The Yield Trap

College of Agricultural, Consumer & Environmental Sciences
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

P | C | M
Precision Conservation Management

South Dakota State University Extension

IL CORN GROWERS ASSOCIATION

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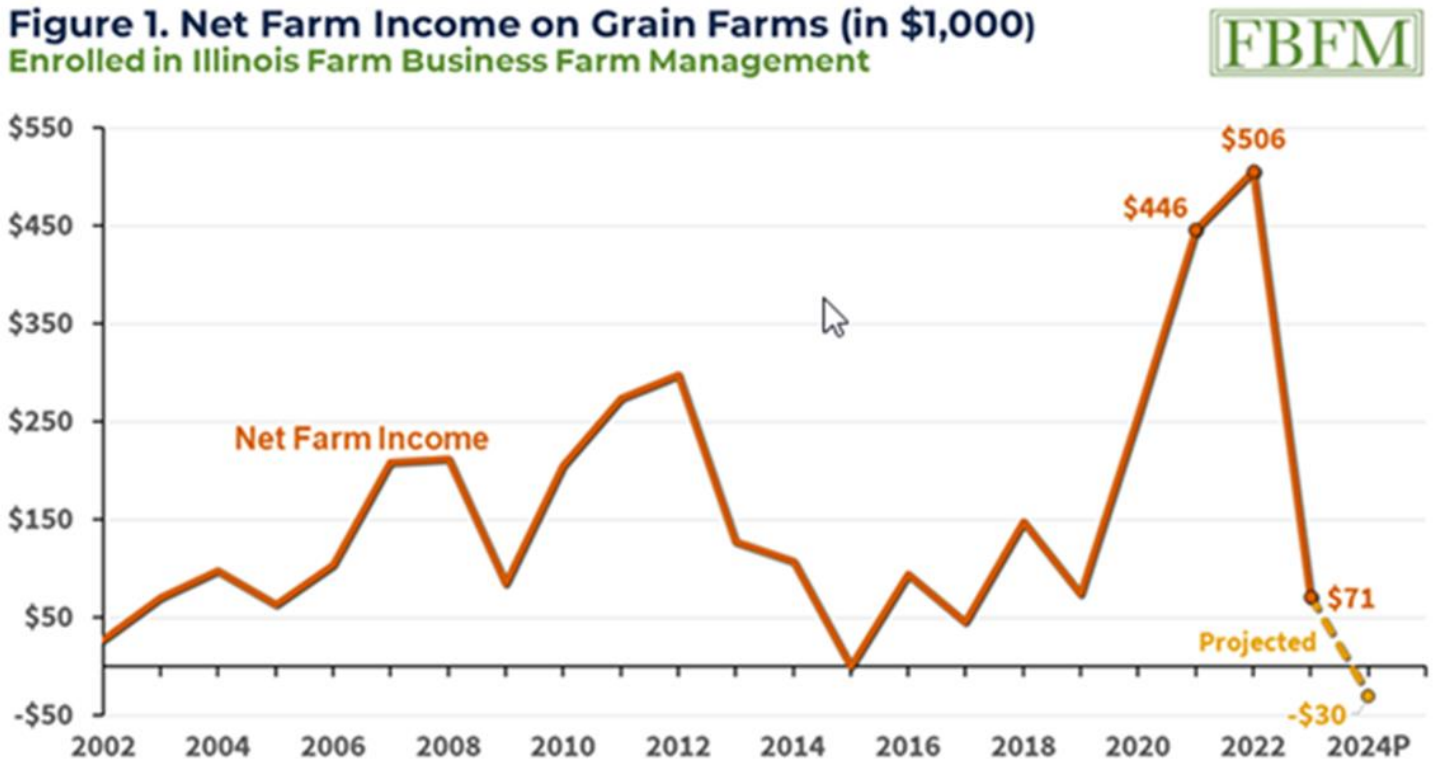
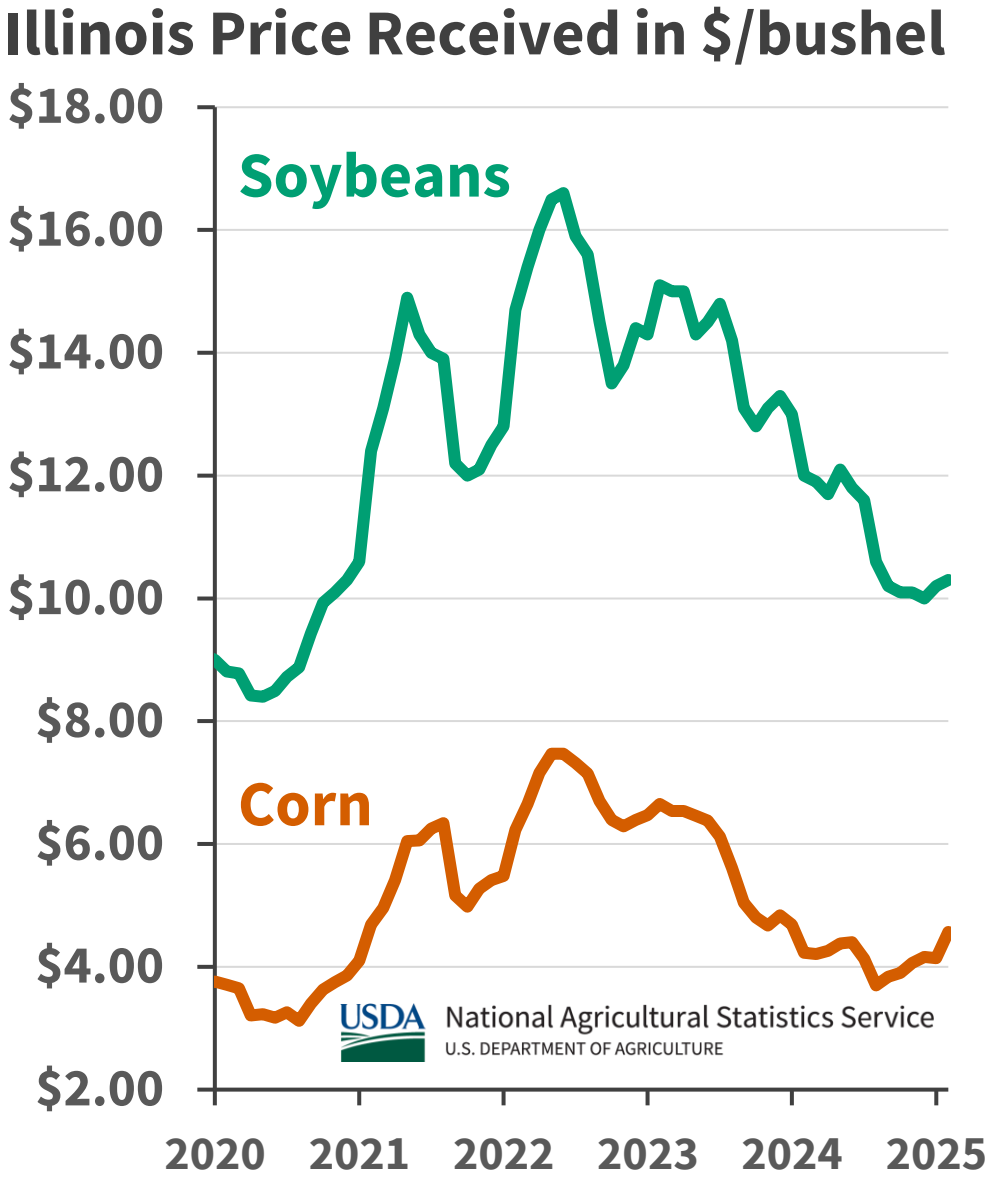
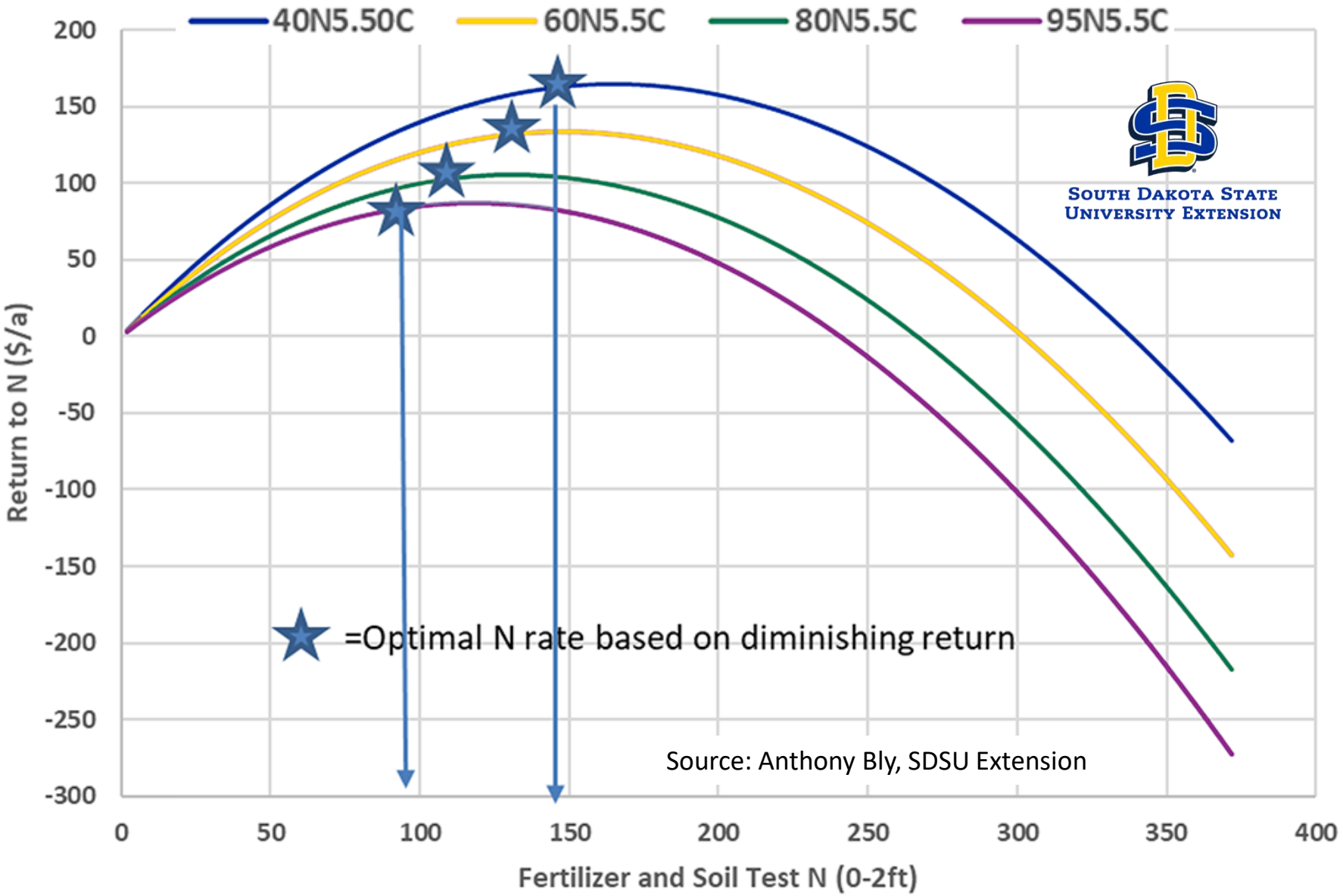
Current Financial Situation, 2025





