

Multistate Research Project Annual Report

Project Number: NC-1178

Project Title: Land use and management practice impacts on soil carbon and associated agroecosystems services

Period Covered: 6/01/2023-5/31/2024

Date of This Report: 08/17/2024

Annual Meeting Dates: 6/17/2024-6/18/2024

A. Participants:

In person: Srinivasulu Ale, Moriah Bilenky, Mohammad Golabi, Rachel Hestrin, Gary Pierzynski, DeAnn Presley, Yichao Rui, Itamar Shabtai, Xi Zhang

Virtually: Humberto Blanco, Sutie Xu

B. Brief summary of minutes of annual meeting:

The meeting was presided over by Dr. Itamar Shabtai (Connecticut Agricultural Experiment Station, New Haven, CT). The attendees agreed to meet in mid-June at the Louisiana State University-Agricultural Center for the 2025 annual meeting. Dr. Xi Zhang will organize and plan the meeting. Drs. Kristopher Osterloh and Yichao Rui were elected to hold the 2026 and 2027 annual meetings in South Dakota and Indiana, respectively.

We agreed to continue the discussions on generating research proposals as a group. After the business meeting, each participant made a 20-minute presentation to report the progresses in the past year. A field trip to Horsebarn Hill at University of Connecticut was organized on the second day. More details can be found in the attached “Meeting Minutes”.

C. Accomplishments:

Research activities: During the past reporting year, the NC-1178 participants continued to carry out a range of research studies to evaluate the impacts of management practices (e.g., reduced tillage, cover crop, burning and grazing managements) on soil organic C (SOC), soil health, environmental footprint and profitability in agricultural, forest and urban soils (Table 1). Team members carried out a shared vision to promote conservation production systems that improve soil health and sustainability through research and extension services. The team has met the 2024 milestones and will continue to implement the planned project.

Table 1. Selected major research activities conducted by NC-1178 participants during 2023-2024

State	PI	Research Activities
CT	Shabtai	<ul style="list-style-type: none"> • Evaluated the effectiveness of organic amendments in enhancing soil water storage and soil carbon stocks. • Investigated the effects of root exudates of maize plants on the dynamics of soil organic matter in the rhizosphere.
GU	Golabi	<ul style="list-style-type: none"> • Evaluated the effectiveness of conservation practices and biochar as soil amendments to enhance soil carbon storage capacity in the degraded soils of southern Guam.
IN	Rui	<ul style="list-style-type: none"> • Assessed the effects of land use and management practices on soil carbon and ecosystem services. • Promoted “Indiana Organic Network (ION)” and soil health census.
KY	Grove	<ul style="list-style-type: none"> • Revised Kentucky’s AGR-1 fertilizer N rate recommendations. • Investigated soil health status of Appalachian fields and developed more appropriate soil health indicators for that region.
LA	Zhang	<ul style="list-style-type: none"> • Evaluated the influences of cover cropping induced changes in soil physical environment on soil hydrologic and biogeochemical processes.
MA	Hestrin	<ul style="list-style-type: none"> • Investigating how land management practices, soil mineralogy, and plant-microbe interactions influence the size and composition of soil organic matter pools, their vulnerability to loss pathways, and their potential to supply nitrogen to crops.
MA	Kaiser	<ul style="list-style-type: none"> • Studied how cover crops impact soil biogeochemical cycles through the exchange of C and N between plant-soil-microbial pools.
MA	Naughton	<ul style="list-style-type: none"> • Evaluated the effectiveness of summer cover crops in improving soil health and water quality while optimizing fall crop yield and value.
MO	Lin	<ul style="list-style-type: none"> • Investigated the effects of different conservation practices on soil chemical profiles using modern metabolomic approaches.
ND	Cihacek	<ul style="list-style-type: none"> • Impacts of low-rate liming on mitigating soil acidity in no-till production system. • Long-term changes in soil C and acidity over a 30-year time period.
NE	Blanco	<ul style="list-style-type: none"> • Evaluate the effects of cover crop fertilization and harvesting on cover crop growth and cash crop growth.
NY	Wickings	<ul style="list-style-type: none"> • Investigated the impact of turfgrass mowing practices and topdressing with rock on soil carbon dynamics and belowground biodiversity.
OH	Lal	<ul style="list-style-type: none"> • Residue retention and drainage impacts on grain yield and soil properties.
OR	Calderon	<ul style="list-style-type: none"> • Evaluated soil acidification on additional sites in northeastern Oregon, including active dryland farms. • Assessed the effects of tillage and nitrogen on soil health and wheat productivity.
SC	Ye	<ul style="list-style-type: none"> • Optimized conservation management practices to improve sandy soils in the context of soil organic carbon content, nutrient cycling and availability, microbial diversity, and agronomy production.

SD	Osterloh	<ul style="list-style-type: none"> • Investigated the temporal variations of SOC in South Dakota. • Utilized high resolution remotely sensed crop reflectivity data to predict precision agriculture soil management zones. • Used Portable X-Ray Fluorescence technology to predict soil EC with nondestructive analysis.
SD	Xu	<ul style="list-style-type: none"> • Soil health and soil carbon assessment under cover crop management, livestock integration, biochar amendment and no till management.
TN	Chen	<ul style="list-style-type: none"> • Economics of soil health management practices. • Investigated the direct effect of two types of soil erosion (water and wind erosion) on agricultural land values.
TN	Jagadamma	<ul style="list-style-type: none"> • Evaluated the effect of long-term conservation crop-management practices such as no-tillage and cover crops on subsoil SOC storage. • Characterized the impacts of crop diversification on soil health and agroecosystem services.
TX	Aburto	<ul style="list-style-type: none"> • Advanced the fundamental understanding of human and biological (e.g., fire ant invasion) impacts on soil dynamics (e.g., carbon, weathering) and intrinsic properties (mineralogy and soil structure) at various spatial and temporal scales. • Provided evidence and determined thresholds for the potential use of rock powder-enhanced weathering for CO₂ capture and nutrient provision across Texas working lands.
TX	Ale	<ul style="list-style-type: none"> • Developed a novel modeling framework to evaluate the watershed-scale effects of tillage management on soil and water conservation. • Assessed grazing management impacts on soil and hydrologic processes.
TX	Dou	<ul style="list-style-type: none"> • Evaluated the impacts of cropping system and related management practices on the amount and quality of residue return and soil carbon sequestration.
TX	Noormets	<ul style="list-style-type: none"> • Investigated management (e.g., burning, grazing) impacts on soil carbon dynamics in both forests and rangelands by integrating field measurements and modeling. • Evaluated the Temporally Integrating Mass Balance Carbon Allocation (TIMBCA) model with multiple experiments.

Outputs: This team has generated a wide range of research-based information and knowledge (Table 2), which has resulted in more than 76 publications in peer-reviewed journals and 117 presentations in academic conferences and meetings. In addition, the team has made more than 29 extension presentations in field days and workshops during the same period, some of which were reported by local media or news outlets.

Short-term outcomes: Data generated by the research team advanced an understanding of how management practices can be optimized to improve soil functions and productivity and agroecosystem profitability (Table 2). Research-based information was delivered to targeted audiences through extension services and academic publications. Resulting benefits included, but not limited to: 1) understanding the effects of different conservation practices (e.g., cover crops, reduced tillage) on the soil chemical profiles (e.g., MO); 2) creating precision agriculture

management zones using soil sensor technology (e.g., SD); 3) optimization of residue return for improving soil chemical and physical properties (e.g., OH); 4) integrations of cover cropping with other conservation management practices for improving soil functions and agroecosystem services (e.g., LA, MA, NE, SC, SD, TN, TX); 5) optimizing nutrient management for better yield outcomes (e.g., KY); 6) untangling the impacts of soil amendments on soil organic carbon stock (e.g., CT, GU); 7) unraveling the influences of land management practices on soil carbon dynamics and ecosystem services in agricultural, forest and urban soils (e.g., IN, MA, NY, TX); 8) mitigating soil acidification effects on crop production (e.g., OR, ND); 9) formulated and improved soil health practices and assessment using cost-benefit analysis (e.g., TN). The resulting research data also demonstrated that the adoption of site-specific management recommendations and system-based conservation is necessary and critical to make agriculture a sound solution to climate change and other environmental issues.

