Center Research Activity in the area of Energy and the Environment

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Outline

- Research themes
- Personnel working in this area
- Data and modeling infrastructure
- Key findings
- Future Directions

Research Themes

- Potential contribution of land-based mitigation strategies to global GHG abatement:
  - Forest carbon sequestration
  - Abatement of non-CO2 emissions from agric
- Biofuels mandates:
  - Policy choices and associated costs
  - Implications for land use and poverty
  - GHG emissions associated with biofuels
- Interactions between climate policies, biofuels mandates and ongoing economic growth
- Impacts of climate change for poverty vulnerability

Staffing: All on Non-Core Funding

- PI's on various projects: Tyner, Hertel, Diffenbaugh, Zhuang (both of Earth and Atmospheric Sciences - Purdue), Ramankutty (Geography-McGill)
- Post-docs: Golub, Taheripour, Rios, Ahmed (as of Sept.)
- Graduate students:
  - GTAP-related: Birur, Beckman, Avetisyan
  - Energy-related: Baldos, Bista, Brechbill, Rismiller, Simon, Perkis, Yu

Data and Modeling Infrastructure (1)

- **Global land use data base** (on web site):

  - Obtain crop land cover from satellite data, but distinguishing crop type requires on-the-ground data

  - AgroMaps = joint project: FAO, IFPRI and SAGE to map the world's crop production; combine satellite data with county level harvested area and production data

  - Monfreda et al. have made this into a usable data set

  - Aggregate grid cells to AEZs based on common Length of Growing Period: depends on temperature and moisture availability

  - 18 AEZs = 6 LGPs x 3 climate zones

  - Use AEZs to disaggregate land endowment in model

  - Crops compete within AEZ for common land base; if crop is not present, will not compete

Data and Modeling Infrastructure (2)

- **GTAP-Biofuels data base** (newly available to board): uses detailed production and use data to disaggregate 3 biofuels sectors using SPLITCOM (see Taheripour et al. RM on the web for documentation):
  - Ethanol from corn
  - Ethanol from sugarcane
  - Biodiesel
- **Non-CO2 emissions data base:** release is still pending final approval by EPA – check with Steve Rose for progress report
- **Various GE and PE models:**
  - GTAP-BIO: See Birur, Hertel and Tyner
  - Energy-related PE models: Tyner and Taheripour

Key Insights to date

- Biofuels:
  - Historic change wrt to linkage of agricultural and energy prices
  - Current level of subsidy to biofuels industry is unnecessary and inefficient; if we do want to subsidize, should be variable
  - However, trade policy and oil prices are more important than the subsidy in the US in driving corn prices
  - In the US, corn ethanol mandates are not binding above $110 oil – the market produces the biofuels
  - Land use impacts are a significant contributor to emissions
  - Interaction between US and EU mandates especially important in third countries (e.g., Brazil)

Key Insights to date

- Carbon pricing changes the pattern of comparative advantage for land-based sectors, e.g.
  - Favors USA for agriculture, relative to forestry
  - In USA, more sequestration at intensive margin
  - Non-CO2 and forest carbon sequestration account for about 1/4th of total abatement at $100/TCE

Future Directions

- Continue to refine work on biofuels model and data base (e.g., palm oil)
- Add two kinds of cellulose sources to the biofuels model: corn stover and similar residues and crops for cellulose (e.g., switchgrass)
- Improve the land supply data especially for large and important countries like the U.S., Brazil, certain African countries, and some Eastern European countries
- Improve the analysis of land use changes and associated GHG emissions