Profit vs. Yield Maximization



Examples of PCM data demonstrating that highest yields don't always equate to highest profits

CORN, Low-SPR (2015-23 avg. values) N Rate lbs/a	<150	151-175	176-200	201-225	>225
# fields	246	646	1533	1534	836
AVG. CORN YIELD (bu/a)	178	192	197	200	207
OPERATOR & LAND RETURN	$293	$285	$292	$278	$266
GHG emissions (metric tons CO2e/a)	0.28	0.46	0.65	0.68	0.85

Corn N RATE, HIGH SPR, LBS PER ACRE I 2015-23 AVG VALUES	<150	151-175	176-200	201-225	>225
# fields	181	599	1,854	2,558	1,430
AVG Corn Yield (bu/a) 2015-23	208	218	220	223	229
OPERATOR & LAND RETURN	$361	$371	$365	$354	$346
GHG emissions (metric tons CO2e/a)	0.38	0.61	0.66	0.74	0.9

Corn HIGH SPR, N TIMING I 2015-23 AVG VALUES	>40% FALL	MOSTLY PREPLANT	MOSTLY SIDEDRESS	50% PRE/ 50% SIDEDRESS	3-WAY SPLIT
NUE (lb N/bu grain)	0.97	0.91	0.90	0.93	0.92
# fields	2,690	1,364	1,514	474	580
Yield per acre	224	220	223	221	225
GROSS REVENUE	$964	$943	$956	$951	$970
N fertilizer	$102	$96	$95	$109	$104
Other direct costs	$349	$323	$338	$344	$369
TOTAL DIRECT COSTS*	$451	$419	$433	$453	$473
Field Work	$16	$16	$17	$16	$20
Other power costs	$106	$98	$104	$104	$104
TOTAL POWER COSTS**	$122	$114	$121	$120	$124
OVERHEAD COSTS	$39	$39	$39	$39	$39
TOTAL NON-LAND COSTS	$613	$573	$594	$612	$636
OPERATOR & LAND RETURN	$351	$370	$362	$339	$334

Reducing Costs and Risks

Nitrogen Rate and Timing Study

Research Questions:

- Do farmers who follow the MRTN have higher yield or profits than farmers who do not?
- Which nitrogen timing results in the highest yield and returns?

