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Agricultural Outlook Forum
U.S. Department of Agriculture

February 21-22, 2008

Corn and Ethanol: Green, Getting Greener

Rick Tolman



Corn and Ethanol: Green, Getting Greener

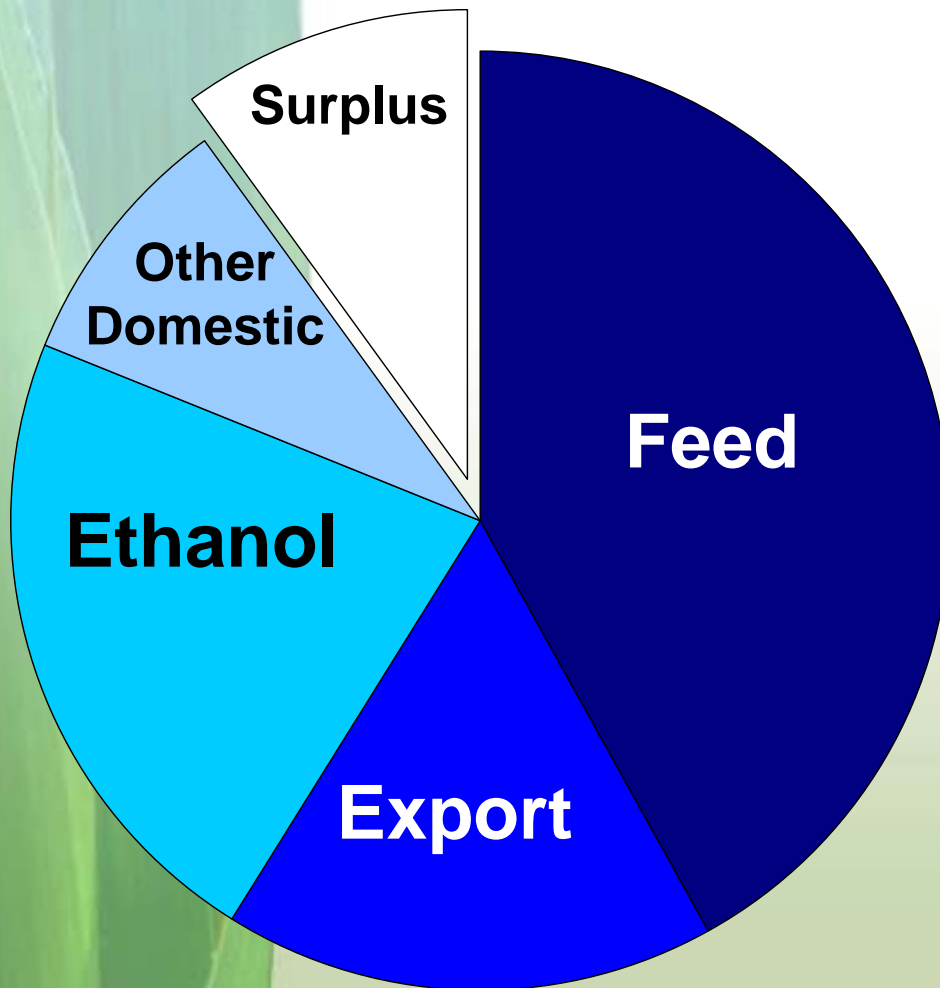
Rick Tolman
National Corn Growers Association

2007 a Very Good Year



- **Production reaches 13.1 billion bushels**
 - Largest crop in U.S. history
- **Average yield hits 151.1 bushels/acre**
 - The second-highest yield estimate in history

2007 Corn Supply and Demand



**Total Supply:
14.4 billion bushels**

Feed: 42%
Ethanol: 22%
Export: 17%
Other Domestic: 9%
Surplus: 10%



Outline

- A. Meeting Demand
- B. Reducing Inputs
- C. Rational Approach to Sustainability

A. Three Steps to Meeting Demand

1. Increase corn production by boosting average corn yield significantly
2. Displace more corn in feed use with coproducts
3. Improve efficiency to squeeze more ethanol from each bushel of corn

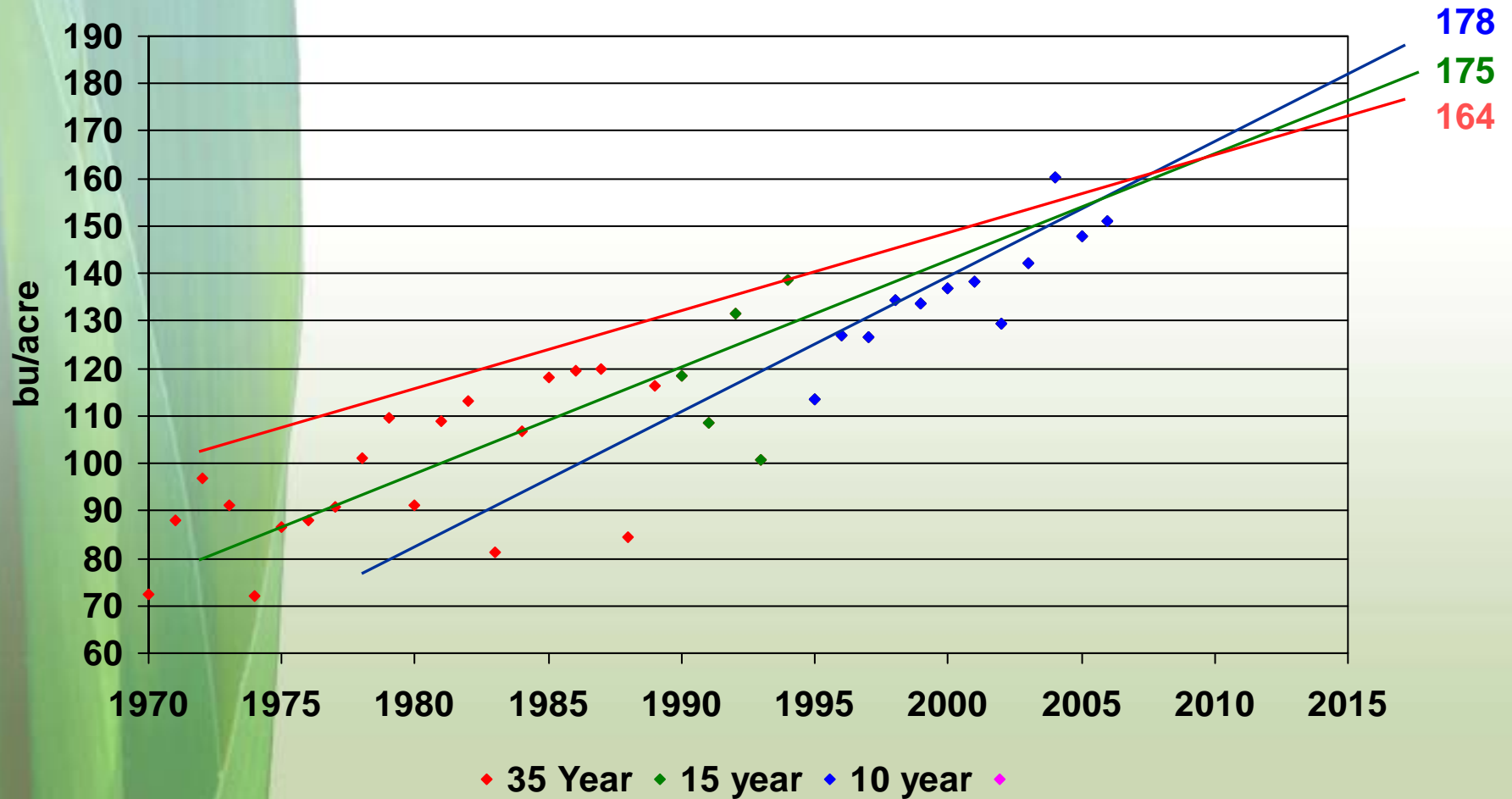
1. Increasing Corn Production

An example of making the unimaginable a reality

U.S. Corn	1944	2007	% Change 1944-2007
Acres Harvested	85 mil	85 mil	
Price (Season Avg)	\$1.03	\$3.04	+195%
Production	2.8 bil bu	13.1 bil bu	+371%
Yield	33 bu/Acre	151 bu/Acre	+364%

