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SAVING THE LAND THAT SUSTAINS US

Conquering Cover Crops Coast-to-Coast:

Highlights from 2021-2025 On-Farm Demonstration Trial featuring farms in CA, KY, MA, CT, & NY

February 4, 2026


Work funded through the National Conservation Innovation Grant
On-Farm Conservation Innovation Trial
#NR213A750013G009 (2/18/21 – 2/15/26)

USDA Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

Session agenda

- About the Project
- Data Collection Overview
- Trial design & results by State
  - Massachusetts & Connecticut
  - California
  - Kentucky
  - New York
- Social survey results
- Lessons learned
- Q&A

A cover crop mix flourishing between almond tree instead of bare soil

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ABOUT THE PROJECT

Presented by Michelle Perez, PhD

Photo: Chris Pierce Demo Trial Site, Kentucky

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AFT's Soil Health Demo Trial Team

CIG Leads

Soils Team

- Bianca Moebius-Clune, PhD (PI)
- Aysha Tapp Ross, PhD
- Kiros Hagdu, PhD

Econ Team

- Michelle Perez, PhD (PI)
- Robert Ellis, PhD
- June Grabemeyer, NRCS (retired)

Social Team

- Gabrielle Roesch-McNally, PhD
- Ellen Yeatman

State Leads

CALIFORNIA

- Paul Lum

KENTUCKY

- Brian Brandt

NEW YORK

- Aaron Ristow & Caitlin Tucker

MA & CT

- Caro Roszell

Partners:

- CA – Project Apis M.
- KY – Craig Givens, NRCS (retired)
- NY – Jodi Letham, Cornell Cooperative Extension & David DeGolyer, Western NY Crop Mgt Association
- MA – Arthur Siller, Masoud Hashemi, & Neda Nikpoor Rashidabad UMASS

Supporting AFT staff:

- Jen Tillman, Harol Gonzalez, Vanessa Lozano Perez, Ben Roosa, Maria Lucero, Kinzie Reiss, Lia Raz, Jose Perez, Anel Trujillo, Whitney Shields
- **Key Past Staff:** Jen Moore (Former PI), Rachel Seman-Varner (Soils)

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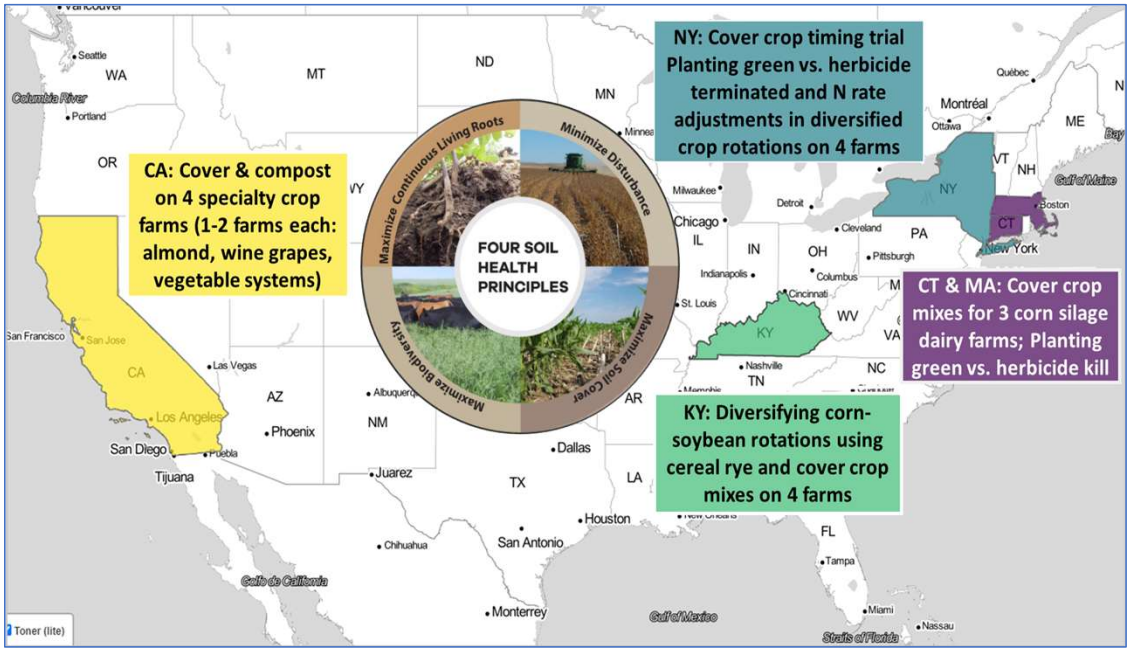
“Conquering Cover Crop Challenges from Coast-to-Coast” (2021-2025)

- Support **farmer-driven transitions** to improve soil health through adoption of cover crops & other soil health practices

- Address **regional issues, cropping system challenges, & farmer interests**:
  - **CA:** soil moisture management
  - **NY:** timing in crop rotations
  - **New England:** termination methods
  - **KY:** cover crop mixes



- Collaborate with 15 farms in 5 states, representing 3 geographic regions & 6 crop systems:

Almonds	Corn-soybeans-wheat
Wine grapes	Corn silage diversified crops
Vegetables	Corn silage

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AFT OFDT Products

Public products coming soon:

- This webinars & slides + 4 others
- 7 Individual On-Farm Trial Case Studies
- Overall project report
- Journal article on NY & KY roller crimping results

Farmer-only products:

- Annual farmer reports - highlights & details of design, soils, economic, & social outcomes
- 8 Individual final farmer reports soils, econ, & social summaries

NRCS products:

- Semi-annual reports
- Detailed social, soils, and economic summary report, including lessons learned & recommendations

Aaron Ristow discussing field ops with participating farmer

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Overall, the experience was awesome…..and hard

- First-ever project of its kind at AFT
- Everyone's reported they were "happy" they participated
- Challenges:
  - **Epidemics, etc.**: Covid, weather challenges (wet, dry, cold, hot…),
  - **Farmer:** Land ownership changes, crop buyer losses, crop failures
  - **AFT staff:** 4 different CIG Leads "bus drivers"
  - **Before application**: Insufficient time to recruit "new adopters"
  - **Trial design**: Already adopters fine-tuning termination & multi-species vs single species; simple vs. replicated trial designs
  - **Data collection**: Had to build from scratch

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Data Collection

Presented by Aysha Tapp Ross

Photo: HaRGo Farm Soil Sampling, New York

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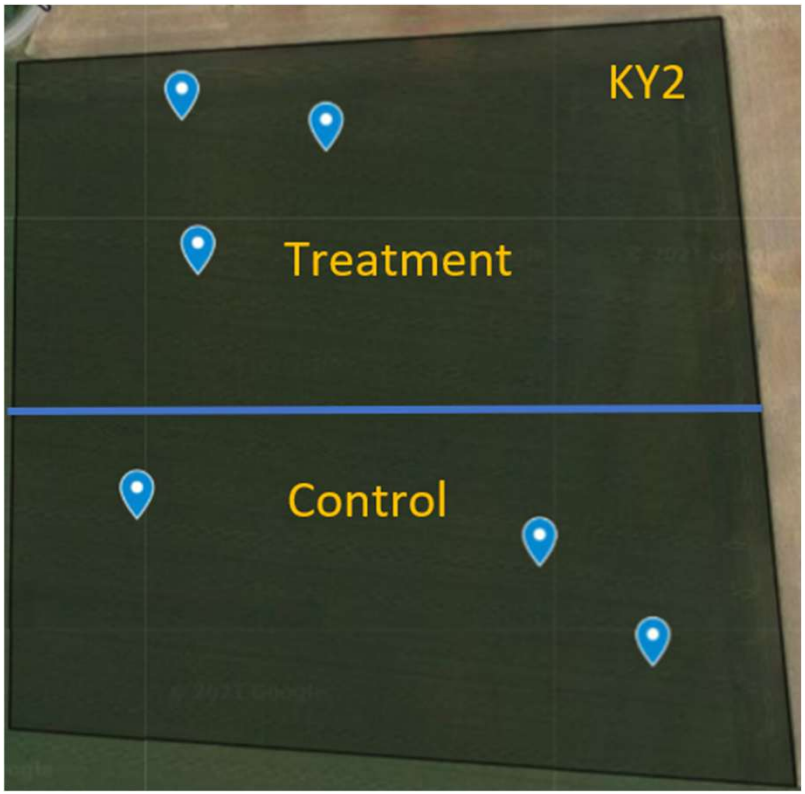
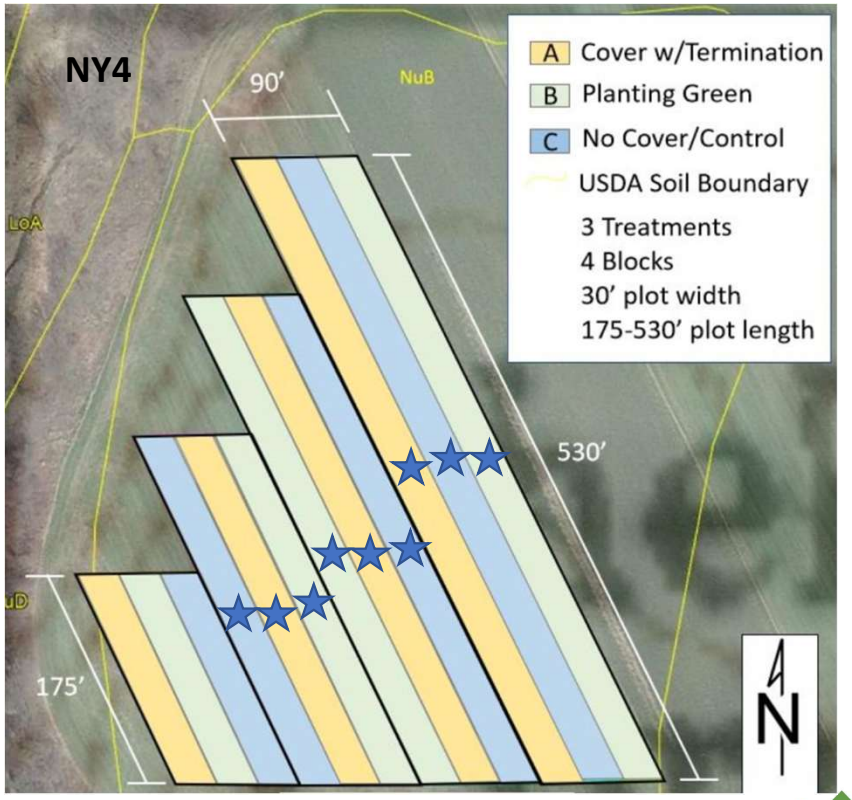
Demo Trial Design Examples



