Soil Health Case Studies: Quantifying Economic, Water Quality, & Climate Outcomes

Michelle Perez, PhD – AFT Project Leader & Water Director

ACWA NUTRIENTS POLICY CMTE WEBINAR
MARCH 23, 2020

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OVERVIEW

Overview Outline

- Distribution of 8 AFT-NRCS Soil Health Case Studies via keyword on the web:

  "FIC soil health case studies"

- Overview of AFT SH CIG Project
- Overarching Findings
- Uses of the Case Studies

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Why quantify soil health outcomes?

- Evidence that no-till/strip-till, cover crops, nutrient management improve water quality & soil health
- Not much information about economic benefits linked with better soil health
- The agricultural community (farmers, retailers, landlords, bankers, etc.) want to know the “bottom line”

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Project Goal

Drive adoption of soil health practices by:

- ✓ Quantifying the economic & environmental outcomes associated with these management changes
- ✓ Increasing awareness
- ✓ Developing a persuasive education tool to help convince farmers to adopt these practices on owned and rented land
- ✓ Improving landowner and operator communication and interaction

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Meet the Team

Michelle Perez
Project Leader
Water Initiative Director

Florence Swartz
Project Economist
Retired NRCS NY Economist

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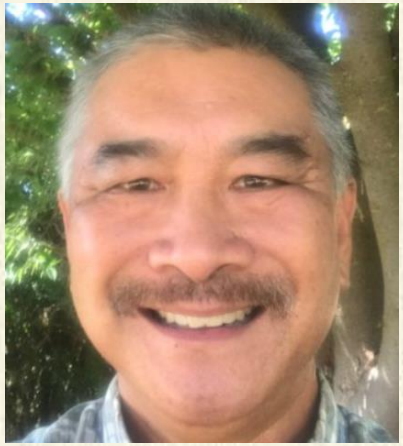
Meet the AFT Authors

Justin Bodell
CA Stewardship Manager



Paul Lum
CA Project Manager

Emily Bruner, PhD
Midwest Science Director, IL

Brian Brandt
Ag Innovations Director, OH

Aaron Ristow
NY Stewardship Mgr

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External Reviewers

- NRCS Economists
  - **Lynn Knight**, Economist, East Region
  - **Bryon Kirwan**, Illinois State Economist
  - **Lakeitha Ruffin**, Oregon State Economist
  - **Richard Lovanna**, FSA Economist
  - **Sophia Glenn**, NRCS Economist
  - **Sarah Cline**, NRCS Economist

- NRCS Soil Health Specialists
  - **Kabir Zahangir**
    West Regional Soil Health Specialist
  - **James Hoorman**
    NE Regional Soil Health Specialist
  - **Candy Thomas**, NRCS SH Specialist
  - **Justin Morris**, NRCS SH Specialist
  - **Barry Fisher**, NRCS SH Specialist

- University Economists
  - **John Hanchar**
    Cornell Cooperative Extension
  - **Gary Schnitkey**
    University of Illinois
  - **Brent Sohngen**
    Ohio State University

- NTT Reviewer
  - **Mindy Selman**, USDA
    Office of Ecosystem Markets

- COMET-Farm Reviewer
  - **Matthew Stermer & Mark Easter**
    Colorado State University

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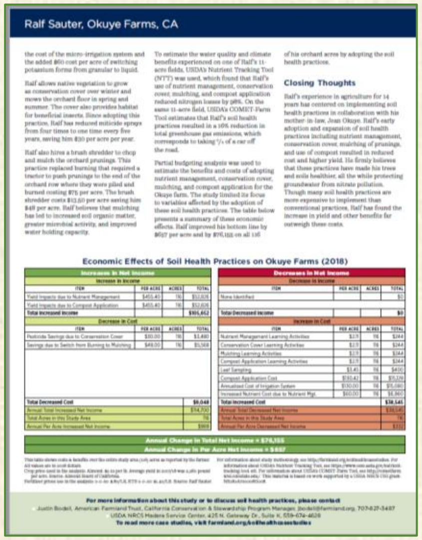
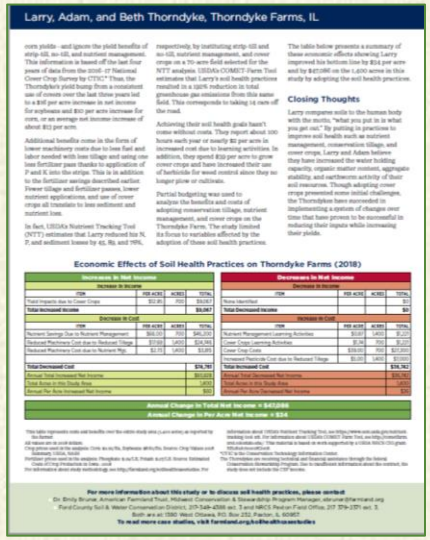
Front page - 8 Soil Health Case Studies