Milestones: The team has completed the 23/24 milestone of “workshops and meetings; begin posting of findings on project website and state agricultural experiment station and extension service web sites” and towards the final milestones of “project completion and publication of results”.

Table 2. Selected major research findings generated by NC-1178 participants during 2023-2024

State	PI	Key Findings/Observations
CT	Shabtai	<ul style="list-style-type: none"> Exudates stimulated both formation of new organo-mineral associations and disruption of existing organo-mineral associations. Formation mainly occurred in the clay-sized particles while disruption mainly occurred in the silt-size particles. Improved compost application recommendations can enhance soil climate resilience. Robust measurements of rhizosphere width and volume can improve understanding of soil biogeochemical processes.
GU	Golabi	<ul style="list-style-type: none"> Biochar can increase SOC storage and reduce carbon dioxide emission. Biochar and reduced-tillage together can increase corn yield.
IN	Rui	<ul style="list-style-type: none"> Corn yield was largely negatively affected by spring precipitation. Additionally, smaller drainage spacing (5m) could mitigate some negative impacts of wet springs on corn yield compared to wider drainage (20m) or no drainage.
KY	Grove	<ul style="list-style-type: none"> There is little need for pre-plant/at plant N for corn in Kentucky – greater NUE can be achieved with delayed N application, especially with greater soil organic matter concentrations and at-planting soil temps. Existing alfalfa nutrient composition norms indicate that regional alfalfa yields are sometimes limited by magnesium, sulfur or potassium nutrition. An existing tall fescue stand, fertilized with 45 to 90 kg N/ha between 15 November and 15 December, will exhibit baseline yield increases of 1 to 2 Mg dry matter/ha in the next year.

LA	Zhang	<ul style="list-style-type: none"> • Cover cropping can influence soil organic carbon and shape subsurface structure and hydrologic processes; however, the impacts are dependent on soil texture.
MA	Hestrin	<ul style="list-style-type: none"> • A large portion of soil N is associated with soil minerals and can serve as a source of crop N. • Compared to reduced tillage and perennial cropping systems, conventional tillage and cultivation of annual grain crops are associated with a decline in the size and complexity of mineral-associated organic matter N.
MA	Keiser	<ul style="list-style-type: none"> • In the absence of herbicide, increasing cover crop seeding rate did not increase soil health measures of soil carbon, nitrogen and microbial biomass.
MO	Lin	<ul style="list-style-type: none"> • Conservation practices can significantly increase the concentrations of the bioactive compounds in the soils that are known to promote plant health, disease resistant and micronutrients uptake. • Organic and conventional corn/soybean rotation monocropping practices had different soil chemicals profiles.
ND	Cihacek	<ul style="list-style-type: none"> • Soil pH had minor changes during the past 30 years. • Soil acidification is an emerging issue in the northern Great Plains. • Utilization of low-rate liming can be an economical means to manage soil acidity and maintaining or improving crop productivity as agricultural production practices intensify.
NE	Blanco	<ul style="list-style-type: none"> • Nitrogen fertilization did not affect CC biomass and subsequent corn or soybean yield. • Cover crop biomass was significantly impacted by CC harvest treatment during years of overall low production compared with high production years.
NY	Wickings	<ul style="list-style-type: none"> • Intermediate level of mowing frequency led to greater soil invertebrate abundances. • A decrease in mowing frequency does not translate to an increase in flowering resources for pollinators.
OH	Lal	<ul style="list-style-type: none"> • The positive effects of crop residues retention depended on soil texture. • About 25% of crop residues can be harvested for other uses without adverse effects on soil health in silt loam soil and up to 50% in clayey soil. • The impacts of crop residue retention on grain and biomass yields were influenced by soil texture.
OR	Calderon	<ul style="list-style-type: none"> • Climate might be an important covariate determining the yield responses of dryland wheat to increasing soil acidity and liming additions. • The acidification is severe on the shallow soils with the highest N rates. The acidification, however, does not affect deep soil layers and is negligible below 12-24 inch depths. Yields have declined

		slightly due to acidification. Tillage is not enough to mitigate acidification when higher amounts of N fertilizer are applied.
SC	Ye	<ul style="list-style-type: none"> • Soil nitrogen availability and air temperature can be used to predict cover crop biomass production. Living cover crops had more significant impacts on various soil biogeochemical properties than their incorporated residues. • Soil clay amendment suppressed microbial enzymatic activities while increasing nitrogen availability. • Legume and non-legume cover crops had distinctive impacts on soil microbial community structure and composition, as well as the abundance of nitrogen-cycling genes.
SD	Osterloh	<ul style="list-style-type: none"> • Long-term tillage practices have caused significant soil erosion in SE South Dakota. • Soil carbon has increased over the last 25 years but is slightly lower than 100 years ago. • Soil management zones for precision agriculture can be predicted and modeled with minimal remotely sensed data. • Portable X-Ray Fluorescence technology can provide accurate estimation of soil EC.
SD	Xu	<ul style="list-style-type: none"> • Cover cropping, livestock integration, and diversified rotation benefited soil physical and biochemical properties.
TN	Chen	<ul style="list-style-type: none"> • Increasing soil erosion levels has a statistically significant negative impact on agricultural land values at the county-level. • Counties with higher levels of soil erosion tend to experience more severe reductions in mean crop yield.
TN	Jagadamma	<ul style="list-style-type: none"> • No-tillage can increase topsoil SOC, while deep-rooted grass-type cover crops resulted in significant subsoil SOC accumulation. • Cover crop diversification has strong effect on soil health indicators but not on crop yield.
TX	Aburto	<ul style="list-style-type: none"> • Fire ants' biological invasions can impact prairie soil functional properties. • Demonstrated rapid recovery of soil properties linked to nutrient and water cycling after soil reclamation practices. • Preliminary data on enhanced weathering rock powder application have found that soil type greatly modulates the response to enhanced weathering treatments. • Land management practices can impact ecosystem services by changing soil erodibility, carbon and nutrient cycling, forest litter processes, and microbial and soil fauna communities.
TX	Ale	<ul style="list-style-type: none"> • No-tillage can increase plant available water and reduce runoff and sediment loss. • Adaptive multi-paddock grazing management can promote soil and water conservation and enhance ecosystem services. • Included soil structure information can improve model performance in assessing the effects of soil management on plant available water.

TX	Dou	<ul style="list-style-type: none"> • Cultivar selection had significant effects on rice production and thus biomass production. High yielding rice had the potential of more residual return for potential C sequestration. • Energycane crop can play a significant role in terms of soil C sequestration with optimal management due to less disturbance to soil. • The effect of winter cover crop had beneficial effect on energycane crop production.
TX	Noormets	<ul style="list-style-type: none"> • Ecosystem management approaches (less frequent burning and adaptive multipaddock grazing) in both forests and rangelands did not result in increased annual soil carbon balance. Forest sites exhibited a slightly negative annual soil C balance, whereas the rangelands slightly positive. • Conservation treatments resulted in greater soil activity, measurable both as autotrophic and heterotrophic CO₂ efflux. • Biomass production efficiency is generally higher aboveground than belowground, with significant variability across years and between different pine species. • Belowground carbon balance can vary from carbon surplus to carbon deficit, depending on precipitation. • Belowground carbon allocation is a minor fraction of total photosynthetic carbon assimilation, occurs after the carbon needs of aboveground growth have been met, and varies with pine species.