Side-by-side design (non-replicated)



Replicated Design

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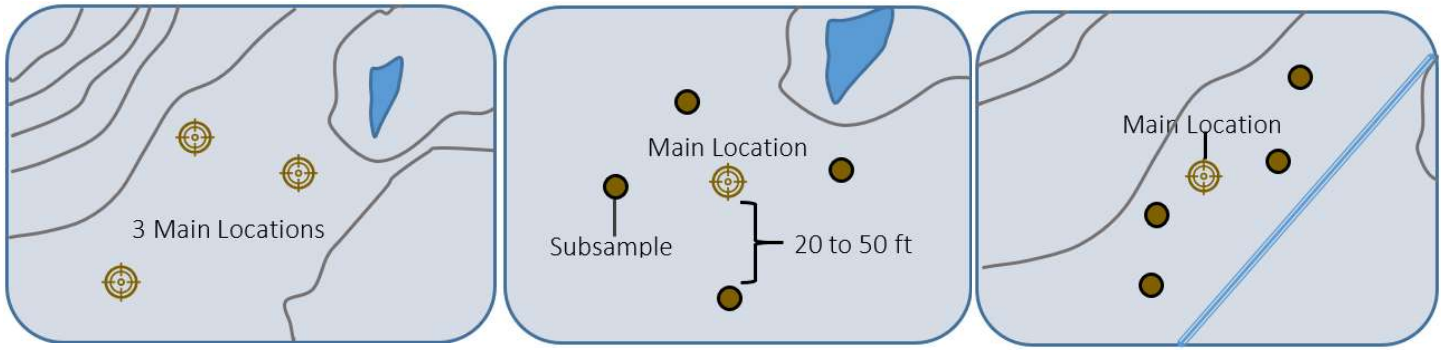
Soil Sampling Protocols

- Sampling protocols reflected USDA-NRCS Collection & processing Instructions for Soil Health Tests
- 3 Main locations per treatment/control
- 5 subsamples per main location



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Soil Health Assessment

- Used two measures of soil health:
  - NRCS In-Field Soil Health Assessment (IFSHA)
  - Cornell Comprehensive Assessment of Soil Health (CASH) reports
- For KY & CA
  - local labs to provide more regionally specific nutrient recommendations

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In Field Soil Health Assessment- IFSHA

- Followed NRCS Cropland IFSHA Guide (Technical note 450-06)
- Evaluate whether 11 different indicators meet threshold criteria
- Assessed the soil for four NRCS-defined soil health resource concerns:
  - Compaction
  - Soil organism habitat loss
  - Organic matter depletion
  - Aggregate instability

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Laboratory soil health assessment: Sample CASH report

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Results by Cornell Comprehensive Assessment of Soil Health

Sample ID:
Field ID: CT2_C_Average
Date Sampled: 04/26/2021
Crops Grown: COS/COS/COS

Measured Soil Textural Class:
Sand: **59%** · Silt: **30%** · Clay: **10%**

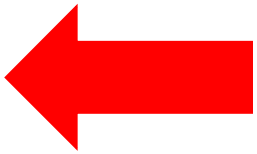
Group	Indicator	Value	Rating	Constraints
physical	Predicted Available Water Capacity	0.19	80	
physical	Surface Hardness	433	0	Rooting, Water Transmission
physical	Subsurface Hardness	564	1	Subsurface Pan/Deep Compaction, Deep Rooting, Water and Nutrient Access
physical	Aggregate Stability	34.0	57	
biological	Organic Matter Total Carbon: 2.1 / Total Nitrogen: 0.2	3.1	91	
biological	ACE Soil Protein Index	6.4	39	
biological	Soil Respiration	0.7	59	
biological	Active Carbon	688	88	
chemical	Soil pH	7.0	100	
chemical	Extractable Phosphorus	44.2	10	High Phosphorus, Environmental Impact Risk
chemical	Extractable Potassium	288.3	100	
chemical	Minor Elements Mg: 265.8 / Fe: 2.2 / Mn: 5.8 / Zn: 9.1		100	

Overall Quality Score: **60** / High

- Quantitatively analyzes 12 physical, biological, and chemical soil properties
- Translated to scores and ranked from very low to very high
- Interpretations are made relative to other farms of similar soil textures
- Each farm is also given an overall score

CASH Scoring Legend

Score	Rank	Color Code
80 – 100	Very High	Dark Green
60 – 80	High	Light Green
40 – 60	Medium	Yellow
20 – 40	Low	Orange
0 – 20	Very Low	Red



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Economic Data

- Combined national estimates with on-farm costs into one worksheet
- National Datasets
  - Machinery Estimates
  - Crop and Input prices
- Farmer provided
  - Cover crop costs
  - Inputs prices & rates (seed & chemical)
  - Crop yields
  - Practice timing

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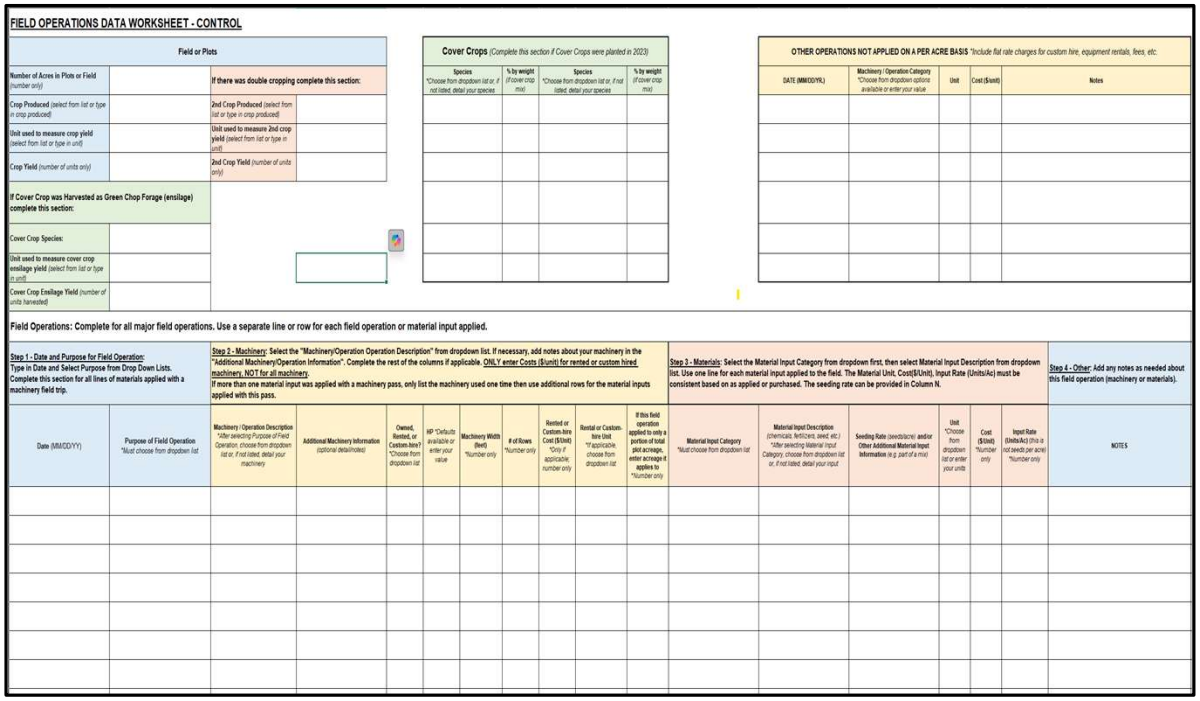
Economic Methods

Data collected

- Crop & yield & acreage
- Operation date & category
- Machinery type
  - Owned/Rented/Custom
  - Horsepower (HP)
  - Row width
  - $/unit of rented or custom operations
- Material Type
  - $/unit
  - Rate (units/ac)
- Other operations not applied on a per acre basis
  - $/unit



FIELD OPERATIONS DATA WORKSHEET - CONTROL

Field or Plots			
Number of Acres in Plots or Field (number only)		If there was double cropping complete this section:	
Crop Produced (select from list or type in crop produced)		2nd Crop Produced (select from list or type in crop produced)	
Unit used to measure crop yield (select from list or type in unit)		Unit used to measure 2nd crop yield (select from list or type in unit)	
Crop Yield (number of units only)		2nd Crop Yield (number of units only)	
If Cover Crop was Harvested as Green Chop Forage (ensilage) complete this section:			
Cover Crop Species:			
Unit used to measure cover crop ensilage yield (select from list or type in unit)			
Cover Crop Ensilage Yield (number of units harvested)			

Cover Crops (Complete this section if Cover Crops were planted in 2023)

Species (*Choose from dropdown list or, if not listed, detail your species)	% by weight (if cover crop mix)	Species (*Choose from dropdown list or, if not listed, detail your species)	% by weight (if cover crop mix)

OTHER OPERATIONS NOT APPLIED ON A PER ACRE BASIS (*Include flat rate charges for custom hire, equipment rentals, fees, etc.)

DATE (MM/DD/YR)	Machinery / Operation Category (*Choose from dropdown options available or enter your value	Unit	Cost ($/unit)	Notes

Field Operations: Complete for all major field operations. Use a separate line or row for each field operation or material input applied.

Step 1 - Date and Purpose for Field Operation: Type in Date and Select Purpose from Drop Down Lists. Complete this section for all lines of materials applied with a machinery field trip.

Step 2 - Machinery: Select the "Machinery/Operation Operation Description" from dropdown list. If necessary, add notes about your machinery in the "Additional Machinery/Operation Information". Complete the rest of the columns if applicable. ONLY enter Costs ($/unit) for rented or custom hired machinery, NOT for all machinery. If more than one material input was applied with a machinery pass, only list the machinery used one time then use additional rows for the material inputs applied with this pass.

Step 3 - Materials: Select the Material Input Category from dropdown first, then select Material Input Description from dropdown list. Use one line for each material input applied to the field. The Material Unit, Cost($/Unit), Input Rate (Units/Ac) must be consistent based on as applied or purchased. The seeding rate can be provided in Column N.

