



Cover Crop Economics




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Why are producers interested in cover crops?



Desired Cover Crop Benefits (% of Respondents)

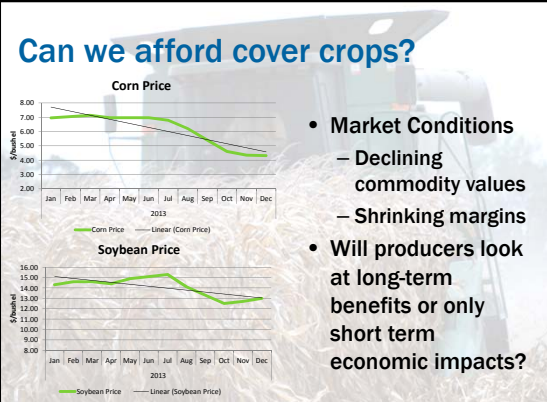
Soil compaction reduction	54%
Soil erosion reduction	54%
Nitrogen leaching	41%
Weed control	40%
Increased yields for future crops	36%
Nitrogen source	36%
Fibrous rooting system	27%
Reduced tillage needs	27%
Economic returns (driving, etc savings)	17%
Other	13%
Decreases future production costs	11%
Winter kills nearby	9%
Water hardening	8%
Disease reduction	7%
Weed control	5%




Weed Control

Compaction Nutrients Disease Suppression Erosion

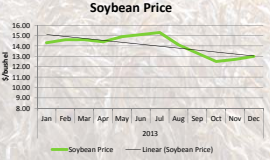
Can we afford cover crops?



Corn Price




Soybean Price




- Market Conditions
 - Declining commodity values
 - Shrinking margins
- Will producers look at long-term benefits or only short term economic impacts?

Closer Look at the Economics



- Hypothetical crop farm in Missouri with a two crop rotation (corn/soybeans)
 - Examine annual impacts (i.e. impacts that affect cash flow)
 - Nutrient & weed management
 - Machinery & labor impacts
 - Disease and pest pressure
 - Examine potential longer term impacts that impact farm profitability


Corn/Soybean Baseline




- Primarily utilized MU 2014 Crop Assumptions
 - Yield
 - Price
 - Input Prices
- M4 Assumptions for remainder of analysis

Corn		Soybean	
Cost/Return Budget			
Estimated Returns per Acre			
Estimated Yield/Acre (bu)	50	45	
Price (per bu)	\$4.00	\$13.70	
Freight (to processor delivery point)	\$0.100	\$0.100	
Net Price (per bushel)	\$4.100	\$13.600	
Estimated Total Returns/Acre	\$205.00	\$612.75	
Estimated Operating Costs/Acre			
Seed	\$101.11	\$18.30	
Fertilizer			
N	\$66.98	\$0.00	
P	\$28.70	\$22.55	
K	\$20.00	\$20.00	
S	\$0.00	\$0.00	
Crop Chemicals/Fungicides/Herbicide	\$17.00	\$18.00	
Machinery fuel & oil	\$17.27	\$17.60	
Machinery repair	\$17.00	\$17.00	
Custom hire and services	\$18.50	\$1.75	
Operator and hired labor	\$18.22	\$18.78	
Crop Insurance	\$30.00	\$0.00	
Other	\$0.00	\$0.00	
Operating interest (7% for 6 months)	\$13.90	\$7.50	
Total Operating Costs/Acre	\$388.54	\$123.70	
Estimated Ownership Costs/Acre			
Machinery depreciation, fuel, tires, & oil	\$23.93	\$48.78	
Real estate taxes, depreciation, and interest (or rent)	\$155.00	\$210.00	
Total Ownership Costs/Acre	\$178.93	\$258.78	
Combined Net Return over Operating and Ownership Costs	\$107.34	\$195.27	
Net Return over Operating and Ownership Costs	\$44.12	\$61.81	

Cover Crops for Analysis



Year 1: crimson clover/annual ryegrass (before corn)
Year 2: crimson clover/tillage radish (before soybeans)




Nutrient Cycling Compaction reduction Source of nitrogen

Compaction reduction Will winter kill Nutrient cycling


Building organic matter Good companion




Annual Impacts



Nutrient Management— Nitrogen Fixation

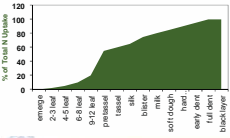


- In the South crimson clover can fix 70 to 150 lbs of nitrogen by mid-May
 - Expect expect less before corn planting unless corn planting delayed
- For our analysis we will assume late April plant date for corn and a contribution of 30 lbs of N




