



THE UNIVERSITY OF ARIZONA

Yuma Center of Excellence
for Desert Agriculture



THE UNIVERSITY OF ARIZONA

Cooperative Extension

Desert Ag Research Symposium on Soil Health

January 9, 2024

Four Points by Sheraton Yuma | 2030 S. Avenue 3E

7:30 Registration and Breakfast Buffet

8:30 Welcome

Stephanie Slinski, Interim Executive Director, Yuma Center of Excellence for Desert Agriculture, University of Arizona

8:35 Opening Remarks: The Importance of Yuma to Arizona Ag's Future

Paul Brierley, CEO & EDD, Arizona Department of Agriculture

8:50 Morning Keynote: The Desert Agriculture Soil Health Initiative (DASHI) & Outcomes Thus Far

Joey Blankinship, Associate Professor, Soil Ecology and Soil Health, Department of Environmental Science University of Arizona

9:15 Industry Stakeholders Panel

Moderator: Stephanie Slinski

Kim Horton, Agronomy Manager, Taylor Farms

Matt McGuire, Chief Agricultural Officer, JV Smith Companies

Vicki Scott, President, Scott Resources

10:05 Break

10:20 Session One: Use-Inspired research for Addressing Soil Health Needs of Desert Ag

Moderator: Joey Blankinship

10:25 UArizona's Roots in Soil Health Research

John Chorover, Interim Associate Dean of Research, College of Agriculture, Life and Environmental Sciences, Professor, Soil and Environmental Biogeochemistry, Department of Environmental Science, University of Arizona

10:45 UArizona Presidential Advisory Commission Report

Kim Patten, Associate Vice President of Research Development, Research, Innovation, & Impact, University of Arizona.

11:05 ARID: Finding Solutions for Challenges Facing Arid Land Agriculture

Duke Pauli, Director, Center for Agroecosystem Research in the Desert (ARID), Associate Professor, School of Plant Sciences, University of Arizona

11:25 Higher Yields from Degraded Land - Advances in Quantifying and Understanding Root-Root Interactions

Alexander Bucksch, Associate Professor, School of Plant Sciences, University of Arizona



THE UNIVERSITY OF ARIZONA

**Yuma Center of Excellence
for Desert Agriculture**



THE UNIVERSITY OF ARIZONA

Cooperative Extension

11:45 Searching for next generation highly specific agricultural antimicrobials

David Baltrus, Associate Professor, School of Plant Sciences, University of Arizona

12:05 Microbial Activity as an Indicator of Biological Soil Health: Taking Action to Advance Method Development

Luisa Ikner, Assistant Professor, Water & Energy Sustainable Technology (WEST) Center, University of Arizona

12:30 Lunch

1:30 State Leaders Panel

Moderator: Ethan Orr

Paul Brierley, CEO & EDD, Arizona Department of Agriculture

Shane Burgess, Vice President for the Division of Agriculture, Life and Veterinary Sciences, and Cooperative Extension and Charles-Sander Dean of the College of Agriculture, Life and Environmental Sciences, University of Arizona

Ralph Ware, Assistant State Conservationist-Field Operations, USDA Natural Resources Conservation Service

Charlene Fernandez, State Director for Arizona, USDA Rural Development

Brian Fernandez, Senator, Arizona State Senate

2:30 Afternoon Keynote: Mycorrhizae in Agriculture: Past, Present and Future

Nancy Johnson, Regents Professor, School of Earth & Sustainability and Department of Biological Sciences, Northern Arizona University

3:05 Break

3:20 Session Two: Applied Research for Addressing Soil Health Needs of Desert Ag

Moderator: Ethan Orr

3:20 Economic Incentives and Programs to Improve Soil Health and Irrigation

Ethan Orr, Associate Director, Agriculture, Natural Resources and Economic Development, Arizona Cooperative Extension, Associate Professor, Community Revitalization and Economic Development, Interim Director, Natural Users Law and Policy Center, University of Arizona

3:40 Effective Measurements of Soil Health

Jenny Bower, Research Soil Scientist, Soil Health Institute

4:00 Enhancing Soil Health through Advanced Management Strategies

Diaa Eldin Elshikha, Assistant Professor and Irrigation Specialist, Maricopa Agricultural Center, University of Arizona



4:20 Healthy Desert Soil Initiative: Updates from a Soil Health Research and Extension Program

Debankur Sanyal, Assistant Professor & Specialist in Soil Health, Department of Environmental Science, University of Arizona

