

A combine harvester is shown from a low angle, pouring a stream of golden-brown grain into a large blue trailer. The scene is set against a dramatic sunset sky with soft, wispy clouds in shades of blue, orange, and yellow. The sun is a bright, glowing orb on the horizon, casting a warm light over the entire scene. The background shows a flat, open landscape under the twilight sky.

Using Partial Budget Analysis to Gauge Economic Benefits

Presented by:

- Jean Brokish, Midwest Program Manager
- Sarah Blount, Midwest Conservation Technician

Overview

Case Studies

- Retrospective look at soil health practices

Predictive Assessment

- Predictive look at soil health practices
 - > featuring Eric Hanson's data



Agenda

Item	Time
Intro to AFT Case Studies	10 minutes
Group review and discussion of case studies	20 minutes
Report out on case studies	10 minutes
Intro to AFT Predictive Assessment tool	5 minutes
Review farmer data in Predictive Assessment	30 minutes
Review farmer data report	5 minutes
Discuss findings	10 minutes



Case Studies

Methods Used to Develop Case Studies

1. Identify “soil health successful” farmers
 - Minimum 4 years of good experiences with 1+ soil health management systems
 - Practices initiated no more than 15 years ago
 - Practices are used on a majority of the farmer’s operation
 - Farmer has a success story to share
2. Data collection
 - Conduct full farmer interview
 - Soil health practices used/for how long, input costs, equipment used, crop rotation, yield, time spent learning
 - Calculator tool creates a partial budget analysis
3. Case study sheet creation
 - Farmer’s story, inputs, and partial budget analysis included
 - One-page (front and back) sheet to share information

Midwest Case Studies

- Four Midwest-based case studies
 - 2 IL, 2 OH
 - Corn/soybean rotation
 - Have been doing soil health practices for some time
 - Read over case study & discuss questions with your group

Group Breakout

- Splitting into groups based on role
 - Farmer
 - Retailer
 - Outreach
- Count by 4s based on role



Soil Health Case Study

Larry, Adam, and

Introduction

Larry Thorndyke started growing 40 years ago and currently farms with, and son, Adam. The family soybeans on 2,500 acres across several counties in North Central Illinois, leasing all but 250 acres. Roughly half the fields are flat with silty clay soils while the rest have clay and silt loam soils with 2 to 2% slopes. Faced with extremely tight margins, including rising rents and fertilizer costs, the Thorndykes wanted to reduce their inputs without hurting yield. Ten years ago, Larry began attending conferences and field days where the importance of soil biology and motivated him to improve the hea

Adam Thorndyke started farming in 2000, and together they started journey in 2008 by transitioning t tillage to strip-till on a 200-acre b into corn. Prior to this change, the two or more tillage passes across 1 soil washed away, additional pass level up the field and fill in gullies.

While Larry said the transition to no-till, transitioning their soybe on their rented ground was a chall some fields taking longer to transi due to the management by previo landowner preference. Because of only includes 1,400 acres because successfully under conservation ti of strip-till corn and 700 acres no



JULY 2019

Soil Health Case Study

Eric Niemeyer, MadMax Farms, OH

Introduction

Eric Niemeyer's MadMax Farms lies in the middle of the Upper Scioto Watershed in Ohio. Eric is a first-generation farmer in his 15th farming season producing corn and soybeans. He has learned many lessons the hard way by trying different ideas and learning what practices work best on his 1,250-acre operation.

His soils are mainly silt and clay loams. Although many of his fields have flat or slightly rolling terrain, Eric saw the impact of erosion when gullies formed in low areas or where soil washed away in areas of concentrated water flow. More importantly, he recognized that using conventional tillage practices made it difficult to consistently grow a profitable crop.

Consequently, Eric spent time educating himself at workshops, field days, and conferences, and by reading about soil health practices. When Eric decided he needed to change how he farmed, he sought the help of Charlie Walker, his right-hand man and a longtime no-till innovator. Following Charlie's advice, Eric converted his cropland to no-till and adopted variable rate fertilizer application technology (VRT) in 2011. To address surface or sub-surface drainage issues, Eric repaired sub-surface drainage tile, gullies, and eroded areas. He also began taking soil tests every two years instead of every four.

