Renewing Soil Restoring Life

REPORT

3rd Annual Meeting

August 1-3, 2018

Hyatt Regency

Albuquerque, New Mexico USA

SOIL HEALTH INSTITUTE

UNIFY ■ RESTORE ■ PROTECT

CONTENTS

EXECUTIVE SUMMARY

On August 1-3, 2018, the Soil Health Institute (SHI) convened more than 260 attendees representing more than 190 organizations as part of its 3rd Annual Meeting in Albuquerque, NM. SHI's annual meetings serve the soil health community by catalyzing collaboration; spurring continued engagement of diverse stakeholders, partners and Action Team Volunteers; and serving as a platform for cross-pollination of ideas and projects that advance soil health.

This year's participants represented diverse backgrounds and experience in soil science, agribusiness and production, public policy, economics, consumer education, and scientific research. During the two-day conference, experts engaged in conversations and listened to keynote presentations on ecosystem service markets, sustainability goals, soil organic matter formation, policies that provide incentives to advance soil health, collaborative partnerships to expand adoption of soil health management systems, strategies to enhance the research-farmer connection, and more. Links to video, slides and full text descriptions of each presentation can be found here.

ADVANCE SHOWING: SOIL HEALTH DOCUMENTARY

On Wednesday evening, the audience viewed a private screening of *Living Soil,* a documentary directed by Chelsea Myers of Tiny Attic Productions and produced by SHI through the generous support of The Samuel Roberts Noble Foundation. This documentary aims to educate the public about the myriad benefits of soil health by interviewing farmers and soil scientists across the United States.

INTRODUCTION TO COLLABORATIVE SOIL HEALTH:HUMAN HEALTH RESEARCH

In the spirit of leading cutting edge, interdisciplinary research, SHI invited Dr. Daphne Miller, practicing family physician and author of *The Jungle Effect: The Healthiest Diets from Around the World, Why They Work and How to Make Them Work for You* and *Farmacology: Total Health from the Ground Up,* to address the intersection of human health and soil health. Dr. Miller challenged the soil health community to think in new and complicated ways about food as medicine with healthy soil serving as the foundation.

"We have to start thinking that things are interconnected," Dr. Miller urged.

"This is our cue to start to get uncomfortable and start to have conversations with someone who might think a bit differently than you do or who might have a slightly different educational background than you do," Miller suggested. "But how do we propel this new area of study to an international scale in policy, education, academia, industry and community?" The keynote presentation launched an exciting announcement: The Conference on Connections between Soil Health and Human Health, coordinated by SHI, will be October 16-17, 2018, in Silver Spring, MD. The goal is to initiate a multi-discipline Roadmap for future research with experts in the agriculture, food, human and veterinary medicine sciences in order to realize major benefits from an improved understanding of connections between soil health (and the farming practices that promote it) and human health.

EXECUTIVE SUMMARY

AGRICULTURE: GREATEST ENTERPRISE OF MANKIND

On Thursday evening, *National Geographic* photographer Jim Richardson presented images of agriculture in which soil was the author of the story. His seamless presentation shined a light on the heart and soul of our collective work as a community: the farmers and the places they farm.

"Agriculture is the center ring of the circus," Richardson reminded the annual meeting participants. "This is the big story. It's the greatest enterprise of mankind." SHI is honored to feature Richardson's photographs of working lands, farmers and soils in its communications.

INAUGURAL SOIL HEALTH POSTER SESSION

As evidence of an ever-increasing demand for substantive, science-based soil health information, SHI accepted 49 submissions for its inaugural soil health poster session. The full list of topics, presenters and organizations can be found in the table on pages 22-23. Please contact authors directly for a copy of their abstract. Next year, SHI plans to make these posters available online.

ACTION TEAMS: STRAW PAPERS TO PLANS

During 2017 and 2018, the Research and Measurements, Standards, and Assessment Action Teams unified measurement straw papers into a single document. This provided the basis for a technical notice of recommended methods for soil health indicator measurements that USDA NRCS posted to the federal register. These Teams also contributed to identifying long-term agricultural research sites for soil health measurements; identified and provided literature on impacts of nematode population density; and provided additional literature for the Soil Health Research Landscape Tool. Meanwhile, the Policy Action Team and Ms. Jamie Fanous of Tufts University developed a catalog of soil health promotion policies that have been developed by academic institutions, state agencies, and legislative bodies. The Communications and Education Team cataloged soil health curricula. This Action Team also is currently developing an even more robust process of cataloging all soil health conferences and field days internationally to be included in the soil health events calendar. For a full report of each Action Team including members, activities and planned next steps, see pages 13-21.

ARTIFICIAL INTELLIGENCE TO BOOST SECONDARY RESEARCH

On Friday afternoon, experts identified keywords to automate the process of finding and increasing the usefulness of soil health research on SHI's Soil Health Research Landscape Tool. SHI is grateful for volunteers' contributions of time and expertise to this collaborative project led by SHI, Tri-Societies and lum.ai. Through the support of Deb Neher at the University of Vermont and the Research Action Team, the research tool will soon have more than 10,000 searchable resources.

MARK YOUR CALENDAR:

In 2019, SHI will host its
4th Annual Meeting
July 16-18
in Sacramento, CA.

Living Soil

Living Soil is a documentary about soil health, featuring innovative farmers and soil health experts from diverse regions sharing thoughts about the health of the soil ecosystem and why farmers are making changes in their farm management. The purpose of the documentary is to educate the general public about the benefits of soil health. The documentary will be accompanied by a curriculum designed for college students as well as the general public.

This documentary was directed by Chelsea Myers and Tiny Attic Productions; and produced by SHI through the generous support of The Samuel Roberts Noble Foundation.

To see the *Living Soil* documentary trailer, click on the photo. To see a video of any Plenary Session, simply click on the session topic.

ECONOMICS

Session: The Farm Road to Environmental Markets and Corporate Sustainability is 'Paved' with Healthy Soil
Moderator: Ms. Carolyn Baltz

Unlocking Connectivity in Agricultural Supply Chains
Ms. Carolyn Baltz, The Sustainability Consortium

SHI collaborates with The Sustainability Consortium (TSC) to drive action and innovation in sustainable practices. SHI invited Ms. Carolyn Baltz, the Senior Manager of Membership and Development at TSC, to address the 3rd Annual Meeting and provide a summary of activities.

TSC is a global, non-profit organization administered by Arizona State University and the University of Arkansas. TSC's mission is to use the best sustainability science to help companies make everyday products better and more sustainable.

The organization enables members to actively participate in multi-stakeholder, science-based, business toolkit development and industry solutions through a pre-competitive approach. More than 100 organizations and 2,000 users contribute to the development and implementation of TSC materials.

According to Ms. Baltz, stakeholders work diligently to create category sustainability profiles that contain relevant information on hotspots, sustainability issues, opportunities for improvement, and key performance indicators. Ms. Baltz shared how these elements are used to develop customized tool kits for member businesses to execute sustainability practices within their organizations.

Advancing Ecosystem Service Markets for Farmer and Public Benefits
Mr. Bill Buckner, Noble Research Institute

Mr. Bill Buckner, President and CEO of the Noble Research Institute, LLC, and The Samuel Roberts Noble Foundation, briefed participants on advancing ecosystem service markets for farmer and public benefits. Mr. Buckner discussed the efforts of The Noble Research Institute to convene a series of meetings with multi-sector stakeholders to explore the potential for a large-scale program to finance, generate, and sell ecosystem service credits from working agricultural lands.

Mr. Buckner outlined the potential for conversion of acreage of cover crops and how to accomplish these steps in a meaningful and responsible manner. The Noble Research Institute has outlined many existing opportunities, historical barriers to success, areas for change with market-based approaches, and how to achieve scalable successes by creating incentives for farmers and ranchers.

The Foundation of Great Food
Mr. Jerry Lynch, General Mills

Mr. Jerry Lynch, the Chief Sustainability Officer of General Mills, offered insight into how consumer behavior affects marketplace sustainability. Mr. Lynch described scenarios in which different marketing approaches reach and resonate with different types of consumers.

Overall, farming is of growing importance and consideration with consumers. Mr. Lynch projected that regenerative agricultural practices may become a big opportunity as consumers appear to value environmentally conscientious management.

Farmer Focused and Farmer Driven: The Land O' Lakes SUSTAIN Program
Mr. Jason Weller, Land O' Lakes

Mr. Jason Weller, the Senior Director of Sustainability of Land O' Lakes, addressed the 3rd Annual Meeting, offering insight into sustainability and soil health successes and challenges faced by private and public entities. Mr. Weller made a strong case for a more focused prioritization of outreach, financial, and educational efforts through direct engagement of farmers and agricultural retailers.

Mr. Weller said his discussions with farmers and agricultural retailers during his time with the NRCS and as the Senior Director of Sustainability at Land O' Lakes, the fourth largest producer-owned co-op in the United States, unveiled concerns of growers and agricultural retailers. Using that input, he recommended methods to address these concerns.

RESEARCH

Session: Advances in Soil Health Research
Moderator: Dr. Veronica Acosta-Martinez

Changes in Soil Health in a Semiarid Region Transitioning to Dryland Cropping Systems
Dr. Veronica Acosta-Martinez, USDA-ARS

Dr. Veronica Acosta-Martinez, Soil Microbiologist and Biochemist, USDA-ARS Cropping Systems Research Laboratory, explained how scientists evaluated soil and water health indicators during recent fluctuations in temperature and precipitation levels.

Dr. Acosta-Martinez highlighted specific studies that focused on the correlation of cover cropping systems to increased yields throughout periods of increasingly erratic accumulation of rainfall. Dr. Acosta-Martinez also described the consideration of increased organic matter within the microbiome and its potential effects on soil and water quality.

