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

Mexico City, Mexico
June 15, 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

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

Trade, Prices, and Physical Flows

- Macroeconomic Variables
- Policy Parameters

- International Dairy
- International Livestock
- International Grains
- Ethanol
- International Oilseeds
- International Sugar
- International Rice
- U.S. Dairy
- U.S. Livestock
- U.S. Crops
Current ethanol capacity: 120 plants, 6.2 billion gallons/year

Total capacity under construction and expansion: 6.4 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 billion bushels of corn are expected to be used in producing fuel ethanol for 2007/2008 marketing year.

U.S. Ethanol Industry
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


Ethanol Production
Projected U.S. Dry Mill Margins

Margin Over Operating Costs
Margin Over Total Cost

US$/bushel

Wholesale Gasoline and Ethanol Prices

US$/gallon

Unleaded Gasoline
Ethanol
Projected U.S. Corn Planted Area

millon acres

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

Corn Planted Area
Projected U.S. Corn and Soybean Prices

US$/bushel


Corn
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
# Corn Market

<table>
<thead>
<tr>
<th></th>
<th>Baseline (2016)</th>
<th>Long-Run</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corn Price ($/bushel)</strong></td>
<td>3.16</td>
<td>4.43</td>
<td>40.2%</td>
</tr>
<tr>
<td><strong>Corn Area (million acres)</strong></td>
<td>92.5</td>
<td>112.3</td>
<td>21.4%</td>
</tr>
<tr>
<td><strong>Corn Production (million bushels)</strong></td>
<td>14,750</td>
<td>18,038</td>
<td>22.3%</td>
</tr>
<tr>
<td><strong>Corn Use in Ethanol (million bushels)</strong></td>
<td>5,046</td>
<td>10,765</td>
<td>113.3%</td>
</tr>
<tr>
<td><strong>Corn Feed Use (million bushels)</strong></td>
<td>5,746</td>
<td>4,914</td>
<td>-14.5%</td>
</tr>
<tr>
<td><strong>Corn Exports (million bushels)</strong></td>
<td>2,451</td>
<td>911</td>
<td>-62.8%</td>
</tr>
</tbody>
</table>
# Livestock Market

<table>
<thead>
<tr>
<th></th>
<th>Baseline (2016)</th>
<th>Long-Run</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Retail Price</td>
<td>4.52</td>
<td>4.71</td>
<td>4.2%</td>
</tr>
<tr>
<td>(US$/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pork Retail Price</td>
<td>3.30</td>
<td>3.44</td>
<td>4.2%</td>
</tr>
<tr>
<td>(US$/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broiler Retail Price</td>
<td>196.07</td>
<td>205.32</td>
<td>4.7%</td>
</tr>
<tr>
<td>(US¢/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey Retail Price</td>
<td>126.28</td>
<td>136.96</td>
<td>8.5%</td>
</tr>
<tr>
<td>(US¢/pound)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egg Retail Price</td>
<td>162.98</td>
<td>177.07</td>
<td>8.6%</td>
</tr>
<tr>
<td>(US¢/dozen)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk Retail Price</td>
<td>14.65</td>
<td>15.44</td>
<td>5.4%</td>
</tr>
<tr>
<td>(US$/cwt)</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 fell by 25% for corn, 18% for soybeans, 11% for wheat
- Ethanol mandate for 2012 assumed to be 14.7 billion gallons
Corn, Soybean and Ethanol Markets

- Corn price increases by 42% 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 15% (switch to wheat)
- 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%)
    - Decline for beef, pork and turkey ranges between 1% and 1.5%

- 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