

SOIL CON

2026

SOIL HEALTH SUCCESSES
AND FAILURES

RESOURCE ROUNDUP



2026 EVENTS

VIRTUAL SOILCON February 12, 2026 | Online via Zoom Webinar

A fully virtual webinar of presentations and panel discussions exploring the latest advances in soil health research and management across cropping systems in Washington and beyond.

Status of the World's Soils

David Lobb, *University of Manitoba*

Long-Term Soils Research

Surendra Singh, *Lind Dryland Research Station*

Tayler Ulbrich, *Kellogg Biological Station LTAR*

Dani Gelardi, *Washington State Department of Agriculture*

Soil Microbiology

Jean-Michel Ané, *University of Wisconsin-Madison*

Mallory Choudoir, *North Carolina State University*

Kirsten Hofmockel, *Pacific Northwest National Laboratory*

Maren Freisen, *Washington State University*

Soil Health Lightning Talks

Kwenama Buthelezi, *University of KwaZulu Natal*

Isha Chand, *Washington State University*

Paul Martinez, *Washington State University*

Leslie Michel, *Washington State Department of Agriculture*

Benedict Okorie, *Utah State University*

Adam Peterson, *Washington State Department of Agriculture*

Teal Potter, *Washington State University*

Gwendolyn Richards, *California Polytechnic State University*

Jadey Ryan, *Washington State Department of Agriculture*

Tejinder Singh, *Utah State University*

2026 EVENTS

IRRIGATED PERENNIALS SOILCON February 26, 2026 | Tri Cities, WA

A hybrid event that delivered practical, science-based guidance from researchers and growers for boosting soil health in irrigated perennial cropping systems, including vineyards and hop yards.

WaSHI Vineyard Long-Term Research Overview

Devin Rippner, *USDA-ARS Prosser*

What is a Healthy Soil for Wine Grape Production?

Noely Gonzalez-Maldonado, *University of California – Davis*

Cover Crops and Weed Management In Wine Grape Systems

Rui Liu, *Washington State University*

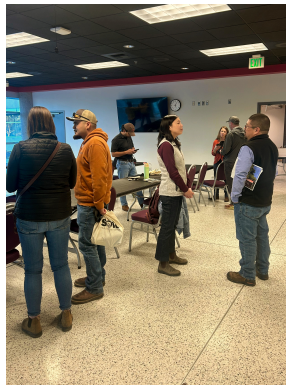
Devin Rippner, *USDA-ARS Prosser*

Producer Panel: Using Soil Data to Better Manage Vineyards

Kade Casciato, *Ciel du Cheval Vineyard*

Catherine Jones, *Wilbur Ellis*

Reid Wilson, *Hedges Family Estate*



2026 EVENTS

DIVERSIFIED ORGANIC SOILCON May 27, 2026 | Puyallup, WA

A field tour and grower panel discussion focused on building soil health in diversified vegetable cropping systems with reduced tillage and animal integration.

Field Tour of WaSHI's Long-Term Research Site

Doug Collins, *Washington State University*

Stephen Bramwell, *Washington State University*

Emily Tzeng, *Local Color Farm and Fiber*

Teal Potter, *Washington State University*

Miki Santosa, *Pacific Northwest National Laboratory*

Equipment Demonstrations

Doug Collins, *Washington State University*

Producer Panel: Reduced Tillage

Jen Aron, *Blue Raven Farm*

Phelan Pagano, *Little Big Farm*

Matt Steinman, *Foothills Farm*



VIRTUAL SOILCON

Session 1



THE STATUS OF THE WORLD'S SOILS

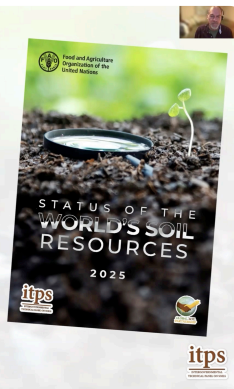
David Lobb *University of Manitoba*



SWSR-2025 Content

- Summarizes the linkages between Soils and the SDGs
- Analyses the major threats to soil functions
- Provides evidence of the direct and indirect drivers of soil threats
- Identifies sustainable soil management practices
- Highlights several strategies to facilitate the adoption of sustainable soil management
- Provides regional overviews of soil threats and adoption of sustainable soil management

It differs from the 2015 report in that it follows a **management-based approach**.



