Profitability of Conservation Systems: Results from PCM

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Topics

1. What does an advanced system look like

2. PCM Results: Moving to an advanced system

What does an advanced system look like? (My observations)

- Committed to the system for more than economics
- Very committed to the idea of building soils, conservation

- Tends to be in rotations (corn-soybeans, or more)
- Tends to have cover crops after both the corn and soybean crops
- Almost always no tillage, with the exception of strip tillage

- Tends to be committed to low costs through minimizing inputs
- Often attempting to substitute cover crops for pesticides
- Likely keeping fertilizer costs lower than average

What does an advanced system look like? (My observations)

- Land base is stable
  - If committed to rotations and cover crops, need owned land or land owners who share a vision of building soils

- Not likely a farmer looking to expand the land base through offering high cash rents.

Budget Differences – Corn in an Advanced System

	Illinois Crop Budgets – Central Illinois	Advanced Cover Crop Systems
Yield	201 bu.	1/
	(per acre)	
Fertilizer	$135	$20 to $30 lower 2/
Seed	$114	$15 lower 3/
Pesticides	$60	$20 lower
Cover crop seed	$0	$20 higher
Machinery related costs	$137	$23 lower than conventional

1/ These will not likely be the high yielding systems, but about the same as convetnional
2/ Primarily due to only apply MRTN
3/ Non-traited seed

Note that the advance system has $50 lower costs

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Field Passes (Soybeans to Corn)

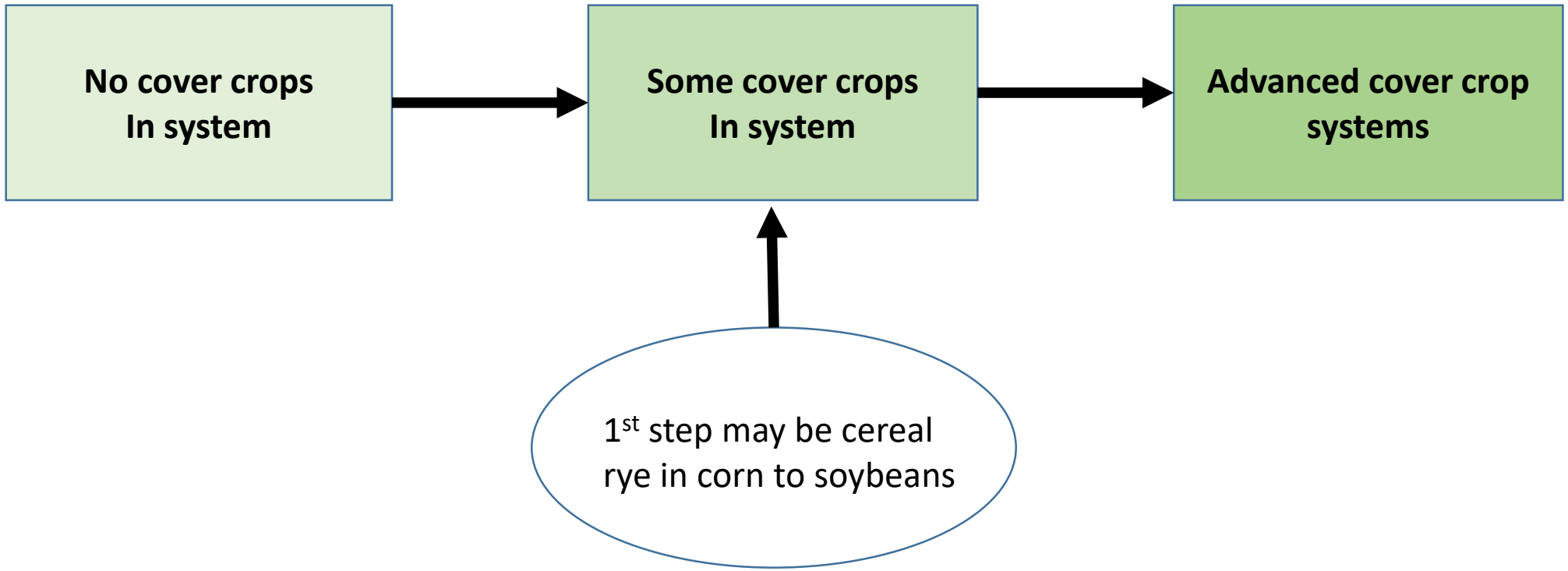
Advanced Cover Crop

1. Plant cover crop seed ($10 per acre)
2. Apply DAP
3. Spray per-plant with N ($4)
4. Plant
5. Spray ($4)
6. Post-plant apply nitrogen ($16 per acre)
7. Harvest

