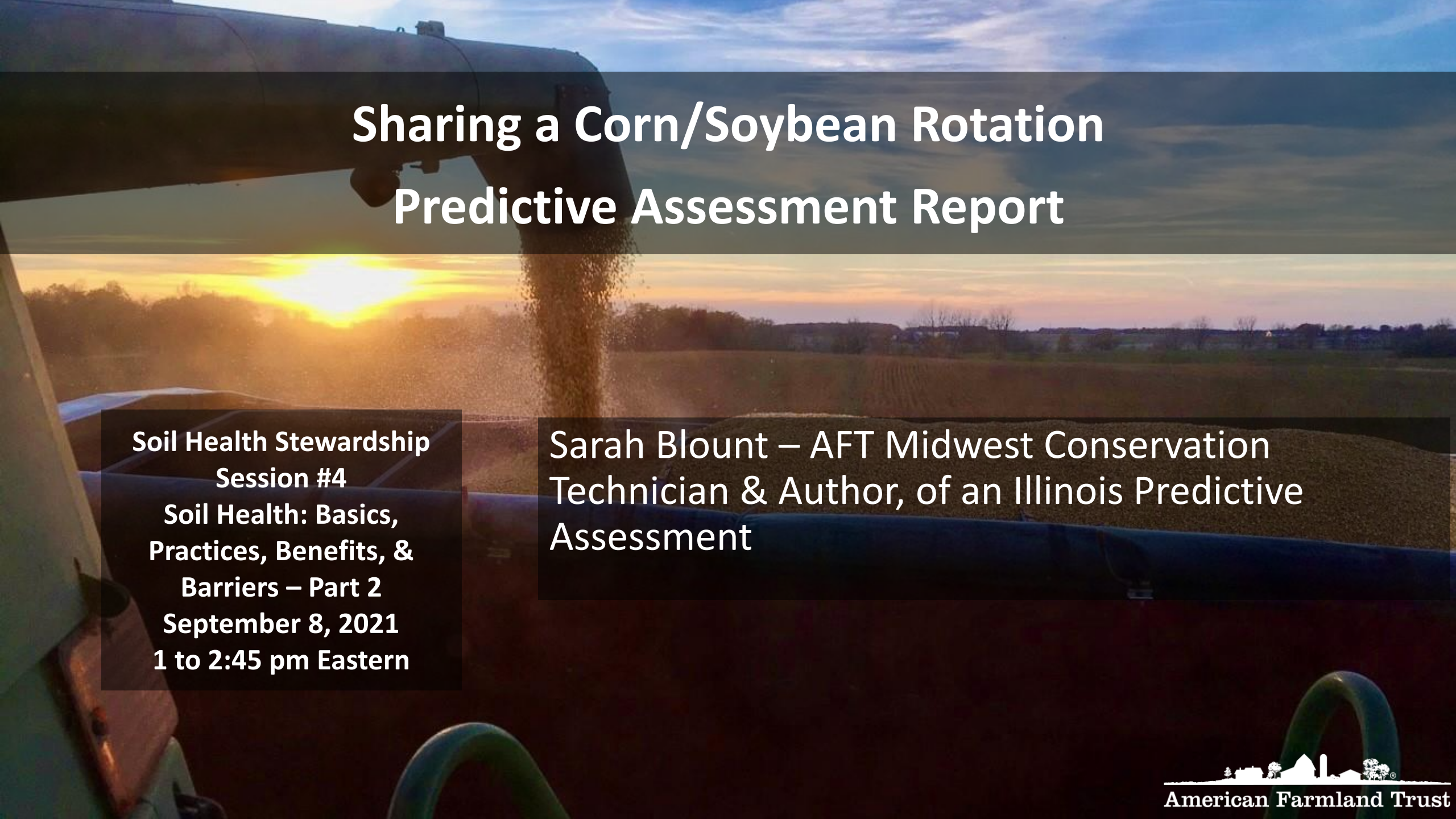


# Sharing a Corn/Soybean Rotation Predictive Assessment Report

**Soil Health Stewardship Session #4**
**Soil Health: Basics, Practices, Benefits, & Barriers – Part 2**
**September 8, 2021**
**1 to 2:45 pm Eastern**