Key Messages



Key Takeaways

- Soil health is a complex and often misunderstood concept that varies depending on context, land use, and management goals.
- Soil health should not be evaluated against a single ideal condition - "healthy" is relative to the soil's inherent properties.
- Core soil health principles (e.g., minimizing disturbance, maximizing cover, increasing diversity, maintaining living roots) remain foundational across systems.
- Management decisions strongly influence infiltration, organic matter, and long-term soil function.

Resources

- [Status of the World's Soils report](#)



VIRTUAL SOILCON

Session 2

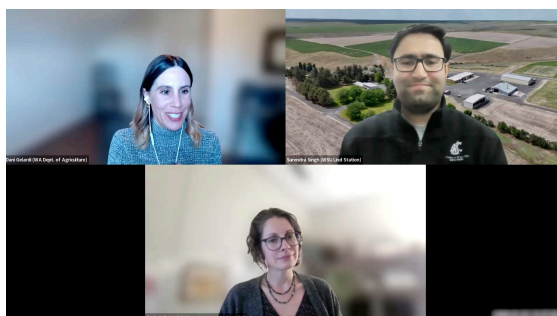
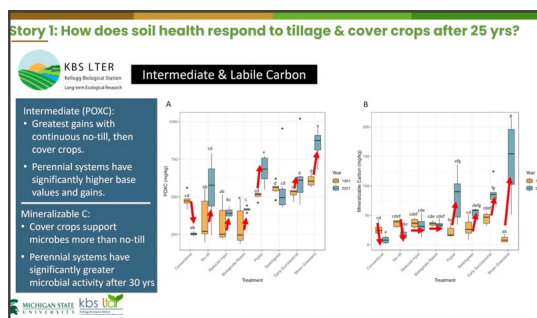
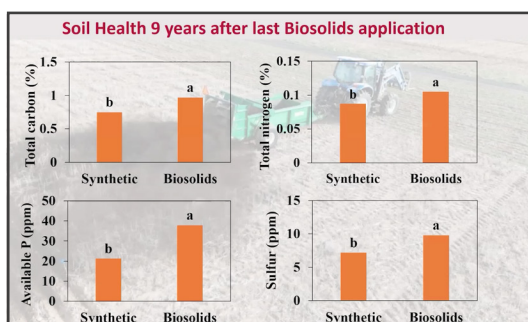


LONG-TERM SOILS RESEARCH



Surendra Singh *Lind Dryland Research Station*

Taylor Ulbrich *Kellogg Biological Station LTAR*



Key Takeaways

- Long-term experiments are critical for understanding how soil health practices perform over decades rather than years.
- Soil organic matter (SOM) plays a central role in productivity, resilience, and carbon cycling.
- Higher SOM soils often exhibit increased biological activity, including higher respiration, but also greater capacity to store and stabilize carbon.
- Soil health metrics and trends must be interpreted carefully within the context of each soil type and environment.
- Archiving soil samples over time enables future research as measurement technologies evolve.

Resources

- Cropping intensity and soil health in dryland wheat systems
- Biosolids' legacy benefits 7 years after application
- An integrated approach to assessing soil biological health
- Farmers' understanding of soil health



VIRTUAL SOILCON

Session 3



SOIL MICROBIOLOGY

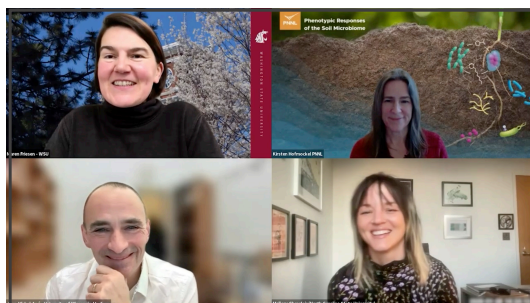
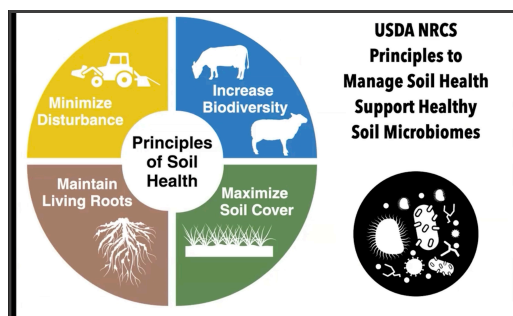
Jean-Michel Ané *University of Wisconsin–Madison*