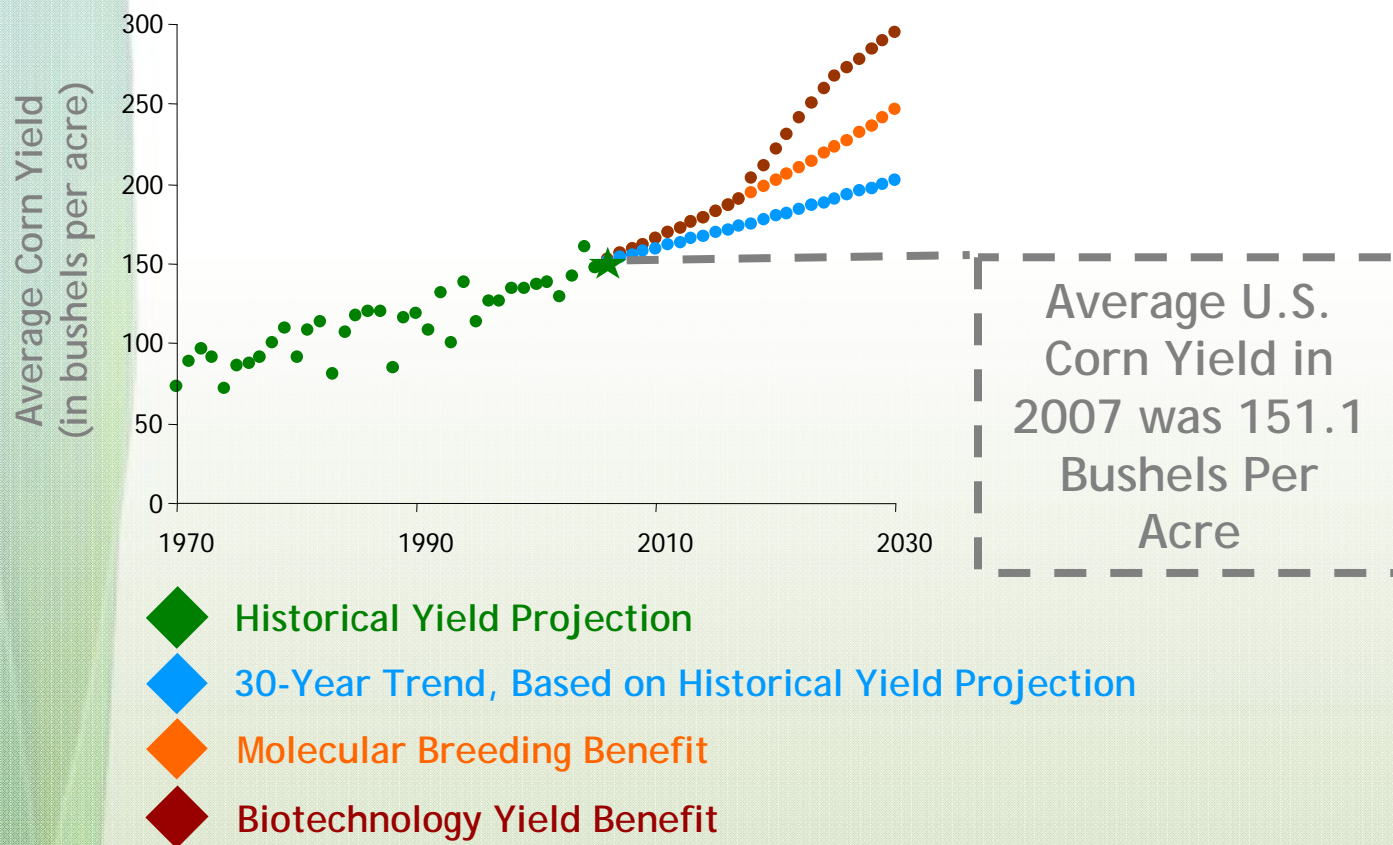
Source: USDA

Corn Yield Trends Are Accelerating



Source: USDA

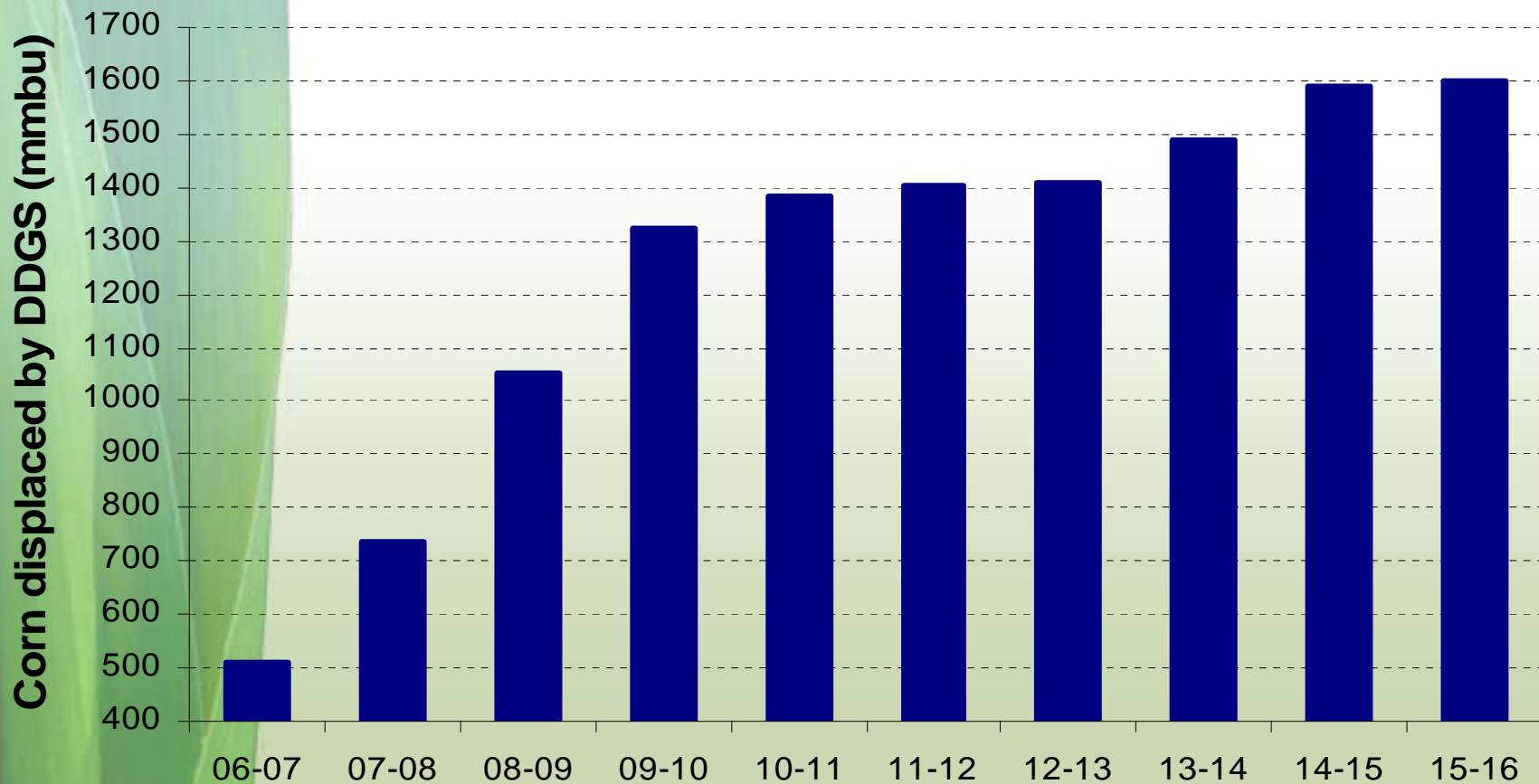
Step-Changes in Corn Potential



Source: Monsanto

2. More Corn to Ethanol

We increase portion of feed corn going to ethanol by replacing feed corn with high-nutrient ethanol coproducts



