

Economics of Soil Health Results of PCM



Precision Conservation Management



CHECKOFF & MEMBERSHIP PROGRAMS

I ILLINOIS
Agricultural & Consumer Economics
COLLEGE OF AGRICULTURAL, CONSUMER
& ENVIRONMENTAL SCIENCES

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Conservation practices analyzed for their ROI



A program of the

Illinois Corn Growers Association 

ILLINOIS SOYBEAN ASSOCIATION CHECKOFF & MEMBERSHIP PROGRAMS 

Data Collection

1. Fields

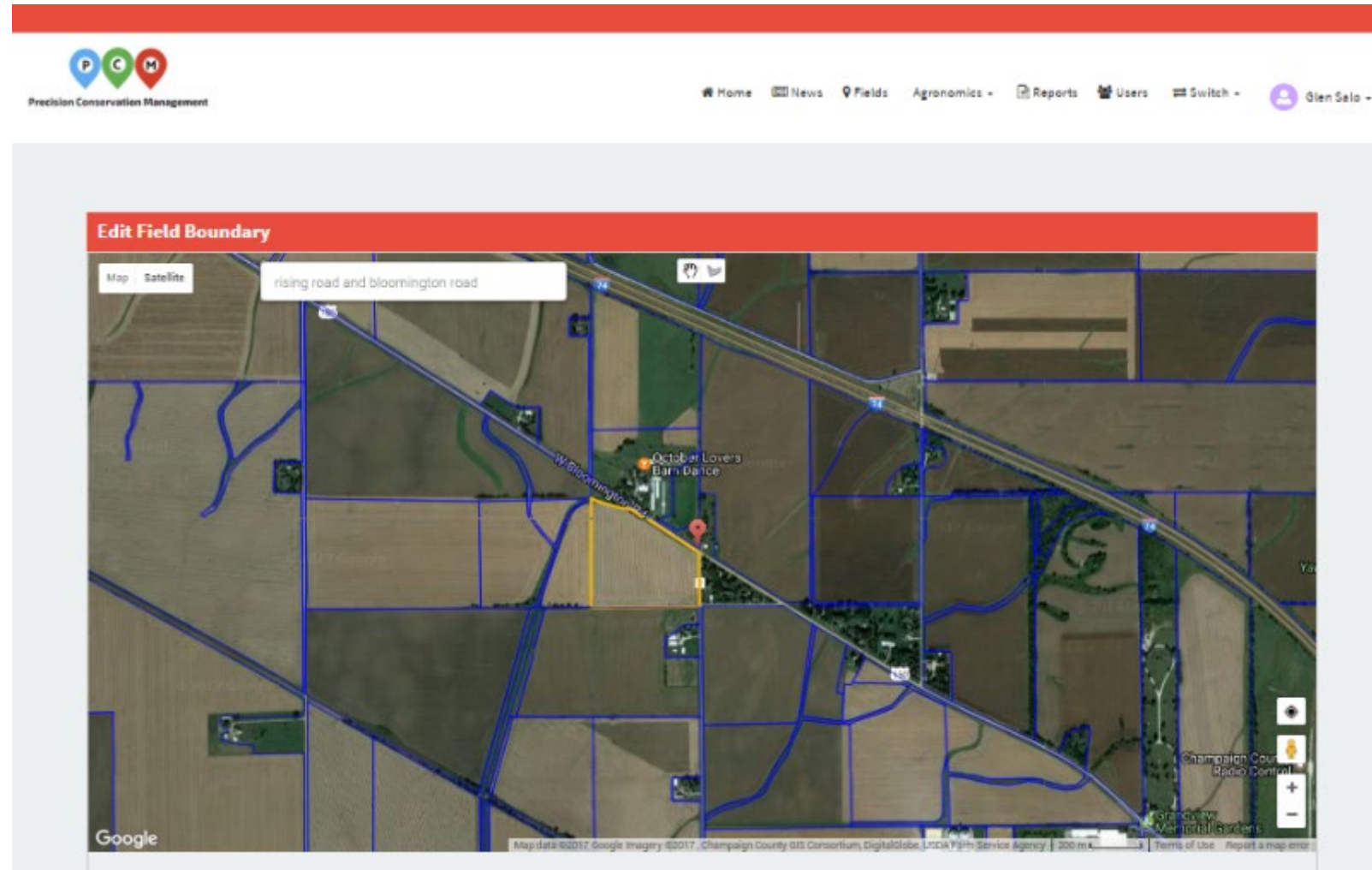
2. Crops

3. Systems

- Conventional
- Non-GMO
- Seed Corn/Bean
- Organic/Transitioning

4. Programs

- Every Pass Across Field
- Inputs; Rates



Calculating Economic Returns

Field Passes (Soybeans to Corn)

