Analyzing the Bio-fuels Market

Richard Stillman

Farm Foundation and ERS Workshop

Global Bio-fuel Developments: Modeling the Effects on Agriculture

Wednesday, February 28

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

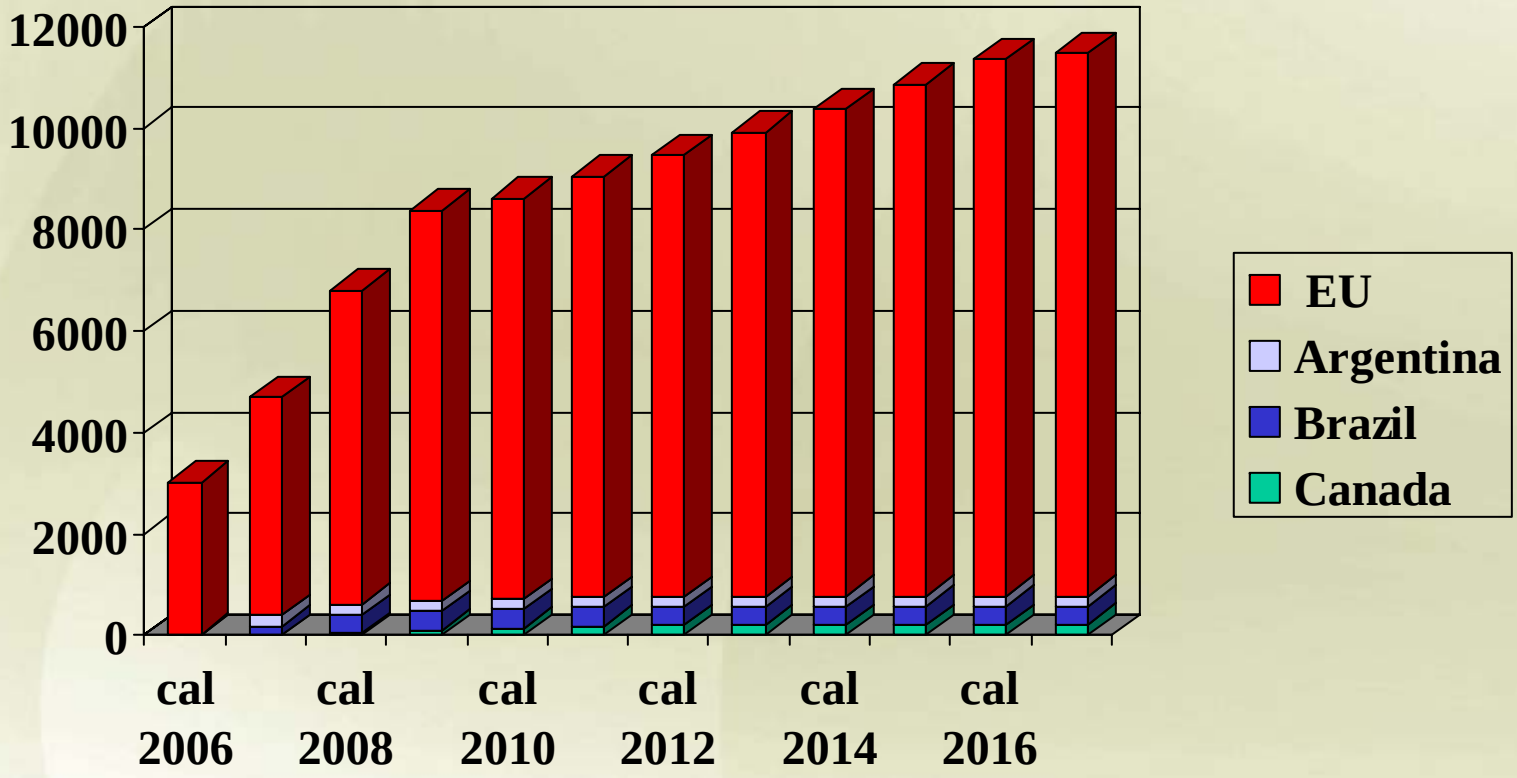
International Baseline

