Economics of Managing GHG In Agriculture

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Agriculture and Forestry Are Targets

(Global Anthropogenic GHG Emissions)

- Energy Supply: 26%
- Buildings: 8%
- Industry: 19%
- Agriculture: 14%
- Forestry: 17%
- Transport: 13%
- Waste: 3%

GHG - Economic Alternatives

- Regulation
- Laissez-Faire Market Approach
- Carbon Tax
- Cap and Trade
GHG - Economic Alternatives

• Regulation
  – Generally less favored by economists
  – High monitoring costs (upstream vs. downstream)
  – Unknown processes
  – Limits efficiency gains/creates rigidities
  – Accelerate response/capture economies

• Laissez-Faire Market Approach

• Carbon Tax

• Cap and Trade
### Renewable Fuel Volume Requirements for RFS2 (billion gallons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cellulosic biofuel requirement</th>
<th>Biomass-based diesel requirement</th>
<th>Advanced biofuel requirement</th>
<th>Total renewable fuel requirement</th>
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</table>
Why GHG Is Complicated

• Global in origins and impacts
• Effects are long term
• Indicators are stochastic
• Stock and flow process
• Effects are large with many potentially irreversible
• Uncertainty in science

Stern, AER, May 2008
Economic Aspects

• Risk and uncertainty
• Present value (individual vs. social $r$)
• Ethics
  – Across generations
  – Humans vs. others in environment
  – Developed vs. less developed countries
  – Regional impacts
GHG - Economic Alternatives

• Regulation
• Laissez-Faire Market Approach
  – Variable adoption pace
• Carbon Tax
• Cap and Trade
GHG – Part of Farm Value Equation

- Crop/Lvstk Insurance
- Lenders
GHG - Economic Alternatives

- Regulation
- Laissez-Faire Market Approach
- Carbon Tax
  - Tax aversion
  - Price is known, Quantity is uncertain
  - Firms can develop optimal response
  - Deadweight losses
  - Revenue can aid adjustment/disadvantaged
- Cap and Trade
GHG - Economic Alternatives

• Regulation
• Laissez-Faire Market Approach
• Carbon Tax
• Cap and Trade
  – Quantity known, Price uncertainty
  – Low administrative cost
  – Risk aversion
  – Free credits (slow response, incumbent advantage, reduced public revenue)
Capital Market Constraints

• Credit market turmoil
• Low equity reserves
  – Low margins
  – Sweeps
• Lack of production benchmarks
Base Case Generation

![Chart showing electricity generation over time by different energy sources. The chart tracks various energy sources such as efficiency savings, distributed PV, storage, CSP, offshore wind, land-based wind, cofired biomass, run-of-river, geothermal, hydro, nuclear, gas-CC-CCS, gas-CC, gas-CT, oil-gas-steam, coal-CCS, coal-IGCC, coal-new, cofired coal, coal-old scrubbed, and coal-old unscrubbed. The chart also indicates total load.](chart_image)
Carbon Case Inputs/Assumptions

• Carbon cap: By 2050 reduce U.S. electric sector carbon emissions to 20% of 2005 emissions

• Technology cost/performance from 20% Wind Energy by 2030 study

• Annual Energy Outlook 2009 Reference Case fuel prices and electric demands

• Climate case projection of PV in buildings from UCS Climate Analysis

• Carbon allowances are assumed to be allocated through an auction system. No assumption is made with respect to the use of the auction revenues.
Ag Carbon Credit Opportunities

• Conservation Tillage
• Grassland
• Range
Agricultural Carbon Credit Markets

• North Dakota Farmers Union (more acres)
  – 42 states, 5.3 million acres
  – 1.7 million in ND
  – Rotational grazing fastest growing segment

• Iowa Farm Bureau (more tons)
  – No-till/forests
Questions?

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