Biofuels – A Catalyst for Needed Change in U.S. Agriculture

- Good for Agriculture — Bringing new investment — will result in a stronger more productive sector
  - No…. We won’t run out of corn.
  - No…. Higher corn prices will not have a major impact on food prices.
  - Yes…. There is a rational pathway for both food AND fuel.

April 2007
A. Misinformation

Myth: Ethanol is Causing a Corn Supply-Demand Imbalance

20-year growth trends are nearly PARALLEL

Myth: Ethanol Diverts Corn Away From the Food Supply

Food uses = 8% of total supply

Myth: Monogastric Animals Can't Use Distillers Grains

SWINE:
• "Corn DDGS is an economical addition to swine diets."
• "Corn DDGS can be effectively used in swine diets with maximum inclusion rates of: 25% for nursery pigs, 20% for grow-finish, 10% for lactating sows, 50% for gestating sows."

POULTRY:
• "DDGS proved to be a successful feed ingredient when used up to 15% in commercial laying hen diets."
• "Max. inclusion levels: broilers, 10%; turkeys (G-F), 15%; layers, 15%.

Myth: Ethanol Takes More Energy

Petroleum Replacement Ratio (PRR) = Petroleum Energy Used

Liquid Fuels Delivered to User

Sources: University of Minnesota, University of Georgia

Date: adapted from Farrell, et al. (2006)
Myth: Ethanol Causing Unprecedented Corn Prices

Corn prices averaged more than $3 per bushel three times in previous 25 years.

Source: USDA, ERS; 06-07 is midpoint estimate from Jan. 07 WASDE

Myth: Increased Corn Demand Leads to Higher Food Prices

- Less than 8% of corn goes toward human use.
- When corn is $4/bushel:
  - A $2.79 box of corn flakes (12 oz.) uses less than a nickel's worth of corn.
  - A $2.69 hamburger (1/4 lb. patty) requires 13¢ worth of corn for production.
  - A six pack of soda uses only 10¢ worth of corn for production.

Sources: Bureau of Labor Statistics; USDA-ERS

Myth: Ethanol Cuts U.S. Corn Exports to Hungry Countries

- U.S. is world’s leading corn exporter.
- Exports are up in 06-07.
- Most U.S. exports go to livestock feed in developed countries.
- Ethanol production contributes DDGS to export market.
- “Scarcity of Food” is not the issue.

Source: USDA-FAS

Myth: Ethanol’s Displacement Impact Isn’t Significant

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billions of gallons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethanol</td>
<td>1.6</td>
<td>4.9</td>
</tr>
<tr>
<td>Gasoline</td>
<td>130</td>
<td>141</td>
</tr>
<tr>
<td>Ethanol Share</td>
<td>1.2%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

Ethanol Growth from ‘00 to ‘06 = 3.3 bil. gals.
Gasoline Growth from ‘00 to ‘06 = 11 bil. gals.
SHARE OF ‘00 to ‘06 GROWTH MET BY ETHANOL = 30%

Adapted from USDA-OCE

Myth: Tariffs and Subsidies

- Oil higher than $45 per barrel – no subsidy needed.
- U.S. imported record amounts of ethanol in 2006.
- Brazil already subsidizes its ethanol industry.
- Tariff rate offsets excise tax exemption.
- Blender’s credit goes to blenders – the oil industry – not to corn growers or to ethanol producers, per se.

Myth: Sugar Cane is the Only Way to Go

Ethanol production costs...
**Myth: Corn Is Bad!**

### Herbicide Usage in Corn Production

- **Source:** USDA, NASS Agricultural Chemical Usage Report
- April 2007

### Insecticide Usage in Corn Production

- **Source:** USDA, NASS Agricultural Chemical Usage Report
- April 2007

### Corn: Nitrogen Utilization Efficiency

- **Source:** USDA, NASS Agricultural Chemical Usage Report
- April 2007

### Adoption of conservation tillage, including no-till, on U.S. cropland

- **Source:** Conservation Technology Information Center
- April 2007

### Erosion on U.S. Cropland by Year

- **Source:** NRCS, January 2007
- April 2007

### NCGA’s Vision

- **15 x 15 x 15**
  - 15 billion bushel corn crop
  - 15 billion gallons of ethanol
  - 8 years for infrastructure development

- **“15 x 15 x 15”**
  - Dozens of yield-acreage combos get us there
  - Ex: 83.5 m. ac. 180 bu./acre
  - ~10% of gasoline mix.
  - ~5 billion bu. demand

- **...by 2015**
How Will We Get There?

