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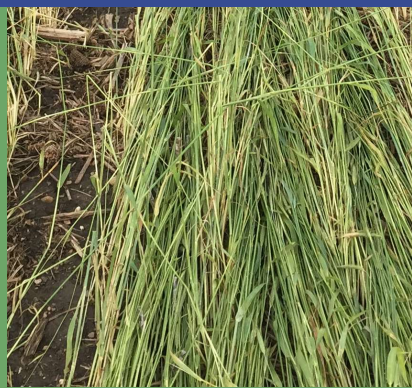
SAVING THE LAND THAT SUSTAINS US

Conquering Cover Crops Coast-to-Coast:
Highlights from 2021-2025 On-Farm Demonstration Trial in Massachusetts & Connecticut

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
- Massachusetts & Connecticut trial design & results

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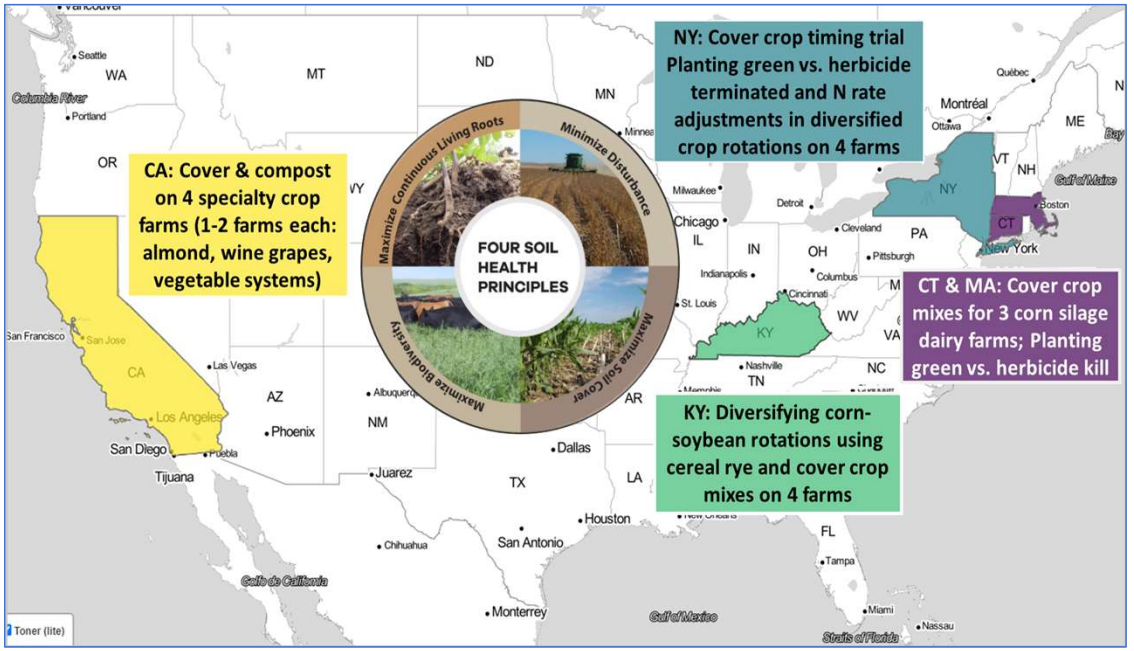
“Conquering Cover Crop Challenges from Coast-to-Coast” (2021-2025)