Data:

- 68% of fields in the dataset receive a nitrogen application above the MRTN profitable range.

Takeaways

- Results suggest that applying above the MRTN increases yield but does not increase returns compared to applying at the MRTN

- The 50% pre-plant/50% post-plant benchmark has 7 bu/acre higher yield compared to fall nitrogen

- Farmers could shift away from fall nitrogen and maintain the same level of profitability

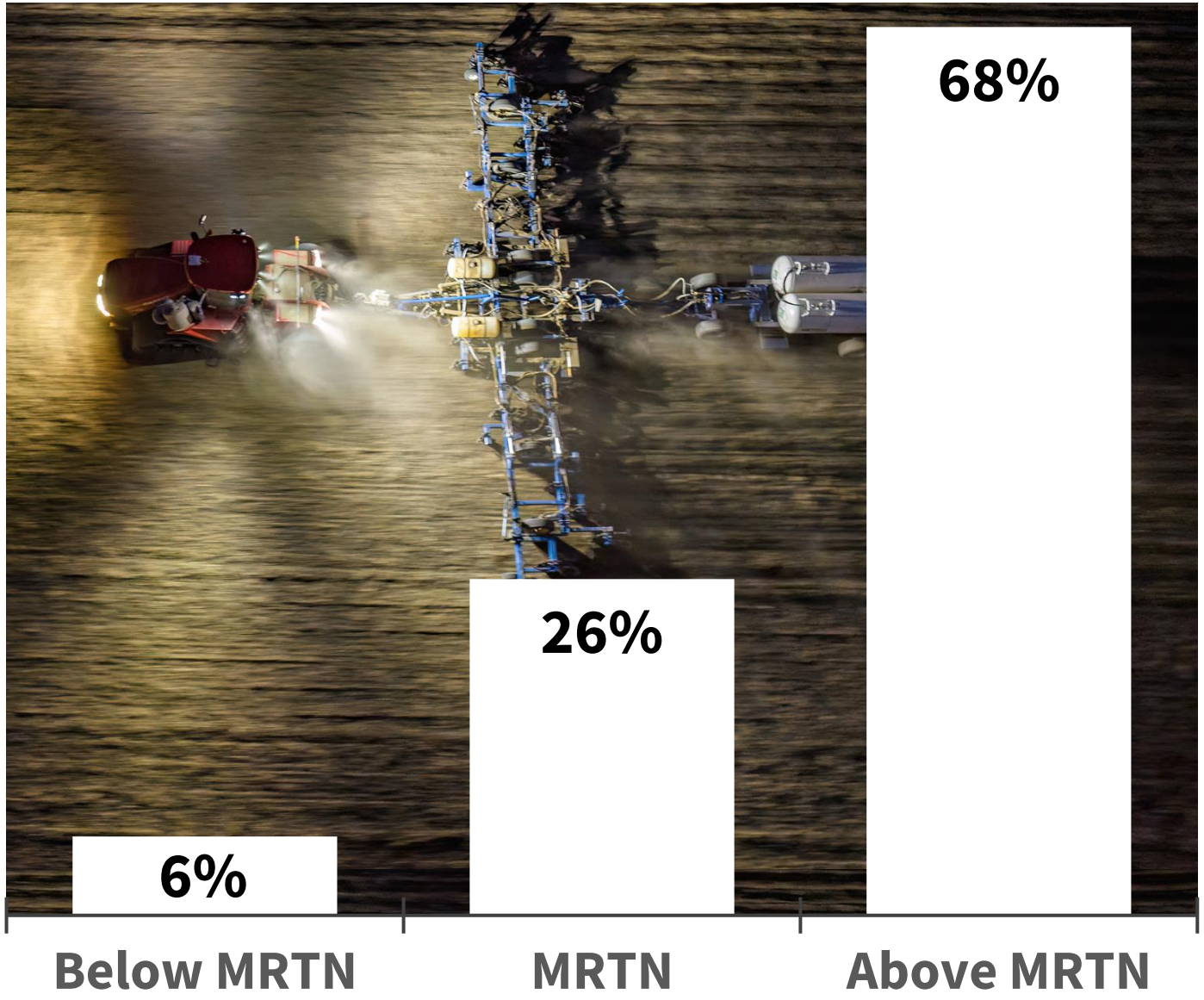
MRTN Adoption Study

What are the observed factors associated with the adoption of the MRTN in Illinois?

