Abstracts and Biographies of Speakers

(in order of presentation)

Invited Speaker: Dr. Daniel Berckmans, Catholic University Leuven, Belgium; University of Tennessee, USA

Title: Can Precision Livestock Farming Generate Value in Small Farms?

Abstract: This year again we will slaughter over 80 billion farm animals to feed the world. The worldwide demand for animal products is increasing by 65% till 2050. It is unimaginable that we need more farm animals seen the serious problems like environmental impact, disease transfer, one health, use of water and land. Today, most animal products are produced in factory farms using advantage of scale. In those farms it is impossible to monitor individual animals without precision livestock farming (PLF) technology that monitors animals 24/7. Do small farms have any chance to survive in the highly competitive world and evolving world? But small farms might have an advantage in the fundamental process of producing animal products. We show examples of the opportunities from PLF-technology.

Biography: Dr. Daniel Berckmans has a master's and a PhD in Bioengineering. He started research in 1979 at the KU Leuven (Catholic University of Leuven, ° 1425, over 65,000 students, ranked by Reuters as the 6th most innovative university worldwide thanks to the 184 spin-off companies). Daniel headed as Full Professor for over 25 years the research Division M3-BIORES (Measure, Model and Manage Bio-responses). Due to Belgian law, he had to retire from KU Leuven in 2017 as full professor to become full professor emeritus with an assignment and is appointed as Adjunct Distinguished Professor at the University of Tennessee USA. The research team counted continuously 25 to 30 PhD students. The team at University of Tennessee has today 33 people. Daniel is founder and CEO of BioRICS NV/Inc, a KU Leuven spinoff focusing on continuous monitoring of human and animal mental and physical health. He co-authored over 340 peer reviewed journal publications, over 450 conference papers, 20 patents, participated in 64 PhD commissions in 9 countries and promoted over 300 Master theses. His Web of Science H-index is 56, in Google Scholar H 72 and I-10 index of 310. He is recognized as one of the World's Top 2% most widely cited scientists, an accolade bestowed by Stanford University. He is recognized as an ASABE Fellow, a title given to 332 people worldwide since 1972 in 2024. He co-developed 20 products for the world market with industrial partners. Daniel is considered worldwide as the spiritual father and academic leader of the field of Precision Livestock Farming (PLF). Research he started in his team in the nineties. He co-founded and is president of the European Association of Precision Livestock Farming that organizes since 2003 the 2-yearly European Conference for Precision Livestock Farming 'ECPLF'. Daniel aims for worldwide scientific collaborations.

Invited Speaker: Dr. Jeffery K. Tomberlin, Texas A&M University, College Station, USA

Title: Expanding Black Soldier Fly Beyond Current Industrial Practices: Opportunities & Challenges

Abstract: The black soldier fly, *Hermetia illucens* (L.), (Diptera: Stratiomyidae) stands at the forefront of innovative solutions within the bioeconomy, offering significant advancements centered on sustainability. Across cultures and history, sustainability has shaped approaches to agriculture, urban planning, and resource management. Traditional practices that prioritize the optimal use of resources and regenerative cycles demonstrate enduring principles that closely align with contemporary bioeconomic strategies. Within the black soldier fly industry, diversification through small-scale production models offers vital pathways to empower local communities and strengthen local resilience. The unique versatility of the black soldier fly bridges disciplines such as entomology, plant science, poultry, aquaculture, economics, engineering, and medicine, promoting collaborative research and fostering new opportunities for innovation. Collaborative initiatives at the University of Tennessee—including extension programs and community resource networks—act as catalysts for integrating black soldier fly applications into communities across the region, nation, and world. By combining cutting-edge technology, while leveraging expertise from a range of academic fields, with current programs in place, the black soldier fly industry reveals transformative potential for building sustainable, resilient economies.

Biography: Dr. Jeffery K. Tomberlin is a Professor, AgriLife Research Fellow, & Presidential Impact Fellow in the Department of Entomology at Texas A&M University and Fellow of the Entomological Society of America. He is the principal investigator of the Forensic Laboratory for Investigative Entomological Sciences (F.L.I.E.S.) Facility (https://forensicentomology.tamu.edu) at Texas A&M University, and he is the Director of the National Science Foundation Center for Environmental Sustainability through Insect Farming. Research in the F.L.I.E.S. Facility examines species interactions on ephemeral resources such as vertebrate carrion, decomposing plant material and animal wastes in order to better understand the mechanisms regulating arthropod behavior as related to arrival, colonization and succession patterns. The goals of his program are numerous; however, a major focus of his research is waste management in confined animal facilities as well as concerns with food waste being placed in landfills and how the black soldier fly can be used to recycle such materials. His research efforts for the past 27 years have been developing methods for the production of alternate protein sources for use as livestock, poultry and aquaculture feed from these resources. Predominately, these efforts have been accomplished through his research with the black soldier fly. Since arriving at Texas A&M University in 2002, 19 Ph.D. and 21 M.S. students have completed their degrees under his supervision. To date, he has edited 8 books, published 28 book chapters, and +260 research articles which have more than 18,500+ citations. Through his efforts, he was recently recognized as a Fellow by the Entomological Society of America. Dr. Tomberlin welcomes those that are interested in collaborating or gaining experience in black soldier fly as a sustainable system to produce protein or other areas of his research to visit the F.L.I.E.S. Facility. Dr. Tomberlin has worked with companies throughout the world including, but not limited to Malaysia, China, and Australia. He has also given presentations (e.g., TEDx) on research throughout the world as well (e.g., 35 countries to date).

