Economic Value of Cover Crops

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Iowa Nutrient Reduction Strategy

- Voluntary, science and technology-based
- State goal of 45% reduction of Nitrogen (N) and Phosphorous (P)

- Point sources: 4% N and 16% P
- Non-point sources: 41% N and 29% P

Variety of tools to reach the goal

Why focus on cover crops?

	Practice	Comments	% Nitrate-N Reduction*	% Corn Yield Change**
			Average (SD*)	Average (SD*)
Nitrogen Management	Timing	Moving from fall to spring pre-plant application	6 (25)	4 (16)
		Spring pre-plant/sidedress 40-60 split Compared to fall-applied	5 (28)	10 (7)
		Sidedress – Compared to pre-plant application	7 (37)	0 (3)
		Sidedress – Soil test based compared to pre-plant	4 (20)	13 (22)**
	Source	Liquid swine manure compared to spring-applied fertilizer	4 (11)	0 (13)
		Poultry manure compared to spring-applied fertilizer	-3 (20)	-2 (14)
	Nitrogen Application Rate	Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10	-1
	Nitrification Inhibitor	Nitrapyrin in fall – Compared to fall-applied [illegible]	9 (19)	6 (22)
	Cover Crops	Rye	31 (29)	-6 (7)
		Oat	[illegible]	-5 (1)
	Living Mulches	e.g. Kura clover – Nitrate-N reduction from one site	41 (16)	-9 (32)

	Practice	Comments	% P Load Reduction*	% Corn Yield Change*
			Average (SD*)	Average (SD*)
Phosphorus Management Practices	Phosphorus Application	Applying P based on crop removal – Assuming optimal STP level and P incorporation	0.6[c]	0
		Soil-Test P – No P applied until STP drops to optimum or, when manure is applied, to levels indicated by the P Index[c]	17*	0
	Source of Phosphorus	Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application	46 (45)	-1 (13)
		Beef manure compared to commercial fertilizer – Runoff shortly after application	46 (96)	
	Placement of Phosphorus	Broadcast incorporated within 1 week compared to no incorporation, same tillage	36 (27)	0
		With seed or knifed bands compared to surface application, no incorporation	24 (46)	0
	Cover Crops	Winter rye	29 (37)	-6 (7)
	Tillage	Conservation till – Chisel plowing compared to moldboard plowing	33 (49)	0 (6)
		No till compared to chisel plowing	90 (17)	-6 (8)

31% reduction in nitrate

29% reduction in phosphorus

Example: Scenarios that Achieve N and P Goal From Non-Point Sources

Scenario	Nitrate-N Reduction	Phosphorus Reduction	Initial Investment	Total Equal Annualized Cost	Statewide Average EAC Costs
	% (from baseline)	% (from baseline)	(million $)	(million $/yr)	($/acre)
MRTN Rate, **60% Acreage with Cover Crop,** 27% of agricultural land treated with wetland and 60% of drained land has bioreactor	42	30	3,218	756	36
MRTN Rate, **95% of acreage in Cover Crops,** 34% of agricultural land in heavily tile drained land treated with wetland, and 5% land retirement	42	50	1,222	1,214	58

How close are we to reaching NRS goals?

No till	~5.25M of 11.1M acres
Cover crops	~470,000 of 12.5M acres
Wetlands	~77 of 7,600
Bioreactors	~50 of 120,000
Prairie STRIPS	617 acres (based on ILF and STRIPs data)

Why are farmers using cover crops?

- Reduce erosion even in no-till
- Reduce nitrate leaching
- Increase soil organic matter
- Improve soil health, quality and productivity
- Suppress winter annual and early season weeds

How do you account for cover crop value in your operation?

Estimating the Value of Cover Crops

On-farm research sites comparing:

cover and no-cover treatments

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RUSLE2

- Input management practices and compare treatments
- Obtain soil loss in tons/acre/year

RUSLE2 Results

- Most sites were no-till corn-soybean rotations
- Results range from 30-80% erosion reduction with cereal rye cover crop