Step 4 - Other: Add any notes as needed about this field operation (machinery or materials).

Date (MM/DD/YY)	Purpose of Field Operation (*Must choose from dropdown list	Machinery / Operation Description (*After selecting Purpose of Field Operation, choose from dropdown list or, if not listed, detail your machinery	Additional Machinery Information (optional detail/notes)	Owned, Rented, or Custom-hire? (*Choose from dropdown list	HP (*Defaults available or enter your value	Machinery Width (feet) (*Number only	# of Rows (*Number only	Rented or Custom-hire Cost ($/Unit) (*Only if applicable, number only	Rental or Custom-hire Unit (*If applicable, choose from dropdown list	If this field operation applied to only a portion of total plot acreage, enter acreage it applies to (*Number only	Material Input Category (*Must choose from dropdown list	Material Input Description (chemicals, fertilizers, seed, etc.) (*After selecting Material Input Category, choose from dropdown list or, if not listed, detail your input	Seeding Rate (seeds/acre) and/or Other Additional Material Input Information (e.g. part of a mix)	Unit (*Choose from dropdown list or enter your units	Cost ($/Unit) (*Number only	Input Rate (Units/Ac) (this is not seeds per acre) (*Number only	NOTES

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Economic Methods

Step 1 - Date and Purpose for Field Operation: Type in Date and Select Purpose from Drop Down Lists. Complete this section for all lines of materials applied with a machinery field trip.		Step 2 - Machinery: Select the "Machinery/Operation Operation Description" from dropdown list. If necessary, add notes about your machinery in the "Additional Machinery/Operation Information". Complete the rest of the columns if applicable. ONLY enter Costs ($/unit) for rented or custom hired machinery, NOT for all machinery. If more than one material input was applied with a machinery pass, only list the machinery used one time then use additional rows for the material inputs applied with this pass.								
Date (MM/DD/YY)	**Purpose of Field Operation** **Must choose from dropdown list*	**Machinery / Operation Description** **After selecting Purpose of Field Operation, choose from dropdown list or, if not listed, detail your machinery*	**Additional Machinery Information** *(optional detail/notes)*	**Owned, Rented, or Custom-hire?** **Choose from dropdown list*	**HP** **Defaults available or enter your value*	**Machinery Width (feet)** **Number only*	**# of Rows** **Number only*	**Rented or Custom-hire Cost ($/Unit)** **Only if applicable; number only*	**Rental or Custom-hire Unit** **If applicable, choose from dropdown list*	**If this field operation applied to only a portion of total plot acreage, enter acreage it applies to** **Number only*
06/28/24	Tillage	Disc Harrow	12 foot disc harrow with 108 hp Kubota	Owned	108	12				

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Economic Analysis

- Developed financial analysis for each farm by crop year
- Calculated net income with partial budget of yield **x** published price **-** machinery & materials cost in $/acre for both control and treatment plots
- Compared net income & costs between treatment and control

Net Income (Profit) Positive Effects		**Net Income (Profit) Negative Effects**	
Increases in Total Value of Production (TVP)		**Decreases in Total Value of Production (TVP)**	
Item	**Treatment $/Ac**	**Item**	**Treatment $/Ac**
Value of Production, Corn Silage		Value of Production, Corn Silage	$85.40
Value of Production, Triticale Ensilage	$216.24	Value of Production, Triticale Ensilage	
Total Value of Production Increases	**$216.24**	**Total Value of Production Decreases**	**$85.40**
Cost Decreases		**Cost Increases**	
Item	**Treatment $/Ac**	**Item**	**Treatment $/Ac**
Pesticide & Herbicide Application		Pesticide & Herbicide Application	$50.00
Cover Crop Termination Machinery		Cover Crop Termination Machinery	$27.50
Pesticides & Herbicides		Pesticides & Herbicides	$49.94
Cover Crop Termination Herbicides/Materials	$49.94	Cover Crop Termination Herbicides/Materials	
Total Decreased Cost	**$49.94**	**Total Increased Costs**	**$127.44**
Total Increased Profit	**$266.18**	**Total Decreased Profit**	**$212.84**
Annual Change in Per Acre Net Income, Treatment		**$53.34**	

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Social Science Data Collection

- **Social indicator surveys of participating farmers (Y1, Y3, Y5)**
  - *Questions on experience, motivations, challenges, knowledge/attitude, & capacity to continue*
- **Farmer focus group (Y5)**
- **Internal project team focus group (Y1, Y3, Y5)**
- **Field day surveys (Y1-Y4)**
- **Final lessons learned report (coming soon!)**

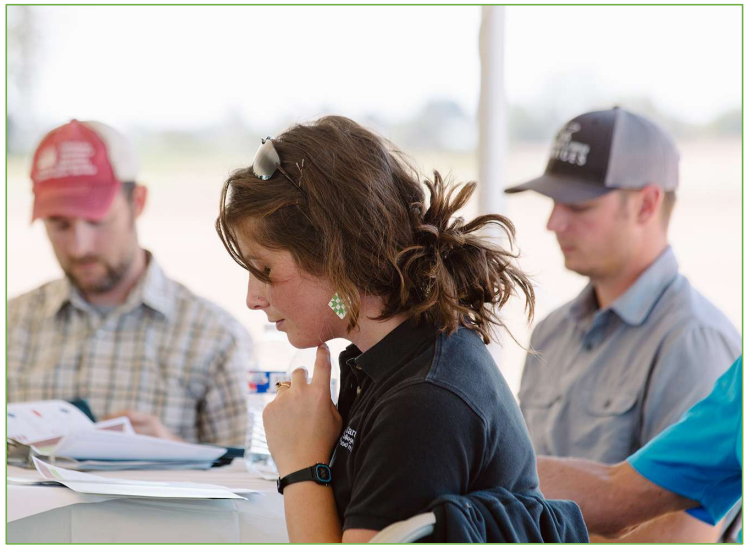

Photo: Field day surveys being collected at the 2024 Kentucky field day

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Results by State

Presented by Caro Roszell, Paul Lum, Brian Brandt, & Caitlin Tucker

Photo: Branton Farm 2023 Field Day, New York

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Slide 19

BMCP1 Noting a couple of things about this slide as it was (all I just did was pull the picture to enlarge to make the bottom ⅓ of the pic not show up in the slide which addresses most of these to make them non-issues

A) is king's agriseeds a contributor/match provider, etc? did we consciously think about being advertisement for them and are we ok with that?

B) also the CC establishment in the front of this pic is imperfect (which is fine - it's the reality of on farm work but also what impression does that pic = 1000 words leave for AFT/King's)

C) the AFT logo looks grainy, probably just because it's superimposed over the wrong part of the pic. It's a little better now. Feel free to undo if you don't like it, or cut the pic to size

Bianca Moebius-Clune, PhD, 2026-01-28T18:08:39.485

BMCP2 To stick with the very nice format with transition slides for speakers used for Michelle and Aysha before, should this slide say "Presented by…" and list the four state leads who are presenting? [@Aysha Tapp Ross]

Or should each regional section say "Presented by…" (different format, but introducing each speaker)

Bianca Moebius-Clune, PhD, 2026-01-28T18:11:21.723

Massachusetts & Connecticut

AFT State Lead: Caro Roszell

Collaboration and Technical Assistance:

- NRCS MA Soil Health Resource Conservationist Kate Parsons
- UMass Plant & Soil Team: Sam Glaze-Corcoran, Artie Siller, and Neda Nikpour-Rashidabad

Massachusetts & Connecticut Demo Trials Design

Farm Name	Production	Control	Treatment A	Treatment B
Bar-Way Farm	Corn silage	Cover crop, conventional tillage termination	Cover crop, **strip tillage** termination + herbicide (originally: roller crimper)	Cover crop, herbicide termination (sometimes **planting green**)
Cushman Farm	Corn silage	Cover crop, herbicide & tillage termination	Cover crop, **green chop**; no-till cash crop	Cover crop, **roller crimper**; no-till cash crop
Canaan View Farm	Corn silage	Cover crop, herbicide termination		Cover crop, **green chop**

*All New England trial designs: 1 split field, no replications

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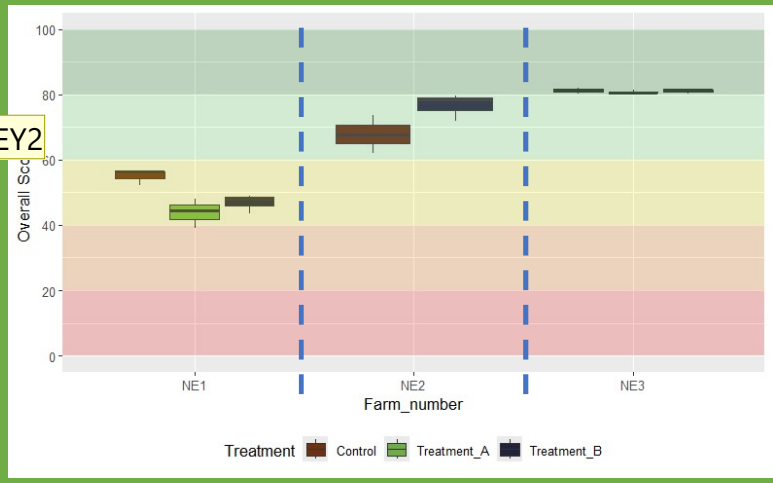
Regional Cover Crop Challenge: Short growing season

- Difficult cover crop establishment before winter, compounded by heavy and erratic precipitation
- Minimal spring cover crop growth from poor fall establishment
- Achieving sufficient maturity of cover crop to crimp within tight seasonal timelines (even with shorter-season corn)

New England Soil Results

- Baseline overall soil health scores were Medium to Very High (scores from 40-82)