An example of making the unimaginable a reality

<table>
<thead>
<tr>
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<th>1976</th>
<th>2006</th>
<th>% Change</th>
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<tbody>
<tr>
<td>U.S. Corn Acres Planted</td>
<td>84.6 mil</td>
<td>78.6 mil</td>
<td>-5.2</td>
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<tr>
<td>U.S. Corn Acres Harvested</td>
<td>71.5 mil</td>
<td>71.0 mil</td>
<td>-0.3</td>
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<tr>
<td>U.S. Corn Production</td>
<td>6.3 bil bu</td>
<td>10.7 bil bu</td>
<td>+76</td>
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<tr>
<td>U.S. Corn Yield</td>
<td>88 bu/Acre</td>
<td>149 bu/Acre</td>
<td>+70</td>
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</table>

Source: USDA

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How Will We Get There?

Corn Yield Trends Are Accelerating

Source: USDA

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Step-Changes in Corn Potential

How Will We Get There?

Transgenic Field Trials, by Crop

Source: APHIS, Strath/Kirn (2006)

How Will We Get There?

DDG Displacement of Corn

Equivalent to projected amount of corn fed to hogs in 2007 (<1.5 mil. bu.)

Source: PRX

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How Will We Get There?

Acreage Shifts

Every additional 1 million harvested acres results in 150 million bushels (assuming yield of 150 bu./acre). That additional corn could produce 420 million gallons of ethanol.

Source: USDA, ERS; 2007 Baseline Projections

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**How Will We Get There?**

**Improved ethanol production efficiency**

(Gallons of ethanol per acre of corn)

- Fiber conversion
- Stover
- High fermentable hybrids
- Yield increase

<table>
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<th></th>
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<tbody>
<tr>
<td>Gallons per acre</td>
<td>600</td>
<td>700</td>
<td>800</td>
<td>900</td>
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</table>

Source: DuPont

**How Will We Get There?**

**Cellulose is Here!**

U.S. renewable fuels production - billions of gallons

<table>
<thead>
<tr>
<th>Year</th>
<th>2006</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
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<tbody>
<tr>
<td>Million Gallons</td>
<td>2.5</td>
<td>5.0</td>
<td>7.5</td>
<td>10.0</td>
<td>12.5</td>
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</tbody>
</table>

Cellulose is Here!

Source: NCGA

**Summary**

U.S. agriculture has the capability to meet U.S. and world food supply needs and still make a significant contribution to domestic fuel needs.

These goals are compatible and not in conflict.

**The Ridiculous Numbers and Claims…**

“30+ billion gallons by 2010”

“50% of our corn supply by 2008”

“8.6 billion bushels used in 2008”

“Consume all of our farmland”

Considerations:

- Ethanol Design/Building Capacity
- Ethanol Plant Site Availability
- Ethanol Demand
- Transportation Infrastructure Capacity
- Demand for Ethanol Coproducts
- Capital Resources/Investment
Good Sites: Getting Harder to Find?

- RED = Operating (23)
- BLUE = Construction (9) & Expansion (2)
- GREEN = Proposed (7)

Ethanol Supply-Demand

- Effective “Blend Cap”
- RFS, Ethanol Share
- EOY Annualized Supply (EOY Run-Rate Capacity)
- RFG/MTBE Replacement, Octane Demand
- Above RFS Target
- Price-sensitive Demand (Gasoline Blending/Supply Extension)

Ethanol Supply-Demand

Bank of America’s View:

- Ethanol Supply/Demand Outlook
- July-Dec. 2007

Recent slide already chasing some “opportunist” investors out

Will Ethanol Continue to be an Attractive Investment?

- Ethanol Plant Profitability
- Gross margins for Midwestern Plants

Farmers Respond to Market Signals

- Percent of Acres
- Corn
- Soybeans

Bottom Line

- Just getting to 15 billion gallons by 2015 is doable, but will be a challenge!
April 2007

Key Variable: Weather

UNITED STATES CORN YIELD DEVIATION FROM TREND vs "NORMAL" PROBABILITY CURVE

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<th>Deviation of Yield from Trend, %</th>
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Will There Be Enough Corn?

Yes...and here’s why:
- Increasing corn yields
- Acreage shifts
- Demand for domestic feed uses are flat
- Corn feed demand partially offset by distillers grains use
- New technologies will “squeeze” more ethanol out of a bushel
  - High-fermentable starch hybrids
  - Low-temperature fermentation
  - Corn fiber conversion

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The future is bright. Challenges and opportunities abound…

U.S. agriculture is up to the challenge.

Bank on it!

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Thank You!
For more information visit www.nnga.com