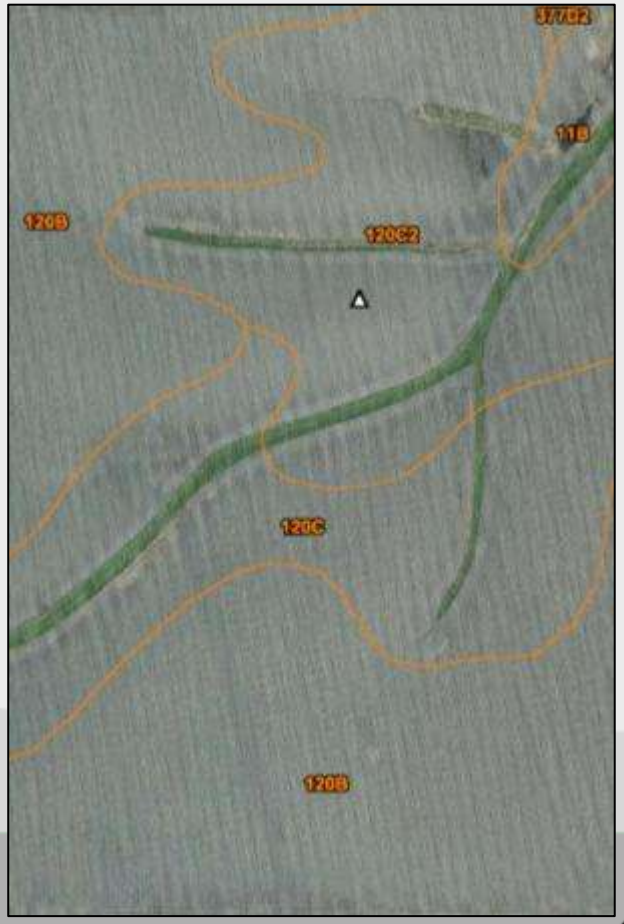
Soil Value Estimates

- Calculated change in:
  - land value
  - lost nutrients

Soil Comparison

- Tama County
  - Tama 120C
  - Tama 120C2

- Lost ~4” to change erosion phase
- 616 tons of soil/acre



Common Land Value Estimation Tools

Changes in:

- New CSR2
- Productivity
- Rental value

Estimating Soil Nutrient Value

- Topsoil is the most nutrient rich horizon
- Higher OM= higher nutrient content and value

Calculating Cost of Soil Erosion

Land value change ~$0.49 per ton + Nutrient value lost ~$5.57 per ton

Total = $6.06/ton

Cover Crop Scenarios

Scenario	No cover erosion rate	Cover crop erosion rate	Difference	Value of retained soil by cover crop use
1	2 tons/acre	1 ton/acre	1 ton/acre	$6.06/acre

Case Study Results

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County	Soil Loss without Cover Crops tons/ac	Soil Loss with Cover Crops tons/ac	Difference tons/ac (% change)	Soil and Nutrient Value $/ac*ton	Value Retained $
Cherokee	0.36	0.066	0.294 (82%)	$7.46	$2.19
Adair	0.89	0.16	0.73 (82%)	$6.59	$4.81
Guthrie*	0.3	0.23	0.07 (23%)	$6.25	$0.44
Tama*	5.7	4.7	1 (18%)	$5.19	$5.19
Hamilton	0.21	0.051	0.159 (76%)	$6.16	$0.98
Benton	0.61	0.12	0.49 (80%)	$5.84	$2.86
Clinton	1.1	0.21	0.89 (80%)	$5.03	$4.48
Wapello	2.1	0.32	1.78 (85%)	$5.63	$10.02
Washington 2*	0.3	0.15	0.15 (50%)	$5.27	$0.79

*Participants in long-term ILF/PFI study

Farmer Partner Spotlight

Rob Stout, Washington Co.

- Goal: Improve soil quality and soil conservation
- 600 acres in cover crops, drilled/aerial
- Cereal rye, annual ryegrass, radish, mix of crimson clover and peas
- Advice: try it on some ground with past soil erosion -> will be sold on how well the covers hold the soil in place

More Bang for the Buck

Largest impacts of cover crop usage were found where erosion rates were highest

For example, Tama County soil losses under 3 scenarios:

Conservation Tillage
=
6 tons/acre

Conservation Tillage + Cover Crops
=
5 tons/acre

~$6/acre
savings

No Tillage + Cover Crops
=
1 ton/acre

~$30/acre
total savings

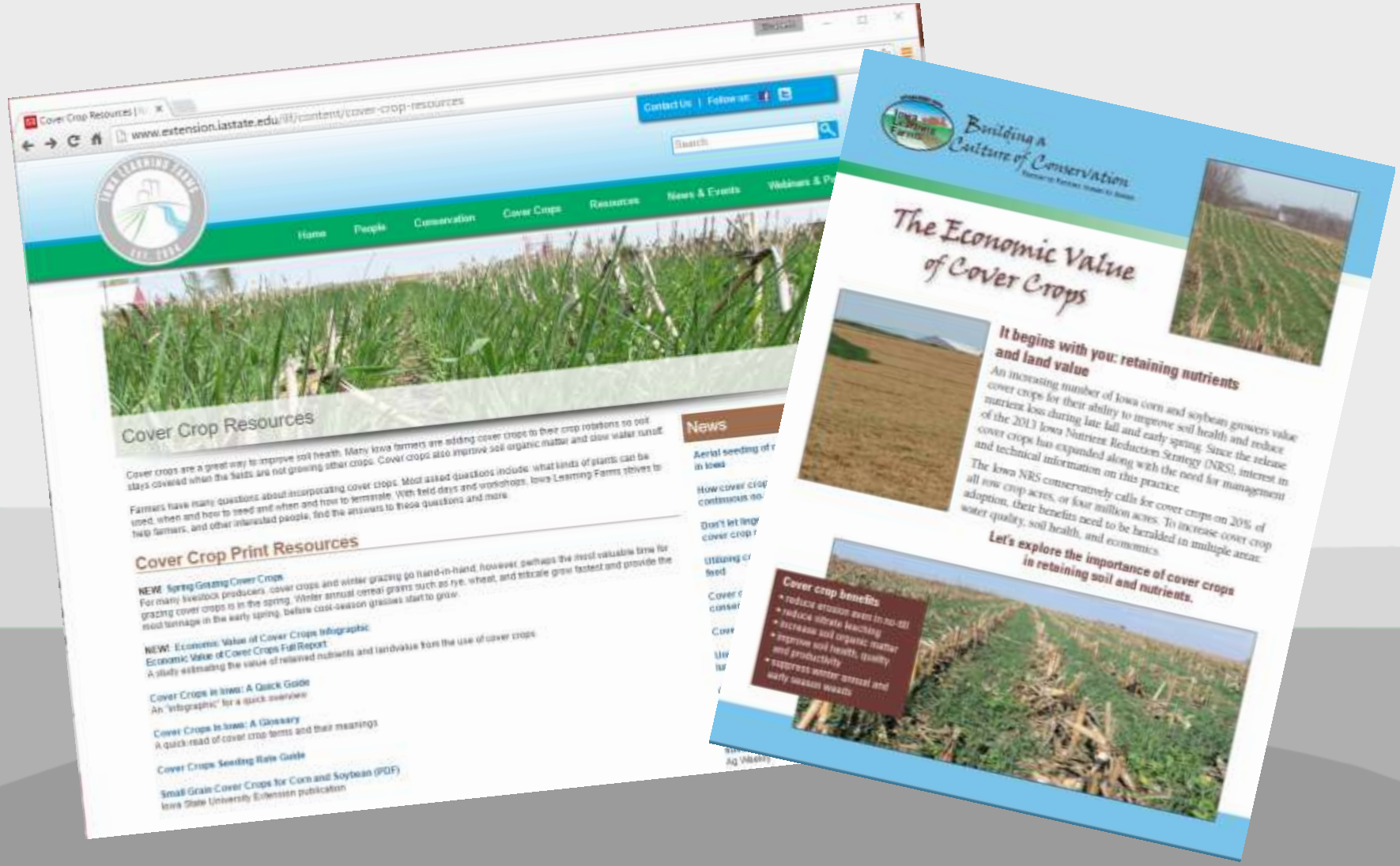
Future Considerations

- Cover crops capture nutrients through plant uptake and sequestration and release them over time
  - Value of N released varies based on many factors
- Improved erosion models and data
- Investigate other ways cover crop can add value

Consider Grazing Cover Crops

- High quality feed without adding acres
- Reduced feed cost
- Rest for permanent pastures
- Pathogen reduction for newborn calves

For more information visit: www.extension.iastate.edu/ilf



Project Funding and Partners

- State Soil Conservation Committee
- Partners
  - USDA-ARS National Lab for Agriculture and the Environment
  - Practical Farmers of Iowa