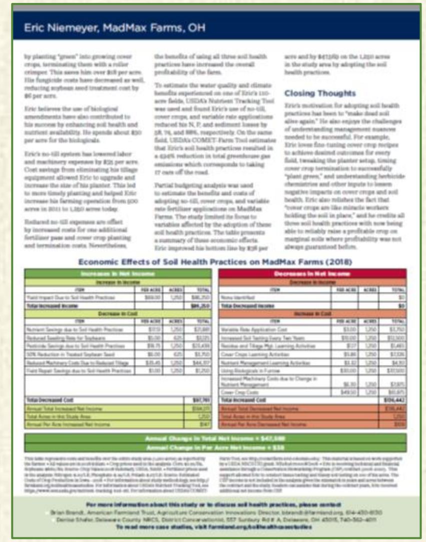
Back page - 8 Soil Health Case Studies


Ralf Sauter, Okuye Farms, CA

Economic Effects of Soil Health Practices on Okuye Farms (2018)


Larry, Adam, and Beth Thorndyke, Thorndyke Farms, IL

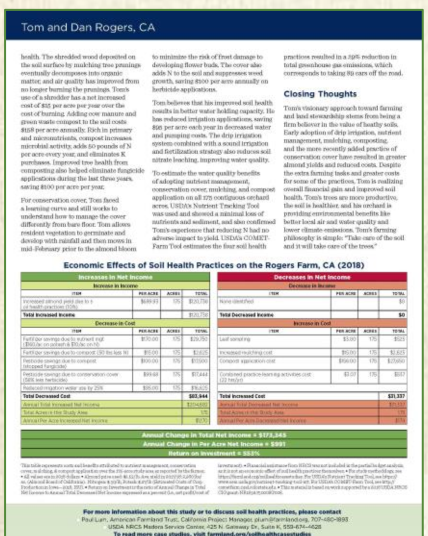
Economic Effects of Soil Health Practices on Thorndyke Farms (2018)


Eric Niemeyer, MadMax Farms, OH

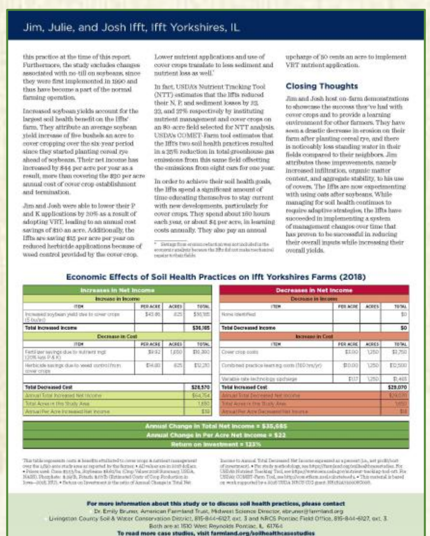
Economic Effects of Soil Health Practices on MadMax Farms (2018)


Jay Swede, Gary Swede Farm LLC, NY

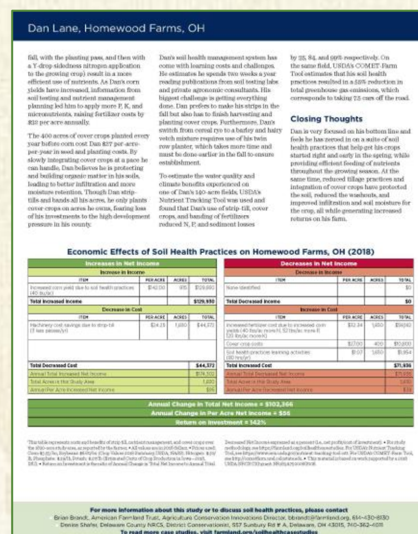
Economic Effects of Soil Health Practices on Gary Swede Farm, LLC (2018)