In 2014, he started planting cover crops on his entire farm. Eric prefers using multi-species mixes and customizes them based on whether he is planting corn or soybeans. In addition, he fine-tunes his cover crop recipe based on what soil health outcomes he is trying to achieve. These include breaking up compaction layers, increasing



JULY 2019

Soil Health Case Study

Jim, Julie, and Josh Ifft, Ifft Farms

Introduction

Jim Ifft started farming in 1975 and currently farms with his wife, Julie, and son, Josh. The family grows corn and soybeans on 1,800 acres in northcentral Illinois, leasing over 1,500 them. They use soil health practices on all the acres, rented and owned.

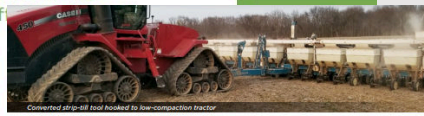
Jim has always had an interest in conservation and employs an adaptive management approach. Jim wanted to diversify his corn-soybean rotation as part of this approach and knew he was on the right track when he discovered cover crops. He started by planting cereal rye after his corn harvest on 80 acres in 2014, and now does so on 825 acres. Jim and Josh were so pleased with the cover crops, they started their own cover crop seed dealership providing custom seed drilling services for surrounding farmers.

Jim credits cover crops for helping them try no-till corn. Although the Iffts transitioned to no-till on their soybean fields in the early 1990s, they continued with a vertical-tillage pass each fall and spring for their corn until 2018, when they planted no-till on corn for the first time. Jim said, "We wouldn't have attempted no-tilling corn if not for the improved soil structure we've noticed from our use of cover crops." Jim adds that, "Cover crops are the key to reducing our inputs." The Iffts have reduced their herbicide inputs because of ample weed control provided by the cereal rye. Jim notes his first attempts at covers in 2014 weren't very successful, but he continued to seek advice from producers using covers successfully and kept at it.

The Iffts have also applied their adaptive approach to nutrient management, having switched to variable rate technology (VRT) application of phosphorus (P) and potassium (K) in 2010. The Iffts haven't applied any nitrogen (N) in the fall for decades, but they have recently adapted their



FEBRUARY 2020



Soil Health Case Study

Dan Lane, Homewood Farms, OH

Introduction

Dan Lane's Homewood Farms lies in the Upper Scioto watershed in central Ohio. Dan and his wife, Jennifer, have been farming for 20 years and own 60% of the 1,830 acres of corn and soybeans they grow. The terrain is flat to slightly rolling with silt and clay loam soils. Dan started farming with his father, John, in 1990 and took over in 2000.

In the past, the Lanes would chisel-plow and use two-field cultivator passes for the corn and soybeans. The Lanes applied their phosphorus (P) and potassium (K) with the planter ahead of corn and then side-dressed with anhydrous ammonia. Then, as now, the Lanes do not apply fertilizer to the soybean crop.

To eliminate runoff and protect his soils, Dan began strip-tilling and banding dry fertilizer on all his corn in 2005. By injecting fertilizer five to six inches deep, banding with strip-till allows Dan to apply fertilizer where and when it's needed. He also began soil testing. Dan believes banding dry fertilizers is the most efficient way to maintain fertility and profitability.

In 2014, Dan transitioned to reduced tillage on all acres ahead of soybeans by using a one-pass operation with a high-speed vertical tillage tool before planting beans in the spring. That same fall, Dan tried planting cover crops after his corn, broadcasting cereal rye and incorporating it with vertical tillage. Later, when Dan began planting soybeans with a twin row planter, he used the same planter to plant a mixture of barley and hairy vetch cover in the fall after the soybeans, followed with a strip-till pass. Dan has achieved a synergy between strip-tilling and cover cropping because

he can plant corn in the spring between the rows of cover crops in a consistent seedbed.