Invited Speaker: Theodore (Ted) Henry, Heriot-Watt University, Edinburgh, UK

Title: Challenges of Sustainability for Aquaculture Enterprises and Artisanal Fisheries in Emerging Economies Confronting Global Crises

Abstract: Small-scale aquaculture enterprises and artisanal fisheries provide the primary sources of protein for human consumption within many communities of emerging economies. Both sources of fish are especially vulnerable to environmental disturbances, mismanagement, and the lack of sustainable systems to provide reliable products to market. Increasing global challenges of climate change, alterations in land use, and pressures of human populations will place greater demands on these systems. Solutions not only lie in enabling access to science and technologies, artificial intelligence, and education, but even more importantly rely on social sciences to build cultural understanding, relationships, and respect as we work towards global fairness. This presentation will use examples from projects in Africa and Amazonia to illustrate challenges that are being confronted by small-scale aquaculture and artisanal fisheries in the management of these resources, sustainability, and the rapid changes that are underway.

Biography: Dr. Theodore (Ted) B. Henry is a Professor of Environmental Toxicology and the Global Head of the Institute of Life and Earth Sciences, in the School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University; he is also the Director of the ENABLE Scholarship program that provides access to HWU Master of Science degrees in programs that address UN Sustainable Development Goals for scholars within emerging economies. Ted has published extensively on the effects of toxicants in surface waters and is particularly focused on environmental issues within tropical ecosystems with current projects in Brazil, Africa, and Malaysia. As a former U.S. Peace Corps Volunteer (Togo 92-94), he is a developer of people and communities and is now part of the Africa Centre of Excellence for Sustainable Cooling and Cold Chain (ACES) where he leads development of the Centre for Master's Training for sustainable cooling systems. While much of his work is conducted internationally, he is based in Campinas, Brazil, where he and his wife live.

Invited Speaker: Dr. Yuji Arai, University of Illinois at Urbana Champaign, Urbana, USA

Title: Current Challenges and Future Directions in Crop Nutrient Management

Abstract: Modern agriculture has emerged through the transition from the British Agricultural Revolution (e.g., crop rotation) to the Green Revolution (e.g., mechanization and scientific innovations such as synthetic fertilizers and selective breeding). This transition made our agriculture a high-yield industry to support a growing global population. However, modern agriculture faces numerous challenges in maintaining food production and security, and environmental health. In this presentation, the challenges of crop nutrient management (e.g., degradation of soil health and water quality, fluctuating fertilizer market, the effects of altered weather patterns on planting season, and the declining nutritional value of crops) and the future directions to overcome these obstacles will be discussed.

Biography: Dr. Yuji Arai is an Associate Professor of environmental soil chemistry at the Department of Natural Resources and Environmental Sciences at the University of Illinois at Urbana-Champaign. Dr. Arai received a B.S. degree in soil and water sciences from the University of California, Davis, and a Ph.D. in environmental soil chemistry from the University of Delaware. He has been teaching the introductory soil science and soil-water chemistry courses for over 20 years and employing a broad range of traditional and cutting-edge molecular-scale approaches and tools at various temporal scales to better understand the mechanisms responsible for macroscopic reactions (e.g., adsorption, precipitation, redox reactions) of nutrients and inorganic contaminants, including engineered nanoparticles, in soils. He is known for the use of in-situ molecular-scale techniques (e.g., synchrotron-based X-ray techniques, vibrational spectroscopy, Nuclear Magnetic Resonance) in environmental soil chemistry and geochemistry research. He has been actively disseminating research findings in peer-reviewed international publications (H-index: 42) and scientific conferences, including invited lectures and presentations. He is a recipient of the 2016 Marion L. and Chrystie M. Jackson Soil Science Award from the Soil Science Society of America. Dr. Arai currently serves as the Vice-President of The Clay Minerals Society.

Invited Speaker: Dr. Charles Martinez, University of Tennessee, Knoxville, USA

Title: Finding Profitability on Every Acre

Abstract: Regardless of an operation's size, profit maximizing production and practices can be achievable. Larger operations have economies of scale that aid in their production costs. Smaller operations have flexibility to their advantage, and different marketing avenues compared to larger operations. But what is the most optimal solution for smaller-sized producers/operations? This session will help participant's think through profitability for their operation, regardless of size or production, and highlight how production and practices can be profit maximizing.