Results:

Extension strategies should target farmers that you would think based on their characteristics should be using the MRTN but are not

Percent of Fields Below, At, and Above MRTN



Takeaways

- Increases Likelihood of Adopting MRTN:
  - Cover crops
  - Enrollment in an NRCS program
  - Use of strip-till or no-till
- Decreases Likelihood of Adopting MRTN:
  - Custom application

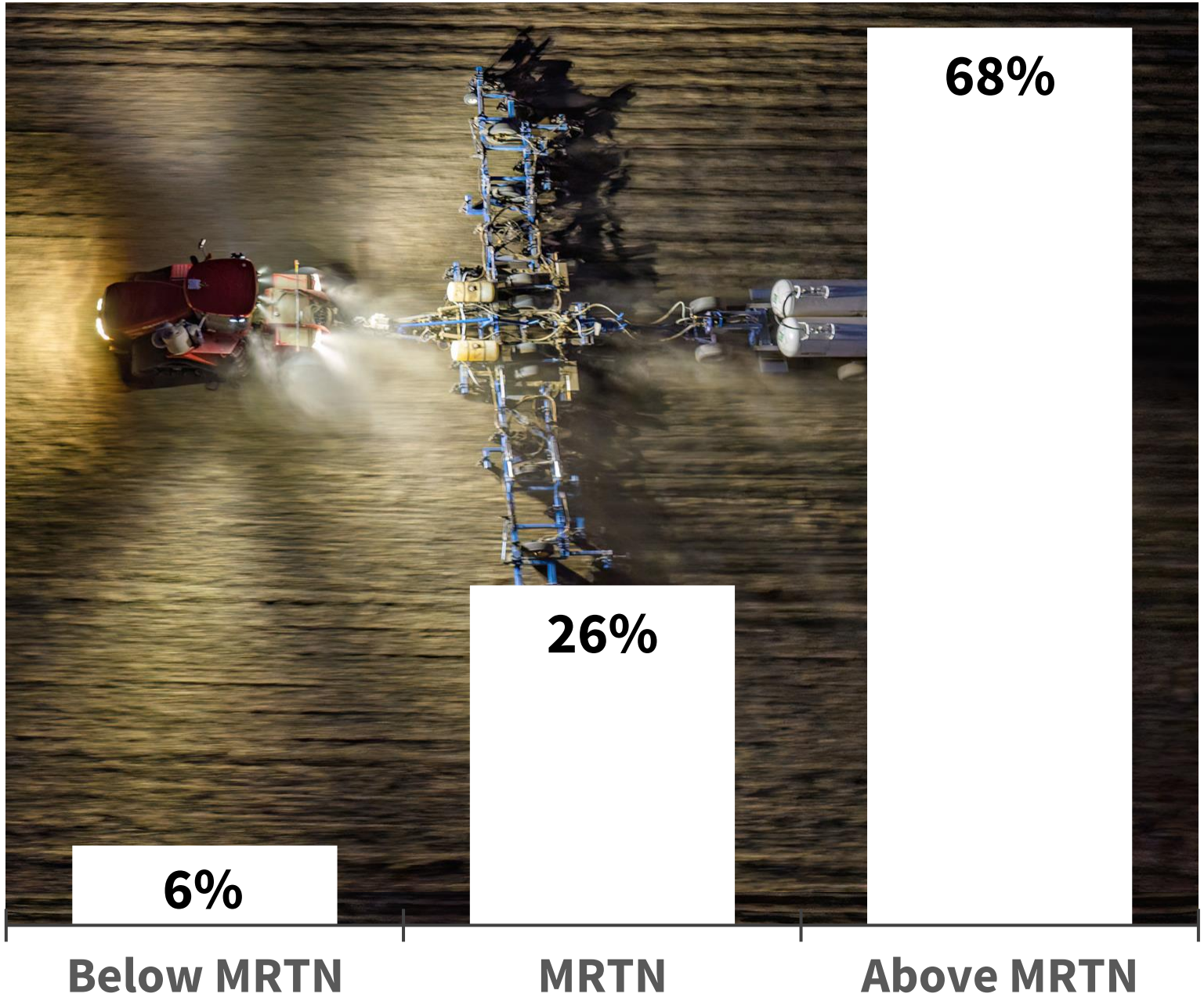
N Fertilizer Rates: MRTNs, 2015-2022

in lbs. of actual N/acre

Year	MRTN, Corn Following Soybeans[1]	Profitable Nitrogen Range, Corn Following Soybeans	PCM Most Profitable N Rate Range (lb N/a)	Net Return at PCM Most Profitable Range ($/a)