Microbial Physiology Regulates How Much Crop Residue Becomes Soil Organic Matter
Dr. Stuart Grandy, University of New Hampshire

Dr. Stuart Grandy, Associate Professor at the University of New Hampshire, Department of Natural Resources and the Environment, pressed the audience to consider how the science behind soil health should progress and innovate.

Dr. Grandy described the process of how microbial cells promote biomass creation over time. He shared insight on how specific microbes are being studied and how differences in inputs figure into biomass creation. Dr. Grandy also explained results of cover crop studies.

Teaching Machines to Read the Soil Health Literature
Dr. Dane Bell, University of Arizona

Dr. Dane Bell registered the need to save time when accessing research information by using machine learning. Dr. Bell is a co-founder of lum.ai, a start-up that develops Natural Language Processing (NLP) techniques to create causal models out of unstructured text.

Dr. Bell explained how machine reading algorithms actually work and how researchers can assist in developing smarter searches while working with the algorithm. Not only will an algorithm search and read pertinent articles at computer speed, it will also sift through topics that may be potentially helpful by scanning research studies cited within other fields of study.

SHI, The American Society of Agronomy, Crop Science Society of America, Soil Science Society of America and lum.ai are partnering on a project that uses NLP and machine learning (ML) to accelerate the retrieval and use of soil health research. Read the full story here.

POLICY

Session: Policies in Action
Moderator: Dr. Jim Jordahl

Turning Soil Health into $oil Wealth: Policy and Economics
Dr. Jim Jordahl, Iowa Agriculture Water Alliance

Dr. Jim Jordahl evaluates monetizing soil health from a land valuation perspective. Dr. Jordahl has more than 30 years of experience in farming operations, soil science, engineering, environmental science, and project management. Dr. Jordahl currently works with the Iowa Agriculture Water Alliance to increase the pace and scale of farmer-led efforts to improve water quality.

Dr. Jordahl said the date for a widely-accepted soil health metric is rapidly approaching. When that metric is accepted, a number of economic incentives will become apparent in the agricultural real estate marketplace. A metric on soil health that properly indicates the increased agricultural productivity of a piece of property could encourage landowners to adopt and/or pressure property managers to adopt better soil health practices.

Farm Bill Update from Washington, DC: Conservation Opportunities and Challenges in 2018 and Beyond
Ms. Alyssa Charney, National Sustainable Agriculture Coalition

Ms. Alyssa Charney, National Sustainable Agriculture Coalition (NSAC) Senior Policy Specialist, addressed the 3rd Annual Meeting of the Soil Health Institute in Albuquerque, NM about the 2019 Farm Bill. The NSAC is a grassroots alliance of more than 120 organizations around the world working together to improve federal food & farm policy.

Ms. Charney summarized the history and impact of the U.S. Farm Bill and explained how certain programs were established. Ms. Charney outlined what experts currently anticipate within the 2019 iteration of the Farm Bill and the potential impact for farmers and ranchers.

State Policies and Programs for Advancing Soil Health
Ms. Jamie Fanous, Tufts University

Ms. Jamie Fanous spoke about policies and programs for advancing soil health at the state level during SHI's 3rd Annual Meeting. Ms. Fanous recently graduated from Tufts University with an M.S. in Agriculture, Food and Environment and an M.A. in Urban and Environmental Policy and Planning. Ms. Fanous has worked with SHI's Policy team on state-level soil health initiatives.

Ms. Fanous highlighted current state bills regarding healthy soils and a number of proposals currently in varying stages of the legislative process. SHI Policy Action Team identified more than 100 programs in 37 states that have agencies focusing on soil health. These can be found in its Soil Health Policy Resources Catalog. Also identified: Private programs that focus on soil health across the United States.

Our Soil, Ourselves: The Links Between Soil and Human Health
Daphne Miller, M.D., University of California-San Francisco

Dr. Daphne Miller connected soil health and human health during SHI's 3rd Annual Meeting. Dr. Miller is an Associate Clinical Professor at the University of California Berkeley who has focused her work during the past 15 years on aligning agriculture and conservation with human health.

Dr. Miller organized a condensed set of four major connections that link soil health to human health: cooking, critters, carbon, and community. Through the lens of these four interlocking connections, Dr. Miller described examples of how understanding and caring for the health and diversity of agricultural ecosystems are vital to the greater health of the human population.

MEASUREMENT, STANDARDS, and ASSESSMENT

Session: Assessing and Expanding Adoption of Soil Health Systems
Moderator: Dr. LaKisha Odom

Importance of Public-Private Partnerships in Achieving Healthy Soils and Thriving Farms: FFAR's Perspective on the Role of Collaborative Science
Dr. LaKisha Odom, Foundation for Food & Agriculture Research

Dr. LaKisha Odom, the Foundation for Food & Agriculture Research (FFAR) Scientific Program Director, revealed the innovative and interdisciplinary research and accumulation and disbursement of grant funding at FFAR.

Dr. Odom illuminated the open and collaborative nature of the breadth of work happening in conjunction with FFAR. She expressed the positive force that FFAR seeks to be in the agricultural research arena.

Strategic Approach for Evaluating Soil Health Indicators
Dr. Wayne Honeycutt, Soil Health Institute

Dr. Wayne Honeycutt, the President and CEO of SHI, provided an overview of SHI's strategic approach to evaluating soil health indicators at a continental scale in the United States, Canada and Mexico.

Dr. Honeycutt described how SHI seeks to engage and include public and private entities in all aspects of SHI strategic research, citing a few examples of the information SHI will gather from a wide range of existing and ongoing long-term research sites. Soon, researchers will be provided data-rich information repositories accessible via user-friendly GIS.

Scaling Soil Health Research and Farmer Engagement
Ms. Elyssa McFarland, Soil Health Partnership

Ms. Elyssa McFarland, Key Relationships Director at the Soil Health Partnership (SHP), explained how the farmer-led research initiative of the National Corn Growers Association is scaling up to provide in-depth data on selected farms. SHP currently works with 140 farms across 14 states, yielding more than 300 years of sample data, and more than 20,000 soil samples.

Ms. McFarland provided an overview of the current research projects, project approaches, and outreach strategy. She also described some of the new strides SHP is making for greater outreach through social media and online communications channels.

Engaging Farmers and Landowner Advisers on Soil Health
Ms. Pipa Elias, The Nature Conservancy

Ms. Pipa Elias, the Soil Health Strategy Manager at The Nature Conservancy (TNC), spoke about engaging farmers and landowner advisors. Ms. Elias shared information from cutting-edge research and provided insight on how TNC leverages research to advance policies and conservation solutions.

Ms. Elias noted that about half of the farmed acres in the United States are operated by farmers who rent the land. She indicated studies show conservation practices are adopted at a 50% lower rate on rented land. In order to increase adoption rates on that land, Ms. Elias highlighted opportunities TNC uncovered after surveying renters and landowners.

Ms. Elias provided survey results from the general population regarding conservation priorities and motivations as well.

COMMUNICATIONS and EDUCATION

Panel Session: Enhancing the Research-Farmer Connection
Panel Moderator: Dr. Rob Myers

Lessons Learned from 30 Years of SARE Farmer-Researcher Projects
Dr. Rob Myers, USDA-SARE

Dr. Rob Myers discussed farmer, rancher, and researcher interaction through the lens of grants and projects funded by Sustainable Agriculture Research and Education (SARE) programming during the last 30 years. Dr. Myers is the Regional Director of Extension Programs for the USDA-NIFA North Central Region, SARE.

Dr. Myers stressed the importance of integrating early and continuous input from farmers and ranchers on potential research projects. He also outlined methods and materials SARE uses for recruiting potential research partners.

PLENARY SESSIONS

The Quest for Understanding Soil Health
Mr. Jimmy Emmons, Farmer, Oklahoma

Mr. Jimmy Emmons provided the story of soil health from a farmer's perspective. Since 1995, Mr. Emmons has been incorporating soil health practices on his family farm in Dewey County Oklahoma.

Mr. Emmons explained that the recurring concerns he hears from farmers surrounding soil health typically center around the economics of implementation or concerns about how much cover crops reduce soil moisture in Spring. Emmons shared his soil management practices and his success stories.

The Science of Soil Health: Progress on the Path from Research to Implementation
Dr. Bianca Moebius-Clune, USDA-NRCS

Dr. Bianca Moebius-Clune, Director of the USDA-NRCS Soil Health Division, updated participants about what NRCS is accomplishing in the arena of soil health science and how that research is implemented in the field. Dr. Moebius-Clune outlined possibilities for a shared database of soil health measurements.

Dr. Moebius-Clune shared the simplified list of four principles of soil health released by the USDA-NRCS Soil Health Division: maximizing living roots, maximizing diversity, maximizing cover, and minimizing disturbance. She announced a new technote on soil health current best laboratory methods that includes the recommendations and decisions of the 2nd Annual Meeting, which is going to the Federal Registrar. In addition, she briefed participants on the support, unification, and leveraging of four cover crop councils.

Communicating 4R to Farmers and Connecting on Content
Ms. Lara Moody, The Fertilizer Institute

Ms. Lara Moody, Vice President of Stewardship and Sustainability Programs at The Fertilizer Institute (TFI), detailed how TFI condensed fertilizer best management practices into the 4R Nutrient Stewardship framework to achieve cropping system goals of production, profitability, environmental protection, and sustainability. (The 4R framework means the right fertilizer at the right rate at the right time and the right place.)

Ms. Moody shared responses to surveys conducted by TFI in which the 4R framework was discussed one-on-one with a wide-range of farmers. Overall, 4R awareness, favorability, and farmer likelihood to try new practices increased during the survey as respondents learned more critical information.