Conventional

1. Apply DAP
2. Perform primary tillage ($16)
3. Apply anhydrous ammonia as fall N ($16)
4. Spring tillage ($13)
5. Plant
6. Spray ($4)
7. Apply fungicide ($4)
8. Harvest

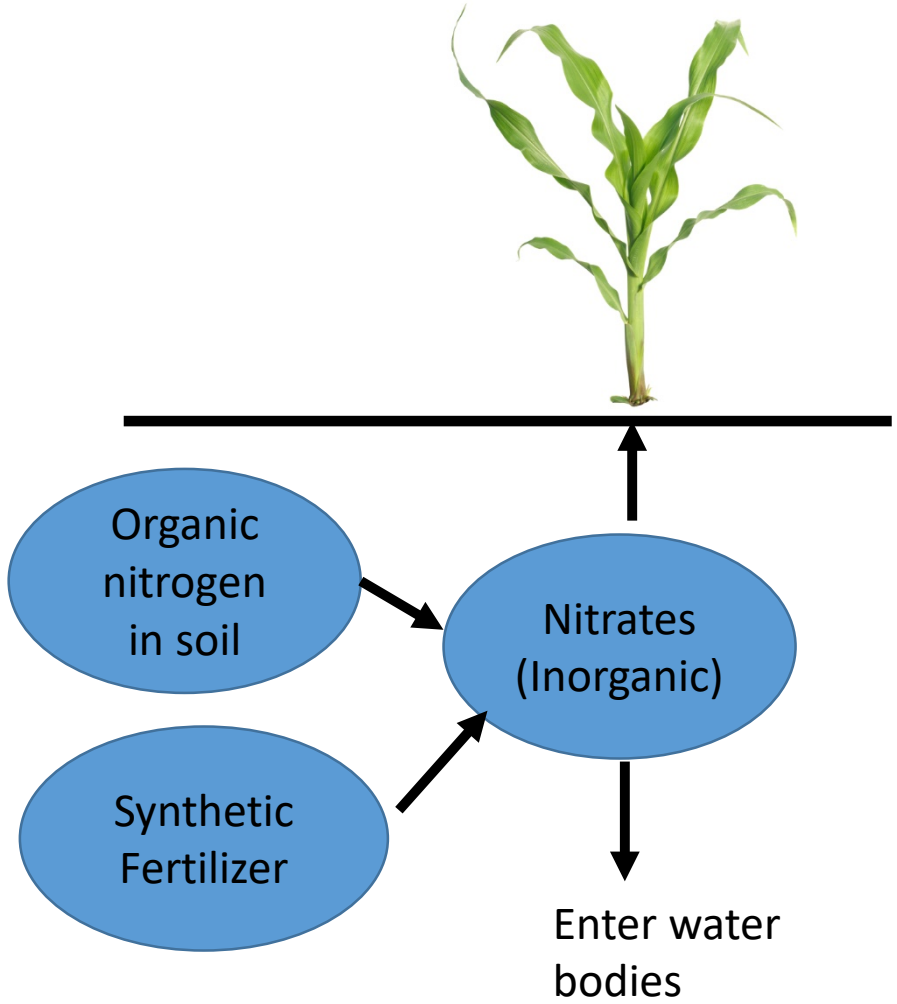
Advanced cover crop system has $23 lower costs, only field passes that differ have costs listed


No cover crops
In system
Some cover crops
In system
Advanced cover crop
systems
1st step may be cereal
rye in corn to soybeans

