A program of the

Illinois Corn Growers Association

2015–2018 Data Summary

The Business Case for Conservation

Cost-Benefit Analysis of Conservation Practices

P C M

Precision Conservation Management

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Note for the reader:

To truly utilize the economic benefit of conservation practices, you must suspend the belief that higher corn yields equal increased profitability. As a farm organization, we believe this quest for higher yields has been "baked" into farmers' psyche for generations. We'd like to challenge readers to consider that obtaining high yields, and the higher input costs that goal often requires, may not be the best economic or conservation model for Illinois farms and Illinois farm families.

What is Precision Conservation Management?

In 2016, the Illinois Corn Growers Association launched a farmer service program, Precision Conservation Management, in response to the Illinois Nutrient Loss Reduction Strategy. The objective of PCM is to work one-on-one with farmers to help them understand the costs and benefits of adopting new conservation practices. By joining PCM, farmers agree to allow IL Corn to aggregate and anonymize their data in a way that demonstrates how conservation practices affect both society and farm income. The advantage of PCM to individual farmers is that they have their own PCM specialist who helps them make decisions about adopting conservation practices in a financially responsible way. But PCM also represents a tremendous opportunity for state and national policymakers and the average consumer to gain a greater understanding of what they are demanding of farmers when they make cavalier statements about how agriculture is negatively impacting our environment. Farmers operate within the confines of the market system, and while there are opportunities to reduce our impact on the environment, each farmer must carefully weigh how those decisions impacts them and their family's financial future.

Using PCM's online farmer portal, farmers can view tables comparing the financial returns of their own farming practices versus aggregated averages of other tillage, cover crop and nutrient management practices. These engineered economic cost tables are generated using standard input and operation costs derived from Farm Business Farm Management (FBFM) data and the University of Illinois Ag Economics Department.

Heartland Science & Technology Group has built the computer platform PCM uses and has also done work for the Department of Defense. We feel very confident that this system keeps farmer data confidential.

Today, PCM works with 200 farmers on 1,900 fields and 200,000 acres.

Users can also enter their own financial numbers in place of the standard costs to get a more individualized assessment of their own on-farm economics.

The farmer's individual information is protected in this system* and is not shared unless the individual farmer grants permission. In this case, data is anonymized and aggregated before it is shared with researchers. Through this system the farmer has access to the agronomic data on each field for his or her farm to see how well the conservation practices may be working.

PCM relies on an extensive set of team members including the U of I, FBFM and Heartland Science & Technology, to aggregate, assess and compare each of these data sets. Now, in its fourth year working with Illinois farmers, PCM is prepared to make some recommendations to help farmers accomplish both their economic and their conservation goals.

The PCM program is focused on the following Illinois counties: Champaign, Christian, Coles, DeWitt, Douglas, Edgar, Ford, Livingston, Macon, Macoupin, McLean, Piatt, Sangamon, Tazewell, Vermilion, Woodford. The program is also offered in Kentucky.

Nitrogen Application Data & Recommendations

PCM nitrogen fertilizer management analysis shows that corn fields receiving more than 40% of the total nitrogen application in the fall demonstrated lower corn yields, higher nitrogen fertilizer application rates and higher total costs than most in-season nitrogen fertilizer application systems, resulting in reduced operator net financial return.

The most profitable nitrogen application system applied less than 40% of the total nitrogen application in the fall with the balance approximately halved between pre-plant and sidedress applications (referred to as the "3-way split" in Table 1).

Table 1 – Economic returns resulting from various nitrogen fertilizer management strategies for corn production in central Illinois from 2015-2018. All soil types combined.

PCM N MANAGEMENT PROGRAM	>40% FALL	MOSTLY PRE-PLANT	MOSTLY SIDEDRESS	50% PRE/50%-SIDEDRESS	3-WAY SPLIT
AVG NUE (lb N/bu grain)	1.00	1.00	0.94	0.94	0.96
Yield (bu/acre)	218	212	218	221	234
No. Fields	585	497	488	209	43
GROSS REVENUE	***$766***	***$742***	***$760***	***$762***	***$814***
N fertilizer	$76	$67	$67	$78	$72
Other direct costs*	$296	$274	$299	$296	$297
TOTAL DIRECT COSTS	***$372***	***$341***	***$366***	***$374***	***$369***
Field work	$15	$16	$16	$19	$15
Other power costs**	$96	$88	$93	$92	$95
TOTAL POWER COSTS	***$111***	***$104***	***$109***	***$111***	***$110***
OVERHEAD COSTS	***$36***	***$36***	***$36***	***$36***	***$36***
TOTAL NON-LAND COSTS	***$520***	***$482***	***$512***	***$521***	***$516***
OPERATOR & LAND RETURN	$246	$260	$248	$240	$298