Relaying Usable Research Results to Farmers
Dr. Diana Jerkins, Organic Farming and Research Foundation

Dr. Diana Jerkins, Research Director of the Organic Farming Research Foundation (OFRF), highlighted the importance of tailoring research information for specific audiences and individuals.

OFRF creates numerous materials to educate and communicate to farmers, including living documents, videos, and other materials that are updated as new research and information are released. Dr. Jerkins also discussed how the foundation engages and empowers farmers and ranchers in political arenas.

The Roots of Food: Exploring the World of Agriculture
Mr. Jim Richardson, Photojournalist, National Geographic Society

Mr. Jim Richardson captured the history of agriculture through agricultural practices from past to present during a much-enjoyed visual presentation. In his time as a photojournalist with the National Geographic Society, Mr. Richardson has documented a wide range of agricultural practices around the world.

Mr. Richardson used photography to discuss the future of agriculture and global land use. Mr. Richardson showed, through photographs, the necessity to adapt current land use and production practices to feed, house, and clothe a rapidly increasing population.

RESEARCH

The Research Action Team is engaged in five distinct projects that will be accomplished during 2018 and 2019.

- List the steps to apply metaproteomics and metagenomics methods for understanding how soil microbial communities respond to agricultural management practices;
- Design a plan that can be implemented in different regions and production systems to calibrate nutrient recommendations;
- Assemble a list of published literature to conduct a meta-analysis of edge-of-field studies evaluating soil health practices;
- Identify watershed-scale models of nutrient uptake by plants; and
- Identify sources of information for determining current watershed-scale adoption levels of soil health management systems.

ACTION TEAM GOAL 1	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
List the steps needed to apply metaproteomics and metagenomics methods for understanding how soil microbial communities respond metabolically and physiologically to agricultural management practices, and in turn, how those changes in microbial community functions influence different soil processes and properties such as carbon sequestration, aggregation, water-holding capacity, and disease suppression. Consider as a resource that SHI and its partners will be sampling approximately 150 long-term agroecosystem research sites across North America in 2019.	1) Literature review revealed insufficient information linking soil health & disease suppressiveness & expanded the charter to include these newer approaches (summary from last year) 2) Identify key microbial functions important for soil health 3) Identify an approach to deal with data & proper interpretation (Bioinformatics that target soil health)	Dan Manter	
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Janice Thies Andrew Curtright Shawn Manns Yaniria Sanchez de Leon Alan Merrill Lindsey Slaughter Diana Jerkins Dale Wilson Jen Moore-Kucern Wyatt Hartman Josh Cowan	

ACTION TEAM GOAL 2	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Design a plan that can be implemented in different regions and production systems for developing/calibrating nutrient recommendations for production systems employing soil health management systems/ practices. The plan for this calibration should make optimal use of the measurements and standards identified by the Soil Health Institute's partner-led work on measurements and standards, ensuring that those particular indicators and methods are included as part of the calibration field studies.	1) National database (P and K) -> Eventually N (needs more research) a) Regional buy-in b) Started discussing databases c) Permission to house USDA ag library 2) Data in database for 10 crops a) Historical b) Current c) Metadata -nutrient response -soil test level -crop variety -management -irrigation -soil sampling protocol -weather -season -4R characteristics Data easily accessible and used for soil testing	Deanna Osmond	
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Dale Wilson Masoud Hashemi Manjula Nathan Forbes Walder Curt Dell Oli Bachie Hailin Zhange (Co-chair)	

ACTION TEAM BREAKOUT REPORTS

RESEARCH

ACTION TEAM GOAL 3	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Assemble a list of published literature (and provide PDFs when available) to conduct a meta-analysis of edge-of-field studies evaluating soil health practices/systems for their impacts on soil and nutrient losses at a watershed scale.	1) Finish Selecting Papers 2) Resolve Conflicts. Compare our selection to lum.ai sorting of abstracts 3) Download PDFs & XMLs 4) In-text automated data extraction? 5) Complete data extraction through SHI RA, students, etc. 6) Classify/quantify types of studies to ID data gaps 7) "Formal" meta-analysis/data synthesis	Steve Wood	monthly
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Rajan Ghimire Joe Magner Sean Bloszies Ron Turco Francisco Arriaga	#4 by 8/19

ACTION TEAM GOAL 4	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Identify (and provide links to their websites or sources) watershed-scale models of nutrient uptake by plants and transport through runoff and leaching that account for changes in soil properties (e.g., root distribution, nutrient mineralization) resulting from soil management systems (including 4R nutrient management).	1) GAP Analysis (example-Soil Acidification) Examines Soil Health Indicators->E.S. Survey? 2) Focus on Decision Support for Farmers/others 3) Need for on-the-ground validation/Feedback Adoption of Models ->Farmers/others 4) Integration of Farmer/others in model development 5) How does SHI navigate "private, public" suite of models Develop "Seal of model effectiveness" criteria?		
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**

ACTION TEAM GOAL 5	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Identify sources of information and the process for determining current watershed-scale adoption levels of soil health management systems (e.g., through the National Soil Health Assessment, NASS, NRCS-CEAP, etc.)	Literature review needed to identify the strengths & weaknesses of current methodology and how have they been applied to agricultural systems (What questions are being asked?) Most studies do not target a specific question but rather are exploratory ->need to be more systematic ID subset of FFAR sites to -molecular PhD post-doc recommend develop a targeted list of skills -need for molecular assessment, get right people to drive methods and approach -Bigger picture needs		
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**

MEASUREMENT, STANDARDS, and ASSESSMENT

After unifying the measurement straw papers to advance soil health measurements and methods, the Measurements, Standards, and Assessments Action Team is focused on three goals;

- Design a framework for conducting a National Soil Health Assessment (NSHA) beginning in 2020;
- Provide a list of variables, attributes, capabilities and other information for an NSHA database;
- Identify key published literature to enable a meta-analysis of methods for the quantification of plant-pathogenic fungi and pathogen bioassays; data on crop productivity; and value and interpretation of bioassays.

ACTION TEAM GOAL 1	PLANNED STEPS	TEAM LEADER	FIRST TELECON-FERENCE DATE
SHI & partners plan to have the right soil health indicators identified by 2020. Given that starting point, design a plan to effectively and efficiently conduct a National Soil Health Assessment. Estimate funding needs for each major step/category.	Assessing Tillage erosion whole profile inherit properties (1"- 40") How do we preserve soil sample from field to lab? Farmers/Govt. Entities/Incs. can include data to feed into larger database to get all included Identify the 5-10 key things that can be used either on site &/or in lab to get benchmark repeated. Repeatable/Affordable tests Make sure that the indicators/soil type/indices are accurate enough to be repeated and are looked at after roll-out-potential soils compared to mgmt. How to present complex properties in a way that is understandable to all. Based on soil series type properties chem/bio/physical get simple x that says x is the potential and be able to get to a rating based on region where you are at in any particular field/soil type. Need "better" testing site that is not flat. (Get with Universities to do that with NRI points) "0-100" rate in SD of 60 is 60% soil health for that area rate in FL of 60 is also 60% soil health for that area Soil Change Guide *ADD Protocol for SH Assessment to NRI points Read TechNote & COMMENT!!	Dan Nelson George Derringer	8/22
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		George Derringer Zouheir Massri Dan Nelson Joe Pepi Andy Wycisio Eric Lund Jose Guzman Bradley Crookston Gene Kelly Allen Casey Jasper Teboh	

MEASUREMENT, STANDARDS, and ASSESSMENT

ACTION TEAM GOAL 2	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Provide a list of the variables, attributes, capabilities, and other information required for a database that houses data collected in a National Soil Health Assessment.	1) Review the ARS DET down-select variables & attributes 2) Create consistency with NRCS and ARS, by using the DET for variables and attributes 3) Normalize soil health indicators - Soil Management Assessment Framework (SMAF) - Cornell Assessment of Soil Health (CASH) 4) Create a home for self-reported citizen scientists (farmers) 5) Deliver insights back to growers to encourage long-term engagement 6) Associate test method citation with each lab test result record 7) Develop a meaningful method of grouping fields for comparison purposes based on soil type 8) Farmers need to be able to easily discern which management strategies will work best in their area and on their soil types 9) Show farmers where they lie along a soil health continuum 10) Auto-feed data from the SHI machine learning initiative 11) Include the DOI number associated with published data	Chris Fennig	9/4/2018
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Chris Fennig Carmen Ugarte Diane Stott Shannon Andrews	May, 2019

ACTION TEAM GOAL 3	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Identify key published literature (and provide PDFs when possible) enabling a meta-analysis of methods for quantification of plant-pathogenic fungi and pathogen bioassays; data on numbers affecting crop productivity; value and interpretation of bioassays instead of direct quantification.	1) ID key fungal, bacterial, nematode spp, virus 2) Deb will analyze her current database and select papers 3) ID methods used in literature (past, current, future) for additional keyword searches 4) Contact key state diagnostic labs for methods used 5) IR4 (national quarantine database) 6) ID key literature repositories to search - W.O.S., Agricola, Scholar, forcasting models -need papers to search by machine learning 7) ID pros/cons, biases of methods 8) Is pathogen id a predictor of disease/crop loss? -YES, do steps 1-7 -NO, what other predictions are in the literature? Eg. complexity of food web, balance-resiliency, step 2-refocus question/restate goal, plant productivity (disease down, promote growth), disease potential Defining soil ecology-ecosystem function plant productivity decomposition nutrient cycling	Deb Neher	Sept. 2018
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Randy Martin John Rose Kevin McLaughlin Tom Powers David Johnson Alexandra Davis	May 2019

ACTION TEAM BREAKOUT REPORTS

POLICY

The Policy Action Team is working to develop case studies evaluating the negative and positive effects of policies on soil health and, when negative, identify ways for improvement. Lastly, the Team will identify volunteers and a process to keep the soil health policy resources catalog up-to-date.

