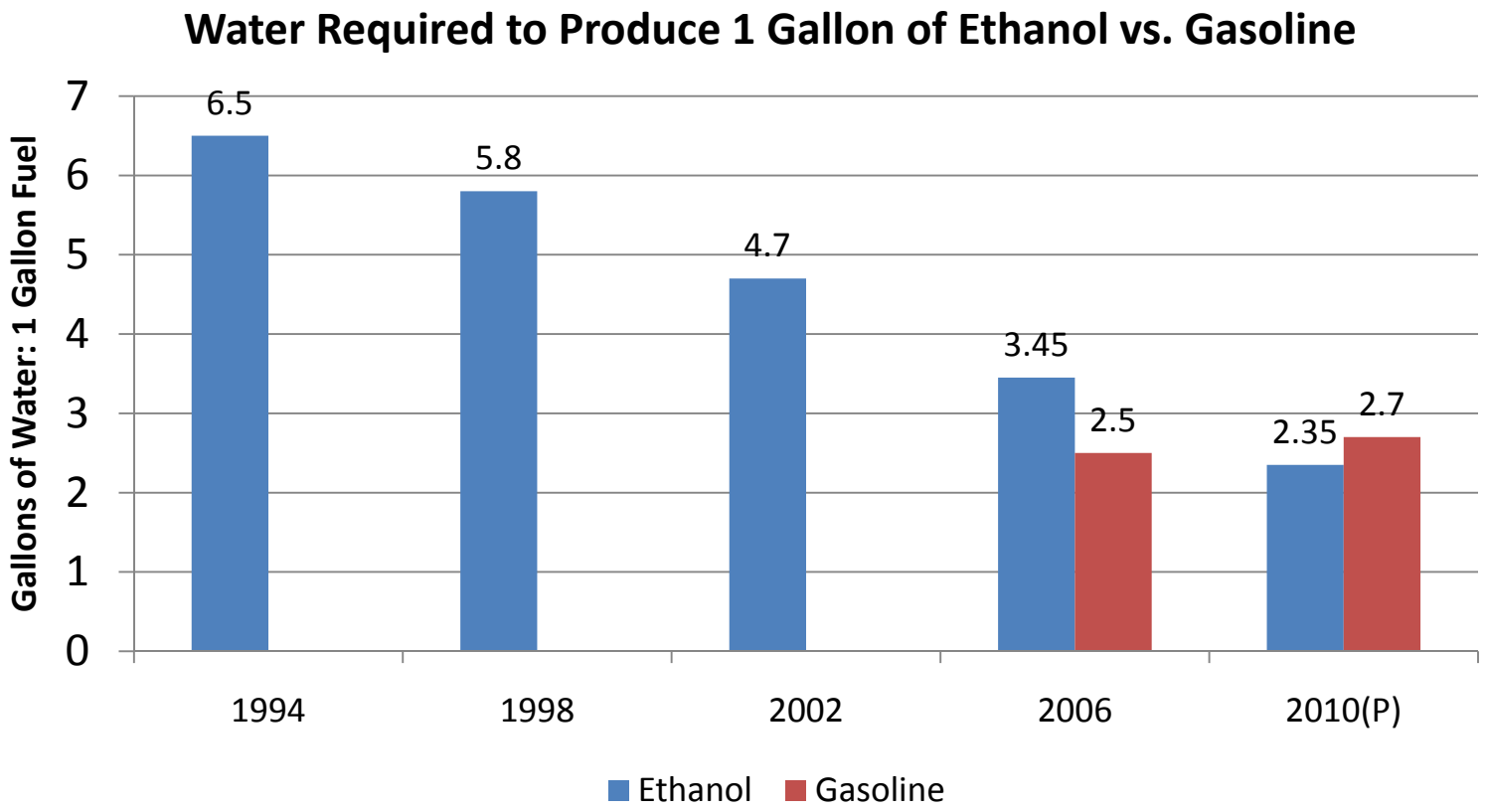
Improvements in water use



Sources: RFA, MN DNR, NREL

The ethanol industry constitutes four-tenths of 1% of total U.S. industrial water use*

*Assumes ethanol industry uses 75 million gallons H2O/day.
Total daily industrial H2O use is 18.5 billion gals./day

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The land use change debate and potential impacts on the biofuels lifecycle

The concept of land use change is based on the following principles:

1. Increased production of plant-based biofuels will lead to the conversion of previously (or recently) uncropped lands (e.g. CRP, forest and grassland) into crop production.
2. Conversion of these lands to cropping systems releases greenhouse gas emissions through clearing and tillage.
3. The GHG emissions resulting from these land conversions are then attributed to the biofuels lifecycle.