Biography: Dr. Charley C. Martinez is an Assistant Professor and Extension Economist in the Department of Agricultural and Resource Economics at the University of Tennessee. He also serves as the Director of the UT Center of Farm Management. His research and Extension programming involves the fields of farm and financial management, experimental economics, livestock and meat market economics, and policy. Charley received his BS in Agricultural Business-Ranch Management from Texas A&M University-Kingsville, and his PhD in Agricultural Economics from Texas A&M University.

Invited Speaker: Dr. Vanja Jurisic, University of Zagreb, Zagreb, Croatia

Title: Maximizing Biogas Yields *via* Targeted Bioaugmentation in Anaerobic Digesters

Abstract: Bioaugmentation of anaerobic digesters using lignocellulosic biomass as substrates is an important strategy to enhance biogas production. It involves adding specific microbial consortia to improve the breakdown of complex organic of the lignocellulosic biomass. Bioaugmentation enhances the degradation efficiency of the substrate, leading to increased biomethane yields. Studies have shown that bioaugmentation can improve microbial activity by introducing specialized microbes that accelerate hydrolysis and methanogenesis phases of anaerobic digestion. This results in higher biogas volumes and better process stability. Moreover, bioaugmentation can adapt the microbial community to better handle the complex structure of lignocellulosic substrates, optimizing energy recovery while reducing retention times.

Biography: Dr. Vanja Jurišić, Associate Professor at the University of Zagreb Faculty of Agriculture, Zagreb, Croatia. Her expertise is related to the field of RES from agriculture, especially the production of liquid (ethanol, biooil) and solid biofuels from lignocellulosic biomass (agricultural residues and dedicated energy crops). V. Jurisic has published 150+ scientific papers, of which 40+ papers are indexed in the WoS database, and has participated in 30+ scientific projects. She is currently coordinating the graduate study program "Renewable and Renewable Energy Sources in Agriculture" at the University of Zagreb Faculty of Agriculture and is acting as a president of the Danube region university network BIOEAST UniNET.

Invited Speaker: Dr. Douglas G. Hayes, University of Tennessee, Knoxville, USA

Title: Micro- and Nanoplastics: A Potential Threat to Agroecosystems

Abstract: Microplastics (MP) and Nanoplastics (NP) are an "emerging pollutant of concern" (European Environment Agency) that serve as a potential threat to food production and water systems globally, hence to human health. M/NPs reside in agricultural soils to a significant extent (~4400 particles/kg), where they reduce soil quality, harm soil biota, including microorganisms and plants, and serve as a reservoir of M/NPs, the latter of which can undergo transport into waterways and air. This presentation will focus upon our recent research involving NP behavior near water-soil interfaces. Using wet grinding as a surrogate method to mimic the low-energy processes that slowly degrade MPs in soil, we found that NPs formed are bimodal in their size distribution (500-1200 nm and < 200 nm, respectively) and that minor components in the M/NPs leach out. Our studies using small-angle neutron scattering (SANS) and batch tests demonstrate that collisions between soil particles and NPs reduce the occurrence of homoaggregation of NPs and the size of the larger NP subpopulation. Collectively, these results demonstrate the importance of electrostatic attractive and hydrophobic interactions in controlling the behavior of M/NP at interfaces and the complexity of the systems involved.

Biography: Dr. Douglas Hayes, Institute Professor of Biosystems Engineering at the University of Tennessee (UT), received his BS from Iowa State University in 1986 and his PhD in 1991 from the University of Michigan, both degrees in Chemical Engineering. He also earned an Executive MBA-Strategic Leadership degree from UT in 2022. He served as a postdoctoral research scientist for the US Department of Agriculture from 1991-1993 and then a Professor of Chemical Engineering at the University of Alabama in Huntsville from 1994-2003, before joining UT in 2004. He currently serves as Editor-in-Chief of *Journal of Surfactants and Detergents* and is on the editorial board for three other journals. He has received several awards, including being named Fellow of the American Oil Chemists' Society. He has co-authored over 115 journal articles, 24 book chapters and co-edited 3 books. His research interests include biodegradable plastics, environmental impacts of micro- and nanoplastics, surfactant self-assembly systems, and enzymatic reactions in nonaqueous media.

Invited Speaker: Dr. Davor Kralik, Josip Juraj Strossmayer University of Osijek, Osijek, Croatia

Title: Circular Food Management Models: Waste Prevention, Recycling and Reuse

Abstract: A new report by the United Nations Environment Programme has revealed the shocking extent of global food waste. Its Food Waste Index for 2021 estimates that people throw away 931 million tonnes of food annually, with an average of 74 kg of food waste per capita per household. 569 million tonnes falls into the household waste category. Supermarkets and other businesses are also guilty of disposing of significant amounts of food, and the total amount discarded also adds up to hundreds of millions of tonnes annually. The report estimates that food services waste 244 million tonnes annually, while retail wastes 118 million tonnes. Waste and by-products from food production have great potential for reuse across various production systems. Given the limitations in the industry, there is a strong tendency towards the possibility of using by-products and the use of essential food ingredients, as they can be an important source of compounds that can partially or completely replace certain raw materials.