One Bushel of Corn



2.8 Gallons Ethanol

AND EITHER

13.5 Pounds Gluten Feed

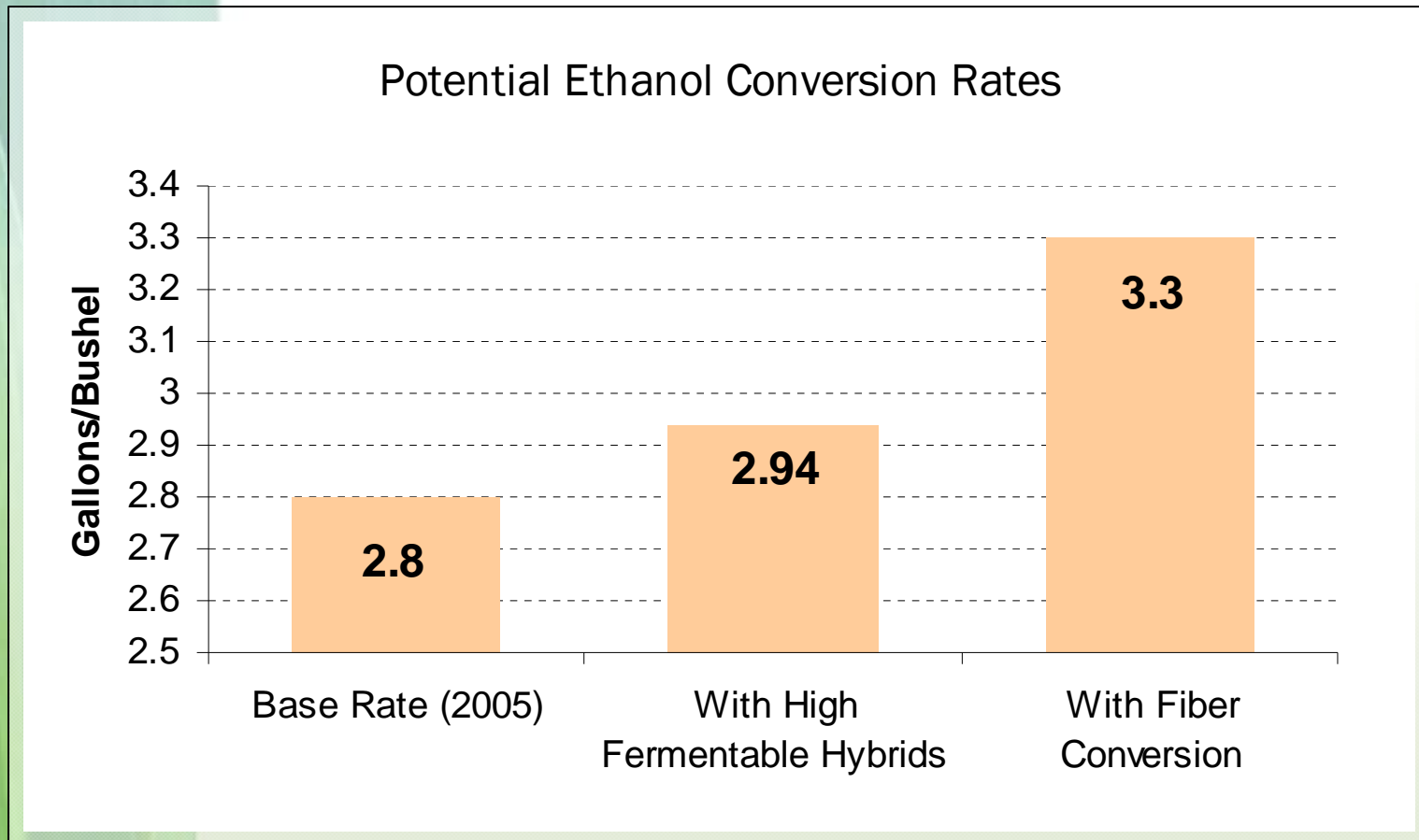
2.6 Pounds Gluten Meal

1.5 Pounds Corn Oil

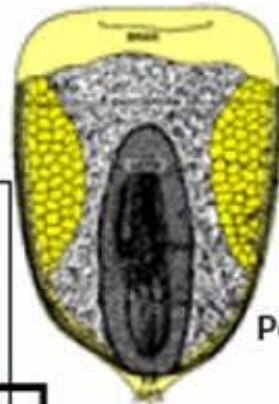
OR

17.5 Pounds Distillers Grains

3. Efficiency in Ethanol Production



Corn Has Huge Potential for Biofuels



Ethanol Productivity

Endosperm → 435 Gal/Acre

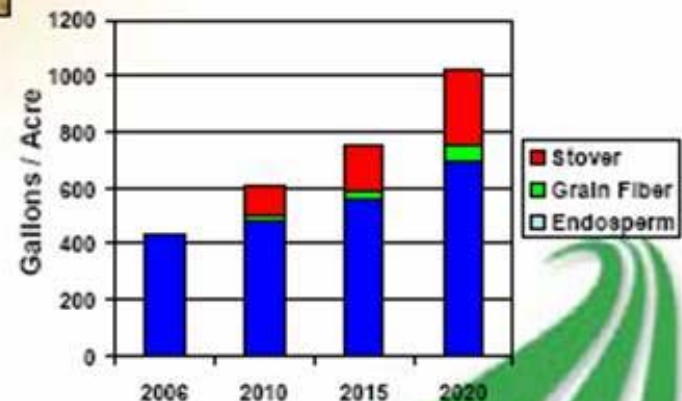
Pericarp → 18 Gal/Acre (2010)

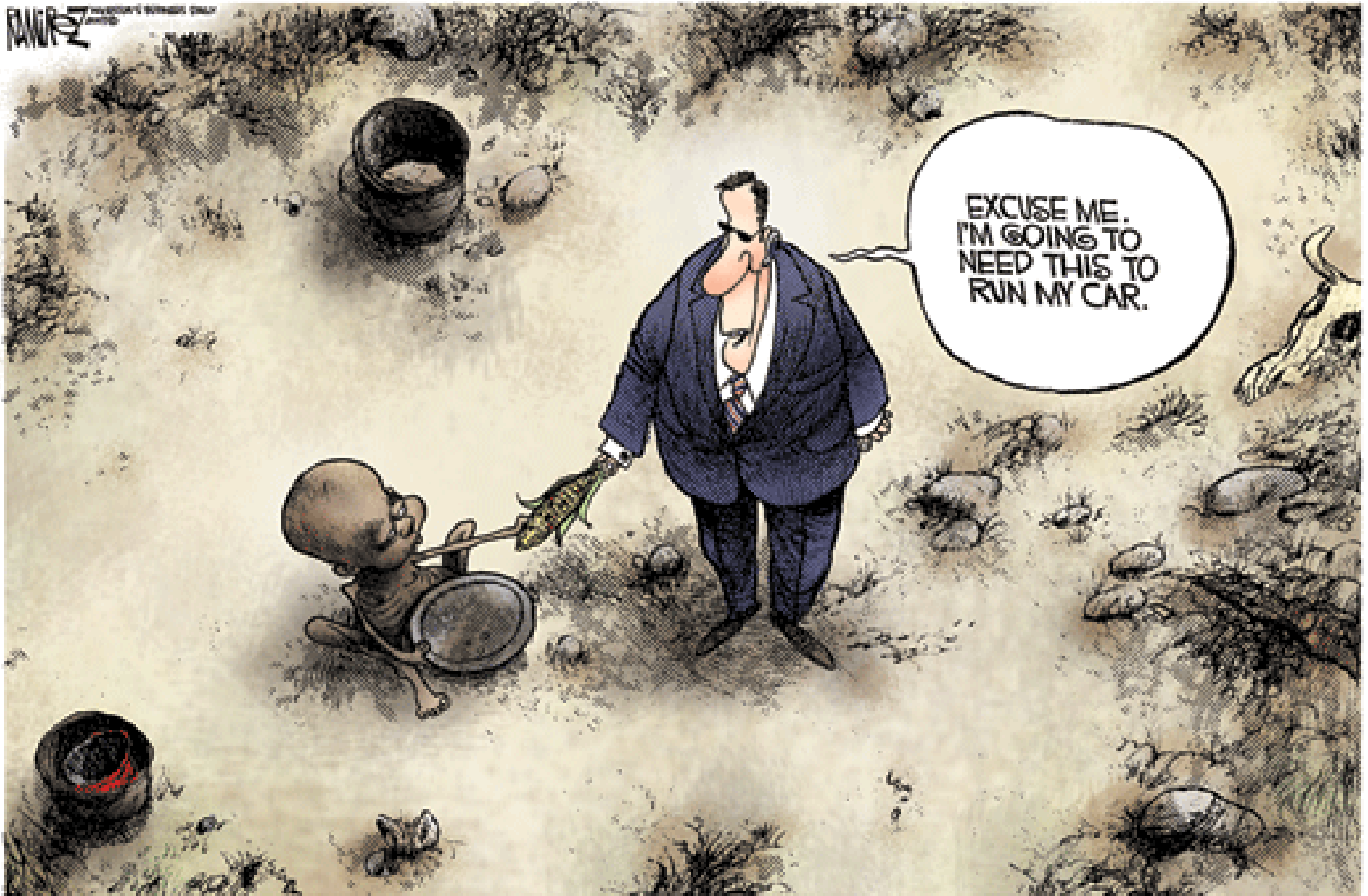
Stover → 100 Gal/Acre (2010)



	10	15	20
Grain Starch			
Bu/Ac	180	200	250
Gal/Bu	2.7	2.9	3.0
Gal/Ac	486	580	750
Grain Pericarp			
Ton/Ac	.45	.500	.625
Gal/Ton	40	60	90
Gal/Ac	18	30	56
Stover			
Ton/Ac	2.5	2.75	3
Gal/Ton	40	60	90
Gal/Ac	100	165	270

