Comprehensive Partial Budgets for Cover Crops in Midwest Row Crop Agriculture

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Introduction

- Benefits of cover crops:
  - promote soil and water sustainability;
  - reduce nitrate-N leaching (Iowa Nutrient Reduction Strategy)
- Barriers to adoption:
  - lack of familiarity, e.g. species selection, management requirement;
  - perception that cover crops are costly
- Science-based information on the potential return on investment to cover crops at the farm-level in Midwest is very limited.
- Our objective: to improve the understanding of the changes cover crops bring to row crop farming in the Midwest.
- Three focus group discussions with 16 experienced cover crops farmers from IA, MN, and IL.
- Partial budgets for cover crops based on a follow-up online survey sent to all the farmers in the focus group. The survey also serves as a pilot for the larger survey to be sent to over 20,000 farmers in the Midwest.

Focus group results

- Figure 1 shows number of farmers by reason for adoption:
  - Leading concerns: soil erosion (impact of climate change; detergent to lawsuit) and soil health (better soil quality translates into better yields in the future)
  - Outside resources include conferences, education programs, cost-share payments

Future work

- Streamline the survey based on experience with pilot survey; then distribute to over 20,000 farmers in the Midwest.
- Create benchmarks of annual net changes in profit for the more extensively used cover crops by rotation system, e.g. soybeans or corn following cereal rye, with breakeven input prices and breakeven output prices.
- Develop an economic model of stochastic marginal costs and marginal benefits of cover crops under alternative scenarios of biomass production and associated uses, and changes in input usage for cash crops. The long-term yield, nutrient load and soil erosion estimates for the participating farms and representative county farms across the Midwest will be simulated for alternative levels of cover crops adoption using the Agricultural Production Systems Simulator (APSIM) model.
- Calculate monetary value of potential cost savings in water treatment plants due to cover crops use based on interviews with water plant managers and secondary data sources.

Acknowledgements

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Project collaborators: Fernando Miguez1; Sarah Carlson2; Bhavna Sharma2

1. Department of Economics, Iowa State University
2. Department of Agronomy, Iowa State University
3. Practical Farmers of Iowa
4. Farm procedures used in all three discussion, following Morgan, et al. (1998)

Pilot survey: structure and data

Table 1. Survey structure

<table>
<thead>
<tr>
<th>Section</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background information</td>
<td>Lifetime cover crop acres</td>
</tr>
<tr>
<td>Main cover crop mix in Fall 2014</td>
<td>Acres of cover crop experience</td>
</tr>
<tr>
<td>Main cash crop planted in Spring 2015</td>
<td>Number of acres</td>
</tr>
<tr>
<td>Change in revenues</td>
<td>Net change, change share, grazing/forage, etc.</td>
</tr>
<tr>
<td>Change in costs</td>
<td>Seed, planting, fertilizer, herbicide, etc.</td>
</tr>
</tbody>
</table>

Summary statistics:
- Mean lifetime cover crops acres: 2456
- Mean years of experience: 9.33
- Mean cover crops acres in 2014: 460
- Mean reported cash crop acres in 2015 following reported cover crop: 370

Figure 2 shows changes in costs and revenues between rotations with and without cover crops by respondent, ranked by net change in profit.
- Highest net change in profit (65.37$/acre) is driven by 18 bushels increase in corn yield. Respondents 15, 1 and 7 also report increases in cash crop yields due to cover crops.
- Most farmers obtained negative net returns from cover crops.
- Only three farmers have cover crops where cover crop termination, most farmers choose herbicide as their termination method, and spring herbicide application is already part of their herbicide program. Little to no additional herbicides costs are associated with cover crops.
- Nitrogen fertilizer, herbicide and tillage costs have changes in both directions across farmers.

Figure 3. Net change in profit, and changes in costs and revenues due to cover crops for the 14/15 crop year, in $ per acre. (Count of responses: 15)

- Partial budget: compares differences in revenues and costs across rotations with and without cover crops.
- Not all items mentioned in the focus group are relevant for the 14/15 crop year. For instance, no farmer reports reduced returns due to cover crops.
- Cost share and yield increase are the main sources of added revenue.
- Cover crop seed and plant are the main sources of added costs.
- Cereal rye is the most prevalent cover crop:
  - cereal rye followed by soybeans(7)
  - cereal rye followed by corn(4)
  - other cover crop or mix (annual ryegrass, crimson clover, radish)(4)

Pilot survey: partial budget

Table 3. Partial budget for cover crops for the 14/15 crop year, in $ per acre. (Count of responses: 15)

<table>
<thead>
<tr>
<th>Sources</th>
<th>Cover seed</th>
<th>Planting</th>
<th>Tillage</th>
<th>Herbicide</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced costs</td>
<td>20.40</td>
<td>20.27</td>
<td>0.54</td>
<td>0.46</td>
<td>21.27</td>
</tr>
<tr>
<td>Reduced revenues</td>
<td>8.65</td>
<td>3.31</td>
<td>0.24</td>
<td>0.32</td>
<td>8.65</td>
</tr>
<tr>
<td>Net change in profit</td>
<td>21.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NA: Not applicable

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