Biography: Dr. Davor Kralik is a Full Professor in the Faculty of Agriculture of Josip Juraj Strossmayer University of Osijek, Croatia. He is a Croatian citizen, and during his professional and scientific career he has established himself as a prominent expert in the field of agricultural mechanization and renewable energy sources. His work is marked by his long-term engagement at the Faculty of Agriculture in Osijek, numerous scientific projects and publications, and his contribution to the development of sustainable technologies in agronomy. He received his master's degree from the Faculty of Agriculture in Zagreb in 1998 in the field of agricultural mechanization, and his doctorate in 2003 with the thesis focused on biogas production after separation from the liquid component of manure. He began his academic career in October 1994 at the Faculty of Agriculture in Osijek as a junior assistant in the field of mechanization in livestock farming. He was elected to the scientific and teaching title of assistant professor in November 2003 and was appointed the Head of the Department of Renewable Energy Sources in October 2005. Dr. Kralik has led many scientific and professional projects related to the application of renewable energy sources in agriculture. Since 2014, he has been the director of the company Obnovljivi izvori energije d.o.o. at the University of Osijek, where he leads and coordinates development projects related to energy efficiency and sustainable agriculture. Dr. Kralik has published more than 90 scientific papers, 11 of which are in the Current Contents database. His research interests include mechanization in livestock farming, biotechnological processes in agriculture, and the application of renewable energy sources, especially biogas. He has led several projects, among which the VIP project 'Biogas production on family farms' stands out. He actively participates in domestic and international professional organizations and is a member of the European Society of Agricultural Engineers. He is married and the father of two children. Throughout his career, he has strived to combine theoretical knowledge with practical application in agriculture, especially in the segment of energy efficiency and sustainable development.

Invited Speaker: Dr. José R. Fábrega, Technological University of Panama, Panama

Title: Research Opportunities in Water Resources and Their Nexus with Energy and Agriculture in Panama

Abstract: This presentation provides an overview of the primary challenges Panama faces regarding water use and examines their implications for national energy and food security. It also outlines the principal research topics currently pursued by the Center for Hydraulics and Hydrotechnical Research at the Technological University of Panama (UTP) and our Center's perspective for the future. Emphasis is placed on research related to the concept of a circular economy, specifically the transformation of wastewater into a resource generator.

Biography: Dr. José R. Fábrega graduated in Civil Engineering from the Santa María La Antigua University (USMA) of Panama. He obtained a Master's and Doctorate in Civil Engineering with a specialization in Environmental Engineering at Purdue University (Indiana, USA). He completed postdoctoral studies at Purdue University and the University of Connecticut. He is a Regular Full-Time Researcher at the Technological University of Panama (UTP), Director of the UTP Hydraulic and Hydrotechnical Research Center (since 2013), and President of the Board of Directors of the Panamanian Association for the Advancement of Science (APANAC) (since 2020). He has led the water program of Interamerican Network of Academy of Sciences (IANAS) (since 2013). Dr. Fábrega was a Member of the Board of Directors of the Global Water Partnership (GWP) (2019-2021) and is President of the Panama chapter of this association (2013-2017, 2021-present). He is President of the Panamanian chapter of the ASCE (2023-Present), Member of Panama's National Commission of Science, Technology and Innovation (CONACYT) (since 2020), Member of Panama's National Research System (SNI) (since 2014), and Fulbright Scholar (USA) (1992-1994), and Valedictorian of the USMA (class of 1990). He has (co)authored more than 30 publications in indexed scientific journals. He has also been PI and Co-PI of multiple international collaborative research projects and advisor of more than 25 undergraduate and graduate theses. Dr. Fábrega obtained professional licenses as a Civil Engineer in Panama, Costa Rica, and Indiana (USA).

Invited Speaker: Dr. Frank Löffler, University of Tennessee, Knoxville, USA

Title: Small Farm Circular Bioeconomy – A Roadmap for a Healthier Planet?

Abstract: Creating closed-loop systems in agricultural production promises a series of benefits including reduced reliance on synthetic fertilizers, soil health improvements, better-quality crops, and a reduced environmental footprint while maximizing farm profitability. The benefits of implementing circular bioeconomy principles at small farms are evident; however, knowledge gaps exist that can compromise the desired outcomes. For example, the unintended introduction of per- and polyfluoroalkyl substances (PFASs) into a circular system can compromise soil health and product quality. A circular bioeconomy system is expected to reduce waste and pollution; however, it is currently unclear if cycling of fixed nitrogen ultimately reduces or increases emissions of the greenhouse gas nitrous oxide (N_2O). These examples highlight the need for translational research to effectively address gaps in scientific understanding that may hinder rapid and widespread adoption of circular bioeconomy approaches.