**Direct costs = fertilizers, pesticides, seed, cover crop seed, drying, storage and crop insurance | **Other power costs = fall fertilizer application, spraying, planting, cover crop planting, spring/in-season fertilizer application, harvesting and grain hauling*

Table 2 – Nitrogen Rates, Yields and Returns. This table demonstrates that the greatest net income is generated from the 151 to 175 lb of total nitrogen per acre rate range when averaged over all years and soils. For reference, corn following soybean rate recommended from the Maximum Return to Nitrogen rate calculator would be about 183 lb nitrogen per acre.

N amount (lbs per acre)	No. of Fields*	SPR	Yield				Operator and land return*
			2015	2016	2017	Average*	
			Bushels per acre				
Less than 150	30	133	142	213	218	**191**	241
151 to 175	61	135	196	209	212	**206**	277
176 to 200	224	132	182	211	214	**202**	248
201 to 225	375	135	196	216	214	**208**	253
Over 225	244	134	187	209	218	**204**	223

**Over three years (weighted by fields)*

Is Changing Nitrogen Applications Your Strategy?

1. Plan to apply less than 40% of your farm's nitrogen rate in the fall and split the remaining rate over pre-plant and sidedress applications.
2. Consider reducing overall nitrogen applications closer to the university recommended MRTN rate.

For more information on economic impact of nitrogen application timing and rates, visit **ilcorn.org/PCM.**

Between now and 2025, we all have to do something different on each acre to achieve the goals of the Illinois Nutrient Loss Reduction Strategy. *We can't do what we've always done and avoid negative publicity or difficult regulations like we see in surrounding states. I use PCM to help inform the decisions I'm making on each acre to make sure my farm is profitable. It's been a valuable tool for me.*

Dirk Rice, PCM farmer

"Thank you to all the PCM farmers who agreed to let us use their data to help other farmers in Illinois and across the Midwest. ***Thank you for letting us all learn from your successes and mistakes and helping us make all of Midwest agriculture better, more profitable and more sustainable.*** *We appreciate your willingness to help fellow farmers even when you know they are your competitors. It is this sense of community and camaraderie that embodies the spirit of the American farmer."*

Dr. Laura Gentry

Cover Crop Data & Recommendations

Growing cover crops is a single management practice solution that addresses an assortment of management and natural resource challenges. For nutrient-loss-related water quality issues, no in-field practice is more effective than cover crops, year in and year out. Cover crops also address soil erosion issues, build soil organic matter, improve water infiltration and encourage greater soil biological activity.

From 2015 to 2018, PCM farmers grew over 30,000 acres of cover crops in Illinois, and some of our initial findings are summarized below. Please understand that there are many ways to grow cover crops profitably, and this data is not meant to represent a "best way" to implement cover crops on your farm. Finally, please note that in the data set shown here, the overwhelming majority of PCM farmers do not produce cover crops, which is reflective of the larger farming community.

The data here shows that cover crops were not correlated with reduced soybean yields regardless of soil type (Table 3) and were found to reduce corn yields by as much as 5 bushels per acre (lower-productivity soils) or by as much as 3 bushels per acre (higher-productivity soils) (Tables 4 and 5). Regardless of a negligible impact on crop yields, other costs associated with growing cover crops, such as seed and planting costs and/or termination costs, can result in reduced net profitability as seen in Table 4.

Table 3 – Economic returns resulting from incorporating cover crops into soybean production systems in central Illinois from 2015-2018. All soil productivity ratings, combined.

PCM PROGRAM – IL 2015-2018 AVG VALUES	OVER-WINTERING COVER CROP	WINTER-TERMINAL COVER CROP	NO COVER CROP
No. Fields	212	25	1876
Yield (bu/acre)	68	67	67
Soil Productivity Rating	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

*Direct costs = fertilizers, pesticides, crop seed, cover crop seed, drying, storage and crop insurance | Power costs = tillage, fall fertilizer application, spraying, planting, cover crop planting, spring/in-season fertilizer application, harvesting and grain hauling | *Cost varies from $5-$40/acre | **Cost varies from $0-$15/acre | ***Does not include costs related to cover crop seed or planting*

The most profitable cover crop farmers, at least in the short term, are those who minimize seed and seeding costs for their cover crop applications. In the longer term, which we cannot address with the dataset developed here, many devoted cover crop farmers report substantially greater profits (relative to non-cover cropped fields) resulting from increased cash crop yields following severe drought and storm events as well as the less-sporadic benefits of improved soil health and increased nutrient cycling.