D. Impacts:

During 2023-2024, the NC-1178 project attracted several new researchers to join in the team. This project continued to assemble a wide range of expertise coupled with a long-term continuum of members and participants to provide a platform for new researchers to develop research that addresses evolving issues in ecosystem sustainability, crop production and environmental quality. The research and extension activities conducted by this team across the U.S. have not only scientific merits, but also ecological, economic, and social impacts.

Demonstrating the importance of soil health. Building healthy and resilient soils is the central focus of most soil conservation programs being implemented worldwide. Team members demonstrated the importance of soil health to various agroecosystem functions and its capacities to provide food, fiber and services to humans and animals. In addition, team members are developing soil health assessment frameworks, emphasizing the significance of site-specific indicators, to be used by professionals and the general public to guide sustainable agricultural management practices.

Highlighting the role of organic carbon in soil functions. Soil organic carbon (SOC) is a critical component of soil health, playing a pivotal role in maintaining ecosystem functions and agricultural productivity. It serves as a key indicator of soil fertility, influencing nutrient availability, water retention, and soil structure. SOC also acts as a major carbon sink, helping to mitigate climate change by sequestering atmospheric carbon dioxide. Additionally, SOC improves soil resilience against erosion and degradation, supporting sustainable land use and enhancing the long-term productivity of diverse ecosystems. The team members are evaluating the impacts of

land management practices on soil carbon dynamics in agricultural, forest and urban soils. These studies help develop scientifically sound practices for managing and preserving SOC, which is essential for environmental sustainability, food security, and climate regulation.

Promoting sustainable soil management. The outcome of this project reinforces the concept of using soil health principles in production agriculture. The research results provide information towards the development of management guidelines to improve the designed agronomic and environmental outcomes.

Social benefits to society. The results generated by the team research allow future researchers and farmers alike to improve N use-efficiency in row cropping systems by minimizing its losses as ammonia, nitrous oxide, and nitrate. The increased fertilizer use-efficiency will increase the economic competitiveness of production agriculture (i.e., less fertilizer inputs), mitigate its climate impacts (i.e., less greenhouse gas emissions), and reduce water degradation potential (i.e., less nitrate leaching to aquatic systems), all of which improve the well-being of individual in the society by improving air and water quality. Meanwhile, the studies on using low-rate liming to mitigate soil acidity will allow the development of management practices to mitigate the negative effects of acidification while reducing producers' financial burden.

Grant and Resources obtained: In addition to the below equipment, the team members secured more than \$12M of grants in total from project's activities.

Equipment:

1. Aburto: Thermo Nicolet IS50R FTIR spectrometer (DRIFT-ATR-EGA Module), Agilent Echo2 plate reader spectrometer, Eijkelkamp calcimeter, Eijkelkamp pipette method apparatus, Meter VS Pro suction cup pore water collection system, Meter SATURO (infiltrometer), PP Systems EGM-5, Eijkelkamp rainfall simulator.
2. Calderon: infrared spectrometers, soil CN analyzer.
3. Hestrin: growth chambers for isotopic labeling with ¹³C-enriched CO₂ gas.
4. Jagadamma: Elementar vario MAX Cube CN analyzer, Mini-Beadbeater, NanoDrop, PCR workstation.
5. Keiser: lysimeters.
6. Lin: XCMS Plus data workstation.
7. Naughton: Root scanner with imaging software.
8. Noormets: Thermo Fisher FlashSmart NC soil elemental analyzer, Campbell Scientific FluoreSens10 sun-induced fluorescence sensor.
9. Osterloh: Eijkelkamp benchtop calcimeter.
10. Rui: GVF hydropneumatic root elutriation system, Molecular Devices SpectraMax iD3 multi-mode microplate detection platform, Shimadzu TOC-L total organic carbon analyzer, LI-COR LI-870 CO₂ analyzer coupled with a smart chamber system.
11. Shabtai: Elementar Isotope Cube elemental analyzer, METER HYPROP2, Opti-Sciences MPM-100 multi-pigment reader.
12. Wickings: soil lysimeters.
13. Xu: roller grinder, wet sieving equipment.
14. Ye: Shimadzu TOC analyzer.
15. Zhang: TEMPOS soil thermal properties analyzer.

Funding:

1. Aburto, Development of a standard protocol for detecting and quantifying dynamic soil change in urban environments. USDA -NRCS.
2. Aburto, SSOIL-COP - Soil science integrated learning and career opportunity partnership, USDA-NIFA Education - Collaborative.
3. Aburto, Support small-scale limited resources farmers for climate-smart commodities using innovative approaches. USDA-NRCS- Partnerships for Climate-Smart Commodities.
4. Ale, Row crops to perennial pasture: feeding the world, conserving water, enhancing soil, and safeguarding the climate. Foundation for Food and Agricultural Research.
5. Ale, Soil carbon assessment across Texas. Texas Corn Producers Board, Cotton Incorporated, Sorghum Checkoff.
6. Calderon. Soil health and crop productivity in Pacific Northwest dryland wheat production systems. USDA-ARS.
7. Dou, Texas A&M AgriLife Research Capacity Fund.
8. Grove, Alfalfa nutrition survey, USDA-CSREES.
9. Grove, Corn N nutrition grant, Kentucky Corn Growers Association.
10. Grove, Soil health testing grant, SARE.
11. Jagadamma, Demonstrating the impacts of cover crops for soil health and farm profitability in Tennessee. Tennessee Department of Agriculture.
12. Jagadamma, Manganese: an unexplored bottleneck of soil organic carbon and nitrogen cycling in agroecosystems. USDA-NIFA-AFRI Program.
13. Jagadamma, Optimizing plant-soil-microbial interactions through crop diversification to enhance sustainability in southeastern croplands. USDA-NIFA Foundational Program.
14. Jagadamma, Row crop production under climate change - assessment of sustainable management practices and soil additives in sand deposited fields. USDA-Agricultural Research Service.
15. Keiser, Integrating living mulch into Massachusetts corn silage production to reduce nitrogen application, minimize nitrogen loss, and improve soil health. USDA, NRCS – Massachusetts Conservation Innovation Grant.
16. Lal, The “carbon farming” multi-state project. Foundation for Food and Agriculture Research.
17. Lal, The CNH project. Case New Holland.
18. Lin, CAFNR Matching Assistantship Program.
19. Lin, Center for Agroforestry at the University of Missouri, USDA-ARS Dale Bumpers Small Farm Research Center.
20. Lin, Impact of long-term cover cropped organic farming practices on the development of disease suppressive soils. USDA Organic Agriculture Research and Extension Initiative.
21. Noormets, Ann Miller Gonzalez Research Grants for Graduate Students - Chali Simpson. Native Plant Society of Texas Award.
22. Noormets, Ann Miller Gonzalez Research Grants for Graduate Students - Dohee Kim. Native Plant Society of Texas Award.
23. Noormets, Carbon allocation dynamics under different prescribed fire frequencies. The Cynthia and George Mitchell Foundation Award.
24. Noormets, Coarse wood decomposition study. Weyerhaeuser Corp. Award.
25. Noormets, Improving degraded soils on rangelands: a potential silver lining of woody plant encroachment. Texas A&M AgriLife Research Award.
26. Noormets, McIntire-Stennis Equipment Grant.