- 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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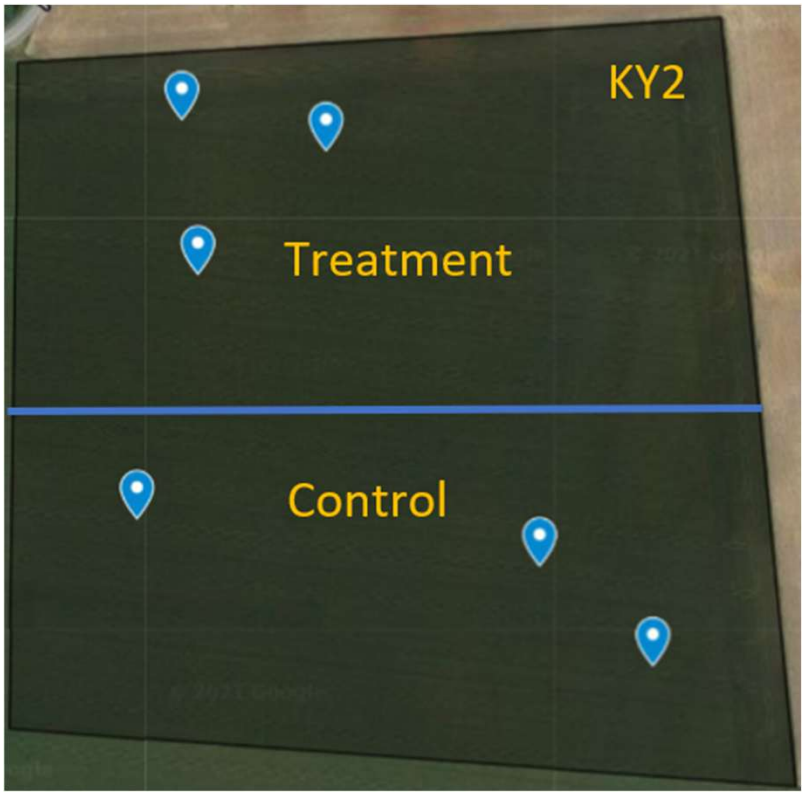
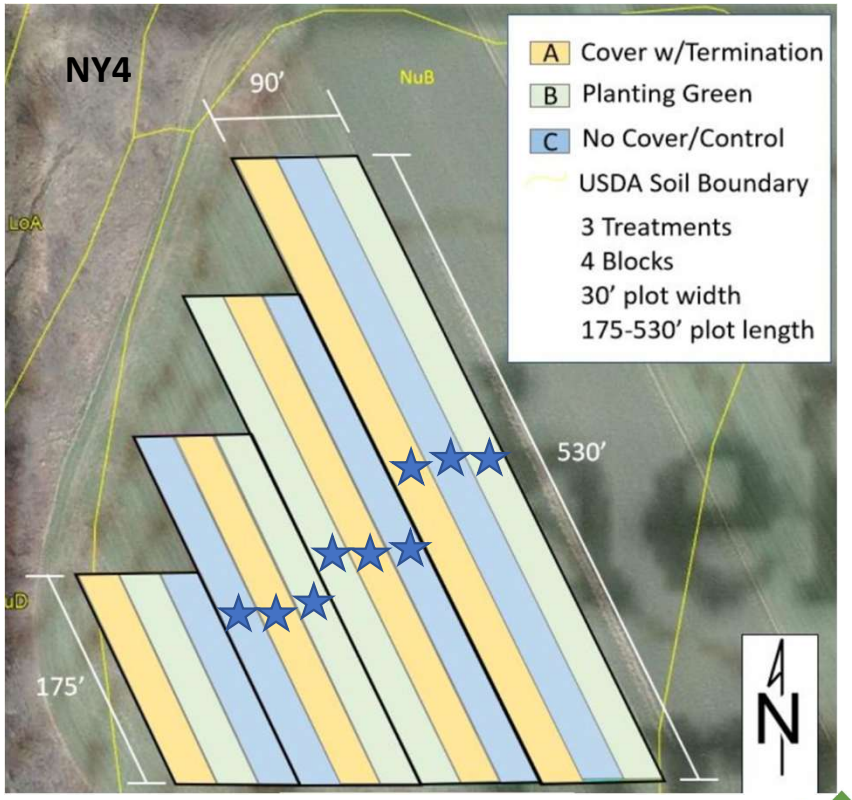
Demo Trial Design Examples



Side-by-side design (non-replicated)