Sarah Blount – AFT Midwest Conservation Technician & Author, of an Illinois Predictive Assessment

American Farmland Trust

# Case Study vs. Predictive Assessment

## Case Study

- Used for "soil health successful" farmers
- Retrospective look at already-implemented practices
- Based on available farmer data
- Quantification of the farmer-observed soil health and economic improvements attributable to implementing soil health practices

## Predictive Assessment

- Used for "soil health curious" farmers
- Predictive look at practices yet to be implemented (or recently adopted)
- Based a combination of farmer's data and predictive models
- Quantification of the anticipated soil health and economic improvements

# Story via Multiple Slides: Zac Weidner, IL

American Farmland Trust

# Predictive Assessment: Zac Weidner, Weidner Farms


**Resource Concerns**

- Soil erosion
- Water holding capacity & infiltration rates
- Nutrient availability

**Macoupin County, IL**

**Farm Size:** 540 acres **Study area:** 40 field acres

**Soil Health Practices Adopted Prior to 2021:**

- Reduced tillage before corn
- Nutrient management

**New Soils Practices Adopted in 2021 & in Predictive Assessment:**

- No tillage before corn
- Cover crop seeding before corn and soybeans
- Remove fall fertilizer from rotation

**Connection to AFT:**

- Attended 2020 watershed winter meeting
- Read the 4 Midwest Case Studies
- Reached out to get involved with AFT programs & learn about adopting healthy soils practices on his farm

American Farmland Trust

# Short-Term Analysis: Zac Weidner, IL

American Farmland Trust

# Weidner's Potential Increases in Net Income (Short-Term Analysis)

| Positive Effects | | | |
|---|---|---|---|
| **Increase in Income** | | | |
| **Item** | **Per Acre** | **Acres** | **Total** |
| None identified | $0.00 | 0 | $0 |
| **Total Increased Income** | | | **$0** |
| **Decrease in Cost** | | | |
| **Item** | **Per Acre** | **Acres** | **Total** |
| Machinery cost savings due to no-till | $6.17 | 40 | $247 |
| Herbicide savings for soybeans due to cover cropping | $21.50 | 20 | $430 |
| Machinery cost savings due to one less fertilizer application | $12.29 | 40 | $492 |
| Fertilizer savings for corn due to change in nutrient management | $9.80 | 20 | $196 |
| Work moves from spring to fall (better distribution of labor) | $7.50 | 40 | $300 |
| Reduced erosion keeps nutrients in field and eliminates field repairs | $28.88 | 40 | $1,155 |
| **Total Decreased Cost** | | | **$2,820** |
| | | **Annual Total Increased Net Income** | **$2,820** |
| | | **Total Acres in this Study Area** | **40** |
| | | **Annual Per Acre Increased Net Income** | **$71** |

## Increased Income:

- None anticipated in the short-term

## Decreased Costs:

- Reducing tillage reduces fuel, repair, and operating expenses
- Using cover crops reduces the need for herbicide applications
- Fewer machine passes reduces fuel, repair, and operating expenses
- Adding fertilizer at planting eliminates an extra fertilizer pass
- More time to accomplish tasks in fall
- Eliminating field repairs decreases cost for supplies and time

