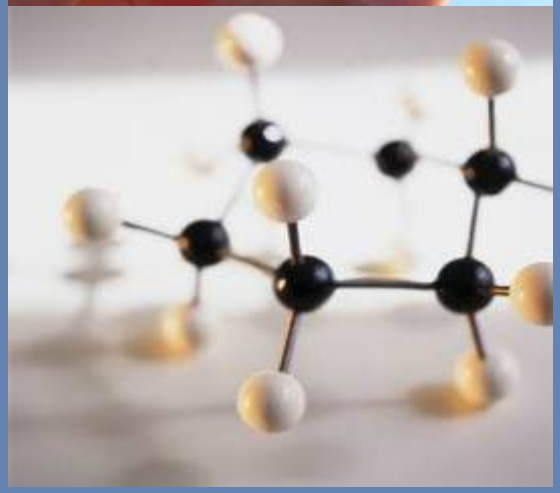

Biomass 2009

Increasing Feedstock Production for Biofuels

March 17-18, 2009

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Office of the Biomass Program
Energy Efficiency and Renewable Energy

Interagency Feedstock Team

- Interagency and interdisciplinary team of researchers (see report)
- Economics
  - Co-chairs: John Ferrell (DOE), Mary Bohman (USDA, chair of feedstock team)
- GHG
  - Co-chairs: William Hohenstein (USDA), Dina Kruger (EPA)
- Sustainability
  - Co-chairs: John Houghton (DOE), Donna Perla (EPA), Bryce Stokes (Forest Service, USDA)
- Reviewers who greatly improved report
- Report available at http://www.brdisolutions.com/default.aspx

Goals of report

- Inform investments in research and development to expand biofuel production
- Four questions
  - What feedstocks and at what price?
  - What is the regional distribution of feedstocks?
  - What are the consequences for sustainability and greenhouse gas (GHG) impacts related to feedstock production?
  - What are the implications for investments in research?

Scope of report

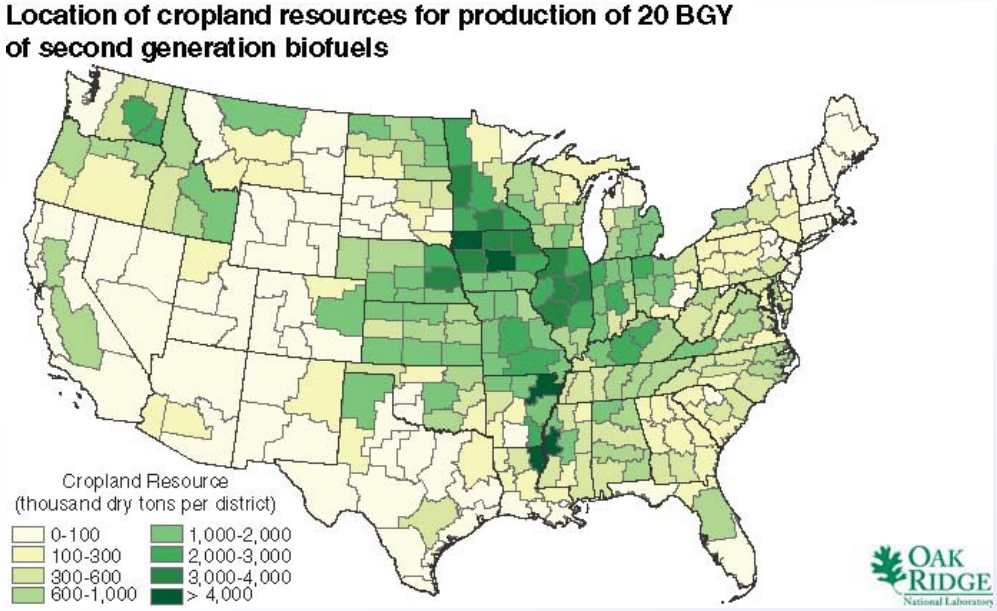
- Feedstocks for 1st and 2nd generation biofuels from agriculture, forestry, and urban sources
- Feedstock production to farmgate or forest roadside (not transportation or conversion)
- Exogenous targets for biofuel production
- Use POLYSYS and REAP models to provide scenario projections
- U.S. domestic focus

Findings: Feedstocks for 1st generation biofuels

- Market response is linked to changes in biofuel targets (12 to 15 billion gallons)
  - Corn production increases 3.5% with an associated increase in prices of 4.6%
  - Prices for other crops increase, especially soybeans which compete directly with corn for land (3.2% soybean prices increase)
  - Total acreage increases 1%; while corn acreage increases 4% (mostly in corn regions)

Findings: Feedstocks for 2nd generation biofuels

- Wider distribution of feedstock sources
- Producer decisions sensitive to profitability
  - Crop residues: sustainability and economic viability
  - Energy crop share increases with higher productivity