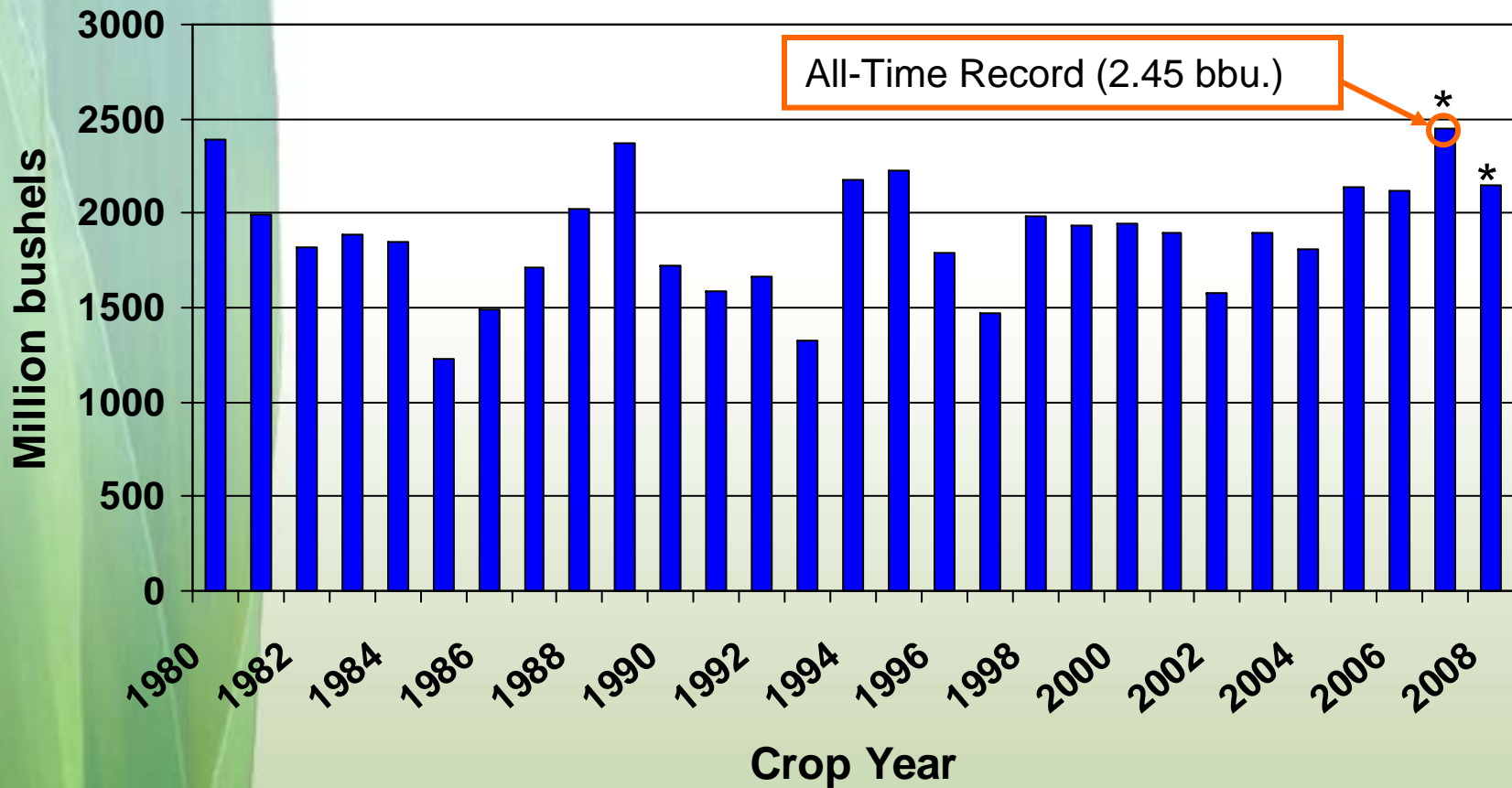
**1,000 gallons /
acre by 2020?**





Linking Biofuels to World Hunger is Irresponsible!

Food vs. Fuel: U.S. Corn Exports



*Projected

Source; USDA, ERS; ProExporter Network

The Truth about Ethanol

- **Our production and surplus numbers indicate we can easily meet demand**
 - Surplus corn for 2007 is projected at 1.3 billion bushels
 - Total supply for 2008 high even with lower acreage planted

***World hunger has many causes.
Lack of corn is not one of them.***

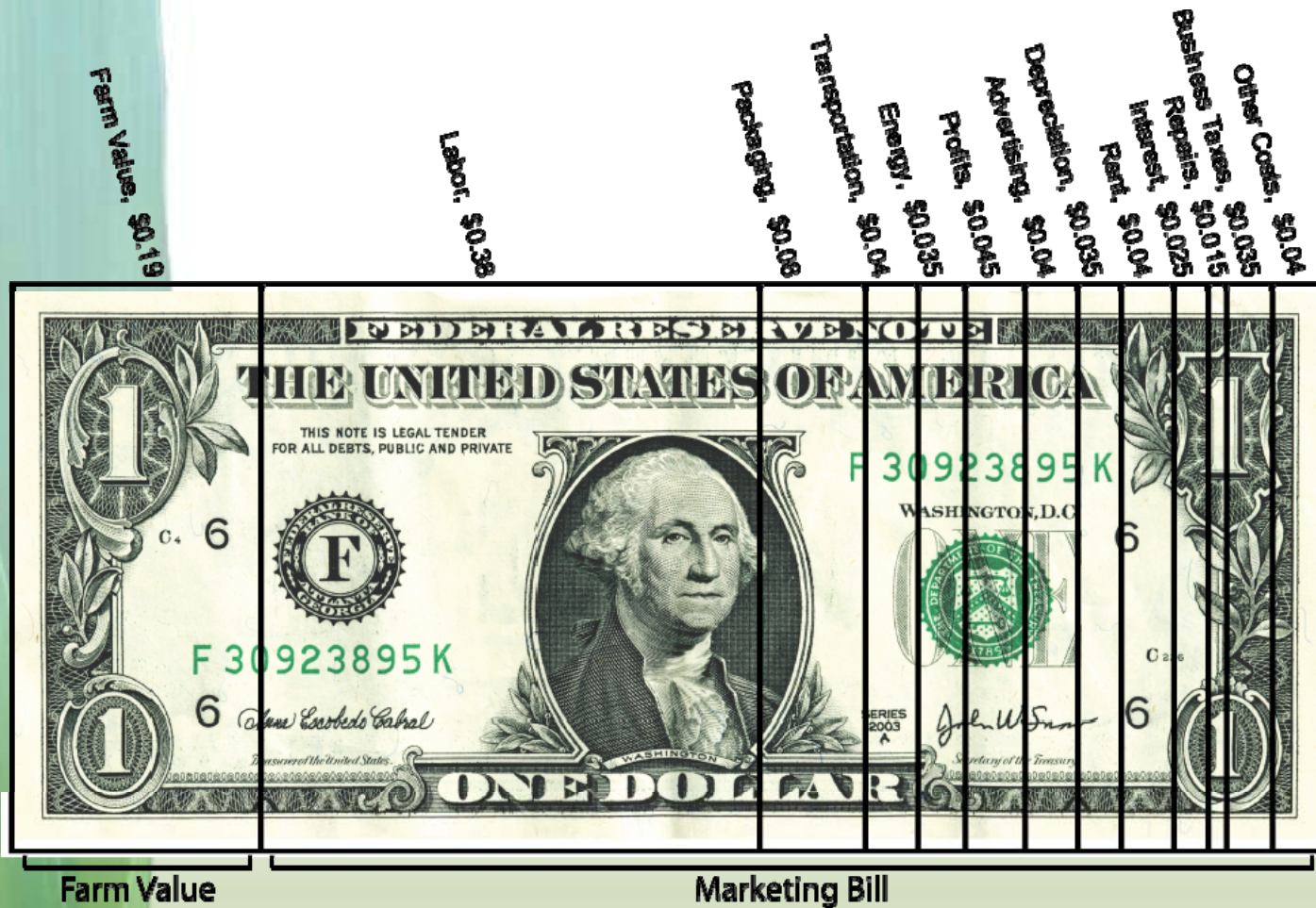
Corn Available for Feed, Food and Export

	2002	2006	2007	2015 (Projected)
<i>Harvested corn acres & yield</i>	69.3M (129.3 bu/A)	70.6M (149.1 bu/A)	86.5M (151.1 bu/A)	85.0M (180 bu/A)
<i>Total Corn Supply Available (prod = carry in)</i>	10,573 Mbu	12,512 Mbu	14,393 Mbu	17,232 Mbu
<i>Ethanol per A</i>	350 gal/A	404 gal/A	435 gal/A	575 gal/A
<i>Ethanol produced</i>	2.96B gal	5.8B gal	8.3B gal	15.3B gal
<i>Corn used for ethanol</i>	1,093 M bu (10%)	2129 M bu (17%)	3010 M bu (21%)	4,695 M bu (27%)
<i>Corn Supply (Less Used for Ethanol)</i>	9,480	10,383	11,383	12,537
<i>DDG Disp (M bu eq)</i>	<u>189</u>	<u>515</u>	<u>792</u>	<u>1,452</u>
<i>Total</i>	9,669 M bu	10,898 M bu	12,175 M bu	13,989 M bu

Food vs. Fuel: Value of Corn in Retail Food Items

Product	Qty.	Corn Req.	Value of corn in unit @ \$2.40/bu	Value of corn in unit @ \$4/bu
Beef	1 lb.	2.8 lbs.	\$0.12	\$0.19
Pork	1 lb.	3.6 lbs.	\$0.15	\$0.26
Milk	1 gal.	1.8 lbs.	\$0.08	\$0.13
Eggs	1 dz.	4.0 lbs.	\$0.17	\$0.28
Broiler Chicken	1 lb.	2.0 lbs.	\$0.09	\$0.14
Corn Flakes	12 oz.	10 oz.	\$0.03	\$0.04