Cover Crop

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

Conventional

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

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

Operator and land returns

Crop revenue (Yield times the same price per year)

- Direct costs (fertilizer, seed, chemicals)
- Power costs (each pass has a cost)
- Overhead costs (same for each farm)

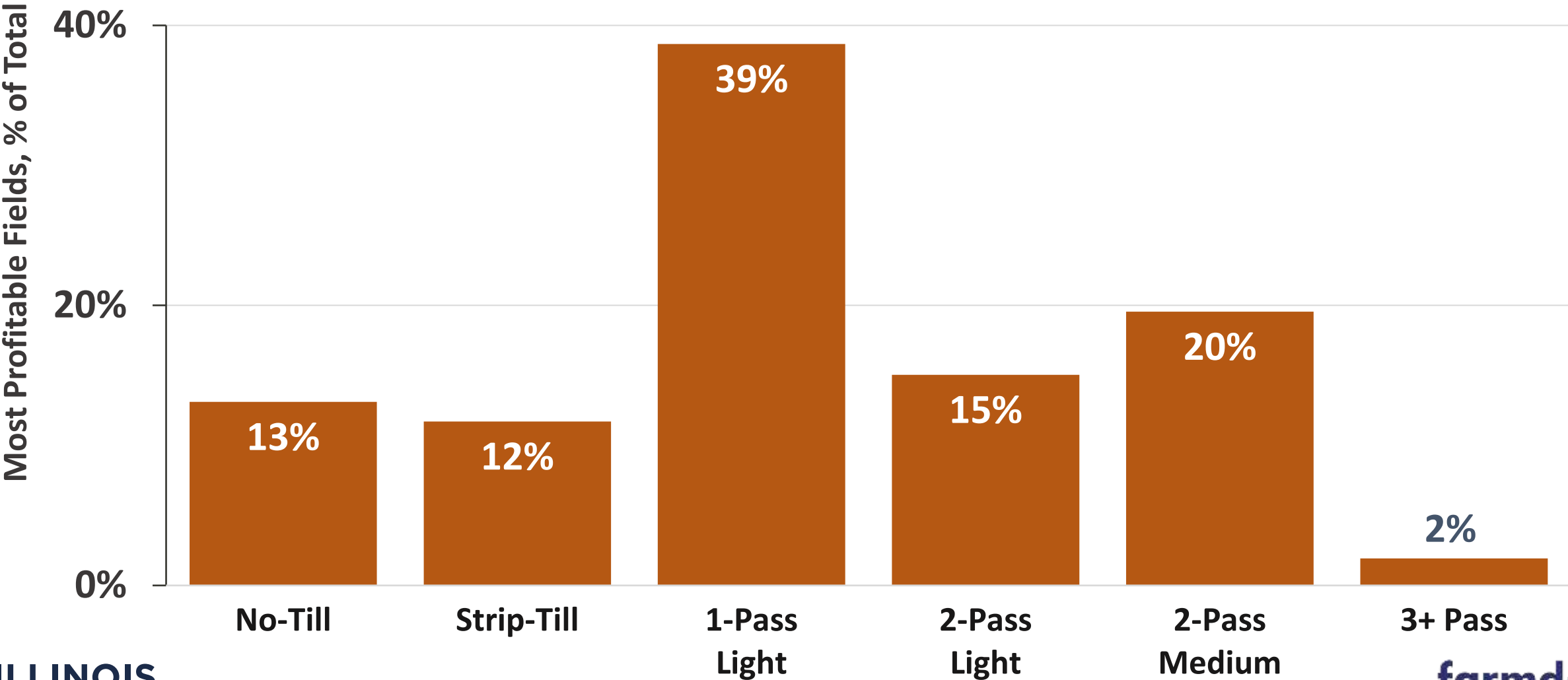
Operator and land return

Corn -- Tillage