Potential Impact: Some questionable and discredited studies suggest GHG emissions from biofuels are worse than gasoline when land use change is considered.

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Land use change

Two Types of Land Use Change:

- **Direct:** Growing biofuels feedstock on ground that previously was used for something else
  - **Example**: CRP to corn for ethanol
  - Analysis is relatively straightforward , data-driven, and verifiable
- **Indirect:** Land somewhere in the world is cleared for agriculture use as a result of land somewhere else being planted to biofuels feedstock
  - **Example**: soy/corn converted to corn/corn → decreases soybean exports → results in demand for more soy acres somewhere else in the world → causes grassland to be cleared for soybean cultivation→ causes deforestation of rainforest to add pasture ground
  - Analysis is complex, driven by compounding assumptions, and unverifiable

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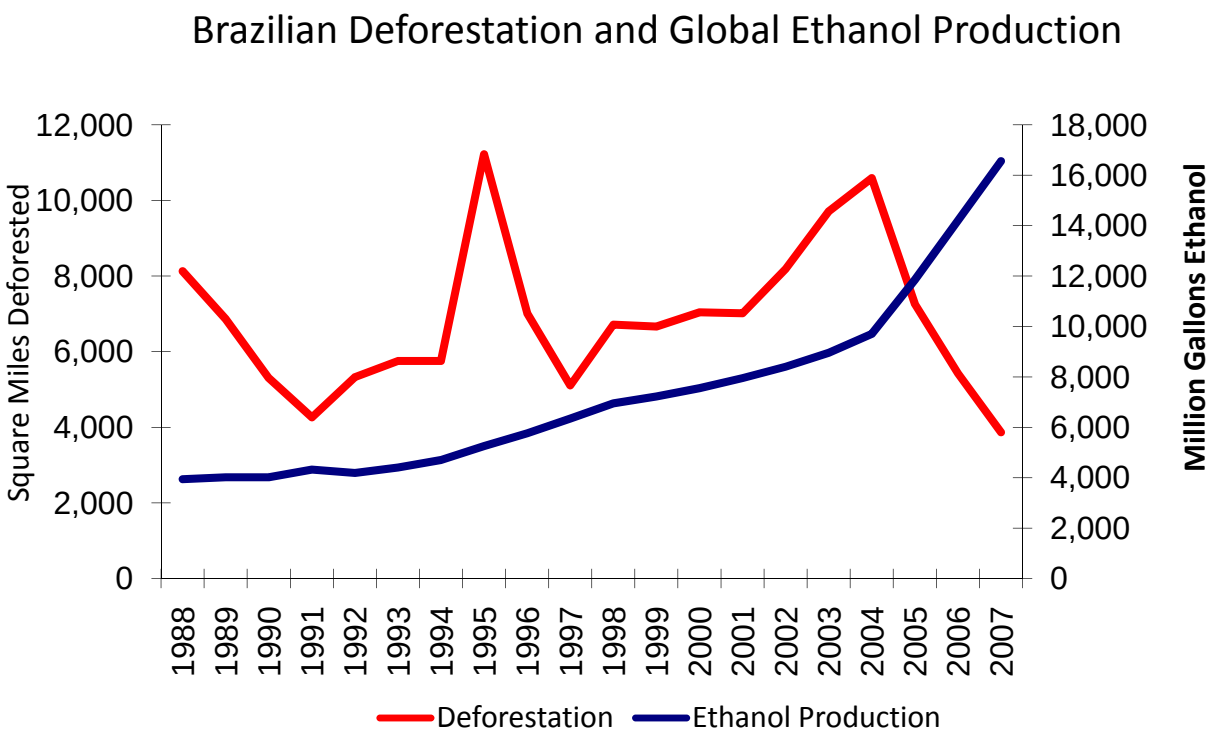
No statistical relationship between ethanol production and Amazon deforestation



- Empirical data do not support the notion that the rate of deforestation in Brazil and world ethanol production are statistically related
- Deforestation has been declining since 2004
- 2007 deforestation was lowest in last 20 years

Source: F.O. Licht; National Institute of Space Research (Brazil)

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Recent analyses of indirect land use change are flawed and invalid

- Quality, validation, and transparency of models
  - GTAP model does not include CRP, idle land in land inventory
  - FASOMGHG, FAPRI models not publicly available
- Purpose of models
  - GTAP was designed for global trade interactions and policy impacts, not LUC
- Inability to verify results
- Assumptions underlying analysis
  - Searchinger assumes 30 BGY corn ethanol by 2015
  - Crop yields, DDGS displacement, soil carbon emissions, etc.
- All fuels need to be evaluated with the same metrics
- No precedent for accurate accounting of indirect effects
- Incapable of integrating interplay of economic, institutional, technological, cultural and demographic variables

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Are indirect effect metrics being applied to other fuels?