Nitrogen Management

- Edge of field technologies – all costs no return

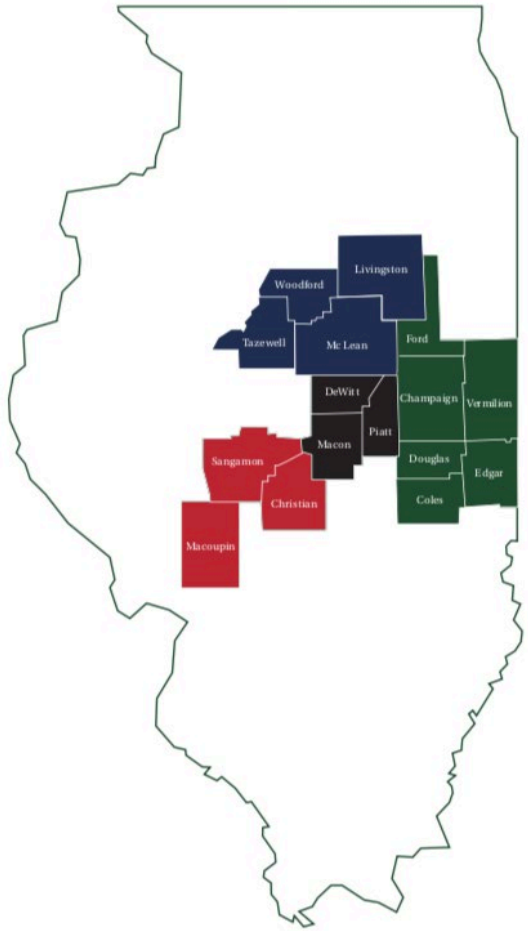
- Less tillage
- Nitrogen
  - Timing
  - Rate
  - Form
- Cover crops



Nitrate leaching largest concern in spring because:

1. Organic N converted to inorganic N
2. Nitrogen applications occur

PCM Results: Moving to an Advanced System



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Dr. Laura Gentry's work focuses on watershed research to support agriculture water quality initiatives and nutrient management. She most recently served as research assistant professor at the University of Illinois at Urbana-Champaign, specializing in the sustainability of high-yielding corn production systems, residue management and reduced tillage, and production and sustainability of annual bioenergy crops. Previous to her position at UIUC, she was an assistant professor at North Dakota State University.

Her Ph.D. studies focused on the effect of tillage, rotation and organic amendments on nutrient cycling.

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Mr. Travis Deppe leads IL Corn's water quality and sustainability initiatives focused on implementing the Illinois Nutrient Loss Reduction Strategy and meeting supply chain sustainability demands. In partnership with others, he develops and implements education, outreach and research to help Illinois corn farmers reach their nutrient loss goals and engage in the sustainability conversation. He most recently was the nutrient management project lead on GROWMARK's Sales Agronomy team. Earlier, as a research technician at Purdue University, he conducted and supported numerous research projects mostly focused on soil health and mitigating nitrogen losses via cover crop assimilation in varying crop production scenarios.

Dr. Gary Schnitkey

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Dr. Gary Schnitkey is a professor and farm management specialist in the Department of Agricultural & Consumer Economics, University of Illinois. His activities focus on farm management and risk management, including examination of issues impacting the profitability of grain farms such as corn-soybean rotations, machinery economics, and factors separating profitable from unprofitable farms. Schnitkey performed economic analysis for the Nutrient Loss Reduction Strategy and the economic analysis for conservation practices through the PCM program.

Results for
1)Tillage
2)Cover crop
3)Nitrogen management

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Number of fields	928	952
	Corn	Soybeans
SPR	134	134
Nitrogen applied -- total	210	2
-- in DAP/MAP	21	1
-- in Anhydrous Ammonia	93	0
-- in UAN	65	0
Revenue		
Yield per acre	205	65
Crop Revenue	714	613
ARC/PLC or ACRE	22	22
Crop Insurance		
Other Farm Receipts		
Gross Revenue	**735**	**635**
Expenses		
P, K and Lime	75	8
Nitrogen	62	0
Pesticides	46	40
Insecticides	1	1
Seed	121	57
Seed - cover crop	0	0
Drying	7	0
Storage	21	6
Crop Insurance	22	15
Direct Costs	**354**	**128**
Field work	15	14
Planting - crop	14	14
Planting - cover crop	0	1
Machine hire/lease/application cost	34	21
Harvest	36	32
Power Costs	**101**	**81**
Overhead Costs	36	30
Total Non-Land Costs	**491**	**240**
Operator and Land Return	**244**	**395**