ACTION TEAM GOAL 1	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Develop case studies evaluating positive and negative effects of policies on soil health.	Possible whitepaper on relationship of soil erosion and soil health, for example, can you have good soil health if you are just meeting T Are there food/product labeling efforts that can/should include soil health and to what extent are such efforts useful?		
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Being referred to the SHI Policy Action Team	

ACTION TEAM GOAL 2	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Develop list of federal policies; evaluate and record their impact on soil health. Identify how each can be improved (if negative, identify how it can at least be neutralized).	Recommendations on: -CSP soil health enhancements -National Program Leader @ NIFA for soil health -Opportunities to regionalize activities -Livestock -Rice 1). How does SHI engage in policy moving forward 2). Post Farm Bill (?) specific items for recommendations 3). Education & Awareness/create a safe space		
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Will be taken up by SHI Policy Action Team	

ACTION TEAM GOAL 3	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Identify individual volunteers and a specific process for keeping the catalog of soil health policy resources up-to-date.	Can we create a state soil health plan template? Adapt the state policy database to allow some type of self-populating. -does it need to be curated? -would need to be well-organized and set up seaves and monitor with analytics (Jamie talk to SHI staff) Note- need better search/navigation features in state database on SHI website. eg. search for all programs in a state	Rob Myers	Sept/Oct
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Matt Hill Allison Hatel Gary Farrell Rob Myers Jamie Fanous	late fall for template

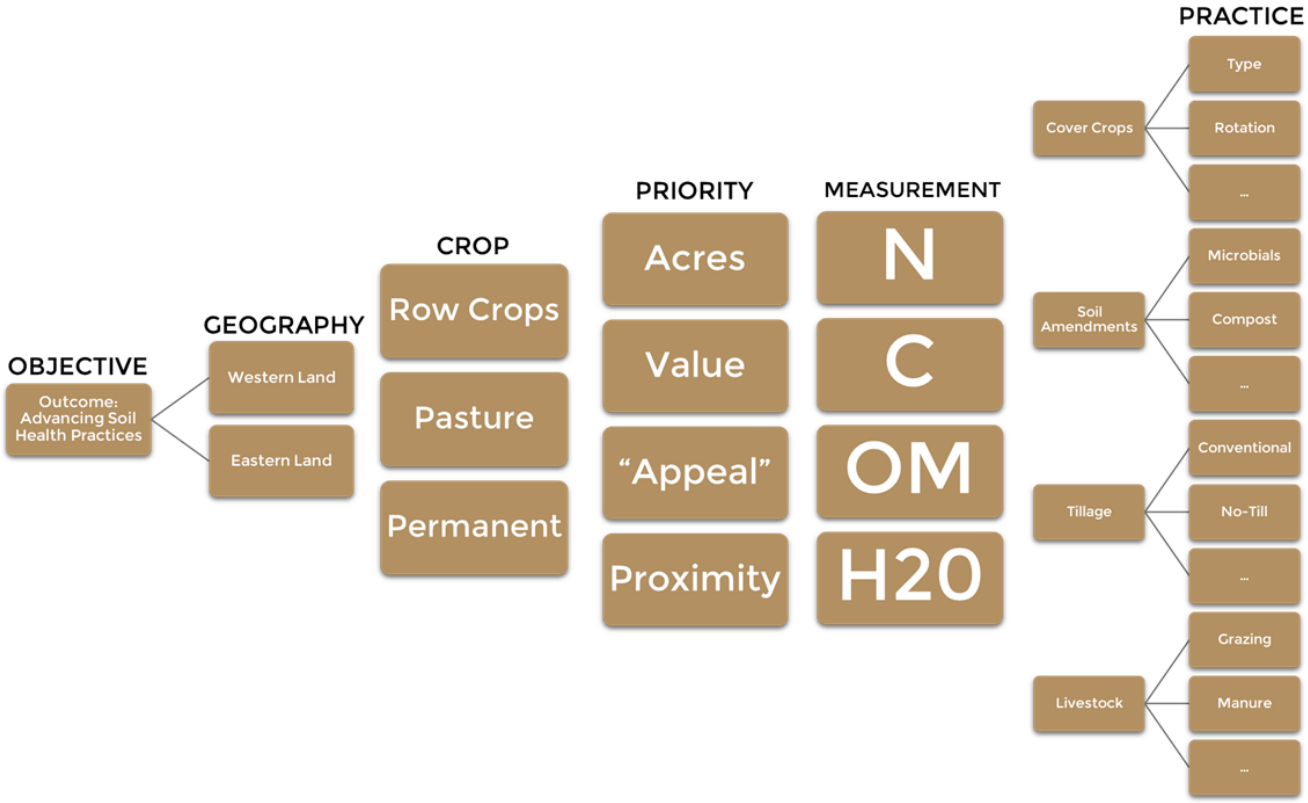
ECONOMICS

The Economics Action Team has two goals for 2018 and 2019.

- Develop a partial budget template for comparing economics of soil health promoting systems that can be used across a range of production systems and inputs;
- Develop an outline to quantitatively relate soil health to land value and the value of ecosystem services.

ACTION TEAM GOAL 1	PLANNED STEPS	TEAM LEADER	FIRST TELECON-FERENCE DATE
Develop a template for a partial budget format for comparing economics of soil health-promoting practices/systems that can be used across a range of production systems and inputs (e.g., manured vs. non-manured; no-till vs. moldboard plow).	1) Comparative Analysis of Partial Budgets as applied to Soil Health. a) Identify Partial Budget Templates via Links & Docs (Request 8/6, Input by 9/1, Done 11/1) b) Team to create brief plan to codify via key words, topics, practices, etc. c) Select Review Panel to SCORE/RANK and select preferred options. d) Tweak or Modify final options as appropriate. 2) Concurrently, Review Partial Budget Time Horizons (In years) and consider while accomplishing 1a, 1b, and 1c. Top Down = Academic, Bottom Up = On Farm. 3a) Based on #1 and #2, submit proposal to SHI to seek grant funding for Literature Review services to tie "literature" (Scientific Papers, articles, case studies, anecdotal narratives, etc.) to OUTCOMES (Benefits, Value, Revenue, etc.) to those partial budgets and time horizons. 3b) Concurrently develop a priority "flow" or "Decision Tree" to prioritize future pilots. What incremental practice changes? What crops? What geographies? See following chart. 4) Form Pilot Planning Team: a) Take 1/2/3 and coordinate a Pilot Plan. b) Develop Proposal Template: Scope, Plan, Partial Budget, Outcomes, etc., Grant Request c) Identify Pilot Participant Recruiting Plan d) With Collaborators, shepherd the Pilot Grant Proposal via CIG grants, others. 5) Refine work based on Pilot Implementation (2019) a) Finalize Partial Budget "Package" for Retailers, CCAs, and Producers b) Develop strategy to Distribute Packages, Collect Data, Analyze, and Disseminate Misc: * Develop an Economic Task Force of practicing economists who can inform Action Team * Consider a Chief Economist-like Board Member for SHI * Work towards inclusion of the value of complex, off farm positive externalities such societal benefits, ecosystem services, etc. for more advanced economic modeling. * Consider control plots, good vs bad "start", if net neg, what would close gap?	Matt Bechdol & Becky Doyle	Sept 15th, then Monthly
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Comparative Analysis: All + Steve Kadas Literature Review: Wendi Rogers Angel Cruz Priority Areas: Steve Kadas Form Pilot Teams: Jerry Hall General Editing and Review: John Wiener	1 and 2: 11/1 3: 12/15, 4: 1/15/19 5: 3/31

ECONOMICS 1: SEGMENTATION & PRIORITIZATION



ACTION TEAM GOAL 2	PLANNED STEPS	TEAM LEADER	FIRST TELECON-FERENCE DATE
Develop outline of a paper that quantitatively relates soil health to land value and the value of ecosystem services (both in monetary terms). Suggest authors for each section of the paper.	Outline of Paper: Define and analyze - comprehensive listing of how land is valued Determine drivers (align incentives) for land ownership (private/public/non-profit) Value existing services Operator Incentives Gap Analysis Wages Services Ecosystem Services "Rights" (Legal rights, entitlements) Carbon and other (GHGs), Water (Quantity, Quality), Easements, Biodiversity, Air Quality, Diversity, Human Health Financial Instruments Case Studies (Carbon Markets - Reason for Failure) Guideline Booklet (Technology Needs and Capacity) Factor BMPs vs loss/regain - reward system Certification and Verification - all three - cap base, system, customer base	Dan Noble Keira Havens	9/1
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Tim Greiner Christophe Jospe Brett Norman Amber Jordan Jean Steiner Judith Fitzpatrick Patrick O'Neill Steve Wiest Carlos Alvarez Rick Gilbert Amanda Free	1/2019

COMMUNICATIONS and EDUCATION

During 2018-2019, the Communications and Education Action Team will develop and implement a process to:

- Collect and update soil health events for the SHI website events calendar;
- Collect and update the K-12 and community college soil health resources for the education resources catalog;
- Integrate soil health education into K-12 schools and community colleges.

