



American Farmland Trust  
SAVING THE LAND THAT SUSTAINS US

Kentucky

2021-2025 Cover Crop Demonstration Trial:  
Soil, Economics, & Social Results  
featuring 4 farms

January 21, 2026

---

*State leads: Aysha Tapp Ross & Brian Brandt*

*AFT National support team: Dr. Michelle Perez, Dr. Bianca Moebius-Clune, Dr. Gabrielle Roesch-McNally, Dr. Robert Ellis, Ellen Yeatman, June Grabemeyer, & Jen Tillman*

# Session agenda

---

- About the Project
- Farms & trial design
- Farmer Testimonial
- Soils results
- Economics results
- Lessons learned
- Q&A



*A cover crop mix with crimson clover in KY demonstration field.*



# ABOUT THE PROJECT

Photo: Chris Pierce Demo Trial Site, Kentucky

# Why Cover Crops?

---

- **Soil health degradation** is a major global concern
- Agriculture
  - is a leading cause of **water quality impairment**
  - contributes 11% of U.S. **GHG emissions**
- **Cover crops** reduce erosion, improve structure, and increase organic matter
- Only **5% of fields grow cover crops**
- **Major barriers:** short-term management challenges & unknown economic effects



# About AFT's OFDT project: “Conquering Cover Crop Challenges from Coast to Coast”

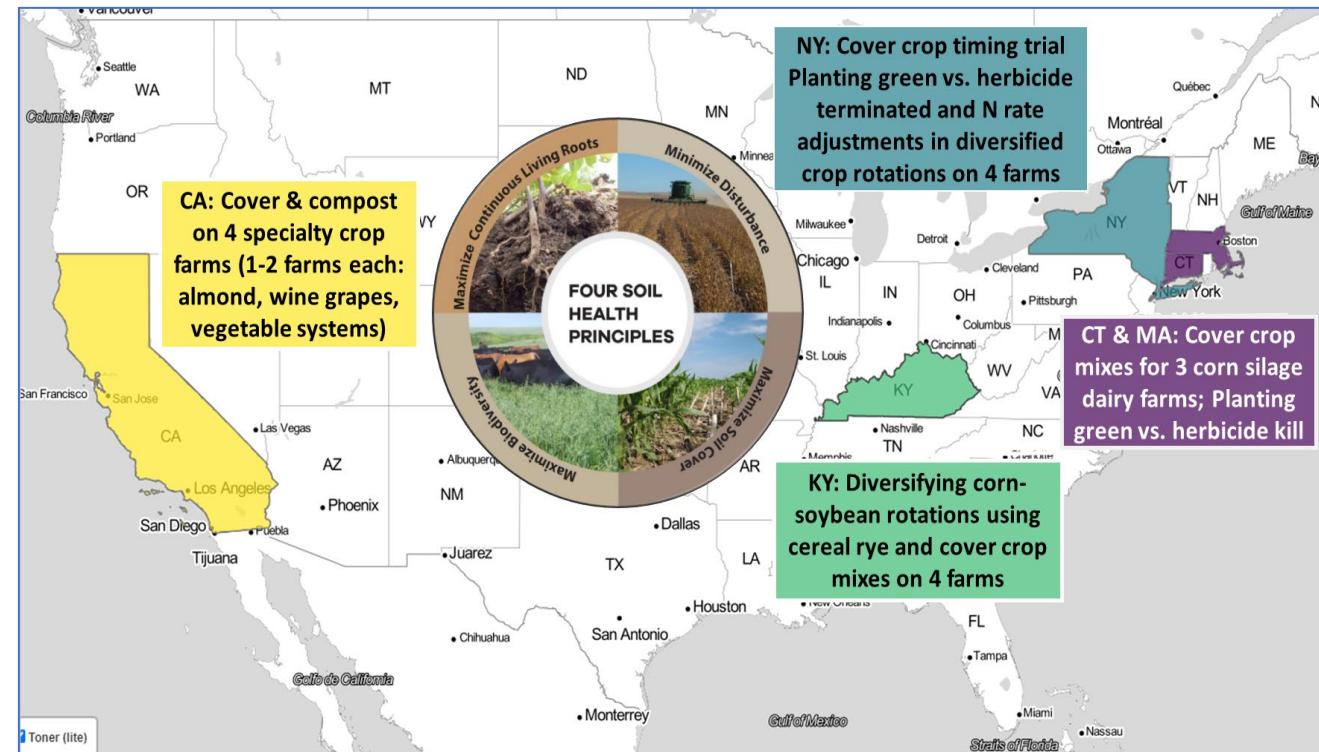
---

- Supporting **farmer-driven transitions** to improve soil health thru adoption of cover crops & other soil health practices
- Provide an innovative combination of **financial and technical resources, decision support, and assistance** for broader adoption
- Analyze the **environmental, economic, and social outcomes** of demo trials.



# About AFT's OFDT project: “Conquering Cover Crop Challenges from Coast to Coast”

- 15 farms in:
  - 3 geographic regions over
  - 5 states
    - CA, KY, NY, MA, & CT
  - representing 6 crop systems
    - Almonds
    - wine grapes
    - Vegetables
    - Corn-soybeans-wheat
    - Corn silage-triticale



- **Regional issues & cropping system challenges:** soil moisture management (CA), planting & termination timing in crop rotations (NY), termination methods (New England), & cover crop mixes (KY)

# AFT's soil health demo trial team

## CIG Leads

Soils Team



Econ Team



Social Team



## State Leads



Kentucky



New York



California



Massachusetts & Connecticut

# Farm & Trial Design



Photo: Cover crop strips in KY demo field.



# Kentucky

**State leads:**

**Brian Brandt & Aysha Tapp Ross**

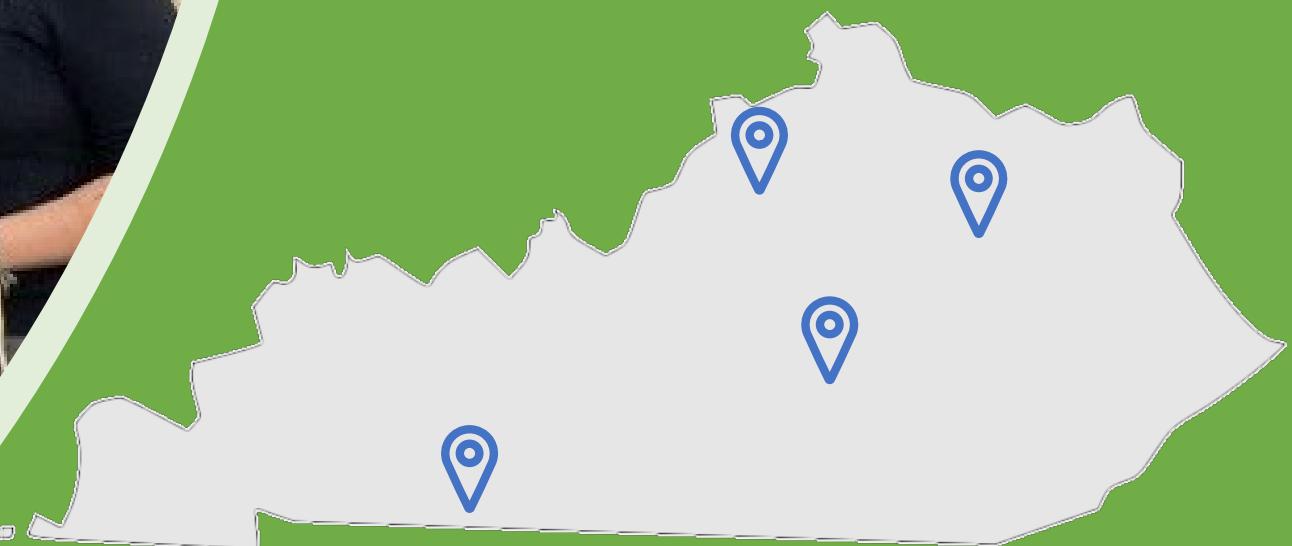


Photo: Chris Pierce (participating farmer), Brian Brandt, Aysha Tapp Ross

# Kentucky growers & their soil health practices

Farm Name	Production	Design	Control	Treatment A	Treatment B
Mount Folly Farm	Corn-soybean-rye-sunflower-hay	1 Field, 3 Replicates	Cover crop, traditional seeding rate, conventional tillage termination	Cover crop, increased seeding rate, conventional tillage termination	Cover crop, roller crimp termination, no-till cash crop
Walnut Grove	Corn-wheat/DC soybean	1 Split Field, No Replicates	No cover crop	Cover crop mix after soybeans	N/A
Pleasure View Farm	Corn-soybean-wheat	2 Fields, No Replicates	Occasional cover crop (cover crop after soybean, fallow after corn)	Yearly cover crop	N/A
Chris Pierce Farms	Corn-soybean-wheat/rye	1 Field, 2 Replicates	Winter cover crop after soybean	Summer high biomass cover crop after wheat/rye summer harvest	N/A