- 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

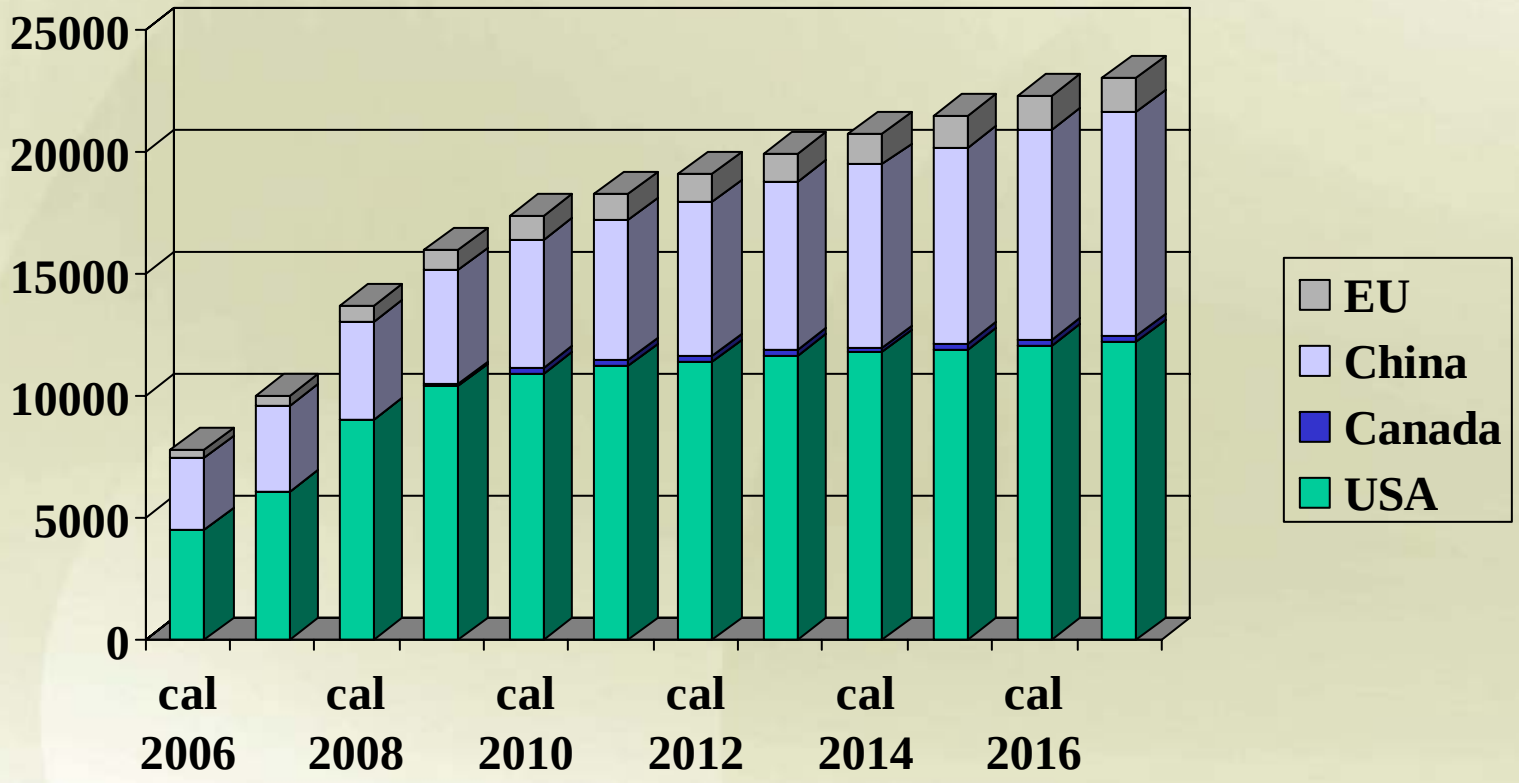
EU Assumptions Bio-diesel

- 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



Ethanol Production from grain feed stocks



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.