Findings: GHG implications

- Changes in farm activities generating the largest reductions in GHG emissions differ across scenarios
  - Supports a comprehensive approach to reducing the farm-sector share of GHG emissions related to biofuels
  - Include a broad set of incentives targeting a variety of farm-sector activities and management decisions
  - Carbon market could be an effective way to increase biofuels production and improve their GHG footprint

Findings: Scenario Implications

- Higher biofuel targets increase cropland with fairly low level shifts in environmental indicators (+/-)
- Improved corn yield reduced environmental impacts
  - Smaller footprint requires less intensive cultivation
  - Reduced quantities of inputs—even though each acre might require higher inputs
- Increased energy price also reduced impact
  - Farmer practices affected by higher fertilizer and diesel costs
  - Apply less fertilizer and employ conservation tillage at higher rates

Implications for research priorities

- Support research on feedstocks that reduces pressure on cropland
- Support research on a broad portfolio of feedstocks
- Support research that leads to feedstocks that are profitable for farmers and forest managers to produce

Research priorities: sustainability

"Sustainability of agricultural production for biofuels is a complex and nascent field", calling for new research including …

- Experimentation and additional data
  - e.g. fate of contaminants in runoff
- Scale
  - e.g. understanding the influence of heterogeneity
- Fundamental Research
  - e.g. understanding determinants of soil fertility

Research priorities: modeling and data

- Integrated agriculture, forestry & energy market models
- Upgrade the capabilities of USDA and DOE's in-house economic models to analyze the GHG implications of changes in various programs, policies, and market conditions
- Capacity to analyze global land-use changes
- Integrate biophysical and behavioral models
- Capacity to analyze more complex solutions, e.g. uncertainty analyses
- Capacity to analyze variability over time
- Data for 2nd generation feedstocks

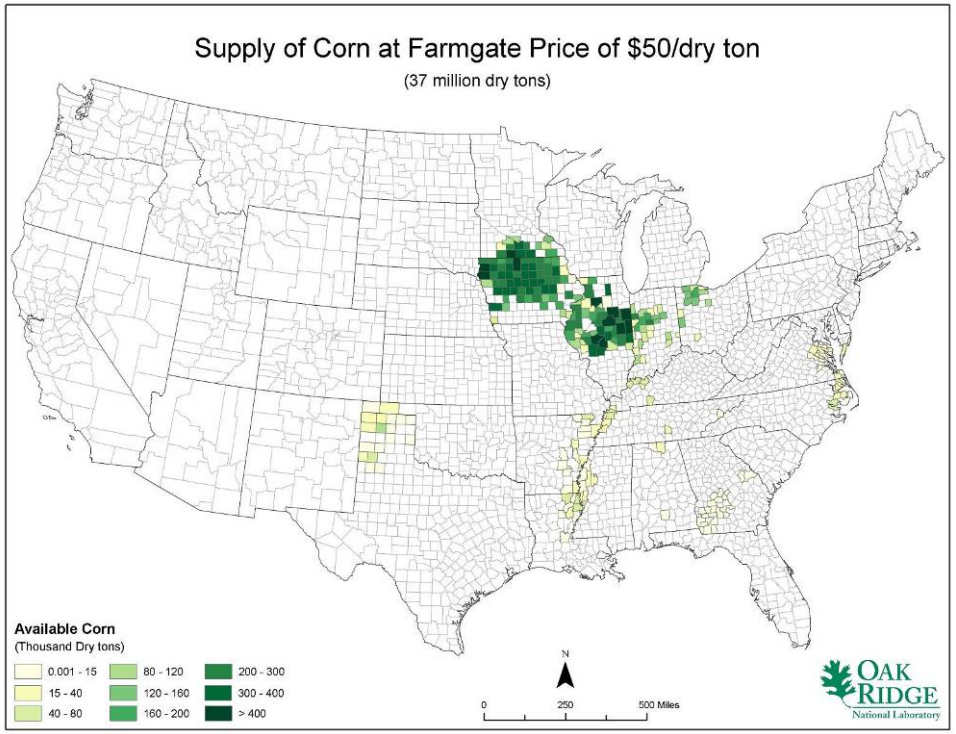
“Billion Ton Vision Update”