Replicated Design

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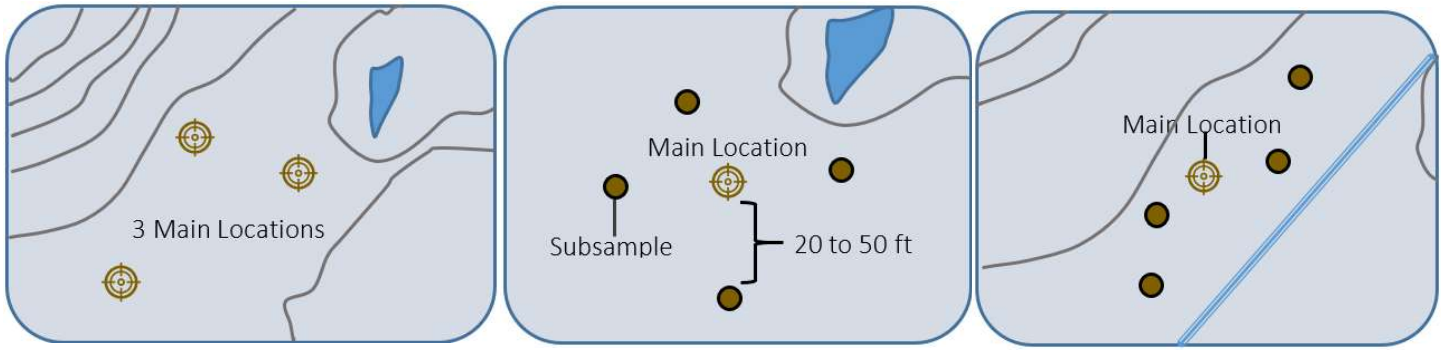
Soil Sampling Protocols

- 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%**

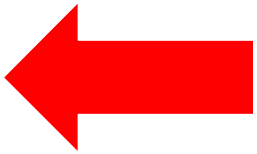
Group	Indicator	Value	Rating	Constraints
physical	Predicted Available Water Capacity	0.19	80	
physical	Surface Hardness	433	0	Rooting, Water Transmission
physical	Subsurface Hardness	564	1	Subsurface Pan/Deep Compaction, Deep Rooting, Water and Nutrient Access
physical	Aggregate Stability	34.0	57	
biological	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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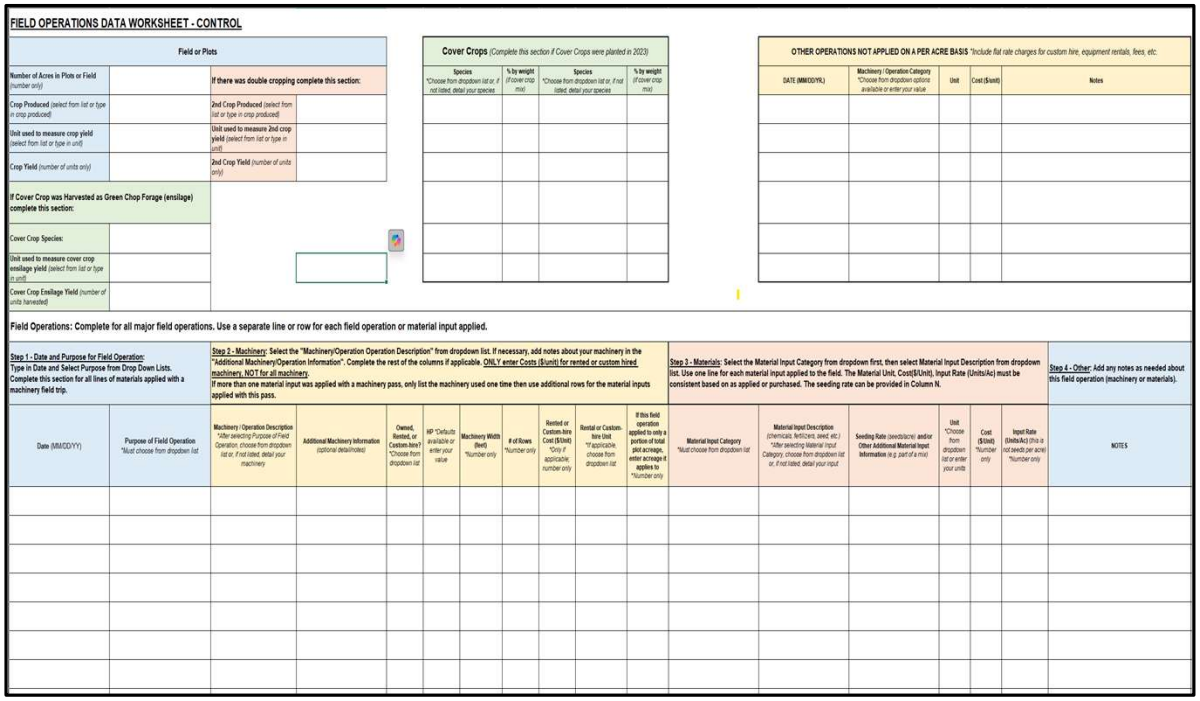
Economic Methods