EY2

Baseline Overall Scores by Farm by Treatment

BMCP1

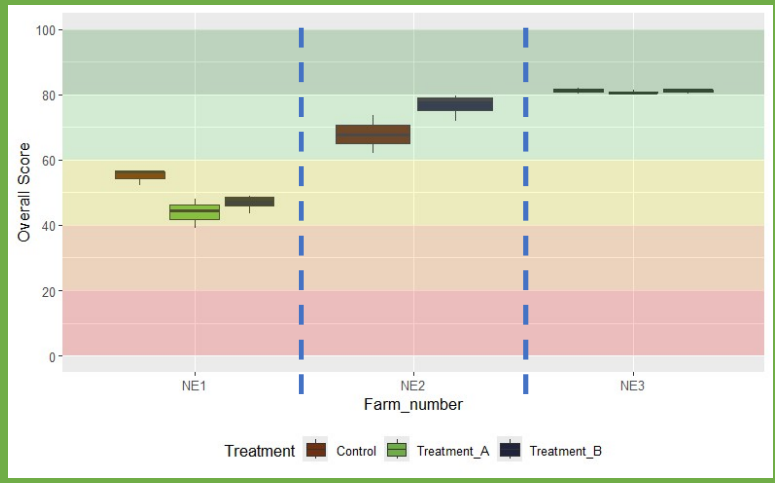
Slide 23

BMCP1 ‘substantial differences from cover cropping’
Bianca Moebius-Clune, PhD, 2026-01-28T18:18:00.258

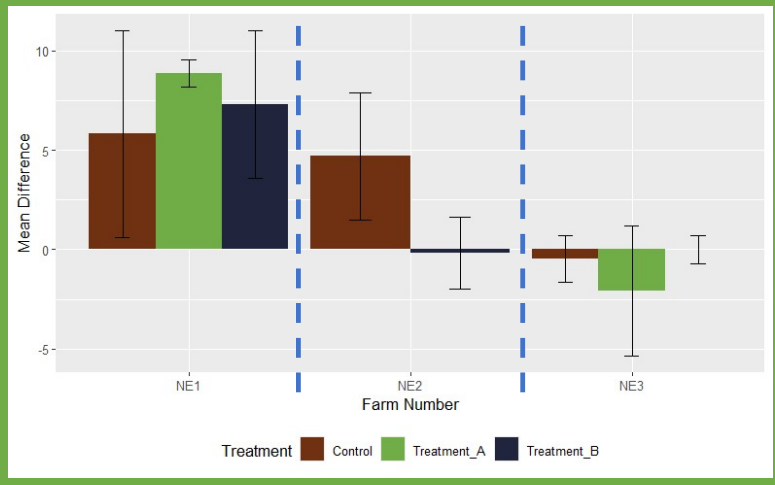
EY2 [@Aysha Tapp Ross] [@Caro Roszell] reminder to include somewhere note that for the two farms that tried Green Chop: “Despite removal of biomass from the Green Chop treatment, soil health outcomes were not noticeably diminished compared to the other two treatments; however, more years of data and a replicated trial design would be needed to be confident in this result.”
Ellen Yeatman, 2026-01-30T15:56:39.418

New England Soil Results

- Baseline overall soil health scores were Medium to Very High (scores from 40-82)
- Y5 minus Y1 = change in overall score over time
  - Overall score trends were inconsistent
  - Lower baseline scores had greater changes



Baseline Overall Scores by Farm by Treatment



Change in Overall Scores from Y1 to Y5 by Farm by Treatment

New England Soil Results

- Baseline overall soil health scores were Medium to Very High (scores from 40-82)
- Y5 minus Y1 = change in overall score over time
  - Overall score trends were inconsistent
  - Lower baseline scores had greater changes
- Soil health indicators change over time
  - Surface hardness values decreased (a good thing!)
  - SOM, aggregate stability, and ACE soil protein index values increased for most farms and treatments

Need more time to see substantial differences!

Change from Y1 to Y5 values (green indicates improvement)												
Farm	**Surface hardness**			**SOM**			**Aggregate Stability**			**ACE Soil Protein**		
	C	TA	TB	C	TA	TB	C	TA	TB	C	TA	TB
NE1												
NE2		NTA			NTA			NTA			NTA	
NE3												

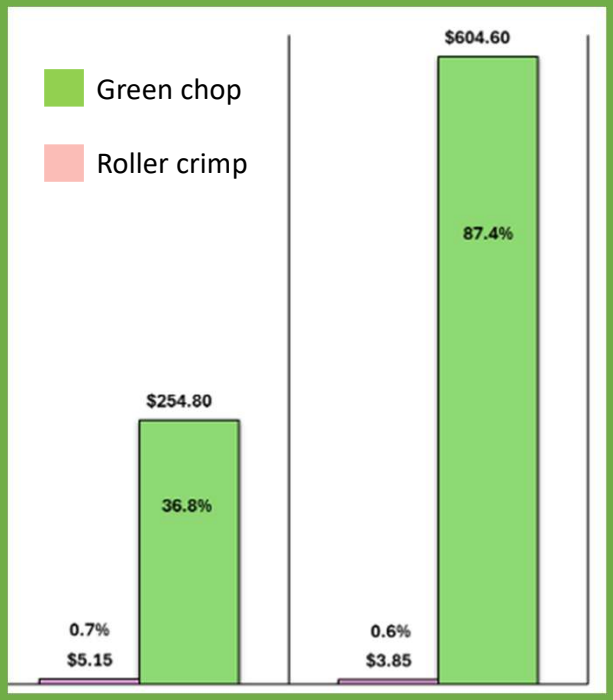
New England Economic Results

GREEN CHOP

- Green chop held a higher net income all years (average 67% higher) compared to the traditional cover crop herbicide termination (Control)
  - Despite additional cost of harvest

ROLLER CRIMPING

- Roller crimping has great economic potential, but very difficult to implement successfully
- When successful, roller crimp treatment net income consistent with pre-plant herbicide treatment because one farmer found no difference in cash crop yield



Difference in net income ($/ac; %) of treatments compared to Control (x-axis) in 2022 & 2023 crop years

Massachusetts and Connecticut Demo Trial Takeaways

Overarching takeaways:

- Silage corn planting and harvest timelines in MA and CT rarely allow for effective **roller crimping**
- Success relies on:
  - Timely fall planting
  - Good germination
  - Favorable spring weather
- Weather caused challenges in our trial:
  - Heavy fall precipitation: late cover crop planting
  - Cold spring: slow maturity
  - Hot spell at planting time: accelerated corn germination preventing crimp

Photo: Successful roller-crimping at Cushman Farm in 2023

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Massachusetts and Connecticut Demo Trial Takeaways

Overarching takeaways:

- **Double cropping** (green chop) increased net profits by $432/ac/yr on average
- No noticeable tradeoffs in soil health outcomes, likely due to:
  - Manure applications
  - Root biomass from cover crop provides substantial OM contributions and soil health benefits

Photo: Spring cover crop growth in the green chop plot at Cushman Farm in 2024

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Massachusetts and Connecticut Demo Trial Takeaways

Overarching takeaways:

- **Zone tillage** appeared to offer the best compromise between no-till and conventional till for one farm that trialed it:
  - **Similar residue** with **fewer skips** compared to no-till
  - **Compaction reduced**, but ground remained **firm enough** for harvest trucks in wettest year

Photo: Residue comparison between two treatments and control at Bar-Way Farm in 2025

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California

AFT CA Team: Tom, Anel, Paul & Harol (left to right)

AFT state leads:
Paul Lum & Harol Gallardo

AFT Outreach & Support:
Anel Trujillo, Vanessa Perez, & Tom Stein

California demo trials design

Farm Name	Production	Control*	Treatment*
CA1	Tomatoes- sunflower-cucumbers	No cover crop	Cover crop (bean, peas, vetch mix)
CA2	Almonds	No cover crop	Cover crop (triticale, bean, peas)
CA3	Wine grapes	No cover crop	Cover crop (clover mix) & reduced tillage

*All CA trial designs are side-by-side, non-replicated

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CA regional challenges

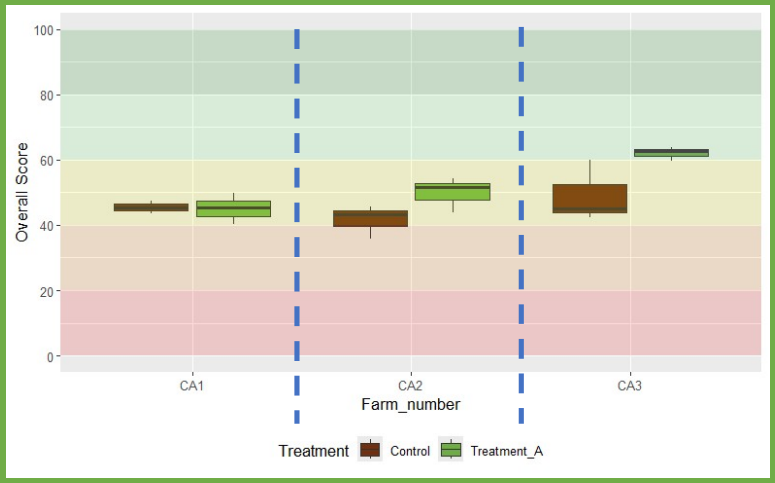
- Long-term drought & water scarcity
- Farmer resistance to cover cropping
  - Worries:
    - Cover crop competition for soil moisture
    - Cover crop competition for soil nutrients
    - For almond & grape growers, frost risk due to cover crop vegetation
    - For almond growers, harvesting interference
    - For vegetable growers, crop residue

Photo: No cover crop (left) versus cover crop (right) prior to Spring cover crop termination & tomato planting

PL1

California Soil Results

- Baseline overall soil health scores were Medium to High (scores from 40-63)



Baseline Overall Scores by Farm by Treatment

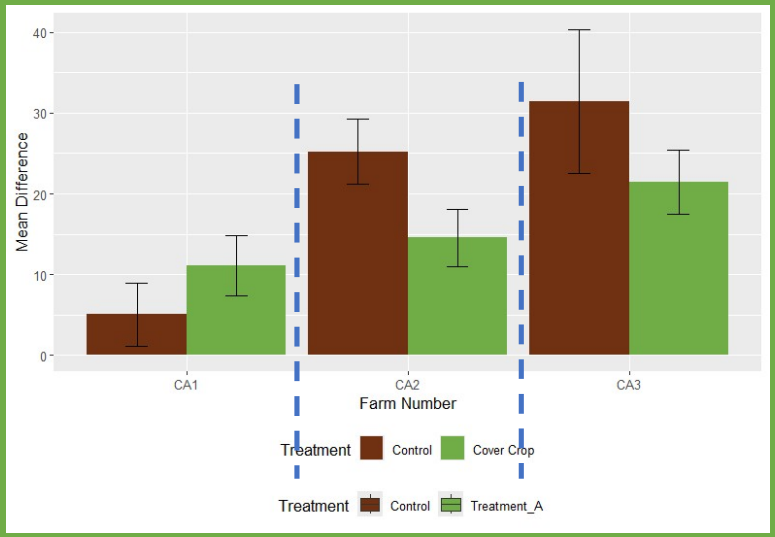
Slide 33

PL1 Shall we say ACE soil protein index" or simplify to "soil protein index", or state the full name?
Paul Lum, 2026-01-30T17:19:55.320