Soil Health, Economic, Water Quality, and Climate Benefits

Partial budgeting analysis was used to estimate the marginal benefits and costs of adopting strip-till, nutrient management, and cover crops on the Lane Farm. The study was limited to only those income and cost variables affected by the adoption of these practices. The table on page 2 presents a summary of these economic effects revealing that, due to the three soil health practices, Dan's net income increased by \$55 per acre per year or by \$103,366 annually on the 1,830-acre study area, achieving a 142% return on investment.

Dan believes the most significant benefit from using all three soil health practices has been a 40-bushel per acre increase in corn yields since 2008, which increased income on the corn acres by \$145 per acre per year.

Using a strip-tiller he converted from an older planter bar, Dan's strip-till system saves him three passes over the field, or about \$24 per acre each year, in machinery and labor costs compared to conventional tillage. Strip till also provides an optimal environment for corn because the soil warms up sooner and the seedbed offers constant seed depth with enough nutrients to grow quickly and early. The cost savings from avoided purchases and maintenance of tillage equipment allowed him to increase his planter size, which also helps achieve earlier planting.

Dan believes that multiple banded nutrient applications (during the strip-till pass in the



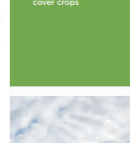
Dan and Jennifer Lane



FEBRUARY 2020

Farm at a Glance

COUNTY: Delaware, OH
WATERSHED: Upper Scioto River
CROPS: Corn & soybeans
FARM SIZE: 1,830 acres
SOILS: Silt & clay loam soils on flat to slightly rolling fields
SOIL HEALTH PRACTICES: Strip-till, nutrient management, & cover crops



Refining converted strip-till tool with strip-till in the fall



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Group Discussion Questions – Case Studies

1. Are the results what you expected, based on the introduction?
 - Are they similar to results you've seen?
2. What were the keys to success?
 - What primary factors contributed to profits?
3. How would you use this information to communicate to:
 - Farmers
 - Retailers
 - Landowners



A close-up, low-angle shot from the perspective of someone inside a combine harvester. The large metal auger is positioned on the left, pouring a thick stream of golden-brown grain into a blue-lined trailer. The background shows a vast, flat landscape under a dramatic sunset sky with wispy clouds. The sun is a bright, glowing orb on the horizon, casting a warm light over the scene. The overall mood is peaceful and industrious.

Predictive Assessment Tool

Case Study vs. Predictive Assessment

Case Study	Predictive Assessment
Used for "soil health successful" farmers	Used for "soil health curious" farmers
Retrospective look at already-implemented practices	Predictive look at practices yet to be implemented (or recently adopted)
Based on available farmer data	Based a combination of farmer's data and predictive models
Quantification of the farmer-observed soil health and economic improvements attributable to implementing soil health practices	Quantification of the anticipated soil health and economic improvements
Data used by farmer to see what previous decisions on their farm have changed	Data used by farmer to make decisions about practices and economics going forward

Questionnaire Review

Main Sections

1. Pre-Interview Information

- Basic farm overview – rotation, location, soil types, acres, etc

2. Soil Health Practices and Potential Short-Term Economic Impacts

- Conservation crop rotation, no-till or reduced tillage, cover crops, nutrient management