Biography: Dr. Frank Löffler received a B.S. degree in Biology and an M.S. degree in microbiology from the University of Hohenheim in Stuttgart, Germany. He performed doctoral studies in biotechnology at the Technical University Hamburg-Harburg and received a Ph.D. degree (summa cum laude) in 1994. As an Alexander von Humboldt fellow, he conducted research in the NSF Center for Microbial Ecology at Michigan State University, before joining the School of Civil & Environmental Engineering at the Georgia Institute of Technology in Atlanta, GA as a faculty member. From 2010 to 2023, Dr. Loeffler served as Governor's Chair Professor at the University of Tennessee and Oak Ridge National Laboratory, and he directed the university's Center for Environmental Biotechnology. He currently holds the Goodrich Chair of Excellence in Civil Engineering and is Professor in the Department of Civil & Environmental Engineering. The Löffler laboratory explores the physiology, diversity, distribution, and ecology of microorganisms that control nitrogen turnover, carbon cycling, and contaminant detoxification, with the goal to harness, manipulate, and predict microbiome functions in both natural and managed habitats. Dr. Löffler is a fellow of the American Academy of Microbiology, is listed among the world's top 2% scientists in his field, has a Google Scholar H-index of 73.

Invited Speaker: Dr. Forbes Walker, University of Tennessee, Knoxville, USA

Title: Is Regenerative Agriculture the Future for Tennessee Agriculture?

Abstract: Since the 1980s Tennessee has been a leader in the development and implementation of no-till systems and other conservation practices such as the use of cover crops and crop rotations. Today, no-till systems are practiced on over 90% of all row-crop acres in the state. In the past five years the term regenerative agriculture has been receiving a lot of interest in the popular press, as well as industry. This presentation will review the current widely accepted definition(s) of regenerative agriculture and compare it with current and future agricultural production practices in Tennessee.

Biography: Dr. Forbes Walker is a Professor and has been an Extension Soil Specialist with the University of Tennessee Extension since 1998. As the Environmental Soil Specialist, he is responsible for coordinating educational and research programs in Tennessee in soil management, cover crops and soil health, nutrient and manure management, the appropriate use of alternative fertilizer materials, waste utilization, nutrient cycling, water quality and climate smart agriculture. In the past year he has been actively involved with a multi-disciplinary team of scientists assisting agricultural producers recover from the sometimes-devastating effects of Helene.

Invited Speaker: Dr. Sebastián Cambareri, National Institute of Agricultural Technology (INTA), Argentina

Title: Closing the Loop: Pecan Agroforestry as a Model for Circular and Regenerative Farming at the Southeastern Pampas of Argentina

Abstract: Pecan (*Carya illinoinensis*) orchards represent a promising model for integrating circularity and regeneration into agricultural systems of Argentina. As a long-lived nut tree species, pecans naturally link carbon storage, biodiversity, and soil health, offering an opportunity to demonstrate how perennial systems can recycle nutrients, strengthen resilience, provide food and eventually wood or energy to fuel diverse systems. Based on field studies conducted in Southeastern Buenos Aires (Argentina), this presentation explores the relationships between management practices, greenhouse gas (GHG) emissions, soil carbon sequestration, tree growth, and canopy structure. The dataset includes trunk diameters, tree height, crown volume, and fertilization regimes providing a comprehensive view of how pecan trees interact with their environment across seasons. Through the combination of these measurements, we aim to develop a predictive framework to anticipate ecological outcomes under different management scenarios. Although still in progress, this approach seeks to bridge empirical observation with data-driven insight, helping design more efficient and circular orchard systems. The results illustrate how pecan-based agroforestry can reduce external inputs, recycle organic matter, and promote carbon retention in soils. Ultimately, pecan orchards demonstrate that tree crops (when managed within a regenerative and circular paradigm) can contribute meaningfully to smart agriculture and to the redesign of farming landscapes towards long-term sustainability.

Biography: Dr. Gustavo Sebastián Cambareri is an environmental scientist and agronomist whose research bridges soil processes, sustainable agriculture, and climate mitigation. He earned his Ph.D. in Environmental Sciences from the University of Guelph, Canada, under the supervision of Dr. Claudia Wagner-Riddle, where he investigated nitrous oxide emissions in maize systems fertilized with liquid dairy manure. Earlier, he completed a Master's in Plant Production and a degree in Agronomic Engineering at the National University of Mar del Plata (Argentina). Currently, Dr. Cambareri serves as a researcher at the Instituto de Innovación para la Producción Agropecuaria y el Desarrollo Sostenible (IPADS Balcarce, INTA–CONICET), focusing on carbon sequestration, greenhouse gases dynamics, and the development of regenerative production models. His recent work centers on pecan (*Carya illinoinensis*) agroecosystems, evaluating carbon balance, tree growth, canopy architecture, and management effects on environmental performance. These studies aim to create predictive tools to improve orchard efficiency and resilience. He has authored publications in journals such as Frontiers in Soil Science, Canadian Journal of Soil Science, and Pecan South, contributing to the understanding of carbon storage and climate-smart management in perennial systems. Beyond research, he mentors students through international programs including the Global Research Alliance on Agricultural Greenhouse Gases (GRA). Dr. Cambareri's career integrates empirical fieldwork, international collaboration, and public engagement, advancing circular and regenerative pathways for the future of agriculture.