4:40 Application of Soil Sensing Technologies to Soil Health Research

Pedro Andrade-Sanchez, Precision Agriculture Specialist, Department of Biosystems Engineering, University of Arizona

5:00 Opportunities to Cooperate with Cooperative Extension on Soil Health Projects

Robert Masson, Assistant Ag Extension Agent, Yuma County Cooperative Extension, University of Arizona

5:15 **Wrap-up**

5:20 **Networking Reception**

Pedro Andrade Sanchez, an Associate Professor-Specialist in Precision Agriculture at The University of Arizona since August 2007, is affiliated with the Department of Biosystems Engineering and is stationed at The Maricopa Agricultural Center. Dr. Andrade-Sanchez earned his doctoral degree in agricultural engineering from the University of California Davis in 2004 where his research focused on soil dynamics applied to tillage and subsoil compaction. In 2006 he worked at the Center for Precision Agricultural Systems at Washington State University where he performed research on wireless sensor networks with applications to agriculture. Currently, Dr. Andrade-Sanchez leads an innovative research and extension program in precision agriculture and advanced technologies for the State of Arizona. His program focuses on the implementation of information-intensive solutions engineered to increase efficiencies in crop production in farming systems of semi-arid lands. To date, Dr. Andrade-Sanchez has performed extensive work in machine navigation systems, field-level yield monitoring, variable-rate input application, monitoring of soil and ambient conditions, and sensor-based characterization of crop development in various crops in Arizona. New emphasis areas in his program include precision planting, on-the-go weed detection using spectral sensors and imaging systems, and soil respiration monitoring using low-cost electronics. Dr. Andrade-Sanchez has published 28 peer-reviewed journal articles, 9 peer-reviewed extension bulletins; and written three book chapters.

David Baltrus is an Associate Professor in the School of Plant Sciences at the University of Arizona. His research focuses on characterizing interactions between bacteria and other organisms at a genetic level and on comparing genomes across environmentally relevant strains to better understand evolutionary dynamics of plant pathogens and symbionts.

Dr. Joey Blankinship is a soil ecologist who grew up in Richmond, Virginia. He earned his Bachelor's degree in Environmental Sciences from the University of Virginia, followed by a PhD in Biology at Northern Arizona University, and then postdoctoral research positions at University of California in both Merced and Santa Barbara. He is now an Associate Professor at the University of Arizona in the Department of Environmental Science addressing both desert soil health problems and solutions. His team's current research tackles grand environmental and agricultural challenges in drylands that are linked to soil health, including dust mitigation, ecological restoration, soil carbon sequestration, crop nutrient density, and improving the efficiency of water and fertilizer in croplands.

Jenny Bower is a Research Soil Scientist at the Soil Health Institute. She uses her background in field sampling and spatial analysis to quantify, analyze, and predict soil health under agricultural management. Her doctoral work sought to understand the influence of topography and water on forested soil formation in the northeastern US. She currently investigates soil health in agricultural systems in Ontario, Canada, and southern and western areas of the US.

Paul Brierley was raised working on his family's diversified farm in California. After earning a computer science degree, he returned to production agriculture in southeast Arizona. He worked with producers across Arizona as Farm Bureau's Director of Organization for 10 years. Then, in 2014 became the founding Executive Director of the University of Arizona's Yuma Center of Excellence for Desert Agriculture, which he built into a highly effective agricultural research organization. Last June, Paul took over the reins as Director of the Arizona Department

of Agriculture under the appointment of Governor Katie Hobbs. He is highly respected and represents the best of our agricultural industry in Arizona.

Alexander Bucksch is an Associate Professor in the School of Plant Sciences (SPLS) at the University of Arizona. He joined in 2023 from the University of Georgia where he was a presidential hire, jointly between Bioinformatics, Plant Biology and Forestry. He obtained a PhD from Delft University of Technology and he was a Postdoc at the Georgia Institute of Technology where he developed algorithms to characterize plant morphology from organismal to ecosystem level, above- and below-ground. In his current research, he develops imaging and simulation approaches to explain and characterize the function of natural variation in agricultural plants and its links to plant cooperation. His work has been funded by the US National Science Foundation (NSF), the Advanced Research Project Agency for Energy and several public-private partnerships. He has published more than 70 scientific manuscripts in refereed venues with over 2600 citations, edited four books, and released plant phenotyping platforms such as Digital Imaging for Root Traits (DIRT) and PlantIT, which are used by over 1000 plant researchers and breeders worldwide. He currently serves as an Associate Editor of Plant Methods and Frontiers in Plant Science. He is the University of Arizona representative in the International Plant Phenotyping Network and chairs their working group “The Science of Plant Phenomics” and is the incoming chair of the Gordon Conference on Collective Behavior. Alexander Bucksch’s research was recognized with an NSF CAREER Award, the Early Career Award of the North American Plant Phenotyping Network, and the Fred C. Davison Early Career Scholar Award.