Mallory Choudoir *North Carolina State University*

Kirsten Hofmockel *Pacific Northwest National Laboratory*

 **The Role of Microbiology in Soil Health**

- Root inputs promote microbial growth and stimulate microbial contributions to nutrient cycling and organic matter formation.
- Microbial growth, activity and death contribute to soil organic matter, even during winter months
- Microbial residues build soil organic matter by contributing lipids, proteins, and mineral-associated organic matter
- Perennial plants and winter cover crops support microbial biomass and beneficial microbial functions



Key Takeaways

- Biological nitrogen fixation could reduce fertilizer needs, with engineered microbes already on the market and new maize and sorghum varieties being developed to capture more nitrogen from the atmosphere.
- Soil microbial communities differ by location, soil conditions, and management practices, highlighting the need for region-specific soil health strategies.
- Microbes are critical to nutrient cycling and long-term carbon storage, with dead microbial material (necromass) now recognized as an important source of stable soil organic matter.
- The best ways to support beneficial soil microbiomes are keeping living roots in the soil, minimizing disturbance, maintaining soil cover, and increasing biodiversity.

Resources

- [Replacement of synthetic nitrogen fertilizer with biological nitrogen fixation in maize](#)
- [Microbe-derived soil organic carbon](#)
- [Soil microbiomes and climate change](#)
- [Microbiome stewardship for ecosystem and human health](#)



SOIL HEALTH LIGHTNING TALKS



Monitoring soil health indicators in potato cultivation using remote sensing and machine learning

Kwenama Buthelezi, *University of KwaZulu Natal*



Managing soil moisture and soil physical health for potato production in northwestern Washington

Isha Chand, *Washington State University*



How does organic management influence soil susceptibility to compaction, plant available water, and water movement?

Paul Martinez, *Washington State University*



WaSHI Soil Health Ambassadors Program

Leslie Michel, *Washington State Department of Agriculture*



Soil Microbial Community Responses to Biostimulant Application in Utah Farms: A Phospholipid Fatty Acid Profile Analysis

Benedict Okorie, *Utah State University*



Managing Nutrients with the Right Tools: New WSDA Resources for Nutrient Management

Adam Peterson, *Washington State Department of Agriculture*



Splitting cover crop benefits between soil and biofuel feedstock

Teal Potter, *Washington State University*



Assessing Carbon Storage Potential of Regeneratively Managed Vineyard Soils

Gwendolyn Richards, *California Polytechnic State University*



Dirt Data Reports: A No-Code Soil Health Reporting Tool

Jadey Ryan, *Washington State Department of Agriculture*



Can Continuous Soil Water Retention Monitoring Enhance Soil Health Assessment?

Tejinder Singh, *Utah State University*

IRRIGATED PERENNIALS SOILCON

Session 1



WASHI VINEYARD LONG-TERM RESEARCH OVERVIEW



Devin Rippner *USDA-ARS Prosser*

Vineyard management treatments

1. **WA 2021 Industry Standard:** +herbicide, +fertiligation
2. **Managed Resident Vegetation:** -herbicide, +fertiligation
3. **Under-vine Cover Crop:** -herbicide (cover crop), +fertiligation
4. **Organic Matter Additions:** -herbicide, - fertiligation (compost)
5. **Integrated Management,** -herbicide (cover crop), - fertiligation (compost).



What is being measured at this site?

 Biological Phospholipid Fatty Acid Analysis Mineralizable Carbon	 Physical Bulk density, aggregate stability, texture, soil structure	 Chemical Available N, P, K+ others Oxidizable compounds (POXC) Total N, C, OC, IC	 Eventually crop performance
Carbon stocks Measure carbon fractions to understand soil's capacity cycle and sequester carbon. 			

