Bottlenecks and Oil Price Spikes: Impact on U.S. Ethanol and Agriculture

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Based on an update of our earlier 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
• Current ethanol capacity: 129 plants, 6.88 billion gallons/year
• Total capacity under construction and expansion: 6.77 billion gallons/year
• 76 new ethanol plants and 10 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

- The “E-85 bottleneck”: the location and quantity of flex-fuel vehicles and E-85 pumps
Three Cases

- Baseline
  - Current policies, “normal” weather

- Higher oil prices throughout projection period
  - Adding $10/barrel to the crude oil price

- Drought in the 2012 crop year
  - Placing a 1988-style drought in the middle of the projection period
Projected U.S. Ethanol Production

billion gallons

Projected U.S. Dry Mill Margins

US$/bushel

-0.40 -0.20 0.00 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60


Margin Over Operating Costs
Margin Over Total Cost
Margins at Various Corn and Gasoline Prices

Wholesale Price of Gasoline

- Corn and Gasoline Prices
  -1.50
  -1.00
  -0.50
  0.00
  0.50
  1.00
  1.50

- Dollars per Bushel
  - 0.00
  - 1.00
  - 2.00
  - 3.00
  - 4.00
  - 5.00
  - 6.00
  - 7.00

- $ per gallon
  - 1.00
  - 1.50
  - 2.00
  - 2.50

Dollars per Bushel

Graph showing the relationship between corn and gasoline prices, with lines indicating wholesale price of gasoline at different price points.
Wholesale Gasoline and Ethanol Prices

US$/gallon

Unleaded Gasoline  Ethanol
Projected U.S. Corn Planted Area

million acres

Projected U.S. Corn and Soybean Prices

US$/bushel

Corn
Soybeans
Projected U.S. Soybean Planted Area

million acres

Projected U.S. Biodiesel Production

million gallons


- 2006: 350 million gallons
- 2008: 500 million gallons
- 2010: 550 million gallons
- 2012: 500 million gallons
- 2014: 450 million gallons
- 2016: 400 million gallons
Projected U.S. Meat Production

- Beef
- Pork
- Broiler
Projected U.S. Retail Meat Prices

$ per pound

Beef - Orange Squares
Pork - Purple Triangles
Broiler - Blue Diamonds

Years: 2006 to 2016
Projected Brazilian Ethanol Production

million gallons

Brazil
Projected Ethanol Production

China EU India

million gallons


- China
- EU
- India
Projected Argentine Area Harvested

thousand hectares

Corn
Wheat
Soybeans
Projected Brazilian Area Harvested

- Corn
- Wheat
- Soybeans

thousand hectares

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

Scenario
Baseline
Projected U.S. Dry Mill Margins

US$/bushel

Margin Over Operating Costs
Margin Over Total Cost

Wholesale Gasoline and Ethanol Prices

US$/gallon

Unleaded Gasoline
Ethanol

Unleaded Gasoline  Ethanol
Projected U.S. Corn Planted Area

million acres

Scenario Baseline
Projected Utilization of U.S. Corn

million bushels

Feed | Fuel | HFCS | Seed | Food, Other | Exports

Projected U.S. Corn and Soybean Prices

US$/bushel


Corn  Soybeans
Projected U.S. Soybean Planted Area

- **Scenario**
- **Baseline**

### Graph Details:
- **Y-axis:** Million acres
- **X-axis:** Years (2006 to 2016)

The graph shows the projected change in million acres planted for soybeans from 2006 to 2016, comparing the scenario and baseline forecasts.
Projected U.S. Biodiesel Production

- Million gallons

- Years: 2006 to 2016

- Graph showing biodiesel production with two scenarios: Baseline and Scenario.
Projected U.S. Meat Production

billion pounds

- Beef
- Pork
- Broiler
Projected U.S. Retail Meat Prices

$ per pound

Beef  Pork  Broiler
# U.S. Meat, Egg, and Dairy Price Changes

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Scenario</th>
<th>Percentage Change</th>
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</thead>
<tbody>
<tr>
<td><strong>Beef Retail Price</strong></td>
<td>4.52</td>
<td>4.62</td>
<td><strong>2.2%</strong></td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pork Retail Price</strong></td>
<td>3.30</td>
<td>3.35</td>
<td><strong>1.5%</strong></td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Broiler Retail Price</strong></td>
<td>1.96</td>
<td>2.00</td>
<td><strong>2.0%</strong></td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Turkey Retail Price</strong></td>
<td>1.26</td>
<td>1.30</td>
<td><strong>3.2%</strong></td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Egg Retail Price</strong></td>
<td>1.63</td>
<td>1.68</td>
<td><strong>3.1%</strong></td>
</tr>
<tr>
<td>($/dozen)</td>
<td></td>
<td></td>
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</table>
## Farm to Retail Food Price Spread

<table>
<thead>
<tr>
<th>Food</th>
<th>Farm Value Share of Retail Food Price</th>
<th>Food</th>
<th>Farm Value Share of Retail Food Price</th>
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<tbody>
<tr>
<td>Eggs</td>
<td>53</td>
<td>Canned Corn</td>
<td>22</td>
</tr>
<tr>
<td>Beef</td>
<td>49</td>
<td>Sugar</td>
<td>27</td>
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<tr>
<td>Chicken</td>
<td>48</td>
<td>Wheat Flour</td>
<td>19</td>
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<tr>
<td>Milk</td>
<td>34</td>
<td>Bread</td>
<td>5</td>
</tr>
<tr>
<td>Pork</td>
<td>31</td>
<td>Corn Flakes</td>
<td>4</td>
</tr>
<tr>
<td>Orange Juice</td>
<td>33</td>
<td>Corn Syrup</td>
<td>3</td>
</tr>
</tbody>
</table>

Impact on Rest of the World

- World grain and oilseed prices increase
- Result in higher feed and food prices
- Higher food prices
- Higher livestock production cost
- Countries in South America and Asia fill the gap
Impact of Short Crop Scenario

- Drought in 2012 similar to 1988
  - Regional yields of corn, soybeans and wheat changed from trend levels
  - Yields were off by 25% for corn, 18% for soybeans, and 11% for wheat in 1988
- Ethanol mandate for 2012 assumed to be 14.7 billion gallons
Corn, Soybean and Ethanol Markets

- Corn price increases by 44% above baseline levels
- Soybean price rises by 22%
- Corn exports and stock levels decline by more than 60%
- Corn exports from South America, China, etc. fill part of the gap from decline in U.S. corn exports
- Corn feed use declines by 16% (switch to other feeds)
- Ethanol trade increases moderately
Livestock Market

- Higher feed costs affect the livestock sector but to a lesser extent as shock is perceived as temporary
  - Production declines
    - Broiler production declines the most (over 2.5%)
    - Milk production declines the least (0.5%)
  - Retail prices increase
    - Egg prices increase the most (about 5.5%)
    - Prices of other products increase by a range between 2% and 4%
Thank You