AT1 0 Say ACE soil protein index
Aysha Tapp Ross, 2026-01-30T19:07:49.589

California Soil Results

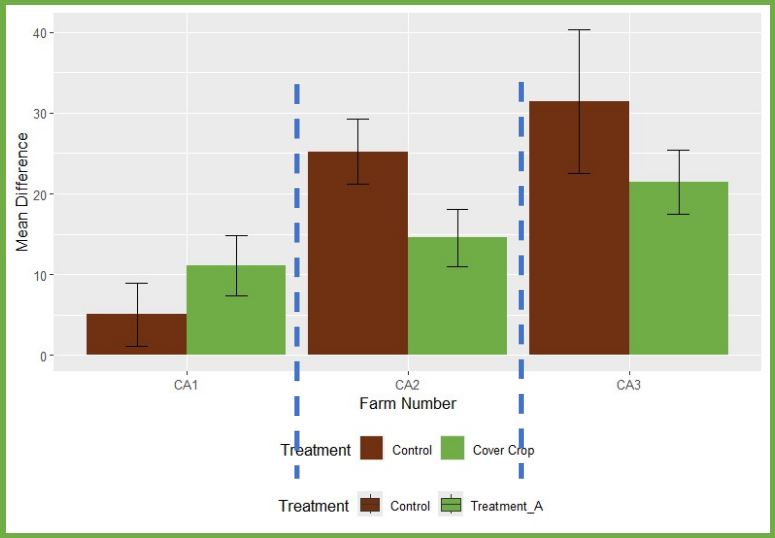
- Baseline overall soil health scores were Medium to High (scores from 40-63)
- Y5 minus Y1 = change in overall score over time
  - Overall scores increased across the board



Change in Overall Scores from Y1 to Y5 by Farm by Treatment

California Soil Results

- Baseline overall soil health scores were Medium to High (scores from 40-63)
- Y5 minus Y1 = change in overall score over time
  - Overall scores increased across the board
- Soil health indicators change over time
  - CA1 major indicators had minimal changes
    - Only 4 years of data
  - SOM, aggregate stability, ACE soil protein index, respiration, and active C values increased for both control and treatment on CA2 and CA3



Change in Overall Scores from Y1 to Y5 by Farm by Treatment

Change from Y1 to Y5 values (green indicates improvement)

Farm	SOM		Aggregate Stability		ACE Soil Protein Index		Respiration		Active C	
	C	TA	C	TA	C	TA	C	TA	C	TA
CA1										
CA2										
CA3										

Need more time to see substantial differences!

California Economic Results

- **Vegetable**
  - Yields did not decrease as a result of cover crops
  - Cover crop costs did not heavily impact net income
- **Almonds**
  - Additional operations were not needed for cover crop termination
  - Higher yields were found with cover crops, resulting in 11% higher net income
- **Wine grapes**
  - Additional operations were not needed for cover crop termination
  - Net income differences were driven by yield impacts

Photo: Demonstration field day at CA1

California Demo Trial Takeaways

Overarching takeaways:

- Farmers observed greater soil biodiversity, organic matter content & water holding capacity.
- Farmer Tanya Gemperle: *"After 3 years of organic matter gains, the soil is loaded with earthworms!"*

Biggest benefit:

- On-farm water conservation in a water-resource impacted region through improved soil health & water holding capacity.

Biggest challenge:

- Managing a trial through variable market conditions, weather, and crop production

Farmer Tanya Gemperle demonstrating cover crop diversity

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Photo: Chris Pierce (demo trial farmer), Brian, Aysha

Kentucky

AFT State leads:

Brian Brandt & Aysha Tapp Ross

Kentucky Demo Trials Design

Farm Name	Production	Control	Treatment A	Treatment B
Mount Folly Farm	Corn-soybean-rye-sunflower-hay	Cover crop, traditional seeding rate, tillage termination	Cover crop, increased seeding rate, tillage termination	Cover crop, increased seeding rate, roller crimp termination
Walnut Grove	Corn-wheat/DC soybean	No cover crop	Cover crop	N/A
Pleasure View Farm	Corn-soybean-wheat	Occasional cover crop	Yearly cover crop	N/A
Chris Pierce Farms	Corn-soybean-wheat	Winter cover crop	High biomass summer cover crop	N/A

*KY trial designs are a mix of replicated and non-replicated

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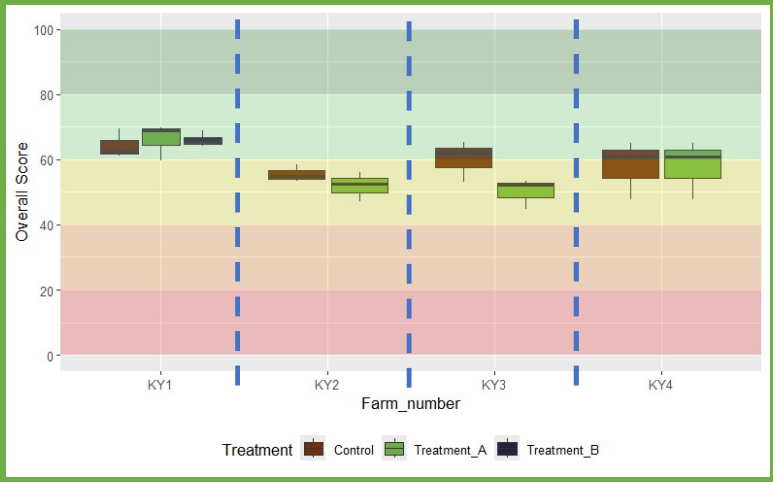
KY Regional Challenges

- Termination timing
- Timely seeding - especially with later harvest of double crop soybeans
- Nitrogen needs for cash crop
- Increased labor and management

Kentucky Soil Results

- Baseline overall soil health scores were Medium to High (scores from 44-74)

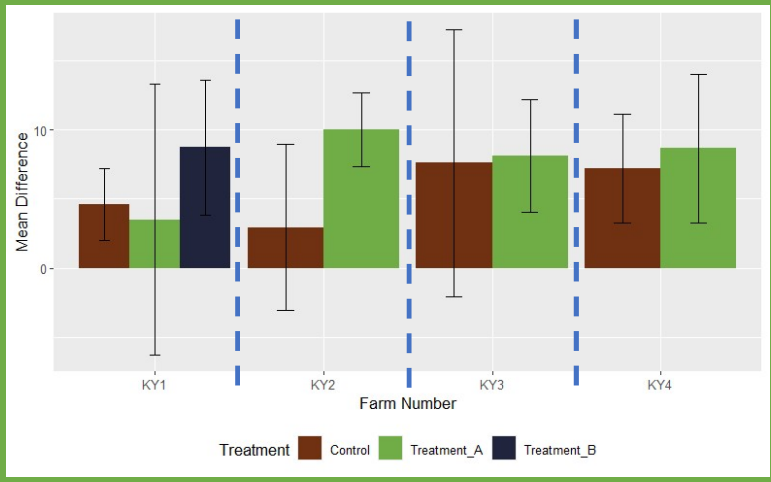


Baseline Overall Scores by Farm by Treatment

Photo: Soil showing presence of mycorrhizal hyphae

Kentucky Soil Results

- Baseline overall soil health scores were Medium to High (scores from 44-74)
- Y5 minus Y1 = change in overall scores over time
  - Overall scores increased across the board



Change in Overall Scores from Y1 to Y5 by Farm by Treatment

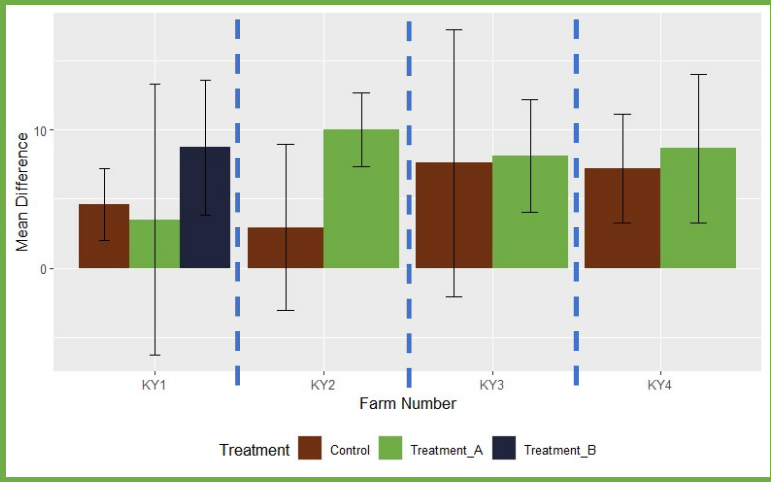
Photo: Soil showing presence of mycorrhizal hyphae

Kentucky Soil Results

- Baseline overall soil health scores were Medium to High (scores from 44-74)
- Y5 minus Y1 = change in overall scores over time
  - Overall scores increased across the board
- Soil health indicators change over time
  - SOM values increased for all farms and treatments
  - Aggregate stability and ACE soil protein index values increased for most farms and treatments

Change from Y1 to Y5 values (green indicates improvement)									
Farm	**SOM**			**Aggregate Stability**			**ACE Soil Protein**		
	C	TA	TB	C	TA	TB	C	TA	TB
KY1									
KY2									
KY3									
KY4									

- Need more time to see substantial differences



Baseline Overall Scores by Farm by Treatment

Photo: Soil showing presence of mycorrhizal hyphae

Kentucky Economic Results

- **Yearly Cover Crops**
  - Implementation takes time to learn
  - Yield remained consistent in most years, but net income decreased from cover crop operations
  - Net income consistently lower
- **Roller Crimping**
  - Challenging to add to an organic system
  - Substantially lower yields