Nutrient Management— Nutrient Cycling


- Yield benefits of side dressing nitrogen documented in literature and field experience
 - Significant N need beginning at V6
- Annual Ryegrass Becomes Nutrient “Catch and Release” Program
 - Could cycle 30 to 90 lbs of nitrogen



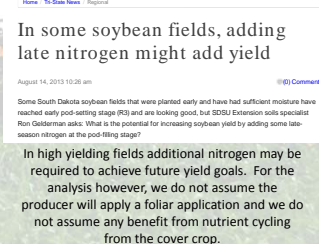

For the analysis, we assume the producer does not side dress urea (field applied, broadcast) when using cover crops.



Nutrient Management— Can soybeans benefit?




- Are there any yield benefits of late season (R3) nitrogen applications to soybeans?
 - 5 to 6 lbs of N required per bushel of yield potential

Other Considerations

- Cover crops can aid with weed control and disease suppression. For this analysis however, no reduction of herbicides or fungicides. Added qt 2,4-D with corn burn down.
- Annual ryegrass has demonstrated benefits of deep, fibrous root system. This, combined with year 2 use of tillage radish, eliminates use of in-line ripper.
- Ariel application of cover crop mix and chemical control in the spring.



Short-term Cash Flow Impact


Baseline Rotation		
Net Return over Operating and Ownership Costs (corn)	\$44.53	
Net Return over Operating and Ownership Costs (beans)	\$62.82	
NET RETURNS FOR TWO (2) YEAR ROTATION	\$107.34	
Input Changes Over Two (2) Year Rotation		
Additional Inputs		
Clover/Ryegrass Blend	(\$31.88)	
Aerial application (year 1)	(\$12.00)	
Additional Herbicides (year 1)	(\$7.00)	
Clover/Radish Blend	(\$35.95)	
Aerial application (year 2)	(\$12.00)	
Additional Herbicide (year 2)	\$0.00	
Reduced Inputs		Per Acre
Reduced Nitrogen in Year 1	\$14.10	
Elimination of In-line Ripper	\$7.42	
Nitrogen Benefits (year 2)	\$14.10	
Elimination of side-dressing (machine hire)	\$7.00	
Elimination of side-dress N	\$21.15	
IMPACT ON CASH FLOW AND NET RETURNS	\$35.00	

- Notes
 - Aerial application vs. drilled
 - Additional herbicide is to ensure clover termination
 - NO Consideration for other soil health benefits



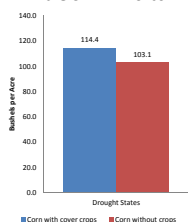
Other Yield Factors

Soil Health Benefits



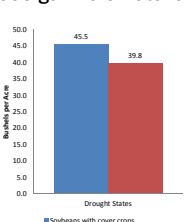
Increased Organic Matter

- Increased Water Holding Capacity
 - A pound of SOM can absorb 18 to 20 lbs water
 - 1% SOM = 20 to 25,000 gal more water available



Drought States

■ Corn with cover crops ■ Corn without cover crops




Drought States

■ Soybeans with cover crops ■ Soybeans without cover crops

Drought States Crop Yields for 2012


Source: SARE/CTIC Survey, 2013




Increased Organic Matter

- Available Nutrients—each 1% increase of soil organic matter (SOM) contains:
 - 10,000 lbs of carbon
 - 1000 lbs of nitrogen
 - 100 lbs of P
 - 100 lbs of S


Annual Benefits of Soil Organic Matter			
<small>A 2% increase in SOM equates to</small>			
Nutrient	Amount	Available	Value
	lbs	lbs	\$/acre
Nitrogen	3000	40	\$18.80
Phosphorus	100	2	\$0.82
Potassium	negligible	negligible	negligible
Sulfur	100	5	\$2.15
			\$21.77



Disease Suppression (example)





- Annual Ryegrass may significantly reduce soybean cyst nematode populations.
 - Roots produce a chemical which causes soybean cyst nematode eggs to hatch in the fall.
 - As Annual Ryegrass is not a suitable "host" plant, the nematodes then starve.