27. Noormets, McIntire-Stennis Program Support Grant.
28. Noormets, Quantifying the soil health benefits of adaptive grazing. Texas A&M AgriLife Research Award.
29. Noormets, Tracing the carbon flow from plants to soil. USDA-NIFA.
30. Osterloh, Tillage effects on liming efficiency in acidified topsoil. South Dakota Nutrient Resource Education Council.
31. Shabtai, Evaluating the use of calcium silicate amendments to manage the bioavailability of organic carbon in agricultural soils. FFAR.
32. Shabtai, Evaluating the use of organic amendments to reduce crop drought stress by increasing plant available water. Connecticut Department of Agriculture Specialty Crop Block Grant.
33. Xu, Impacts of N fertilizer placement method and rate on sunflower growth, yield, seed oil content and N use efficiency. South Dakota Oilseeds Council.
34. Zhang, Demonstration of climate-smart agricultural solutions for sugarcane and rice production in Southern U.S.A. USDA-NRCS Conservation Innovation Grants.
35. Zhang, Climate-smart strategies of water management-cover crop system to enhance productivity, greenhouse gas mitigation, and soil health in rice production. USDA-AFRI.
36. Zhang, Exploring the potential of using cover cropping for making soil resilient to extreme weather and promoting weather-proofing agriculture. U. S. Geological Survey.
37. Zhang, Untangling the soil-roots interactions in agroecosystem under cover cropping management. LSU-AgCenter Center of Research Excellence in Plant Biotechnology and Crop Development.
38. Zhang, How does cover crops impact soil water dynamics and soybean production in Louisiana. Mid-South Soybean Board.

E. Publications

1. Asmita, G., Bagavathiannan, M. V, Balkcom, K.S., Basche, A., Beam, S., Bradley, K., Canisares, L.P., Darby, H., Davis, A.S., Devkota, P., Dick, W.A., Evans, J.A., Everman, W.J., de Almeida, T.F., Flessner, M.L., Fultz, L.M., Gailans, S., Hashemi, M., Haymaker, J., Helmers, M.J., Jordan, N., Kaspar, T.C., Ketterings, Q.M., Kladvik, E., Kravchenko, A., Law, E.P., Lazaro, L., Leon, R.G., Liebert, J., Lindquist, J., Loria, K., McVane, J.M., Miller, J.O., Mulvaney, M.J., Nkongolo, N. V, Norsworthy, J.K., Parajuli, B., Pelzer, C., Peterson, C., Poffenbarger, H., Poudel, P., Reiter, M.S., Ruark, M., Ryan, M.R., Samuelson, S., Sawyer, J.E., Seehaver, S., Shergill, L.S., Upadhyaya, Y.R., VanGessel, M., Waggoner, A.L., Wallace, J.M., Wells, S., White, C., Wolters, B., Woodley, A., Ye, R., Youngerman, E., Needelman, B.A., Mirsky, S.B., 2024. U.S. cereal rye winter cover crop growth database. *Scientific Data* 11, 200.
2. Batool, M., L. J. Cihacek, and R. S. Alghamdi. 2024. Soil inorganic carbon, formation and the sequestration of secondary carbonates in global carbon pools: a review. *Soil Systems* 8(1): 15.
3. Blanco-Canqui, H. 2023. Do cover crops impact labile C more than total C? Data synthesis. *Soil Use and Management* 39: 989-1005.
4. Blanco-Canqui, H. 2024. Do cover crop mixtures improve soil physical health more than monocultures? *Plant and Soil* 495: 99-112.

5. Blanco-Canqui, H., C.F. Creech, A.C. Easterly, R.A. Drijber, and E.S. Jeske. 2024. Does biochar combined with cover crops improve the health and productivity of sandy, sloping, and semi-arid soils? *Soil Science Society of America Journal* 88: 1340-1357.
6. Blanco-Canqui, H., K. Koehler-Cole, S.J. Ruis, R.W. Elmore, C. Proctor, C.A. Francis, and R.B. Ferguson. 2023. Cover crop impacts on soil health indicators in rainfed and irrigated systems: what did we learn after eight years? *Soil Science Society of America Journal* 87: 1174-1190.
7. Blanco-Canqui, H., W.K. Wilke, J. Holman, C. Creech, A. Obour. and L. Anderson. 2023. Grazing cover crops: how does it affect soils and crops? *Agronomy Journal* 115: 2801–2828.
8. Cabello-Leiva, S., M. T. Berti, D. W. Franzen, L. Cihacek, and T Peters. 2024. Can Nitrogen in fall-planted cover crops be useful to a subsequent maize crop? *Journal of Soil and Water Conservation* 79(2): 99-112.
9. Chen, L., Rejesus, R. M., Aglasan, S., Hagen, S., and Salas, W. 2023. The impact of no-till on agricultural land values in the United States Midwest. *American Journal of Agricultural Economics* 105(3): 760-783.
10. Davenport, R., Bowen, B.P., Lynch, L.M., Kosina, S.M., Shabtai, I.A., Northern, T.R., Lehmann, J. 2023. Decomposition decreases diversity and ecosystem similarity of soil organic matter. *Proceedings of the National Academy of Sciences* 120(25): e2303335120.
11. Dhakal, M., Rui, Y., Benson, A. R., Hinson, P. O., Delate, K., Afshar, R. K., Luck, B., and Smith, A. 2024. Cover crop management strategies affect weeds and profitability of organic no-till soybean. *Renewable Agriculture and Food Systems* 39: e3.
12. Ding, D., T. Li, L. Wu, X. Zhang, Y. Zhao, H. Feng, C. Zhang and O. Wendroth. 2024. Energy compensation for crop growth under plastic mulching: theories, models, and limitations. *Agronomy* 14 (5): 1005.
13. Ding, D., Z. Yang, L. Wu, Y. Zhao, X. Zhang, X. Chen, H. Feng, C. Zhang and O. Wendroth. 2024. Optimizing nitrogen-fertilizer management by using RZWQM2 with consideration of precipitation can enhance nitrogen utilization on the Loess Plateau. *Agricultural Water Management* 299: 108890.
14. Duan, X., Gunina, A., Rui, Y., Xia, Y., Hu, Y., Ma, C., Qiao, H., Zhang, Y., Wu, J., Su, Y., and Chen, X. 2024. Contrasting processes of microbial anabolism and necromass formation between upland and paddy soils across regional scales. *Catena* 239: 107902.
15. Duan, X., Rui, Y., Xia, Y., Hu, Y., Ma, C., Qiao, H., Zeng, G., Su, Y., Wu, J., and Chen, X. 2024. Higher microbial C use efficiency in paddy than in adjacent upland soils: evidence from continental scale. *Soil and Tillage Research*, 235: 105891.
16. Duarte ,E. Rubilar, R. Matus, F. Garrido-Ruiz, C. Merino, C. Smith-Ramirez, C. Aburto, F. Rojas, C. Stehr,A. Dörner,J. Nájera, F. Barrientos, G. Jofré, I. 2024. Drought and wildfire trends in native forests of South-Central Chile in the 21st Century. *Fire* 7(7): 230.
17. Duro, A., D. Hirmas, H. Ajami, S. Billings, X. Zhang, L. Li, A. Flores, V. Moreno, X. Cao J. Guilinger, E. Oleghe, D. Giménez, A. Gray and P. Sullivan. 2024. Topographic correction of visible near-infrared reflectance spectra for horizon-scale soil organic carbon mapping. *Soil Science Society of America Journal* 88: 207–223.
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F. Conference Presentations

1. Aburto, F. Carbon cycling in soils and forests. Radiocarbon Modeling in Forest Soils - Soil R and Compartmental Dynamic System.
2. Aburto, F. Forest degradation and recovery. 60th Annual Soil Survey and Land Resource Workshop, College Station, TX. Feb. 7-8, 2023.