Photo: No-till drill used for seeding cover crops

Kentucky Demo Trial Takeaways

Overarching takeaways:

- Participating farmers are more willing to use cover crops on all fields

Biggest benefit:

- Farmers as active participants in the trial/learning process and learning from the other farmers
- Interest in creating a statewide soil health network with a specific need for sampling protocols, analysis and TA for farmers

Biggest challenge:

- Seeding of cover crop after double crop beans
- Equipment (roller crimper)
- Letting cover crops grow longer to create more bio-mass
- Trying to utilize no-till in an organic system

Photo: Soil health discussion at Chris Pierce Farm Field Day (2024)

New York

Aaron & Jay Swede, 2023 Demo Farm Tour

State leads:

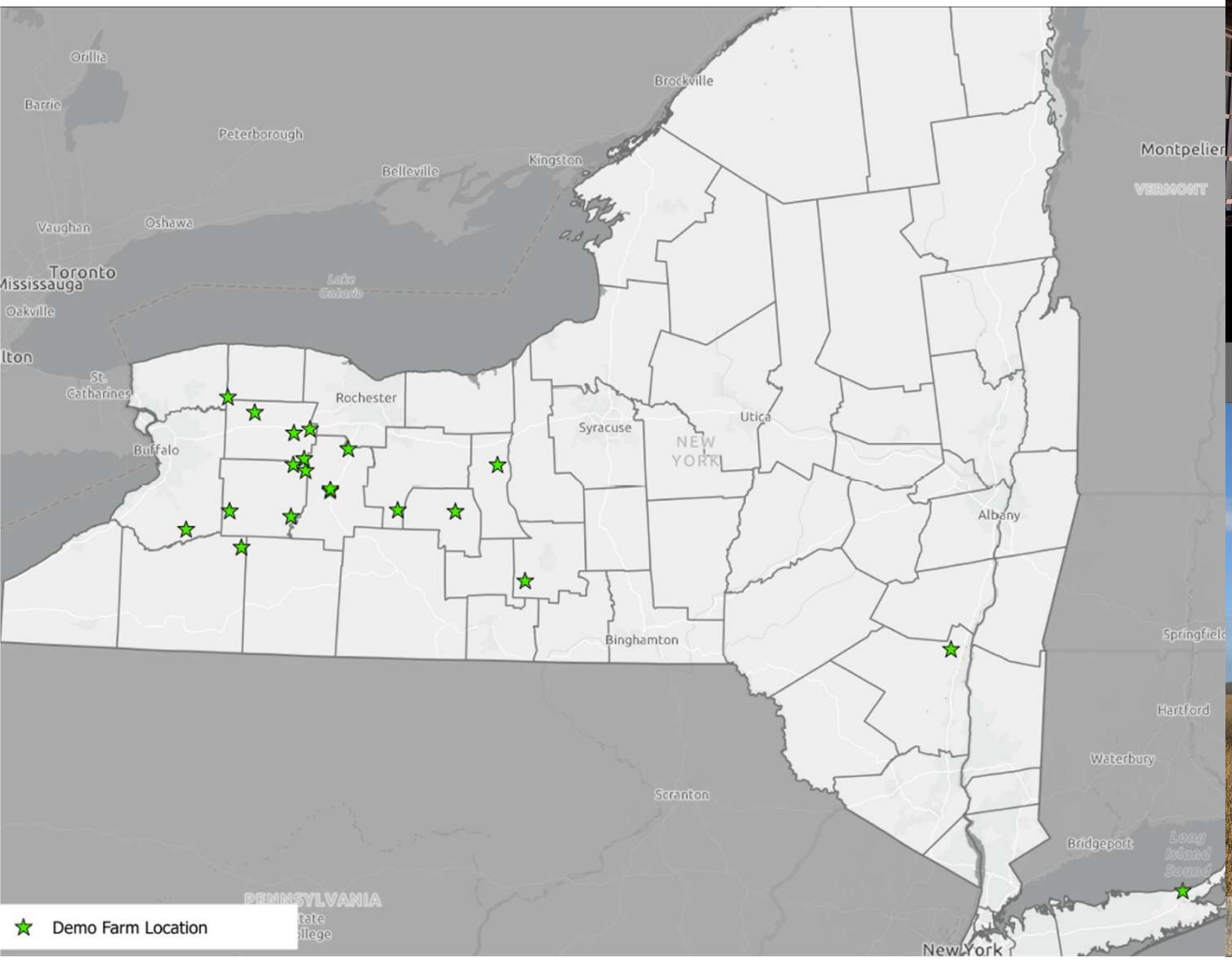
Aaron Ristow

with support from

Caitlin Tucker

& Ben Roosa

NY Demonstration Farm Network



2023 WNY Soil Health Field Day

Biochar application at Gary Swede Farms

Regional cover crop challenges

- Short window for cover crop establishment after corn
- Field access in wet springs
- Nitrogen availability for cash crop

Planting Green

- Planting cash crop into living cover crop
- Delay cover crop termination by a week or two

Benefits

- Extend benefits of cover crops, while mitigating challenges of wet soil
- Biomass accumulation, can double in two weeks
- Dries soil at planting, conserves moisture later in growing season

New York Demo Trials

Farm Name	Production	Control*	Treatment A	Treatment B
Swede Farm	Corn-Soy-Winter Wheat	No cover crop	Cover crop, pre-plant herbicide termination	Cover crop, planting green, herbicide term.
Macauley Farms	Corn-Soy-Winter Wheat	No cover crop	Cover crop, pre-plant herbicide termination	Cover crop, planting green, herbicide term.
Mulligan Farm	Corn silage	Cover crop, pre-plant herbicide termination	Cover crop, planting green, roller crimp + herbicide term.	Cover crop, planting green, roller crimp only
HarGo	Organic Corn-Soy-Triticale	No cover crop	Cover crop, pre-plant tillage termination	Cover crop, planting green, roller crimp term

*All NY trial designs are replicated

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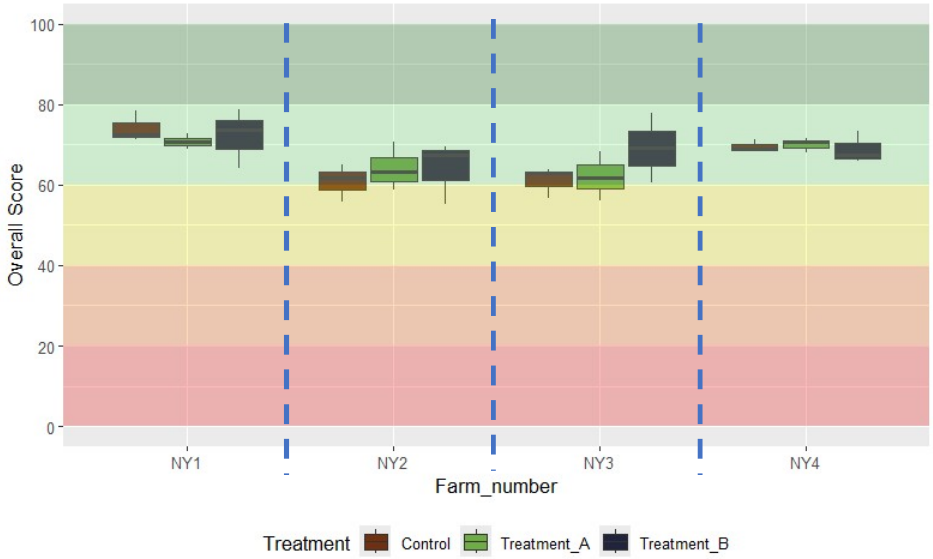
Soil cover at the time of planting corn silage May 14, 2024. From left to right: ***No Cover Crop*** *plot sprayed with herbicide April 29;* ***Pre-Plant Termination*** *plot cover crop terminated April 29;* ***Planting Green*** *cover crop to be terminated May 15 (darker areas between the green cover crop rows are from the planter).*

New York Soil Results

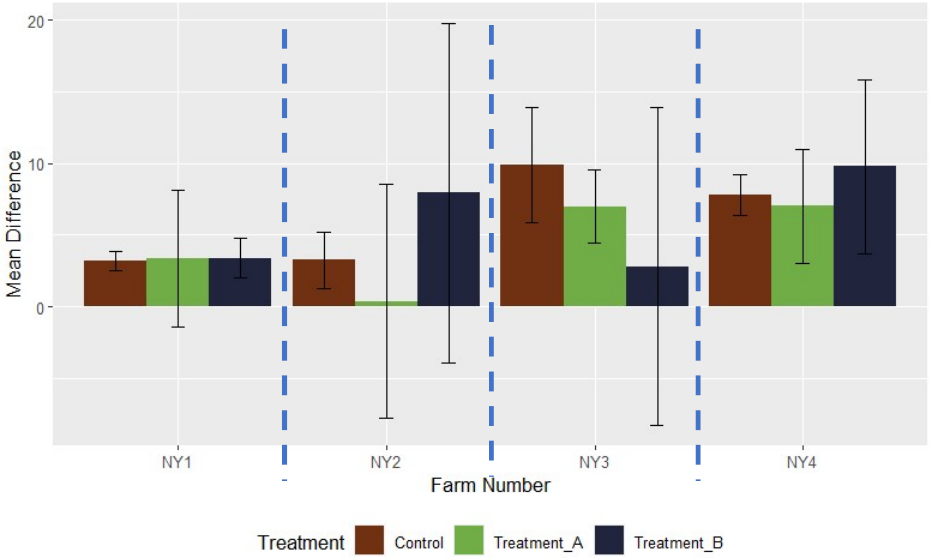
- **Baseline overall soil health scores were HIGH** (scores from 60-74)



Baseline Overall Scores by Farm by Treatment

New York Soil Results

- **Baseline overall soil health scores were HIGH** (scores from 60-74)
- **Overall scores increased** from Y1 to Y5 across all treatments and farms
- **Soil health indicators:** Aggregate stability and SOM values increased for all farms and treatments