2016	168	154 – 184	151-175, 176-200	$279
2017	172	158 – 189	<150 (131)	$273
2018	176	161 – 193	151-175 (168)	$377
2019	173	158 – 189	151-175 (167)	$273
2020	184	169 – 200	151-175(165)	$327
2021	194	179 – 210	<150 (116)	$767
2022	165	155 – 176	151-175 (163)	$806
2023	182	171-194	<150 (133)	$351

N Fertilizer Rates

% of PCM Fields Below, At, and Above MRTN



Reducing Direct Costs

N fertilizer is a "low hanging fruit"

- Apply N at the University MRTN rate
- Apply more in-season than in fall

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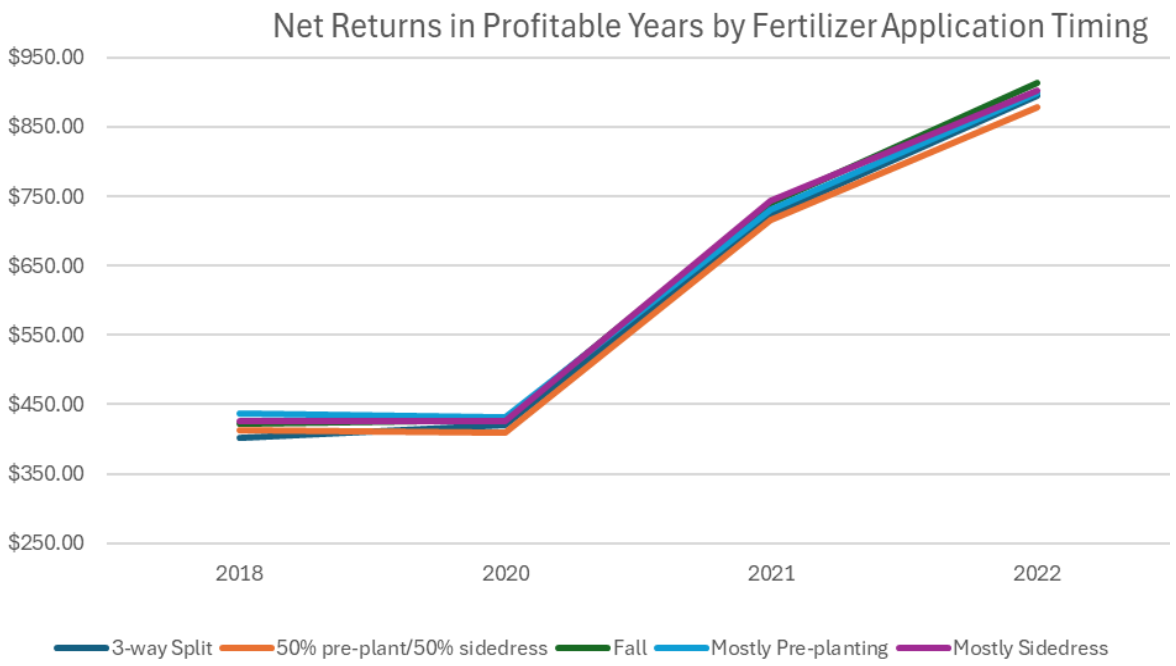
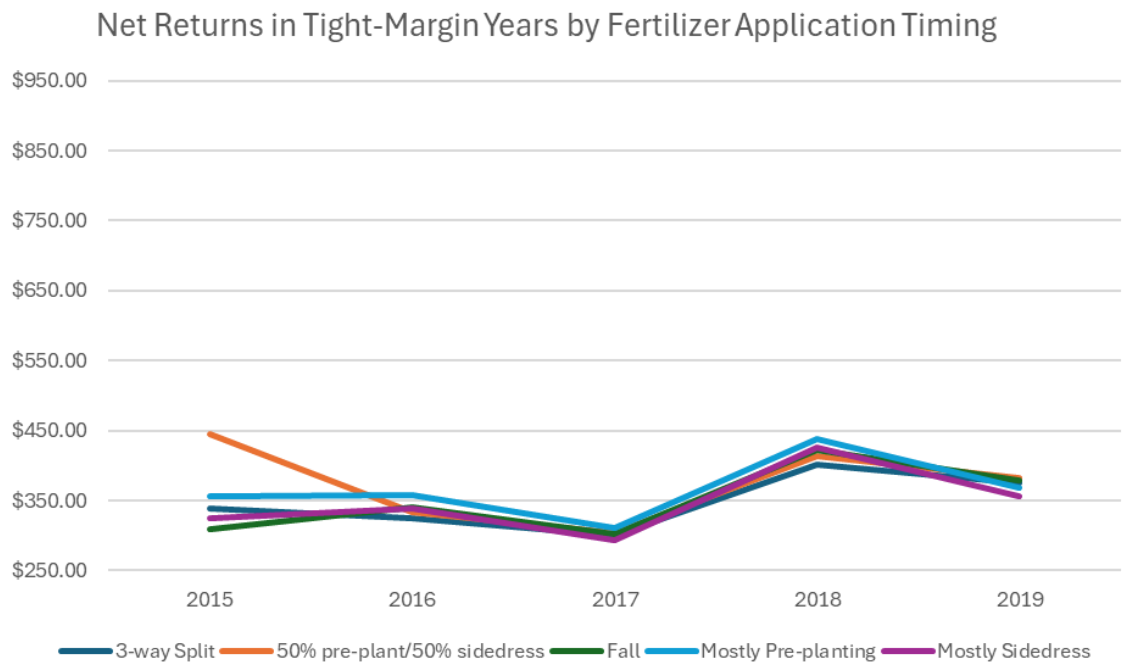
Reducing Direct Costs