Decreased Soil Erosion

- Use of cover crops to reduce soil erosion will
 - Maintain yield potential
 - Decrease loss of nutrients
- What is the most credible way to monetize this benefit?





And More.....


- Economic benefits of grazing
- Rotation benefits of adding an additional crop
- Resistance to soil compaction
- Alleviation of soil compaction

Soil resistance to compaction ranked from best (top) to worst

Continuous no-till, controlled traffic, cover crop
Continuous no-till with growing cover crop
Continuous no-till, heavy residue, no cover crop
Continuous no-till, light residue or bare ground
Intermittent no-till
Shallow tillage
Strip-till
Subsoiled, wide-spaced shanks
Moldboard or chisel plowed, finely tilled seedbed
Subsoiled, deep ripped, full surface tillage


Systems at the top of the list compact soil the least. Systems further down the list create more compaction.

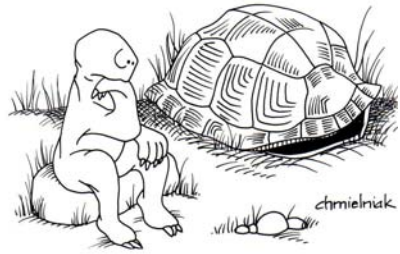
Impact on Profitability



Baseline Rotation	
Net Return over Operating and Ownership Costs (corn)	\$44.53
Net Return over Operating and Ownership Costs (beans)	\$62.81
NET RETURNS FOR TWO (2) YEAR ROTATION	\$107.34
Cover Crop Rotation with 5% Long Term Yield Benefits	
Net Return over Operating and Ownership Costs (corn)	\$99.43
Net Return over Operating and Ownership Costs (beans)	\$84.40
NET RETURNS FOR TWO (2) YEAR ROTATION	\$183.82
Benefit Over Traditional Rotation	\$76.48


Other Points to Ponder



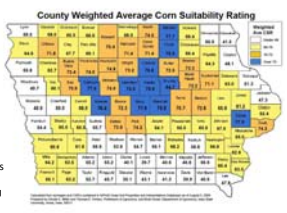


Thinking outside the box.

Land Value




- What if organic matter was a key component of land value (thus RENT)?
 - CSR2 in Iowa
 - \$125 per point this fall in Iowa



CSR2 = S-M-F-W-D-C±EJ

Where:
S is the taxonomic subgroup class of the soil series
M is the family particle size class
F refers to the field conditions of a particular SMU
W is the water holding capacity of the series
D is a soil depth & tolerable rate of erosion factor
C refers to the climate
EJ is an expert judgment correction factor

Water Quality




“Voluntary but not Optional”

Total Nitrate-N Lost 2002-2012

Treatment	Nitrate-N lost	
	11-yr sum kg/ha	11-yr avg kg/ha
Corn-soybean	454	41
Corn-Soyb w. Rye	<u>206</u>	<u>19</u>
Reduction	248	22
% Reduction	55%	

Source: Tom Kaspar, USDA-ARS (Ames, IA)

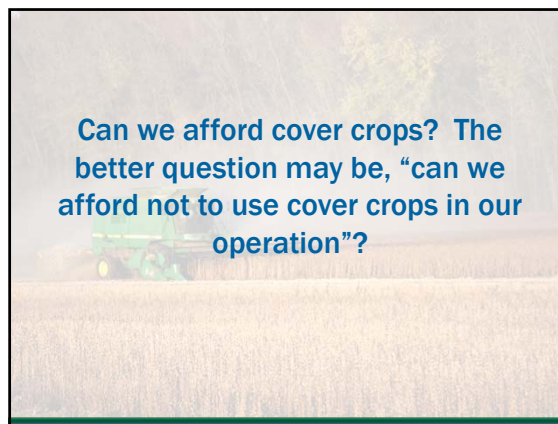
Are Cover Crops Good Insurance?



- Yields on corn and soybeans in the drought states where cover crops were used were higher on average in 2012 than those where no cover crops were used (based on side by side field comparisons)
- This trend holds regardless of experience level with cover crops, although yield benefits from cover crops increase over time

Experience Level with Cover Crops	Corn	Soybeans
All respondents	9.6% Yield Increase	11.6% Yield Increase
More than 3 years of experience	10.5% Yield Increase	11.6% Yield Increase
3 years or less of experience	6.1% Yield Increase	11.4% Yield Increase

Source: SARE/CTIC Survey, 2013





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