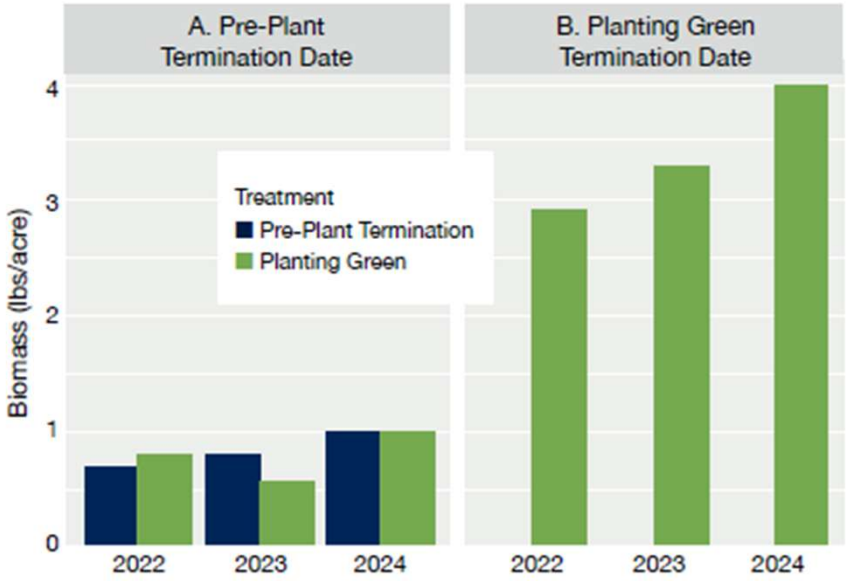


Change in Overall Scores from Y1 to Y5 by Farm by Treatment

New York Soil Results

- **Baseline overall soil health scores were HIGH** (scores from 60-74)
- **Overall scores increased** from Y1 to Y5 across all treatments and farms
- **Soil health indicators:** Aggregate stability and SOM values increased for all farms and treatments
- **Planting Green**
  - 3 X the cover crop biomass versus pre-plant herbicide
  - The additional biomass retained 2.5 X more potentially available nitrogen
  - Aggregate stability values and overall score increased more for Planting Green than for the control and the cover crop termination pre-cash crop planting
- **Need more time to see substantial differences**

FIGURE 3: COVER CROP BIOMASS (LBS/ACRE) COMPARISON BETWEEN PRE-PLANT TERMINATION AND PLANTING GREEN. A: Biomass of both treatments the day Pre-Plant Termination was terminated. B: Biomass of Planting Green two to four weeks later, when the cover crop for this treatment was terminated.



New York Economic Results


Roller crimping on HaR-Go Farm (NY)

ROLLER CRIMPING

- Had the **lowest cash crop yields** compared to control and other treatments
- BUT when successful resulted in -66% **lower cover crop costs** due to no herbicide inputs on one farm
    - The more mature the cover crop, the higher chance of successful roller crimping
- **Extremely difficult for organic operations** to successfully implement; there were complete cash crop failures in two of four years
- Of the two farms that tried roller crimping, only one had successful termination → **more data is needed** to determine best balance between successful roller crimping and minimizing negative impact on cash crop yields

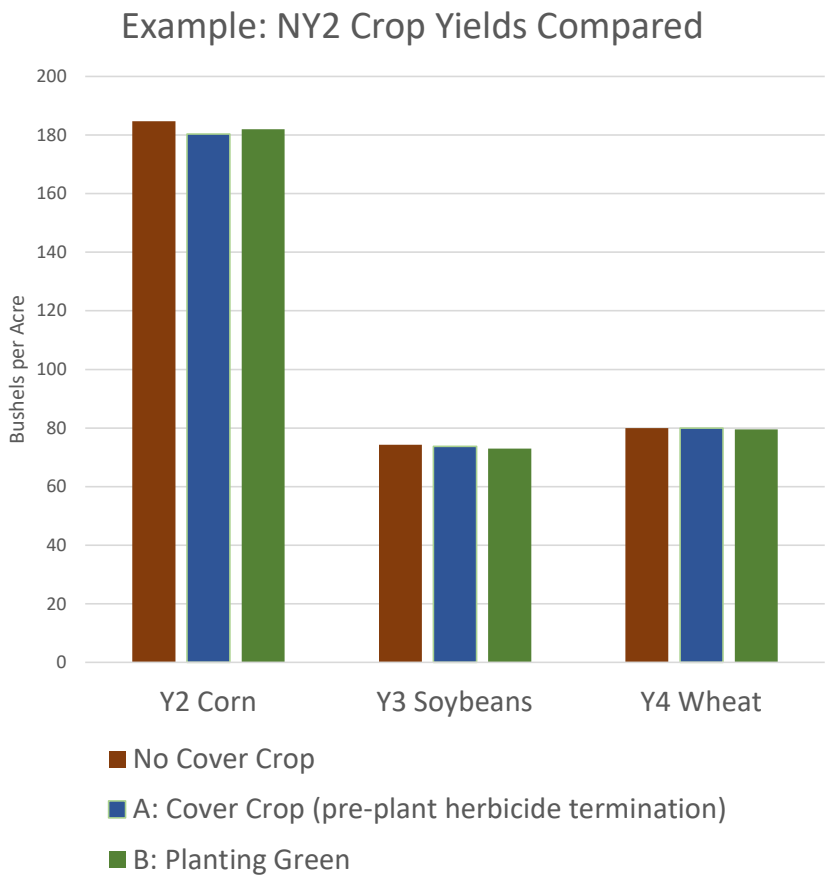
New York Economic Results

No Cover Crop
versus
Cover crop

- **Minimal difference in cash crop yields**

Traditional Cover Crop
pre-plant herbicide termination
vs.
Planting Green

- Planting green has great potential as it had **minimum impact on yield** for two of the applicable farms
- **No cover crop cost difference** between these two termination strategies despite the higher cover crop biomass on planting green treatments



New York Demo Trial Takeaways

Overarching takeaways:

- First year improvements noted in infiltration and planter performance
- Planting green and roller-crimping boosted biomass and nitrogen without substantial yield loss
- Organic systems struggled with weed control and crop establishment

Biggest benefit: Farms can remain profitable while adopting soil health management systems

Biggest challenges:

- Establishing cover crops after corn limits varietal selection
- Organic Roller/Crimper in Corn/Soybeans challenged by weed management
- Conventional Roller/Crimper caused delayed cash crop planting that led to delayed harvest which prevented following fall cover crop planting

"The feeling of needing to till due to compaction is virtually gone. We're breaking up compaction with roots instead of iron."
- Forrest Watson, Mulligan Farms

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SOCIAL SCIENCE RESULTS

Presented by Ellen Yeatman

Photo: Bar-Way Farm 2024 Field Walk, Massachusetts

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Social Science Farmer Survey Results

Photo: Participating farmers gathered at a 2024 KY field day event

- **Social leads:** Dr. Gabrielle Roesch-McNally (PI) & Ellen Yeatman
- **Social indicator surveys of participating farmers (Y1, Y3, Y5)**
  - *Questions on experience, motivations, challenges, knowledge/attitude, & capacity to continue*
- **Farmer focus group quotes (Y5)**
- **Field days overview (Y2-Y4)**

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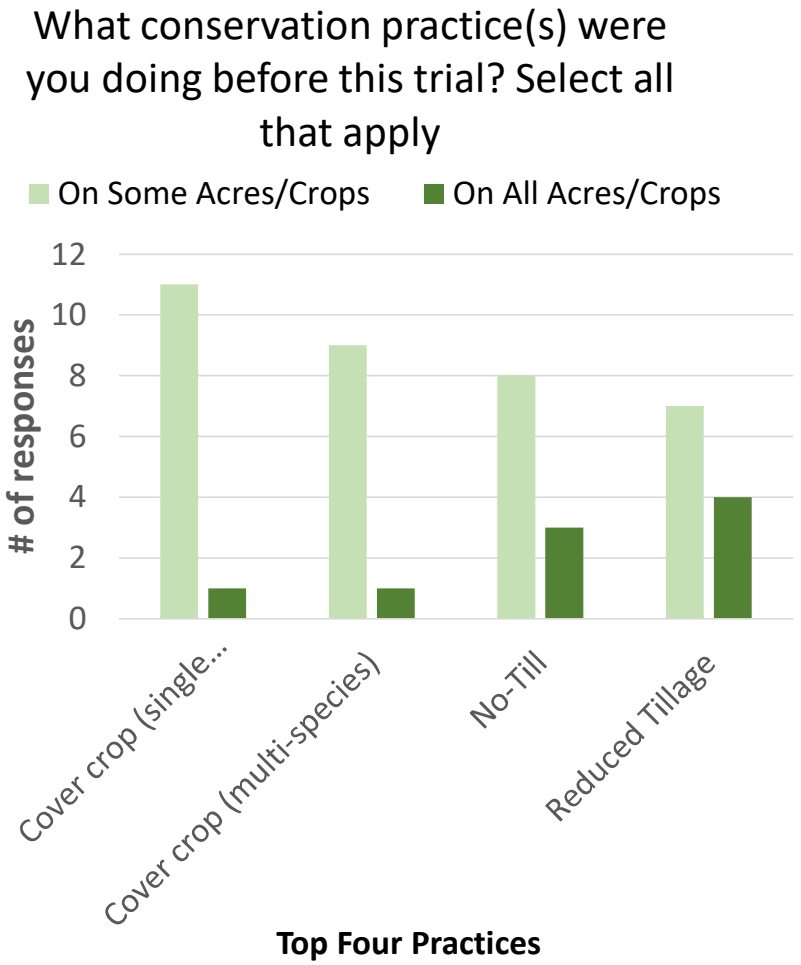
Majority of participants had experience with cover crops



Key Takeaways

- 12 farmers with cover crop experience
- 2 farmers that cover crop on all acres/crops
- 1 farmer with no cover crop experience
- Majority with > 5 conservation practices
- Explains variation in farm trial designs

Despite these farmers being early adopters, **there was desire to participate in this trial to learn more!**

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Motivations to adopt new new cover crop practices broadened

Top 3 motivations	Y1 (%)	Y5 (%)	+/- change
Improve crop yields	**73%**	**60%**	↓
Reduce erosion	20%	**40%**	↑
Increase my resilience to drought	**47%**	**40%**	↓
Sequester carbon in my soils	**40%**	20%	↓

- 14 motivations to select from
- Largest Y1 to Y5 changes were:
  - **+20%** motivated to **reduce erosion**
  - **+20%** motivated to **improve biodiversity**
  - **-20%** motivated to **sequester carbon**
- **Distribution of responses increased** potentially due to participants learning of additional benefits