- Energy consumed in exploration and drilling
- Protection of oil supply
- Energy intensity and land use impacts of oil sands
- Oil field fires
- Venting and flaring
- Petroleum-related deforestation (Ecuador, Nigeria)
- Etc.

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Economic Issues

- Managing higher corn prices
- Energy input costs
- Transportation costs
- Perceptions about ethanol's role in food prices

Transportation Costs

- Transportation Impacts of 100 MGY ethanol plant:
  - 3,448 railcars of Fuel Ethanol per year
    (10 tank cars per day)
  - 9,867 railcars of Corn per year
    (60% by Rail, 17 railcars per day)
  - 3,048 railcars of DDGS per year
    (9 hopper cars per day)

Shipping Ethanol via Pipeline

- Ethanol CAN be shipped via pipeline
- Most economical mode of transportation
- Much research is being conducted
  - Kinder-Morgan to ship fuel ethanol (E95) in pipeline from Tampa to Orlando
  - Dept. of Transportation Research
  - Association of Oil Pipelines Research Program

Ethanol and Food Prices

- During the first 4 months of 2008, the all food CPI increased by 4.8 percent, with increased ethanol and biodiesel consumption accounting for only about 4-5 percent of the total increase while other factors accounted for 95-96 percent of the increase. In 2007, 97% of food price increases had nothing to do with ethanol. -- *USDA/DOE Letter to Senator Jeff Bingaman, Chairman of Senate Energy and Natural Resources Committee, June 11, 2008*

- Minimal impacts substantiated by studies by Texas A&M, Federal Reserve Bank of K.C., USDA-ERS, Purdue University, Informa Economics, others

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ESTIMATING THE IMPACT OF INCREASED ETHANOL PRODUCTION ON U.S. HOUSEHOLD SPENDING

TABLE 1. Ethanol Impact on Household Gasoline Spending		
	Variable	***Source***
A. Miles Driven per Household per Yr. (miles)	21,252	Fed. Highway Administration
B. Average Vehicle Fuel Economy (mpg)	20.2	Environmental Protection Agency
C. Gasoline Use per Household per Year (gals.)	1,052	(A÷B)
D. Ethanol Savings per Gallon of Gasoline	$0.20-0.50	Lower: DOE/USDA Upper: Merrill Lynch
E. GASOLINE SAVINGS PER HOUSEHOLD	**$210.40 – $526**	**(C x D)**

TABLE 2. Ethanol Impact on Household Food Spending		
	Variable	***Source***
A. Average Household Food Spending (2006)	$6,111	Bureau of Labor Statistics
B. Added Cost to Food due to Food Price Inflation (5.2% June07 to June08) **with** Ethanol Impact	$317.77	June 2008 Consumer Price Index
C. Added Cost to Food due to Food Price Inflation **without** Ethanol Impact (4.95%-5.1%)	$302.49-$311.66	Lower: DOE/USDA Upper: W.H. Cncl. of Econ. Advisors
D. ADDED COST TO FOOD DUE TO IMPACT OF ETHANOL ON FOOD INFLATION (.10% TO .25%)	**$6.11 - $15.28**	**(B - C)**

TABLE 3. Net Impact of Ethanol on Total Household Spending		
	Variable	***Source***
A. Ethanol **Savings** per Household	$210.40 - $526	Table 1, Row E
B. Added Cost to Food per Household due to Impact of Ethanol on Food Inflation	$6.11 - $15.28	Table 2, Row D
C. NET IMPACT OF ETHANOL ON HOUSEHOLD SPENDING	**$204.29 - $510.72**	**(A – B)**

Summary

- Ethanol will continue to play an important role in reducing GHGs from the transportation sector
- The ethanol industry continues to improve its energy efficiency and sustainability
- Much research is needed on land use change issues; the current level of understanding is insufficient
- The costs and benefits of ALL fuels should be evaluated using the same metrics
- Ethanol producers are facing higher production costs
- Ethanol's impact on the household budget is positive

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Thank You

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