Table 4 – Economic returns resulting from incorporating cover crops into corn production systems on lower productivity soils in central Illinois from 2015-2018.

PCM PROGRAM – IL 2015-2018 AVG VALUES	OVER-WINTERING COVER CROP	WINTER-TERMINAL COVER CROP	NO COVER CROP
No. Fields	42	14	629
Yield (bu/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	***$104***	***$104***	***$106***
OVERHEAD COSTS	***$36***	***$37***	***$36***
TOTAL NON-LAND COSTS	***$500***	***$485***	***$483***
OPERATOR & LAND RETURN	$186***	$242***	$217

*Direct costs = fertilizers, pesticides, crop seed, cover crop seed, drying, storage and crop insurance | Power costs = tillage, fall fertilizer application, spraying, planting, cover crop planting, spring/in-season fertilizer application, harvesting and grain hauling | *Cost varies from $5-$40/acre | **Cost varies from $0-$15/acre | ***Does not include costs related to cover crop seed or planting*

Cover Crop Data & Recommendations (continued)

Table 5 – Economic returns resulting from incorporating cover crops into corn production systems on higher-productivity soils in central Illinois from 2015-2018.

PCM PROGRAM – IL 2015-2018 AVG VALUES	OVER-WINTERING COVER CROP	WINTER-TERMINAL COVER CROP	NO COVER CROP
No. Fields	60	26	1338
Yield (bu/acre)	218	219	221
Soil productivity rating	139	141	140
GROSS REVENUE	***$756***	***$771***	***$780***
Cover crop seed	*	*	$0
TOTAL DIRECT COSTS	***$353***	***$328***	***$371***
Cover crop planting	**	**	$0
TOTAL POWER COSTS	***$104***	***$104***	***$108***
OVERHEAD COSTS	***$36***	***$36***	***$36***
TOTAL NON-LAND COSTS	***$493***	***$468***	***$517***
OPERATOR & LAND RETURN	$263***	$303***	$263

*Direct costs = fertilizers, pesticides, crop seed, cover crop seed, drying, storage and crop insurance | Power costs = tillage, fall fertilizer application, spraying, planting, cover crop planting, spring/in-season fertilizer application, harvesting and grain hauling | *Cost varies from $5-$40/acre | **Cost varies from $0-$15/acre | ***Does not include costs related to cover crop seed or planting*

Is Growing Cover Crops Your Strategy?

1. Consider gaining cover crop experience by starting on a few fields. Start with a winter-terminal cover crop.
2. Utilize PCM specialists in your area to help you develop a strategic cover crop plan for your farm.
3. Investigate and utilize cost-share assistance from PCM's corporate and conservation partners (PepsiCo, MARS and The Nature Conservancy with a generous dollar-for-dollar match from the Council for Best Management Practices) in your learning process. Illinois Corn Growers Association members can also utilize a cover crop seed discount, and members trying cover crops for the first time may also qualify for the ICGA Reduced Cost Cover Crop Opportunity, in partnership with Beck's Seed.

For more information on PCM's cover crop data, analysis and results, visit **ilcorn.org/PCM.**

Tillage Data & Recommendations

PCM's tillage analysis summarized the results of more than 3,600 corn and soybean fields in Illinois from 2015-2018. The most meaningful analysis resulted from segregating the data into higher (SPR>136) and lower (SPR<136) soil productivity levels.

Reduced tillage systems (one pass and strip tillage) are consistently higher-yielding systems relative to more (and more intense) tillage passes. However, the increase in inputs on lower-productivity soils can sometimes negate the benefit of higher yields, making these conservation systems less profitable.

Table 6 – Economic returns resulting from various tillage practices for corn production in central Illinois from 2015-2018. High soil productivity rating soils (SPR>136).

