Economic Development Implications of a Biomaterials Industry in North Dakota

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Transition to a Bioeconomy: Environmental and Rural Development Impacts
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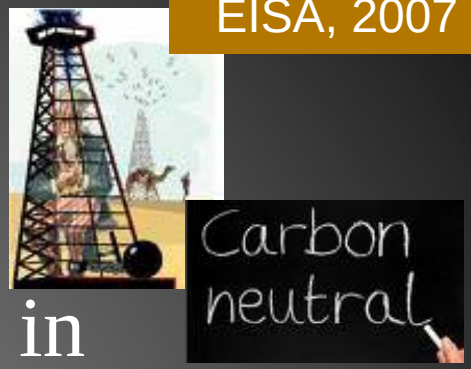
North Dakota DEPARTMENT OF COMMERCE DIVISION OF ECONOMIC DEVELOPMENT & FINANCE

NDSU College of Agriculture, Food Systems, and Natural Resources

Rationale



EISA, 2007

- 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

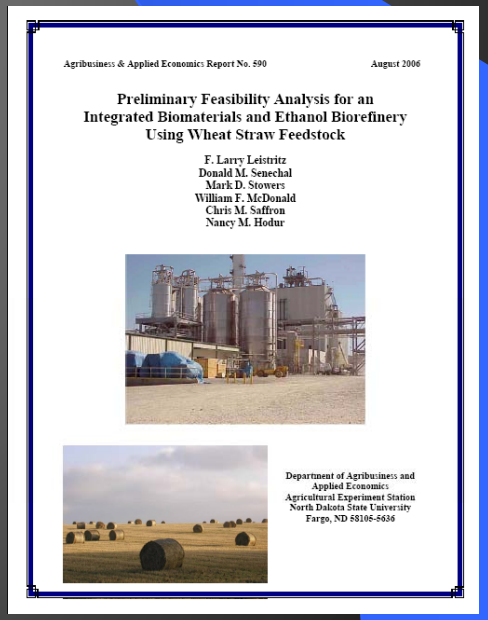
economic development potential?

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



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Preliminary Feasibility Analysis for an Integrated Biomaterials and Ethanol Biorefinery Using Wheat Straw Feedstock

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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
  - 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

Energy Independence and Security Act of 2007

- 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

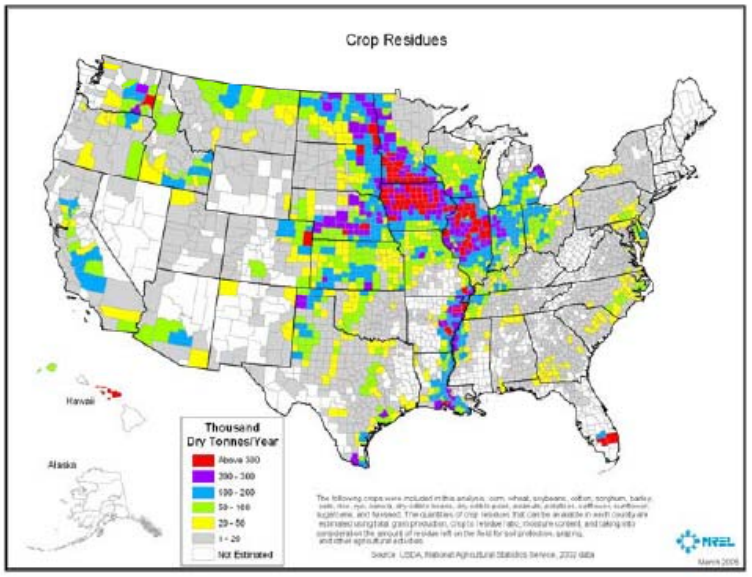

Figure 11 Estimated Crop Residues by County

- 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
***$53 million each

**$176 .5 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*

**176.5 million each*

	million dry tonnes
Iowa	34.5
Illinois	27.0
Minnesota	25.0
North Dakota	17.2
Total N. Central Region	198.8

Red Trail Energy, Richardton

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)