Invited Speaker: Dr. Jie (Joe) Zhuang, University of Tennessee, Knoxville, USA

Title: Restructuring Soil Pore System to Increase Carbon Sequestration Capacity of Soils

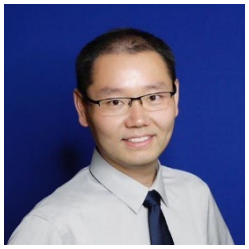
Abstract: A key process of soil regeneration is restructuring of soil pore systems. Without optimal soil pore system (e.g., hierarchical structure comprising pores with a wide range of sizes), soil chemical and biological restorations are impossible or extremely slow. Organic carbon sequestration through surface-coating and pore-filling is an effective process that reshapes soil pore systems by changing the distribution of soil aggregate fractions. The changed pore systems can exert feedback effect on further sequestration of organic carbon, enhancing soil carbon sequestration capacity. Under certain conditions (e.g., no-tillage, crop residue return to soil, and manure application), this carbon-pore synergy increases soil water hysteresis and drought tolerance. Often ignored processes that significantly influence carbon-pore interactions are the formation and stability of macroaggregates arising from organic carbon input and transformation. This presentation will address how the carbon-pore interactions vary with time, organic carbon input, soil disturbance, and nitrogen input. Our results provide an insight into the role of macroaggregates (an instable carbon pool) in facilitating new carbon transfer into microaggregates (a stable carbon pool) and increasing carbon sequestration.

Biography: Dr. Jie (Joe) Zhuang is a Professor in the Department of Biosystems Engineering and Soil Science, director of environmental and soil science graduate studies, member of the Advisory Council of University of Tennessee (UT) Institute of Agriculture, and faculty lead of UT Cluster Hire Initiative of Resilient Agriculture and Forest Systems (RAFS). He received his B.S., M.S., and PhD degrees in soil science from Shenyang Agricultural University (China). His research topics range from food-energy-water nexus to the fate and transport of contaminants (such as viruses, bacteria, organic pollutants, heavy metals, engineering nanoparticles, and nutrients), soil hydrology modeling, pore-scale carbon-water interactions, crop-water relations, and physical foundation of phage-host interactions. In recent years, he links soil science to food-energy-water nexus by innovating strategies or solutions for soil restoration, safe reclaimed water irrigation, and soil resilience to environmental stresses. Currently, Dr. Zhuang leads projects aiming to develop climate-smart food-energy-water nexus on small farms within the framework of circular bioeconomy. In teaching, he provides undergraduate and graduate students with transdisciplinary training for understanding the complexity and impacts of food-energy-water nexus, circular agriculture, and food circular bioeconomy.

Invited Speaker: Dr. Xi Zhang, University of Tennessee, Knoxville, USA

Title: The Role of Cover Cropping in Shaping Soil Structure and Subsurface Water Dynamics for Building Resilient Agroecosystems

Abstract: Crop production is highly susceptible to extreme weather conditions. United States is experiencing increasing variability in rainfall, which can lead to more frequent soil water deficits during the growing seasons and increased the risk of yield losses. To close crop yield gaps, it is critical to develop management practices that buffer against short-term water stress and sustain crop production. Cover cropping has potential in increasing soil organic matter and improving soil structure and thus enhancing soil water retention. However, cover crops transpire water for their growth, and conserve soil water after they are terminated if the residues are retained on soil surface. The overall impacts of cover cropping on yield due to changes in soil water storage, availability, and recharge for cash crops are complex and context dependent. It is unclear whether the adverse effects of cover cropping on water balance can be offset by improved soil water retention to mitigate drought impacts. This work aims to untangle cover cropping and soil water dynamics interactions for evaluating the benefits of cover cropping for crop production in humid subtropical southern regions. This study provides insight into optimizing cover cropping management to build resilient agroecosystem and sustain crop production in a changing climate.



Biography: Dr. Xi Zhang is an Assistant Professor in the Department of Biosystems Engineering and Soil Science at the University of Tennessee, Knoxville. The central theme of his work has been to understand how environmental changes (e.g., climate, land cover) and perturbations (e.g., land use, agricultural management) in the Anthropocene govern the functioning of the Earth's critical zone and how this interaction influences soil physical environment evolution, hydrologic cycles, biogeochemical processes, soil-climate feedback loops, and ecosystem services.