PCM TILLAGE STANDARD	NO-TILL	STRIP TILL	1-PASS LIGHT	2-PASS LIGHT	2-PASS MODERATE	2+ TILLAGE PASSES
No. Fields	160	178	329	139	238	20
Yield per acre	222	227	223	232	227	212
Soil productivity rating	142	141	141	142	141	142
GROSS REVENUE	***$772***	***$797***	***$781***	***$801***	***$790***	***$735***
TOTAL DIRECT COSTS	***$377***	***$372***	***$362***	***$381***	***$386***	***$325***
Field work	$0	$18	$11	$22	$26	$49
Other power costs**	$96	$95	$96	$94	$94	$100
TOTAL POWER COSTS	***$96***	***$113***	***$107***	***$116***	***$120***	***$149***
OVERHEAD COSTS	***$36***	***$36***	***$36***	***$36***	***$36***	***$36***
TOTAL NON-LAND COSTS	***$510***	***$521***	***$505***	***$533***	***$542***	***$510***
OPERATOR & LAND RETURN	$262	$276	$276	$267	$248	$224

**Direct costs = fertilizers, pesticides, seed, cover crop seed, drying, storage and crop insurance | **Other power costs = fall fertilizer application, spraying, planting, cover crop planting, spring/in-season fertilizer application, harvesting and grain hauling*

Is Improving Tillage Your Strategy?

1. Farms with an SPR>136 could immediately implement a strip-till or one-pass tillage system to capitalize on increased profitability opportunities.
2. Farms with an SPR<136 should consider their entire system and determine if reduced tillage could be implemented without increasing other direct costs like fertilizer, pesticides, seed, drying, storage and insurance.

For more information on PCM's tillage data, analysis, and results, visit **ilcorn.org/PCM.**

Who is Analyzing PCM Data?

Dr. Laura Gentry

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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.

Travis Deppe

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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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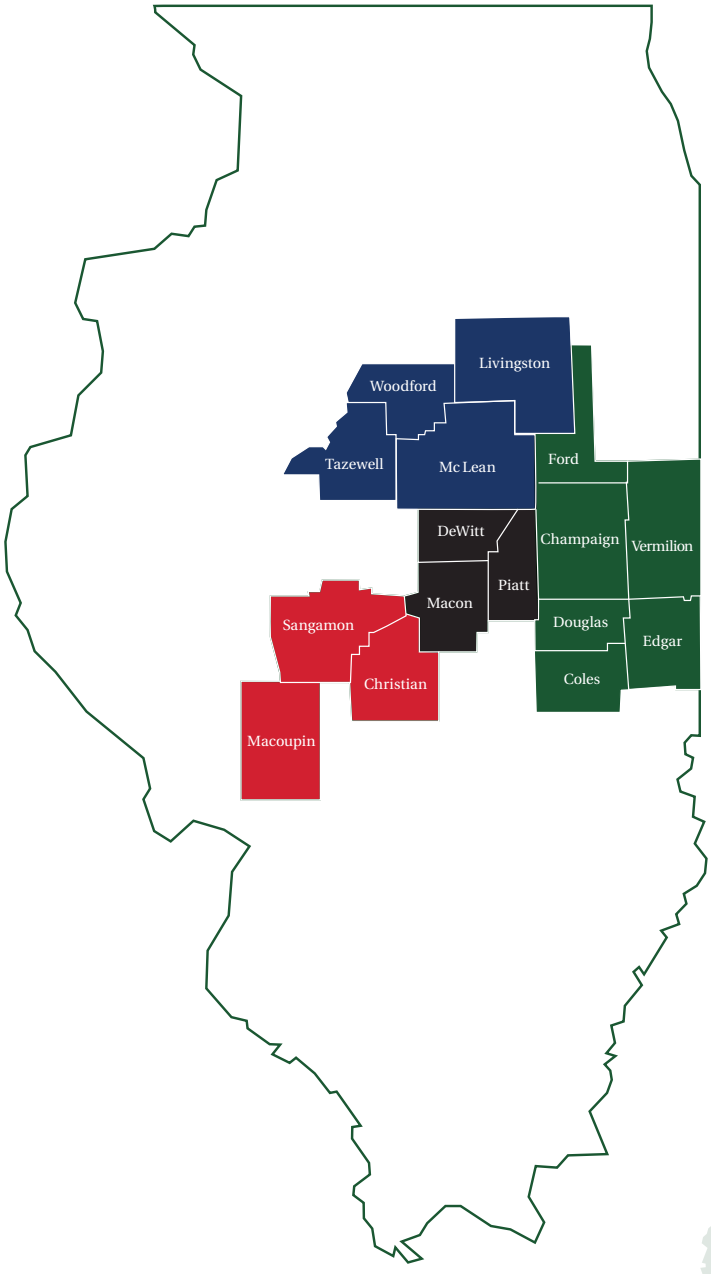
Dr. Gary Schnitkey is a professor and farm management specialist in the Department of Agricultural & Consumer Economics, University of Illinois. His activities focus on farm management and risk management, including examination of issues impacting the profitability of grain farms such as corn-soybean 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.



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The PCM program is also active in Kentucky.


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