*Regional cover crop issues: Termination timing, soil moisture conditions, nitrogen needs for cash crop, increased labor and management costs*

# Walnut Grove Farms Control and Treatment Fields

---

- Control and treatment each 25 acres
- PeA: Pembroke Silt Loam, 0 to 2 percent slopes
- PeB: Pembroke Silt Loam, 2 to 6 percent slopes
- Cover crops planted on treatment in Fall of 2021, 2023
- Soil sampling occurred 2021-2025
- GPS located sampling points and revisited each year



# Sam Halcomb Walnut Grove Farms

---

- Why did Sam Halcomb participate in the trial?
  - Desire to reduce the amount of winter fallow acres
  - Believe that soil health practices are more profitable, more sustainable, etc.
  - Didn't have the data that tells us it is beneficial but wanted to validate that concept
  - Wanted to work with reputable organization and have confidence comprehensive analysis would be completed
  - Side by side field comparison was a valid commercial comparison. Understood the data limitations.
  - "Perfect can be the enemy of good"

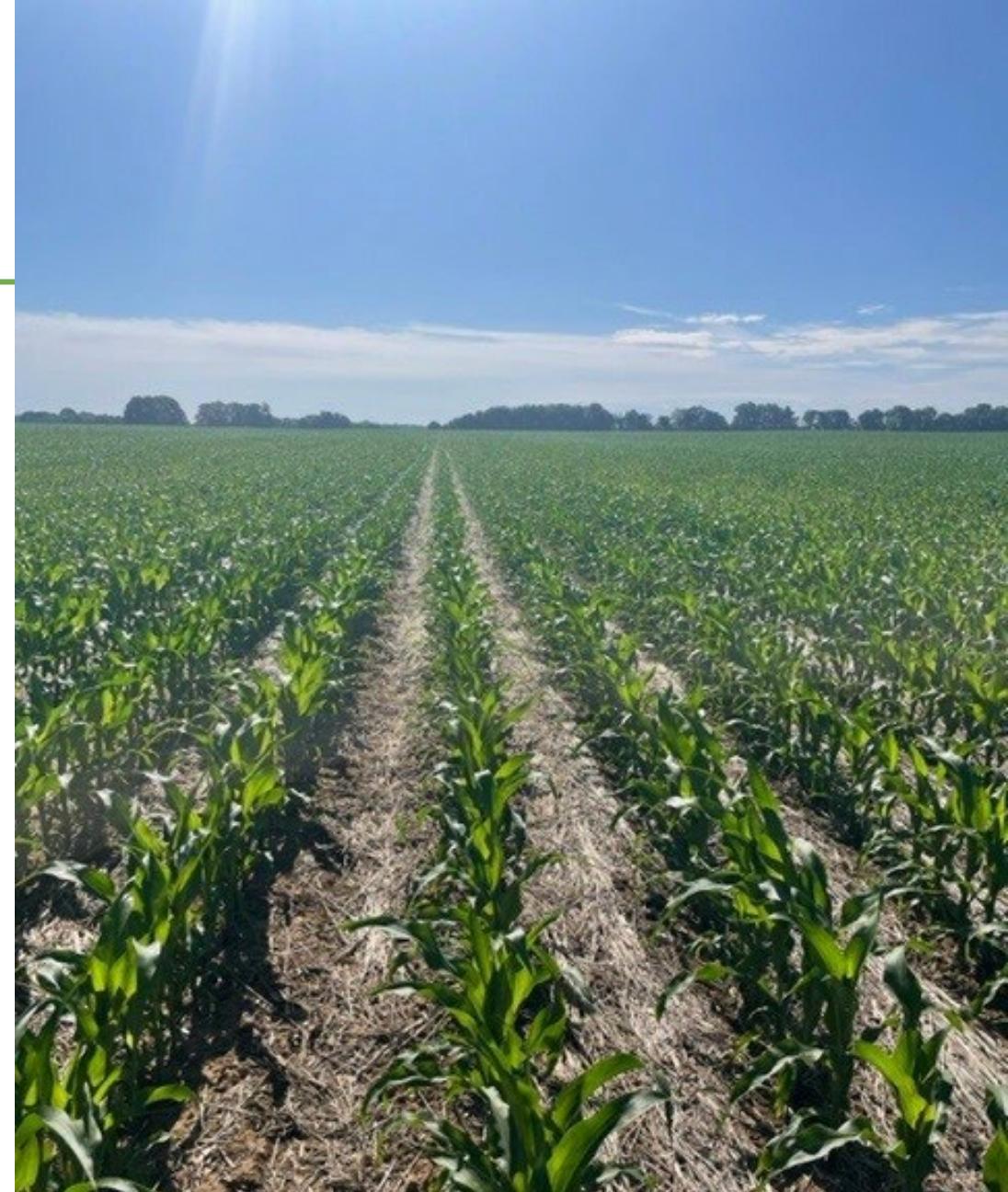


Photo: Corn growing in small grain/cover crop residue (Walnut Grove Farm)

# Sam Halcomb

## Walnut Grove Farms

---

- How did Sam determine what cover crop mix to trial?
  - Philosophy – Desire to select species that make sense economically and agronomically
    - What will work behind wheat/double crop soybeans when seeding during early to mid November
    - Using a drill to seed the cover crop.
    - Focused on cereal rye as a base for any mix
    - Does it make sense on a large number of acres
    - Timing of termination in the spring
  - Tried to keep it simple and consistent



Photo: Terminated cover crop showing rye and hairy vetch (Walnut Grove Farm)

# Sam Halcomb Walnut Grove Farms

---

- What challenges did Sam have with cover crops?
  - The challenge was having an impact. Either positive or negative.
    - Only had the opportunity to plant a cover crop twice
    - Picked one of the best fields to conduct the demonstration And is in a consistent corn-wheat-dc bean rotation
  - Getting cover crops seeded as soon as possible after harvest
  - Making sure equipment is set up to plant into more biomass with later termination dates
  - Experimenting with precision cover crop – Leave a narrow corridor to plant cash crop



Photo: Terminated cover crop with rye and balansa clover (Walnut Grove Farm)

# Sam Halcomb Walnut Grove Farms

---

- What successes did Sam observe with cover crops?
  - Letting cover crops live into April is a benefit to the soil.
    - Obvious to see from last two winters/spring. Massive amounts of rainfall during middle of planting season and problematic getting corn planted. Later terminated fields much better protected from a soil health/erosion perspective.
  - Lessons learned include modifying cover crop approach to test “Precision/strip” cover crops – a method that would allow cover crops to grow later/be terminated later.
  - Getting more experience
    - The more times you try things and learn/you can better know how to tweak the system.