3. Aburto, F. Welcome update of the research of soil science group of the Department of Soil and Crop Sciences at Texas A&M. 61st Soil Survey and Land Resource Workshop, College Station, TX.
4. Aburto, F., Castillo, C., Czimeczik, C., Sierra, C., Trumbore, S. Natural deciduous forest conversion to pine plantations induces changes in SOC radiocarbon pools across soil types but not in respired $\Delta^{14}\text{C-CO}_2$ dynamics. AGU 2023 Meeting, San Francisco, CA.
5. Aburto, F., Castillo, P., Albornoz, F. Deep changes in soil mineralogy and physicochemical properties across different soil types after natural forest conversion to exotic plantations. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
6. Aburto, F., Khadka, D., Deng, Y., Margenot, A. Soil weathering intensification, and mineralogical alteration after a century of agricultural use. 2024 Soil Science Society of America Bouyoucos Summer Conference, San Juan, PR.
7. Ahlersmeyer, A., Clark, J., Kovacs, P., Osterloh, K., Clay, D. E. Relationships between soil test potassium and clay mineralogy. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
8. Ale, S., Samanta, S., Singh, J., Himanshu, S.K., DeLaune, P.B., Morgan, C.L.S. Enhancing resiliency of rainfed crop production systems through the adoption of regenerative agricultural practices. ASABE Annual International Meeting, Omaha, NE, July 9-12, 2023.
9. Alghamdi, R., Senturklu, S., Landblom, D., Cihacek, L. J. Soil health using Haney biological analysis in calcareous soils in semi-arid environments. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
10. Araji, HA., T. Bera, F. Dou, Y. Yang, LT. Wilson, J. Knoll, J. Jifon, W. Rooney, A. Wright, C. Otero, H. Sandhu, J. Morrison, B. Baldwin. Relationship between climatic variables, aboveground biomass sorghum and soil properties in the southern USA. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
11. Atenas, A. Aburto, F. Radiocarbon reveals changes in carbon pool dynamics after native forest conversion to tree plantations. 61st Soil Survey and Land Resource Workshop, College Station, TX.
12. Atenas, A. Aburto, F. Merino, C. Castillo, P. Jofre, I, Rubilar, R. Sierra, C. Trumbore, S. Natural forest replacement by exotic tree plantation induces changes in topsoil CNP stoichiometry across contrasting soil. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
13. Atenas, A., Aburto, F. Natural Forest replacement by exotic tree plantations induces CNP stoichiometric changes across contrasting soils. 61st Soil Survey and Land Resource Workshop, College Station, TX.
14. Bachina, S., Osterloh, K. Deep-learning framework for optimal selection of soil sampling sites. 2023 NRCS National Cooperative Soil Survey Conference, Bismark, ND.
15. Bachina, S., Osterloh, K. Deep Learning framework for optimal selection of soil sampling sites. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
16. Baniya B, Kim D, Nkrumah M, Ono M, Noormets A. Seasonal dynamics of carbon allocation in a shortleaf pine forest. AGU Fall Meeting, December 11-15, 2023.
17. Batool, M., L. J. Cihacek, R. Alghamdi. Carbon dynamics in three land managements in the northern Great Plains. NCSS National Conference, Bismarck, ND. July 11, 2023.
18. Batool, M., Cihacek, L. J., Alghamdi, R. Variation of organic and inorganic carbon stocks with depth under three land management systems in North-Central South Dakota. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.

19. Batool, M., L. Cihacek, R. Alghamdi. Carbon dynamics in three land management systems in the northern Great Plains. SWCS International Annual Conference, Des Moines IA. August 3-6, 2023.
20. Batool, M., L. Cihacek, R. Alghamdi. Variation of organic and inorganic carbon stocks with depth and slope under three land management systems in north central South Dakota. systems in the northern Great Plains. SWCS International Annual Conference, Myrtle Beach, SC. July 21-24, 2024.
21. Batool, M., L. J. Cihacek, R. Alghamdi. Carbon dynamics in three land managements in the northern Great Plains. NCSS National Conference, Bismarck, ND. July 8-14, 2023.
22. Bera, T., H. Araji, F. Dou, Y. Yang, L.T. Wilson. Greenhouse gas emissions from bioenergy feedstock production in the southern Texas. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
23. Campos, S., Aburto, F. Uncovering the hidden impact of red-imported fire ants' bioturbation on soil biogeochemical functions. 61st Soil Survey and Land Resource Workshop, College Station, TX.
24. Campos, S., Aburto, F. Uncovering the hidden impact of imported fire ants' bioturbation on soil carbon, nutrient, and water cycling functions. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
25. Cancel Vazquez, R. S., Hestrin, R., Keiser, A. D. Hyphosphere influence on plant growth and soil organic matter turnover under nitrogen-limiting conditions. SSSA 2024 Summer Conference, San Juan, PR.
26. Chen, L., Rejesus, R. M. The impact of soil erosion on agricultural land values in the US Midwest. AAEA Annual Meeting, Washington, D.C. July 2023.
27. Chen, L., Rejesus, R. M. The impact of soil erosion on agricultural land values in the US Midwest. AAEA Annual Meeting, Washington, D.C. July 2023.
28. Chen, L., Cho, SH., Mingie, J. Optimal spatial targeting of agricultural conservation program payments for cover crop adoption. SAEA Annual Meeting, Atlanta, GA. Feb. 2024.
29. Cihacek, L. Linkages between soil, plant animal and human health. Mekong One Health Innovation Program (MOHIP) Webinar No. 9. Michigan State University. October 19, 2023.
30. Cihacek, L. J., Malimbayeva, A., Batyrbek, M. Effects of soil management on phosphatase activity in maize in long-term crop rotations. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
31. Cihacek, L., R. Alghamdi, C. Augustin, D. Landblom, S Senturklu. Can low lime rates be successful in mitigating soil acidity in the northern Great Plains? SWCS International Annual Conference, Myrtle Beach, SC. July 21-24, 2024.
32. Cihacek., L. The importance of topsoil: what could be the worth of a layer with the thickness of a dime? NDSWCS Annual Workshop, Fargo, ND. December 12, 2023.
33. Clark, J., Ahlersmeyer, A., Kovacs, P., Osterloh, K., Clay, D. E. Does clay mineralogy and other soil tests improve prediction of corn response to K fertilization? ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
34. Cuervo-Correa, J. Pena-Yewtukhiw, E.M., J.H. Grove, D.J. Mata-Padrino. Soil health homogeneity index (SHHI) as an indicator of soil health in intensively managed agriculture systems. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.

