Economic Development Implications of a Biomaterials Industry in North Dakota

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Transition to a Bioeconomy: Environmental and Rural Development Impacts
Farm Foundation
October 15-16, 2008
St. Louis, MO
Rationale

- Forces that have stimulated interest in biobased fuels and materials previously stated
  - Crude oil prices
  - Reliance on foreign oil
  - Environmental considerations
  - Mandates

- Considerable discussion and research into process technologies, pretreatment, feedstock availability and cost

*But what about the economic development potential?*
Methods: Corn Ethanol

- Based on recently completed studies, able to do a comparison.
  - Corn ethanol facilities provided estimates of payroll and construction costs (Hodur et al. 2006)
  - Corn requirements and transportation costs from Iowa study (Swenson and Eathington 2006)
  - Other expenditures were assumed to be in the same proportion to payroll as other agricultural processing facilities (Coon and Leistritz 2003, 2001, 1997)
Methods: Cellulosic Ethanol

- Part of a study examining the economic feasibility of a biorefinery using wheat straw as feedstock (Leistritz et al 2006)

- Estimates based on an economic-engineering model developed by NREL

- Leistritz et al 2006 estimated total annual operating expenditures and the percentage that represented in-state expenditures
Methods: Corn and cellulosic ethanol secondary impacts

- North Dakota Input-Output Model was used to estimate total economic impacts (direct and secondary).

Red Trail Ethanol, Richardton

Blue Flint Ethanol, Underwood
Economic Impact of 50 Million Gallon Corn Ethanol Plant

- Direct Economic Impacts
  - Construction Costs (one time, in state) $12.5 million
  - Annual Expenditures (in state)* $16.8 million
    - Households $3.6 million
    - Coal** $8.25 million
    - Employment 40 workers
  - Total Direct Economic Impacts $16.8 million

- Total Direct Economic Impacts $16.8 million
  - Direct and Secondary $45.8 million
  - Secondary Employment 497 workers

*Purchase price of corn not included
**Coal represents in-state expenditure
Economic Impact of 50 Million Gallon Cellulosic Ethanol Plant—Wheat Straw

- **Direct Economic Impacts**
  - **Construction Costs** (one time, 15% in state) $26.4 million
  - **Annual Expenditures** (in state) $53.0 million
    - Feedstock $36.3 million
      - Payments to farmers $16.4 million
      - Baling $11.0 million
      - Transportation $8.8 million
    - Payroll $2.7 million
    - Employment 77 workers
  - **Total Direct Economic Impacts** $53.7 million
- **Direct and Secondary (statewide)** $185.2 million
- **Secondary Employment** 2,400 workers
  (includes feedstock harvest and transportation)
Comparison: One 50 million gallon per year plant

- Total construction costs:
  - $83 million vs $176 million..........2x
- Annual operating expenditures:
  - $17 million* vs $53 million..........3x
- Direct Employment
  - 40 workers vs 77 workers.............2x
- Secondary Employment
  - 500 workers vs 2,400..................5x

*excludes corn, includes coal
Regional Economic Development
Implications

- Goal of 36 billion gallons of ethanol by 2022
- 21 billion gallons of advanced biofuels, of which 16 billion gallons from cellulose
- Require 320 plants, 50 million gallons each
Regional Economic Development Implications (cont.)

- 60 percent of total biomass come from the Midwest and Northern Great Plains

- 60 percent of 16 billion gallons is 9.6 billion gallons which would require 192 plants, 50 million gallons each
Regional Economic Development Implications—12 state region*

- Construction Costs** $34 billion
- Annual Direct Expenditures***$10 billion
- Direct Employment**** 15,000 workers
- Secondary Employment
  - Many thousand additional jobs in feedstock harvest and transportation

*9.6 billion gallons, 192---50 million gallon plants
**$176 .5 million each
***$53 million each
****77 workers per plant
Benefits of a Biomaterial Industry in North Dakota

- 8.6 percent of NC Region’s potential biomass would come from North Dakota
- 16 plants, 50 million gallons each, could be located in North Dakota
- *Initial investment*:* 3.1 billion, $465 million in state

<table>
<thead>
<tr>
<th>State</th>
<th>Potential Biomass (million dry tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>34.5</td>
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<tr>
<td>Illinois</td>
<td>27.0</td>
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<tr>
<td>Minnesota</td>
<td>25.0</td>
</tr>
<tr>
<td>North Dakota</td>
<td>17.2</td>
</tr>
<tr>
<td>Total N. Central Region</td>
<td>198.8</td>
</tr>
</tbody>
</table>

*176.5 million each
Benefits of a Biomaterial Industry in North Dakota

- Annual operations of 16 plants (in state expenditures only): over $800 million*
- Annual direct economic contribution of lignite mining, conversion industry, and related activities in North Dakota:
  - $634 million in 2006
  - $734 million in 2007
  (Coon and Leistritz 2008)

*Does not include construction costs
Implications:

- ND and other “biomass belt” states are well placed to capture the economic impacts of an emerging industry, plants will be located near the feedstock source.

- Obviously these estimates were calculated prior to recent increases in prices of petroleum, construction materials, ag inputs, and commodities.

- This could be a very substantial economic development opportunity perhaps the largest in a generation.

- This could substantially change the economic and demographic make-up of some Midwestern and Great Plain counties.


Questions?

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