Photo: Slake test demonstration at Chris Pierce Farms Field Day

# Sam Halcomb

## Walnut Grove Farms

---

- Significant considerations/takeaways
  - Knew from beginning it would be challenging to be able to show impact. That was intentional.
  - Ok with the possibility of not showing significant results at the end of 5 years
  - Very pleased with the comprehensive analysis that was completed
  - Could have chosen a different field that had a different history or different crop rotation and might have been able to show more of an impact
    - If an impact is shown on one of the best fields, then would expect to see an impact on a lesser field
  - Would like to see at least see a minimum of 10 years for a demonstration trial



C3

Photo: Soil showing presence of mycorrhizal hyphae



# SOIL RESULTS

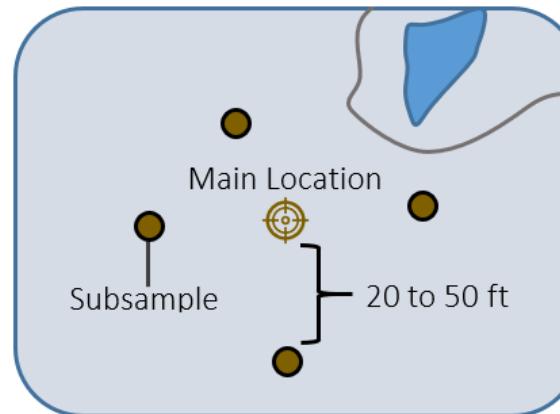
Photo: HaRGo Farm Soil Sampling, New York



American Farmland Trust

# 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



# 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
  - UK to provide more regionally specific nutrient recommendations



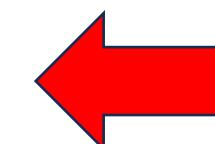
Measured Soil Textural Class: Sand: 59% - Silt: 30% - Clay: 10%				
Group	Indicator	Value	Rating	Constraints
physical	Predicted Available Water Capacity	0.19	80	
physical	Surface Hardness	433	0	Rooting, Water Transmission
physical	Subsurface Hardness	564	1	Subsurface Pan/Deep Compaction, Deep Rooting, 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: <b>60 / High</b>				

# Laboratory soil health assessment: Sample CASH report

- CASH report quantitatively analyzes physical, biological, and chemical soil properties, known as soil health indicators
- Raw values are translated to scores based on soil texture and ranked from very low to very high
- The rank is color coded
- Each farm is also given an overall score

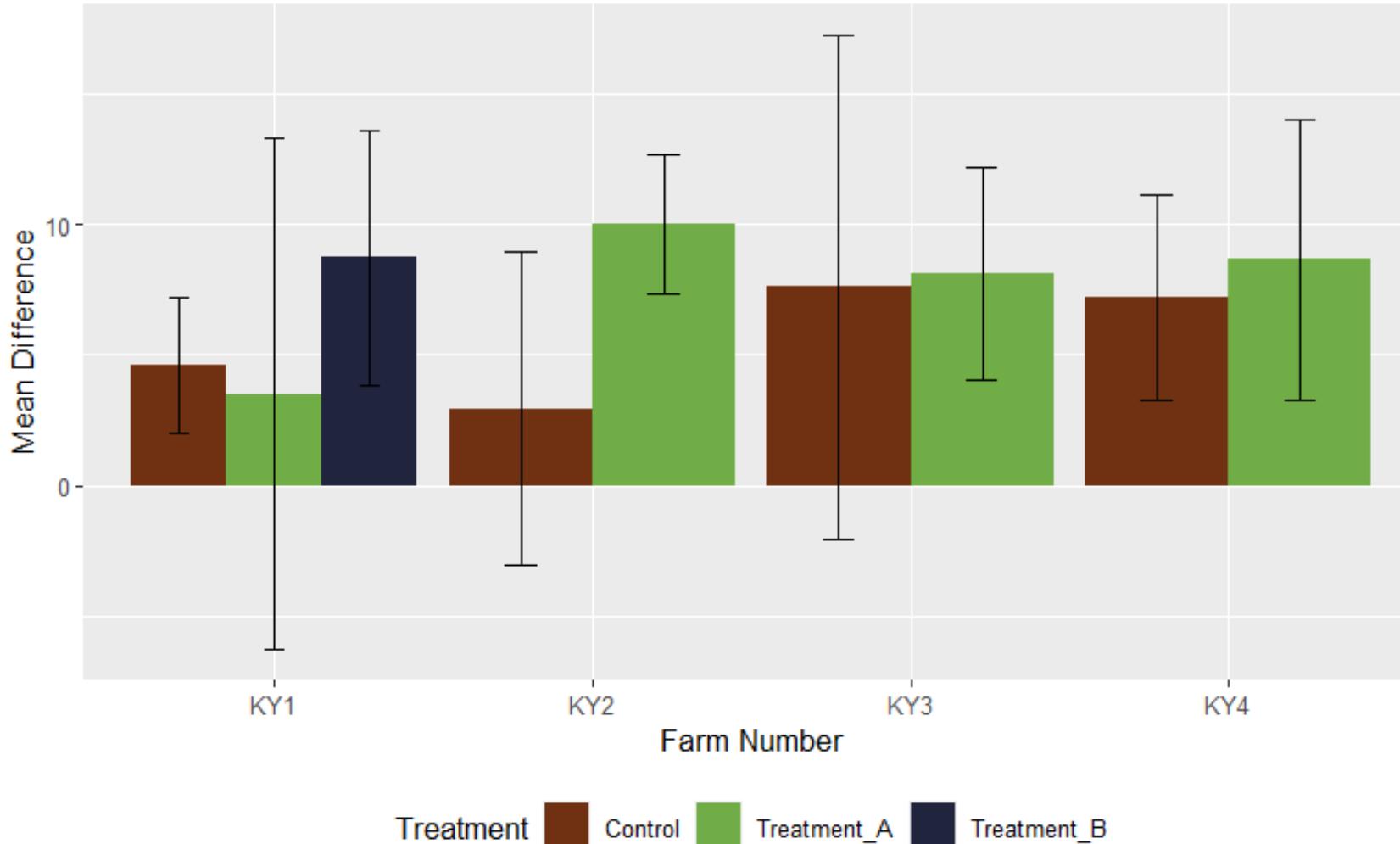
## CASH Scoring Legend

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



# Differences in Overall Score from Y1 to Y5

---



- Y5 minus Y1 = change in overall score
- Overall scores increased across the board
- Some differences between treatments
- Most likely due to moderate changes in management practices with short study period

Measured Soil Textural Class:

Sand: 59% - Silt: 30% - Clay: 10%

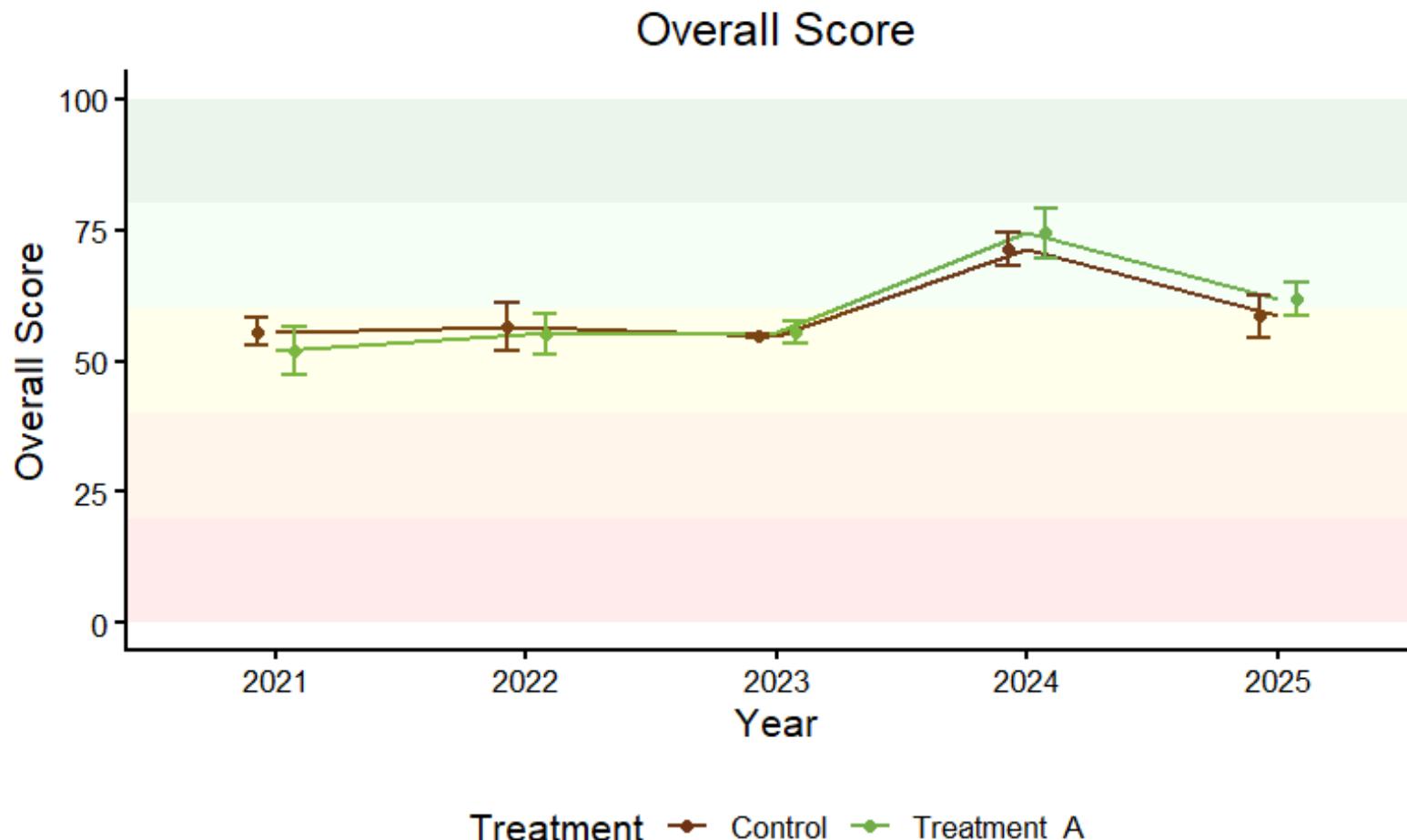
Group	Indicator	Value	Rating	Constraints
physical	Predicted Available Water Capacity	0.19	80	
physical	Surface Hardness	433	0	Rooting, Water Transmission
physical	Subsurface Hardness	564	1	Subsurface Pan/Deep Compaction, Deep Rooting, Water and Nutrient Access
physical	Aggregate Stability	34.0	57	
biological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