American Farmland Trust

# Weidner's Potential Decreases in Net Income (Short-Term Analysis)

## Decreased Income:

- None anticipated in the short-term

## Increased Costs:

- Learning costs for transitions in soil health management
- Cover crop costs include seed, establishment, and termination costs
- More fertilizer is needed for corn to make up for cover crop nutrient use
- Cost to upgrade planter to 2x2 system
- Cost to install storage tanks on the farm
- Cost to purchase a liquid tender to pull behind planter to feed 2x2 system

| Negative Effects | | | |
|---|---|---|---|
| **Decrease in Income** | | | |
| **Item** | **Per Acre** | **Acres** | **Total** |
| None identified | $0.00 | 0 | $0 |
| **Total Decreased Income** | | | **$0** |
| **Increase in Cost** | | | |
| **Item** | **Per Acre** | **Acres** | **Total** |
| Typical learning costs | $2.81 | 40 | $112 |
| Cover crop costs | $43.70 | 40 | $1,748 |
| Increased fertilizer cost for corn due to cover crops | $4.20 | 20 | $84 |
| 2x2 equipment upgrade | $4.00 | 40 | $160 |
| Liquid storage tanks | $2.00 | 40 | $80 |
| Liquid tender | $3.00 | 40 | $120 |
| **Total Increased Cost** | | | **$2,304** |
| **Annual Total Decreased Net Income** | | | **$2,304** |
| **Total Acres in this Study Area** | | | **40** |
| **Annual Per Acre Decreased Net Income** | | | **$58** |

American Farmland Trust

# In the short-term, Weidner may experience an increase in net returns from his investments in soil health practices

| | |
|---|---|
| Annual Total Increased Net Income | $2,820 |
| Total Acres in this Study Area | 40 |
| Annual Per Acre Increased Net Income | $71 |

| | |
|---|---|
| Annual Total Decreased Net Income | $2,304 |
| Total Acres in this Study Area | 40 |
| 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%** |

American Farmland Trust

# Long-Term Analysis: Zac Weidner, IL

American Farmland Trust

# General Info: Data Entry in Weidner's Long-Term Analysis

- **Planning horizon chosen**
  - 5-year and 20-year
  - Based on enrollment in 3-year side-by-side trial program
- **4% discount rate chosen**
- **Soil health practices chosen:**
  - Cover crops, planted annually
  - Reduced tillage to no tillage
- **<u>P-SHEC Tool results</u> =**
  - **.375% increase in SOM after 5 years**
  - **1.496% increase in SOM after 20 years**

American Farmland Trust

# Yield Data Entry in Weidner's Long-Term Analysis

| Cash Crop | Corn | Soybeans |
|---|---|---|
| Unit | Bushel | Bushel |
| Current Average Yield per Acre | 210 | 72 |
| Potential % Increase in Yield due to a 1% Increase in SOM* | 8% | 12% |
| Potential % Increase in Yield after 5 years of SH practices | 3% | 4.5% |
| Potential % Increase in Yield after 20 years of SH practices | 12% | 18% |
| National Crop Price per Unit** | $3.85 | $8.75 |

*Weidner chose to select the average of the yield increases reported in the 4 existing case studies

- The user can modify % increase in yield due to SOM change to perform sensitivity analysis

**Based on USDA NASS Crop Values 2019 Summary

American Farmland Trust

# Soil Fertility Data Entry in Weidner's Long-Term Analysis

**Soil Fertility Inputs**

- **Price per pound of nutrient from farmer**:
  - Nitrogen ($/Lb.): $0.28
  - Phosphorus ($/Lb.): $0.37
  - Sulfur ($/Lb.): $0.54
- **Dominant Soil Texture:** Silt loam
- **P-SHEC Tool Default Nutrient Mineralization Rates**
  - Nitrogen (Lb./Ac): 18.1
  - Phosphorus (Lb./Ac): 1.8
  - Sulfur (Lb./Ac): 0.7

American Farmland Trust

# Water Storage Benefits: Dryland Farming Drought Resistance

- **Historic Yield Loss due to Drought:**
  - -15% for corn
  - -60% for soybeans
- **Estimated Future Yield Loss due to Drought (after a 1% increase in SOM):**
  - -10% for corn
  - -25% for soybeans
- **Drought Resistance Benefit:**
  - $40/ac/year for corn
  - $221/ac/year for soybeans
- **Total Average Discounted Water Storage Benefits for Study Area: <u>$180/year</u>**