Economic Report

- Revenue and Cost calculations
  - Gross revenue, inputs and power costs are assigned according to standard commodity prices, input costs and field operation costs
    - Based on annual reports from IL FBFM and USDA-ERS
  - Direct costs reflect the farmer's rate and source for inputs
  - Power costs reflect the farmer's tillage practices
- Summaries are prepared based on aggregated values, by standard

Practice standard: Tillage

- NO-TILL
- STRIP TILL
- 1 TILLAGE PASS, LIGHT
- 1 TILLAGE PASS, HEAVY

- 2 TILLAGE PASSES, LIGHT
- 2 TILLAGE PASSES, MODERATE
- 2 TILLAGE PASSES, HEAVY
- 2+ TILLAGE PASSES

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PCM Tillage Results for Corn, 2016 to 2018.

Tillage pass	Percent of Fields	Yield	Non-land Costs	Operator and Land Return
		bu/acre	$/acre	$/acre
No-till	15%	212	399	241
Strip Till	15%	221	429	256
1-pass	31%	216	496	259
2-pass light	12%	221	515	254
2-pass heavy	24%	216	518	234
2+ pass	2%	212	500	230

PCM Tillage Results for Soybeans, 2016 to 2018.

Tillage pass	Percent of Fields	Yield	Non-land Costs	Operator and Land Return
		bu/acre	$/acre	$/acre
No-till	45%	66	243	362
1-pass	13%	70	254	379
2-pass light	8%	65	234	366
2-pass heavy	17%	72	272	383
2+ pass	17%	65	261	334

List Prices of Machinery, 2019

Tractors	
370 HP, FWD)	$358,000
570 HP, FWD	$488,000
290 FWA	$391,000
225 FWA	$274,000

Tillage equipment	
Disk Ripper (17 ft)	$60,228
Mulch Finisher (27 ft)	$73,000
Vertical Tillage (29 ft)	$105,300
Field cultivator (29 ft)	$58,000

Combine and Planters	
16-row planter	$150,000
Combine (320 HP)	$383,000
8 row head	$71,000
30 foot	$43,000

Practice standard: cover crops

- NO COVER CROP
- WINTER TERMINAL COVER CROP
- OVER-WINTERING COVER CROP

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Cover Crop Data & Recommendations, Soybeans

PCM PROGRAM – IL 2015-2018 AVG VALUES	OVER-WINTERING COV CROP	WINTER TERMINAL COV CROP	NO COVER CROP
# Fields	*212*	*25*	*1876*
Yield per acre	*68*	*67*	*67*
Soil Productivity Ratin	134	125	133
GROSS REVENUE	**$623**	**$619**	**$616**
Cover Crop Seed	*	*	$0
TOTAL DIRECT COSTS	**$146**	**$127**	**$137**
Cover Crop Planting	**	**	$0
TOTAL POWER COSTS	**$71**	**$74**	**$80**
OVERHEAD COSTS	**$30**	**$30**	**$30**
TOTAL NON-LAND COSTS	**$247**	**$231**	**$247**
OPERATOR & LAND RETURN	**$376*** **	**$388*** **	**$369**

*No Difference in Yield

*Cost varies from $5-$40/a

**Cost varies from $0-$15/a

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Cover Crop Data & Recommendations, Corn

PCM PROGRAM – IL 2015-2018 AVG VALUES	OVER-WINTERING COV CROP	WINTER TERMINAL COV CROP	NO COVER CROP
# Fields	*42*	14	*629*
Yield per acre	*194*	*211*	*199*
Soil Productivity Rating	122	114	118
GROSS REVENUE	**$686**	**$727**	**$699**
Cover Crop Seed	*	*	$0
TOTAL DIRECT COSTS	**$360**	**$344**	**$341**
Cover Crop Planting	**	**	$0
TOTAL POWER COSTS	**$71**	**$74**	**$80**
OVERHEAD COSTS	**$36**	**$37**	**$36**
TOTAL NON-LAND COSTS	**$500**	**$485**	**$483**
OPERATOR & LAND RETURN	**$186*** **	**$242*** **	**$217**

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Practice standard: n management

- >40% FALL-APPLIED
- MOSTLY PRE-PLANT
- MOSTLY SIDE DRESS
- 50% PRE-PLANT/50% SIDE DRESS
- 3-WAY SPLIT (<40% FALL)

