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

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

Commodity Markets Council/Transportation, Elevator & Grain Merchants Association Meeting
Chicago, Illinois
September 6, 2007
Outline

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
Model Interactions

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
Current ethanol capacity: 128 plants, 6.78 billion gallons/year

Total capacity under construction and expansion: 6.65 billion gallons/year

77 new ethanol plants and 8 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

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

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

Dollars per Bushel

$ per gallon

Wholesale Price of Gasoline

- 1.00
- 1.50
- 2.00
- 2.50
Projected U.S. Corn Planted Area

million acres

- 2006
- 2008
- 2010
- 2012
- 2014
- 2016
Projected Utilization of U.S. Corn

![Projected Utilization of U.S. Corn Chart]

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

million bushels

Projected Utilization of U.S. Corn from 2006 to 2016.
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


300 350 400 450 500 550 600
Projected U.S. Meat Production

billion pounds


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

$ per pound


Beef - Pork - Broiler
Projected Brazilian Ethanol Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Million Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>4000</td>
</tr>
<tr>
<td>2007</td>
<td>5000</td>
</tr>
<tr>
<td>2008</td>
<td>6000</td>
</tr>
<tr>
<td>2009</td>
<td>7000</td>
</tr>
<tr>
<td>2010</td>
<td>8000</td>
</tr>
<tr>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
</tr>
</tbody>
</table>

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

thousand hectares


Corn Wheat Soybeans
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
Projected U.S. Dry Mill Margins

US$/bushel

Margin Over Operating Costs  Margin Over Total Cost
Wholesale Gasoline and Ethanol Prices

![Graph showing Wholesale Gasoline and Ethanol Prices from 2006 to 2016. The graph includes two lines: one for Unleaded Gasoline and another for Ethanol. The Y-axis represents the price in US$/gallon, ranging from 1.00 to 3.00. The X-axis represents the years from 2006 to 2016. The graph illustrates the price trends of Unleaded Gasoline and Ethanol over the years, with Unleaded Gasoline generally being higher in price than Ethanol.](image-url)
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

million acres


- Scenario
- Baseline
Projected U.S. Biodiesel Production

million gallons


Baseline
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>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Retail Price</td>
<td>4.52</td>
<td>4.62</td>
<td>2.2%</td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pork Retail Price</td>
<td>3.30</td>
<td>3.35</td>
<td>1.5%</td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broiler Retail Price</td>
<td>1.96</td>
<td>2.00</td>
<td>2.0%</td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey Retail Price</td>
<td>1.26</td>
<td>1.30</td>
<td>3.2%</td>
</tr>
<tr>
<td>($/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egg Retail Price</td>
<td>1.63</td>
<td>1.68</td>
<td>3.1%</td>
</tr>
<tr>
<td>($/dozen)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</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>
</tr>
</thead>
<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>
</tr>
<tr>
<td>Chicken</td>
<td>48</td>
<td>Wheat Flour</td>
<td>19</td>
</tr>
<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
Historical Corn Production Deviations

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