Lesson: In profitable years, N timing is less impactful on net returns. In lean years, in-season N application is more profitable.





Reducing Direct Costs, N Fertilizer Costs

N fertilizer is a “low hanging fruit”

Move toward in-season application during tight-margin years

Reducing Power Costs

- Combine trips across the field
- Reduce tillage
  - High SPR
  - Low SPR – corn is straightforward vs. nuance of soybean yields

Corn HIGH SPR | 2015-23 AVG VALUES	NO-TILL	STRIP TILL	1-PASS LIGHT	2-PASS LIGHT	2-PASS MODERATE	2+ TILLAGE PASSES
# of fields	1,262	1,628	1,964	708	889	112
Yield per acre	219	221	222	227	227	223
GROSS REVENUE	$944	$953	$952	$976	$975	$963
TOTAL DIRECT COSTS*	$437	$456	$432	$442	$450	$446
Field work	$0	$22	$11	$25	$29	$41
Other power costs	$108	$101	$105	$103	$102	$106
TOTAL POWER COSTS**	$108	$123	$116	$128	$131	$147
OVERHEAD COSTS	$39	$39	$39	$39	$39	$39
TOTAL NON-LAND COSTS	$584	$618	$587	$609	$620	$632
OPERATOR & LAND RETURN	**$360**	**$335**	**$365**	**$367**	**$355**	**$331**
Estimated soil loss (tons/a)	0.66	0.61	2.02	1.87	1.63	2.31
Soil Carbon Index (-1 to 1, higher=better)	0.69	0.79	0.50	0.54	0.54	0.44
GHG emissions (metric tons CO2e/a)	0.62			0.83		1.00

Reducing Power Costs

- Combine trips across the field
- Reduce tillage
  - High SPR
  - Low SPR – corn is straightforward vs. nuance of soybean yields

CORN, Low-SPR (2015-23 avg. values)	NO-TILL	STRIP TILL	1-PASS LIGHT	2-PASS LIGHT	2-PASS MODERATE	2+ TILLAGE PASSES
# fields	1498	720	1275	472	583	168
Yield per acre	191	203	195	205	197	211
GROSS REVENUE	$824	$881	$840	$888	$848	$901
TOTAL DIRECT COSTS*	$405	$443	$418	$415	$412	$441
Field Work	$0	$21	$11	$25	$27	$40
Other power costs	$106	$100	$100	$99	$98	$97
TOTAL POWER COSTS*	$106	$121	$111	$124	$125	$137
OVERHEAD COSTS	$39	$39	$39	$39	$39	$39
TOTAL NON-LAND COSTS	$551	$604	$569	$578	$576	$618
OPERATOR & LAND RETURN	**$273**	**$277**	**$272**	**$310**	**$272**	**$283**
Estimated Soil Loss (Tons/a)	0.99	0.77	1.76	1.85	2.00	2.38
GHG emissions (metric tons CO2e/a)	0.57	0.75				0.95