ACTION TEAM GOAL 1	PLANNED STEPS	TEAM LEADER	FIRST TELECON-FERENCE DATE
Develop and Implement a process to collect and continuously update information on soil health related events, conferences, and opportunities on SHI's publicly accessible calendar.	Commodity Coordination SARE Coordinator & Communication/Region Quarterly Min/Monthly Max Other Events? Subcommittee Audience|Topic Functionality Ability to select (zip code) radius (100, 250, 500 miles) Ability to upload PDF Email notification (Google alerts) Select tags Ability to click on a button and post your event to Social Media Outreach Past Event: Link to archive (and YouTube/Vimeo video) Ability to sign up and select from event list, e.g., "I want to see all environmental events, or I want to see all cover crop events." Add Corporate Social Responsibility events and that category of search so all CSR events can be posted as well. Video|Functionality Commodity Name of Coordinator PR newsletter	Keith Berns	August, 2018
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Farmside: Nathan Wheeler Aracely Teller Policy: Tom Driscoll Municipal: Tina Hendon Jim Johnson Sami Tellatin	TAGS-October

COMMUNICATIONS and EDUCATION

ACTION TEAM GOAL 2	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Develop and Implement a process to integrate soil health education into K-12 schools and community colleges.	1) Develop spreadsheet of existing groups working in this space and other existing curricula 2) Development of aggregated system that allows for efficient searching 3) One-Stop Portal-Plan a discussion of path forward use Ag in the classroom to NACD as model? "Access is the issue, not content" 4) Ed-Gate-service that allows teachers to search by state to meet standards; may be able to connect. 5) Curricula Review Criteria Development a) Scientific b) Education-Need K12 teacher to peer review 6) Develop Advisory Team to vet new material -Scientist -K-12 Teacher -Smithsonian -Nutrients4Life 7) Development of "outreach model" to connect with teachers, attend conferences, and connect to existing efforts.	Jessica Chiartis	October 2018 Doodle Poll
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Clarence Chavez Lakisha Odom Latasha Lyte Harriet Wegmeyer Greg Anderson Sandra Arrango-Caro Leslie Michel Jim Johnson	1) Spreadsheet GoogleDoc 2) Advisory Teacher GoogleDoc

ACTION TEAM GOAL 3	PLANNED STEPS	TEAM LEADER	FIRST TELECONFERENCE DATE
Develop and Implement a process to keep Educational Resources Catalog up-to-date.	1) Organize by audience/geography/format searchable database 2) Form a review committee to develop scientific credibility + pedagogy/application 3) Funding for full-time position to coordinate with a team representing different organizations, networks and geographies 4) GAP analysis & available additions to team 5) Quarterly calls (reminder 2 weeks) 6) Determine utility by web-based metrics/survey (5 question) by audience/potential partner 7) Thinking about a budget/MOU	Lead from North Central Soil Health Nexus	October, 2018
		TEAM MEMBERS	**PRODUCT DELIVERY DATE**
		Kurt Lawton Rebecca Power Chris Boomsma Daniel Biodel Kirk Iversen Alan Kruszel Jim Johnson Kim Sheese	July, 2019

POSTER SESSION

Poster	TITLE	SUBJECT	AUTHORS	AFFILIATIONS
1	A comparison between fatty acid methyl ester profiling methods as soil health indicators for microbial community composition	Microbial Community Composition and Structure	Amanda Cano; Chenhui Li; Veronica Acosta-Martinez; Kristen Veum; Jennifer Moore-Kucera	Texas Tech University, Department of Plant and Soil Science, Lubbock, TX; USDA-ARS, Cropping Systems Research Laboratory, Wind Erosion and Water Conservation Unit, Lubbock TX; University of Missouri, School of Natural Resources, Columbia, MO; USDA-ARS, Cropping Systems and Water Quality Research, Columbia, MO; USDA-NRCS, Soil Health Division, West National Technology Support Center, Portland, OR
2	Soil Health Promoting Practices and Yield Consistency: A Systematic Evaluation	Yield stability through Soil Health	Sean Bloszies; Wayne Honeycutt; Steve Shafer	Soil Health Institute
3	A Rapid Low-cost Cell Phone Test for Soil Microbial Load Estimation	Microbial Biomass testing	Judith Fitzpatrick; E. Brady Trexler	Prolific Earth Sciences Inc.
4	Achieving Soil Health Objectives with PRSÂ® Technology and Models	Integration of soil measurements into cropping decisions	Ken Greer; Eric Bremer; Cheyne Ogilvie; Tabitha Brown; David Huggins	Western Ag Innovations; USDA-ARS
5	Application Of An Integrated Environmental, Economic, And Farm Management Decision-Making Tool (Nutrient Tracking Tool: NTT) For Evaluating Best Available Conservation Practices To Improve Soil Health	NTT application for Soil Health improvement	Ali Saleh; Oscar Gallego; Edward Osei	Texas Institute for Applied Environmental Research, Tarleton State University
6	Building a Multi-Decadal Library on Soil Biology Research	Research Landscape Tool	Deborah A. Neher	University of Vermont
7	Building Robust Datasets and Databases for Soil Health Assessment	Databases for Soil Health indicators	Carmen M. Ugarte; Y. Xia; H. Kwon; M.M. Wander	University of Illinois at Urbana-Champaign; Argonne National Laboratory
8	Changes in plant and soil micronutrients with Nitrogen fertilization in a long-term continuous maize no-till cropping system	Micronutrients, Soil Organic Carbon, Nitrogen	Grace L. Miner; Jorge. A. Delgado; James A. Ippolito; Ken A. Barbarick; Catherine E. Stewart; Daniel K. Manter; Stephen J. Del Grosso; Ardell D. Halvorson; Bradley A. Floyd; Robert E. D`Adamo	Colorado State University; USDA-ARS
9	Changes in Soil Health with the Increasing Years under Tallgrass Prairie Restoration in Central Missouri	Changes in Soil Health under prairie restoration	Chenhui Li; Kristen Veum; Keith Goyne	School of Natural Resources, University of Missouri, Columbia, MO; USDA-ARS Cropping Systems and Water Quality Research Unit, Columbia, MO
10	Cover crop impacts on carbon retention and sequestration on US cropland	Carbon sequestration under cover crop management	Sami Tellatin; Rob Myers	Division of Food Systems and Bioengineering, University of Missouri, Corvallis, OR (remote position); Division of Plant Sciences, University of Missouri, Columbia, MO
11	Cover Crops in Low-Rainfall Eastern Washington	Cover Crops, Soil Health, Grazing Cover Crops	Leslie Michel; Lynne Carpenter-Boggs; Ian Burke; Doug Collins; Nichole Embertson	Okanogan Conservation District; Washington State University; Whatcom Conservation District
12	Decrease of soil macroaggregates with higher exotic earthworm abundance in a tropical soil and its implications for using earthworms as indicators of soil health	Earthworms as indicators of Soil Health	Yaniria Sanchez-de Leon; Mauricio R. Morej`an Centeno	University of Puerto Rico at Mayagüez, Department of Agro-environmental Sciences, Mayagüez, PR
13	Diversified Crop Rotations are a Powerful Management Strategy for Improving Soil Health and Function	Soil Health Crop Production Systems	Michael Lehman; Shannon Osborne	USDA-ARS Brookings, SD
14	Effects of Fire on Soil Health and Crop Production in South Dakota	Soil Health	Jose Guzman; Dwayne Beck; Savahnah Eastwood	South Dakota State University, Dakota Lakes Research Farm
15	Estimating the addition of nutrients and carbon to the soil from beef cattle production activities	Soil Health	N. Kannan; A. Saleh; A. Cole; H. Aljoe	Texas Institute for Applied Environmental Research, Retd. (USDA-ARS); Noble Research Institute
16	Evaluating Procedures to Measure Soil Organic Carbon in North Carolina Soils	Soil Organic Carbon	Wayne Roper; Deanna Osmond; Joshua Heitman; Wayne Robarge	North Carolina State University
17	Evaluating the effect of pasture type and grazing intensity on the hydrology of Southern Great Plains	Pasture types and grazing intensity effects on soil hydrology	R. Niraula; A. Saleh; N. Kannan; R. Bajgain; P. Gowda; J. Neel	Texas Institute of Applied Environmental Research (TIAER), Tarleton State University, Stephenville, TX; Department of Microbiology and Plant Biology, University of Oklahoma, Norman, OK; Forage and Livestock Production Research Unit, USDA-ARS Grazinglands Research Laboratory, El Reno, OK
18	Impact of 20 Years of Agricultural Management on Soil Organic Matter Quantity and Quality	Soil Organic Matter	Jessica Chiartas; Nicole Tautges; Kate Scow	UC Davis
19	Impact of Improved Soil Health on Sustainability and Profitability of Cotton	Impact of Improved Soil Health on Sustainability and Profitability of Cotton	Bill Robertson; Amanda Free; Mike Daniels; Breana Watkins; Steve Stevens	University of Arkansas System Division of Agriculture Cooperative Extension Service
20	Improving the Science behind Soil Health: NRCS-University collaborative assessment projects	Methods for Measuring Soil Health	Michael Robotham; Skye Wills	USDA-NRCS
21	Integrating Soil Health and Ecological Resiliency Concepts to Advance Sustainable Intensification of Agriculture	Linking resilience theory to soil health concepts provides an interesting analytical perspective that frames soil health properties and functions using four main attributes of resilience: latitude, resistance, precariousness, and panarchy.	David R. Huggins; Alexandra G. Davis; John P. Reganold	USDA-ARS; Washington State University
22	Integrating Soil Respiration and USDA-NRCS Defined Hydrologic Groups to Improve Nitrogen Fertilizer Management	Nitrogen Management	G.M. Bean; N.R. Kitchen; K. Veum; J.J. Camberato; R.B. Ferguson; F.G. Fernandez; D.W. Franzen; C.A.M. Laboski; E.D. Nafziger; J.E. Sawyer	University of Missouri-Columbia; USDA-ARS; Purdue University; University of Nebraska; University of Minnesota; North Dakota State University; University of Wisconsin; University of Illinois; Iowa State University
23	Linking Edge-of-Field Water Quality to Soil Health - Great Lakes Project	Linking Soil Health and Water Quality	Kevin Fermanich; Ron Turco; Mathew Dornbush; Molly Meyers; Greg Lawrence; Marianne Bischoff Gray; Lisa Duriancik	University of Wisconsin - Green Bay; Purdue University; U.S. Geological Survey; USDA-NRCS
24	Linking soil microbial communities to the health of Oregon soils	Microbial Communities and Soil Health	David D. Myrold; Christopher Burgess	Oregon State University