# Example Assessment

- Assessed the score changes over time for the 3 indicator groups
  - Physical
  - Biological
  - Chemical

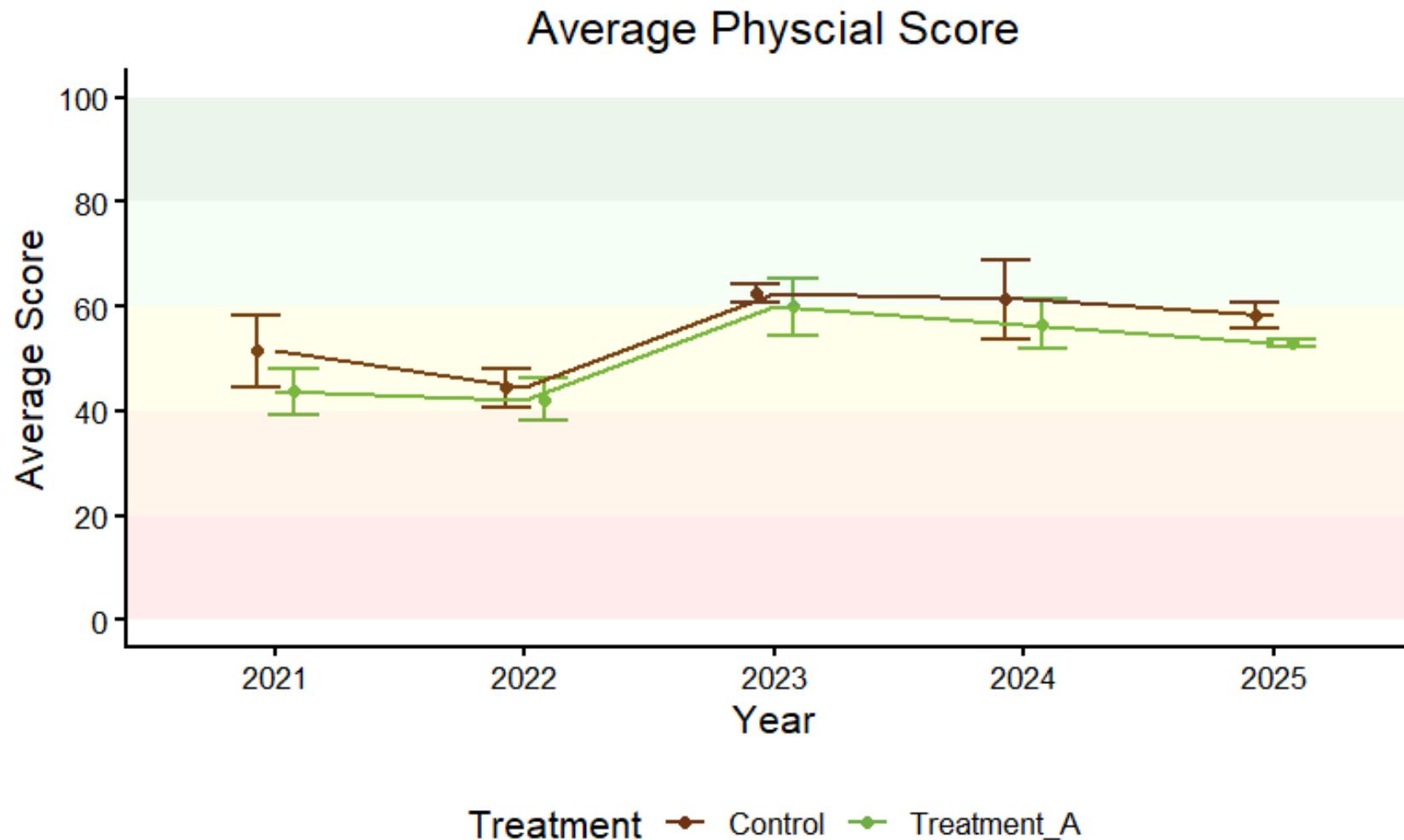
# Walnut Grove overall score changes over time



CASH Scoring Legend

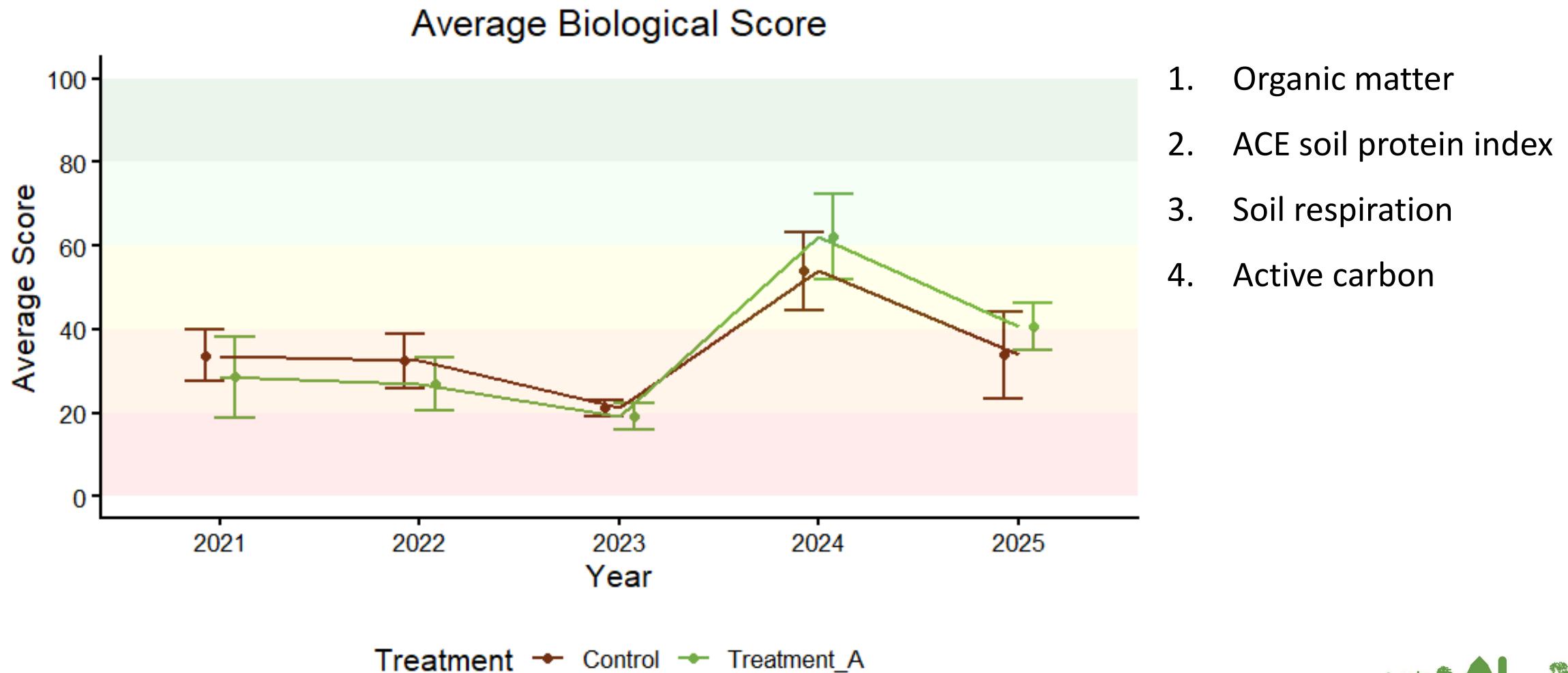
Score	Rank	Color Code
80 – 100	Very High	Dark Green
60 – 80	High	Light Green
40 – 60	Medium	Yellow
20 – 40	Low	Orange
0 – 20	Very Low	Red

