Global Land Conversion Decisions and the Impact of U.S. Carbon Offset Credits on Agriculture

Dermot J. Hayes                Jerome Dumortier

Biobased Industry Center Grants Program

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Overview

• Project update
  – Linking Carbon Policy and Agricultural Practices

• Proposal
  – Global land conversion decisions
  – International Forest Model
  – Global fertilizer application decision
  – Complementary project:
    • Enhancing FAPRI’s Ability to Assess Climate Change Policy
Project Update

• Linking Carbon Policy and Agricultural Practices
  • Calculating intensification and extensification of grazing systems: Completed
  • First in first out for crop land: Completed
  • Relationship between US crop and forest land: Completed
  • Sensitivity paper” revise and resubmit
  • In progress: Estimation of country-specific stocking rates over time
  • Pasture paper is almost ready to submit to “Global Environmental Change”

– GreenAgSim is now complete and it is working very well
BIC 2010 Proposal - Overview

Macroeconomic Variables → Policy Parameters

United States Agricultural Model ↔ International Agricultural Model ↔ Brazil Agricultural Model

United States Forest Model

International Forest and Pasture Model

Emissions from Agricultural Production

Emissions from Land-Use Change
International Forest Model

• Need international forest model to understand implications of carbon offsets in the United States

• Data requirement
  – Global forest location
  – Trend in forests
  – Economic data about global forest resources
  – Importance of the spatial component of cropland, forest, idle land and pasture
Forest Trends and Economics

• Food and Agriculture Organization Forest Resource Assessment 2010
  – Release date: 4 October 2010
  – Forest data by country from 1990, 2000, 2005, and 2010
  – Basis for estimating forest – cropland relation

• Global Timber Market and Forestry Data Project (Brent Sohngen, Ohio State)
  – Land rent
  – Growth function, yield function
  – Basis for forest valuation
Forest Model

• First step:
  – Linking forest cover change to cropland evolution on a global scale

• Modeling competition between cropland and forest at the international level
  – Calculating the revenue from forestland under timber and carbon prices

• Potential forest policies:
  – Afforestation through a carbon price, i.e., offset credits
Fertilizer Model

• Fertilizer model at a global scale

• Objective:
  – Fertilizer demand projections
  – by nutrient | by country | by commodity

• We have collected historic fertilizer application rates by crop and country
  – An optimal fertilizer application rate is solved for each crop in each country in each projection year
Fertilizer Model

• The model:
  – Improves CARD/FAPRI’s intensification component, allows yields to respond to input and output prices
  – Previous work showed that higher yields offset iLUC
  – Uses better data on fertilizer input prices at the country level
Future work

- Will incorporate a world fertilizer market clearing condition that endogenizes fertilizer prices
- We need a supply curve for each of the three nutrients
- Will allow us to project world fertilizer prices by nutrient
Proposed Scenarios

• Impact of potential domestic offset allowances from agriculture on commodity prices, real options and rational expectations

• Fertilizer policy (tax?)
  – Possible result: yield reduction in the U.S. and land-use change elsewhere

• Other suggestions from BIC?