Food vs. Fuel: Farm Inputs Are = 19% of Food Dollar

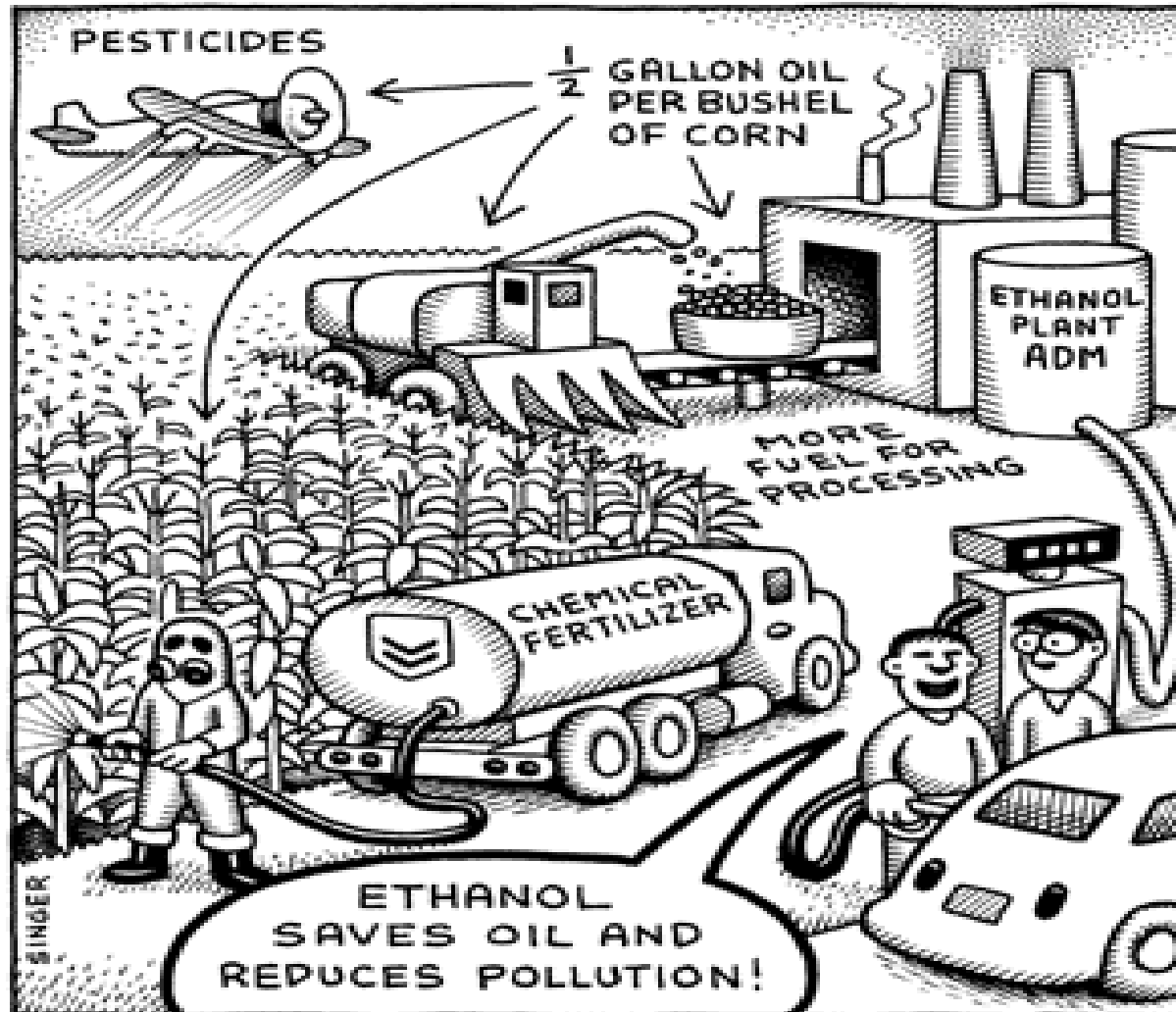


A \$1 per gallon increase in the price of gasoline has three times the impact on retail food prices as a \$1 per bushel increase in corn prices.