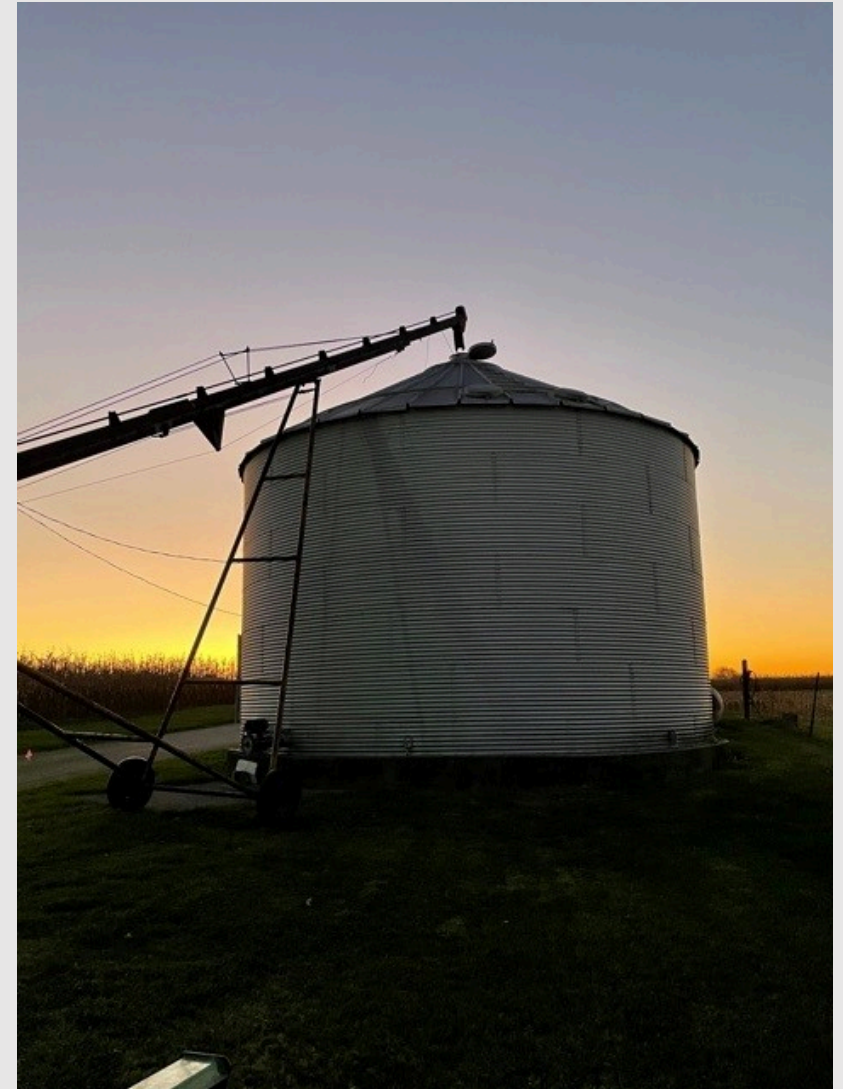
3. Potential Long-Term Economic Benefits

- Effects of improved soil organic matter over time on yield, nutrient availability, and water holding capacity



Discussion Questions – Predictive Assessment

1. Are the assumptions reasonable?
 - Do you agree that increased SOM results in
 - Yield increase?
 - Drought resiliency?
2. Are the short / long term results what you expected? Why?
3. What other tweaks could be made to increase ROI? (seeding rate, different equipment, etc)
4. Would you use this type of tool? How?



Live PSHEC Demo

Predictive Soil Health Economic Calculator (P-SHEC) Questionnaire For "Soil Health Curious" Farmers (Those who have yet to adopt soil health practices but are interested in evaluating the potential costs and benefits of doing so) Row Crop Version: Corn, Soybeans, Hay, and Wheat

August 10, 2021

I. Information Provided in the "Pre-Interview Form"

Thank you for completing the Pre-Interview Form in advance of this full P-SHEC Questionnaire. Your responses have been inserted below. At this point, you should have read and discussed the Predictive Soil Health Economic Assessment Project's "Introduction" document with your advisor and signed the Consent Form. Please do so if you have not. Please complete the rest of this full questionnaire with your advisor.

Name of farm: Hanson Farms Name of farmer: Eric Hanson
 Total farm acres: 2300 Acres owned: 2000 Acres rented: 300
 Farm address: ~1/2 mile north of Berwick IL
 Mailing address (if different from above): _____
 County: Warren Watershed: _____
 Phone number: _____ Email: _____
 Date: _____ Name of Advisor: _____

Hanson Farms

Eric and his Dad farm together: 2300 total acres, 2000 owned (Eric, Dad, Grandma) + 300 acres rented (Eric)

600 acres under Eric's mgmt; 2021 was Eric's fifth crop year

Study field is 40 acres just north of Berwick Illinois in Warren County
 Varies from 0-2% slopes to 10% slope, with grassed waterways and WASCOBs to mitigate slope.

