An Analysis of the Long-Run Impact of Ethanol Expansion on Agricultural Markets

Chad Hart
Center for Agricultural and Rural Development
Iowa State University
chart@iastate.edu
515-294-9911

Presentation for representatives from Nidera
Ames, Iowa
August 20, 2007
Outline

- Based on the CARD study “Emerging Biofuels: Outlook of Effects on U.S. Grain, Oilseed, and Livestock Markets”
  http://www.card.iastate.edu/publications/synopsis.aspx?id=1050

- Updated with available 2006 and 2007 data

- The objective is to estimate:
  - how large the biofuels sector in the U.S. could become
  - the impact of the biofuels sector on crops markets, trade, and on livestock markets
  - the response of world agricultural markets
Model Interactions

Model Interactions
Trade, Prices, and Physical Flows

Macroeconomic Variables

Policy Parameters

International Dairy

International Livestock

International Grains

Ethanol

U.S. Dairy

U.S. Livestock

U.S. Crops

International Oilseeds

International Sugar

International Rice

Iowa State University
• Current ethanol capacity: 124 plants, 6.48 billion gallons/year

• Total capacity under construction and expansion: 6.4 billion gallons/year

• 76 new ethanol plants and 7 expansion projects underway

• 2.2 billion bushels of corn were used in producing fuel ethanol in 2006/2007 marketing year.

• 3.2-3.5 billion bushels of corn are expected to be used in producing fuel ethanol for 2007/2008 marketing year.
Key Determinants of Impacts

- Crude oil prices
  - Used NYMEX futures prices as a guide
- Policy incentives in the U.S.
  - $0.51/gallon ethanol blenders credit
  - $0.54/gallon import duty and 2.5% import tariff
- Demand for E-85 included
Projected U.S. Ethanol Production

billion gallons

- 2006
- 2008
- 2010
- 2012
- 2014
- 2016

Ethanol Production
## Projected U.S. Dry Mill Margins

<table>
<thead>
<tr>
<th>Year</th>
<th>Margin Over Operating Costs</th>
<th>Margin Over Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>-0.40</td>
<td>0.00</td>
</tr>
<tr>
<td>2008</td>
<td>-0.20</td>
<td>0.00</td>
</tr>
<tr>
<td>2010</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2012</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>2014</td>
<td>0.40</td>
<td>0.50</td>
</tr>
<tr>
<td>2016</td>
<td>0.60</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Wholesale Gasoline and Ethanol Prices

<table>
<thead>
<tr>
<th>Year</th>
<th>Unleaded Gasoline</th>
<th>Ethanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$2.75</td>
<td>$1.50</td>
</tr>
<tr>
<td>2008</td>
<td>$2.50</td>
<td>$1.25</td>
</tr>
<tr>
<td>2010</td>
<td>$2.00</td>
<td>$1.00</td>
</tr>
<tr>
<td>2012</td>
<td>$1.75</td>
<td>$1.25</td>
</tr>
<tr>
<td>2014</td>
<td>$1.50</td>
<td>$1.00</td>
</tr>
<tr>
<td>2016</td>
<td>$1.25</td>
<td>$0.80</td>
</tr>
</tbody>
</table>

US$/gallon


Unleaded Gasoline Ethanol
Projected Utilization of U.S. Corn

- **Feed**
- **Fuel**
- **HFCS**
- **Seed**
- **Food, Other**
- **Exports**

million bushels

- 2006
- 2007
- 2008
- 2009
- 2010
- 2016

2006 2007 2008 2009 2010 2016

Projected utilization trends from 2006 to 2016, showing changes in demand for corn in various sectors.
Projected U.S. Corn and Soybean Prices

US$/bushel


Corn
Soybeans
Projected U.S. Soybean Planted Area

- 2006: 75 million acres
- 2008: 65 million acres
- 2010: 70 million acres
- 2012: 70 million acres
- 2014: 70 million acres
- 2016: 70 million acres