B. Reducing Inputs – More Output Per Input

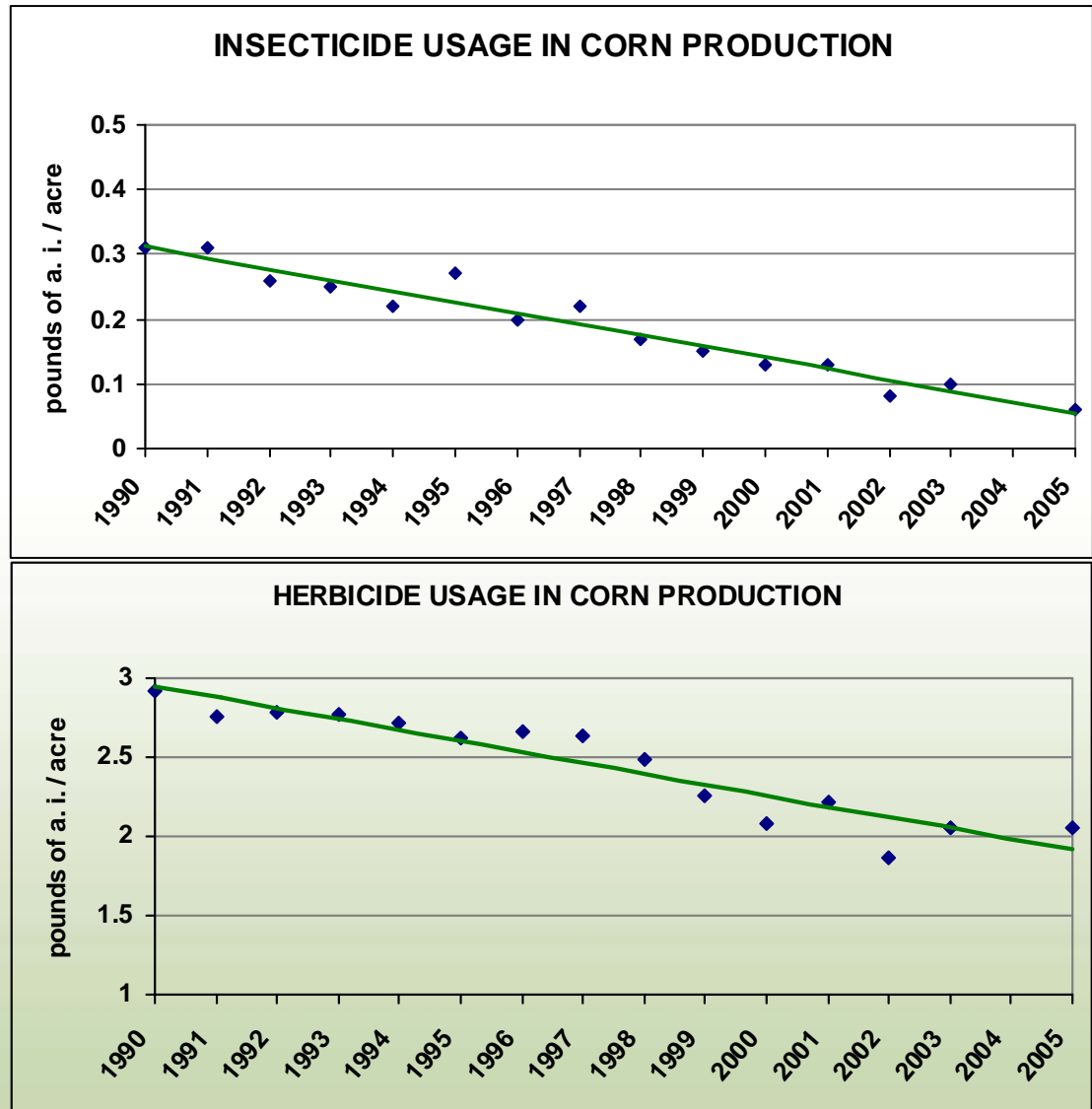
NO EXIT

© **Andy Singer**



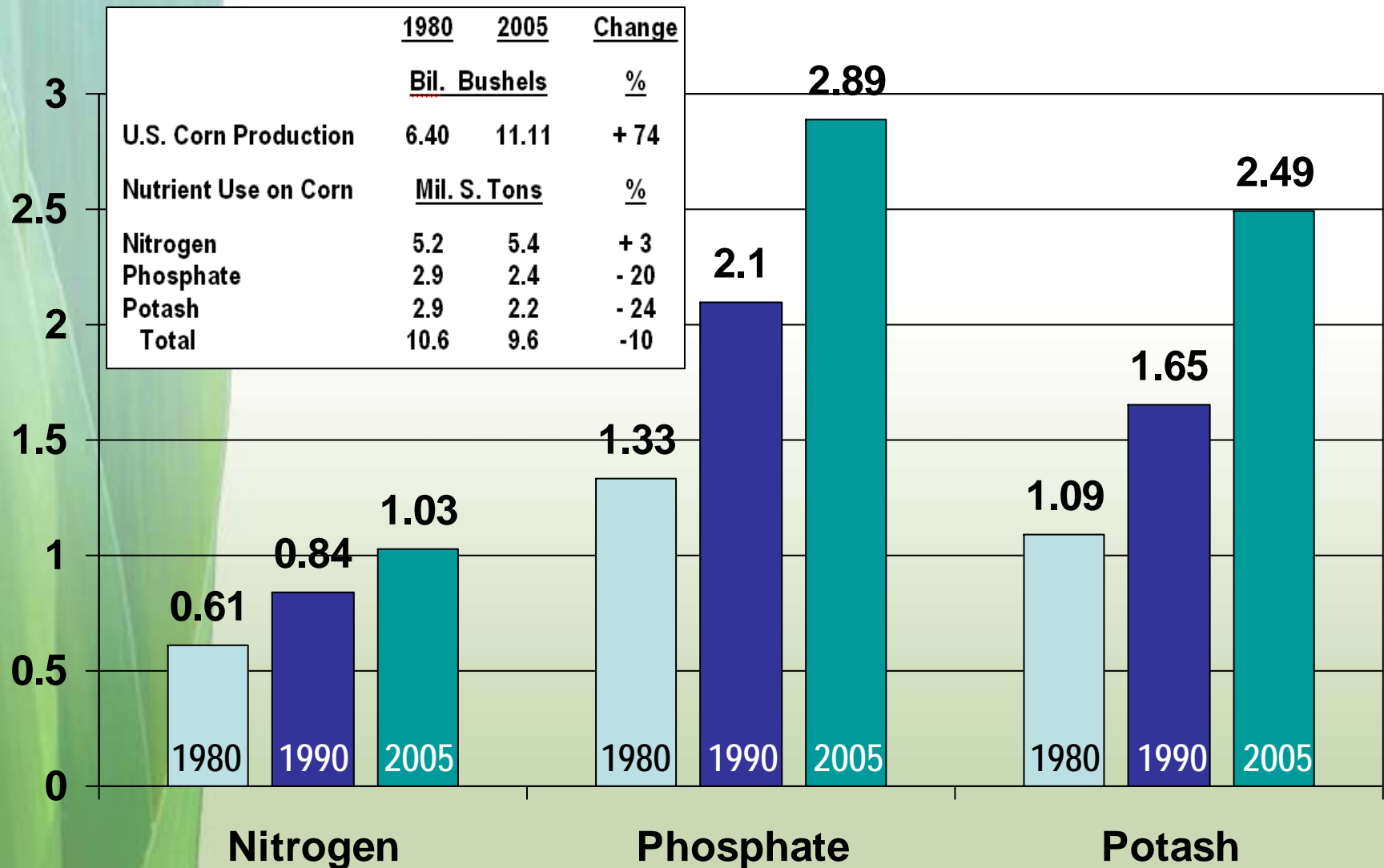
Sustainability: Pesticide Use in Corn Production

Increasing adoption of hybrids with insect-resistant and herbicide-tolerant traits have greatly reduced the need for synthetic applications of herbicides and insecticides.



Corn Nutrient Use Improving

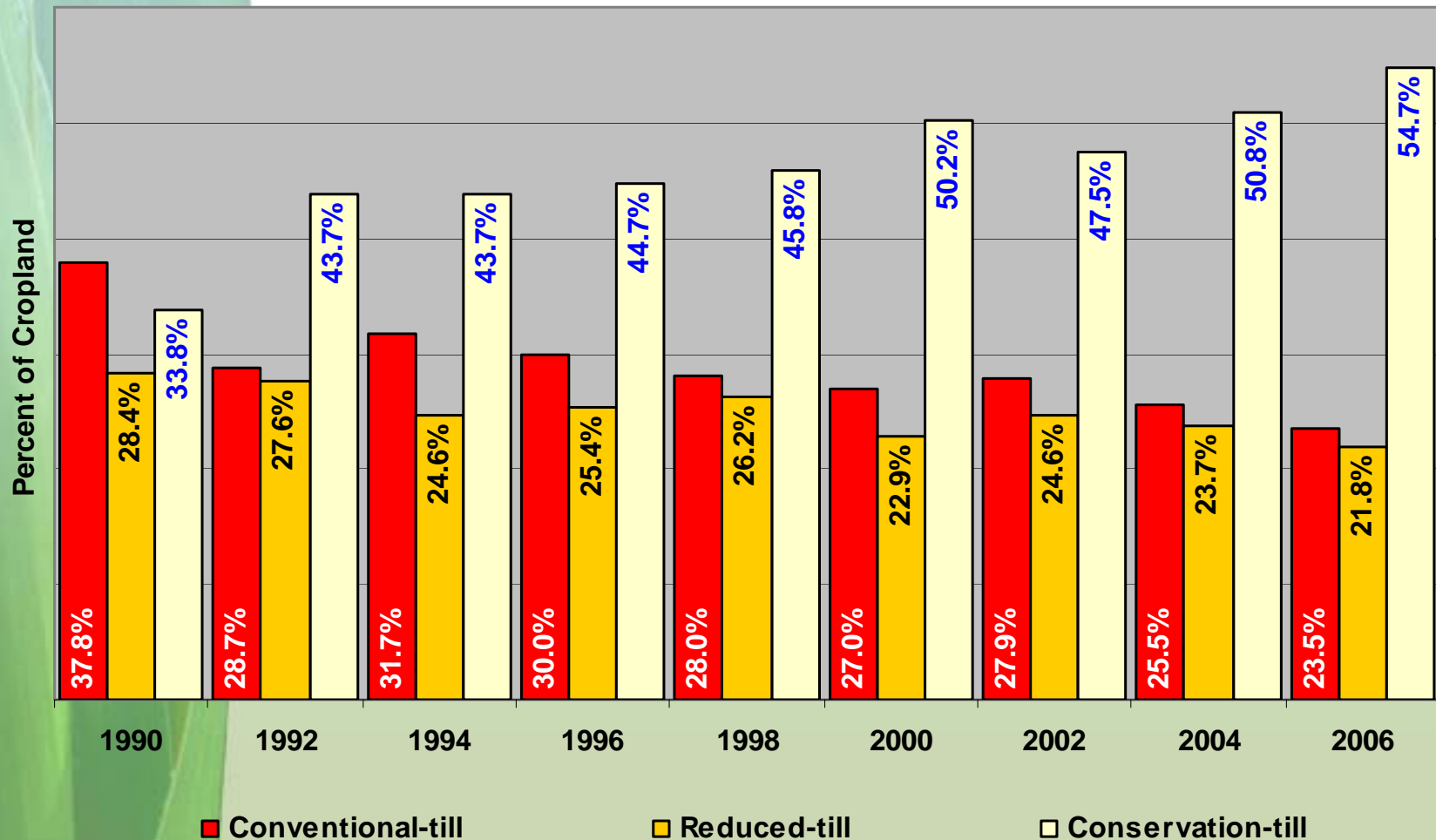
Bushels Produced Per Pound of Nutrient Applied