Jon Chorover is Interim Associate Dean for Research in the College of Agriculture, Life, and Environmental Sciences, and Professor of Soil Biogeochemistry in the Department of Environmental Science at the University of Arizona. His research focuses on how soil geochemical reactions - including mineral and metal(loid) transformations - are mediated by gas and water flows and associated biological activity. His work seeks to connect molecular to catchment scales of inquiry in critical zone science, and his team conducts coupled field and laboratory studies on systems that range from those that are relatively pristine to those that are highly disturbed and contaminated.

Dr. Diaa Elshikha is an Assistant Professor and Irrigation Specialist in the Biosystems Engineering Department at the University of Arizona. He is stationed at the University of Arizona Maricopa Agricultural Center. He has a Ph.D. degree in Agricultural and Biosystems Engineering from the University of Arizona. Dr. Elshikha was a research associate at the University of Arizona and the USDA Arid Land Agricultural Research Center from 2012 until 2022. His extension program is focused on optimization of all irrigation systems, detection of crop water status through remote sensing and in-situ soil sensors, optimization of water application for maximum water-use efficiency, irrigation scheduling techniques and models, and the adoption of low water use crops. Dr. Elshikha is currently involved in research projects focusing on the use of gravity drip irrigation system for cotton and guayule crops. Furthermore, He is doing a comparative analysis between center pivot and drip irrigation systems, comparing them to flood irrigation, with a particular focus on their implications on water-use, crop growth, and yield across diverse cool and warm season crops. Furthermore, his research includes the evaluation of OpenET, which involves satellite-derived estimations of evapotranspiration, as a promising tool for enhancing irrigation efficiency and crop water productivity.

Brian Fernandez is an Arizona native elected to represent Legislative District 23 in the Arizona State Senate. Legislative District 23 covers most of Arizona's border with Mexico and is a major international logistics thoroughway with a robust agricultural industry. Before being elected to the State Senate Brian Fernandez served as State Representative, where he secured millions of dollars for rural infrastructure projects to include: 20 million to expand Jack Rabbit Trail in the West Valley, and 34 million to build and improve Cesar Chavez Blvd in San Luis AZ. He also funded education voting for the historic 1-billion-dollar education budget and secured over 5 million dollars for rural undergraduate programs. Brian is now serving on the Appropriations, Finance and Commerce, and Natural Resources, Energy, and Water committee. Brian Fernandez has spent his career creating solutions for complex problems and is proud to bring that experience to the Arizona State Senate.

Charlene Fernandez was elected to the Arizona House of Representatives in 2014. Her district in Southwestern Arizona contains many farmers and ranchers who contribute to the state's role as the United States' top producer of winter lettuce. Elected House Minority Leader in 2019, Fernandez was integral to the Drought Contingency Plan agreement in 2019, bringing states, tribal nations, farmers, and other stakeholders together to ensure a sustainable water supply for Arizona. Prior to entering elected office, she worked for Congressman Ed Pastor and Congressman Raúl M. Grijalva in constituent services in Yuma County office. Fernandez also served Governor Janet Napolitano as a liaison for the Arizona Department of Environment Quality. She is a former member of the Arizona Department of Agriculture's Food & Agriculture Policy Advisory Committee.

Kim Horton began farming insects in 1998 as a part-time job in college. It was an immediate perfect fit and blossomed into her choice of pursuing a B.S. degree in Entomology and Nematology at the University of Florida, Gainesville. She continued rearing insects and mites for the biological control industry for the next 15 years. In 2015, Kim decided to change gears and began working on a large organic vegetable farm in the San Joaquin Valley in California. Currently, Kim is the Agronomy Manager at Taylor Farming on the Central Coast and in the SW Desert where she continues to be fascinated by the above ground and below ground associations between plants, insects, diseases, and soil.