# Walnut Grove physical score changes over time

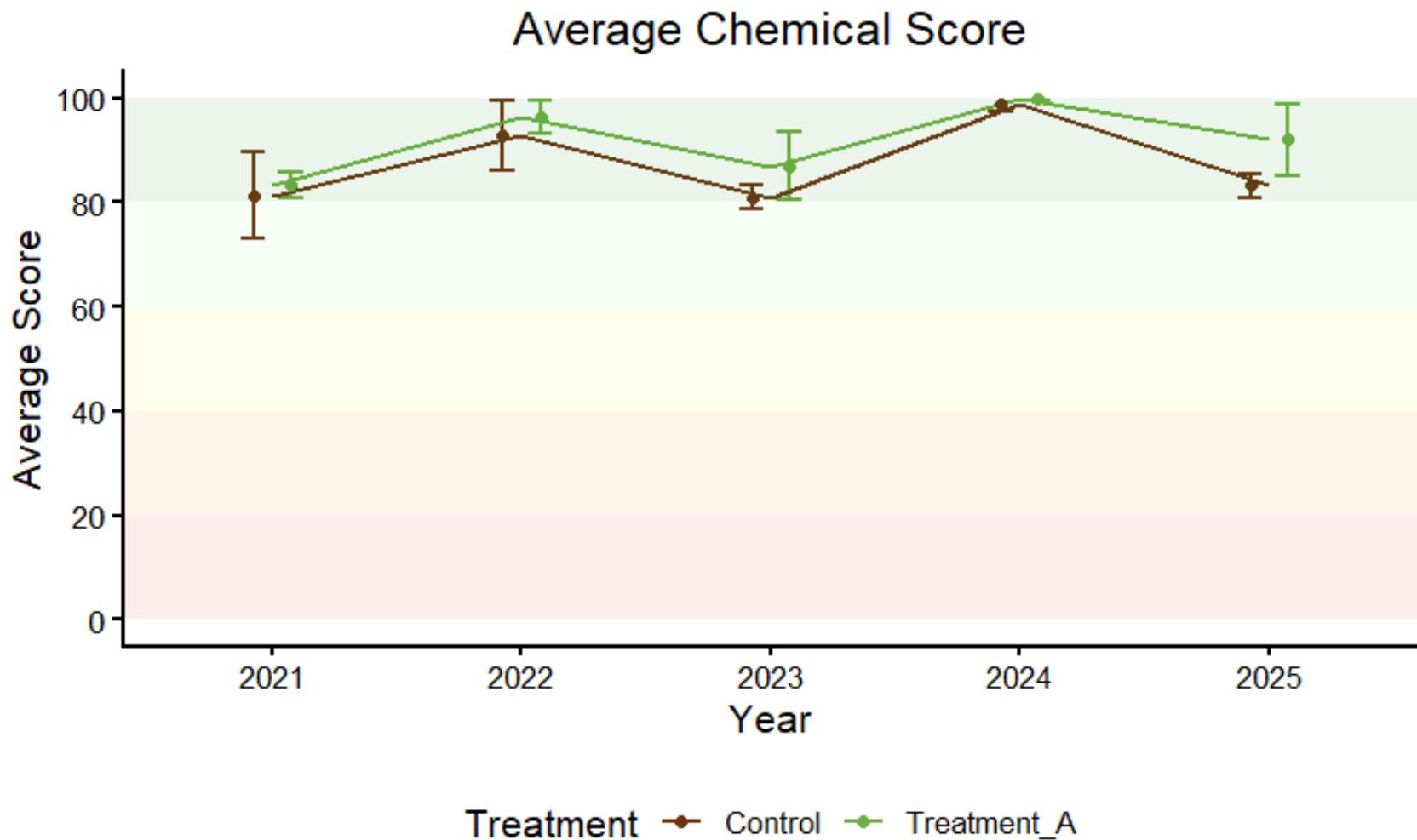


1. Surface hardness
2. Subsurface hardness
3. Aggregate stability
4. Predicted available water capacity

# Walnut Grove biological score changes over time



# Walnut Grove chemical score changes over time



- pH
- Phosphorus
- Potassium
- Minor elements
  - Magnesium
  - Iron
  - Zinc
  - Manganese

# Soil Results Key Takeaways

---

## Overarching takeaways:

- Need more time: only changing cover crops takes over 5 years for significant changes