Source: USDA/Fertilizer Institute

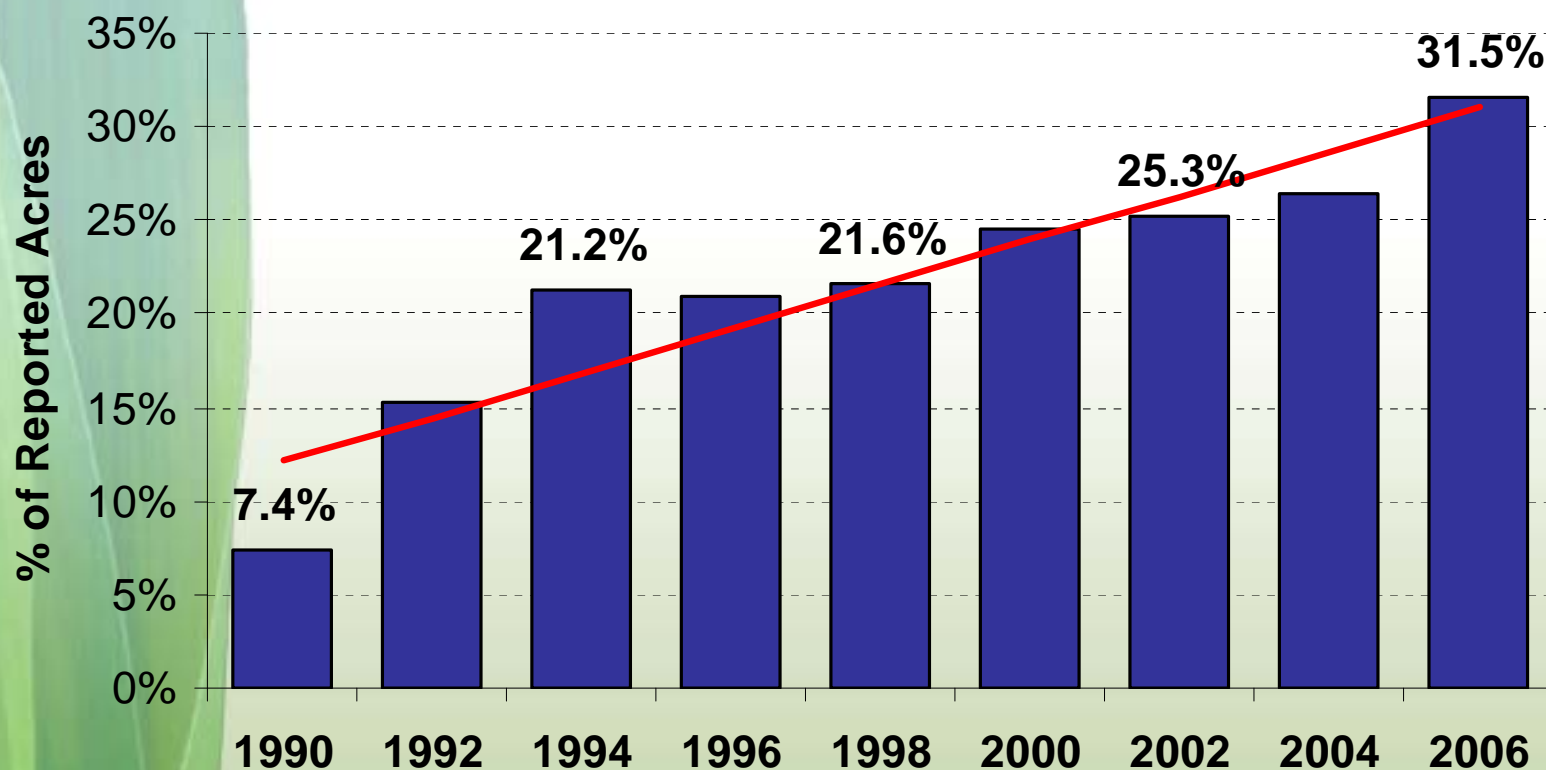
2006 CTIC Tillage Survey – Reporting

Percent Residue Cover Management
Conventional 0-15% Reduced 15-30% Conservation +30%



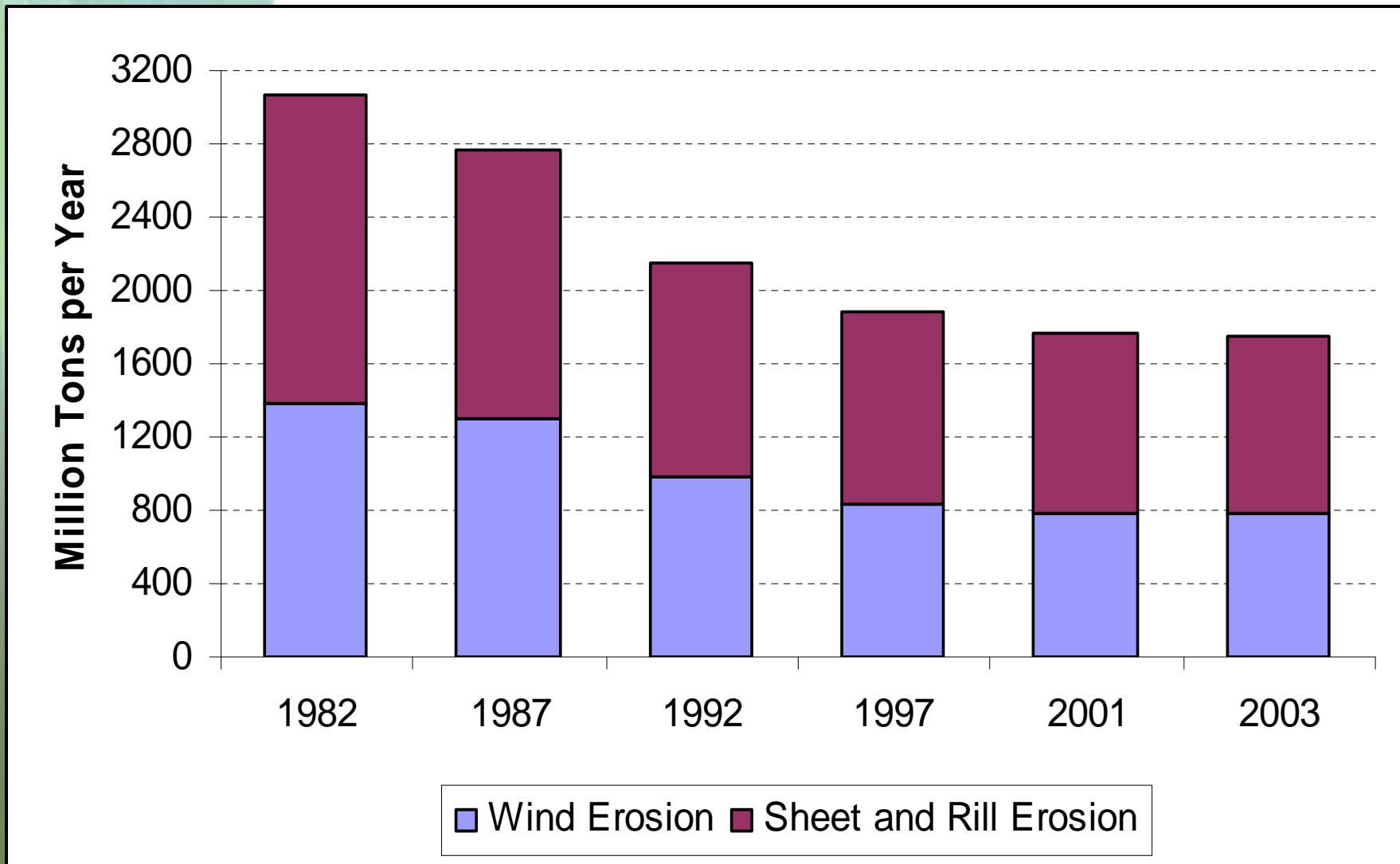
No-Till Trends

NO-TILL ACRES AS % OF REPORTING ACRES



NOTE: DOES NOT INCLUDE OTHER CONSERVATION TILLAGE PRACTICES SUCH AS LOW-TILL, RIDGE-TILL, ETC.

Erosion on U.S. Cropland by Year



Source: NRCS, January 2007

Corn's Water Needs

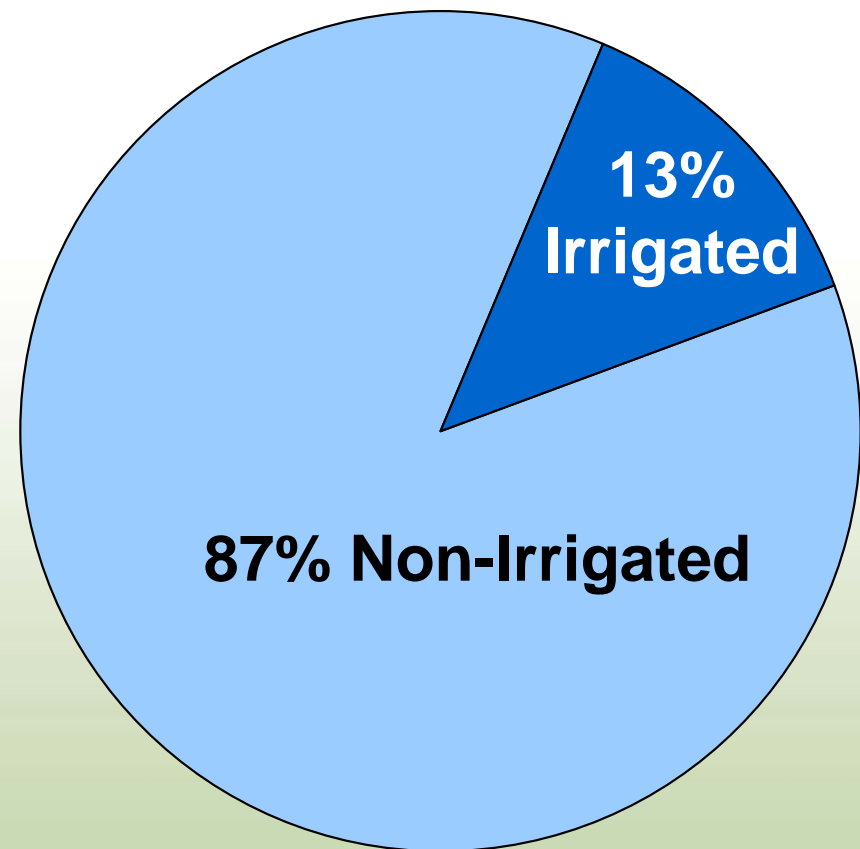


- Approximately 20-25 inches of water are necessary to produce an acre of average-yielding corn
- This translates to about 597,388 gallons per acre per year, or nearly 4,000 gallons per bushel

Based on 22 acre-inches (U of KY)

What They Don't Tell You

**Nearly nine
out of ten
acres of corn
require no
water other
than natural
rainfall**



What They Don't Tell You



**An acre of corn
gives off 4,000
gallons of water a
day in
evapotranspiration**

About 1 to 1.5 million gallons of
moisture per acre annually



Corn: Water Positive

- In aggregate, corn returns more moisture to the atmosphere than it withdraws from ground and surface water for irrigation
 - 12.4 million acres require 9.22 billion gallons of surface and ground water irrigation per day
 - But the entire corn crop (~83 million acres) is returning about 290 billion gallons of water per day to the atmosphere through transpiration*

* 3,500 gallons per day per acre

Water Use in Production



- 62,600 gallons to produce a ton of steel
- 39,090 gallons are needed to manufacture a new car, including tires
- 28,100 gallons to process a ton of beet sugar to make processed sugar
- 1,500 gallons to process a barrel of beer

Source: USGS/USEPA

More Perspective



- The average home uses 107,000 gallons of water per year
- 24 gallons of water needed to produce one pound of plastic
- 101 gallons of water needed to produce one pound of cotton
- 300 million gallons are needed to produce a single day's supply of U.S. newsprint
- 150 gallons to produce the average size Sunday newspaper

Land Use Controversy...