American Farmland Trust

# Weidner's Long-Term Benefit Results

| Benefit Category | Per Acre | Affected Acres | Study Area |
|---|---|---|---|
| Discounted Annual Yield Increase | $15.33 | 40 | $613 |
| Discounted Annual Soil Fertility Benefit | $1.34 | 40 | $54 |
| Discounted Annual Water Storage Benefits | $1.43 | 40 | $57 |
| **Total Annual Long-Term Benefits** | **$18.10** | **40** | **$724** |

5-year

| Benefit Category | Per Acre | Affected Acres | Study Area |
|---|---|---|---|
| Discounted Annual Yield Increase | $48.31 | 40 | $1,932 |
| Discounted Annual Soil Fertility Benefit | $4.22 | 40 | $169 |
| Discounted Annual Water Storage Benefits | $4.49 | 40 | $180 |
| **Total Annual Long-Term Benefits** | **$57.02** | **40** | **$2,281** |

20-year

- **Yield** – $613 increase from yield improvements in 5 years, $ 1,932 increase in 20 years (85% of the increase in net income, based on increases in SOM)
- **Soil Fertility** – Minor increases in net income may occur over 5 and 20 years due to improvements in soil fertility
- **Water Storage** – Minor increases in net income may occur due to water storage capacity improvements, which enhance drought resistance
- **Total Discounted Annual Benefits** – Combined benefits could increase net income by $18 /acre/year over 5 years and $57 /acre/year over 20 years

American Farmland Trust

# Weidner's Combined Results

| 5-Year Planning Horizon | | | |
|---|---|---|---|
| **Result Category** | **Per Acre** | **Affected Acres** | **Study Area** |
| Short-Term Annual Change in Net Income | $13 | 40 | $516 |
| Total Annual Long-Term Benefits | $18 | 40 | $724 |
| **Total Long-Term and Short-Term Annual Change in Net Income** | **$31** | **40** | **$1,240** |
| **Return on Investment** | **53%** | | |
| **Number of Years before Break Even** | **0** | | |

| 20-Year Planning Horizon | | | |
|---|---|---|---|
| **Result Category** | **Per Acre** | **Affected Acres** | **Study Area** |
| Short-Term Annual Change in Net Income | $13 | 40 | $516 |
| Total Annual Long-Term Benefits | $57 | 40 | $2,281 |
| **Total Long-Term and Short-Term Annual Change in Net Income** | **$70** | **40** | **$2,797** |
| **Return on Investment** | **121%** | | |
| **Number of Years before Break Even** | **0** | | |