DETERMINE STUDY AREA FOR PREDICTIVE ECONOMIC ANALYSIS:

Jean note: much of this section is gathering data on whole farm and is likely not needed

1. Is your farm sub-divided into enterprises (e.g., row crop, pasture, vegetables)? If so, please describe each enterprise and associated acreage (please make sure all acres add up to the total farm acres provided above):

2. Please describe your farm's topography (e.g., rolling hills, flat, flood plain, etc.):

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1

A	B	C	D	E	F	G	
Row Crop General Farm Information							
ABOUT THIS TAB:							
The Farm Info tab records very general information including farmer name, name of farm, county and state location of farm, watershed (optional), Study Area acreage, Study Area soil health practices, time spent each year on educational activities, and farmer's fertilizer and crop prices (optional). The Clear All Data button below will clear entries in yellow cells throughout the workbook.							
Farmer Name		Farm Name	County	State			
Eric Hanson		Farms	Warren	IL			
Watershed Name							
Is this an Organic Farm? (Y/N)		No					
Study Area Acreage		40					
Tips:							
(1) Analysis assumes selected soil health practices will be used on ALL acres every year.							
(2) Enter "x" in all that apply.							
Soil Health Practices Selected for Assessment							
No-till/Strip Till/Reduced Tillage		x					
Cover Crops		x					
Nutrient Management							
Conservation Crop Rotation		x					
Anticipated Cost for Educational Activities							
Typical Learning Cost (\$/Acre) ¹		\$2.91					
OR Farmer's Estimated Learning Cost (Optional)							
Hourly Labor Rate (\$)							
Expected Hours/Year for Study Area							
Total Cost for Study Area		\$0.00					
Cost per Acre (\$/Acre)		\$0.00					
¹ Average per acre cost for seven AFT published farmer cropland case studies. (See Prices tab cells A26-B36.)							
Read Me		Farm Info		Cons Crop Rotation		Tillage	
Cover Crops		Nutrient Mgt.		Combin			

Farmer Report – 2 pages

What's Included

- Size of study area, crop rotation, soil health practices assessed
- Short-term economic analysis table
- Long-term economic analysis tables
 - Due to increase in SOM
 - Combined short- and long-term results
- Written summary of results




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Long-Term Economic Analysis

Potential Long-Term Economic Effects due to increase in Soil Organic Matter:

Table 2: Potential Long-Term Annual Benefits for 20 Years of Soil Health Practice Use

Benefit Category	Per Acre	Affected Acres	Study Area
		40	\$1,932
		40	\$169
		40	\$180
		40	\$2,281



SOIL HEALTH PREDICTIVE ASSESSMENT REPORT
ABRIDGED VERSION

For: Zac Weidner
Macoupin County, Illinois
Date: March 2, 2021

By: Sarah Blount
AFT Midwest Conservation Technician
sblount@farmland.org, (765) 256-0660

Study Area and Planned Practices:

- Study Area Name and Acreage: Janet's 40, 40-acre field
- Crop Rotation: Corn-Soybean
- Soil Health Practices Assessed:
 - No-Till – Reduced, vertical tillage to no-till for corn
 - Cover Crops – No cover crop to cover crop mix planted in Fall after corn and soybean
 - Nutrient Management – No Anhydrous Ammonia applied in Fall after corn

Short-Term Economic Analysis

Potential Short-Term Annual Economic Effects:

Table 1: Potential Short-Term Annual Economic Effects of Soil Health Practices

Positive Effects				Negative Effects			
Increase in Income				Decrease in Income			
Item	Per Acre	Acres	Total	Item	Per Acre	Acres	Total
None identified	\$0.00	0	\$0	None identified	\$0.00	0	\$0
Total Increased Income			\$0	Total Decreased Income			\$0
Decrease in Cost				Increase in Cost			
Item	Per Acre	Acres	Total	Item	Per Acre	Acres	Total
Machinery cost savings due to no-till	\$6.17	40	\$247	Typical learning costs	\$2.81	40	\$112
Herbicide savings for soybeans due to cover cropping	\$2.50	20	\$430	Cover crop costs	\$43.70	40	\$1,748
Machinery cost savings due to one less fertilizer application	\$12.25	40	\$490	Increased fertilizer cost for corn due to cover crops	\$4.20	20	\$84
Fertilizer savings for corn due to change in nutrient management	\$9.80	20	\$196	2x2 equipment upgrade	\$4.00	40	\$160
Work moves from spring to fall (better distribution of labor)	\$7.50	40	\$300	Liquid storage tanks	\$2.00	40	\$80
Reduced erosion keeps nutrients in field and eliminates field repairs	\$28.88	40	\$1,155	Liquid tender	\$8.00	40	\$320
Total Decreased Cost			\$2,820	Total Increased Cost			\$2,304
Annual Total Increased Net Income			\$2,820	Annual Total Decreased Net Income			\$2,304
Annual Per Acre Increased Net Income			\$71	Annual Per Acre Decreased Net Income			\$58
Annual Change in Total Net Income =			\$516	Annual Change in Net Income Per Acre =			\$13
Return on Investment =			22%				

Notes:

- This table represents costs and benefits over the entire study area (40 acres) as reported by the farmer.
- All values are in 2019 dollars except for fertilizer values.
- Farmer-supplied fertilizer prices: Nitrogen: \$ 28/Lb, Phosphate: \$ 37/Lb, Sulfur: \$ 54/Lb (Zac Weidner, 2020).
- Reduced soil erosion benefits are based on farmer-estimated savings in field repairs.

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Affected Acres	Study Area
40	\$516
40	\$724
40	\$1,240

Affected Acres	Study Area
40	\$516
40	\$2,281
40	\$2,797

Farmer Report – 7 pages

What's Included

- Written farm description
- Chart of current and planned practices
- Written summary of the short-term partial budget analysis methods and key findings
- Short-term economic analysis table
- Written summary of the long-term economic benefit analysis, inputs used, and key findings
- Written and tabular versions of yield analysis, soil fertility, and water storage benefits
- Written summary of potential long-term benefits with key findings with table
- Written conclusion with combined short- and long-term results



SOIL HEALTH PREDICTIVE ASSESSMENT SUMMARY REPORT
For: Zac Weidner By: Sarah Blount
Date: March 2, 2021 Midwest Conservation Technician
 (765) 256-0660; sblount@farmland.org

FARM DESCRIPTION

Zac Weidner owns and farms 540 acres in western Macoupin County, IL in close cooperation with his father. Together, they farm 1,400 total acres, sharing equipment, labor, and ideas. These acres fall within the Upper Macoupin Creek watershed, a HUC 10 watershed that flows to the Macoupin Creek, then the Illinois River, and ultimately the Mississippi River. Zac is a corn-soybean rotation farmer who wants to incorporate cover crops into much of his acreage. The topography is mostly flat, with a few fields having slight hills. The study area, or focus field, is a 40-acre flat and moderately to poorly drained field named "Janet's 40." Soil types for the study area include Cowden, Fishhook, Harrison, and Marine (all silt loam) and Virden (a silt clay loam). The percent Soil Organic Matter (SOM) is 3.317%.

CURRENT AND PLANNED PRACTICES IN THE STUDY AREA

In addition to cover cropping, Zac is interested in switching completely to no-till before corn planting and improving his nutrient management practices by no longer fertilizing in the fall.