- **“Finally, these analyses published in Science may not be termed life cycle analyses. Life cycle analysis (LCA) follows a specific set of rules, one of which is that the most recent and most appropriate data be used. LCA is data driven, but these two analyses are not driven by actual data at all.”**
- **“There are no real, verifiable data in either of these papers on the land use changes that actually occur as more corn is processed to ethanol—hence these are not LCA studies. They are in fact speculation.”**
- **“Even if there were such data, ethanol produced in the United States under a specific set of production criteria would not be “responsible” for anything but its own environmental profile.”**

Dr. Bruce Dale, MSU

Land Use Controversy...

- **“Brazil can produce twice as much grain and ethanol as it now produces today without clearing another hectare of land.”**
- **“Deforestation is driven by the hypocrisy of those that shout about saving the Amazon Forest, but are willing to pay a fortune for Amazon hardwood for their buildings, home and furniture. If trade in hardwood is prohibited, deforestation will stop.”**

Alfredo Navarro

A Rational Approach to Sustainability....





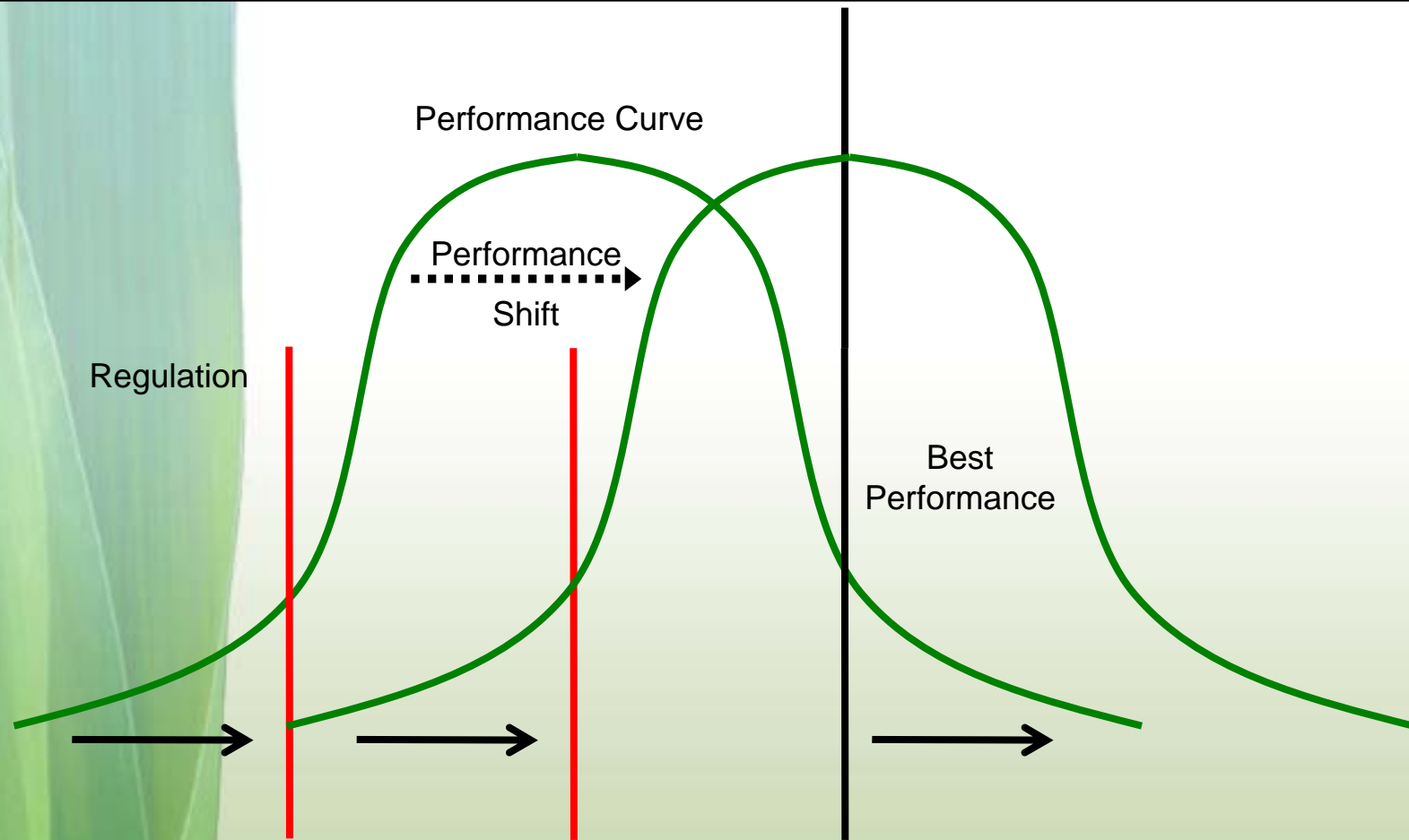
Steering Committee Members and Participants

- American Soybean Association
- Bunge Limited
- Cargill, Incorporated
- The Coca-Cola Company
- Conservation International
- Cotton, Inc
- DuPont
- Farm Bureau
- Fleishman-Hillard
- General Mills Inc.
- Grocery Manufacturers Association/Food Products Association
- McDonald's
- Mars, Inc.
- Monsanto
- National Association of Conservation Districts
- National Association of Wheat Growers
- National Corn Growers Association
- National Cotton Council
- Syngenta
- The Nature Conservancy
- United Soybean Board
- World Wildlife Fund

Other expertise

- University of Wisconsin
- Michigan State University
- University of Arkansas
- NRCS
- USDA
- EPA

Accelerating better practice adoption



Source: World Wildlife Fund - US

Our working definition of sustainable agriculture

Sustainable agriculture will meet the needs of the present while improving the ability of future generations to meet their own needs by:

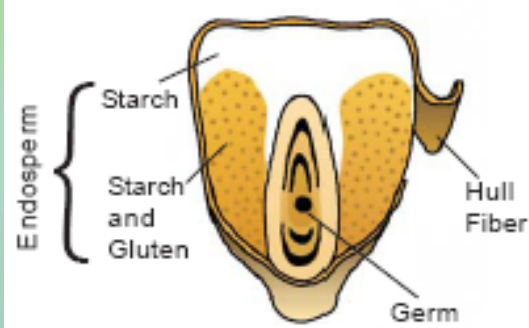
- Increasing productivity to meet future nutritional and fiber needs while decreasing impacts on the environment
- Improving human health through access to safe, nutritious food
- Improving the social and economic well being of agricultural communities

The initial work will focus on the first aspect of sustainable agriculture (first bullet above).

Proposed outcomes

- **Better informed decision-making** throughout the agricultural supply chain from grower to consumer
- A **sustainability tool** for growers to map and improve their own performance
- An **index** based on measurable outcomes that can assist in setting performance goals
- **Documented improved performance** over time
- **A single platform that entities** throughout the supply chain can use in their sustainability efforts

Maturation of the Industry – Key to Sustainability



Value Chain Integration

- **Seed to Feed**
 - Green Ethanol
 - IP Coproducts

Increase Revenues

- **Fractionation: High-value feeds/oils**
- Corn fiber cellulosic ethanol
- **Protein isolates**
- Industrial chemicals

Reduce Costs/ GHG

- **Anaerobic digestion**
- **Biomass combustion/gasification**
- Combined heat and power; **pinch analysis**
- Alternative starch/sugar feedstocks
- **Process simulation**

Optimization

- Ethanol tailored hybrids
- Enterprise-wide process control
- High-quality branded coproducts
- Knowledge based smart plant

Value

Corn Available for Feed, Food and Export

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Summary



- Organized Campaign to smear corn and ethanol
- Facts misused and selectively used
- Corn and ethanol's contribution to the environment and economy strong— and getting stronger

Thank you!