Tom and Dan Rogers, CA

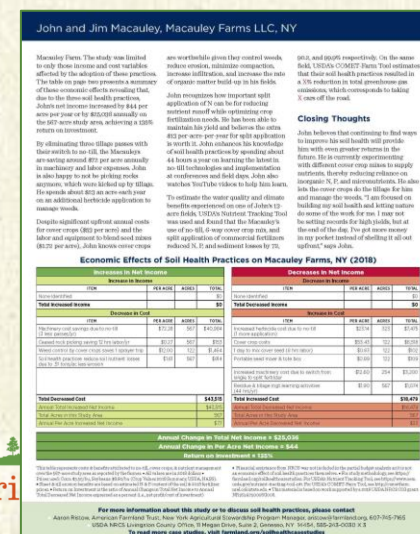
Economic Effects of Soil Health Practices on the Rogers Farm, CA (2018)


Jim, Julie, and Josh Ifft, Ifft Yorkshires, IL

Economic Effects of Soil Health Practices on Ifft Yorkshires Farm (2018)


Dan Lane, Homewood Farms, OH

Economic Effects of Soil Health Practices on Homewood Farms, OH (2018)


John and Jim Macauley, Macauley Farms LLC, NY

Economic Effects of Soil Health Practices on Macauley Farms, NY (2018)

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METHODS FOR ECONOMIC ANALYSIS

Economic Methods

- Partial budget analysis:
  - Estimates the economic effect (benefits and costs) of changes in a farming operation
  - Focuses only on variables affected by the change
  - Compares costs & benefits “before” & “after” soil health practice implementation

- Primary effects evaluated:
  1. Machinery
  2. Fertilizer
  3. Pesticide
  4. Yield
  5. Erosion repair
  6. Learning costs
  7. Other

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Example of Partial Budget Analysis

Economic Effects of Soil Health Practices on Gary Swede Farm, LLC (2018)

Increases in Net Income

Increase in Income

Item	Per Acre	Acres	Total
Yield Impact Due to Soil Health Practic	$71.95	600	$43,168
Total Increased Income			**$43,168**

Decrease in Cost

Item	Per Acre	Acres	Total
Reduced Machinery Cost due to Reduced Tillage	$23.43	1,500	$35,152
Nutrient Savings due to Nutrient Mngmnt.	$40.65	600	$24,390
Value of Decreased Erosion due to Soil Health Practices	$2.25	1,500	$3,369
Total Decreased Cost			**$62,911**
Total Increased Net Income			$106,079
Total Acres in the Study Area			1,500
Per Acre Increased Net Income			$71

Decreases in Net Income

Decrease in Income

Item	Per Acre	Acres	Total
None Identified			
Total Decreased Income			**$0**

Increase in Cost

Item	Per Acre	Acres	Total
Cost of Setting up Planter to Handle Residue	$0.72	600	$432
Cover Crop Costs	$51.00	450	$22,950
Residue and Tillage Management Learning Activities	$0.07	1,500	$98
Cover Crops Learning Activities	$0.22	450	$98
Nutrient Management Learning Activities	$0.16	1,500	$244
Total Increased Cost			$23,822
Total Decreased Net Income			$23,822
Total Acres in the Study Area			1,500
Per Acre Decreased Net Income			$16