Tillage & Profitability: Corn

Top 25% Most Profitable for 2015-2020



Average Return, Yield, and Cost, High SPR, 2015-2020

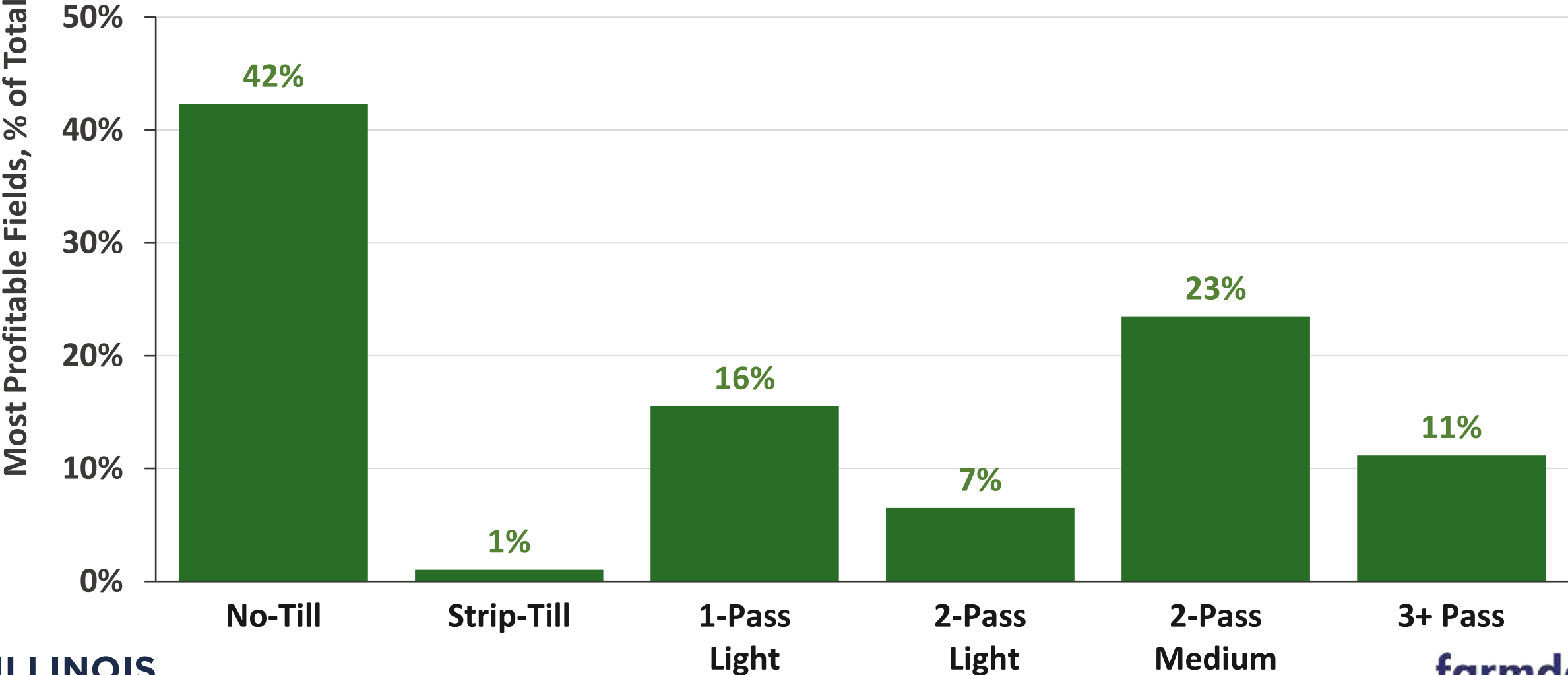
	% of Fields	Operator and Land Return	Yield	Direct Cost	Power Cost	Total Non-Land Cost
No-Till	13%	272	213	384	97	519
Strip-Till	15%	256	219	401	112	550
1-Pass Light	37%	279	218	387	106	530
2-Pass Light	13%	276	224	391	116	545
2-Pass Medium	20%	261	222	391	122	550
3+ Pass	2%	247	230	414	136	588

