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[4] 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. Reasons for adoption.

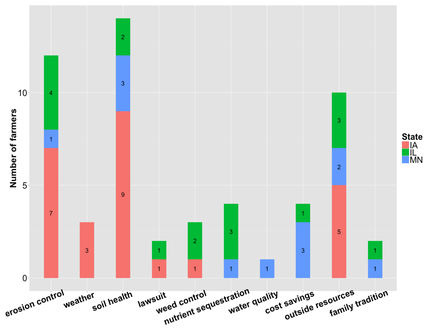
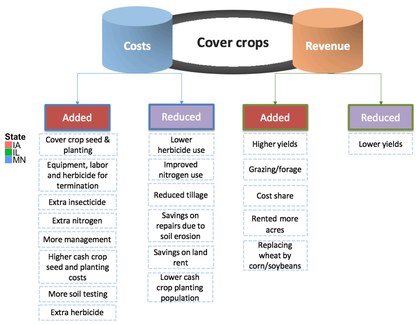


Figure 2. Changes in costs and revenues



- Figure 1 shows number of farmers by reason for adoption.
  - Leading concerns: soil erosion (impact of climate change; deterrent to lawsuit) and soil health (better soil quality translates into better yields in the future)
  - Outside resources include conferences, education programs, cost-share payments
- Figure 2 shows changes in costs and revenues associated with cover crops.
  - Apart from cover crop seed, planting, and termination, most frequently mentioned added costs are: extra insecticide(number of farmers: 2), extra nitrogen(2), and more management(2)
  - Reduced costs: lower herbicide(5), lower nitrogen(5), reduced tillage(3), lower costs to repair land erosion(2)
  - Added revenues: higher cash crop yields(8), grazing(3)
  - Reduced revenues: lower cash crop yields(6)

Pilot survey: structure and data

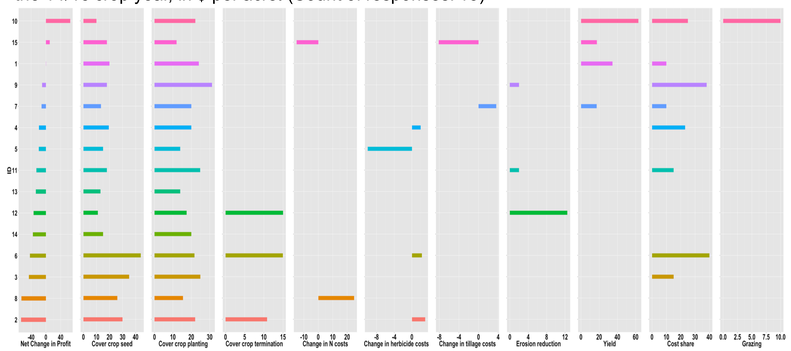
Table 1. Survey structure

Section	Components	
Background information	Lifetime cover crops acres	
	Years of cover crops experience	
Main cover crop mix in Fall 2014	Number of acres	
	Added costs	Seed, planting, termination
Main cash crop planted in Spring 2015, after main cover crop mix	Number of acres	
	Change in revenues	Yield change, cost share, grazing/forage, etc.
	Change in costs	Seed, planting, fertilizer, herbicide, etc.

- Own machinery costs for planting, termination and tillage are derived from NCRS's Cover Crop Economics Version 2.1
- Opportunity costs of added management are calculated at $12 per hour.
- Changes in revenue due to yield differences are calculated using 2015 marketing year average prices: $3.5/bu for corn, $8.65/bu for soybeans.

- 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 3 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 costs for cover crops termination. Most farmers choose herbicide as their termination method, and spring herbicide application is already part of their herbicide program. Little to no additional herbicide 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)



Pilot survey: partial budget

- 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 revenues due to cover crops.
- Cost share and yield increase are the main sources of added revenue.
- Cover crop seed and planting 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)

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

Reduced revenues (A)		Added revenues (B)	
NA	0	yield increase	8.27
		cost share	11.73
		grazing	0.67
		Total	21.23
Added costs (C)		Reduced costs (D)	
cover crop seed	20.40	lower herbicide	0.67
cover crop planting	20.27	lower nitrogen	1.00
cover crop termination	2.72	erosion reduction	1.10
increased management	0.56	reduced tillage	0.54
extra herbicide	0.48	Total	3.31
extra nitrogen	1.65		
increase in tillage costs	0.24		
Total	46.32		
		Net change in profit (B+D-A-C)	-21.79

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.

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3. Practical Farmers of Iowa
4. Same procedures used in all three discussion, following Morgan, et al. (1998)