Poster	TITLE	SUBJECT	AUTHORS	AFFILIATIONS
25	Mathematical model for calibration of CO2 released by soil respiration captured by passive sampler in field conditions	Evaluation of microbial activity respiration level determined by measuring the amount of CO2 generated in the specific combinations of beneficial microbes and carbon compounds of liquid fertilizers.	Zouheir Massri; Jerry Wilhm	AgroLiquid
26	Measuring Soil Health Benefits on Private Rangelands through Wyoming Ranchers' Profitability from Improved Forage Production	Rangeland Soil Health	Kristie A. Maczko; Holly Dyer; John Ritten; John Tanaka; Jennifer Moore-Kucera	Sustainable Rangelands Roundtable University of Wyoming; University of Wyoming, Department of Agricultural and Applied Economics; University of Wyoming, Agricultural Experiment Stations; Soil Health Division, USDA-NRCS
27	Molecular Tools for Soil Health Assessments	Soil Health indicators - microorganisms	Daniel K. Manter; Jennifer Moore-Kucera	USDA-ARS, USDA-ARS-PA-CARR; Soil Management and Sugar Beet Research, Fort Collins, CO; USDA-NRCS, Soil Health Division, Portland, OR
28	Monitoring Impacts of Cover Crops on Soil Health in Indiana	Cover Crops and Commercial Soil Health Tests	Stacy M. Zuber; Eileen J. Kladivko	Department of Agronomy, Purdue University, West Lafayette, IN
29	Nematodes are Bioindicators of Soil Function	Biological Indicators	Deborah A. Neher	University of Vermont
30	Organic soil management practices promote natural pest control through enhanced plant resistance	Role of soil management in pest preference	Robert Blundell; Jenifer E. Schmidt; Andrea L. Cheung; Rachel L. Vannette; Amelie Gaudin; Clare L. Casteel	Department of Plant Pathology, University of California, Davis, CA; Department of Plant Sciences, University of California, Davis, CA; Department of Entomology, University of California, Davis, CA
31	Pacific Northwest Cover Crop Variety Adaptation Trial	Cover Crop Variety Testing	Allen Casey; Annie Young-Matthews; Terron Pickett; Joel Douglas	USDA-NRCS
32	Rapid and simple field test of soil bio-available nutrients	True Balance Soil Testing	Cody J. Hatzenbuhler; Marko Davinic	True Balance LLC, Bismarck State College
33	Seasonal trends in microbially-mediated nutrient cycling in soils with cover crops interseeded in corn	Soil microbiology	Andrew J. Curtright; Lisa K. Tiemann	Michigan State University, Department of Plant, Soil and Microbial Sciences
34	Sensor Data Fusion for Soil Health Assessment	Precision Soil Health	Kristen S. Veum; Kenneth A. Sudduth; Newell R. Kitchen	USDA-ARS
35	Soil Health Evaluation in Three Grazed Texas Rangelands	Rangeland Soil Health	Kristie A. Maczko; Jennifer Moore-Kucera; Jeff Goodwin; Timm Gergen; J.K. Brite; Deborah Clark; and Diaz Murray	Sustainable Rangelands Roundtable University of Wyoming; Soil Health Division, USDA Natural Resources Conservation Services; Noble Resources Institute; University of Wyoming, Department of Ecosystem Science and Management; JA Ranch, Birdwell-Clark Ranch, Diaz Murray Ranch
36	Soil Health Indicators Do Not Differentiate Management of North Carolina Soils	Soil Health Testing and Indicators	Wayne Roper; Deanna Osmond; Joshua Heitman; Michael Wagger; S. Chris Reberg-Horton	North Carolina State University
37	Soil Health Interpretations – Using soil survey data to inform soil health assessment and conservation planning	Use of soil survey data to inform conservation planning	Diane Stott; Maxine J. Levin; Cathy Seybold; Steve Campbell; Bob Dobos; Steve Peaslee; Wade Bott; Jennifer Moore-Kucera; Brandon Smith; Dana Ashford; Lindsay Haines	USDA-NRCS
38	Soil profile carbon and nitrogen under diverse cover crops in a winter wheat-sorghum-fallow rotation	Cover Cropping and Soil Health	Pramod Acharya; Rajan Ghimire; Young Cho	Eastern New Mexico University, Portales, NM; New Mexico State University, Agriculture Science Center, Clovis, NM
39	Soil stoichiometric characteristics of different ecosystems under the same climatic conditions in the agro-pastoral ecotone of northern China	Soil Health of natural and artificial grasslands, and field and commercial crops in the agro-pastoral ecotone of northern China	Xiajie Zhai; Kesi Liu; Paulette Ford; Deborah M. Finch; Kun Wang	Institute of Grassland Science, China Agricultural University, Beijing, China; Rocky Mountain Research Station, USDA Forest Service, Albuquerque, NM
40	Soil Your Undies: A Demonstration of Soil Health	Soil Your Undies: A Demonstration of Soil Health	Bill Robertson; Ricki N. Gilbert; Amanda Free	University of Arkansas System Division of Agriculture Cooperative Extension Service
41	Temporal dynamics of soil health parameters as influenced by tillage and cover crops	Temporal dynamics of soil health parameters as influenced by tillage and cover crops	Ayush Gyawali, Ryan Stewart	Virginia Tech
42	The short-term and long-term effects of adoption of conservation tillage: perceptions of farmers in South Dakota	Profitability of adoption of soil conservation practices	Alexander E. Saak; Tong Wang	South Dakota State University, Department of Economics
43	The Use of Microbial Metagenomics to Determine the Effects of Tillage and Residue Management on Soil Biodiversity in Mid-South Corn-Soybean Systems	Microbial biodiversity	William L. Kingery; Shankar G. Shanmugam; Normie Buehring; M. Wayne Ebelhar; Michael S. Cox; Daniel G. Peterson	Department of Plant and Soil Sciences, Mississippi State University; Institute for Genomics, Biocomputing and Biotechnology, Mississippi State University; North Mississippi Research and Extension Center, Mississippi Agriculture and Forestry Experiment Station, Verona, MS; Delta Research & Extension Center, Mississippi Agriculture and Forestry Experiment Station, Stoneville, MS
44	Tillage impact on soil organic matter, nitrogen, and phosphorus from 1990 to 2014	Tillage and Soil Organic Matter	Jasper M Teboh, Ezra Aberle, Blaine G. Schatz, Mike Ostlie	North Dakota State University - Carrington Research Extension Center
45	Tracking Changes in Soil Health Indicators under Different Management Practices	Soil Health Indicators	Jennifer Moore-Kucera; Daniel K. Manter; Diane Stott; Bianca Moebius-Clune; Veronica Acosta-Martinez; Skye Wills	USDA-NRCS, Soil Health Division; USDA-ARS, USDA-ARS-PA-CARR, Soil Management and Sugar Beet Research, Fort Collins, CO; USDA-ARS, Cropping Systems Research Laboratory, Wind Erosion & Water Conservation Unit, Lubbock, TX; USDA-NRCS, Soil Science Division
46	Understanding the Barriers and Needs of Agricultural Retailers and Certified Crop Advisers in Providing Cover Crop Services	Cover Crop Adoption	Angel Cruz; Monica La; Sofia Tenorio Fenton; Marcy Lowe	Datu Research
47	Variability of Soil Health Tests Compared to Chemical Nutrient Tests: A Soil Test Survey on 18 Farms in New England	Soil Testing Variability	Will Brinton; Tom Morris; Karl Guillard; Dan Davidson	Woods End Laboratory; University of Connecticut
48	Binning for Soil Health Scores – Capturing Intrinsic versus Dynamic Soil Characteristics	Soil Health Scores	Shannon Andrews; Adam Fund; Drew Childs; Teresa Matteson; Markus Kleber	Oregon State University Crop and Soil Science Department Central Analytical Laboratory; Benton County Soil and Water Conservation District; Funding from Oregon Natural Resources Conservation Service
49	The Soil Health Partnership Database: Preliminary Results and Future Prospects	Overview and preliminary analyses of the effects of cover crops and other soil management practices on several potential soil health indicators, based on more than 100 Midwest farms.	Bradley Crookston; Matt Yost; Jack Cornell; Kristen Veum; Douglas L. Karlen	Utah State University, Soil Health Partnership, USDA-ARS