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!)**

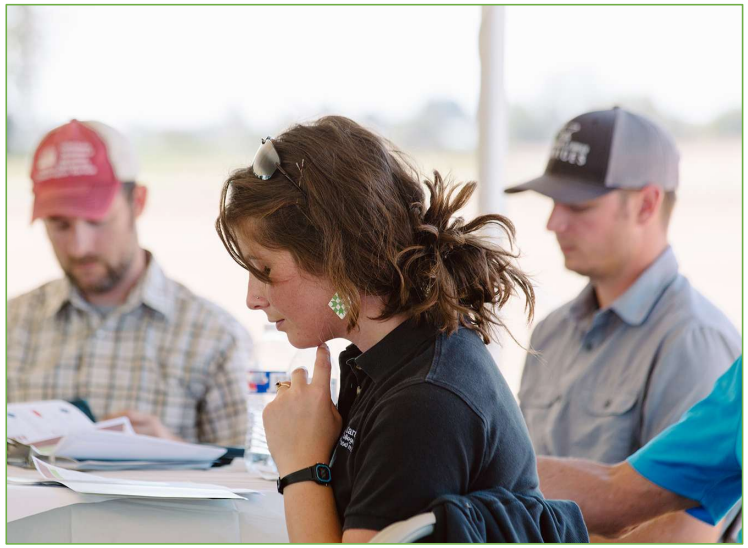

Photo: Field day surveys being collected at the 2024 Kentucky field day

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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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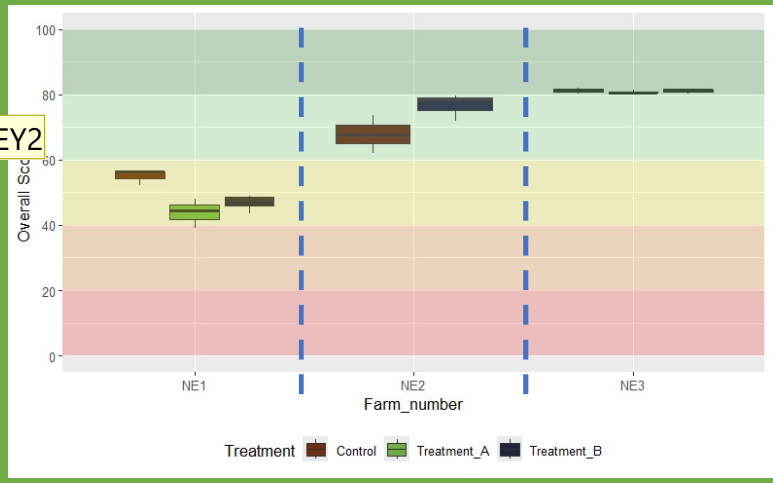
Regional Cover Crop Challenge: Short growing season