The graph shows the projected planted area in million acres for each of the years from 2006 to 2016.
Projected Brazilian Ethanol Production

million gallons

2007 2008 2009 2010 2016

Brazil
Projected World Area Harvested

- Million hectares
- 2007-2016
- Corn, Wheat, Soybeans

Iowa State University
Projected Argentine Area Harvested

million hectares

2007 2008 2009 2010 2016

Corn  Wheat  Soybeans

IOWA STATE UNIVERSITY
Projected Brazilian Area Harvested

- Corn
- Wheat
- Soybeans

million hectares

2007 2008 2009 2010 2016

C A R D

I O W A  S T A T E  U N I V E R S I T Y
Projected World Corn Net Exports

2007/08
- Argentina: 15%
- Brazil: 7%
- U.S.: 57%
- Rest of World: 15%

2016/17
- Argentina: 11%
- Brazil: 4%
- U.S.: 66%
- Rest of World: 19%
Projected World Wheat Net Exports

2007/08
- Argentina: 11%
- Canada: 20%
- U. S.: 24%
- Rest of World: 45%

2016/17
- Argentina: 11%
- Canada: 16%
- U. S.: 24%
- Rest of World: 49%
Projected World Soybean Net Exports

2007/08
- Argentina: 11%
- Brazil: 2%
- U.S.: 45%
- Rest of World: 2%

2016/17
- Argentina: 9%
- Brazil: 2%
- U.S.: 28%
- Rest of World: 61%
Projected World Soybean Meal Net Exports

2007/08
- Argentina: 26%
- Brazil: 53%
- U. S.: 15%
- Rest of World: 6%

2016/17
- Argentina: 28%
- Brazil: 52%
- U. S.: 12%
- Rest of World: 8%
Impact of Higher Crude Oil Price

- Increased crude oil price by $10/barrel over the projection
- Margins on ethanol plants increase
- New incentive to invest in added capacity for ethanol production
- Eventually, a new equilibrium reached where there is no incentive to invest in or exit the ethanol industry
- Will demand for ethanol be enough?
  - E-10 market will saturate around 15 billion gallons
  - Drop in ethanol price will eventually encourage increase in demand for the flex-fuel cars
Projected U.S. Ethanol Production

billion gallons


Ethanol Production
Projected U.S. Dry Mill Margins

US$/bushel

Margin Over Operating Costs
Margin Over Total Cost

IOWA STATE UNIVERSITY
Wholesale Gasoline and Ethanol Prices

US$/gallon


Unleaded Gasoline
Ethanol
Projected U.S. Corn Planted Area

million acres

- 2006
- 2008
- 2010
- 2012
- 2014
- 2016

Corn Planted Area
Projected Utilization of U.S. Corn

million bushels

Feed
Fuel
HFCS
Seed
Food, Other
Exports

IOWA STATE UNIVERSITY
Projected U.S. Corn and Soybean Prices
Projected Brazilian Ethanol Production

Brazil

million gallons

2007 2008 2009 2010 2016

4000 5000 6000 7000 8000
Projected Ethanol Production

- **China**
- **EU**
- **India**
Projected World Area Harvested

million hectares

225
175
125
75

2007 2008 2009 2010 2016

Corn
Wheat
Soybeans

- Corn
- Wheat
- Soybeans
Projected Argentine Area Harvested

- Million hectares
- 2007 to 2016
- Corn, Wheat, Soybeans

Card
Iowa State University
Projected Brazilian Area Harvested

- Corn
- Wheat
- Soybeans

million hectares
Projected World Soybean Net Exports

2007/08
- Argentina: 11%
- Brazil: 42%
- U. S.: 45%
- Rest of World: 2%

2016/17
- Argentina: 9%
- Brazil: 64%
- U. S.: 25%
- Rest of World: 2%
Projected World Soybean Meal Net Exports

2007/08
- Argentina: 53%
- Brazil: 26%
- U. S.: 15%
- Rest of World: 6%

2016/17
- Argentina: 52%
- Brazil: 28%
- U. S.: 13%
- Rest of World: 7%

Legend:
- Red: Argentina
- Yellow: Brazil
- Blue: U. S.
- Gray: Rest of World
Projected World Soybean Oil Net Exports

2007/08
- Argentina: 71%
- Brazil: 26%
- U.S.: 3%

2016/17
- Argentina: 66%
- Brazil: 29%
- U.S.: 5%
Thank You