The Biofuel Industry in Southeast – The Implications on Transportation Systems

Bruce Lambert
Institute for Trade and Transportation Studies

R. Wes Harrison
Warner L. Bruner Professor
Louisiana State University AgCenter
How will we live?
What is a Biofuel, BioMass?

- Biofuel
- Biomass – feedstocks
- Electricity or portable fuel?
- The Southeast – “The Saudi Arabia of Biomass”? 
Factors Driving Growth in Biofuels

- Energy Independence & Environmental Concerns
- Public Policies that Support the Biofuels Industry
  - Mandatory Blending, Production Incentives, Tax Credits
- High Oil Prices and Relatively Cheap Corn
Processes and Biofuel Production

CHEMICAL
Oleochemical/Chemical Platform

THERMOCHEMICAL
Gasification Platform

BIOCHEMICAL
Sugar Fermentation Platform

Fuels,
Chemicals,
Energy &
Co-products
Sources of Biofuels in the Southeast

- Sugar
  - Root crops
  - Stalk crop
  - Sugar beets
  - Sugar cane
  - Sweet sorghum
- Starch
  - Cereals
    - Corn
    - Barley
    - Rye
    - Wheat
    - Sorghum grain
    - Potatoes
    - Cassava
    - Willows
    - Poplar
  - Root crops
  - Forest residues
  - Energy crops
  - MSW
  - Agricultural waste
  - Straw
  - Corn stover
  - Bagasse
- Cellulose
  - Paper waste
World Biodiesel Production (1975-2008)

- 3.9 Billion Gallons
- EU, US, Brazil – 90% of World Supply
- Feedstocks
  - Rapeseed and Sunflower Oil in EU
  - Soybean Oil and Waste Grease in US and Brazil
World Ethanol Production (1975-2008)

- 17.3 Billion Gallons in 2008
- Ethanol Suppliers –
  - United States (corn)
  - Brazil (cane)
  - 88% of World Supply
Federal Policies

- 2004
  - American Jobs Creation Act
  - Federal Tax Credits
- 2005 - Energy Policy Act
- 2007 - Energy Independence and Security Act
- 2008
  - The Emergency Economic Stabilization Act;
  - The Energy Improvement and Extension Act
  - The Food, Conservation and Energy Act (The Farm Bill)
Economic Viability at Regional or State Level

At each point:
- technical and economic feasibility
- political factors
- capital investment and infrastructure
- other factors
Current Production and Distribution

Ethanol

Petroleum

State and Local Incentives

- Production Incentives
- Distribution Incentives
  - Clean Fleet
  - Filling Station Locations
## Southeast Regional Energy Market

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Share of U.S. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population, projection 2030 (1000)</td>
<td>97570.0</td>
<td>26.8</td>
</tr>
<tr>
<td>Gasoline consumption (mil. gal.)</td>
<td>39736.2</td>
<td>28</td>
</tr>
<tr>
<td>Ethanol consumption (mil. gal.)</td>
<td>837</td>
<td>12</td>
</tr>
<tr>
<td>Ethanol to gasoline ratio (percent)</td>
<td>2.1</td>
<td>(4.7 for U.S.)</td>
</tr>
<tr>
<td>E85 consumption (mil. gal.)</td>
<td>17.6</td>
<td>33</td>
</tr>
<tr>
<td>Number of ethanol plants (operating)</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Ethanol production capacity (operating, mil gal)</td>
<td>461.3</td>
<td>4</td>
</tr>
<tr>
<td>Number of licensed FFVs (million)</td>
<td>1.07</td>
<td>24</td>
</tr>
<tr>
<td>Number of E85 fuel stations</td>
<td>249</td>
<td>13</td>
</tr>
<tr>
<td>Biodiesel production (mil. gal.)</td>
<td>449.9</td>
<td>20</td>
</tr>
</tbody>
</table>
Despite Rapid Growth in Recent Years, Future Expansion Depends on …

- Overcoming challenges of cellulosic feedstocks
- Expand Cellulosic Ethanol and E85 Demand
- Moving ethanol from major producing regions
- Refitting/Constructing E85 Fueling Stations
- Additional Demands on Rail, Truck and Barge
- Availability of local feedstocks year round
### Seasonal Production and Mode

<table>
<thead>
<tr>
<th>Crops</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed / Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Wheat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camelina</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed / Dump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Castor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flax</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed / Dump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Canola</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gravity Fed/Dump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugarcane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenaf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flatbed (module trucks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flatbed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop Residues</td>
<td>Flatbed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flatbed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscanthus</td>
<td>Flatbed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Semi</td>
<td></td>
<td>Flatbed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switchgrass</td>
<td>Flatbed</td>
<td>Semi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flatbed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRWC</td>
<td>Semi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flatbed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: StrataG
Ethanol Expansion Approaches E10 “Blend Wall”

Ethanol expansion in the United States pushes use toward the 10-percent blend wall

Source: USDA, Economic Research Service using data from U.S. Department of Energy, Energy Information Administration and USDA.
U.S. Biofuels Are Not Projected to Reach 36 Billion by 2022 – Cellulosic Challenges?

Source: Annual Energy Outlook, 2010
Rural Development Issues

- Equipment not necessarily compatible
- Transportation Costs may limit effective range (yields per acre, sources, etc.)
- Economic Incentives may work were existing infrastructure can source feedstocks
- Size and density of plants
- Road deficiencies
Final Thoughts

- Can we develop regional Corn Ethanol Substitutes in Southeast?
- Can we develop biomass given concerns over natural gas production?
- What about electricity as a fuel substitute?
- What are implications for rural economies?