Slide courtesy of Tianna Dupont and Gemini

Washington Soil Health Initiative

Key Takeaways

- Soil health practices must be tailored to specific soils and cropping systems; there is no one-size-fits-all approach.
- Most organic carbon, microbial biomass, and microbial diversity in eastern Washington vineyard soils are concentrated in the top 6 inches of soil.
- Drill-seeding perennial cover crops was far more successful than broadcast seeding, especially under droughty conditions.
- Under-vine legume cover crops remain difficult to establish because of winter injury, weed competition, and timing challenges.
- Effective weed control during vineyard establishment is critical; vines in herbicide-managed plots grew roughly three times larger than vines in mowed-only plots.

Resources

- [Washington Soil Health Initiative long-term vineyard research site](#)
- [Soil Health in Washington Vineyards](#)



IRRIGATED PERENNIALS SOILCON

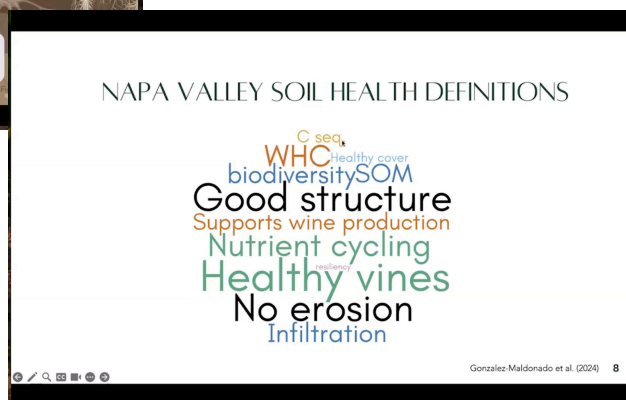
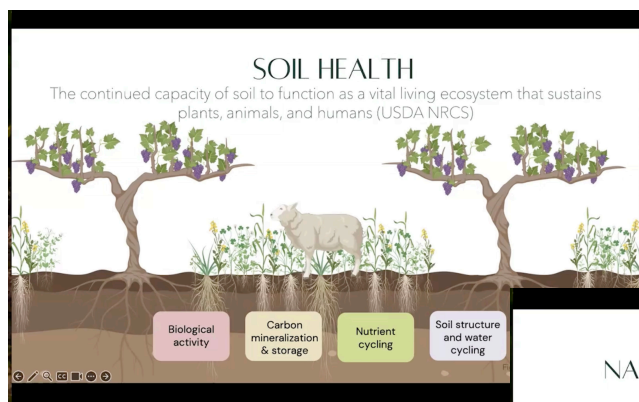
Session 2



WHAT IS A HEALTHY SOIL FOR WINE GRAPE PRODUCTION?



Noely Gonzalez-Maldonado, *University of California–Davis*



Key Takeaways

- Growers tend to define soil health in terms of vine balance, fruit quality, water management, and controlled vigor rather than maximizing yield.
- Many growers associate soil health closely with soil fertility, creating concern that some soil-health practices could increase vigor beyond desirable levels.
- The biggest barriers to adopting soil-health practices are concerns about cost, labor, water use, uncertainty about returns, and limited evidence linking soil-health indicators to wine quality.
- Cover crops are widely accepted among growers, while no-till systems are viewed more cautiously because of weed, pest, and water-management concerns.
- Soil-health priorities differ by region, highlighting the need for locally relevant research rather than universal recommendations.

Resources

- What is a healthy soil for wine grape production? Grower perspectives differ from soil health paradigms
- Wine grape grower perceptions and attitudes about soil health



IRRIGATED PERENNIALS SOILCON

Session 3



COVER CROPS AND WEED MANAGEMENT IN WINE GRAPE SYSTEMS



Devin Rippner, *USDA-ARS Prosser*
Rui Liu, *Washington State University*



Key Takeaways

- Cover crops can reduce erosion, suppress weeds, and improve soil protection, but successful establishment requires careful species selection and management.
- Intermediate wheatgrass and crested wheatgrass show strong potential for irrigated perennial systems because of their drought tolerance and long-term persistence.
- Hydroseeding under-vine cover crops may offer a practical, scalable solution for large commercial vineyards.
- Effective weed management requires a combination of mechanical, cultural, chemical, and biological approaches rather than reliance on a single tactic.
- Electrical weeding showed promising weed-control results in vineyard trials but may present fire-risk concerns during dry conditions.
- Vineyard managers should rotate herbicide modes of action, follow label recommendations, and integrate non-chemical practices to preserve future weed-control options.