Nitrogen Benchmark Classes, Corn, 2015-2018

N Benchmark Class	Percent of Fields	Operator and Land Return	Yield	Nitrogen Applied[1]	Average Nitrogen Cost	Average Nitrogen Cost per Lb
		$/acre	Bu/acre	lbs./acre	$/acre	$/Lb.
Mostly Fall	32%	$248	220	218	$76	$0.35
Mostly Pre-Planting	25%	$257	209	206	$67	$0.33
3-Way Split	3%	$274	225	216	$71	$0.33
50% Pre-Plant/50% Sidedress	11%	$245	216	204	$76	$0.36
Mostly Sidedress	26%	$253	213	199	$65	$0.32

[1] Pounds of actual nitrogen applied

Source: Precision Conservation Management

Source: farmdocDaily, November 12, 2019

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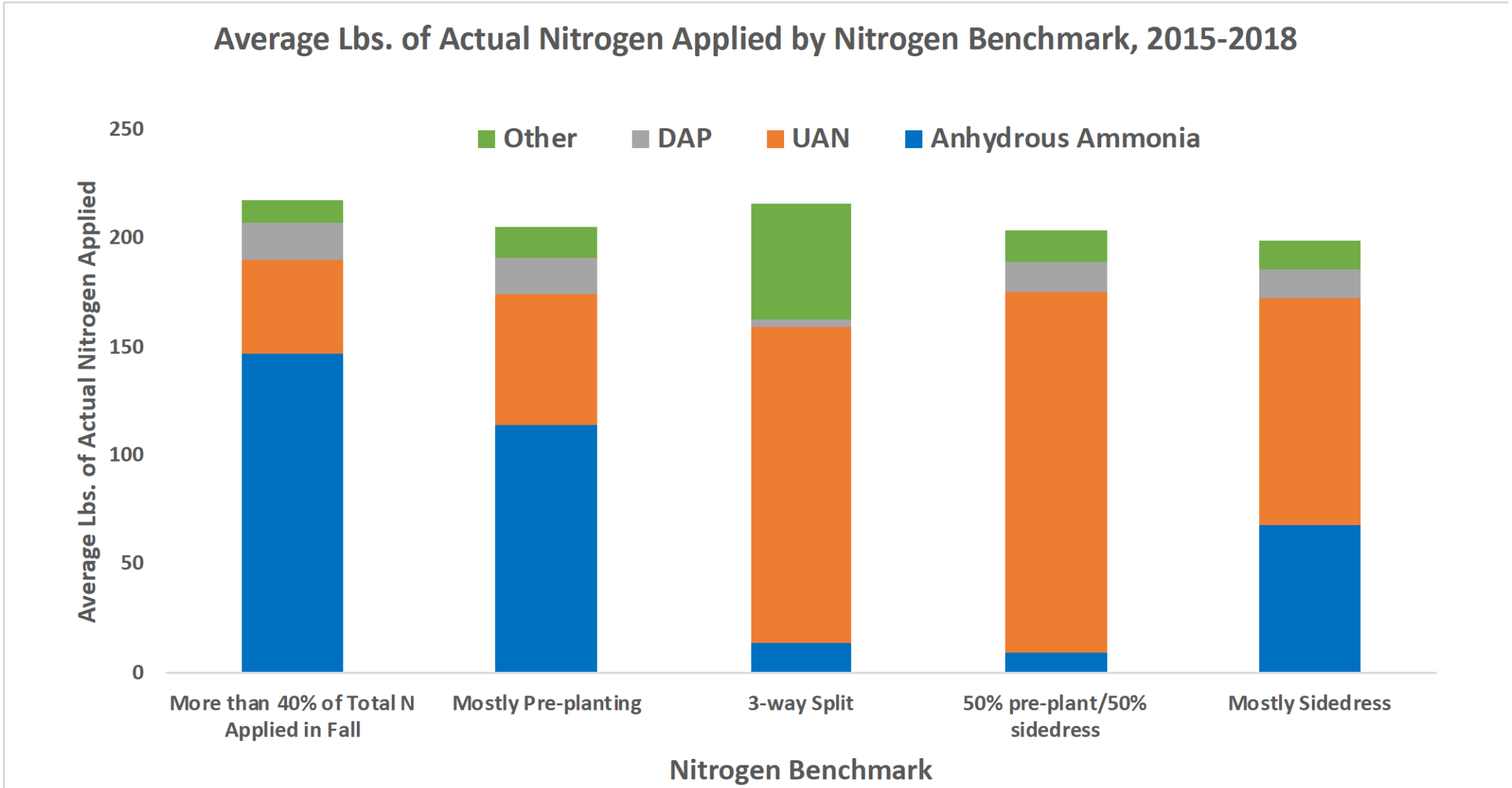