Dr. Luisa Ikner is an Assistant Professor and Environmental Microbiologist in the Department of Environmental Science at The University of Arizona. At the Water & Energy Sustainable Technology Center, she collaborates with academic, industry, and municipal partners on a broad spectrum of research projects. She currently serves as a co-investigator for research ventures funded by the USDA, EPA, and U.S. Army Corps of Engineers, among others. Dr. Ikner's research interests include developing a new index to measure the biological health of soil, and pathogen reduction in water to promote resiliency and reuse across multiple sectors. She also recently served as a Water Quality Expert for UArizona's Presidential Advisory Commission on the Future of Agriculture and Food Production in a Drying Climate.

Nancy Collins Johnson is a Regents Professor of soil ecology at Northern Arizona University. She earned a PhD in Ecology and Plant Pathology from the University of Minnesota and a MS degree in Botany from the University of Wisconsin. Johnson and her students study interactions

Desert Ag Symposium on Soil Health Speaker Bios

among communities of plants and soil organisms in natural and agricultural ecosystems throughout the world. They have discovered that resource availability influences mycorrhizal symbioses and associated belowground microbiomes and they develop empirical tests and theories to better understand these responses.

Robert Masson began his professional career in the United States Navy, where he served aboard the aircraft carrier USS Harry S Truman repairing aircraft. He later worked seven years as a USDA-ARS plant breeding technician in North Carolina, conducting nursery, yield, and abiotic stress trials, as he pursued his master's degree in breeding part-time. Upon graduation he transitioned to private industry, working at Weaver Popcorn Company in Indiana as a research scientist developing quality and efficiency advancements for the Hybrid Research, R&D, Quality Assurance, and Grain Conditioning departments. He moved to Yuma, Arizona, and continued his work in private industry at RD4AG, an agricultural contract research company, where he performed field trial services for demonstration, breeding, product development, and GLP Registration. He currently works for the Yuma County Cooperative Extension service as an Assistant Extension Agent for Yuma County, where he works on addressing grower needs with research and connecting them with research specialists and industry advancements.

Matt McGuire is a Chief Agricultural Officer for JV Smith Companies, a family-owned business that mainly farms fresh vegetables. He oversees growing and Ag operations for 28,000 acres of vegetable crops and another 10,000 acres of non-vegetable crops. He earned his Bachelor's degree from University of California San Diego, majoring in Biology with a minor in chemistry and psychology. He has completed coursework for an MBA at Texas A&M. Throughout the years Matt has a wide range of experience that includes cooling operations, sales, harvest management, grower, and general manager of operations in the Southwest and Salinas, CA.

Dr. Ethan Orr is the Director for Agriculture, Natural Resources and Economic Development for the University of Arizona Cooperative Extension and an Associate Professor of Community Vitality and Economic Development. He has taught government and business at the UA and NAU for over 23 years and completed his doctorate at ASU. He is a fourth generation Arizonian, and a third generation Wildcat.

Ethan served in the Arizona legislature where he worked with both parties to bring commercial spaceflight to Arizona, create the mental health first aid program, and resolve a number of difficult issues in education, agriculture and natural resources. Ethan has also served as the Assistant Vice President for Government Affairs and Community Relations for the University of Arizona and helped secure funding to complete the Phoenix Bio-Medical Campus and to start the College of Veterinarian Sciences. In the Arizona Cooperative Extension, Ethan oversees the \$63 million on-farm irrigation program, which has partners with growers to conserve over 36,400 waf. The Agriculture Apprentice program which partners with over 60 farms to train the next generation of ag workers, and the Mesonet which is used by growers across Arizona to project irrigated water needs.

Kim Patten is Associate Vice President for Research Development at the University of Arizona. She leads a team of research development professionals supporting faculty in their pursuit of extramural funding from federal, corporate, and foundation (through honors and awards)

sponsors. Their work has resulted in more than \$700 million in awards to the university since 2014. She advocates a holistic view of research development and the research lifecycle, emphasizing societal impacts of research (e.g., the incorporation and promotion of undergraduate research experiences, core community partnerships, and inclusive practices). Kim currently serves on the National Organization of Research Development Professionals (NORDP) Board of Directors (Term 2022-2026). Before joining the University of Arizona, Kim managed national and international projects and programs in conservation, renewable energy, and distributed data systems. As associate director at the Arizona Geological Survey, she managed and worked with a \$30 million research portfolio, including as co-principal investigator on a \$3.6 million National Science Foundation (NSF) project and project manager of a \$22 million U.S. Department of Energy (DOE) project. Prior to that, she helped develop the research portfolio of a science-based non-profit organization and secured its first NSF funding.