35. Dai, W., G. Feng, X. Zhang, D. Reginelli. Cover crop application affecting soil chemical properties in a silt loam soil. SSSA 2024 Bouyoucos Summer Conference, San Juan, PR. Jun. 10-12, 2024.
36. Devlin, A., Osterloh, K. Portable XRF for measuring Northern Great Plains soil salinity ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
37. Devlin, A., Osterloh, K. Portable X-ray fluorescence spectrometry for sensing salinity and sodicity in Glacial Northern Great Plains soils. Pedometrics 2024: Addressing the 10 Challenges International Conference, Las Cruces, NM. Feb. 5-9, 2024.
38. Dollinger J., N. Ghile, C. Lin, R. Udawatta, C. Gantzer. Effects of conservation practices on the soil chemical profiles using the modern metabolomic approaches. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
39. Fischer M, Katul G, Noormets A, Pozníková G, Domec KC, Orság M, Trnka M, King JS. Evaluating and bridging the flux-variance and surface renewal methods. EGU General Assembly, Vienna, Austria. April 24-28, 2023.
40. Fleming, W.R., C.D. Teutsch, E.L. Ritchey, J.H. Grove. The alfalfa yield plateau: is soil fertility the cause? Proceedings of the 2023 North Central Extension-Industry Soil Fertility Conference, Des Moines, IA. November 15-16, 2023.
41. Golabi, M. H. Effect of land application of biochar on 'sequestering' carbon on the tropical soils of southern Guam? International Union of Soil Sciences (IUSS) Centennial World Conference, Florence, Italy. May 19-21, 2024.
42. Golabi, M. H. Will conservation tillage combine with the land application of 'biochar' impact the soil carbon and associated agroecosystems services. Multi-State (NC 1178) Annual Meeting, New Haven, CT. June 17-18, 2024.
43. Griffen, G. Mineral-associated organic nitrogen: management and mineralogical controls on pool size and composition. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
44. Grove, J.H., E.M. Pena-Yewtukhiw. It's about time. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
45. Halverson, E., Osterloh, K. Century-long quantification of soil loss in Eastern South Dakota agricultural fields. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
46. Halverson, E., Osterloh, K. Century-long soil carbon stock changes in Eastern South Dakota. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
47. Halverson, E., Osterloh, K. Century-long quantification of soil loss in Eastern South Dakota agricultural fields. Pedometrics 2024: Addressing the 10 Challenges International Conference, Las Cruces, NM. Feb. 5-9, 2024.
48. Halverson, E., Osterloh, K. Century-long quantification of soil loss in Eastern South Dakota. NCSS Technical Planning Workshop, Fargo, ND. April 2-3, 2024.
49. Hendrix, B.L., C.D. Teutsch, J.H. Grove. 2024. Nitrogen rate and timing effects on the yield and nutritive value of tall fescue. Proceedings of the 2024 Annual Conference of the American Forage and Grassland Council, Mobile, AL. January 7-10, 2024.
50. Jagadamma, S. Climate-smart agriculture for subsoil carbon storage in the Southeast U.S. 78th SWCS International Annual Conference, Des Moines, IA. August 6-9, 2023.
51. Jarecke, K.M., R.M. Keen, V. Moreno, M. Dumont, J.B. Nippert, S.A. Billings, A.N. Flores, K. Singha, K. Sadayappan, B. Li, D.R. Hirmas, H. Ajami, L. Li, X. Zhang, P.L. Sullivan. Impacts of woody encroachment on soil hydrology: insights from root

- distribution, soil moisture time series, and electrical resistivity imaging. AGU Fall Meeting, San Francisco, CA. Dec. 11-15, 2023.
52. Jeong, C., H. Jeon, X. Zhang. Recycling tailwater using agricultural return-flows to improve irrigation water quantity and quality in Louisiana. Annual Louisiana Water Conference. Baton Rouge, LA. Aug. 2-3, 2023.
 53. Jha, A. Khadka, D. Aburto, F. Calabrese, S. An aggregate-based modeling approach to study the impact of microscale heterogeneity on soil heterotrophic respiration. AGU 2023 Meeting, San Francisco, CA.
 54. Keiser, A. D., Heaton, E., VanLooche, A., Studt, J. E., McDaniel, M. D. Historical land management alters belowground carbon allocation by bioenergy crops. SSSA 2024 Summer Conference, San Juan, PR.
 55. Kerman, J., Aburto, F. Evidence of fast soil recovery on a rewilded fly ash deposit. 61st Soil Survey and Land Resource Workshop, College Station, TX.
 56. Khadka, D., Aburto, F. Effects of agricultural intensification on Mineral Weathering. 61st Soil Survey and Land Resource Workshop, College Station, TX.
 57. Khadka, D., Aburto, F. Exploring the potential of enhanced weathering rock powder for carbon capture. 61st Soil Survey and Land Resource Workshop, College Station, TX.
 58. Khadka, D., Deng, Y., Margenot, A.J., Aburto, F. Effects of agricultural intensification on mineral weathering. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 59. Kommineni, V., Xu, S., Clay, D., Bly, A., Geza M. N. Investigating soil health in South Dakota cropping systems using cover crops and organic amendments. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 60. Kommineni, V., Xu, S., Clay, D., Bly, A., Geza M. N. Analysis of soil gaseous emissions using LICOR 8100A: assessing the impact of cover crops and organic amendments. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 61. Kommineni, V., Xu, S., Clay, D., Bly, A., Geza M. N. Impacts of biochar and manure amendments on soil health and water dynamics in cover cropping systems, South Dakota. SWCS International Annual Conference, Des Moines, Iowa. August 6-9, 2023.
 62. Li, S., Y. Yang, J. Zhang, F. Dou, L.T. Wilson, SOPB Samonte, T. Bera, X. Zhou, J. Wang. Application of UAV images for estimating seedling gaps in rice. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 63. Lloyd, A.W., F. Dou, T. Bera, L.T. Wilson, P.W. Inglett, P. White, Y. Yang, and H. Araj. Effect of winter cover crop on energycane production. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 64. Miller, R. O., Cihacek, L. J., Sawyer, D. Uncertainty in soil carbon capture: why results reporting matters. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 65. Monger, C. Micheli, E. Aburto, F. Itkin, D. Soil classification as a tool for forecasting the impacts of management and climate change on agricultural and forest soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 66. Musah, S. A., Ye, R. Cover crops integration with nitrogen management for dryland cotton in sandy Ultisols. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 67. Mvuyekure, R.F.S., Singh, J., Ale, S., Lewis, K., Burke, J., Cobos, C., Barnes, E., Mohtar, R. Assessing the effects of cover crops on soil water use and soil health in semi-arid

- irrigated cotton production systems in the Southern High Plains region. ASABE Annual International Meeting, Omaha, NE. July 9-12, 2023.
68. Nitish, Xu, S., Lang, K., Nleya, T., Sexton, P., Burrows, R., Wang, T., Mahal, N. Soil health influenced by living mulch in organic vegetable production systems in South Dakota. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 69. Noormets A. Süsinikuringest vanus metsis. Metsakonverents, Tallinn, Eesti. February 1, 2023.
 70. Oladoye, C. T., Farmaha, B. S., Marshall, M. W., Payero, J. O., Bridges, W., Ye, R. Influence of short-term cover crops on soil physical and biological properties. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 71. Oladoye, C. T., Farmaha, B. S., Marshall, M. W., Payero, J. O., Bridges, W., Ye, R. Effects of cover crops and nitrogen fertilization on cotton growth, yield, and fiber quality. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 72. Oliver, F. E., Ye, R. Carbon and nitrogen cycling as influenced by tillage, cover crops, and manure in organic agriculture. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 73. Ono M, Briske G, Mitra B, Taylor RS, Brantley ST, Noormets A. Soil carbon balance of two pine forests in the Southern United States. AGU Fall Meeting, December 11-15, 2023.
 74. Osterloh, K. Measurement of soil carbon stocks in-situ with dual wave sensors. Pedometrics 2024: Addressing the 10 Challenges International Conference, Las Cruces, NM. Feb 5-9, 2024.
 75. Osterloh, K. SDSU Pedology Updates. NCSS Technical Planning Workshop, Fargo, ND. April 2-3, 2024.
 76. Osterloh, K., Reuter, S. Dual wave sensors for in-situ measurement of soil carbon stocks. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 77. Osterloh, K., Westhoff, S. Morphological soil variability at the trial scale in Eastern South Dakota. NRCS National Cooperative Soil Survey Conference, Bismark, ND.
 78. Pachon, J., D. Hirmas, H. Ajami, P. Sullivan, S. Billings, K. Jarecke, M. Sena, X. Zhang, L. Li, K. Singha, J. Nippert, A. Flores, X. Cao, A. Nemes. Incorporating structural macropores into dual porosity water retention pedotransfer functions. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 79. Parajuli, B., Ye, R. Microbial diversity and responses to different cover crop species. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 80. Parajuli, B., Poudel, P., Ye, R. Cover crop biomass production, decomposition and C/N efflux in clay-amended sandy soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 81. Parajuli, B., Poudel, P., Ye, R. Nutrient benefits from cover crop residue decomposition in sandy Ultisols. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 82. Parajuli, B., Poudel, P., Ye, R. Three mixture cover crops had higher carbon acquisition and emission in sandy soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
 83. Park, W. J., Boyles, R. E., Ye, R., Caughman, W., Beasley, S., Smith, C. Establishing cool-season canola crop production in SC. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.