Resources

- [Wine Minute: Integrated Weed Management](#)
- [Cover Crops as a Floor Management Strategy for Pacific Northwest Vineyards](#)



IRRIGATED PERENNIALS SOILCON

Session 4



PRODUCER PANEL: USING SOIL DATA TO BETTER MANAGE VINEYARDS



Kade Casciato, *Ciel du Cheval Vineyard*
Catherine Jones, *Wilbur Ellis*
Reid Wilson, *Hedges Family Estate*



Key Takeaways

- Soil health decisions are most effective when based on multiple data sources—including soil tests, tissue samples, water analysis, soil moisture monitoring, and field observations rather than any single metric.
- Healthy soils are ultimately evaluated through plant performance, including vine vigor, resilience, longevity, fruit quality, and the ability to manage water and nutrients effectively.
- Regenerative, organic, and biodynamic growers are increasingly using cover crops, native plants, compost, sheep grazing, and biodiversity-focused practices to improve soil function and reduce dependence on outside inputs.
- Water management is a top priority, with growers relying on soil moisture probes, pressure bombs, and irrigation monitoring to improve efficiency and adapt to drought, heat events, and potential water shortages.
- Successful soil-health management is highly site-specific and adaptive; growers emphasized combining scientific measurements with hands-on observation, experimentation, and long-term monitoring to guide decisions.

Resources

- [Ciel du Cheval Vineyard](#)
- [Soil Health Ambassador: Reid Wilson](#)
- [Hedges Family Estate](#)



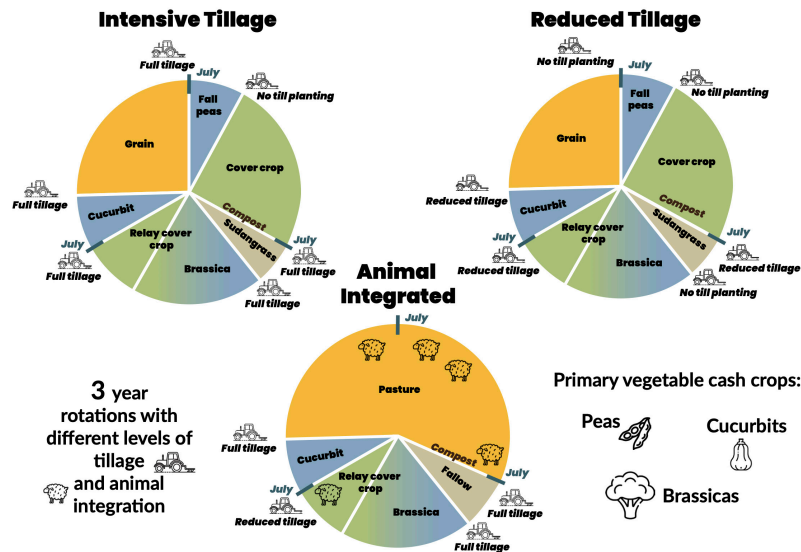
REDUCED TILLAGE ORGANIC SOILCON

Session 1



SOIL HEALTH IN REDUCED TILLAGE AND ANIMAL-INTEGRATED DIVERSIFIED ORGANIC CROPPING SYSTEMS

Doug Collins, *Washington State University*



Key Takeaways

- WaSHI's long-term study compares intensive tillage, reduced tillage, and animal-integrated organic vegetable systems within a three-year crop rotation.
- Compost applications reduced soil bulk density and significantly increased mineralizable carbon, indicating improved biological activity.
- Reduced tillage showed trends toward improved soil aggregation, although differences were not yet statistically significant.
- Compost increased several soil nutrients and improved broccoli yields, particularly when applied shortly before transplanting.
- Early results showed lower broccoli and squash yields under reduced tillage compared with intensive tillage, highlighting potential tradeoffs during transition periods.