REGISTERED ATTENDEES

First Name	Last Name	Organization
Pramod	Acharya	Eastern New Mexico University
Veronica	Acosta-Martinez	USDA-ARS
Ann	Adams	HMI
Jack	Algiere	Stone Barns Center for Food & Agriculture
Nabilah	Alshibli	South Dakota State University
Lisa	Alvares	Happy Life Healing
Carlos	Alvarez	Liventia
Gregory	Anderson	USDA-NRCS
Karma	Anderson	USDA-NRCS
Shannon	Andrews	Oregon State University
Sandra	Arango-Caro	Donald Danforth Plant Science Center
Francisco	Arriaga	University Of Wisconsin-Madison
Dana	Ashford-Kornburger	USDA-NRCS
Amanda	Ashworth	USDA-ARS
Drexel	Atkisson	USDA-NRCS
Oli	Bachie	University of California Cooperative Extension Imperial County
Elsaffory	Bakry Awad Eltahir	Dr. Rajendra Prasad Central Agricultural University
Carolyn	Baltz	The Sustainability Consortium
Todd	Barker	Meridian Institute
Hanna	Bates	Iowa Water Center
Matt	Bechdol	GeoSilos
Doug	Beck	Monterey Pacific Inc
Dane	Bell	Lum.ai
Dan	Berning	Pioneer
Brian	Berns	Green Cover Seed
Keith	Berns	Green Cover Seed
Dr. Krishna	Bhandari	Texas Tech University
Patrick	Binns	Westbrook Associates LLC
Joey	Blankinship	University of Arizona
Daniel	Bloedel	USDA-NRCS
Sean	Bloszies	Soil Health Institute
Robert	Blundell	UC Davis
Christopher	Boomsma	American Society of Agronomy and Soil Science Society of America
Clovis	Borges	MIT
Kevin	Branum	USDA-NRCS
Timothy	Brennan	Farm Foundation
Bill	Buckner	Noble Research Institute
Kelly	Bumpus	Syngenta
Amanda	Cano	Texas Tech University
Allen	Casey	USDA-NRCS
Alyssa	Charney	National Sustainable Agriculture Coalition
Clarence	Chavez	USDA-NRCS
Jessica	Chiartas	University of California - Davis
Larry	Clemens	The Nature Conservancy
Ben	Cloud	Beem Biologics, Inc

REGISTERED ATTENDEES

First Name	Last Name	Organization
Emily	Cole	Westfield State University
Billy	Cook	Noble Research Institute
Josh	Cowan	Grain Farmers of Ontario
Rori	Cowan	DRD Associates
Joe	Coy	Missouri Department of Conservation
Aimee	Coy	Missouri Department Of Conservation
Bradley	Crookston	Utah State University
Harvey	Crowley	4 Daughters Land & Cattle
Angel	Cruz	Datu Research
Karelyn	Cruz	USDA-NIFA
Michael	Cullen	Manobi
Constance	Cullman	Farm Foundation
Andrew	Curtright	Michigan State University
Hanaa	Dakhel	
Mike	Daniels	University of Arkansas
Daniel	Davidson	Woods End Laboratory
Alexandra	Davis	Washington State University
Jeff	Dearborn	AGRIAN
Karen	DeBoer	Nebraska Extension
Lori	Dekan	Valent
Curtis	Dell	USDA-ARS
Catherine	DeLong	Soil and Water Conservation Society
George	Derringer	USDA-NRCS
Rebecca	Doyle	HGPF and Context
Jason	Drake	
Thomas	Driscoll	National Farmers Union Foundation
Jerry	Duff	AgriThority
Mary	Duff	AgriThority
Lisa	Duriancik	USDA-NRCS
Lisa	Durso	USDA-ARS
Jim	Ehrlich	Colorado Potato Administrative Committee
Pipa	Elias	The Nature Conservancy
Chad	Ellis	Noble Research Institute
Ana	Duarte	
Jimmy	Emmons	Oklahoma Association of Conservation Districts
Sandy	Endicott	DuPont Pioneer
Jamie	Fanous	Tufts University
Gary	Farrell	Ag Enterprise Supply, Inc.
Lance	Feikert	No Till On The Plains
Chris	Fennig	MyFarms
Giulio	Ferruzzi	USDA-NRCS
Judith	Fitzpatrick	Prolific Earth Sciences
William	Flory	Flory Farms
Robert	Flynn	
Paulette	Ford	USDA Forest Service, RMRS

REGISTERED ATTENDEES

First Name	Last Name	Organization
Robert	Foster	Foster Brothers Farm Inc
Amanda	Free	University of Arkansas System, Division of Agriculture Cooperative Extension Service
Dan	Froehlich	Anuvia
Lisa	Fultz	LSU AgCenter
Earl	Garber	NACD/SHI
Janis	Garber	
Rudy	Garcia	USDA-NRCS
Terrence	Gardner	North Carolina State University
Rajan	Ghimire	New Mexico State University
Thomas	Giambra	USDA-FS
William	Gibbons	South Dakota State University
Gill	Giese	New Mexico State University
Ricki	Gilbert	University Of Arkansas System, Division Of Agriculture Cooperative Extension Service
Jeff	Goebel	VSWCD
Myrna	Goebel	
Jeff	Goodwin	Noble Research Institute
Eli	Gottfried	Gottfried Environmental
Christopher	Graham	South Dakota State University
Stuart	Grandy	University of New Hampshire
Ken	Greer	Western Ag
Tim	Greiner	Pure Strategies
Jeremy	Groeteke	Corteva Agriscience
Steve	Groff	Cover Crop Coaching
Alexsandra	Guerra	Nori
Steven	Guldan	New Mexico State University
Jose	Guzman	South Dakota State University
Ayush	Gyawali	Virginia Tech
Stephen	Hagen	Applied Geosolutions
Kater	Hake	Cotton Incorporated
Lauren	Hale	University of Oklahoma
Jerry	Hall	Grassland Oregon
Ashley	Hammac	USDA-ARS
Wyatt	Hartman	Trace Genomics, Inc.
Dave	Harwood	Corteva AgriScience
Masoud	Hashemi	University of Massachusetts
Alison	Hatch	USDA-NRCS
Cody	Hatzenbuhler	PanAg/True Balance
Keira	Havens	Pivot Bio
Neil	Havermale	Red Hen Systems, LLC
Jana	Hazelbaker	Bernalillo County Extension Master Composters
Randy	Hegwer	Corteva Agriscience
Tina	Hendon	Tarrant Regional Water District
MIke	Hendrix	Soil Bed Systems
Reuel	Heyden	Verdesian Life Sciences
Lori	Hill	Jackson Hill Properties

REGISTERED ATTENDEES

First Name	Last Name	Organization
Matt	Hill	MFA Incorporated
Christina	Hoberg	UNM Lobo Gardens/Rio Grand Community Farm
Wayne	Honeycutt	Soil Health Institute
Greg	Horstmeier	DTN/Progressive Farmer
Neal	Hoss	Corteva
Steven	Huckett	Great River Greening
David	Huggins	USDA-ARS
Syed	Imam	Flozyme/Bontera BioAg
Kirk	Iversen	USDA-NRCS Alabama
Susan	Jennings	Arthur Morgan Institute for Community Solutions
Diana	Jerkins	Organic Farming Research Foundation
Aaron	Jimenez	Advancing Eco Agriculture
Jim	Johnson	Noble Research Institute
Chris	Johnston	Inter-Mountain Labs
Sheldon	Jones	Soil Health Institute
J.T.	Jones	ABQ BioPark
Jim	Jordahl	Iowa Agriculture Water Alliance
Christophe	Jospe	Nori
Mark	Joyce	Dairy One
Zahangir	Kabir	USDA-NRCS
Steven	Kadas	USDA-NRCS
Narayanan	Kannan	Tarleton State University
Douglas	Karlen	USDA-ARS/NLAE
Judith	Karlen	
Eugene	Kelly	Colorado State University
Mark	Kieser	Kieser & Associates, LLC
William	Kingery	Mississippi State University
Andy	Knepp	Monsanto Company
Bruce	Knight	Strategic Conservation Solutions
Julie	Knight	Strategic Conservation Solutions
Orion	Kobayashi	sweetgreen
Alan	Kruszel	Soil Conservation Council of Canada
Nicole	Kubiczki	USDA-NRCS
Michael	Kucera	USDA-NRCS
Jedrek	Lamb	
Dave	Lamie	Clemson University
Amy	Larsen	NMSU Alcalde Science Center
Andy	LaVigne	American Seed Trade Association
Kurt	Lawton	Corn+Soybean Digest
Mike	Lehman	USDA-ARS
Brad	Leibov	Dragonfly Trust
Chenhui	Li	University of Missouri
Xinhu	Li	
Bryce	Lidtka	University of Wyoming
Clare	Lindahl	Soil and Water Conservation Society

REGISTERED ATTENDEES

First Name	Last Name	Organization
Daniel	Liptzin	University Of Colorado
Jim	Loar	Cool Planet
Tyler	Lown Vandenburg	Earthgreen Products, Inc.
Javier	Lugo	University of Puerto Rico at Utuado
Eric	Lund	Veris Technologies, Inc.
Jerry	Lynch	General Mills
Latasha	Lyte	USDA-NIFA
Xuefeng	Ma	Noble Research Institute
G.	Mac Bean	University of Missouri
Melissa	Machowski	Valent USA
Randall	MacIntosh	
Jim	MacQuigg	
Kristie	Maczko	Sustainable Rangleands Roundtable University of Wyoming
Noell	Madrid	Synagro Technologies
Joe	Magner	University of Minnesota
Shawn	Manns	Novozymes
Daniel	Manter	USDA-ARS
Annie	Martin	Kiss the Ground
Randy	Martin	Valent BioSciences
V Larkin	Martin	Martin Farm
Lukas	Martinelli	Soil Science Society of America
Marjorie	MartzEmerson	Coyote & Chirp
Zouheir	Massri	Agroliquid
Lama	Massri	
Muhammad	Massri	
Noura	Massri	
Melissa	McCann	USDA-NRCS
Josiah	McClellan	United Soybean Board
Glenna	McCollum	
Chris	McCracken	Local Seed Company
Jay	McEntire	Glennoe Farms
Elyssa	McFarland	National Corn Growers Association
John	McGrath	Amana Farms, Inc.
Cathy	McGuire	USDA-NRCS
Kevin	McLaughlin	Lum.ai
Alan	Merrill	BioHumaNetics Inc.
Leslie	Michel	Okanogan Conservation District
David	Miles	Noble Resources
Robin	Miller	United Soybean Board
Ann	Mills	Agua Fund
Grace	Miner	Colorado State University/USDA-ARS
Steven	Mitchell	DuPont Pioneer
Bianca	Moebius-Clune	USDA-NRCS
Summer	Montacute	BOF
Maria	Monteros	Noble Research Institute