84. Patra, R., Saha, D., Jagadamma, S. Residue type and agricultural management practices alter microbial processing of topsoil and subsoil organic carbon. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
85. Patra, R., Saha, D., Jagadamma, S. Impact of residue type and management practices on microbial metabolic efficiency and organic carbon storage under conservation agricultural subsoil. Ecological Society of America Annual Meeting, Portland, OR. Aug. 6-11, 2023.
86. Pena-Yewtukhiw, E.M., J.H. Grove. It's about time, Part 2: dealing with uncertainty. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
87. Poffenbarger, H., Rawal, A., Canisares, L. P., Miguez, F., Thapa, R., Mirsky, S. B., Ye, R., Poudel, P., Mulvaney, M. J., Upadhyaya, Y., Devkota, P., Singh, H., Pelzer, C. J., Ryan, M., Loria, K., Youngerman, E., Basche, A., Ferreira de Almeida, T., Tomlinson, P. J., Presley, D. R., Roozeboom, K. L., Sener Guzel, G., Correira, A., Sadeghpour, A., Kula, C., Ruark, M. D., Waggoner, A., Wallace, J. M., Adam, J., Miller, J. O., Woodley, A., Fultz, L., Carrillo, A., Darby, H. M., Ruhl, L., Armstrong, S. D., Gautam, A. Winter cover crop effects on the optimum N rate of corn across multi-state field experiments. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
88. Poudel, P., Ye, R. Assessing cover crop biomass production potential in the Southeast Coastal Plain Soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
89. Poudel, P., Parajuli, B., Ye, R. Cover crop residue decomposition and its impacts on soil properties were species-specific in no-till sandy soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
90. Poudel, P., Parajuli, B., Ye, R. Managing cover crop for climate resilience: insights from residue decomposition and greenhouse gas emissions. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
91. Hestrin, R. Introduction to mineral-associated organic matter: integrating fundamental concepts to inform ecological and agronomic applications. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
92. Reuter, S., Osterloh, K. Landscape scale variability of dynamic soil properties. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
93. Reuter, S., Osterloh, K. Determining dynamic soil position spatial variability using digital soil mapping. NRCS National Cooperative Soil Survey Conference, Bismark, ND.
94. Reuter-Schmitt, S., Osterloh, K. Quantifying the spatial variability of dynamic soil properties. Pedometrics 2024: Addressing the 10 Challenges International Conference, Las Cruces, NM. Feb. 5-9, 2024.
95. Samanta, S., Ale, S., Mvuyekure, R.F.S., Jain, S., DeLaune, P., Morgan, C.L.S, Singh, J. A regression-based approach to estimate soil water content in cover crop-based cotton production systems from UAS-based images. Beltwide Cotton Conferences, Fort Worth, TX. January 3-5, 2024.
96. Samanta, S., Ale, S., Singh, J., Mvuyekure, R.F.S., DeLaune, P. 2023. Comparison of soil water content estimates from machine learning and physically based crop models. ASABE Annual International Meeting, Omaha, NE. July 9-12, 2023.
97. Senturklu, S., Alghamdi, R., Landblom, D., Cihacek, L. J. Soil health using Haney biological analysis in calcareous soils in semi-arid environments. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.

98. Shabtai, I.A. Hafner, B., Lehmann, J., Bauerle, T. Probing the spatial and chemical distribution of MAOM in the rhizosphere. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
99. Singh, B., Samanta, S., Dowhower, S., Ale, S., Cason, J., Gomez-Casanovas, N. Characterizing rangeland composition managed under adaptive multi-paddock grazing. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
100. Singh, B., Samanta, S., Dowhower, S.L., Ale, S., Cason, J., Gomez-Casanovas, N. Mapping vegetation species in a mixed rangeland managed under adaptive multi-paddock grazing using UAV acquired RGB images. ASABE Annual International Meeting, Omaha, NE. July 9-12, 2023.
101. Singh, B., Samanta, S., Kothari, K., Singh, H., Barnes, E., Ale, S. Simulated effects of projected climate change on cotton phenology and growing season length in the Texas High Plains. ASABE Annual International Meeting, Omaha, NE. July 9-12, 2023.
102. Singh, H., Samanta, S., Mvuyekure, R.F.S., Ale, S., Lewis, K., Burke, J., Cobos, C., Mohtar, R. Simulated effects of winter rye termination date on cotton production systems in the Southern High Plains. Beltwide Cotton Conferences, Fort Worth, TX. January 3-5, 2024.
103. Singh, H., Singh, B., Ale, S., Himanshu, S., DeLaune, P., Mohtar, R. Simulated effects of winter wheat termination date on cotton production systems in the Texas Rolling Plains. ASABE Annual International Meeting, Omaha, NE. July 9-12, 2023.
104. Sullivan, P.L., L. Bixby, K.M. Jarecke, R.M. Keen, L. Souza, X. Zhang, H.R. Barnard, A.N. Flores, M.F. Kirk, J.B. Nippert, V. Moreno, K. Sadayappan, A. Guthrie, E. Hauser, H. Ajami, S.A. Billings, D.R. Hirmas, L. Li, K. Singha. Constraining the belowground ecohydrologic consequences of land cover change. AGU Fall Meeting, San Francisco, CA. Dec. 11-15, 2023.
105. Torres, A., Aburto, F. Leaf-cutter ant pedoturbation affects soil carbon and Infiltration dynamics in a planted tropical forest. AGU 2023 Meeting, San Francisco, CA.
106. Vital, S., Xu., S., Sexton, P. Cover crops addition to crop rotation improve X-ray CT derived soil pores and hydro-physical properties in South Dakota long-term no-till systems. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
107. Vital, S., Xu., S., Sexton, P. soil profile total and active carbon, and the microbial community as influenced by crop rotational diversity and cover crops under long-term no-till. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
108. Wachtel, C. Everton, E. Husted, S. Buskirk, R. Nguyen. W, Aburto, F. McKay, G. Brumbelow, J. Smith, A.P. Knappett, P. Rainfall pauses in a pre-montane rainforest drive fermentative degradation of organic carbon from tropical Andisols. AGU 2023 Meeting, San Francisco, CA.
109. Wang, Z., D. Timlin, R. Thapa, D.H. Fleisher, W. Sun, S. Beegum, Y. Lu, S.B. Mirsky, C. Reberg-Horton, X. Zhang, V. Reddy, R. Horton, K. Tully. Modeling the dynamics of the cover crop growth and residue decomposition in a cereal rye-residue mulch management strategy during winter fallow periods. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
110. Wang, Z., Ye, R., Saski, C. Hairy vetch and manure compost enhanced soil nitrogen availability and altered bacterial community structure in organic production. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.

111. Wang, Z., Ye, R., Saski, C. Hairy vetch and manure compost improved soil nitrogen availability and reduced bacterial diversity in organic vegetable production. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
112. Wendroth, O., Y. Yang, L. Ma, J. Reyes, X. Zhang, L. Liang, C.A. Knott, C.D. Lee, R.J. Walton, M.A. Ilgun. Opportunities for soil physics to contribute to understanding and managing soils. ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
113. Wickings, K. A cut above: impacts of mowing height and frequency on soil invertebrate biodiversity in residential lawns. Entomological Society of America Annual Meeting, National Harbor, MD. November 7, 2023.
114. Wooliver, R., Kivlin, S., Lee, J, Jagadamma, S. Can diverse cover crop mixtures provide agronomic and ecosystem benefits in the southeastern United States? ASA-CSSA-SSSA Annual Meeting, St. Louis, MO. Oct. 29-Nov. 1, 2023.
115. Yan, H., Rejesus, R. M., Chen, L., Aglasan, S. The impact of soil erosion on mean yields and yield risk. AAEA Annual Meeting, New Orleans, LA. July 2024.
116. Zhang, X. Building resilient and sustainable agroecosystem by adopting climate-smart practices. Southern Regional Cooperative Soil Survey Conference, Lafayette, LA. May 21-24, 2024.
117. Zhang, X., W. Dai, G. Feng, D. Reginelli. Alterations of aggregation in soils under various cover crops and poultry litter addition. SSSA 2024 Bouyoucos Summer Conference, San Juan, PR. Jun. 10-12, 2024.