Resources

- [Washington Soil Health Initiative long-term diversified organic cropping systems research site](#)



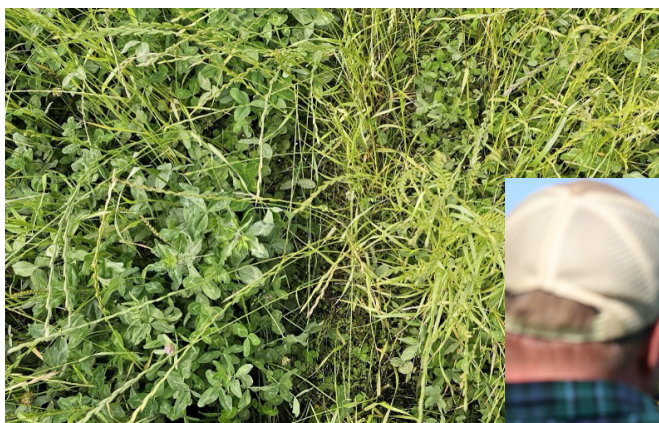
REDUCED TILLAGE ORGANIC SOILCON

Session 2



MANAGING FOR THE LEGUME: EVALUATING NUTRIENT STATUS ON COVER CROP LEGUMES AND PASTURE LEYS

Stephen Bramwell, *Washington State University*



Key Takeaways

- Researchers are investigating how liming and micronutrient amendments influence pasture establishment and legume performance.
- Nitrogen fixation by legumes depends on adequate availability of essential nutrients, including sulfur, magnesium, zinc, boron, and copper.
- Several micronutrients play direct roles in root nodule formation, rhizobium activity, and biological nitrogen fixation.
- Dolomite, sulfur, and micronutrient applications were evaluated as tools to improve legume growth and nutrient function compared with untreated and lime-only treatments.
- Nutrient deficiencies can limit nitrogen fixation even when legumes are successfully established.

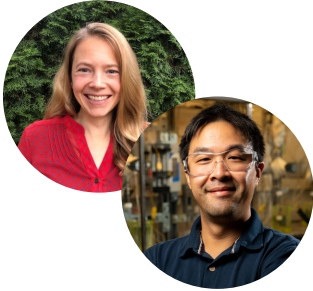
Resources

- [Nutrient Management for Pastures: Western Oregon and Western Washington](#)
- [Applying Adaptive Grazing Management](#)



REDUCED TILLAGE ORGANIC SOILCON

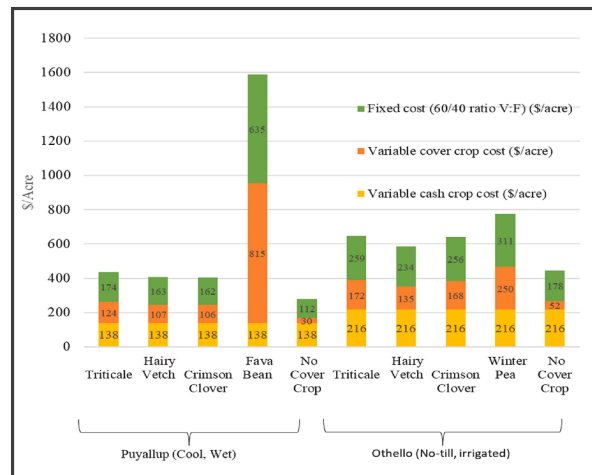
Session 3



COVER CROP BIOFUELS RESEARCH

Teal Potter, *Washington State University*

Miki Santosa, *Pacific Northwest National Laboratory*



Variable and fixed costs of planting cover crops and cash crops on a per acre basis.

Key Takeaways

- This project evaluates cover crop growth and biomass production across multiple Washington growing regions.
- Economic analyses compare the costs of cover crop establishment and management alongside cash crop production.
- Biomass yield varies considerably by location and cover crop treatment, affecting both agronomic and economic outcomes.
- The project explores whether cover crop biomass can serve as a low-carbon biofuel feedstock while maintaining soil health benefits.
- Research focuses on understanding tradeoffs between retaining residue for soil improvement and removing biomass for energy production.