Average Lbs. of Actual Nitrogen Applied by Nitrogen Benchmark, 2015-2018
Other
DAP
UAN
Anhydrous Ammonia
Average Lbs. of Actual Nitrogen Applied
250
200
150
100
50
0
More than 40% of Total N Applied in Fall
Mostly Pre-planting
3-way Split
50% pre-plant/50% sidedress
Mostly Sidedress
Nitrogen Benchmark

Recommendations from Midwest Universities

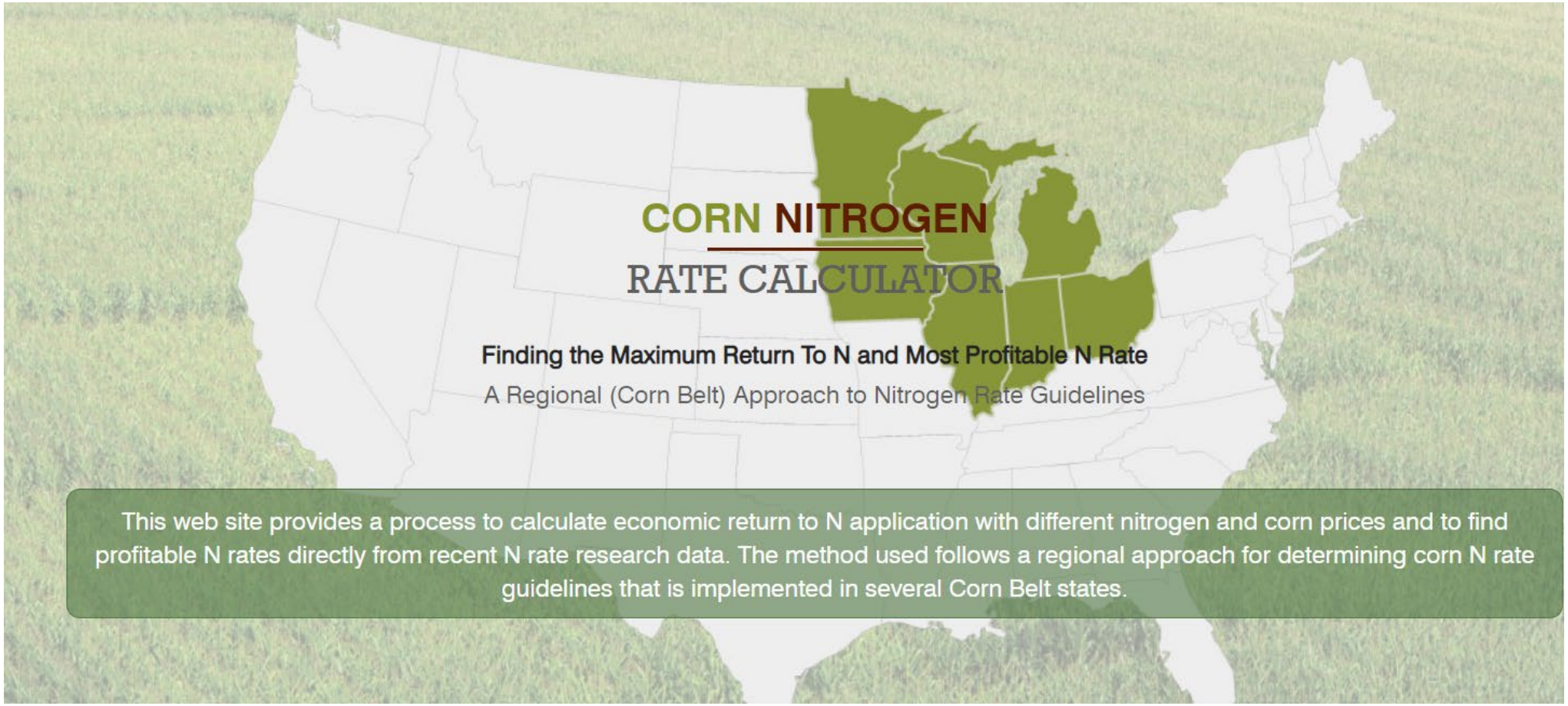
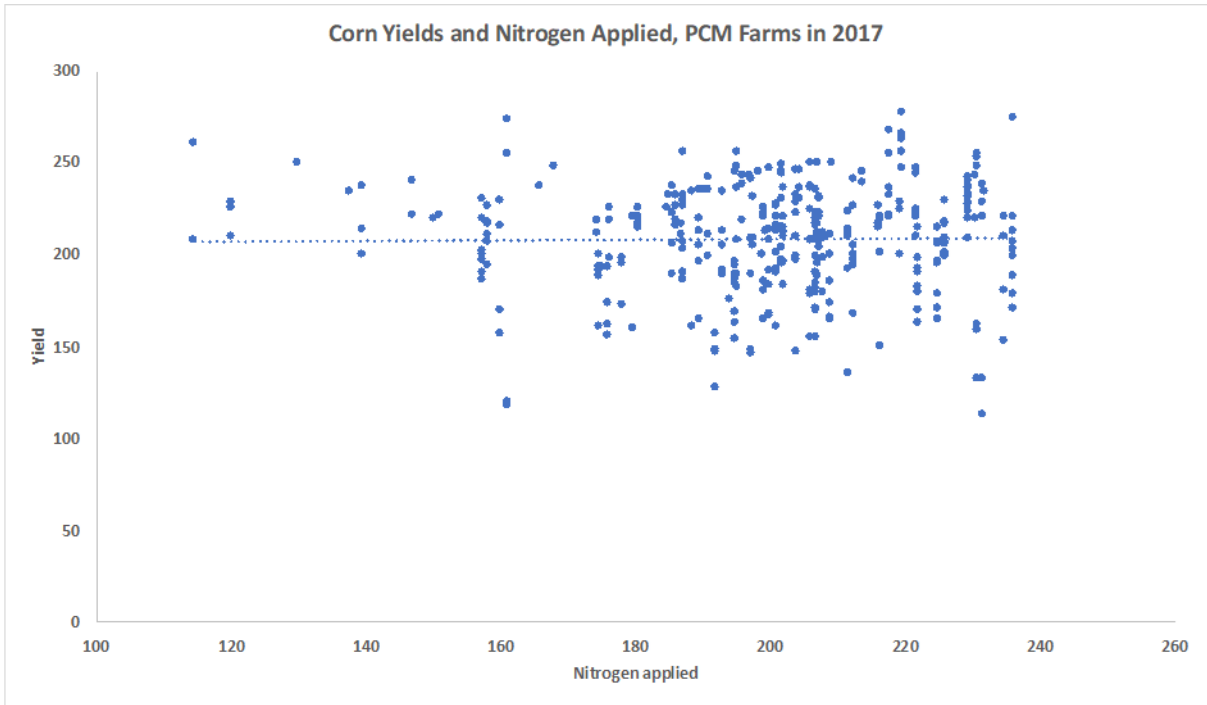


Table 1. Maximum Return to Nitrogen (MRTN) Rates in Pounds of N Applied, 2019[1,2]

	Corn-following-soybeans		Corn-following-corn	
Region of Illinois	Anhydrous Ammonia	28% Nitrogen Solution	Anhydrous Ammonia	28% Nitrogen Solution
	lbs./acre	lbs/acre	lbs/acre	lbs/acre
North	157	144	200	186
Central	174	163	200	188
South	180	166	193	180

[1] Taken from the *Corn Nitrogen Rate Calculator (http://cnrc.agron.iastate.edu/) on March 18, 2019.*

[2] MRTNs determined with a $3.70 corn price, $615 anhydrous ammonia price, and a $280 nitrogen solution price.



Steps in conservation

- Consider less tillage
- Consider lowering n rates and moving more post plant
- Consider cover crops (with beginning step moving into cereal rye in corn to soybeans

Thank you and Questions