Soybeans -- Tillage



Tillage & Profitability: Soybean

Top 25% Most Profitable for 2015-2020



Average Return, Yield, and Cost, High SPR, 2015-2020

	% of Fields	Operator and Land Return	Yield	Direct Cost	Power Cost	Total Non-Land Cost
No-Till	45%	356	67	149	74	254
1-Pass Light	15%	362	68	143	84	258
2-Pass Light	5%	364	68	135	89	255
2-Pass Medium	19%	379	73	150	97	277
3+ Pass	14%	345	68	132	110	273



N Management Cost Comparisons

N Timing Comparisons

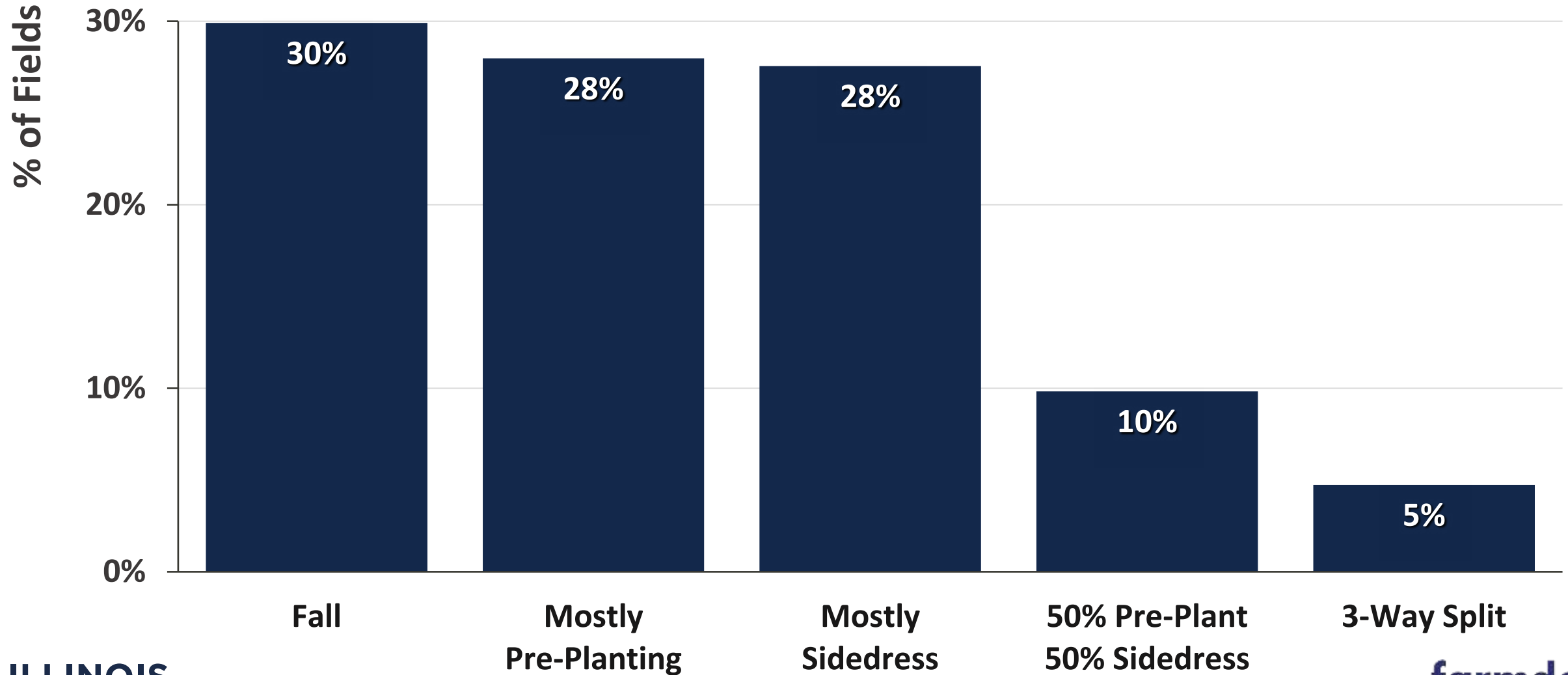
N Rate Comparisons

Nitrogen standards

- **Fall – >40% of total nitrogen is applied in fall**
- **Mostly pre-plant – majority of nitrogen is applied in spring before planting or at planting**
- **Mostly sidedress – majority of nitrogen is applied after planting**
- **50% pre-plant / 50% sidedress – Split application**
- **3-way split – split application with three passes (<40% fall-applied)**