Total Net Returns = $82,257

Per Acre Net Return = $55

Return on Investment = 345%

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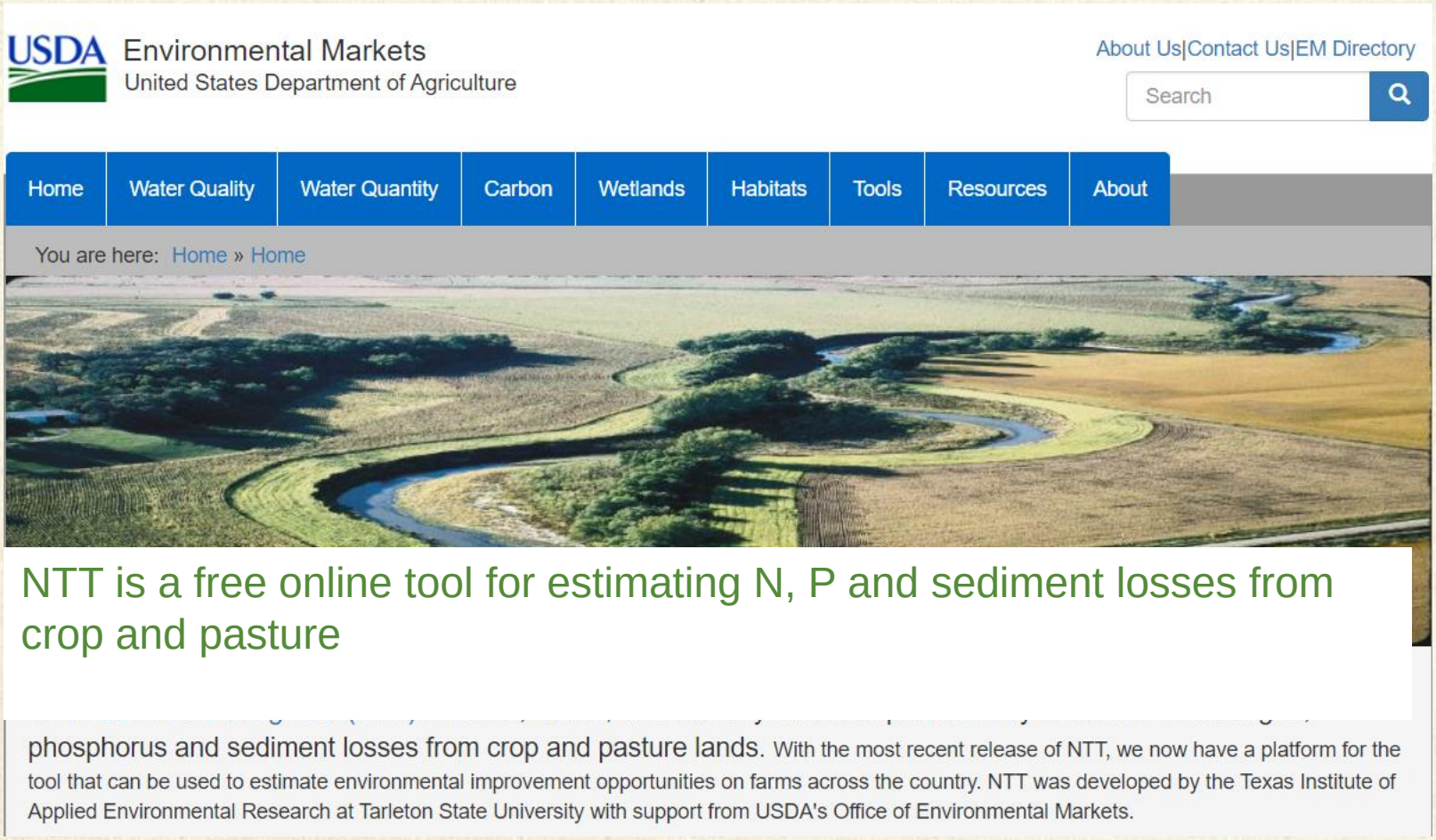
METHODS FOR ENVIRONMENTAL ANALYSIS

Nutrient Tracking Tool – Water Quality



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COMET-Farm – Greenhouse Gases

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FEATURED FARMER

Jay Swede, NY, diversified crop rotation

- Genesee County Genesee River Watershed;
- Sweet corn, alfalfa, corn silage, grain corn
- **Study area:** 1,500 / 4,500 acres
- No-till, strip-till, cover crops, & nutrient management
  - **Cover crops: 450/ac/yr, oats, wheat, radishes or a mix in sweet corn after alfalfa, and corn silage**

Annual SH Benefits: $106,079
Annual SH Costs: $23,822
Annual SH PROFITS: $82,257 or $55/ac
(2018 dollars)

343% ROI

NTT results: On a 25-acre field, N, P, & sediment reduced by 40, 92, & 96%

COMET results: Same field, total GHG reduced by 560%, taking 3 cars off road

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Jay Swede, NY, diversified rotation