- 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

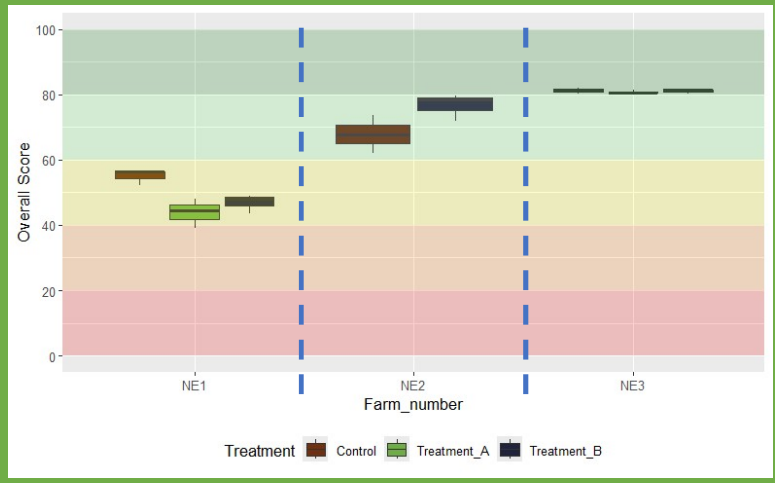
Slide 22

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

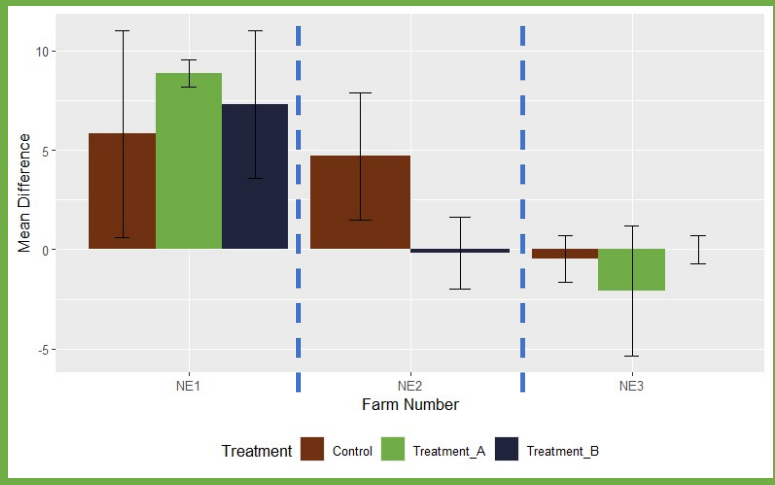
EY2 [@Aysha Tapp Ross] [@Caro Roszell] reminder to include somewhere note that for the two farms that tried Green Chop: “Despite removal of biomass from the Green Chop treatment, soil health outcomes were not noticeably diminished compared to the other two treatments; however, more years of data and 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												

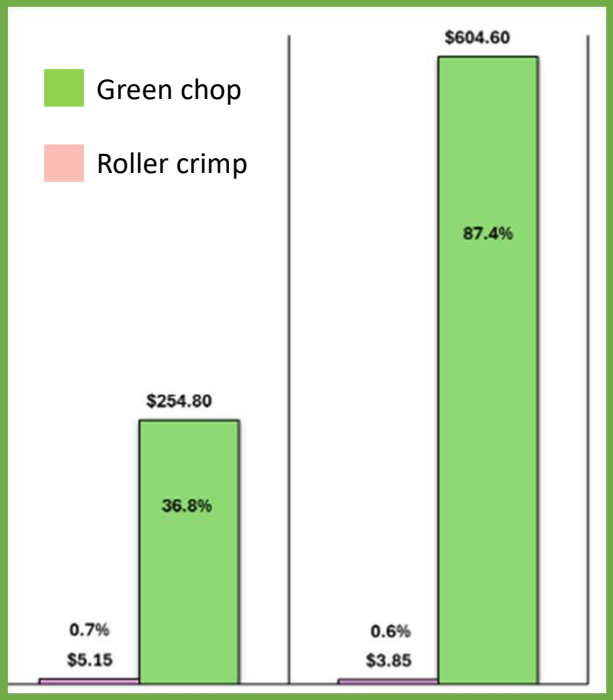
New England Economic Results

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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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!