Economic Value of Ecosystem Services Provided by Agricultural Lands

Tatiana Borisova, Laila Racevskis, and Ed Hanlon
**Florida Public Survey (2008 – 2009)**

How important are the following actions in protecting our water resources?

<table>
<thead>
<tr>
<th>Action</th>
<th>Not important / Somewhat important</th>
<th>No opinion</th>
<th>Important or Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving agricultural practices</td>
<td>9%</td>
<td>5%</td>
<td>86%</td>
</tr>
<tr>
<td>Preserving agricultural lands and open spaces</td>
<td>9%</td>
<td>5%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Borisova, Brett, and Gardner. 2010. UF EDIS Publications #FE841 - FE842
Photo by Carlton Ward, Jr.
## Amenities, Services, and Products Provided by Agricultural Lands

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Amenity, service, or product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrarian cultural heritage</td>
<td>Maintenance of the “traditional” agricultural character of the land Continuation of farming as a way of the life in the rural community</td>
</tr>
<tr>
<td>New agricultural economy</td>
<td>Farm produce / organics and other niche products / added value farm food (cheeses, etc.) Local and regionally produced food Farm shops / farmers markets</td>
</tr>
<tr>
<td>Traditional agricultural economy</td>
<td>Food quality (taste and nutritional value) Adequate supply of food “Cheap” food Agricultural / relate employment Income from agricultural exports Farm incomes</td>
</tr>
<tr>
<td>Environmental</td>
<td>Farmland landscape Farmland habitats Biodiversity – species associated with agriculture</td>
</tr>
<tr>
<td>Rural leisure activities</td>
<td>Walks in pastoral settings Visiting local farms</td>
</tr>
<tr>
<td>Cultural / Amenity</td>
<td>Agricultural landscape Farm-based educational activities</td>
</tr>
</tbody>
</table>

Ecosystem Services to and from Agriculture

Source: Swinton et al. / Ecological Economics (2007)
Producers’ actions can increase or decrease the provision of ecosystem services

<table>
<thead>
<tr>
<th>Environmental Service</th>
<th>Farm-Level Management Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon sequestration in soils</td>
<td>Manage soil organic matter</td>
</tr>
<tr>
<td>Carbon sequestration in perennial plants</td>
<td>Convert cropland to grassland or forest</td>
</tr>
<tr>
<td>Methane emission reduction</td>
<td>Capture and destroy methane from animal waste storage structure</td>
</tr>
<tr>
<td>Water quality maintenance</td>
<td>Reduce agricultural use, establish vegetable buffers, and improve nutrient management</td>
</tr>
<tr>
<td>Erosion and sediment control</td>
<td>Manage soil conservation and runoff, and increase soil cover</td>
</tr>
<tr>
<td>Flood control</td>
<td>Create diversions, wetlands, and storage ponds</td>
</tr>
<tr>
<td>Salinization and water table regulation</td>
<td>Grow trees and manage</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Protect breeding areas and wild food sources, improve timing of cultivation, increase crop</td>
</tr>
<tr>
<td></td>
<td>species / varietal diversity, and reduce use of toxic chemicals</td>
</tr>
</tbody>
</table>
Ecosystem Services to and from Agriculture

- Markets for most ecosystem services have generally not developed
  - Hard to measure the total value of ecosystem services to the society
  - No reward for agricultural producers to provide ecosystem services
Methods for Valuing Ecosystem Services

- **Travel cost method:**
  - Our travel plans to a sight (and our travel expenses!) depend on the site’s ecosystem service provision

- **Contingent valuation:**
  - surveying people about their willingness-to-pay / accept payment for changes in ecosystem services

- **Hedonics:**
  - changes in property prices due to changes in ecosystem service provision

- **Replacement costs methods:**
  - costs of mitigating / replacing the service

- **Factor-income approach:**
  - link ecosystem services to the incomes from agriculture

Source: Swinton et al. / Ecological Economics (2007)
Example: Value of Agricultural Easement in Howard and Calvert Counties, Maryland

<table>
<thead>
<tr>
<th>Description</th>
<th>Howard County</th>
<th>Calvert County</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] Sum of total housing within 1 mile of each easement</td>
<td>41,631</td>
<td>29,526</td>
</tr>
<tr>
<td>[2] Average housing price</td>
<td>$227,963</td>
<td>$134,245</td>
</tr>
<tr>
<td>[4] 1% increase in open space</td>
<td>181 acres</td>
<td>148 acres</td>
</tr>
<tr>
<td>[5] Estimated elasticity from spatial model</td>
<td>0.5869</td>
<td>0.7118</td>
</tr>
<tr>
<td>[6] Expected housing value increase for a 1% increase in open space (= [3]• [5])</td>
<td>$55,695,442</td>
<td>$28,214,618</td>
</tr>
<tr>
<td>[7] Additional property tax collected on increased value</td>
<td>$579,233</td>
<td>$251,674</td>
</tr>
<tr>
<td>[8] Average easement price per acre</td>
<td>$5,274</td>
<td>$2,855</td>
</tr>
<tr>
<td>[9] Additional acres of easement that could be acquired (= [7]÷[8])</td>
<td>110 acres</td>
<td>88 acres</td>
</tr>
</tbody>
</table>

Geoghegan et al. / Agricultural and Resource Economics Review (2003):

- Hedonic price method

http://www.mainefarmlandtrust.org/
Example: Recreational benefits from conservation tillage (Corn Belt)

- Conservation tillage reduces erosion-based pollution => greater enjoyment of water-based recreation
- Travel cost method
- 2 levels of adoption of conservation tillage (based on 2002 Farm Bill projections)
- Water-based recreational benefits: $175.5 – 242.6 million / year

http://nfrec.ifas.ufl.edu/programs/impacts_conservation_tillage.shtml

Baylis et al. / Review of Agricultural Economics (2002)
Incentives for Ecosystem Service Provision

- Range of approaches traditionally used by government agencies
  - Financial and technical assistance
  - Regulations
  - Education

- Market-based mechanisms can be more efficient
  - Farmers have the flexibility to chose the practices to supply ES based on their private information and price signal
Existing markets for supplying ecosystem services from agriculture

- Emission trading
  - Greenhouse gas trading
  - Water quality trading

- Wetland mitigation

- Eco-labeling
Market-based Policy Mechanisms: Challenges

- Measuring the performance of agricultural management practices
- Lack of cost of information
- Transaction costs of bringing together buyers and sellers
- Coordinating federally- and state-funded conservation programs with market-based programs
Conclusions

- Agriculture provides a range of ecosystem services that are valued highly by society

- Policy mechanisms are needed to provide incentives to the farmers to provide ecosystem services

- A range of policy instruments can be used, each with advantages and disadvantages

- Research needs for Florida:
  - Value of ecosystem services
  - Determinants of the farmers’ decisions to “supply” ecosystem services
  - Policy instruments and producers’ level of participation
Thank you!

Questions?

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