Invited Speaker: Dr. Eminé Fidan, University of Tennessee, Knoxville, USA

Title: Transdisciplinary Teamwork in the Era of AI: A Way to Empower Communities and Mitigate Disaster Limitations with Respect to FEW systems

Abstract: Transdisciplinary collaborations are a powerful tool for understanding community operational and organizational strengths. These information resources can be leveraged and focused to empower communities and mitigate disaster limitations with respect to Food, Energy, and Water (FEW) Systems. In the face of complex and compounding effects of multiple disasters, integrating transdisciplinary frameworks with artificial intelligence (AI) offers new opportunities for data-driven decision-making, predictive modeling, and community-informed resilience planning. This presentation explores how AI-enabled analytics, when coupled with participatory and cross-sectoral collaboration, can help identify system vulnerabilities, optimize resource distribution, and enhance adaptive capacity across FEW systems. By bridging disciplinary boundaries and technological innovation, this work highlights pathways for empowering communities to understand, anticipate, withstand, and recover from disruptions more effectively.

Biography: Dr. Eminé Fidan is an Assistant Professor of Ecological Systems Engineering at the University of Tennessee. Her research leverages data analytics and AI to understand how extreme weather and disturbances impact agriculture, water resources, and ecological communities. Her prior research includes quantifying water-quality impacts from Hurricane Florence (2018), characterizing flood dynamics in agricultural landscapes during Hurricane Matthew (2016), and co-designing community-based resilience interventions in Puerto Rico following compound hurricane events. She is presently engaging with agricultural producers impacted by Hurricane Helene (2024) to support recovery of agroecosystems.

Invited Speaker: Dr. Charels Cao, University of Tennessee, Knoxville, USA

Title: AI-Enabled Precision Agriculture Management: From Disease Detection to Smart Farming

Abstract: The integration of AI and Internet of Things (IoT) technologies is transforming precision agriculture, including livestock management, row crops, among others. This presentation discusses practical AI-based IoT-based solutions for smart farming, with a focus on disease detection and control in dairy cattle. I will present our earlier work on SocialCattle, an AI-IoT-based framework that uses wearable sensors and social behavior analytics to detect and predict mastitis infections in dairy herds. By tracking cattle movement patterns and social interactions through GPS sensors, we developed probabilistic models that can identify high-risk animals for early intervention, reducing disease spread and treatment costs. The talk will cover: (1) practical sensor deployment strategies for small farms, (2) data-driven decision making for disease management, (3) integration of AI/ML for predictive analytics, and (4) lessons learned from real-world deployments. I will also discuss our ongoing USDA-funded precision dairy farming project and emerging opportunities for AI-powered agricultural monitoring systems. The presentation aims to bridge the gap between academic research and practical implementation for small farm operations.

Biography: Dr. Charles Qing Cao is an Associate Professor in the Department of Electrical Engineering and Computer Science at the University of Tennessee, Knoxville. He received his Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign in 2008. His research focuses on Gen-AI, Internet of Things (IoT), cyber-physical systems, and applications in precision agriculture and smart farming. Dr. Cao leads multiple federally funded projects including a USDA/NIFA precision dairy farming initiative on real-time disease monitoring and diagnosis, and an NSF AI-ENGAGE project on AI based holistic agricultural response validation systems. Dr. Cao's research emphasizes practical, data-driven solutions that can be deployed in real-world agricultural settings to improve farm productivity and animal welfare.

Invited Speaker: Dr. Lyda Hok, The Royal University of Agriculture, Cambodia

Title: Potential Extension Pathways for Sustainable Agricultural Intensification Practices in Cambodia: Farmer Fields and Secondary School Systems

Abstract: The further transformation of agriculture in Cambodia through the development of sustainable agricultural intensification practices has contributed to the improvement of agricultural productivity and soil health. The technology transfer process that involves the relationship between the knowledge providers and users significantly affects the adoption. Drawing on the experience of the Center of Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN), the presentation highlights the extension mechanism to transfer agricultural research findings from researcher-managed plots to smallholder farmers in rural communities and secondary school students who engage in mini-agricultural technology parks serving as interactive learning and demonstration platforms on school campuses. These pathways could connect some missing gaps to move closer to resilient and circular smallholder farming systems by fostering the adoption of promising agricultural practices and establishing a coordination mechanism and extension systems for farmers and youth. This approach helps raise a new generation of agriculturally literate youth, future farmers, and qualified frontline extension agents to facilitate the smoother adoption of sustainable agricultural intensification practices.

Biography: Dr. Lyda Hok currently serves as the Dean of the Faculty of Agricultural Education and Communications as the Director of the Center of Excellence on Sustainable Agricultural Intensification and Nutrition (CE SAIN) at the Royal University of Agriculture, Cambodia. Holding a Ph.D. from North Carolina A&T State University, his career is dedicated to promoting sustainable agricultural intensification in Cambodia through research on soil health in conservation agriculture, the development of innovative extension pathways, and strengthening the capacity of frontline agricultural extension agents. He has directed and co-led numerous multi-stakeholder projects funded by various development partners.