Increases in Net Income			
Increase in Income			
ITEM	**PER ACRE**	**ACRES**	**TOTAL**
Yield Impact Due to Soil Health Practices	$71.95	600	$43,168
Total Increased Income			**$43,168**
Decrease in Cost			
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Jay Swede, NY, diversified rotation

Decreases in Net Income			
Decrease in Income			
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None Identified			$0
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Increase in Cost			
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Total Increased Cost			**$23,822**
Annual Total Decreased Net Income			$23,822
Total Acres in this Study Area			1,500
Annual Per Acre Decreased Net Income			$16

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OVERARCHING FINDINGS

Yield & Income Benefits of Soil Health Practices Across Six Crop Farms

- **Improved Yield:**
  - 1 farm reported no yield change while
  - 5 reported yield increases
  - Range: 2% to 22% for at least one of the crops grown
- **Annual Change in Per Acre Net Income:**
  - 6 farms reported increases
  - Average increase: $41/ac/yr
  - Range: $22 to $56/ac/yr
- **Return on Investment:**
  - 6 farms reported positive ROI
  - Average was 151%
  - Range was 35% to 343%

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Input Benefits & Costs of Soil Health Practices Across Six Farms

- **Changes to Fertilizer Costs:**
  - 1 farm increased costs while
  - 5 farms reduced costs
  - Average savings: $36/ac/yr
  - Range: $18 & $66/ac/yr

- **Changes to Machinery, Fuel, and Labor Costs due to Change in Tillage:**
  - 1 farm reported no change while
  - 5 farms reduced costs
  - Average savings: $31/ac/yr
  - Range: $20 to $60/ac/yr

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Input Benefits & Costs of Soil Health Practices Across Six Farms

- **Pesticide Usage: (Herbicide, Insecticide, and Fungicide)**
  - 2 farms reported no change while
  - 4 reported changes
    - 2 farms increased by an average of $8/ac/yr; Range: $5 & $11/ac/yr
    - 2 farms decreased by average of $17/ac/yr; Range: $15 to $19/ac/yr
- **Learning Costs:**
  - Average: $3.12/ac/yr
  - Ranged from $440 to $12,940/yr or 44 cents to $10.35/ac/yr

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Environmental Benefits of Soil Health Practices Across all Six Farms

- **Water Quality Improvement:**

  All 6 row crop farmers *observed* reduced soil and water runoff

  On selected fields, NTT estimated:

  - Average reduction in N losses was 61% (range was 23 to 72%);
  - Average reduction in P losses was 74% (range was 33 to 92%); &
  - Average reduction in sediment losses was 81% (range was 37 to 99%

- **Climate Improvement**:

  On selected fields, COMET-Farm estimated total GHG emissions were reduced an average of 217% (range was 35 to 560%)

Uses of the Case Studies by the Conservation Community

We hope:

- **Government partners -** NRCS, SWCD, & Extension
- **Non-profits** – ACWA, Field-to-Market, ESMC
- **Private sector -** Ag retailers, crop consultants, cover crop seed dealers, strip-till equipment providers, etc.

Use the case studies with their farm customers to help answer questions about the costs & benefits of adopting soil health practices.

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Farmer Uses of the Case Studies

We hope farmers will:

- **Read the case studies & try one soil health practice w/ or w/o help**

  AFT, 2 ag retailers, NRCS, & SWCD are at the ready to help

- **Say "yes" to a "Predictive Assessment"**

  AFT is offering 4 "soil health curious farmers" the service of running "what if" scenarios => potential, future economic, water quality, & climate benefits

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Farmer Uses of the Case Studies

We hope farmers will share the case studies with:

- **Existing landowners** - To discuss sharing the risks and rewards of the soil health investments
- **New landowners** – To add new fields
- **Bankers** –To secure additional financing for the farm expansion

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Thank you & More Info

Michelle Perez, PhD
Water Initiative Director
mperez@farmland.org

Download the case studies at:
farmland.org/soilhealthcasestudies

To sign-up for a training, email:
SHtraining@farmland.org

Let us know if you use the case studies in your projects with farmers as an outreach & education material!

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