## Biggest benefit:

- Overall increase in soil health across the board

## Biggest challenges:

- Weather, Machinery issues

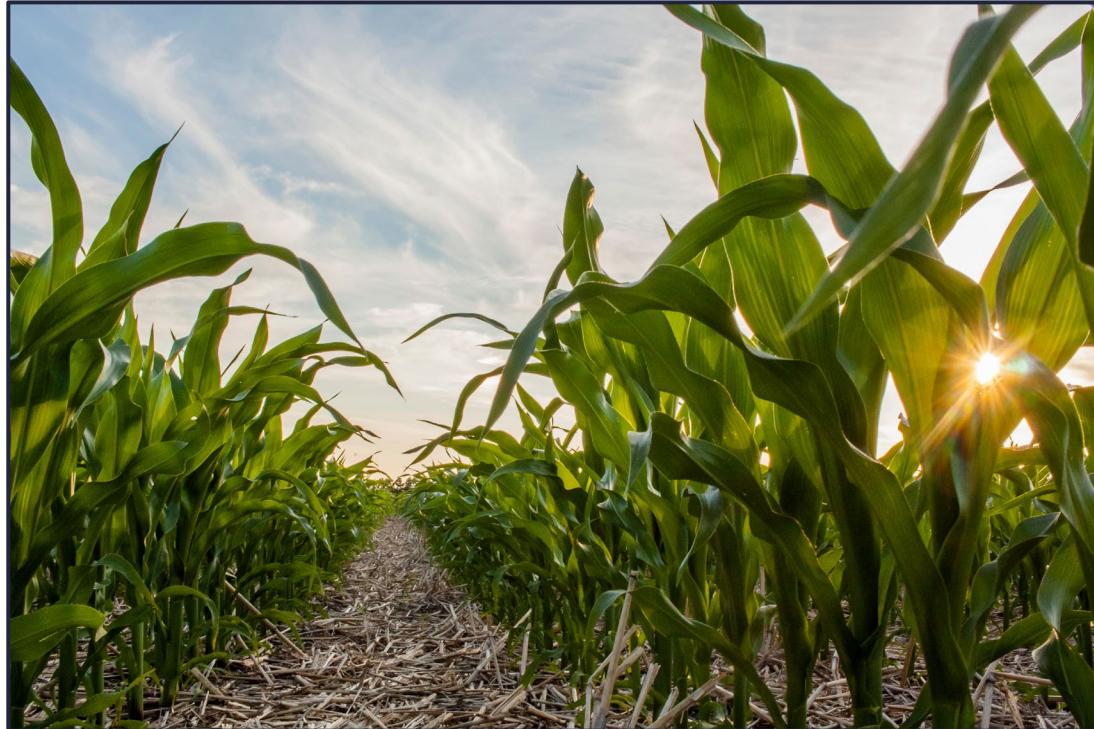


# ECONOMIC RESULTS



# 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

# 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



# Economic Analysis

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

Report Table Y: Value of Production, Costs and Summary of Field Operations Data	2021 Winter Wheat			10 way mix - Corn Silage			Rye - Soybeans			Triticale - Corn Silage		
	Control	Treatment A	Treatment B	No Cover Crop	Pre-Plant Termination	Planting Green	Control	Treatment A	Treatment B	Control	Treatment A	Treatment B
Acres	6	6	6	6.08	6.08	0	6.08	6.08	6.08	6.08	6.08	6.08
<b>Production<sup>1</sup></b>												
Crop Produced	Winter Wheat	Winter Wheat	Winter Wheat	Corn Silage	Corn Silage	Corn Silage	Soybeans	Soybeans	Soybeans	Corn Silage	Corn Silage	Corn Silage
Yield Unit	bu	bu	bu	Ton	Ton	Ton	Bushel	Bushel	Bushel	Ton	Ton	Ton
Yield in Unit per Acre	121.70	121.70	121.70	25.05	24.4	22.57	67.7	71.7	65.7	24.87	24.9	25.33
Price/Value per Unit <sup>2</sup>	\$5.00	\$5.00	\$5.00	\$61.00	\$61.00	\$61.00	\$13.30	\$13.30	\$13.30	\$61.00	\$61.00	\$61.00
Cover Crop Harvested as Ensilage/Forage	0	0	0	0	0	0	0	0	0	0	0	0
Yield Unit	0	0	0	0	0	0	0	0	0	0	0	0
Yield in Unit per Acre	0	0	0	0	0	0	0	0	0	0	0	0
Price/Value per Unit <sup>2</sup>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Crop Produced	0	0	0	0	0	0	0	0	0	0	0	0
Yield Unit	0	0	0	0	0	0	0	0	0	0	0	0
Yield in Unit per Acre	0	0	0	0	0	0	0	0	0	0	0	0
Price/Value per Unit <sup>2</sup>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Value of Production</b>	<b>\$608.50</b>	<b>\$608.50</b>	<b>\$608.50</b>	<b>\$1,528.05</b>	<b>\$1,488.40</b>	<b>\$1,376.77</b>	<b>\$900.41</b>	<b>\$953.61</b>	<b>\$873.81</b>	<b>\$1,517.07</b>	<b>\$1,518.90</b>	<b>\$1,545.13</b>
<b>Machinery Cost Estimates<sup>1,3,4</sup></b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>	<b>\$/Ac</b>
Tillage Operations	\$0.00	\$0.00	\$0.00	\$17.30	\$17.30	\$17.30	\$17.30	\$17.30	\$17.30	\$17.30	\$17.30	\$17.30
Planting Operations	\$15.40	\$15.40	\$15.40	\$17.20	\$17.20	\$17.20	\$17.20	\$17.20	\$17.20	\$17.20	\$17.20	\$17.20
Nutrient Application	\$18.35	\$18.35	\$18.35	\$25.15	\$25.15	\$25.15	\$5.55	\$5.55	\$5.55	\$36.35	\$36.35	\$36.35
Pesticide & Herbicide Application	\$25.60	\$25.60	\$25.60	\$18.00	\$9.00	\$9.00	\$4.50	\$4.50	\$4.50	\$9.00	\$9.00	\$9.00
Harvest Operations	\$62.30	\$62.30	\$62.30	\$179.20	\$179.20	\$179.20	\$33.40	\$33.40	\$33.40	\$32.80	\$32.80	\$32.80
Other Machinery Operations	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Cover Crop Planting Operations	\$0.00	\$0.00	\$0.00	\$0.00	\$15.40	\$15.40	\$15.40	\$15.40	\$15.40	\$0.00	\$15.40	\$15.40
Cover Crop Termination Machinery	\$0.00	\$0.00	\$0.00	\$0.00	\$4.50	\$4.50	\$4.50	\$4.50	\$4.50	\$0.00	\$4.50	\$4.50
Irrigation Application				\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Mowing				\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Pruning or Trimming				\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Machinery Cost</b>	<b>\$121.65</b>	<b>\$121.65</b>	<b>\$121.65</b>	<b>\$256.85</b>	<b>\$267.75</b>	<b>\$267.75</b>	<b>\$82.45</b>	<b>\$97.85</b>	<b>\$97.85</b>	<b>\$112.65</b>	<b>\$132.55</b>	<b>\$132.55</b>
<b>Materials Purchased Actual Cost<sup>1</sup></b>												
Crop Seed	\$ 40.04	\$ 40.04	\$ 40.04	\$153.30	\$153.30	\$153.30	\$70.00	\$70.00	\$70.00	\$120.31	\$120.31	\$120.31
Cover Crop Seed	\$ -	\$ -	\$ -	\$0.00	\$33.60	\$33.60	\$0.00	\$18.90	\$18.90	\$0.00	\$10.40	\$10.40
Nutrients	\$ 71.69	\$ 71.69	\$ 71.69	\$368.80	\$368.80	\$368.80	\$127.68	\$127.68	\$127.68	\$201.53	\$201.53	\$201.53
Pesticides & Herbicides	\$ 28.74	\$ 28.74	\$ 28.74	\$47.06	\$25.17	\$25.17	\$32.86	\$23.50	\$23.50	\$14.18	\$14.18	\$14.18
Cover Crop Termination Herbicides/Materials	\$ -	\$ -	\$ -	\$0.00	\$18.11	\$8.58	\$0.00	\$9.36	\$9.36	\$0.00	\$9.36	\$9.36
Other Materials	\$ -	\$ -	\$ -	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Materials Cost</b>	<b>\$140.47</b>	<b>\$140.47</b>	<b>\$140.47</b>	<b>\$569.16</b>	<b>\$598.97</b>	<b>\$589.44</b>	<b>\$230.54</b>	<b>\$249.44</b>	<b>\$249.44</b>	<b>\$336.03</b>	<b>\$355.79</b>	<b>\$355.79</b>
<b>Total Cost Per Acre</b>	<b>\$262.12</b>	<b>\$262.12</b>	<b>\$262.12</b>	<b>\$826.01</b>	<b>\$866.72</b>	<b>\$857.19</b>	<b>\$312.99</b>	<b>\$347.29</b>	<b>\$347.29</b>	<b>\$448.68</b>	<b>\$488.34</b>	<b>\$488.34</b>
<b>Net Income (Value of Production minus Costs)</b>	<b>\$346.38</b>	<b>\$346.38</b>	<b>\$346.38</b>	<b>\$702.04</b>	<b>\$621.69</b>	<b>\$519.58</b>	<b>\$587.42</b>	<b>\$606.32</b>	<b>\$526.52</b>	<b>\$1,068.39</b>	<b>\$1,030.56</b>	<b>\$1,056.79</b>
Cover Crop Termination Cost	\$0.00	\$0.00	\$0.00	\$0.00	\$22.61	\$13.08	\$0.00	\$13.86	\$13.86	\$0.00	\$13.86	\$13.86
Cover Crop Establishment Cost	\$0.00	\$0.00	\$0.00	\$0.00	\$49.00	\$49.00	\$0.00	\$34.30	\$34.30	\$0.00	\$25.80	\$25.80
<b>Total Cover Crop Cost</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$71.61</b>	<b>\$62.08</b>	<b>\$0.00</b>	<b>\$48.16</b>	<b>\$48.16</b>	<b>\$0.00</b>	<b>\$39.66</b>	<b>\$39.66</b>