Nitrogen values are total pounds of actual N, including that in dry fertilizer (DAP, MAP)

Percent of Fields in Nitrogen Benchmarks, 2015-2020



Average Return, Yield, and Cost, High SPR, 2015-2020

	% of Fields	Operator and Land Return	Yield	N Rate lb/acre	Direct Cost	Power Cost	Total Non-Land Cost
Fall	35%	258	220	212	400	113	550
Mostly Pre-Planting	24%	287	218	203	376	107	521
Mostly Sidedress	26%	276	220	201	388	112	537
50% Pre-Plant 50% Sidedress	10%	259	218	198	389	111	537
3-Way Split	5%	246	221	215	428	114	579

Average Nitrogen Cost, High SPR, 2015-2020

	2015 to 2020 \$/acre	2015 \$/acre	2016 \$/acre	2017 \$/acre	2018 \$/acre	2019 \$/acre	2020 \$/acre
Fall	79	96	86	74	72	85	82
Mostly Pre-Planting	78	89	80	70	70	81	86
Mostly Sidedress	75	91	71	69	69	77	81
50% Pre-Plant 50% Sidedress	80	102	79	75	72	82	88
3-Way Split	91	111	91	87	79	110	90

2021 MRTN Recommendation (in pounds of N applied)^{1,2}

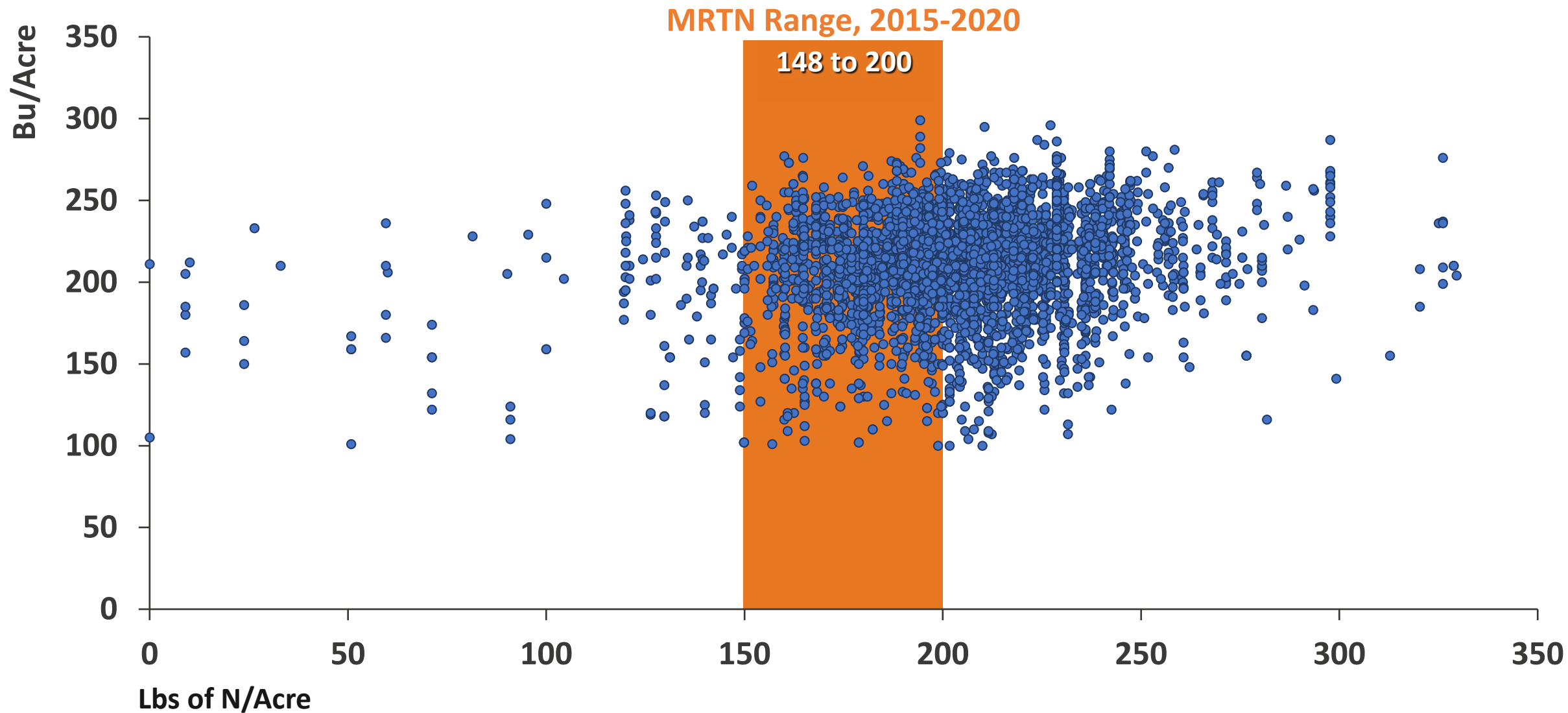


	Corn-Following-Soybeans		Corn-Following-Corn	
	Anhydrous Ammonia lbs/acre	28% Nitrogen Solution lbs/acre	Anhydrous Ammonia lbs/acre	28% Nitrogen Solution lbs/acre
North	178	159	213	194
Central	187	172	202	190
South	206	191	206	186

¹Taken from Corn Nitrogen Rate Calculator (<http://cnrc.agron.iastate.edu/nRate.aspx>) on June 22, 2021

²MRTNs determined with a \$5.00 corn price, \$700 per ton anhydrous ammonia price, and \$360 per ton nitrogen solution price.

Nitrogen Application and Yield, 2015-2020



Yield and Returns by MRTN Nitrogen Categories

Category	Yield bu/acre	Returns \$/acre
Below MRTN	-16*	-16
MRTN		
Above 1	-1	-20*
Above 2	6*	-21*
Above 3	7*	-31*
Above 4	18*	-31*

***Indicates significant different at 5% levels from MRTN category after controlling for soil productivity**

Summary

1. For the PCM fields, 70% receive a nitrogen application greater than the MRTN profitable range