Resources

- [Unlocking the biofuel power of cover crop in Washington State](#)
- [Helping farmers, boosting biofuels](#)
- [Maximizing the value of cover crops in the pacific northwest](#)



REDUCED TILLAGE ORGANIC SOILCON

Session 4

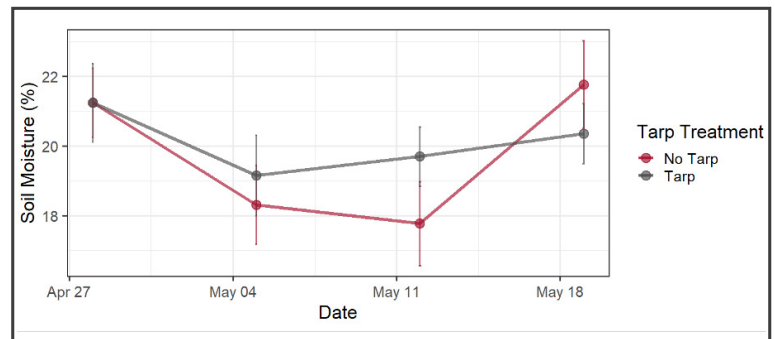


REDUCED-TILLAGE AND TARPING VS. INTENSIVE-TILLAGE WITHOUT TARPING

Doug Collins, *Washington State University*

Samantha Shortledge, *Washington State University*

Joseph Zimbric, *Washington State University*



Soil moisture at 10cm in different tarping and tillage treatments in 2026

Key Takeaways

- The project evaluates whether combining reduced tillage with temporary silage tarps can improve organic sweet corn production.
- In a 2024 field trial, reduced tillage plus tarping increased sweet corn yield by 48% and marketable ear production by 51% compared with intensive tillage without tarping.
- Weed suppression provided by tarps may help reduce some of the challenges typically associated with reduced-tillage systems.
- Ongoing research is measuring soil temperature, soil moisture, and nitrogen availability during the tarping period.
- Practical adoption considerations include the labor required to install and remove tarps, along with concerns about potential plastic contamination.

Resources

- [Review of tarping and a case study on small-scale organic farms](#)
- [Weed management](#)
- [Cover crop variety, termination timing, and termination method in organic reduced-tillage systems](#)



REDUCED TILLAGE ORGANIC SOILCON

Session 5



PRODUCER PRESENTATIONS **AND PANEL DISCUSSION:** **REDUCED TILLAGE**



Jen Aron, *Blue Raven Farm*
Phelan Pagano, *Little Big Farm*
Matt Steinman, *Foothills Farm*



Key Takeaways

- Successful reduced-tillage systems are highly site-specific, with farmers emphasizing optimization of disturbance rather than strict adherence to no-till practices.
- Diverse cover crops, continuous living roots, and long crop rotations were repeatedly identified as the foundation of soil health, weed suppression, and long-term productivity.
- Healthy soils can reduce pest and disease pressure over time, but some growers still use targeted tillage to manage challenges such as symphylans, nematodes, and other soil-borne pests.
- Farmers expressed skepticism about single soil-health solutions and emphasized using multiple tools—including soil tests, tissue analyses, field observations, and experimentation—to guide management decisions.
- Climate resilience emerged as a major theme, with cover crops, soil cover, strong soil biology, and water management viewed as critical strategies for coping with extreme heat and other weather stresses.
- The panel generally defined regenerative agriculture as continuous improvement of soil, ecosystem, and farm health, while cautioning that regenerative practices must also remain practical and economically sustainable.

Resources

- [Review of tarping and a case study on small-scale organic farms](#)
- [Weed management](#)
- [Cover crop variety, termination timing, and termination method in organic reduced-tillage systems](#)



2026

COMMON THEMES

- 1** Keeping **living roots** in the soil through cover crops, perennial vegetation, or pasture integration is a key strategy for supporting soil health, microbial activity, carbon storage, and nutrient cycling.
- 2** Building soil organic matter requires **multiple complementary practices**, with research showing benefits from compost additions, cover crops, reduced disturbance, and microbial processes that contribute to long-term carbon storage.
- 3** Soil health **outcomes are highly site-specific**, with soil texture, water availability, climate, and production goals strongly influencing which management practices are most effective.
- 4** Management changes often involve **tradeoffs** between soil-health benefits and short-term production goals.
- 5** Successful soil-health management depends on **long-term monitoring and adaptive decision-making** using soil tests, plant measurements, water monitoring, and field observations rather than relying on any single metric or practice.



Annual Report

Read about our recent work in soil health research & extension

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