Reducing Power Costs

- Combine trips across the field
- Reduce tillage
  - High SPR
  - Low SPR – corn is straightforward vs. nuance of soybean yields

SOYBEANS, Low SPR (2015-23 avg. values)	NO-TILL	STRIP TILL	1-PASS LIGHT	2-PASS LIGHT	2-PASS MODERATE	2+ TILLAGE PASSES
# fields	2940	29	620	287	398	267
Yield per acre	62	65	61	63	64	65
GROSS REVENUE	$655	$770	$653	$676	$677	$690
TOTAL DIRECT COSTS*	$173	$226	$167	$163	$163	$157
Field Work	$0	$22	$12	$25	$26	$44
Other power costs	$80	$91	$75	$73	$71	$72
TOTAL POWER COSTS*	$80	$113	$88	$98	$97	$116
OVERHEAD COSTS	$33	$35	$33	$33	$33	$33
TOTAL NON-LAND COSTS	$286	$374	$287	$293	$292	$305
OPERATOR & LAND RETURN	**$369**	**$395**	**$366**	**$382**	**$385**	**$385**
Estimated Soil Loss (Tons/a)	1.55	1.38	1.67	3.49	3.60	3.97
GHG emissions (metric tons CO2e/a)	-0.23	-0.02				0.16

Reducing Risks

- Chances of low yields did not increase with cover crops
- But it still increases your costs
- Might not be the year to start with cover crops

Soybean HIGH SPR | 2015-23 AVG VALUES	OVERWINTERING	WINTER TERMINAL	NO COVER CROP
# of fields	1,340	44	4,554
Yield per acre	68	71	70
Soil Productivity Rating (SPR)	139	139	140
GROSS REVENUE	$723	$762	$747
COVER CROP SEED	$14	$16	$0
TOTAL DIRECT COSTS*	$180	$180	$173
COVER CROP PLANTING	$11	$16	$0
Other power costs	$95	$75	$89
TOTAL POWER COSTS**	$106	$91	$89
OVERHEAD COSTS	$33	$33	$33
TOTAL NON-LAND COSTS	$318	$304	$295
OPERATOR & LAND RETURN	$375-$425	$435-$485	$452
Estimated soil loss (tons/a)	1.24	1.12	2.03
GHG emissions (metric tons CO2e/a)	-0.42		-0.02

Data

- Conventional, non-manured soybean fields from 2015-2022
- Data represents 370 farmers, 3,074 fields, and 5,292 field observations
- Research question:
  How do tillage and cover crops affect yield and profit?

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Tillage and Cover Crop Benchmarks

Tillage

- No-Till
- Strip-Till
- One-Pass Tillage
- Two-Pass Tillage
- Three or More Pass Tillage

Cover Crops

- Cover Crop
- No Cover Crop

South Dakota State University Extension

Results

- No-Till systems reduce yield by 1 bu/acre, but do not reduce profit
- Three-pass tillage systems are $27/acre less profitable than one-pass tillage systems
- Cover crops do not affect yield and decrease profit by $40/acre
- Farmers can do any tillage system besides three or more passes of tillage and be equally as profitable

SOUTH DAKOTA STATE UNIVERSITY EXTENSION

Finding Additional Revenue Streams

Cost-Share Incentives

Precision Conservation Management

Earn up to $60 per acre through PCM & partner incentives!

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The Alliance for Sustainable Agriculture

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Stacking Payments

Precision Conservation Management

Stacking conservation incentives is possible but can be complicated.

Your PCM Specialist can show you the best options for your farm!

The basics

Federal/State Funding: You cannot be paid twice for the same practice on the same acre. You are contracted **by practice**.

Carbon Credits: You cannot sell a carbon credit or receive a carbon intensity premium twice from the same acre, **no matter the practice**.

Climate-Smart Commodities Programs:
You cannot be enrolled in two of these programs at the same time.

How Can PCM Help You?

Precision Conservation Management

1. Get a better understanding of your farm financials and a pathway to profitable conservation farming. This service is **free** to farmers in PCM regions.

2. After we benchmark your operation, we can provide you with **conservation funding from our partners**. We can even provide incentives for previous use of cover crops and no-till.

3. PCM Specialists help you to **understand conservation program options**. Our staff has expertise in most IL, KY, and NE conservation programs.

Whether you receive funding through PCM or someone else, our goal is to get conservation on the ground. You have nothing to lose!

We all need a little help sometimes...

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