2. MRTN most profitable nitrogen application rates
3. On average, mostly pre-planting and mostly sidedress had the highest operator and land return
4. Mostly pre-planting and mostly sidedress also had the lowest nitrogen costs

Cover Crops: Lessons for New Adopters

Need to “experiment” with cover crops

Cover Crop Standards

- Overwintering
- Winter Terminal
- None

Cover Crop Benchmarks (2016 to 2020)

Cover crop	Soybeans			Corn		
	Yield Bu/Acre	Non-land Costs \$/Acre	Return \$/Acre	Yield Bu/Acre	Non-land Costs \$/Acre	Return \$/Acre
Overwintering	68	\$269	\$344	214	\$545	\$232
Winter Terminal	67	\$254	\$371	218	\$532	\$263
No cover crop	69	\$258	\$388	220	\$540	\$261
Count	372 overwintering 21 winter terminal 4,546 no cover crop fields			150 overwintering 65 winter terminal 2,815 no cover crop fields		

Cover Crop on Soybeans, 2016 – 2020, High SPR Fields, All fields and no-till

	All Fields			No-till		
	None	Over-wintering	diff	None	Over-wintering	diff
No of fields	2546	372		933	236	
Yield	69	68		67	67	
Gross Revenue	\$628	\$619	-\$9	\$613	\$611	-\$2
Direct non-cover costs ¹	141	139	-2	143	135	-8
Power non-cover costs	86	72	-14	67	67	0
Overhead	30	30	0	30	30	0
Cover crop costs ²		28	28		26	26
Total Non-land costs	\$258	\$269	\$11	\$240	\$258	\$18
Operator and land returns	\$370	\$350	-\$20	\$373	\$353	-\$20

1 Seed, pesticides, fertilizer, drying, storage, crop insurance.

2 Cover crop seed, planting, and termination costs

Cover Crops

- Cover crops are key to reducing nutrient losses and reducing greenhouse gas emissions
- Soybeans don't find a yield drag, particularly when control for tillage.
- Need to keep cover crop costs in line
- Expect policy innovations in this area
- Ecosystem service markets offers farmers opportunity to benefit from conservation practice



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