Dakota Westmoreland Corp, Beulah

*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

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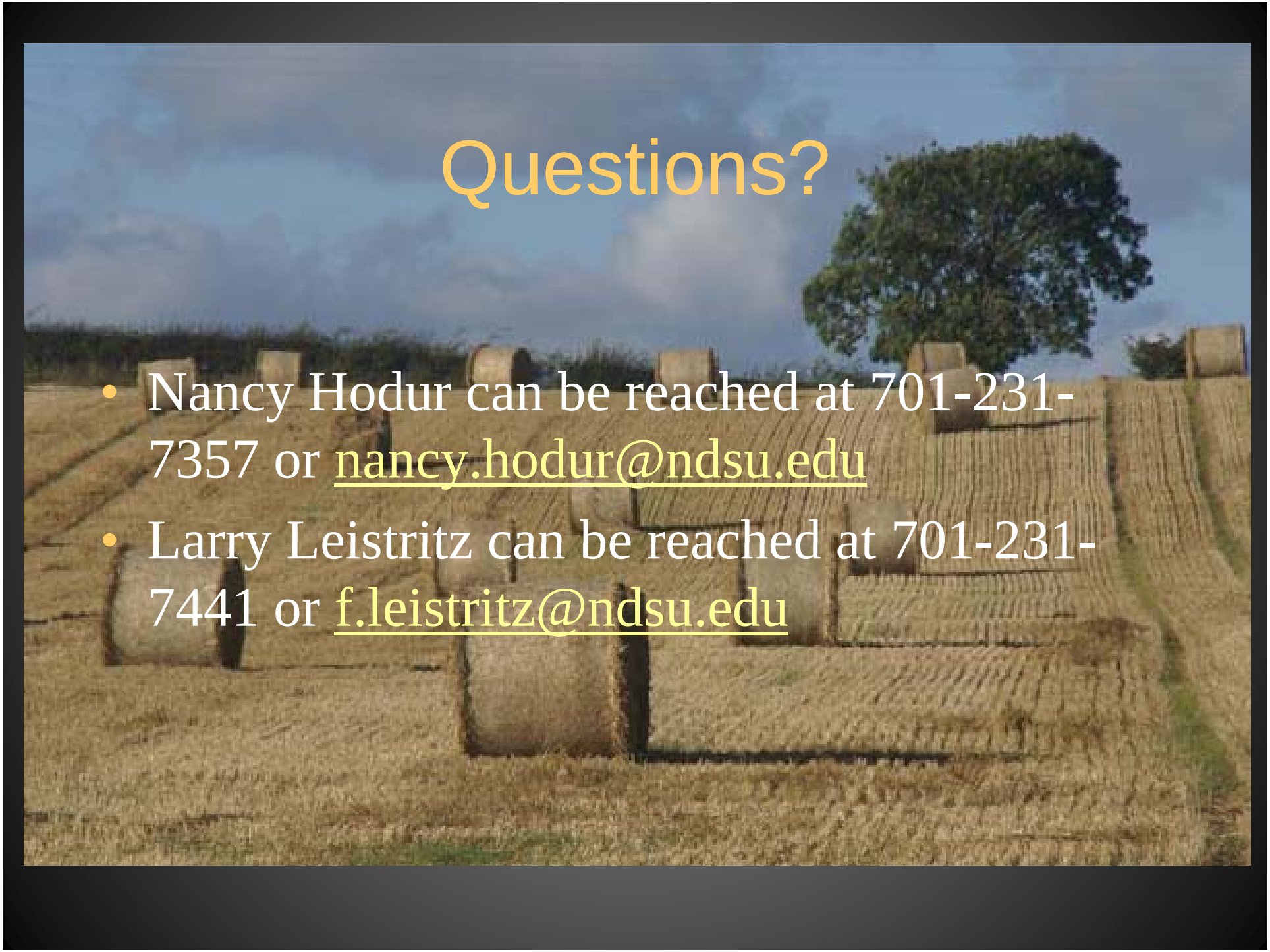

Questions?

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