Invited Speaker: Dr. Tabibul Islam, University of Tennessee, Knoxville, USA

Title: Dynamic Environmental Control Strategies for Resource-Efficient Controlled Environment Agriculture

Abstract: Controlled Environment Agriculture (CEA) enables year-round strawberry production but faces energy and resource challenges. We are exploring dynamic environmental control strategies to improve efficiency by examining the effects of light quality, photoperiod, temperature, and plant genotypes on growth and fruit quality. Our experimental data will train reinforcement learning models that drive AI for real-time environmental adjustments, optimizing plant performance and reducing energy use. By applying circular economy principles, such as energy recovery and sustainable inputs, this research aims to develop scalable, resource-efficient CEA systems that support sustainable, low-waste production for smallholder and commercial farms.

Biography: Dr. Tabibul Islam is an Assistant Professor at the Plant Sciences Department, UTIA. He is leading research to enhance the performance of fruit crops in controlled environment agriculture (CEA). By integrating plant physiology, biochemistry, molecular biology, and environmental management, he aims to optimize growth, enhance stress resilience, and improve resource-use efficiency for fruit crops. Furthermore, he is actively working on innovative biomaterials and the development of RNA interference (RNAi)-based biopesticides, with the potential to revolutionize crop production systems.

Invited Speaker: Dr. Dale Manning, University of Tennessee, Knoxville, USA

Title: The Fiscal Impact of Biodiversity Loss and a Pathway for Conservation Finance

Abstract: The Global Biodiversity Framework seeks to leverage private finance to achieve conservation goals. Therefore, identifying instances where conservation investment can generate positive returns for private investors is an imperative. Here, we investigate how natural asset changes impact municipal bond yields by examining the effects of sudden bat population losses on the bonds of rural counties. Bats provide pest control services for farmers. Bat population losses reduce agricultural land tax revenues, driving up bond spreads in affected counties by 11.5 basis points, a 27% increase. This result implies that conservation investors purchasing bonds with a principal value of $1 million and restoring bats could expect bond prices to increase by $13,855. This payoff can potentially cover conservation costs without new government actions.

Biography: Dr. Dale T. Manning is an Associate Professor of Agricultural and Natural Resource Economics at the Howard H. Baker Jr. School of Public Policy and Public Affairs at the University of Tennessee, Knoxville. His research focuses on natural resource and environmental economics, development economics, and the intersection of economic policy with sustainable resource management. Dr. Manning joined UT in 2024 after more than a decade at Colorado State University. He uses optimization methods, integrated modeling, and econometrics to investigate topics such as the fiscal impacts of biodiversity loss, agricultural resilience to climate change, and the economics of groundwater management.

Invited Speaker: Dr. Sathish Samiappan, University of Tennessee, Knoxville, USA

Title: Evidence-Based Land Conservation Framework Using Multi-Criteria Acceptability Analysis

Abstract: Dr. Sathish Samiappan will present Conservation Prioritization Tool (CPT), developed to support data driven land conservation decisions based on openly available GIS and remote sensing data. This project was funded by the U.S. Fish and Wildlife and this tool was developed based on a co-production framework. This web-based geospatial tool utilizes multi-criteria decision analysis (MCDA) to evaluate areas for land conservation based on ecological and socioeconomic priorities identified by stakeholders in the Gulf of Mexico coastal region. The CPT allows users to weight conservation goals and data measures, providing a flexible and transparent framework for strategic land conservation planning. It is designed to be user-friendly and accessible online, requiring minimal prior GIS knowledge.

Biography: Dr. Sathishkumar (Sathish) Samiappan is an Associate Professor in the Department of Biosystems Engineering at The University of Tennessee at Knoxville. He has a Ph.D. in Electrical and Computer Engineering from Mississippi State University, where he also held positions as an Associate Research Professor, Assistant Research Professor, and Postdoctoral Associate at the Geosystems Research Institute between 2014 and 2024. His research interests include the application of remote sensing, artificial intelligence, and machine learning to various fields such as agriculture, environmental monitoring, and wildlife management.

Invited Speaker: Mr. Asher Wright, Farm Director of Caney Fork Farm, Nashville, Tennessee, USA

Title: Regenerative Agriculture in Middle Tennessee

Abstract: This presentation will explore the spectrum of regenerative agriculture in the United States through the lens of a 550-acre regenerative organic farm in Middle Tennessee. Small bioregional farms play an important role in food system resilience and food sovereignty by decentralizing and decommodifying food production in a way that puts power back into the hands of farmers and regional communities.

Biography: Asher Wright has been working in regenerative agriculture since 2005, with a heavy focus on diversified crop and livestock systems. He loves all things related to agriculture and food systems. His career experience began at the agriculture program at Warren Wilson College, which led him to work on farms around the US and Central and South America. After his travels, he received an M.S. in Animal Science from Clemson University. While at Clemson, he researched forage-finished beef, studying both animal performance and the interface between meat quality and human health. Asher has a diverse career background working in both for-profit farm businesses and agriculture education. He is also an Accredited Professional with the Savory Institute. Asher is particularly excited about the role that Caney Fork Farms can play in the world and the opportunity to be a part of a team working to make a strong business case for regenerative agriculture through the integration of research and production agriculture.