American Farmland Trust

# Barriers Overcome

American Farmland Trust

# Barriers Didn’t Materialize

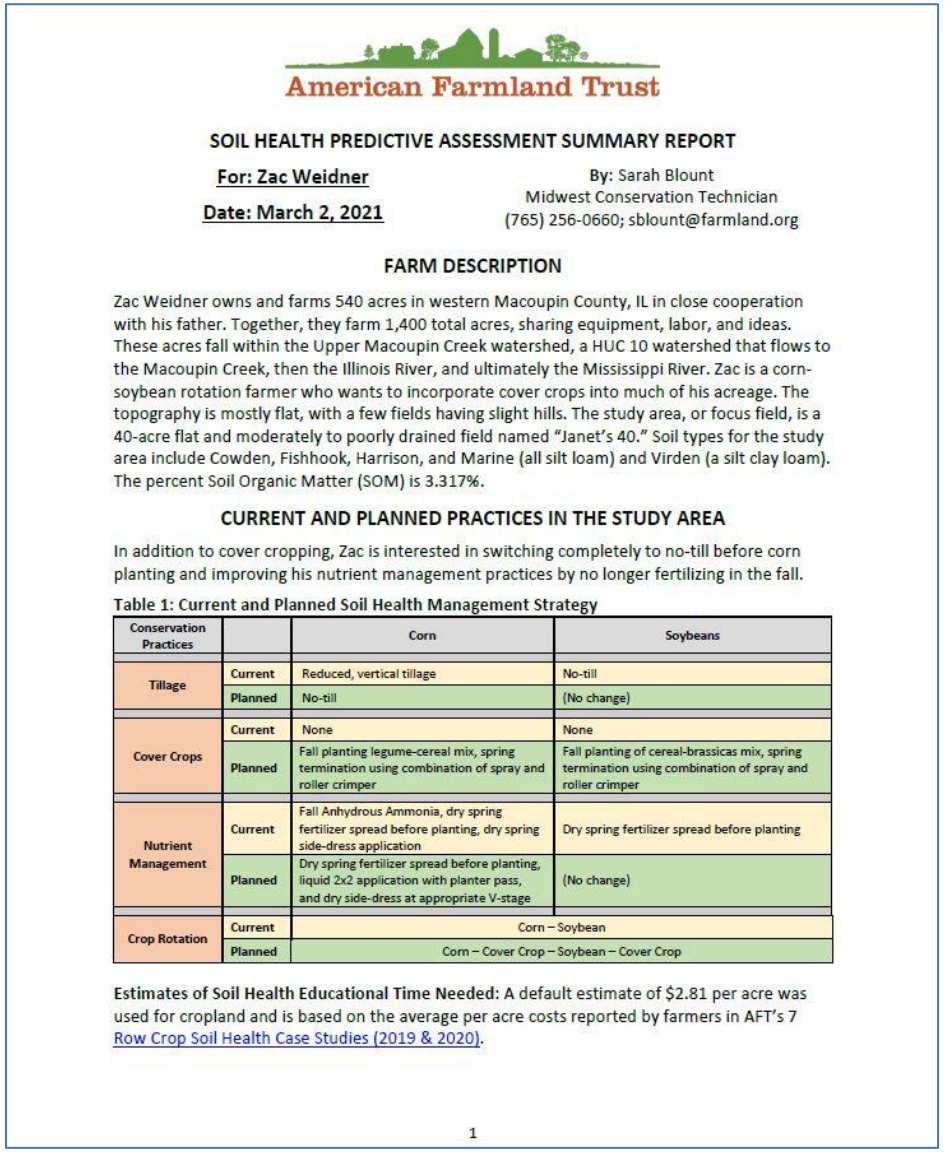
- **Financial barriers**
  - Didn’t feel they needed to apply for financial assistance because they wanted to do it alone
- **Technical assistance barriers**
  - Used ag retailers and AFT to answer questions on cover crop seeding information and 2x2 equipment choices
- **Technological barriers**
  - Overall, had good experiences with implementing nutrient management and cover crop practices

American Farmland Trust

# Take Home Messages: Zac Weidner, IL

American Farmland Trust

# Highlights: Zac Weidner Predictive Assessment



American Farmland Trust

**SOIL HEALTH PREDICTIVE ASSESSMENT SUMMARY REPORT**

**For: Zac Weidner**

**Date: March 2, 2021**

**By:** Sarah Blount
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 |
|---|---|---|---|
| Tillage | Current | Reduced, vertical tillage | No-till |
| | Planned | No-till | (No change) |
| Cover Crops | Current | None | None |
| | 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 |
| Nutrient Management | Current | Fall Anhydrous Ammonia, dry spring fertilizer spread before planting, dry spring side-dress application | Dry spring fertilizer spread before planting |
| | Planned | Dry spring fertilizer spread before planting, liquid 2x2 application with planter pass, and dry side-dress at appropriate V-stage | (No change) |
| Crop Rotation | Current | Corn – Soybean | |
| | 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).

1

- Zac recently adopted no till before corn, cover crop seeding before corn and soybeans, and avoidance of fall fertilizer from rotation
- Trying the practices & the predictive estimates helped Zac accomplished his goal to convince Dad to use cover crops and reduce tillage
- **Short-term predictive estimates**:
  - 22% ROI & $13/ac
- **Long-term predictive estimates** :
  - 5-year
    - 53% ROI & $31/ac
  - 20-year
    - 121% ROI & $70/ac

American Farmland Trust