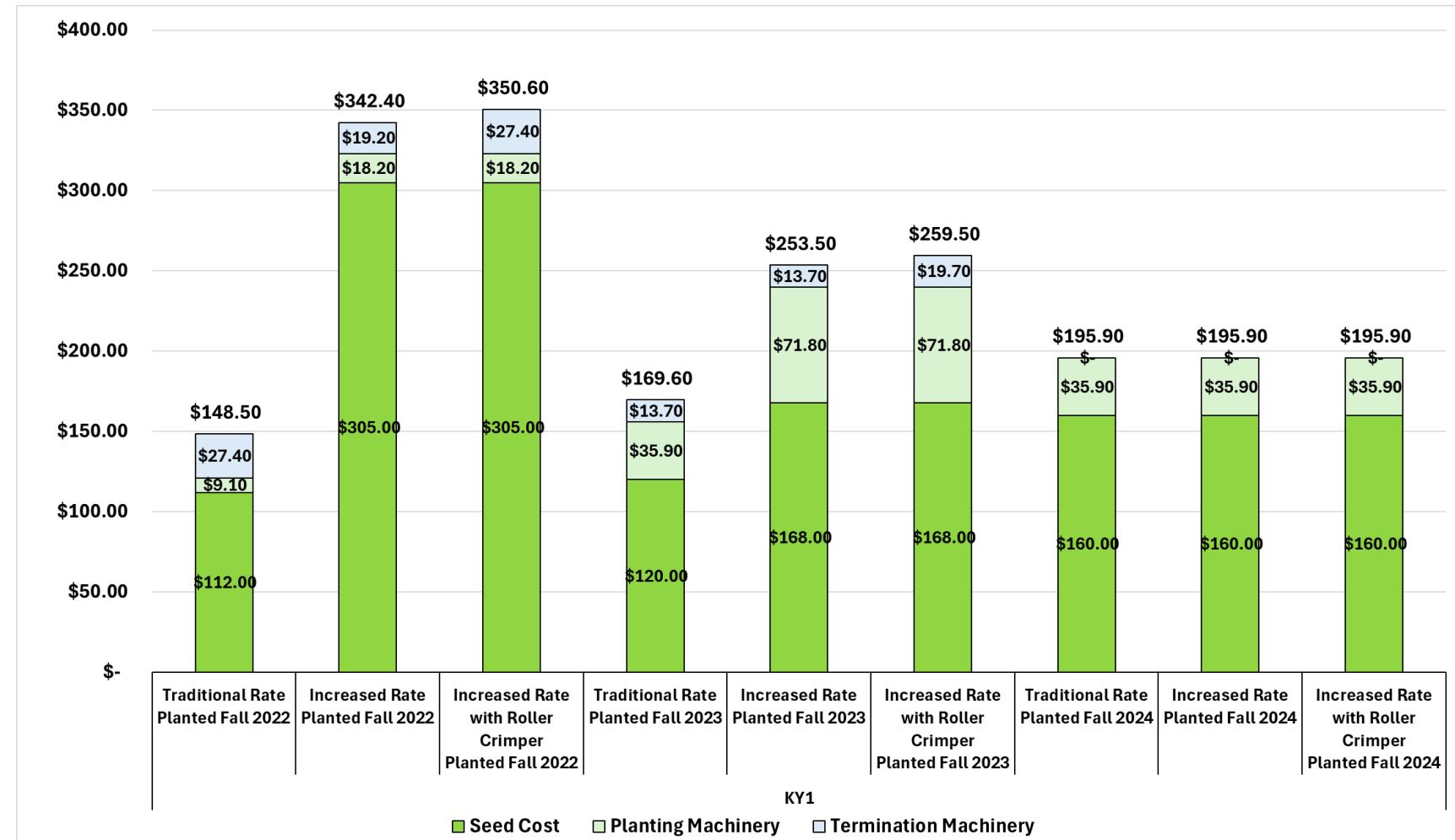


# Kentucky Farms

- Treatment Types
  - 1 Farm incorporated roller/crimping into termination and testing seeding rates
  - 1 Farm used no cover crops compared to cover crops
  - 1 Farm compared yearly vs occasional cover crops
  - 1 Farm incorporated a high biomass cover crop
- Typical Row Crops
  - Corn, Soybeans, Winter Wheat, Organic corn, & Organic soybeans
- Cover Crop Types
  - Rye-clover, Cereal rye, Clover-vetch, & High biomass mix

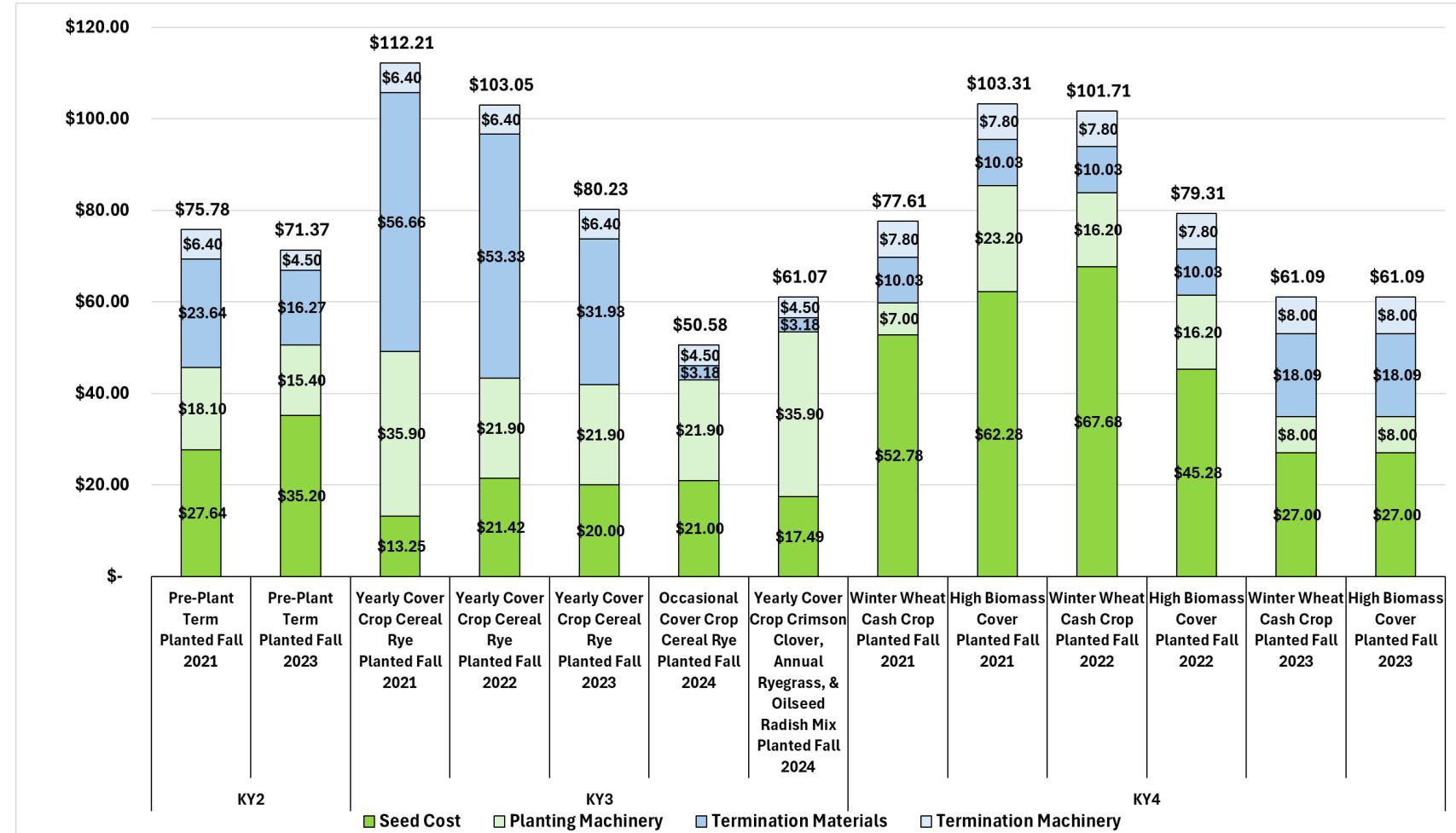
# Kentucky Cover Crop Costs (\$/ac) by Farm by Year