REGISTERED ATTENDEES

First Name	Last Name	Organization
Lara	Moody	The Fertilizer Institute
Jennifer	Moore-Kucera	USDA-NRCS-SHD
Sara	Moran	New Mexico State University
Lillia	Mullins	Kiss the Ground
Chelsea	Myers	Tiny Attic Productions
Rob	Myers	University of Missouri
David	Myrold	Oregon State University
Manjula	Nathan	University of Missouri
Deborah	Neher	University of Vermont
Dan	Nelson	Soiltest Farm Consultants, Inc
William	Nelson	William J. Nelson, LLC
Dan	Noble	Association of Compost Producers
Brett	Norman	Trace Genomics, Inc.
Dan	Northrup	Booz Allen / ARPA-E
LaKisha	Odom	Foundation for Food and Agriculture Research
Oladapo	Olayemi	Colorado State University
Mohammed	Omer	New Mexico State University
Patrick	O'Neill	Soil Health Services, PBC
Deanna	Osmond	North Carolina State University
Phillip	Owens	USDA-ARS
Vance	Owens	South Dakota State University
Eugenia	Pena-Yewtukhiw	West Virginia University
Joseph	Pepi	California Tahoe Conservancy
Robert	Pepperman	Synagro
Michelle	Perez	American Farmland Trust
Aaron	Phillips	Aaron Phillips Photography
Tim	Pilcher	Tiny Attic Productions
Mary	Podoll	USDA-NRCS
Sandra	Postel	Global Water Policy Project
Rebecca	Power	North Central Region Water Network/UW-Extension
Bharath	Prithiviraj	Prime Discoveries Inc / City University of New York
Adam	Prothrop	
Eric	Radliff	DuPont Pioneer
John	Ramirez-Avila	Mississippi State University
Amanda	Raster	The Sustainability Consortium
Byron	Rath	Soil Health Institute
Debbie	Reed	C-AGG
Lorraine	Regnier	AgriSource Crop Consulting
Sidney	Reynolds	Signature Agency
Jim	Richardson	National Geographic
Amber	Riordan	USDA-NRCS
Jim	Ristau	SD Corn
Bruce	Roberts	California State University Fresno
Clay	Robinson	Illinois State University
Michael	Robotham	USDA-NRCS

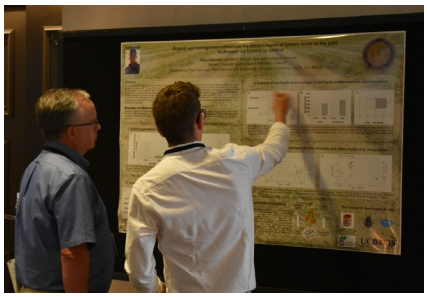
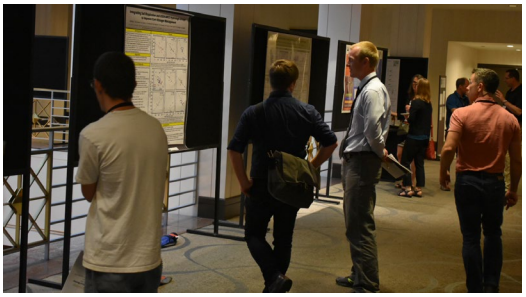
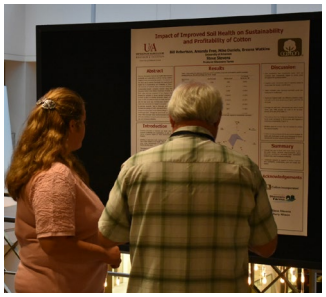
REGISTERED ATTENDEES

First Name	Last Name	Organization
Wendi	Rogers	Tatanka Resources
John	Rose	Rose Farm
Wade	Ross	New Mexico State University
Cait	Rottler	USDA-ARS
Steven	Rowe	NEWTRIENT
Greg	Ruehle	Servi-Tech, Inc.
Alexander	Saak	South Dakota State University
Ali	Saleh	Tarleton State university
Susan	Samson-Liebig	USDA-NRCS
Yaniria	Sánchez de León	University of Puerto Rico at Mayaguez
Gretchen	Sassenrath	Kansas State University
Karen	Scanlon	Innovation Center for U.S. Dairy
Jerron	Schmoll	Pioneer Hi-Bred, Int'l
Gregory	Scott	Oklahoma Conservation Commission
Amy	Seiger	Oklahoma Conservation Commission
Annie	Shapiro	AGree
Ernie	Shea	Solutions from the Land
Kim	Sheese	ANP, Inc.
Aaron	Shew	USDA ARS Dale Bumpers Small Farms Research Center
Brenda	Simpson	USDA-NRCS
Lindsey	Slaughter	Texas Tech University
Ryan	Smith	Delta Institute
Avery C Anderson	Sponholtz	Globetrotter Foundation and The #NoRegrets Initiative
David	Stark	Holganix
Beth	Stebbins	Grain Millers
Darrick	Steen	Missouri Corn Growers Assoc.
Jean	Steiner	USDA-ARS
Joshua	Stewart	USDA-NRCS
Ryan	Stockwell	National Wildlife Federation
Diane	Stott	USDA-NRCS
Steve	Swaffar	No-Till On The Plains Inc
Joseph	Tabor	Altar Valley Conservation Alliance
Joe	Tabor	University of Arizona
Haiying	Tao	Washington State University
Jasper	Teboh	NDSU - Carrington Research Extension Center
Sami	Tellatin	USDA-SARE
Aracely	Tellez	National Young Farmers Coalition
Janice	Thies	Cornell University
Allison	Thomson	Field to Market
Paul	Tracy	Soil Health Institute
Ronald	Turco	Purdue University
Carmen	Ugarte	University of Illinois
Brad	Van Kooten	Pioneer
Kristen	Veum	USDA-ARS
Fred	Vocasek	Servi-Tech Laboratories

REGISTERED ATTENDEES

First Name	Last Name	Organization
Keith	Vodrazka	Cool Planet
Jay	Vroom	CropLife America
Caroline	Wade	The Nature Conservancy
Heidi	Waldrip	USDA-ARS
Forbes	Walker	University of Tennessee
Daniel	Wallace	USDA-NRCS
Matthew	Wallenstein	Colorado State University
Harriet	Wegmeyer	Nutrients For Life Foundation
Cynthia	Weiss	ABQ Master Gardener
Jason	Weller	Land O'Lakes SUSTAIN
Guy	Wendler	Amana Society, Inc.
Nathan	Wheeler	RavenRidge Farm and Vineyard
Cynthia	Wheeler	
Kelly	Whiting	United Soybean Board
John	Wiener	University of Colorado
Steve	Wiest	Valent BioSciences LLC
Brent	Wilson	DowDupont
Dale	Wilson	Valent BioSciences LLC
Paul	Wolfe	Walton Family Foundation
Stephen	Wood	The Nature Conservancy
Andy	Wycislo	Waypoint Analytical
Xiajie	Zhai	Clark Atlanta University
Stacy	Zuber	Purdue University
Mike	Zwingman	Verdesian Life Sciences




CONCLUSION

Enhancing soil health is one of the most important endeavors for ensuring a sustainable food supply and conserving our natural resources. Achieving improvements at scale requires collaboration across multiple organizations. SHI is dedicated to serving this community by building a foundation to support the continued engagement and collaboration of its many partners. A special thanks to our Action Team Volunteers and Co-Chairs, plenary speakers, and keynote speakers. Thank you to The Samuel Roberts Noble Foundation, Walton Family Foundation, General Mills, Foundation for Food and Agriculture Research, and McKnight Foundation for your generous and continued support. Thank you to our partners at the Tri-Societies, Datu Research, Soil Health Partnership, University of Missouri-SARE, USDA Agricultural Research Service, Conservation Technology Information Center, Field to Market, National Association of Conservation Districts, Soil and Water Conservation Society, The Nature Conservancy, The Fertilizer Institute, USDA Natural Resources Conservation Service, and FoodShot Global for your support in research and application.

We look forward to seeing you all next year for the Soil Health Institute's 4th Annual Meeting, July 16-18, 2019 in Sacramento, California!

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COORDINATING COALITION FOR SOIL HEALTH

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4th Annual Meeting
July 16-18, 2019

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CONFERENCE on CONNECTIONS BETWEEN SOIL HEALTH and HUMAN HEALTH

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Kickstarter Conference to Create a Research Collaboration Roadmap

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- Identify promising research opportunities;
- Build interdisciplinary teams to address those research needs; and
- Propose funding mechanisms that will lead to scientific findings that benefit the health of agricultural systems, the environment, and the public.

Information ● Registration
soilhealthinstitute.org/humanhealthconference

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ABOUT THE SOIL HEALTH INSTITUTE

The Soil Health Institute works with its many stakeholders to identify gaps in research and adoption; develop strategies, networks and funding to address those gaps; and ensure beneficial impact of those investments to agriculture, the environment and society.

OUR MISSION: SAFEGUARD AND ENHANCE THE VITALITY AND PRODUCTIVITY OF SOIL THROUGH SCIENTIFIC RESEARCH AND ADVANCEMENT

To become even more involved in SHI activities, please contact us at soilhealthinstitute.org.

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