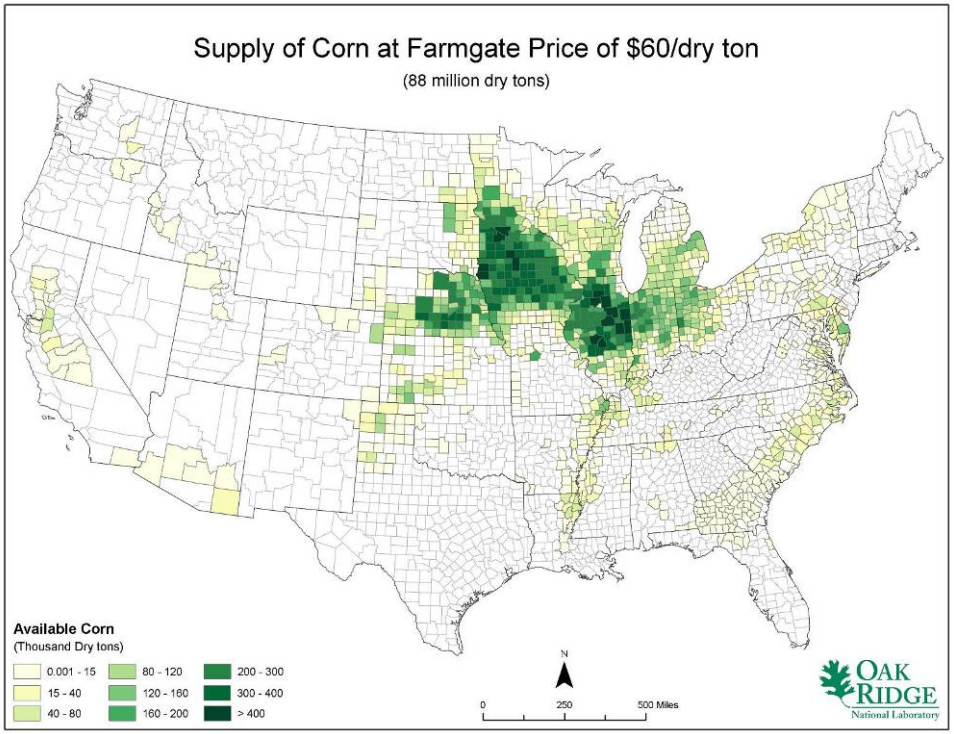
- Update the Billion-Ton Resource Assessment (published in 2005)
  - Focus on near to mid-term time periods (2010 to 2030)
  - Disaggregate resource potential to regions, states, counties, and finer spatial scale
  - Estimate costs to access these resources (county-level supply curves)
  - Consider how the resource potential is affected by environmental, sustainability, harvest/collection technologies

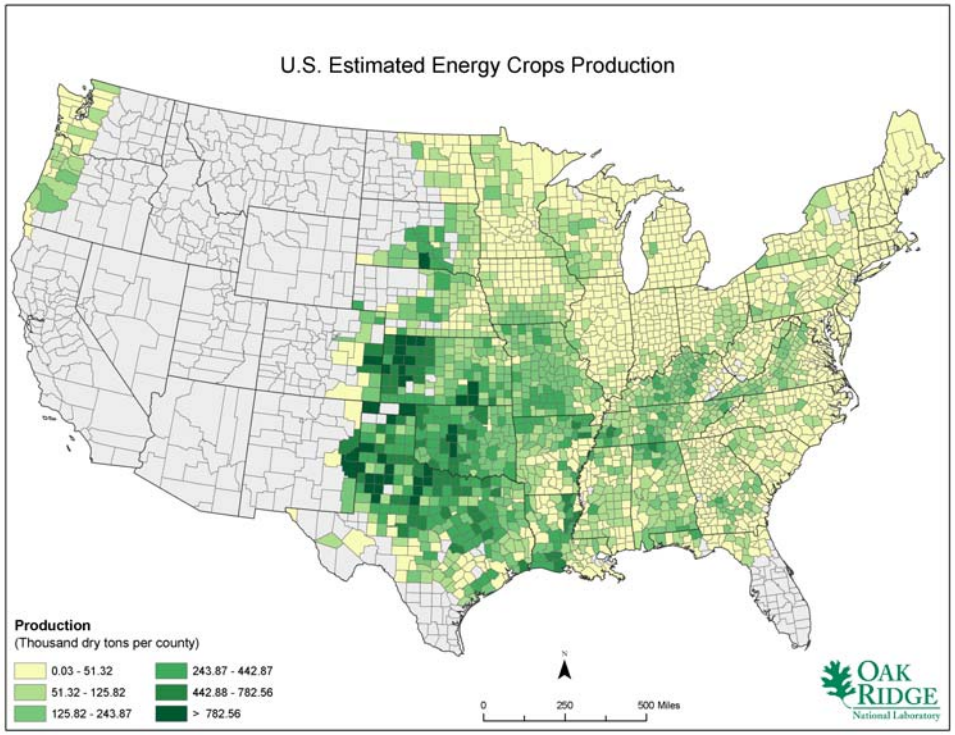
- Feedstock resources considered
  - Agricultural crop residues (corn stover, wheat straw)
  - Forest residues (logging and other removal residues, fuel treatment thinnings, primariy mill and urban wood wastes, preliminary work on conventionally sourced wood)
  - Dedicated energy crops (herbaceous crops such as switchgrass, woody crops such as poplar and willow, annual crops such as sorghum)

Preliminary Estimates – Crop residues

- County-level supply estimates available





Preliminary Results
Dedicated Energy Crops

- Potential of energy crops is very much dependent on assumptions affecting land use change – residue removal, pasture and grasslands, relative crop productivity and economics
- Supply curves modeled using POLYSYS
- Still calibrating the model and developing scenarios