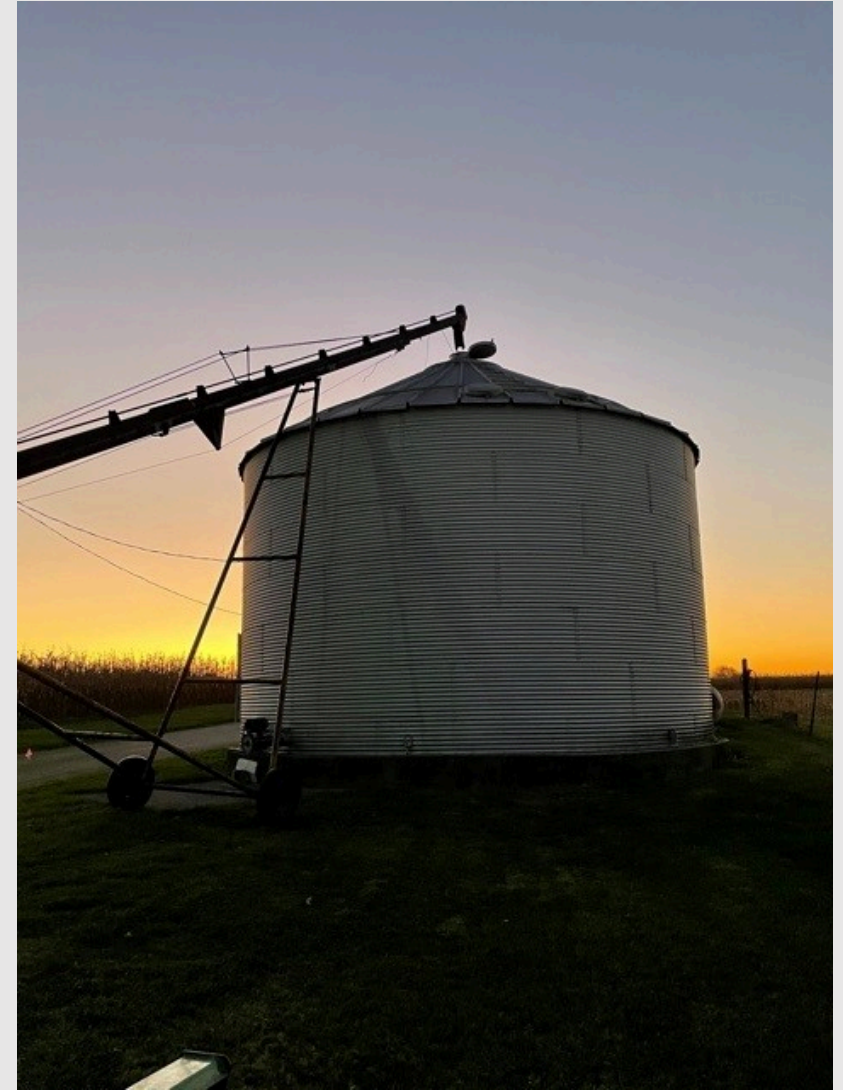
Table 1: Current and Planned Soil Health Management Strategy

Conservation Practices		Corn	Soybeans
		Current	Reduced, vertical tillage
Tillage	Planned	No-till	(No change)
	Current	None	None
Cover Crops	Planned	Fall planting legume-cereal mix, spring termination using combination of spray and roller crimper	Fall planting of cereal-brassicas mix, spring termination using combination of spray and roller crimper
	Current	Fall Anhydrous Ammonia, dry spring fertilizer spread before planting, dry spring side-dress application	Dry spring fertilizer spread before planting
Nutrient Management	Planned	Dry spring fertilizer spread before planting, liquid 2x2 application with planter pass, and dry side-dress at appropriate V-stage	(No change)
	Current	Corn – Soybean	
Crop Rotation	Planned	Corn – Cover Crop – Soybean – Cover Crop	

Estimates of Soil Health Educational Time Needed: A default estimate of \$2.81 per acre was used for cropland and is based on the average per acre costs reported by farmers in AFT's 7 Row Crop Soil Health Case Studies (2019 & 2020).

Discussion Questions – Predictive Assessment

1. Are the assumptions reasonable?
 - Do you agree that increased SOM results in
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 - Drought resiliency?
2. Are the short / long term results what you expected? Why?
3. What other tweaks could be made to increase ROI? (seeding rate, different equipment, etc)
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To Learn More...



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Helpful Links

- Soil Health Case Study Methods & Tool Kit page with RSHEC Training Videos
 - <https://farmland.org/soil-health-case-studies-methods/>
- Blank PSHEC questionnaire
 - In ISAP folder
- Equipment list
 - In ISAP folder

Share your story

AFT is recruiting farmers experienced with regenerative soil health practices

- Interview
- Data analysis
- Video profile