Dr. Duke Pauli is an Associate Professor in the School of Plant Sciences where his lab is focused on understanding the genetic mechanisms responsible for stress adaptive traits in cotton, lettuce, and sorghum as well as other crops. He is also the founder and Director of the Center for Agroecosystem Research in the Desert (ARID) whose mission is to deliver science-based solutions to challenges facing arid land agriculture.

Debankur Sanyal is a Soil Health Specialist and Assistant Professor. He has a Ph.D. in Soil Science from North Dakota State University and is a soil biogeochemist broadly trained in soil health management for sustainable crop production. As a researcher, he seeks answers to the fundamental questions about soil carbon nutrient cycling in the agroecosystems at multiple scales, using approaches that range from laboratory-based experiments to extensive field trials. His research interests include but are not limited to quantifying the impacts of various soil management tools to improve soil health with an aim to create climate-resilient, sustainable, and healthy agro-environments for human welfare. Understanding soil-plant-microbe interactions that influence soil biogeochemical properties in arid and semi-arid environments is one of his major research goals. Dr. Sanyal runs a statewide soil health extension program and collaborates with stakeholders in studying soils under diverse agroecosystems. To design applied research questions and identify priority research needs in the desert southwest, his team conducts surveys that are distributed to more than a thousand stakeholders around the state, both electronically or physically during field events. I and my team also present research outcomes and deliver lectures on field days, meetings, and conferences, and publish research and extension articles for outreach and education.

Vicki Scott is the owner of Scott Resources and offers consulting in water and agriculture related to food safety. She served as the Technical Advisor to the Arizona Leafy Greens Marketing Agreement Food Safety Committee from 2019-2022. Vicki has been involved with the AZ LGMA since its inception and has served on both the Food Safety Committee and the Technical Subcommittee of the same.

In her first career, Vicki spent 18 years with the City of Yuma's Water & Wastewater Treatment Division in various environmental laboratory positions including Chemist II and Laboratory Director before accepting a position at Amigo Farms as the Director of Food Safety and Quality Assurance. She held that position for 19+ years.

Desert Ag Symposium on Soil Health Speaker Bios

She serves on the executive board and is a founding member of the Yuma Safe Produce Council. The mission of the Council is to enhance food safety education for its members and the Yuma community in order to protect public health by fostering the production of safe, quality produce.

Stephanie Slinski has degrees in Plant and Soil Science, Microbiology and a PhD in Plant Pathology. She started her plant pathology career in a plant disease diagnostic clinic working with fungal, bacterial, viral, and nematode diseases of vegetable and ornamental crops at the University of Massachusetts, Amherst. She continued her studies in plant pathology at the University of California, Davis followed by postdoctoral training at the Forestry and Agriculture Biotechnology Institute at the University of Pretoria in South Africa. She then returned to working with the agriculture industry as a project manager at the Citrus Research and Development Foundation in Florida. She came to Yuma in 2018 as the Associate Director of Applied Research and Development for the Yuma Center of Excellence for Desert Agriculture and currently is the Interim Executive Director. One focus has been building a program to address Fusarium wilt of lettuce and includes yearly field trials and building a collaboration network to expand active research on this disease. She is also involved in projects addressing other important diseases, soil health, Agtech, water conservation, food safety, and other agricultural production needs.

Ralph Ware is the Assistant State Conservationist for NRCS Field Operations in Arizona. In that position, he oversees all aspects of non-engineering NRCS field staff state-wide. He also participates as an active member of the NRCS Executive Leadership and works side by side with NRCS State Conservationist Keisha Tatem and other members of NRCS Arizona Leadership. Ralph is a native of Michigan; having grown up on a fruit and vegetable farm in the northwest part of the State. He graduated from Michigan State University with a Bachelor of Science degree in Soil Science. He began his career with NRCS as an intern with NRCS while he attended college. After graduation, he went to work for NRCS full time and spent the first 8 years of his career in Michigan. In the early 1980's, he moved to Oklahoma where he spent 2 years as an Ag Management Specialist and 2 years as Horticulturist with the Cooperative Extension Service. In 1987, Ralph and his wife Jean moved to Tucson, Arizona where they have resided ever since. Ralph has several positions with NRCS-Arizona: initially working in Casa Grande and Tucson as a soil conservationist and local office supervisor. For the past 19 years he has worked as an Area Conservationist, at first working only in Southern Arizona and eventually his "backyard" means that he covers NRCS Field Operations Statewide.