Analyzing the Bio-fuels Market

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Global Bio-fuel Developments: Modeling the Effects on Agriculture
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ERS Bio-fuels Baseline Activity and Modeling Efforts

• Bio-fuels and the baseline activity
  – Assumptions about growth in the demand for bio-fuels
  – Bio-fuel production and demand assumed to be exogenous

• FAPSIm
  – Domestic Bio-fuel analysis

• PEATsim
  – International Bio-Fuel analysis
  – Develop a Bio-fuel component
Bio-fuels and the Baseline

• Domestic baseline activity
  – Paul Westcott’s presentation described the assumptions about bio-fuels in the domestic baseline

• International baseline activity
  – We developed assumptions about bio-fuel activity in other countries.
International Baseline

• The international baseline focused on grain and oilseed production of bio-fuels
• Brazil sugar is not part of the baseline modeling system
  – Brazils bio-diesel production was included.
International Baseline

• Our main focus was on a few countries
  – European Union bio-fuel mandate
    • The majority of the mandate is bio-diesel
      – About two thirds bio-diesel
      – We assumed that the EU did not meet their mandate by the end of the baseline
  – Canada has a small bio-fuels sector
    • Both ethanol and bio-diesel
International Baseline

• China was assumed to continue to develop their ethanol sector
  – China has the third largest ethanol sector behind Brazil and the US
• Our main focus was the impact on the grains and oilseeds markets
EU Assumptions Bio-diesel

- Rapeseed oil makes up the 80 percent of bio-diesel oil
  - Oil could be either imported as seed or oil
  - The model determined the levels of production and imports of seed and oil
- Other oils (tropical) make up the other 20 percent of bio-diesel
Bio-diesel Production

- EU
- Argentina
- Brazil
- Canada
Ethanol Production from grain feed stocks

- EU
- China
- Canada
- USA
ERS Bio-energy Research Projects
2007-2008

• Markets and Trade Issues
  – Ethanol and Related Market
  – Demand for Ethanol: Implications for Alcohol Fuel Use of Corn
  – The Market for Distillers Grains
  – The Effect of Different Growth Patterns in the Demand for Ethanol on the Agricultural Sector: A Stochastic Analysis
  – Animal Products Sectors Adjustments to Rising Feed Costs Led by Corn

• Economy-wide Impacts of Bioenergy
  – Ethanol and Biodiesel: A National, Regional, and Farm Household Analyses using a CGE Framework
  – An Economy-Wide Assessment of Long-Term Gains from Renewable Fuel Substitution
  – Global Biofuels Policies and Their Effects on Agriculture
  – Bioenergy Implications for China

• Resource Economic Issues
  – Implication for Land, Resource Use, and Environmental Impacts
  – Biofuels and the Changing Agricultural Landscape
  – Biofuels and the Conservation Reserve Program
  – Global Resource Use & Environmental Impacts
  – Economic and Environmental Implications of Biofuels Development and Production: A Global View and Implications for the U.S.

• Rural Economic Issues
  – Implications for Rural Development and Farms
  – Ethnography: The Geography of Ethanol Production and Local Economic Development
  – Bio-energy and the American Farm

• Food Economic Issues
  – How much will higher corn prices increase retail food prices?
Future Modeling Efforts

• As part of the ERS analysis of bio-energy, we plan to develop a small bio-energy sector for our trade and policy model PEATSim
PEATSim

- Partial Equilibrium
- 13 countries/regions
- Thirty-five commodities
- Gross trade model
- Static version and a dynamic
- Explicitly incorporates a wide range of domestic and border policies
PEATSim’s Advantages

• Country coverage—major bio-fuel producing countries
• Policy richness of model—can include most of the major policies influencing bio-fuel production, consumption, trade
• Ability to evaluate impacts of individual policy instruments
• Multiple commodities—permits evaluation of cross-commodity impacts
PEATSim

- PEATSim is a partial equilibrium model that uses Mixed Complementarily Programming
  - Allows the model to solve the discontinuous functions associated with TRQ’s
  - Should allow us to deal with mandated levels of bio-fuel use
    - Can handle kinked demand functions
PEATSim

- Policy instruments in PEATSim
  - tariffs
  - TRQs
  - support prices
  - producer payments/subsidies
  - production (marketing) quotas
  - export subsidies (implicit)
Commodity Coverage

- Rice, Wheat, Corn, Other coarse Grains
- High-fructose corn syrup (HFCS)
- Sugar
- Soybeans, Sunflower seeds, Rapeseed, Cottonseeds, Peanuts, Other oilseeds
- Soybean oil, Sunflower seed oil, Rapeseed oil, Cottonseed oil, Peanut oil, Tropical oil, Other oilseed oil
- Soybean meal, Sunflower seed meal, Rapeseed meal, Cottonseed meal, Peanut meal, other oilseed meal
- Cotton
- Beef and veal, Pork, Poultry meat
- Milk, Butter, Cheese, Non-fat dry milk, Fluid milk, Whole dry milk, other dairy products
Country Coverage

- United States
- European Union
- Japan
- Canada
- Mexico
- Brazil
- Argentina
- China
- Australia
- New Zealand
- South Korea
- Rest of the world
- India
Modeling Challenges

- Define the relationship between Oil and Gas prices and the demand for ethanol and bio-diesel.
  - Develop a small bio-energy component with supply and demand sectors
    - Much work has been done by the previous presenters
    - Incorporate trade as well as any TRQ structure that is necessary
  - Reflect domestic policies on bio-fuels
Summary

• Most of the work done at ERS has been based on assumed levels of bio-fuel use or mandates

• Work on modeling the markets for ethanol and bio-diesel and link these to the agricultural markets.