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Cover crop concerns were addressed

TOP 4 CONCERNS (Y1 survey)

1. Cash crop yield drag
2. Additional costs
3. Selecting the right cover crop species
4. Adjusting fertilizer appropriately

*"**Grew more of a crop** than I expected with **less inputs**"*

*"… I never, I guess had **the courage to give the income up** to take that chance to try to learn. So it was very impactful to me and then get to see, like I say, some of the differences in soil quality."*

*"…we've been experimenting with cover crops for many years and a lot of it has been sort of just sticking our thumb in the wind trying to say whether or not there was a true benefit … **having AFT do all that stuff for us [gather the data]**, to me was a big benefit"*

*"Having a better idea what a specific cover crop mix [provides] as far as fertility in the next 2-3 years that you know **has really helped adjust our fertilizer rates** … just being more confident about counting what cover crops are providing and being, you know, confident that cutting back the fertilizer by X amount is OK because it's already there."*

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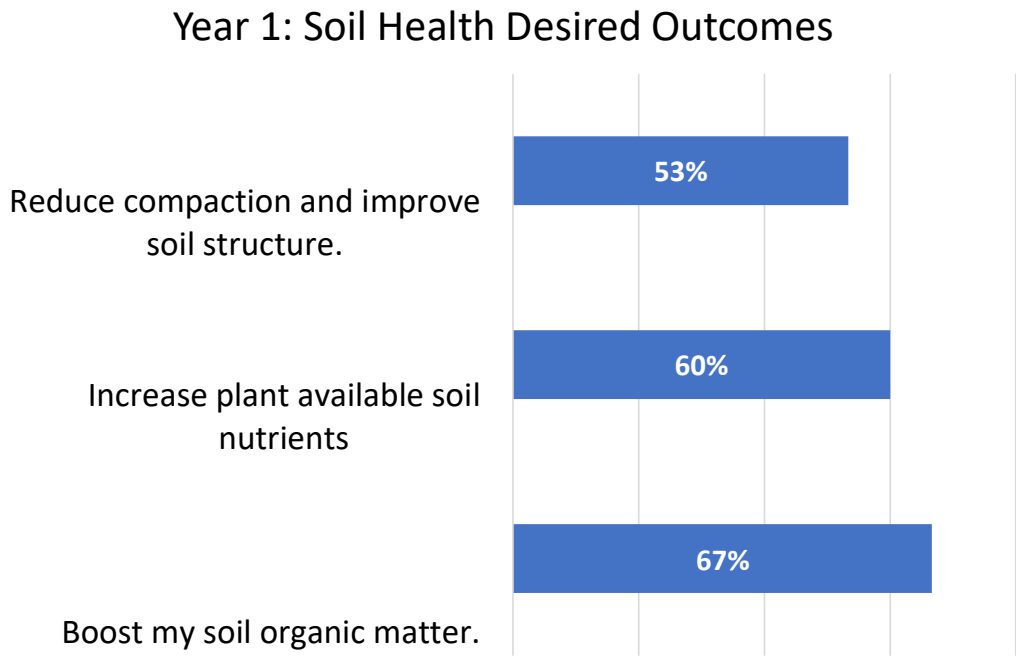
Soil Health Outcomes Desired vs Observed

Q: What are your top three soil health outcomes you would most like to achieve through your change in practices?



**Note: Only 7% selected "Reduce sediment loss due to soil erosion"*

Q: Did you observe your desired soil health outcomes?

*"Definitely an increase in organic matter and **soil erosion** control"*

*"I think we eliminated **erosion** in that field, and I think yields increased every year…we identified compaction and then started to improve it."*

*"Yes, the cover crops helps reduce sediment loss due to **erosion** (which also reduces nutrient loss). I can see where increasing organic matter will improve soil water holding capacity"*

LOTS of reduced soil erosion observations!

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Impact on Social Networks

Q: How has your engagement with networks of other farmers or service providers changed since participating in this project?

KEY TAKEAWAYS

- 24% increase in engagement with other participating farmers between Y3 & Y5
- No network growth outside of trial
- Farmers shared in focus group how much they valued the opportunity for knowledge exchange

Photo: 2022 New York soil health field day

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Field Days

- 9 field days
- ~400 attendees
- Survey results in final report

"Was surprised to see the folks that showed up, some of my neighbors that were interested that never used cover crops … A good showing of ag professionals and resource people that came and that was great to get so many …" – Host farmer

"And then the second part [I really enjoyed about this project] was not only just sharing the information with me but having the field days. We had two separate days on our on our site and they were really well attended. And you know… if AFT and the farms are going to do the work, it's nice to share." – Participating Farmer

Photo: 2025 New York soil health field day

Farmers are “likely” to “very likely” to persist with new practices

Q: How likely are you to continue implementing the conservation practices you are experimenting with as part of this project?

KEY TAKEAWAYS

- +27% increase in “very likely” responses
- Likely & very likely: 80% to 100%, Y1 to Y5
- One farmer added: “*I plan to implement the trial practices across the whole [operation].*”

Likelihood Likert Scale	Y1 (%)	Y5 (%)	% change
Very likely	33%	**60%**	+27%
Likely	47%	**40%**	-7%
Neither likely or unlikely	13%	0%	-13%
Unlikely	0%	0%	=
Very unlikely	0%	0%	=
Other	7%	0%	-7%

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Key Social Data Takeaways

Overarching takeaways:

- Fairly experienced farmers, yet there was still room to grow
- Increased their willingness to persist with new practices by 20%

Biggest benefit:

- Networking with other participating farmers
- Soil sampling and analysis
- Reduced soil erosion observations

Biggest challenges:

- Weather impediments
- Cover crop timing
- Need more time

Photo: 2024 Massachusetts Farm Field Day

"I have enjoyed working with the project and feel as though it is some of the most useful information we gather on our farm."

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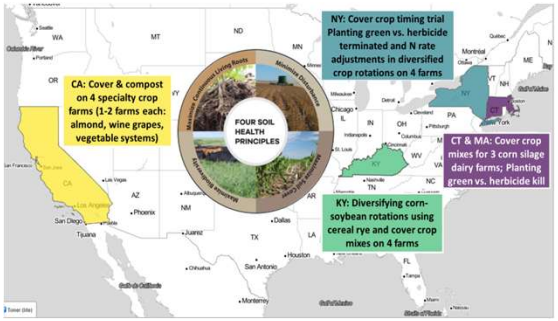
OVERALL LESSONS LEARNED

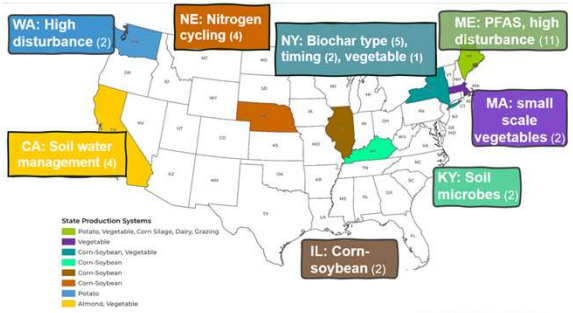
Presented by Dr. Bianca Moebius-Clune (PI)

Photo: Cover crop termination activities on NY2

Successes

- Achieved 5 years of interdisciplinary assessments across 15 farms
- Working relationships across the country: 15 farmers, > 40 AFT staff, 6 partners
- Learned a lot, inspired adoption
- Applied lessons from our shortcomings to new national Biochar Trials Network





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MP1

Lesson Learned – AFT Recommendations for On-Farm Demo Trial Leaders

Build in these key elements

- **Flexibility:** co-production and challenges
- **Time:** planning and farmer recruitment
- **Tiers:** trials that work for diverse farmers:
  - Replication level (single strip to fully replicated)
  - Adoption level (soil health expert to new adopter)
- **Co-design:** plan for process
- **Outcomes:**
  - Realistic expectations
  - Aligned methods

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Slide 70

MP1 [@Bianca Moebius-Clune, PhD] [@Aysha Tapp Ross] [@Ellen Yeatman] - I'm concerned these three lessons learned slides are not helpful enough, specific enough, or direct enough. What was wrong with the SWCS Lessons Learned 3 slides that categorized lessons that applied to the Beginning, Middle, and End? I feel that is a categorization that is easy to understand AND to act on.
Michelle Perez, 2026-02-04T03:23:04.703

BMCP1 0 1) too long for 4 min - the recommendations were more important
2) Most of the lessons will already have become clear by now - this is a recap distilling those into recommendations
3) I took the recommendations, added a few nuggets from the lessons.
4) a number of the bullets seems like 'throwing NRCS under the bus' and I want to be sensitive to that in what we put out in a recorded presentation
Bianca Moebius-Clune, PhD, 2026-02-04T13:15:22.116

MP1 1 [@Bianca Moebius-Clune, PhD] Alright. Roger that. Might I suggest inserting verbs somewhere in each bullet? Either within your bolded headers or right after the colon to start off the text with an action verb. As these are recommendations, I find it helpful to have them read with action verbs. The list, as it stands, without verbal remarks is not easy to understand.
Michelle Perez, 2026-02-04T13:24:22.402

Lesson Learned – AFT Recommendations for On-Farm Demo Trial Leaders

- **Know your goals**
- **Design project to address goals**
  - **Adoption Impact?** Include peer network scale up component. More, easier trials. Training, TA & adoption incentives.
  - **Big soil health change?** large management differences, replication, minimize other variables.
  - **Increased Profits?** Include experts, adaptation, need more time!

https://farmlandinfo.org/publications/soil-health-case-studies/

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Lessons Learned – AFT Recommendations for NRCS-CIG Team

Keep Up the Vision

- **Still Need that National Soil Health, Economic, and Social Dataset**
  - Interconnections
  - Paths to adoption
  - Rates of change
- **Awardees need**
  - Expanded minimum dataset methods guidance
  - Co-learning mechanisms
  - Usable system for data sharing with USDA and beyond

Dreaming – Soil Health changes slowly, so consider

- Networking across awardees in recruitment year
- Path for CIG project continuations for promising projects
- Path for CIG project partner mentorships
- 10 years of funding?

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Thank you!
Please get in touch with Aysha Tapp Ross, our Soils Team Manager with questions or suggestions for us:
ATappRoss@farmland.org
Join our mailing list, become a member!