G. Extension Services and Reports

1. Bera, T., H. Araj, Y. Yang, F. Dou, L. Wilson. 2023. Greenhouse gas emissions from sustainable bioenergy feedstock production in Southeast Texas. *Texas Rice*. 41-42.
2. Calderon, F. 2024. Fertility in dryland cropping systems. Columbia Conservation District Annual Meeting. Dayton, WA.
3. Dou, F., J. Samford, S. Lamichhane. 2023. Responses of rice production to nitrogen applied to main crop. *Texas Rice*. 26-27.
4. Dou, F., J. Samford, S. Lamichhane, A. Lloyd. 2023. Effects of rice variety on main, ratoon, and total crop yields. *Texas Rice*. 24-25.
5. Grove, J.H. 2023. Hands-on soil sampling for soil organic matter and plant available nutrients. 2023 Kentucky Fall Grazing School. September 27, Versailles, KY.
6. Grove, J.H. 2023. Nitrogen timing for corn: and a couple other things. December 13, Hickman, KY.
7. Grove, J.H. 2023. Soil health. ANR County Agent Training. October 27, Elizabethtown, KY.
8. Grove, J.H. 2023. Soil health: management responsive soil properties. 2023 Kentucky Fall Grazing School. September 27, Versailles, KY.
9. Grove, J.H. 2024. In-field discussion of profile soil chemical properties of limestone and fragipan soils - their strengths and limitations. Kentucky Agricultural Training School. June 6, Princeton, KY.
10. Grove, J.H. 2024. Interpreting your soil test report. Spring 2024 Beginning Grazing School. May 1, Princeton, KY.
11. Grove, J.H. 2024. Intro to Web Soil Survey. Kentucky Agricultural Training School. June 6, Princeton, KY.

12. Grove, J.H. 2024. Soil health and cover crops. Boyle County Nutrient and Water Quality Program. February 21, Danville, KY.
13. Grove, J.H. 2024. Soil sampling for soil organic matter, pH and plant available nutrients. Spring 2024 Beginning Grazing School. April 30, Princeton, KY.
14. Halverson, E., Osterloh, K. 2024. Century-long quantification of soil loss in eastern South Dakota. NCSS Technical Planning Workshop. April 2-3, Fargo, ND.
15. Lal, R. 2023. Managing ecological footprint of food systems. Carbon Footprints Journal Editorial Office, Beijing, China. February 2.
16. Lal, R. 2023. Managing soil health for adaptation to and mitigation of climate change. California Climate Change Webinar, March 2.
17. Lal, R. 2023. Managing soil health for food and climate security. Global Forum for Food and Agriculture (GFFA), World Food Program (WFP), Berlin, January 20.
18. Lal, R. 2023. Managing soil health for food and climate security. Extinction or Regeneration Conference, London, U.K. May 11-12.
19. Lal, R. 2023. Principals of carbon farming. OneAgro 2023, Campinas, Brazil. June 13-14.
20. Lal, R. 2023. Regenerative agriculture on global scale for people and the planet. Future Harvest Conference Keynote, The Chesapeake Alliance for Sustainable Agriculture, College Park, MD. January 12-14.
21. Li, S., Yang, S. Samonte, F. Dou, L. Wilson, T. Bera, X. Zhou, J. Wang, J. Zhang. 2023. Estimation of rice seedling gaps and seedling density from UAV images. Texas Rice. 27-30.
22. Osterloh, K. 2024. SDSU pedology updates. NCSS Technical Planning Workshop. April 2-3, Fargo, ND.
23. Rui Y. 2023. Soil microbes help sequester carbon but can we achieve that in intensive agroecosystems? Indiana Certified Crop Advisor (CCA) Conference, Dec. 20.
24. Rui Y. 2024. Introducing ION, the Indiana Organic Network. Indiana Organic Grain Farmer Meeting, West Lafayette, IN. Feb. 28.
25. Rui Y. 2024. Soil health and soil carbon sequestration in agroecosystems. Cargill RegenConnect Soil Health Field Day, West Lafayette, IN. April 4.
26. Rui Y. 2024. Soil microbes help sequester carbon but can we achieve that in intensive agroecosystems? Midwest Cover Crop Council Annual meeting, Indianapolis, IN. Feb. 15.
27. Wickings, K. 2023. Impacts of mowing practices on the ecosystem service value of turfgrasses. Chittenden City Clean Water Committee. December 5.
28. Wickings, K. 2023. Mowing practices for increasing carbon storage capacity of turfgrasses. Genesee Finger Lakes Climate Action Committee. June 7.
29. Wickings, K. 2023. Sustainable lawn care and climate change. Annual IPM Conference - Sustainable Landscapes & IPM. June 15.

NC-1178 Annual Meeting
6/17/2024-6/18/2024
The Connecticut Agricultural Experiment Station, New Haven, CT

6/17/2024 9:00 am-5:00 pm

Participants:

In-person: Srinivasulu Ale, Moriah Bilenky, Mohammad Golabi, Rachel Hestrin, Gary Pierzynski, DeAnn Presley, Yichao Rui, Itamar Shabtai, Xi Zhang

On-line: Humberto Blanco, Sutie Xu

What Happened/Discussed:

Items agreed upon:

1. The 2025 annual meeting will be hosted by Xi Zhang from Louisiana State University-Agricultural Center. Location is to be determined.
2. Kristopher Osterloh from South Dakota State University will be the Chair for 2025-2026 and the annual meeting will be held in South Dakota in 2026.
3. Yichao Rui from Purdue University volunteered to serve as the Vice-Chair for 2025-2026 (Chair 2026-2027) and the annual meeting will be held in Indiana in 2027.

Project update presentation (20 min each):

1. Gary Pierzynski, The Ohio State University
NC-1178 project overview and updates, Federal funding issues
2. Srinivasulu Ale, Texas A&M University
Cover cropping on soil health and soil/water conservation
3. Sutie Xu, South Dakota State University
Research program overview, Cover cropping and soil health
4. Humberto Blanco, University of Nebraska-Lincoln
Cover cropping on soil nutrient/carbon and crop yield
5. Xi Zhang, Louisiana State University-Agricultural Center
Cover cropping on soil physical structure and soil moisture dynamics
6. Yichao Rui from Purdue University
Research program overview, Organic farming and soil health
7. DeAnn Presley, Kansas State University
Tillage and soil functions
8. Mohammad Golabi, University of Guam
Biochar and conservation tillage on soil functions, C sequestration and GHG emissions
9. Moriah Bilenky, Purdue University
Research program overview, Management in small farms, Crop-livestock integration
10. Rachel Hestrin, University of Massachusetts, Amherst
Research program overview. Root and fungal processes. Soil organic matter dynamics
11. Itamar Shabtai, Connecticut Agricultural Experiment Station
Rhizosphere processes and soil organic matter dynamics

Other matters:

1. The annual report should highlight multi-state collaboration and benefits and will be submitted 60 days from now.
2. Sign up for the new NC-1178 project 2024-2029.
3. Midterm report will be submitted in 2026.

6/18/2024 8:30 am-2:30 pm

Participants:

Srinivasulu Ale, Moriah Bilenky, Mohammad Golabi, DeAnn Presley, Itamar Shabtai, Xi Zhang

What Happened/Discussed:

Field trip to Horsebarn Hill at University of Connecticut.