- KY1 – Termination costs leveled off with tillage; seed costs became consistent

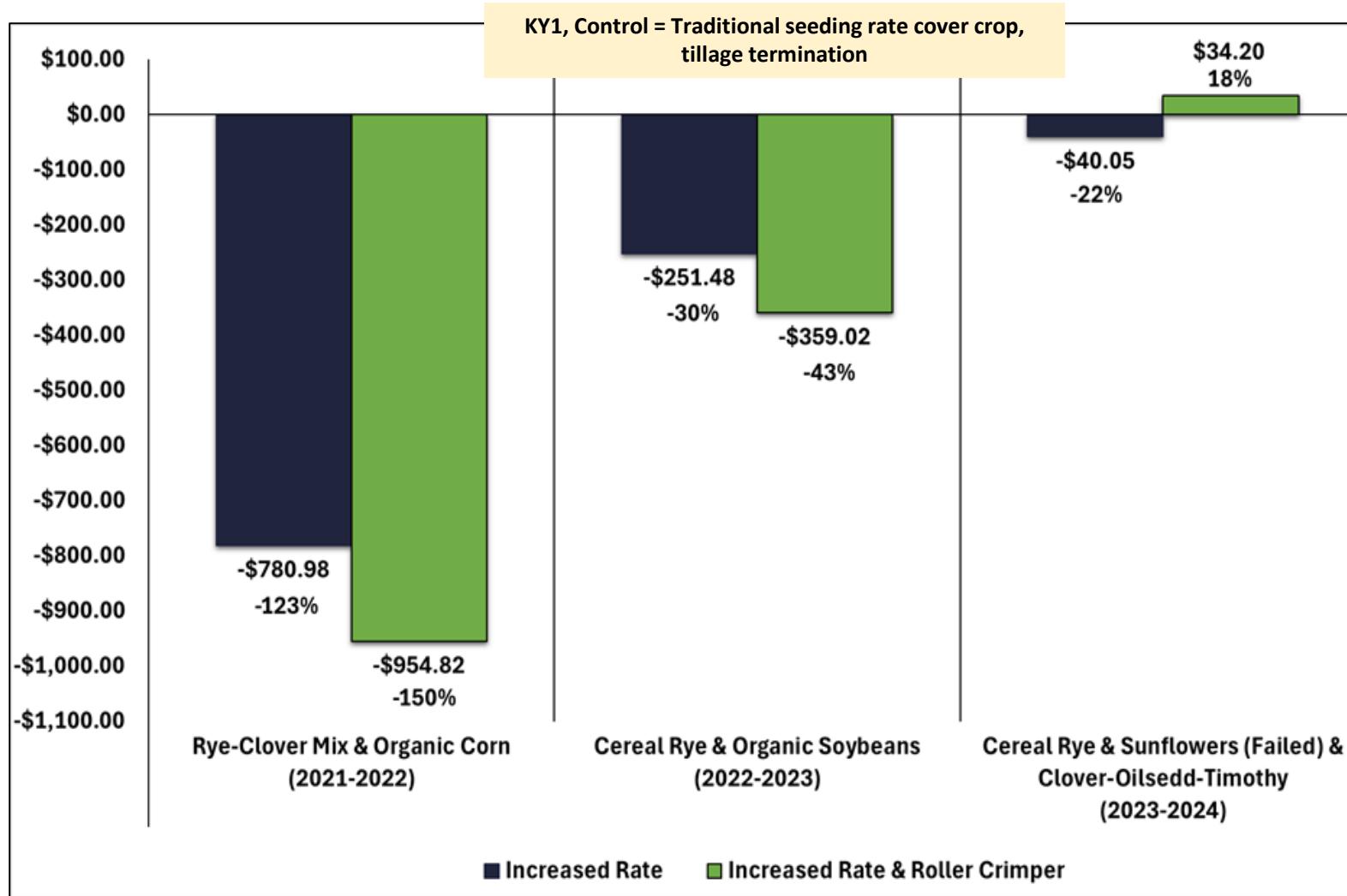


# Kentucky Cover Crop Costs (\$/ac) by Farm by Year

- KY2 – only 2 years of cover crop data, but consistent costs
- KY3 – costs consistent year-to-year
- KY 4 – High biomass cover had operational challenges

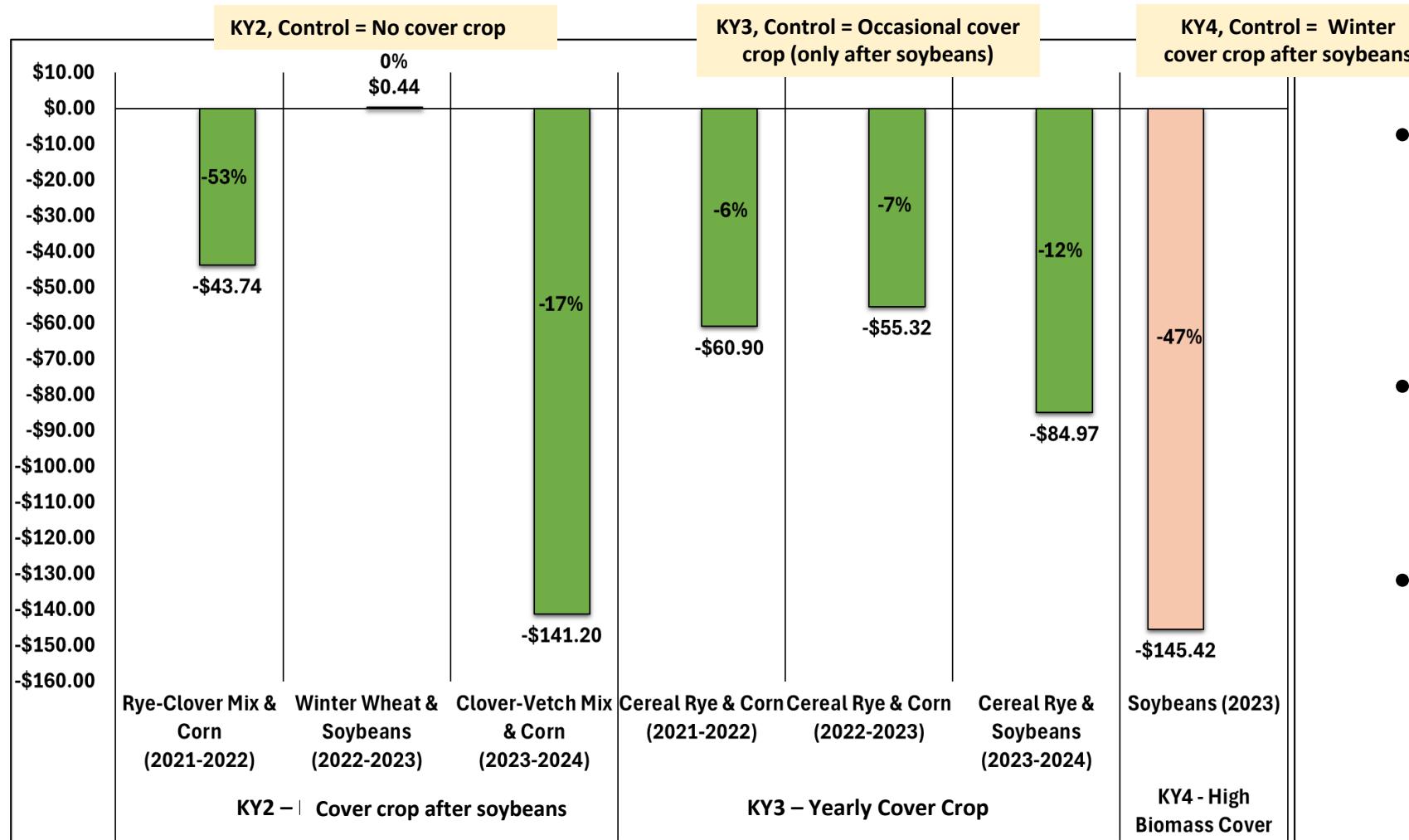


# Kentucky Results: Difference in Net Income (\$/ac) of Treatments compared to Control



- KY1
  - Roller crimping was a major struggle at the beginning, but when successful had a higher net income than traditional cover crop termination

# Kentucky Results: Difference in Net Income (\$/ac) of Treatments compared to Control



- KY2 – Yield decreases did not outweigh cover crop costs; difficult to plant cover crop timely
- KY3 – Competitive with occasional cover crop control
- KY4 – High biomass cover had operational challenges

# Key Takeaways

---

## Overarching takeaways:

- Cover crop economics heavily depend on the system and farmer
- There is economic potential for cover cropping, but we need time

## Biggest benefit:

- Adoption did not impact practice timing

## Biggest challenges:

- Learning curve for adoption is a major challenge, even for farmers with cover crop experience



Photo: No-till drill used for seeding cover crops



# RECAP OF LESSONS LEARNED

Photo: Walnut Grove Farm, Demo Field, Kentucky

# Kentucky Demo Trial Takeaways

---

## Overarching takeaways:

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

## Biggest state-specific benefit:

- Learning from the other farmers participating
- Interested in creating a greater soil health network of farmers with a specific need for soil sampling and interpretation and technical assistance

## Biggest state-specific 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: Discussion on soil health at Chris Pierce Farm Field Day



*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!*

